

# A scoping study of vegetable

# seedling systems in urban

# and peri-urban areas of Nairobi, Kenya

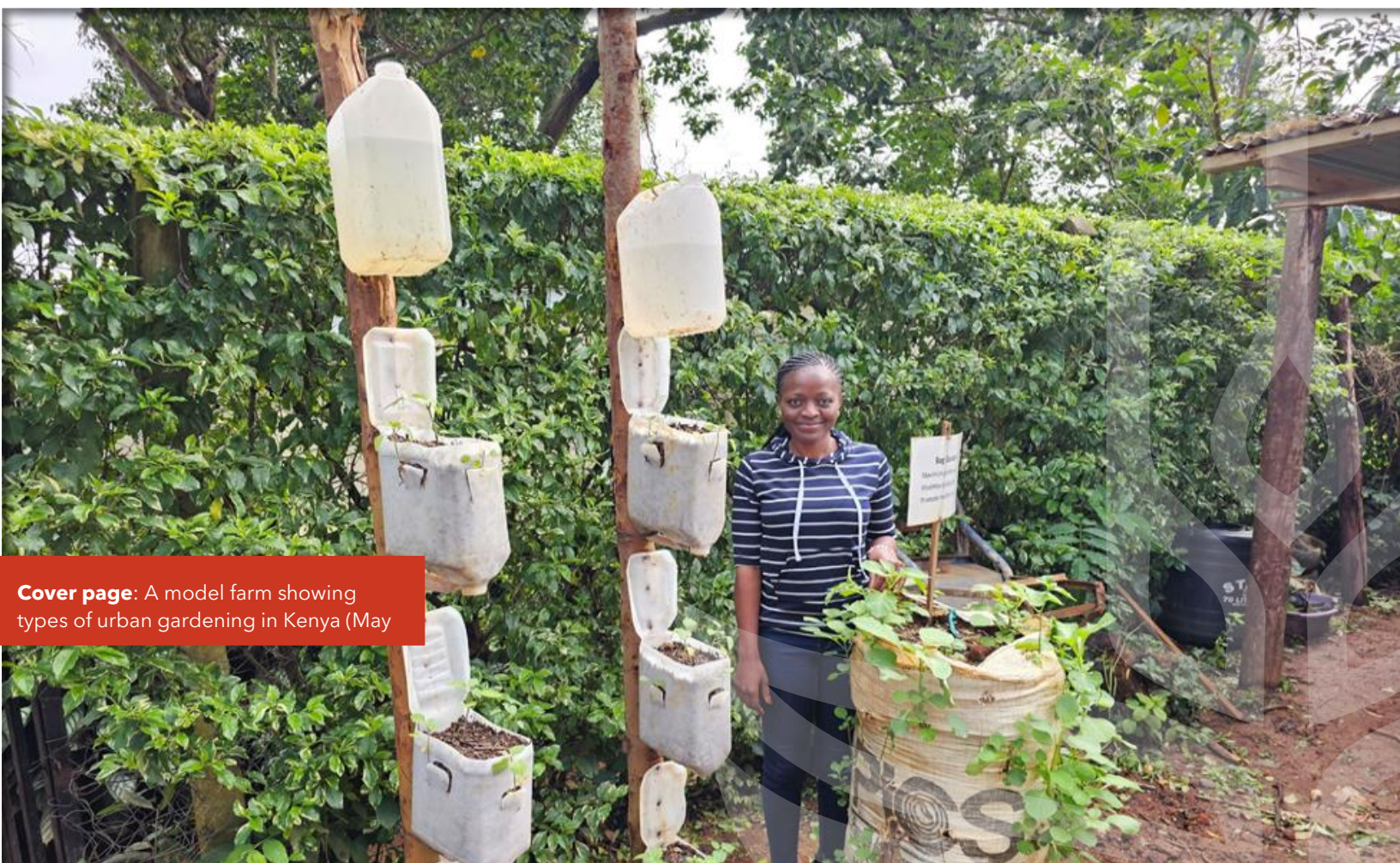


INITIATIVE ON  
Resilient Cities

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**Cover page:** A model farm showing types of urban gardening in Kenya (May

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The above notwithstanding, the authors take responsibility for the contents of this report.



## Acronyms

AGRA	Alliance for a Green Revolution in Africa
APHRC	African Population & Health Research Centre
AIVs	African Indigenous Vegetables
ENABLE	Empowering Novel Agribusiness-Led Employment Youth Kenya
FAO	Food and Agriculture Organization of the United Nations
FGD	Focus Group Discussion
IITA	International Institute of Tropical Agriculture
ISTA	International Seed Testing Association
KII	Key Informant Interview
KEPHIS	Kenya Plant Health Inspectorate Service
KES	Kenya Shillings
NEFSALF	Nairobi and Environs Food Security, Agriculture and Livestock Forum
NGO	Non-Governmental Organization
OECD	Organisation for Economic Co-operation and Development
UPU	Urban and Peri-urban Agriculture

## Executive Summary

Agri-food systems in Kenya are facing unprecedented challenges including the triple burden of malnutrition, environmental degradation and climate change. Increased urbanization and population growth is further exacerbating the food provisioning challenges. Urban and peri-urban agriculture (UPU) has been touted as a pathway for achieving food security through supply of fresh, nutritious and affordable food especially to the urban poor. UPU can also contribute to nutrient recycling and biodiversity conservation. Against this, this study sought to assess the role of improved seedling systems on urban and peri-urban food safety and production. The study employed a range of methods including, review of documents, interviews with urban farmers and, a survey of 50 commercial seedling propagators in the greater Nairobi region of Kenya.

Vegetable farming accounts for the majority of UPU enterprises in the greater Nairobi region. Kales, spinach, tomato and onions are the mostly widely produced vegetables - usually through open field agriculture. In turn, at least half of the propagators surveyed produced kales, spinach, onion, lettuce, tomato and cabbage seedlings. Linkages between the urban farmers and propagators can increase seedling uptake. This can also be catalysed by mass adoption of new production methods including rooftop farming, greenhouses and hydroponics.

Seedling propagators sampled were mostly males aged 40 years or more. UPU programming must deliberately include the women and youth. Across the propagation sites, only 40% of the operators had formal training in seedling management. Propagators expressed the need for formal training in agronomy. Such training would also enforce the requirement of registration with the Kenya Plant Health Inspectorate Service (KEPHIS). Whereas such registration is mandated by the law, half of the propagators were non-compliant, potentially undermining the quality assurance of their products. In Kenya, about 300 nurseries are certified in Kenya. Majority of the uncertified propagators face a myriad of challenges including poor seedling production systems, unprotected structures that aid pests and diseases and, limited documentation of source of propagation material. The lack of training in formal propagation systems means limited use of bud grafting among vegetable seedlings. Proper understanding of propagation (cutting, layering, division, grafting, budding) is still limited among propagators.

Seedling propagators can be classified by size, location, type of seedling sold and target market. On average, they sold over 3000 seedlings per month for different vegetables. Farmers, schools, hospitals, county governments and retailers were the main buyers of the seedlings. The retailers comprised wet markets, plant markets, supermarkets and roadside sellers. For most enterprises the price of the seedling was KES 4, depending on the volume and quality. The findings also suggest lack of organised marketing arrangements between propagators and buyers leading to low uptake of seedlings. The collective action mechanisms for bringing the buyers and sellers together appeared weak and fragmented.

Agronomic considerations for quality seedling production are widely varied among propagators. The sample respondents reported regular use of certified seed, animal manure and compost, mineral fertilizers and, chemicals for pest and disease control. Integrated pest management practises were scarce on account of limited training. There was also little or no documentation of the seedling characteristics propagated. Seedling producers did not have information on the available varieties from research organizations, some which are highly productive and disease resistant as per market requirements. Half of the seedling production relied on conventional

production and did not incorporate greenhouse technology or hydroponics. In addition, most vegetable seedlings were packed in non-recyclable trays and polythene. The shift to renewable, compostable, and durable, options is slow due to their high cost, as well as availability. Policy measures to make eco-friendly packaging cheaper is desired.

Conventionally, seedlings are propagated on soil seed beds (seedling nurseries). Use of soil-less media in screenhouses is now being promoted since it has high germination and low transplant shock. Only 34% of the propagators used soil-less media. Cocopeat, peat moss and perlite were the most used media, usually by large propagators – due to high cost and technical knowledge on the application. Reducing the cost of the media and increasing training on its use, can help increase uptake.

The seedling sector consists of formal and informal systems. Over 80% of the farmers rely on the informal systems characterised by using own seed and buying seed from uncertified sources. The formal seed system on the other hand operates through an established regulatory process and according to international seed testing and certification schemes. Whereas, the seedling operators are guided by various laws and regulations, we observed low compliance with respect to registration with KEPHIS and the County government and trading of quality products. Enhancing institutional support from KEPHIS, County Governments and research organizations can help increase compliance and quality. Access to land, water, extension and market information can also ensure uptake of quality seedlings.

Increasing uptake of seedlings in UPU requires various interventions. Collective action mechanisms that link propagators and existing retailers can help increase utilization of quality seedlings. This can be enhanced by promoting use of schools, public spaces and homesteads as places for gardening. Also, seedling propagators require capacity strengthening in multiplication of local varieties, sustainable production of seedlings and, use of new systems such as vertical gardening and soil-less media.

In light of demand–supply gaps being wide in the industry, there is need to increase market information among stakeholders. Information on nursery management, pricing, location of sellers, extension, types of seedlings, propagation systems and quality, may help increase uptake. Leveraging on ICT may be help accelerate information access at a low cost. Also, there is need for a policy change to strengthen greater flexibility in the applicable legal and regulatory framework. This includes the prioritization of breeding of vegetables in the National Seed Policy, which would need to be updated and develop a strategy for the vegetable seed/seedling industry. The policy framework could also be revised to allow for the registration and commercialization of traditional/indigenous vegetable varieties.

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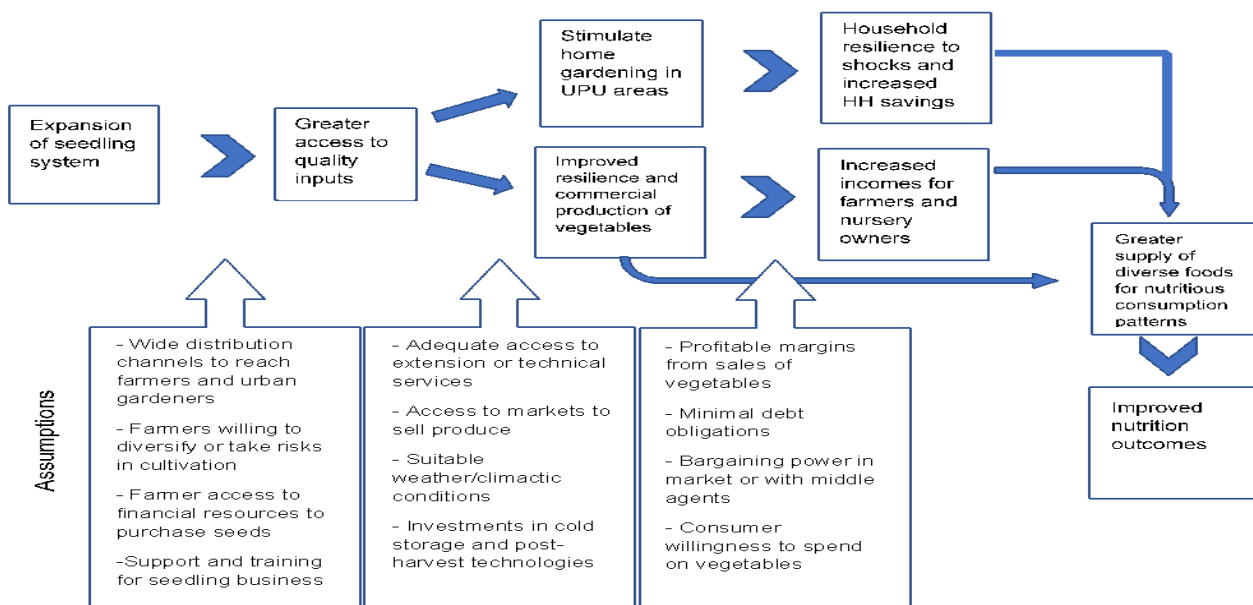
# Section 1: Introduction

## 1.1 Background

The 2030 Agenda for Sustainable Development highlights the pivotal role agri-food systems play in tackling global challenges, such as malnutrition and poverty. The COVID-19 pandemic had serious long-term impacts on the already fragile livelihoods and developing economies across the World. In Kenya, some of the impacts include: reduced agricultural production and supply chain disruptions. As a result, urban populations remain vulnerable as Kenya’s population is already more urbanized with 1 in 3 already living in urban areas and a projected 54% urban population by 2030.

In view of this rapidly rising urbanization, Kenyan urban food systems are experiencing competing demands of limited resources, climate change, pressing environmental stresses, and growing food demands. Meanwhile, nutrition indicators among the most vulnerable populations remain stagnant or are worsening in the absence of nutritionally diverse diets. As such, creating resilient agri-food systems is key if the population is to continue getting access to food that is safe, nutritious and affordable. At the heart of these systems are nutritious but highly perishable foods such as fruit and vegetables. Food production in these urban and peri-urban (UPU) environments face a wealth of challenges, however, including land tenure insecurity, access to water and other inputs and contamination of soil and water with chemical pollutants, plastics, heavy metals or pathogens.

Against this, The International Institute of Tropical Agriculture (IITA) in conjunction with The World Vegetable Center (WorldVeg), and within the context of the One CGIAR initiative “Resilient Cities Through Sustainable Urban and Peri-urban Agri-food Systems,” sought to understand the landscape of UPU agriculture. The overall key research question was “What is the effect of improved seedling systems on urban and peri-urban food safety and production?” Improving vegetable seedling systems can improve productivity, safety, production and access to vegetables in UPU areas (Figure 1).



**Figure 1: Theory of change for improved access to seedlings for vegetable production and nutrition outcomes**

Figure 1 shows that expanding access to and quality of seedlings can stimulate production and improve resilience of vegetable systems. This is hinged on establishing channels through which commercial farmers, home gardeners and nursery owners can supply quality seedlings. In addition, commercial seedling suppliers create demand for quality inputs, such as improved seed varieties, soil media and indigenous bio-based inputs, and create job opportunities for youth and women in seedling nurseries and seedling retail.

## 1.2 Objectives of the study

The study was guided by the following research questions, that encompass both the socioeconomic and biophysical domains. The questions are organized in four themes.

### A. Current status of urban and peri-urban vegetable production

- i) What vegetable species are commonly produced in and around the focus city? Which of these potentially lend themselves for seedling production in nurseries?
- ii) What are the characteristics of current commercial vegetable producers and home gardeners (e.g., location, socioeconomic background, age, gender, employment, land size and tenure, water sources and access, labour use)?
- iii) What technical challenges do commercial producers and home gardeners typically encounter with regard to vegetable seed and seedlings?
- iv) Do commercial producers and home gardeners already purchase seedlings from the market? How does this vary by location, crop or gender of the producer?
- v) Are any seedlings grafted? If so, describe existing root and scion combinations.

### B. Understanding market demand for vegetable seedlings

- i) Who are and how many commercial vegetable seedling propagators are there? Characterize their business in terms of scale or operations, target markets, professionalism and expertise, use of technology, and employment of youth and women.
- ii) Where are vegetable seedlings sold (e.g., wet markets, plant markets, supermarkets, online, by government offices)? Who are the main buyers?
- iii) How widely are these retail outlets available across the UPU landscape? That is, how easy is it for (men and women) farmers and gardeners to obtain them when needed?
- iv) What is the observed price and quality of the available seedlings? What is the diversity in terms of species and varieties?
- v) What is the existing demand from commercial producers and/or home gardeners for seedlings? Are they aware, are they interested, is their demand satisfied or is it unmet?
- vi) Do commercial producers and home gardeners have any specific requirements about the appearance of seedlings, type of containers used, packaging, etc.?
- vii) What key UPU locations offer good potential to sell quality seedlings?
- viii) Which kind of retailers could be enticed to sell vegetable seedlings?

### C. Agronomic considerations for quality seedling production

- i) What disease-resistance or tolerance characteristics must particular seedlings minimally have (e.g., bacterial wilt, flood tolerance); what other characteristics are desirable?
- ii) What low-cost reusable or biodegradable containers are available to grow and sell seedlings (i.e., alternatives to non-recyclable plastic trays)?
- iii) What types of suitable soil media are commercially available for seedling production? How much does it cost? Are supplies reliable? Is the media sustainably produced?
- iv) What other technical constraints need to be overcome when setting up local seedling nurseries?
- v) Is vegetable seed for producing high quality seedlings commercially available? For which crops (specify crops, varieties and companies)?

### D. Policy considerations for quality seedling markets

- i) Are there any ongoing programs, projects or initiatives promoting the use of vegetable seedlings? (Specify names, describe existing activities, and provide contact details).
- ii) Are there any ongoing programs, projects and initiatives working on UPU food production that could help to promote the use of seedlings? (Specify names, describe existing activities, and provide

contact details).

- iii) Is there any local government support (e.g., city governments) for commercial seedling production?
- iv) Are local financial institutions interested to invest in seedling nurseries?
- v) What are strong public and/or private sector partners that the program can work with to pilot the commercial production and marketing of vegetable seedlings? (Specify names, contact details, rationale).

### 1.3 Methodological note

The overall objective of the study was to assess the effect of improved seed and seedling systems on UPU food safety and production. The study was conducted between 2022 and 2023 and included a desktop review of documents and in-depth interviews with government agencies, non-governmental organizations, propagators, kitchen gardeners, commercial farmers, visits to fresh markets and plant markets. Under document review, technical and policy papers from the National Ministries of Agriculture, Trade, Health and Environment were analysed.

The report also benefited from selected county reports and strategies and other food system related plans. The study utilized Key Informant Interviews (KIIs) including, National and County Governments, non-state actors in UPU space, such as Mazingira Institute, RUAF, Nairobi and Environs Food Security, Agriculture and Livestock Forum (NEFSALF) and African Population & Health Research Centre (APHRC).

To understand the status of the seedling vegetable value chain, a total of 50 commercial seedling operators were interviewed in the greater Nairobi region covering Nairobi, Kiambu and Machakos regions. The sample selection was purposive to cover small, medium to large commercial producers capable of supporting UPU in the Nairobi region. The sampling also addressed possible gender and plant diversity considerations.

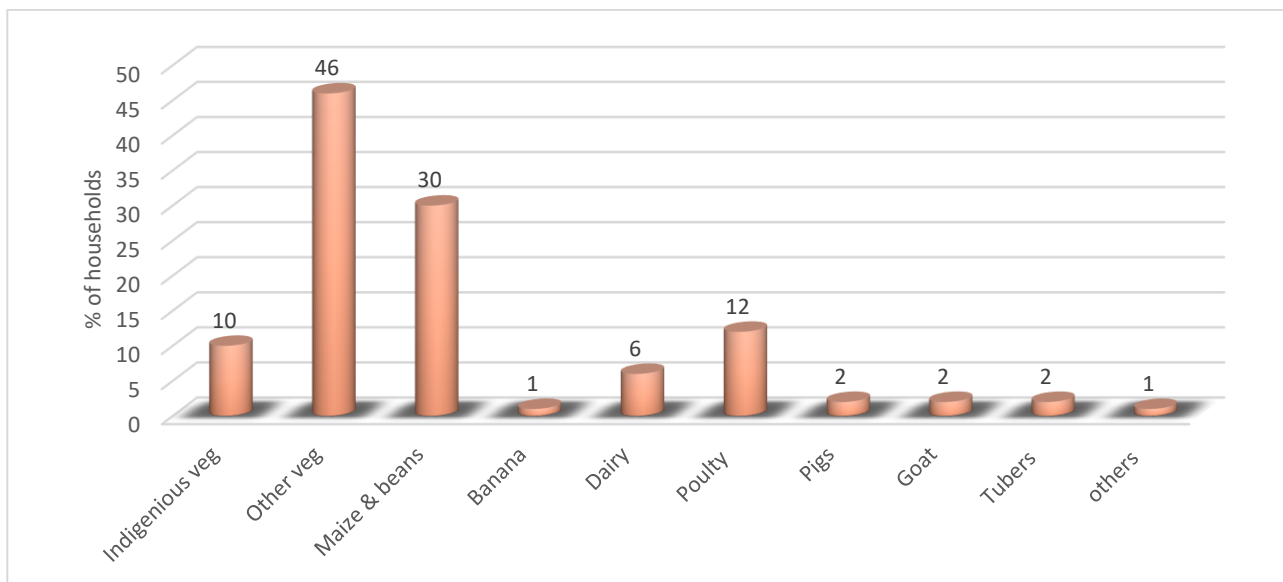
## Section 2: Findings of the Study

### 2.1 Current status of urban and peri-urban vegetable production in Nairobi, Kenya

#### 2.1.1 Vegetable systems and potential seedling production in nurseries

Vegetable farming accounts for over half of the agricultural enterprises in Nairobi, Kenya. Most urban farmers plant kales, spinach, tomato and onion but are low on African Indigenous Vegetables (AIVs) (Figure 2). The choice of enterprise is driven by lack of enough for production, demand for vegetables and low cost of production. The frequently mentioned AIVs include African night shade, amaranth, spider plant and cowpeas. Urban farmers prefer exotic vegetables over AIVs on account of high demand and shorter season.

**Figure 1: Agricultural Enterprises practiced in Nairobi City County**



Source: JKUAT and FAO (2018)<sup>1</sup>

Vegetables are mostly produced through conventional agriculture. Small holder urban farmers utilize open fields within dwelling areas and the size averages one eighth of an acre. Other farmers utilize larger public or private lands where the contracts for land use are informal and unstructured. Most urban farmers set up the small plots along river channels to take advantage of cheap water. In view of diminishing land sizes, micro gardening is now an emerging system but mostly for own consumption. Here, farmers use hanging containers, baskets, plastic bottles, boxes and tires – with most of these being low cost and recyclable. As such, urban farmers could be supported to have micro-gardens in their places of residence. For commercial oriented farmers, protected cultivation by way of greenhouses is being embraced given its potential for high productivity and efficiency in the use of soil, water and nutrients. **Targeting these farmers could catalyse seedling uptake in the city.** Future systems that have potential are open-air rooftop farming, rooftop greenhouses, indoor farming, hydroponics and aquaculture. These need to be promoted to spur production among urban farmers by reducing cost of infrastructure and enhancing extension.



Photo: African Nightshade

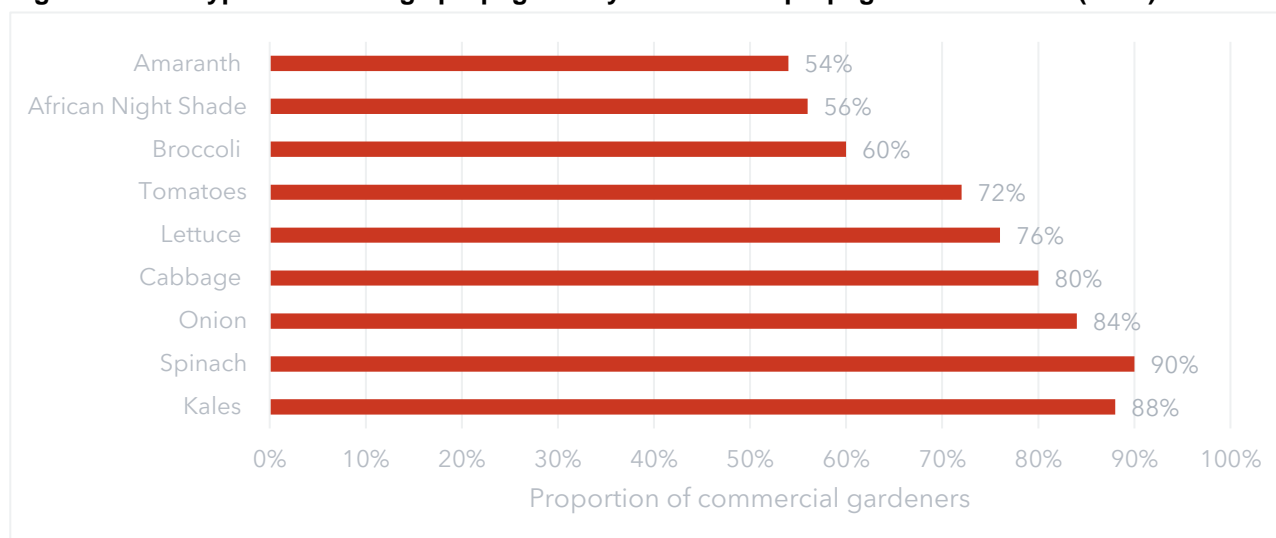


Photo: Spider plant

<sup>1</sup> JKUAT and FAO (2018) Developing Sustainable Food Systems for Urban Areas: Nairobi City County Food System Components under NADHALI Project (unpublished)

Most smallholder farmers buy seedlings from nearby commercial nursery operators during the rainy season. The nursery operators buy seed from established agrovets or seed companies and often have prior knowledge of the efficacy of vegetable seeds from various companies. The study survey showed that kales, spinach, onion, lettuce and cabbage were propagated by 7 in 10 commercial producers (Figure 3). In larger farms, African Night Shade, Amaranth and Tomato are gaining ground due to increased demand.

**Figure 3: Main types of seedlings propagated by commercial propagators in Nairobi (n=50)**



Source: Seedling survey (2022)

The demand, cost and production considerations affirm that kales, spinach, lettuce, onions and tomatoes offer a great promise for scale up. Nutritional considerations imply that increasing production of traditional indigenous vegetables, such as African Night Shade and Amaranth is also recommended, but this should be preceded by demand creation and awareness of their nutritional value among consumers.

### 2.1.2 Demographic characteristics of vegetable seedling propagators

Results from the survey show that 42% of larger seedling propagators were male plus 24% joint (Table 1), while 30% of respondents surveyed were women, pointing to the need for inclusivity in UPU programming. In addition, most propagators were >40 years, with just 4% under 35 years. Future programs can also be supporting youth inclusion. KIIs affirmed that community gardening can help the youth to actively participate in seedling production. The existing youth groups can collectively propagate seedlings in shared areas and can also take part in seedling marketing. Through financing and extension support, the youth can overcome financial and production constraints of propagation.

Majority of nurseries surveyed were run by employees with 4 of 10 median employees having formal training in seed/seedling management. However, all owners and employee managers had secondary school education or better. Most producers had 1-5 permanent employees who are relatively younger and hired on a casual basis. The respondents expressed capacity strengthening as key need given that majority of employees were not formally trained in propagation or agronomy. In addition, there was little county government extension support since only 15% of the propagators were ever visited by an extension officer. Given that 8 in 10 propagators belonged to an association, extending capacity strengthening support or market information can be done through these groups.

**Table 1: Socioeconomic characteristics of commercial seedling producers in Nairobi**

Variable	Metric	Value (n=50)
Gender of owner	Male (%)	42

	Female (%)	34
	Joint (%)	24
<b>Age of owner</b>	Mean years	44.5
	Owners <35 years	4
<b>Highest education level of owner</b>	Secondary (%)	22
	Tertiary/College (%)	60
	University (%)	18
<b>Who manages nursery</b>	Owner (%)	38.3
	Employee (%)	61.7
<b>Employment</b>	Has employees (%)	76.6
	Total employees (median)	10
	Permanent employees (median)	6
	Casual employees (median)	4
	Women employees (median)	4
	Youth employees (median)	5
	Has formal seed training (median)	4
<b>Nursery establishment</b>	Years of operation of nursery (mean)	8.8
	Whether nursery is registered (%)	83
	Sole proprietor (%)	38
	Company (%)	40
	Registration with KEPHIS (%)	50
	Has trading permit (%)	94
<b>Institutional support</b>	Belongs to an association (%)	82
	Been visited by extension officer (%)	15

**Source: Seedling survey (2022)**

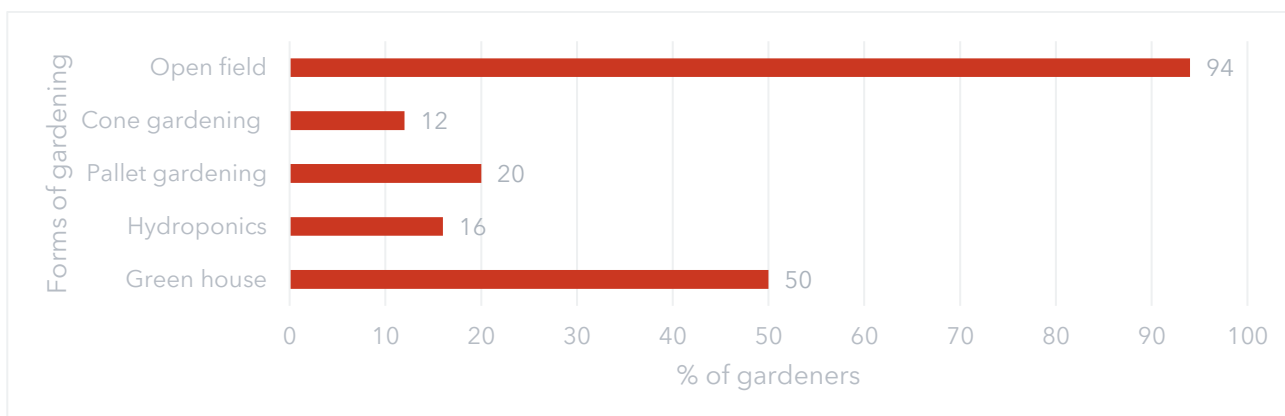
Table 1 further shows that the propagators were formally registered businesses that had operated for at least 8 years. However, at least of half of them were not registered with the Kenya Plant Health Inspectorate Service (KEPHIS). The agency is responsible for assuring the quality of agricultural inputs and produce to prevent adverse impacts on the economy, the environment, and human health<sup>2</sup>. The law requires that all nurseries producing seedlings for distribution or sale should be certified to ensure production of clean seedlings that are also free of pest and diseases. KEPHIS has established a process for certification and charges a fee for inspection and certification<sup>3</sup>. KII estimate that **300 nurseries are certified in Kenya**. Most nurseries are not certified due to challenges in: i) low operator knowledge and skills in seedling production, pest and disease, ii) poor prevention and management, iii) limited documentation of source of propagation material (seeds, scions, buds), iv) poor quality structures in place and, iv) poor record keeping.

Most commercial propagators practice mixed nursery for fruit trees, vegetables, flowers and forest trees. The survey revealed that greenhouses were the main facilities used by 50% of the sampled producers (Figure 4). Between 10-20% used cone or pallet gardening. More than 90% of the producers ran open field nurseries with normal climatic conditions – presenting a risk of pests and diseases in seedling production. Less than 10% propagated seedlings under controlled conditions for the provision of good quality, healthy seedlings.

**Figure 4: Forms of seedling gardening in Nairobi (n=50)**

<sup>2</sup> The laws for seedling production include: Plant Protection Act CAP 324, Seeds and Varieties Act CAP 326, Agriculture Food Authority Act, Crops Act (2013) and Pest Control Products Board Act Cap 346. The regulations are: Horticulture Crops Regulations (2019)

<sup>3</sup> KEPHIS charges KES 7000 (USD 56) for certification. The charges exclude laboratory analysis.

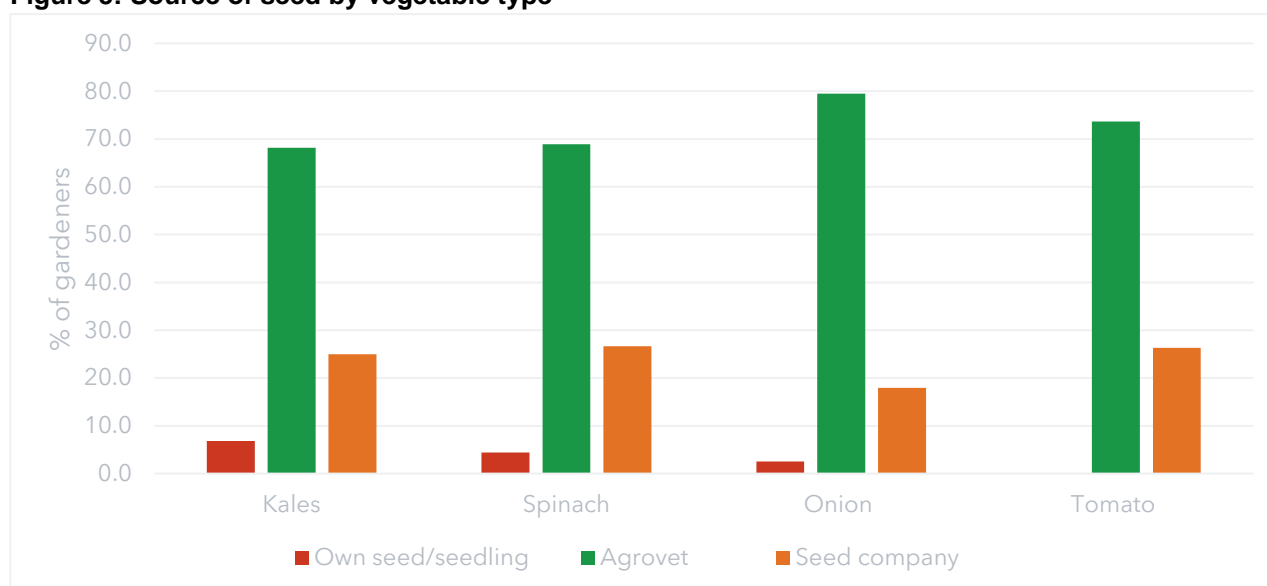


Source: Seedling survey (2022)

### 2.1.3 Seed sources and grafting systems

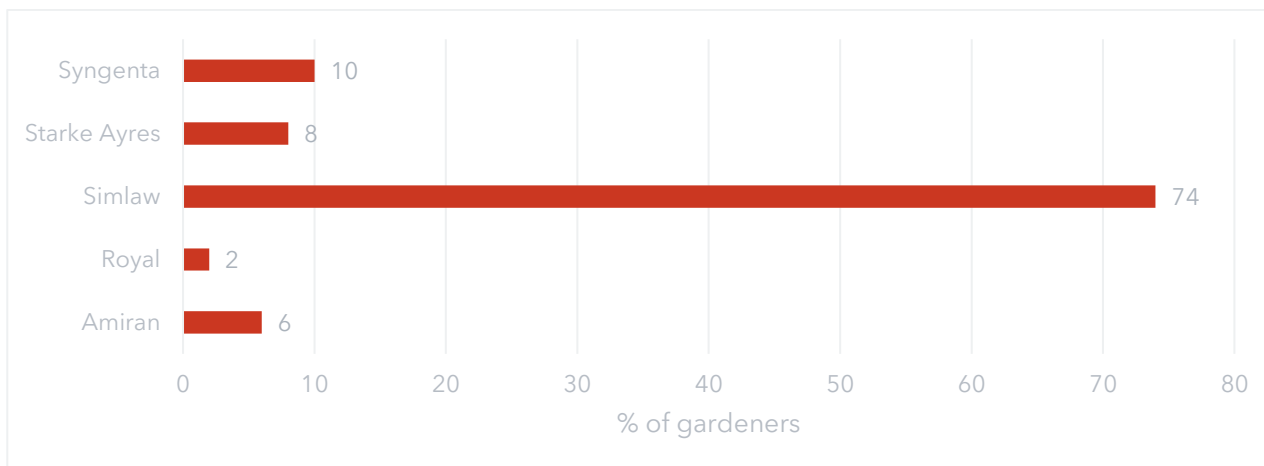
Commercial propagators use different propagation systems for their seedling. The results indicated that over 4 in 10 propagators grafted their seedlings. Budding, or bud grafting, is the most common of form of vegetative propagation by which an exact replica of the parent plant is produced. **This applied primarily, however, to fruit tree seedlings.** For example, avocado, cv Hass is used as the scion and cv Topa-topa as the rootstock. The result suggests further support in the scaling of existing and new root and scion combinations for various vegetable plants. The results further uncovered wide preferences for sources of seed (Figure 5).

Figure 5: Source of seed by vegetable type



Agrovets were the most popular sources of seed for propagation. Only larger farms sourced their seed directly from seed companies. For some crops especially kales and indigenous vegetables own seed or seedling was used. KIs affirmed that locally multiplied seedlings were less prone to diseases and experienced higher demand by consumers. Whether seed was sourced from an agrovets or seed company, propagators had preferences for different types of seed (Figure 6). Among the seed producers Simlaw company provided seed to at least 70% of commercial propagators.

Figure 6: Main source seed for grafting of vegetable seedlings



Source: Seedling survey (2022)

#### 2.1.4 Challenges in commercial seedling production

In the process of commercial seedling production, the **lack of training in formal propagation** systems was cited as one of the biggest bottlenecks in seedling production. The problem is compounded among smaller propagators who rely on traditional knowledge for production. Some of the practices around the use of fertilizers, water and nutrients are not scientifically verified. Proper understanding of propagation (cutting, layering, division, grafting, budding) could not be ascertained. In addition, the use of modern technologies, such as tissue culture techniques have not been widely adopted.

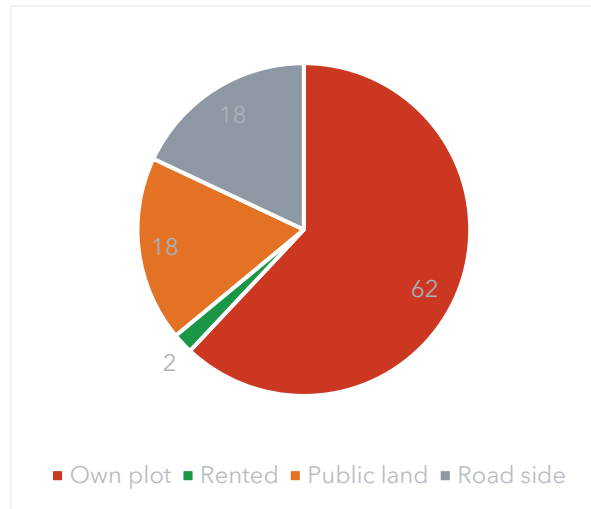
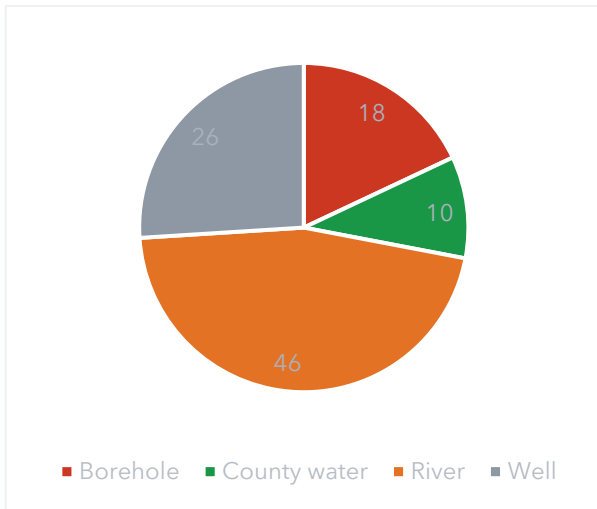
Lack of adequate and quality water is also a major challenge. Figure 7 shows that nearly half of propagators relied on rivers for production, which provides for a potential source of infecting the seedlings with contaminants and diseases. For instance, the Nairobi River which has been a key source of water for agriculture is thought to contain high levels of lead, copper, chromium and manganese - far beyond allowable levels by the World Health Organisation (WHO) and the National Environment Management Authority (NEMA). In 2019, up to one million units of *Escherichia coli* (*E. coli*) in 100 ml water (against a standard of 100-200 units/100 ml of water) were recorded in the river<sup>4</sup>. Worse still, most propagators had no capacity to test water before use - whether from the river, borehole, well or piped water supplied by the County Government.

The median land size under vegetable propagation was 2650 sq. m with the range being 150-10000 sq. m. Most of the gardening was in own plots but under small sizes (Figure 8). The production systems are now increasingly affected by pollution and weather extremes – pointing to the need for more controlled production environments. Yet the seedling producers and farmers lack the capital/credit or funds and knowledge to invest in cost effective greenhouse technologies to help reduce incidences of pests and diseases as well as contamination. **Protected production facilities are key for the sustainability of high-quality and high-yielding vegetables in cities.**

Figure 7: Source of water for commercial propagators (N=50)

Figure 8: Type of plot for commercial nursery production (N=50)

<sup>4</sup> See report on Nairobi River Pollution: Scope For The Future <https://earth5r.org/fighting-communities-nairobi/#:-:text=The%20levels%20of%20Escherichia%20coli,in%20100%20ml%20of%20water.>



## 2.2 Understanding market demand for vegetable seedlings

### 2.2.1 Business characteristics of key commercial seedling nurseries

The commercial seedling nursery operators in the Nairobi area can be characterised by size, location, specialization and target market. Our analysis shows that operators range from small, through medium to large. Three key large-scale propagators were included in the study:

#### Grace Rocks Farm:

Grace Rocks Farm is a gardening business specialised in producing both vegetable and fruit seedlings of different kinds and of the highest quality. The firm is based in Rironi, Limuru, Kenya. The organization champions biological pest control and are lead distributors of pest control products.



Photo: Seedbed at Grace Rocks Farm



Photo: Gardeners at Grace Rocks Farm

The company has a program for training existing and prospective farmers in good agricultural practices, seedling propagation and nursery management. The key seedlings produced are kales, cabbages, onions, lettuce, tomatoes and broccoli. Sale of seedlings is mostly organised on a pre-order basis to minimise an excess of seedlings. The majority of workers are youth with over 40% female. By intentionally employing women and youth from adjacent communities, there is social economic empowerment throughout the area as more people are involved in commercial farming.

## Plant Raisers:

Plant Raisers is a supplier of vegetable seedlings to both small- and large-scale farmers in Kenya. The firm was established in 2010 in Isinya, Kajiado County, Kenya. Initially, it began with four employees and a small 480 square metre seedling propagation unit. It has, however grown to employ 15 people and improved on the propagation land size to over 2,000 m<sup>2</sup> with a current production capacity of over 20 million seedlings.

Plant Raisers supplies over 100 different varieties of vegetable seedlings with the varieties being monitored and improved. The farm produces seedlings for farmers. Plant plugs provide a convenient and effective way to start and transplant plants, and can help improve plant survival rates and overall growth. Some of the merits of this include ease of planting and less cost since they are substantially less expensive than potted plants. These seedlings grow faster because they have a healthy, vertically oriented root system and a good balance between foliage and roots.



Photo: Green House at Plant Raisers farm



Photo: Seedling preparation at the farm

Seedlings are propagated on order basis and supplied to different parts of the country including Machakos, Nairobi, Narok and Naivasha. The organization has a strong community empowerment strategy including, partnerships with primary schools to plant and grow food, employment of youth and women and training of local farmers.

## Intriscapes Plant Nursery:

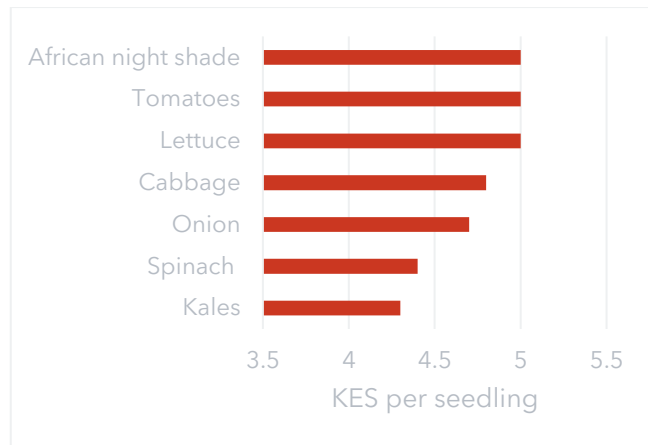
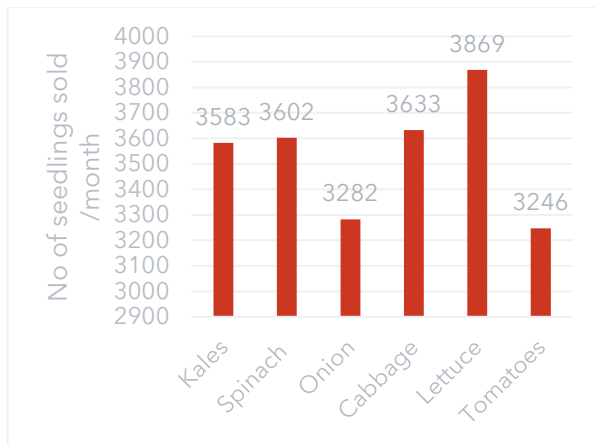
Intriscapes is a medium size farm located in Limuru and is located on a five-acre land with several greenhouses. The firm is strategically situated along a permanent river and is able to produce vegetable seedlings for farmers and gardeners in Nairobi, Kiambu, Nakuru and other parts of the country. The key customers are garden centres, landscaping companies and homes. The organization employs integrated pest management practices to reduce the reliance on inorganic fertilizers. Other smaller vegetable nurseries are provided in a separate Annex.

### 2.2.2 Demand for seedlings and pricing

Increased demand for vegetables has resulted in increase in demand of seedlings. Our survey results (N=50) show that exotic vegetables had the highest demand with sample propagators selling at least 3000 seedlings per month (Figure 9). The main buyers of these seedlings were urban and rural farmers, schools, hospitals, county governments and seedling retailers.

Figure 9: Average number of seedlings sold by propagators /month (N=50)

Figure 10: Average seedling price for selected crops (N=50)



Seedling producers (N=50) reported that their buyers comprised wet markets, plant markets, supermarkets and roadside sellers. In most cases, there was no after-sale service or technical support offered to the retailers, especially those operating informally. In turn the retailers, relied on anecdotal knowledge or experience when dealing with last mile consumers. Observation of quality of the seedlings was not readily ascertainable to last minute buyers, except where the seller-buyer relationship was already established.

In terms of demand – supply gap, commercial propagators demonstrated capacity to avail seedlings for small to medium customers on a real time basis. For large customers, orders must be placed early, in which case the majority of propagators have adequate land and resources to deliver. An emerging need is the demand creation of quality seedlings among smallholder urban farmers and kitchen gardeners. UPU can take off if multistakeholder engagements and urban planning initiatives can promote use of schools, public spaces and homesteads for small scale gardening, which would in turn spur demand for seedlings. Other strategies for uptake might include:

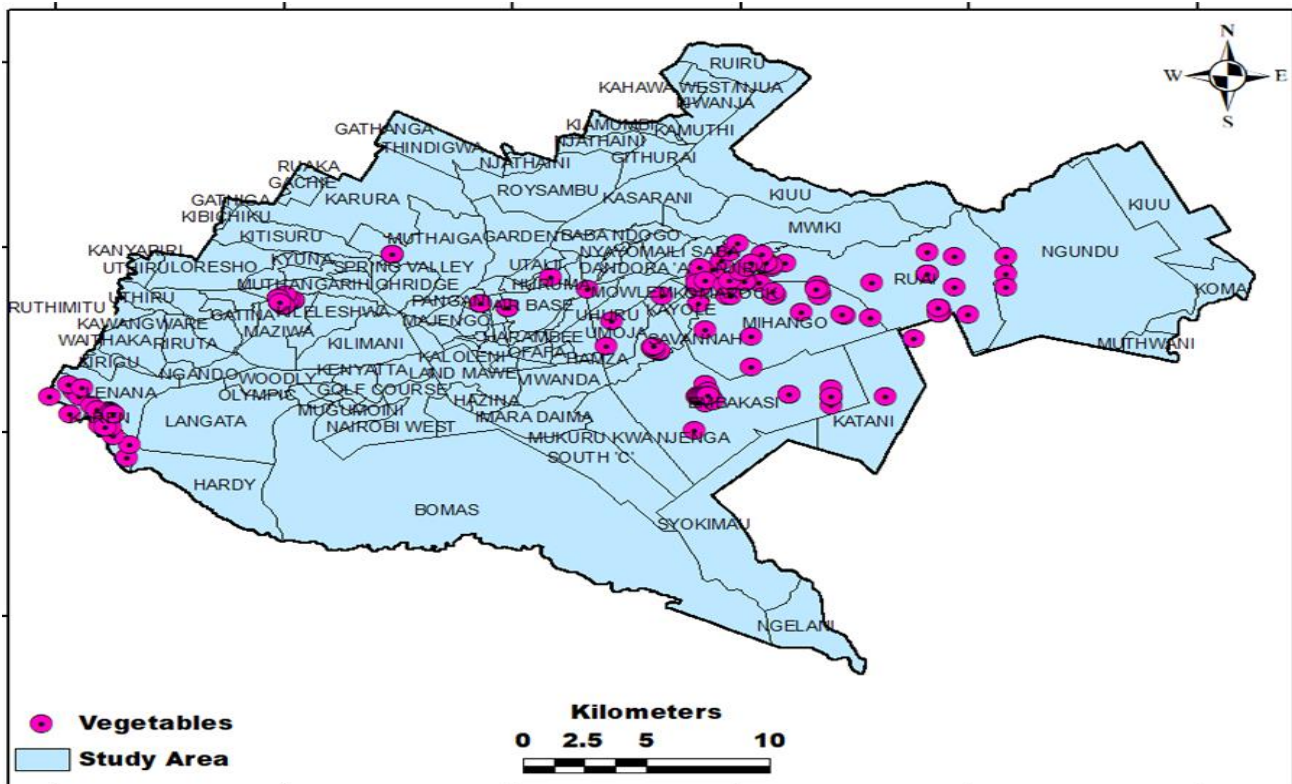
- Work with youth groups to act as producers and last mile retailers in strategic place;
- Work with existing retailers to scale-up seedling sales in open air markets and other outlets;
- Improve appearance of seedlings, type of containers used and packaging;
- Promote uptake of indigenous vegetables among farmers and kitchen gardeners.

Pricing remains a critical component for the uptake of seedlings. A survey with propagators revealed that **seedling price is on average KES 4 per seedling** (Figure 10). The prices can be slightly lower depending on the volumes. Interviews with kitchen gardeners opined that seedling prices were affordable and would not be a big constraint to UPU. Comparatively, fruit trees were significantly more expensive than vegetable crops. Various models exist to manage price including: collective purchasing, own nursery production and grants by government. In the past, provision of free seed by County governments has been a strategy to enhance vegetable gardening.

### 2.2.3 Key urban and peri-urban locations for commercial seedling production

Vegetable farming is undertaken everywhere, in backyards, along roadsides, rivers and railways, in parks and industrial areas. The geospatial distribution of vegetable farming is presented in Figure 11. A high concentration of producers is in Njiru, Karen, Ruai and Embakasi. In the peri-urban areas vegetables are produced in Ruiru, Limuru, Kikuyu and Ngong areas.

**Figure 11: Distribution of vegetable farming in Nairobi**



Source: JKUAT and FAO (2018)

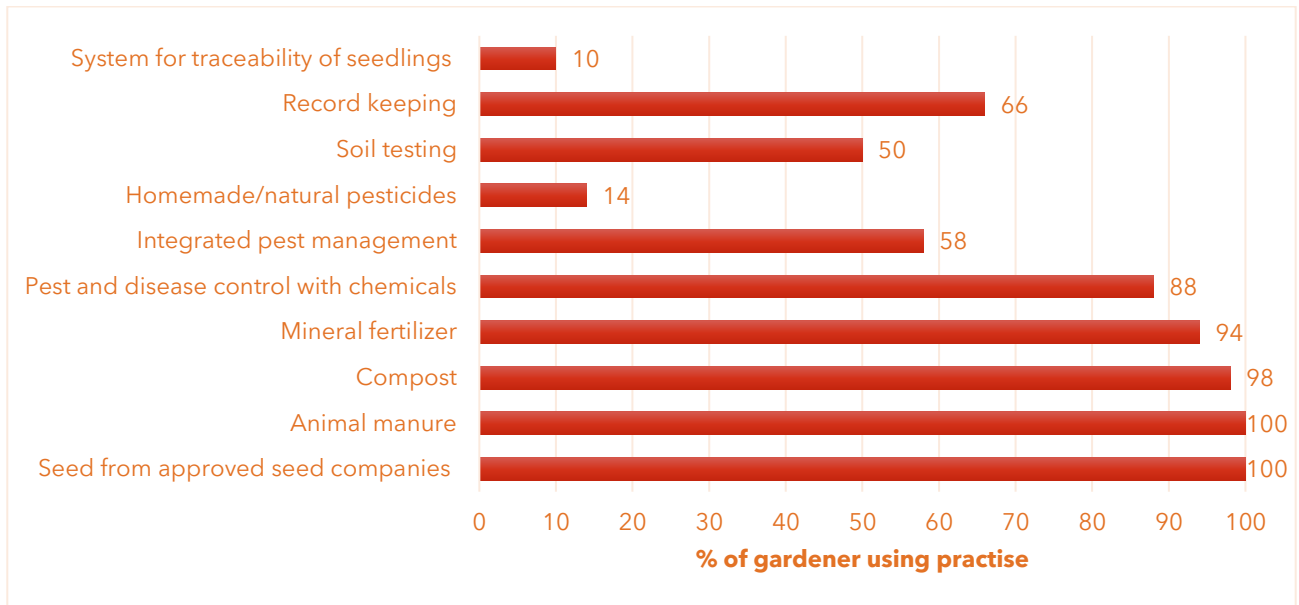
A number of small to medium scale propagators are situated in the vegetable growing zones and target smallholder farmers directly. The distribution of the operators appears scanty in other parts of Nairobi where kitchen and vertical gardening can be scaled up. This is largely due to low demand for seedlings. Demand creation activities in residential areas can scale up urban production. Already, wet markets and open-air markets have the capacity to supply the seedlings on demand.

## 2.3 Agronomic considerations for quality seedling production

### 2.3.1 Characteristics of seedlings required

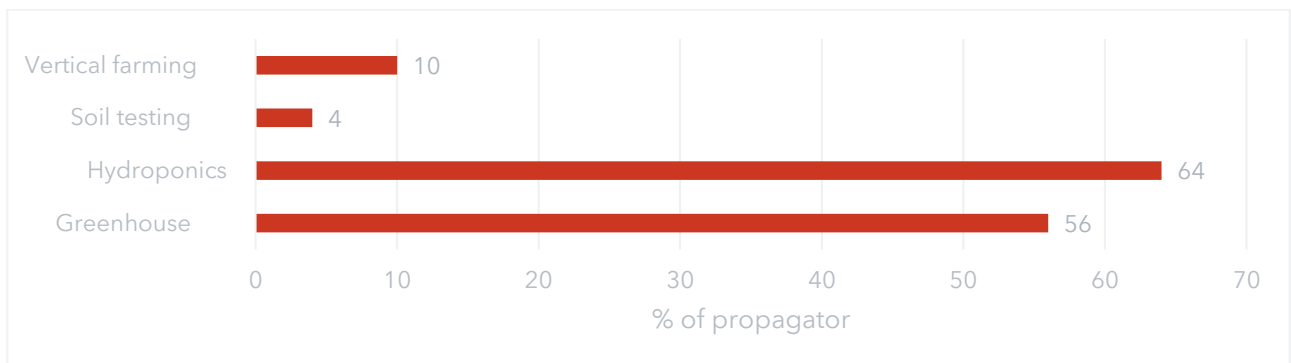
Seedling propagators engage in different practices for seedling production. All the study respondents reported obtaining seed from approved seed companies, and use of animal manure and compost (Figure 12). 94% of the propagators used mineral fertilizers with another 88% for their production using chemicals for pest and disease control. For many propagators, use of integrated pest management and bio-pesticides was less widespread. Respondents expressed their willingness to transition to more sustainable production systems but require capacity strengthening in agronomy and support in the sourcing of eco-friendly resources.

**Figure 12: Production practises by seedling propagators (for seedling production) (N=50)**



The preferred seedling characteristics included: bacterial wilt resistance, flood tolerance, disease-free properties, seedling with a vigorous growth cycle and high yield. Yet, most retailers or consumers did not have a compendium of the properties of different seedlings. It was also noted that research organizations, such as Kenya Agriculture and Livestock Research Organization (KALRO) had seedling varieties that would match these desired characteristics but the awareness was lacking and uptake was low. Partnerships among researchers and propagators can help scale up adoption of superior varieties across the different value chains. These can be coupled with technical support to adopt new technologies. As Figure 13 shows, more than half of propagators, wish to use hydroponics and greenhouse technology in their production. But they require training and financial support to purchase more affordable technologies.

**Figure 13: Willingness of propagators to adopt different technologies**

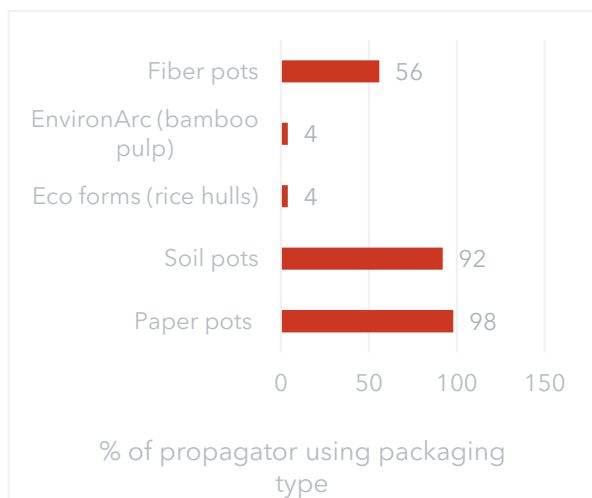


### 2.3.2 Packaging containers for seedlings

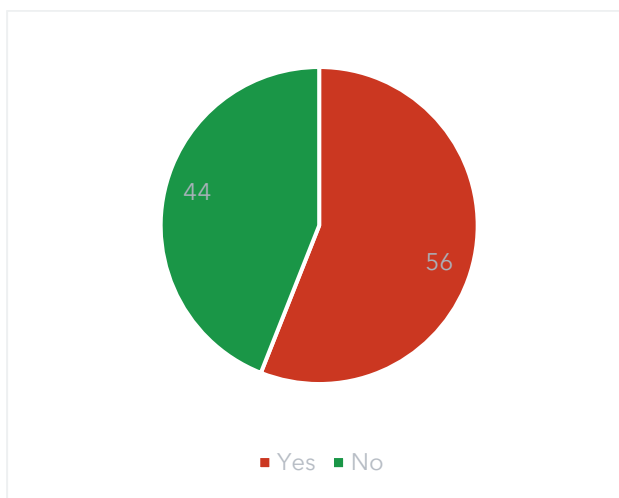
Non-recyclable trays and polythene form the bulk of packaging material for vegetable seedlings. However, there has been a shift to renewable, compostable, and durable, yet low-cost options for packaging. The shifts are happening for fruit seedlings more than the vegetable seedlings. The results show that paper and soil pots (made of clay) are used by 9 in 10 propagators as low-cost reusable and biodegradable containers (Figure 14). Fibre pots are used by 56% of the propagators but these are more expensive. In fibre pots, roots

can push through the pot sides. As this occurs, they are air-pruned, which promotes even root distribution and plants don't become pot-bound. Another merit is that the plant, along with the fibre pot, can go straight into the ground, causing no root disturbance, no transplant shock and no down time while roots settle in.

**Figure 14: Packaging material used (N=50)**



**Figure 15: Whether propagators face challenges when sourcing for eco-friendly containers (%) (N=50)**



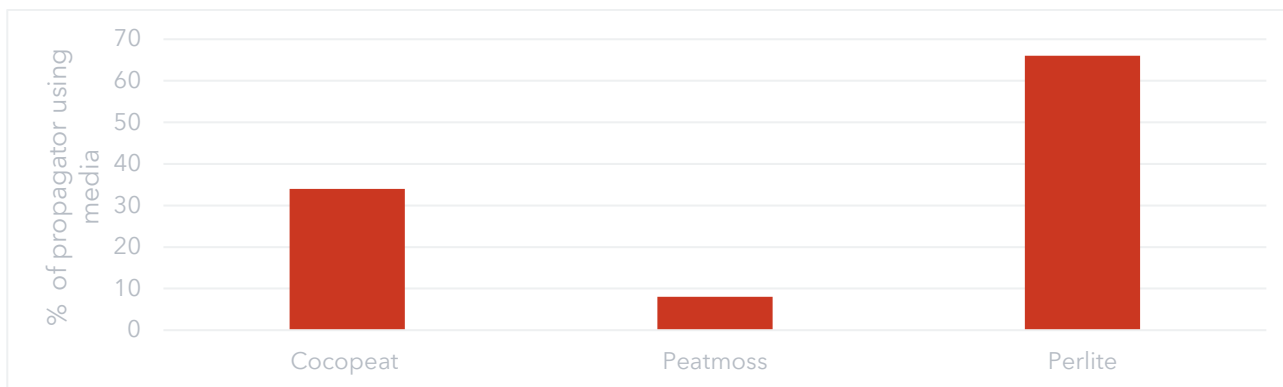
Bamboo and eco forms are a sustainable replacement for plastic or polythene but this are still to gain widespread uptake. At least 56% of the propagators expressed challenges in sourcing for these containers (Figure 15). The costs of bioplastic polymers are generally still much higher than their traditional plastic counterparts making adoption rates low. Most of these are imported and not available locally and sometimes the supply is not consistent. Strengthening capacity for production and supply for eco-friendly material is key for sustainability and environmental protection. Also, raising awareness on the available alternatives can increase uptake.

### 2.3.3 Soil media that are commercially available for seedling production

The conventional way for seedling propagation for most propagators is through soil seed bed (seed nurseries) propagation. This involves preparation of the garden in which the seeds are sown directly into the soil, in defined nursery beds in the field. For larger propagators, greenhouse seedling propagation is popular and involves seedling development under controlled conditions (temperature, water and nutrients). This method may use soil-less media, which uses sizeable planting trays and the seedlings are sowed singly into individual 'holes' in plastic or polystyrene trays. This method is highly advantageous, with high germination and very low transplant shock since the root system is not interfered with during transplanting and can also withstand the transplanting shock. From the sample survey, only 34% of the propagators used soil-less media (N=50).

The most common types of soil-less media being used are cocopeat, peat moss and perlite. Cocopeat costs about KES 70 - 90/kg and comes in compressed (5 kg blocks) or in loose forms (18 kg bags). The media holds well as 5 kgs of coco peat can be applied on 15 seedling trays. The media is made from coconut husks and is suitable for seedling propagation, hydroponic farming and soil amendments. The media has worked well for tomato, cabbage, onion, and fruit trees.

**Figure 16: Distribution of propagators using different soil-less media (N=17)**



A typical cocopeat has suitable properties for many seedlings as well as crops (Table 2). Large scale propagators observed that cocopeat has many advantages when used properly since it is highly porous, sanitised (disease and pest-free), has a good water holding capacity and is non-acidic. Small scale propagators find the cost to be high and they also lack the capacity for utilization of soil-less media.

**Table 2: Properties of coco peat**

Property	Metric
PH	6.3 – 6.7
Electrical conductivity (EC)	1.6 – 2.0
Expansion ratio	2.5 – 3
Moisture content	<5%
Compression volume	28L
Fibre content	<3%
Sand content	<1%

Source: Grekkon Limited <sup>5</sup>

Peat moss is also a widely used media. It is partially decomposed sphagnum moss, which are harvested from peat bogs. The media is difficult to wet, but once wet it retains up to 20 times its weight in moisture, and releases water slowly as plants need it. The media decomposes slowly over several years compared to compost that can decompose within one year. The media has a reliable pH (3.4 to 4.8) and is environmentally friendly. The product is sold in 50 kg bags and costs KES 5000 – 7000. It is available on demand from a few large suppliers. In the recent past, perlite and vermiculite have become cheaper alternatives among propagators. For instance, 10 kg (100L equivalent) of vermiculite costs KES 1000 – 1200 and can be used over a wide area. Interviews suggest mixing of the different media can yield better results.

Overall, there are various soil-less media being used for seedling propagation but is skewed towards large propagators who are able to afford and have the technical capacity to use it. On the other hand, small scale operators as well as households are not able to afford and lack awareness of the benefits of these types of media. Reducing its cost and strengthening the capacity of propagators to utilize it may help increase productivity of seedling and crop urban production.

## 2.4 Policy considerations for quality seedling markets

The vegetable seed sector in sub-Saharan Africa is poorly developed in general and has received little attention in the development agenda<sup>6</sup>. In contrast, vegetable production and consumption in Asia have grown rapidly in the last two or so decades with the development of a dynamic vegetable seed industry playing a

<sup>5</sup> Grekkon is one of the largest suppliers of coco peat in Kenya: <https://grekkon.com/product/coco-peat-for-sale-in-kenya/>

<sup>6</sup> Pepijn Schreinemachers et al. (2019). Africa's evolving vegetable seed sector: status, policy options and lessons from Asia. Food Security (2021) 13:511–523. <https://link.springer.com/article/10.1007/s12571-021-01146-y>

pivotal role in that process. The availability of locally-bred and adapted varieties has facilitated the rapid expansion of production and increased the supply of affordable vegetables to consumers. While the existing literature on seed development is growing, the focus is more exclusive on the staple food crops, with limited attention to vegetables. Policies and strategies for seed sector development in Africa are often modelled on the maize seed sector, without the recognition that other crops are very different in terms of seed production and commercialization<sup>7</sup>. Consequently, smallholder farmers in sub-Saharan Africa have limited access to affordable sources of quality vegetable seed or seedling and restricted choice in terms of species and varieties.

In this section we review the existing seed laws and regulations and assess the extent to which they enable or restrict the development of a thriving vegetable seed sector in Kenya. We also assess institutional support including presence of programs, projects or initiatives promoting the use of vegetable seedlings in Kenya.

#### **2.4.1 Review of the seed laws and regulations**

Kenya's seed industry consists of formal and informal sub-sectors. The informal sub sector (which provides 80% of the country's seed) involves mainly cases where farmers use seed from unregulated sources, such as own seed saved from their own production, seed bought from the local market, or seed obtained from neighbours. The formal seed subsector is comprised of the private and public seed entities involved in the development of crop varieties, seed multiplication, processing, marketing, and distribution as per rules and regulations of the country. The formal seed sector (representing 20% of the market) operates through an established regulatory process and according to international seed testing and certification schemes (ISTA and OECD). The latter is applicable mainly to seeds of major and/or high value crops grown in high potential or under intensive production systems.

The seed sector in Kenya is mainly regulated through the National Seed Policy and three key legislations: 2012 Seeds and Plant Varieties (Amendment) Act; the 2013 Crops Act; 2013 Kenya Agricultural and Livestock Research Act<sup>8</sup>. Kenya's seed industry is guided by its National Seed Policy and associated laws. The Policy aims to develop, promote and regulate a modern and competitive seed industry. The principal law guiding the seed industry is the Seeds and Plant Varieties Act (Cap 326) from 2016. Under the Crops Act (2013), the Crops (Horticultural Crops) Regulations of (2020) have various provisions relevant to operations of vegetable seedlings (Box 1).

##### **Box 1: Legal provisions relating seedling operations in Kenya**

- All persons operating nurseries to obtain registration from the County government (part II, subsection 6, Clause I),
- And obligations to source planting materials from approved sources (part II, subsection 5, Clause I),
- Restriction on sale of planting materials that have not been certified by KEPHIS ((part II, subsection 11, Clause I).

The implication is that most of the UPU vegetable nurseries were conducting their activities in contravention of the existing regulations.

Over the years the seed policy and regulatory instruments in Kenya transitioned from government-controlled seed systems to stimulate greater development of the private sector<sup>9</sup>. Despite these developments, the

<sup>7</sup> Christine Wamuyu, Josiah Ateka, Robert Mbeche, Elijah Ateka (2020). Seed security for vegetatively propagated orphaned crops and its implication for household food security in rural Kenya: A case of sweet potato (*Ipomea batatas*). Journal of Agriculture and Food Research, (2)1-8. <https://doi.org/10.1016/j.jafr.2020.100087>

<sup>8</sup> Munyi P& De Jonge B (2015)

<sup>9</sup> Astrid Mastenbroek and Bonny Ntare, 2016. Uganda Early Generation Seed Study: unlocking pathways for sustainable provision of EGS for food crops in Uganda. Wageningen University & Research (Wageningen UR) Centre for Development Innovation. Report CDI-16-030. Wageningen.

sector is still biased towards key staples, mainly because of their importance on household food security<sup>10</sup>. There are, however, recent efforts promoting vegetable seed uptake through international research centres (World Veg), universities, national and county government programs, NGOs (e.g., SNV) and development agencies (e.g., AGRA). Recent amendments of the Seed Act and the implementing regulations have been undertaken to authorize specified seed certification activities on behalf of the regulator.

In addition, Kenya's legal and regulatory framework on seed includes certain flexibilities related to vegetable seed variety registration and release, certification, and importation. More specifically, vegetable seed is exempted from mandatory national performance evaluation trials (NPTs) and mandatory certification. This approach is positive, since vegetables have different properties compared to grains and legumes. However, stakeholders reported that seed authorities continue to insist on certification in practice. Notwithstanding these positive developments, the study found that vegetable seed policy environment still faces a number of challenges including:

- The production and marketing of indigenous vegetable seed is constrained by factors: low quality of seeds; spatial and time gaps in seed distribution systems, and lack of structured seed or seedling markets. While there are many seed companies in Kenya (over 80), only a few of them deal with indigenous seed. Kenya Seed Company and East African Seed are active in the field of vegetable crops, such as *Amaranthus* and *Crotolaria*.
- While existing studies tend to focus on the development of the regulated formal seed sector, the value of the informal seed sector is not given prominence<sup>11</sup>. There are hundreds of cultivated vegetable species in Africa, while only a handful are of interest to the formal seed sector. Although seed laws and regulations govern the formal sector, it is important to consider implications of the legal and regulatory system for the informal sector as well, because the formal and informal sectors interact.<sup>12</sup>
- Informal trade in vegetable seed, while relatively affordable and widely available, can lead to low quality seed being circulated, leading to low producer yields. Further, breeding of vegetables is not prioritized in the National Seed Policy, which would need to be updated from the 2010 version, and develop a strategy on implementation to encourage investment in the vegetable seed industry.
- Vegetable seed of exotic vegetables is either imported from outside the continent or comes from a narrow range of open-pollinated varieties imported long ago or sourced from the public sector. Imported vegetable seed of hybrids is widely available, but expensive and does not always perform well under local farm conditions.
- Prevalence of adulterated and counterfeit vegetable seed and by extension seedlings, including lack of awareness amongst farmers on how to spot fake or adulterated seed; difficulty tracing the actual source of the seed; low priority given by authorities to addressing the problems in vegetable seed; and weak enforcement of laws and regulations, amongst others.

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**KEPHIS, has developed a system whereby all seed packages under 10 kilograms are accompanied by scratch-off labels. The labels reveal a code which farmers can use to ascertain the legitimacy of the seed by sending a phone message through an initiative known as Mulika Mbegu Mbovu ('stop bad seed'). Stakeholders stated that this approach has been quite effective, although not all farmers are aware of it.**

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- Lack of capacity by the government systems to support compliance and enforcement of the Horticultural Crops Regulations of (2020) especially sale of planting materials that have not been certified by KEPHIS.

<sup>10</sup> Langyintuo et al (2010); Nzuve, 2018

<sup>11</sup> Croft, M.M., Marshall, M.I., Odendo, M., Ndinya, C., Ondego, N.N., Obura, P., et al. (2018). Formal and informal seed systems in Kenya: supporting indigenous vegetable seed quality. *J. Dev. Stud.* 54, 758–775. doi: 10.1080/00220388.2017.1308487

<sup>12</sup> Kuhlmann, K., & Dey, B. (2021). Using regulatory flexibility to address market informality in seed systems: A global study. *Agronomy*, 11(2), 377. <https://doi.org/10.3390/agronomy11020377>. <https://www.mdpi.com/2073-4395/11/2/377>

Inadequate public inspectors, lack of transport and logistical support, limited laboratory facilities, and knowledge gaps among personnel are all major constraints.

- Limited synergies within the seed system institutional framework – While their collaboration between international research centers and NARs is growing, a framework for collaboration across the seed system is lacking.
- Lengthy variety release procedures, both of which are linked primarily to the level of development of the vegetable seed research, development and uptake in the country. KEPHIS have already embarked on a system of licensing private seed inspectors but there are fears by some seed companies that without proper supervision, the system could lead to degeneration of seed quality standards. On a positive note, Kenya’s national variety catalogues for vegetables is regularly updated and is accessible online<sup>13</sup>.
- Farmers in Africa tend to purchase much of their exotic vegetables but seed of indigenous vegetables, on the other hand, is more likely to be saved on farm (Ayenon et al., 2021; Pincus et al., 2018).

### 2.4.2 Institutional support

In Kenya, the major players in the seed ecosystem are the government-owned certification agency, KEPHIS, KALRO, seed companies (mostly privately owned), stockists, nursery operators and farmers. The other key industry participants in the market include seed breeders and policymakers. Also, there are several NGOs that influence policies around the effective utilization of agrochemicals, seeds, machinery, and technologies in domestic agricultural practices. Plant Breeders Association, Kenya Farmers Association, and Kenya National Federation of Co-operatives (KNFC) are some of the key players in the market. One of the objectives of this study was to assess the level and extent of institutional support for promoting the use of vegetable seedlings in Kenya. The results of the study based on a survey of nursery operators and KIIs reveals that support towards the promotion of vegetable seedlings is weak (Figure 17).

**Figure 17: Access to institutional support and services to nursery operators**

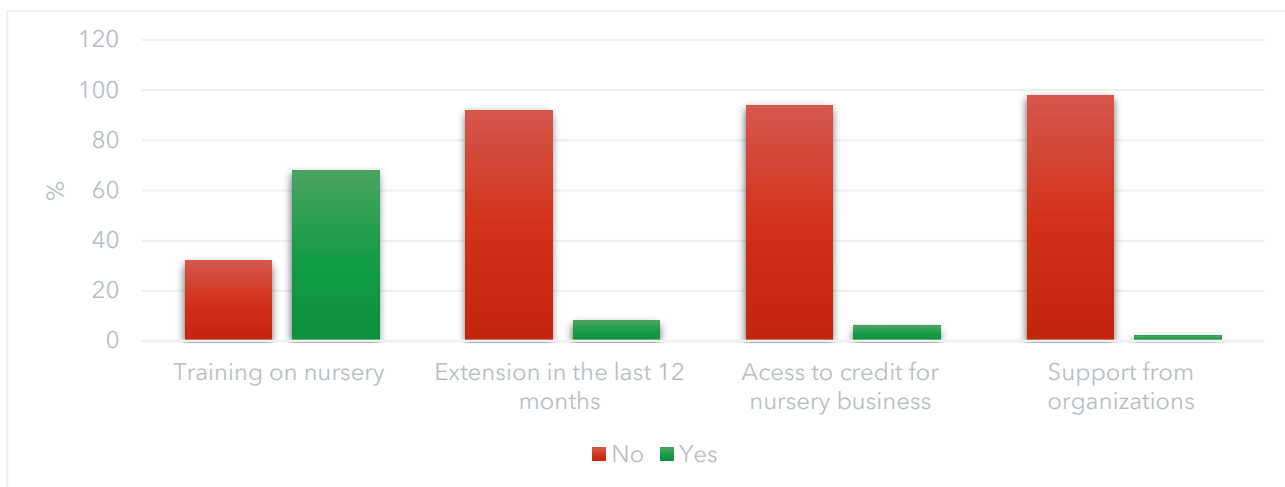


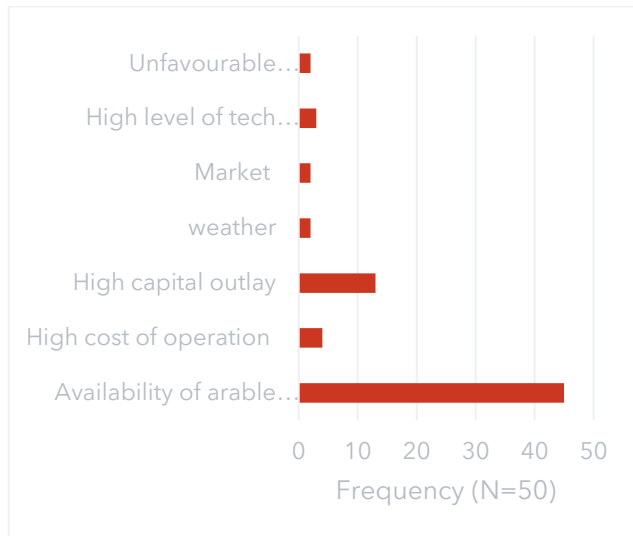
Figure 17 shows that nearly all the interviewed nursery operators (49 of 50) had not accessed support from organizations such as NGOs or projects. The access to other support services such as extension (8%) and credit (6%) were equally very low. While the level of access to training on nursery operations was generally high, follow up with those who had been trained indicated that this was through their own internal initiatives. Nursery management especially for vegetables requires various information (about the quality, availability, and prices of seeds they require) including the need to consider agro-ecological factors such as soil type,

<sup>13</sup> <https://www.kephis.org/images/pdf-files/NATIONALVARIETYLISTEDITEDAPRIL2023FINAL.pdf>

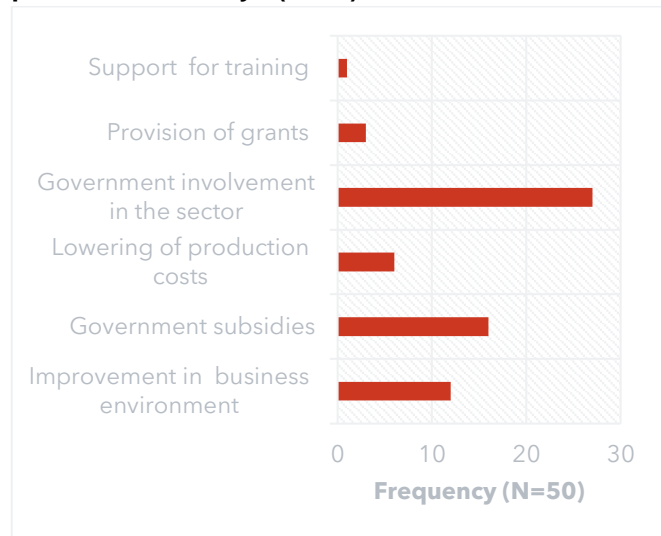
amount of rainfall, altitude etc. There is therefore, need to activate and strengthen link with various players in the ecosystem.

The nursery operators who are the key players in this sector face a number of challenges but also require skills and the appropriate market linkages. The key challenge reported by most actors was access to arable land (N=45) as shown in Figure 18. Most of the nurseries we surveyed operate on public land along the road reserves. The access to public land happens under very unclear and cartel-like arrangements. High capital and costs of operations, unfavourable business environment and poorly structured markets for seedlings are the other key challenges that were mentioned.

**Figure 18: Key challenges in seedling production (N=50)**



**Figure 19: Interventions for supporting nursery production in Kenya (N=50)**



The constraints reported by propagators and KII include: poor quality of seeds, low access to market information, rising business costs and climate change, among others. Nursery operators sometimes get frustrated with the poor quality of seeds that they buy from seed companies or shops as some register very low germination rates. Others are highly susceptible to pest and diseases attacks. Ironically, they also register lower yields than informal seeds.

Farmers practicing vegetable growing in Nairobi indicated they mainly relied on “informed” friends and neighbours about the best seeds to plant. The only quality market information is possessed by seed company agent and retailers with access to agricultural extension officers being seldom. The concern is that agents are very biased for their aim is to attract more sales revenue for their company and self-gain. The extension service in the country is dysfunctional and not accessible, including among urban farmers in Nairobi. In addition, many seed companies operating in Kenya are multinationals operating regionally and across different ecological zones. They yet to provide area -specific or customized information for all regions.

Based on these challenges, a number of interventions are envisaged (Figure 19). More than half of the respondents indicated the need for greater government involvement through: promotion of vegetable seedlings, reduce taxes and cost of business, increase access to water and land and, training. Some of the key areas of training include; nursery establishment and management, seed sourcing, collection, storage and germination, common mistakes in seed propagation, vegetative propagation, soil health and nutrition, and how to run a nursery as a business.

### 1. 2.4.3 Projects and programmes with potential to support vegetable seedling farming

Interviews with KIIs revealed that there are no programs or projects that are specifically dealing with the promotion of seedlings. However, a number of projects/ programs would be relevant and provide entry points for partnership with the project (Table 3).

**Table 3: Selection of projects supporting vegetable seedling production**

	Name of initiative and implementer	Description	Period & Target group	Partners / donors
1	Urban food system project (UFSP) by Mazingira Institute	<ul style="list-style-type: none"> <li>Promotes urban systems through training, advocacy, inquiry</li> <li>Has a platform of food system actors called NEFSALF (500 members) which supports UPU through mentorship and training?</li> <li>Uses a food system perspective to support UPU</li> </ul>	<ul style="list-style-type: none"> <li>Project ongoing</li> <li>Targets all age groups but those with interest in UPU</li> </ul>	<ul style="list-style-type: none"> <li>Rooftops Canada/Abri International</li> <li>HIC</li> <li>RUAF</li> <li>APHRC</li> <li>Lund University</li> </ul>
2	Women`s Spaces Project by Mazingira Institute	<ul style="list-style-type: none"> <li>Promotes women`s access to land and productive resources</li> <li>Ensure policies are gendered</li> </ul>	<ul style="list-style-type: none"> <li>Period: 2019 – 2022</li> <li>Targets women interested in UPU</li> </ul>	<ul style="list-style-type: none"> <li>Govt of Canada through Global Affairs for Canada</li> </ul>
3	ENABLE Youth Kenya Program by National Ministry of Agriculture	<ul style="list-style-type: none"> <li>Uses the incubator model to promote youth in agriculture</li> <li>Targets to train 2000 Agripreneurs in 8 centres spread across the country</li> <li>Key components; Enabling policy environment, incubation and financing youth agribusinesses</li> <li>Project link: <a href="#">project</a></li> </ul>	<ul style="list-style-type: none"> <li>Period: 2020 – 2025</li> <li>Targets youth aged 18-35 years</li> <li>Should have a viable agribusiness idea that fits within priority value chains.</li> </ul>	<ul style="list-style-type: none"> <li>African Development Bank</li> <li>Government of Kenya</li> </ul>
4	Healthy Food Africa / Food System Lab by APHRC	<ul style="list-style-type: none"> <li>Seeks to empower women and youth by providing avenues to participate in UPU</li> <li>Project done: <a href="#">APHRC project</a></li> </ul>	<ul style="list-style-type: none"> <li>Project ongoing</li> <li>Targets mainly urban poor settlements</li> </ul>	<ul style="list-style-type: none"> <li>European Union</li> </ul>
5	AgriBiz project by Kenya Climate Innovation Center (KCIC) and partners	<ul style="list-style-type: none"> <li>Stimulate sustainable jobs for women and youth in the agricultural sector in Kenya</li> <li>Project promotes access to finance and business development services through incubation</li> <li>Project link: <a href="#">Agribiz project</a></li> </ul>	<ul style="list-style-type: none"> <li>Project ongoing</li> <li>Seeks to generate 17,000 jobs &amp; 2,400 SMEs</li> <li>Project has hubs in 8 regions of Kenya</li> </ul>	<ul style="list-style-type: none"> <li>European Union,</li> <li>Danida</li> <li>FAO</li> <li>AfDB</li> <li>AGF</li> </ul>
6	AgriFin Accelerate Program (AFA) by Mercy Corps`	<ul style="list-style-type: none"> <li>Support development and scaling up of digitally-enabled services for smallholder farmers across Kenya, Tanzania &amp; Zambia.</li> <li>Project link: <a href="#">Mercycorp project</a></li> </ul>	<ul style="list-style-type: none"> <li>Period: 2018-2024</li> <li>AFA is intended to scale ICT services for one million farmers</li> </ul>	<ul style="list-style-type: none"> <li>Mastercard foundation</li> </ul>
7	Vijabeez by CTA and Ustadi Foundation	<ul style="list-style-type: none"> <li>Create sustainable employment for the rural youth through engagement in agribusiness</li> <li>Project link: <a href="#">Vijabeez project</a></li> </ul>	<ul style="list-style-type: none"> <li>Supported business mentorship to over 163 youth groups in Kenya</li> <li>Linked groups to the market</li> </ul>	<ul style="list-style-type: none"> <li>IFAD</li> </ul>
8	National Agricultural Value Chain Development Project (NAVCDP)	<ul style="list-style-type: none"> <li>Project aimed at increasing market participation and value addition</li> <li>Project link <a href="#">World Bank project</a></li> </ul>	<ul style="list-style-type: none"> <li>Period 2021 – 2027</li> <li>Targets 500,000 farmers in Kenya in 9 VCs across 26 counties</li> </ul>	<ul style="list-style-type: none"> <li>World Bank</li> </ul>

## Section 3: Summary of Findings and Recommendations

UPU has great potential to build resilient urban livelihoods by supplying food, generating income, creating jobs and building social capital. This is especially critical since rapid urbanization in Kenya is posing serious challenges to the cities and towns that already have high levels of poverty, unemployment and informality. Within UPU, production is constrained by lack of access to quality inputs, land, water and other resources. Supporting sustainable access to high quality and affordable production resources is fundamental for

transforming UPU. This report sought to understand the potential effect of improved seed and seedling systems on urban and peri-urban food safety and production.

### 3.1 Key findings

1. Vegetable farming accounts for over half of the agricultural enterprises in Nairobi, with urban farmers planting more exotic vegetables - kales, spinach, tomato and onion. AIVs (African Night Shade, Spider Plant and Amaranth) are produced on a low scale despite their high nutritional value.
2. Vegetables are mostly produced through conventional agriculture in small open fields within dwelling areas. A high concentration of producers is in Njiru, Karen, Ruai and Embakasi. In the peri-urban areas, they are produced in Ruiru, Limuru, Kikuyu and Ngong areas.
3. Micro gardening is emerging as a low-cost alternative system but for own consumption. To a small degree, protected cultivation through greenhouses is now being adopted by large scale farmers. Vertical farming (rooftop farming, indoor farming, hydroponics and aquaculture) is nascent due to a high cost of set up and technical requirements.
4. Majority of seedling propagators are male aged over forty years. Women constitute 30% of the propagators, while youth are less than 4% of the propagators – pointing to the need for gender inclusive programming. While most commercial producers have employees with some having formal training in seed/seedling management, capacity strengthening in modern agronomy and new urban farming techniques is an emerging need.
5. While the law requires that all nurseries producing seedlings are certified, at least half of them are not registered with KEPHIS. This is due to: low operator knowledge and skills in seedling production, poor prevention and management, limited documentation of source of propagation material and poor-quality production structures.
6. For fruit seedlings budding is the most common of form of vegetative propagation by which an exact replica of the parent plant is produced. Further support in the scaling existing and new root and scion combinations for various fruits is desired plants, while extending this to vegetables would be advantageous, but would require much training.
7. Agrovets are the most popular sources of seed and these are usually licensed and approved, But, for AIVs, farmers prefer local and informal sources for their seed given their resilience to diseases and high demand by consumers. Yet, this knowledge remains informal and among only experienced farmers.
8. The commercial nursery operators can be characterised by size, location, specialization and target market. There exist a few propagators producing high volumes of organic seedlings and supplying these throughout the country. These nursery operators feed smaller scale operators who are closer to the kitchen gardeners and urban households.
9. Improvement in UPU is reflected in demand for exotic vegetable seedlings - with nursery operators selling over 3000 seedlings per month. The main buyers are urban and rural farmers, schools, hospitals, county governments and seedling retailers. The retailers (wet markets, plant markets, supermarkets and roadside sellers) are a key anchor for increasing kitchen gardening, but they need training on basic agronomy to support the consumers.
10. Demand creation of quality seedlings among smallholder farmers and kitchen gardeners is key for UPU transformation. Multistakeholder strategies for involving farmers, youth, retailers and institutions can

spur UPU.

11. While some commercial propagators are using conventional seedling production approaches, there is a high willingness to transition to more sustainable production systems. These propagators require capacity strengthening in agronomy and sourcing of eco-friendly resources. They have low awareness for superior varieties (*bacterial wilt resistance, flood tolerance, disease-free properties, seedling with a vigorous growth cycle and high yield*) available from research organizations.
12. Non-recyclable trays and polythene form the bulk of the packaging material for seedlings. However, there has been a shift to a renewable, compostable, and durable yet low-cost options for packaging.
13. The conventional way for seedling propagation (seed nurseries) is popular among propagators but there is now a shift to soil-less media such as coco peat, peat moss and perlite. The media have a range of advantages but are expensive especially for small scale propagators and kitchen gardeners.
14. There exists a policy for seedlings but there is less focus on informal seed systems which have potential for scaling production of indigenous vegetables. In addition, compliance to the legal provisions is low, exposing the sector to poor quality seed.

### 3.2 Recommendations and implications

In view of the findings of the study, the following recommendations are envisaged:

1. Recognising that sustainable UPU can increase food availability as well as food safety, there`s need for demand creation for clean and high-quality planting materials. This may be through:
  - a. Work with existing retailers to scale up selling of seedlings in supermarkets, open air market vendors and fresh produce outlets.
  - b. Promote use of schools, public spaces and homesteads as places for small scale gardening.
  - c. Work with youth groups to act as producers and last mile retailers in strategic places.
  - d. Improve appearance of seedlings, type of containers used and better packaging.
2. In view of the high demand for local indigenous vegetable seedlings, there is need to support multiplication of local varieties through knowledge sharing and capacity strengthening among propagators.
3. There is need to shift from conventional seedling to more sustainable production of seedlings as well as produce. This may be through:
  - a. Awareness creation and adoption of new systems such as vertical gardening and hydroponics.
  - b. Price incentives to make protected cultivation more affordable.
  - c. Training of commercial and kitchen gardeners on organic farming, use of soil-less media, IPM and other sustainable practices through Urban Producer Field Schools (UPFS) for both seedling propagators and kitchen gardeners.
  - d. Incentives such as rent rebates, utility service discounts for green infrastructure that reflect savings to the city (rooftop gardening and water harvesting).
  - e. Increase compost programs to UPU e.g., establish low-cost facilities for close to source collection and sorting of organic waste.
  - f. Incorporate and enforce new green roof standards into bylaws and building and construction codes.
  - g. Leverage on ICT to improve market information in propagation systems, nursery management, pricing, location of sellers, extension, types of seedlings and quality

4. To improve the policy, legal and regulatory environment for the vegetable seedlings, the following recommendations are proposed:
  - a. Promote farmer seed systems through training or capacity strengthening in seed production, harvesting time, processing, storage and quality assurance to enable nursery operators produce and sell quality seedlings.
  - b. Bridging the demand–supply gaps by developing a mechanism for linking farmers with nursery operators. This would involve identifying and profiling individual farmers interested in commercial vegetables, strengthening their capacity and linking them to nursery operators.
  - c. Working together with seed companies to establish demonstration sites to create awareness on the importance of good quality seed, performance of different seed varieties and availability of these seeds from the formal sector.
  - d. Creating awareness on the importance of buying seeds from the recommended agrovets to avoid cases of buying counterfeits and the use of scratch codes that can be used to ascertain seed quality.
  - e. Lobbying for policy change to strengthen greater flexibility in the applicable legal and regulatory framework. This includes the prioritization of breeding of vegetables in the National Seed Policy, which would need to be updated from the 2010 version and develop a strategy on implementation to encourage investment in the vegetable seed industry. The framework could also be revised to allow for the registration and commercialization of traditional vegetable varieties.
  - f. Raise awareness about optional vegetable seed certification flexibilities - Most stakeholders, including those in the public sector, appeared to be unaware of the exemption of vegetable seed from NPT.



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