CGIAR INITIATIVE ON Resilient Cities

Scoping study of vegetable seedling systems in urban and peri-urban areas of Addis Ababa, Ethiopia

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Cover page: Vertical urban gardening in Addis Ababa, Ethiopia

Acronyms

ETB	Ethiopian Birr
FUADC	Farmers and Urban Agriculture Development Commission
GIS	Geographical Information System
GoE	Government of Ethiopia
KII	Key Informant Interview
MoA	Ministry of Agriculture
NGO	Non-Governmental Organization
NPS	Nitrogen Phosphorus and Sulfur
JAIMDTC	Urban Agriculture Input Multiplication, Demonstration, and Training Center
UPU	Urban and Peri-urban

Executive Summary

Ethiopia's urban and peri-urban (UPU) vegetable production has grown significantly, enhancing food security and nutrition in densely populated areas. UPU agriculture reduces dependence on external food sources, lowers transportation costs, and provides fresh produce, thus improving dietary diversity and public health. It also empowers communities, creates jobs, and stimulates local economies. Access to quality seedlings is crucial to sustain urban agriculture and increase its productivity. Quality seedlings ensure vigorous growth and adaptability of vegetables, leading to a better nutrititive value and less use of chemical inputs, such as pesticides. This study assessed the functioning of vegetable seedling systems in UPU areas of Addis Ababa, Ethiopia. The study is based on in-depth interviews with 36 vegetable seedling producers and other key informants.

The findings indicate a pronounced preference among UPU farmers in Addis Ababa cultivating leafy vegetables like spinach, kale, and lettuce alongside popular vegetables like head cabbage, onion, and tomato. But the range of vegetables produced appears narrow, suggesting an opportunity for diversifying production systems. Doing this would require policymakers and agricultural organizations to develop initiatives to increase the production of underutilized vegetables, thereby promoting a more diverse agricultural landscape.

The demographic analysis of vegetable seedling growers in Addis Ababa reveals a predominantly male workforce with an average age of 36 years. Most growers have completed secondary education and possess moderate agricultural experience. Many vegetable nurseries are relatively new, with an average age of 8 years, indicating a vibrant but potentially unstable nursery environment that could benefit from more systematic institutional support and resources. Family labor is the primary mode of workforce engagement among vegetable seedling producers, accounting for 66% of labor input. This reliance provides flexibility and availability during busy planting and harvesting periods. A key concern of nursery operators is the high cost of hired labor during peak seasons, and of laborers commitment and work quality, resulting in a preference for family labor.

Most seedling producers use an open-field system for seedling production, with roughly a third employing a combination of open-field and pot/tray systems. Just 11% of producers utilize greenhouses, reflecting a general lack of exposure and knowledge regarding greenhouse technology. Many seedling producers rely on rented or shared land without investing in equipment or greenhouses. Vegetable seed in UPU Addis Ababa is available from shops and local markets, with specific vegetable seed often sourced from rural areas. There is much scope for improved

seed distribution systems and tailored support programs to ensure farmers have reliable access to high quality seeds.

Vegetable seedling production in Addis Ababa faces many challenges, including pests and diseases, rising input costs, inadequate access to quality seed, land tenure insecurity, and inadequate extension services. The opportunities for UPU agriculture in general arise from a growing consumer demand for healthy eating and the support of the Farmers and Urban Agriculture Development Commission. However, over 85% of seedling producers indicated low farmer demand for seedlings, which indicates a need for creating awareness by farmers on the benefits of using healthy seedlings. Seedling producers perceive that the main reasons for the lack of farmer buy-in are the high cost of seedlings and that many farmers produce their own (bare root) seedlings. Farmers' willingness to adopt the use of certified seeds and having interest in establishing a tracking system for seedling performance suggests a path toward improved practices and productivity in urban agricultural systems.

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1. Introduction

Photo: Greenhouse for vegetable and seedling production in Addis Ababa (Photo credit: Zenebe Adimassu)

Ethiopia's urban and peri-urban (UPU) vegetable production has shown significant growth and development (Assefa et al., 2016). It is crucial in enhancing food security and nutrition, especially in densely populated areas (Hunde, 2017). Urban agriculture reduces dependency on external food sources, minimizing transportation costs and carbon footprints. It fosters access to fresh, nutrient-rich produce, which can significantly improve dietary diversity and health outcomes for urban populations (Binalfew, 2018; Puigdueta et al., 2021). Furthermore, UPU agriculture can empower communities, create job opportunities, and stimulate local economies (Zikargae et al., 2022). By integrating urban vegetable production into food systems, cities can build resilience against supply chain disruptions and contribute to sustainable urban development (Langemeyer et al., 2021).

Ethiopia has made efforts towards increasing vegetable production in UPU areas to meet the rising demand for fresh produce in urban centres (Tadesse et al., 2018). A reliable supply of quality inputs, including seedlings, is essential for profitable and sustainable vegetable production. Quality planting material is crucial for all crops, and quality propagated seedlings of most vegetable types has clear benefits, serving as the foundation for healthy, productive vegetable cultivation (Tadesse et al., 2018). They ensure vigorous growth, better resilience to

pests and diseases, and higher yields (Dassa et al., 2019; Shiferaw et al., 2011). Healthy seedlings develop more robust root systems that can better cope with environmental stresses, resulting in improved nutritional value and reducing reliance on chemical inputs, such as pesticides. Additionally, quality propagated seedlings have a well formed root 'ball', which substantially reduces transplant shock and helps farmers maximize their investment through more efficient access to and use of nutrients (fertilizer) and water.

In Addis Ababa, the vegetable and seedling production is flourishing, with a diverse range of vegetables being cultivated across the city. From commercial producers to community gardens, residents in Addis Ababa actively cultivate a range of vegetables, such as tomatoes, lettuce, spinach, cabbage, peppers, carrots, onion, garlic, shallot, and kale (Gosa et al., 2024; Tadesse and Bekele, 2022). Local nurseries are crucial in providing high-quality seedlings to support urban farming (Ayana et al., 2014). The increasing interest in urban agriculture and sustainable food production has increased the demand for vegetable seedlings (Artmann et al., 2020).

This scoping study aimed to analyze vegetable seedling systems in the city, including key challenges and opportunities for improvement. The study provides important information to policymakers, urban planners, and agricultural stakeholders in developing targeted interventions to support urban vegetable farmers. By understanding the unique characteristics of vegetable seedling production in Addis Ababa, stakeholders can tailor interventions to address specific needs and foster more resilient urban vegetable production systems.

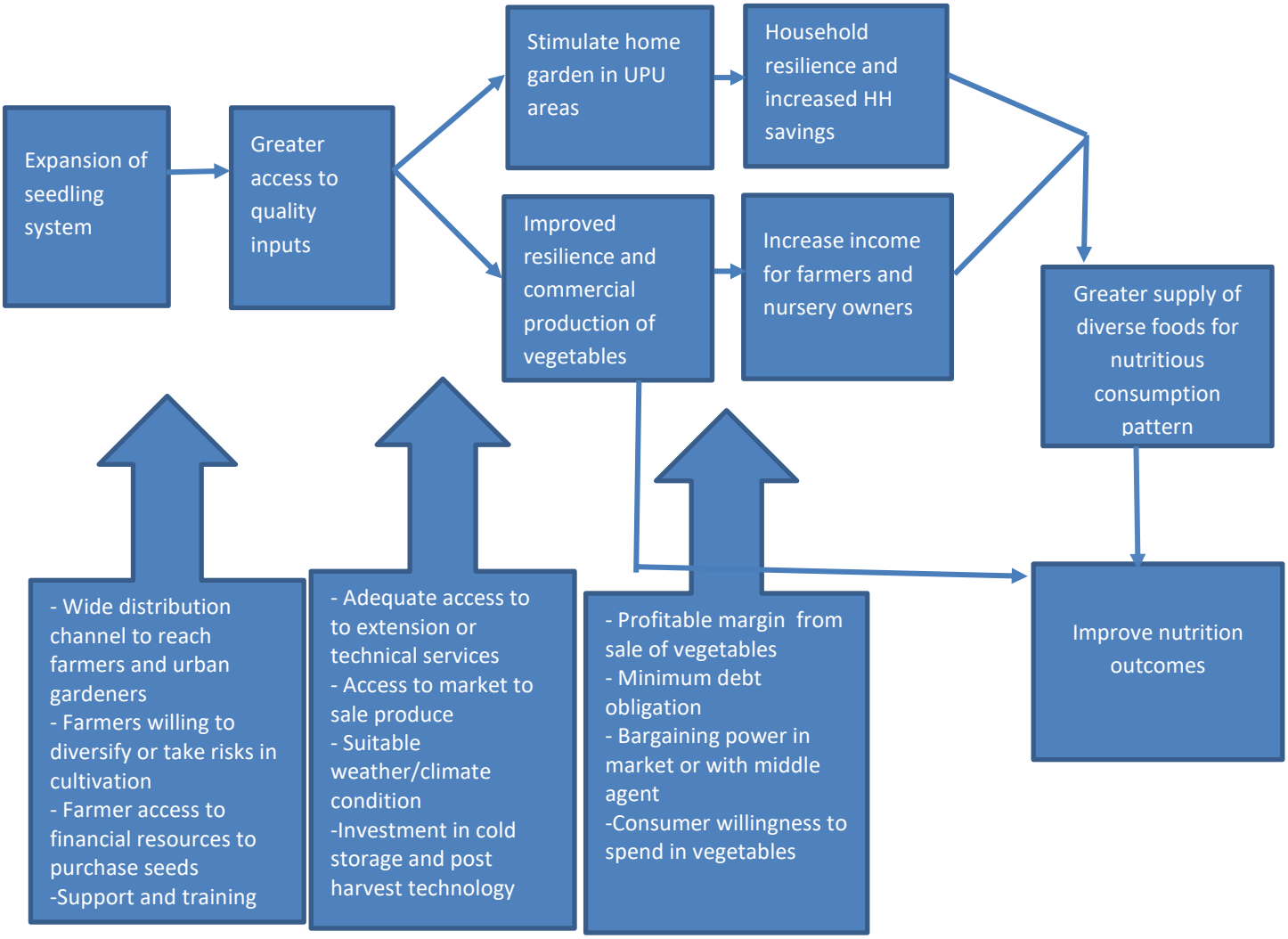

Figure 1. Theory of change for improved access to seedlings for vegetable production and nutrition outcomes (Source: World Vegetable Center, 2022)

2. Objectives and research questions

This scoping study aims to develop a thorough understanding of the status of seedling systems in and around Addis Ababa city, including opportunities, challenges, and research needs.

The study was guided by the following research questions encompassing the socioeconomic and biophysical domains and organized into four thematic areas:

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

i) What vegetable species are commonly produced in and around Addis Ababa? Which of these potentially lend themselves to seedling production in nurseries?
ii) What are the characteristics of commercial vegetable producers and home gardeners (e.g., location, socioeconomic background, age, gender, employment, land size and tenure, water sources and access, labor use)?
iii) Which technical challenges do commercial producers and home gardeners encounter concerning 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 of the seedlings grafted? If so, what are typical root and scion combinations?

B. Understanding market demand for vegetable seedlings
i) List names and contact details of commercial vegetable nurseries. 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? 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 available seedlings? What is the diversity in terms of species and varieties?
v) What is the demand for seedlings from commercial producers and/or home gardeners? Are they aware and interested, and is their demand satisfied or 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 urban and peri-urban 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 seedlings minimally have (e.g., bacterial wilt resistance, flood tolerance); and 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 soil media are commercially available that could be suitable for seedling production? How much does it cost? Are supplies reliable? Is the media sustainably produced?
iv) Which technical constraints will need to be overcome when setting up local vegetable 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) Which ongoing programs, projects, or initiatives promote using 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 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 in investing 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,
and rationale).

3. Data and methods

Photo showing partial view of Urban Agriculture Input Multiplication, Demonstration, and Training Center (UAIMDTC) in Addis Ababa (Photo credit: Zenebe Adimassu)

3.1. Study area

This study focused on Addis Ababa, the capital city of Ethiopia. The city has a vibrant market culture, for example Merkato, one of the largest open-air markets in Africa, where any variety of goods and local products can be found. Addis Ababa is the largest city in Ethiopia, with an area of 527 sq. km and a population of 5.7 million (World Population Review, 2024). The city is divided into 11 sub-cities, each with its distinct administrative structure and services: Arada, Addis Ketema, Akaky Kaliti, Bole, Gullele, Kirkos, Kolfe Keraniyo, Lideta, Nifas Silk-Lafto, Yeka and Lemi-Kura (Figure 2). This study focussed on Bole, Lemikura, and Akaki Kaliti because vegetable production is common in these sub-cities.

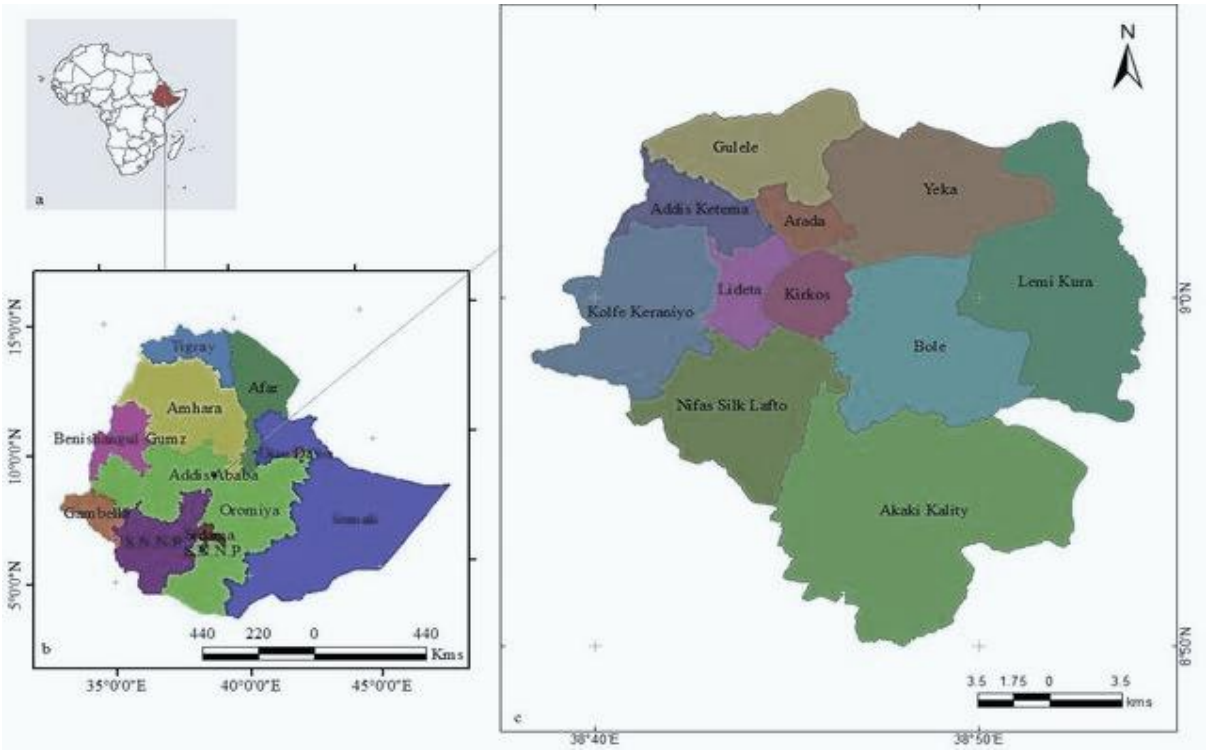

Figure 2. Map of Addis Ababa with sub-cities. Source: Ethio GIS (2023)

3.2. Data collection and analysis

The study involved a desk review of documents and in-depth interviews with government and non-governmental organizations, seedling growers, and vegetable growers. Published articles, reports, strategy documents, technical papers, and policy briefs from various sources were reviewed to understand vegetable seedling production. In August 2024, we interviewed 36 vegetable seedling producers and vegetable growers in and around Addis Ababa in August 2024. Respondents were purposefully selected to include seedling and vegetable producers in various locations. The in-depth interviews used semi-structured questions to collect data.

4. Results

Photo showing seedbeds with compost application to grow vegetable seedlings in Addis Ababa (Photo credit: Zenebe Adimassu)

4.1. Status of urban and peri-urban vegetable production

4.1.1. Vegetables produced and seedling production in nurseries

Farmers grow a range of vegetables and vegetable seedlings, reflecting the popularity of certain vegetables over others (Fig. 3). Many farmers produce spinach (97.2%), kale (97.2%), and lettuce (94.4%), demonstrating a strong preference for leafy vegetables in the study areas. This trend may be influenced by cultural dietary habits, the nutritional advantages of these vegetables, their ease of cultivation, or market demand. The high percentage of farmers growing head cabbage (72.2%), onions (63.9%) and tomatoes (52.8%) provides an indication of vegetables common in the local diet.

Over half of the respondents reported growing mustard and beetroot, while shallots, carrots, cauliflower, and broccoli were less commonly cultivated. The choice of vegetables may also be influenced by climate, market access, seed availability, and agricultural practices in UPU areas. Understanding these dynamics can inform the planning of agricultural programs, assist farmers in diversifying their vegetables, and potentially address nutritional needs in these communities.

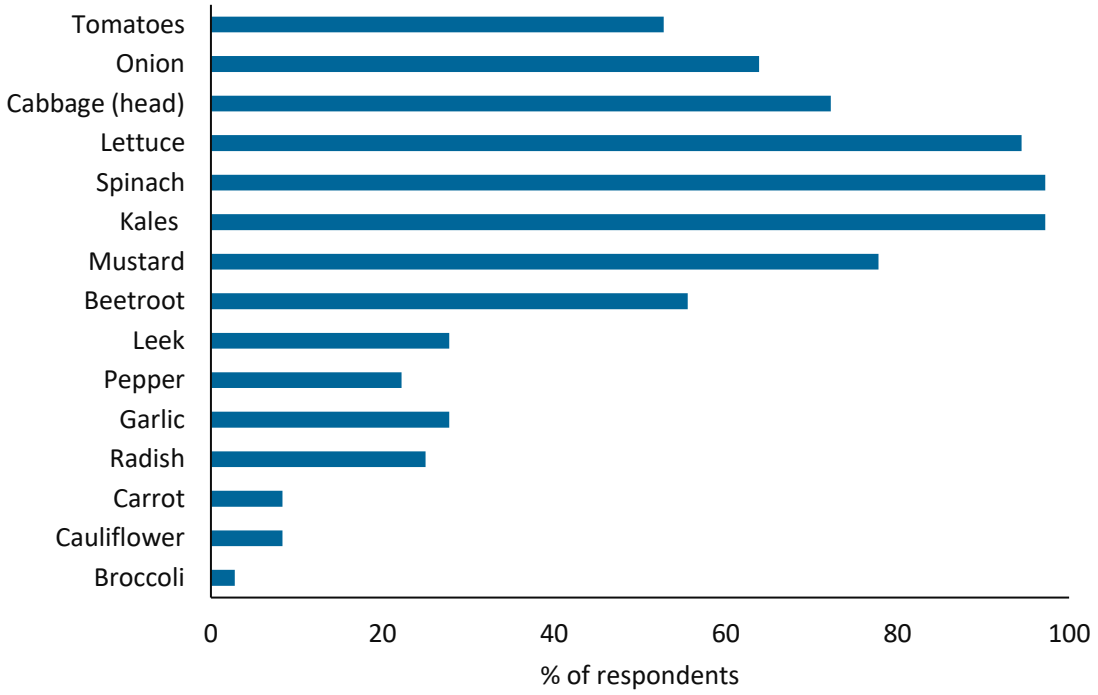

Figure 3. Major vegetable types grown in urban and peri-urban areas of Addis Ababa (n=36)

4.1.2. Key characteristics of vegetable and seedling producers

Table 1 summarizes the socioeconomic characteristics of vegetable seedling producers in Addis Ababa. The average age of these growers is 36.4 years, of which 78% are male, with 50% having completed secondary education (grades 9-12), 17% having just basic literacy skills, and 17% holding a diploma (beyond 12th grade). Most vegetable growers are married (70%) and, on average, have a family size of three. Their average experience in vegetable seedling production is 8 years, indicating moderate expertise in this field.

Table 1. Socioeconomic characteristics of vegetable seedling growers in urban and periurban areas of Addis Ababa (n=36)

Characteristics	Values
Gender of the owner (Male %)	77.78
The average age of respondents (yrs.)	36.44
Education level (%)	
Read and write	16.67
Primary education (1st -8th grade)	16.67
Secondary (9th-12th grade)	50
Diploma (above 12th grade)	16.67
Marital status (% married)	69.44
Average family sizen(number)	3.14
Experience in vegetable/seedling production (yrs.)	8.40 (6.00)
Year of establishment (average year of operation)	8.36 (6.00)
Owner of the nursery (Men%)	77.78
Nurseries registered in sub-cities (yes %)	61.11
Employment	
Total employee[1] (#/nursery)	1.52
Casual employs (#/nursery)	0.88
Female employs (#/nursery)	0.61
Youth employ (#/nursery)	0.69
Labour sources	
Family labor (%)	66.66
Hired labor (%)	33.33

[1] both family and hired

The average age of vegetable nurseries was 8.36 years, with a median of 6 years and a range of 4 to 14 years (Fig. 4).

Figure 4. Years of operation for vegetable seedling nurseries in Addis Ababa (n=36)

In vegetable seedling production, labor is crucial to ensure efficiency, quality, and cost-effectiveness. Family labor only is used by 66% of nurseries (Fig. 5). Family members often provide more flexible schedules and are available to work extra hours during peak planting, weeding, and harvesting times. Family members share a vested interest in the business's success, and so are more committed and provide better quality work. However, one-third of nurseries additionally used hired labor during the peak season for planting and weeding. However, respondents indicated that hired labor does not share the same level of commitment and delivers lower-quality work.

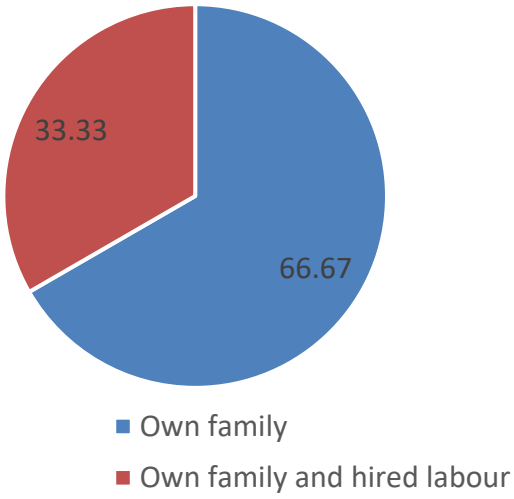

Figure 5. Labor use at vegetable/seedling production in UPU areas of Addis Ababa (n=36)

The study shows that most respondents produced seedlings in the open field (Fig. 6). Approximately one-third of the respondents used a combination of open–field and pot seedling production systems. In contrast, a small proportion of the respondents employ an integrated approach that combines open-field, pot, and greenhouse methods for seedling cultivation. Most producers do not use greenhouses and are unaware of the benefits of using them for growing vegetable seedlings.

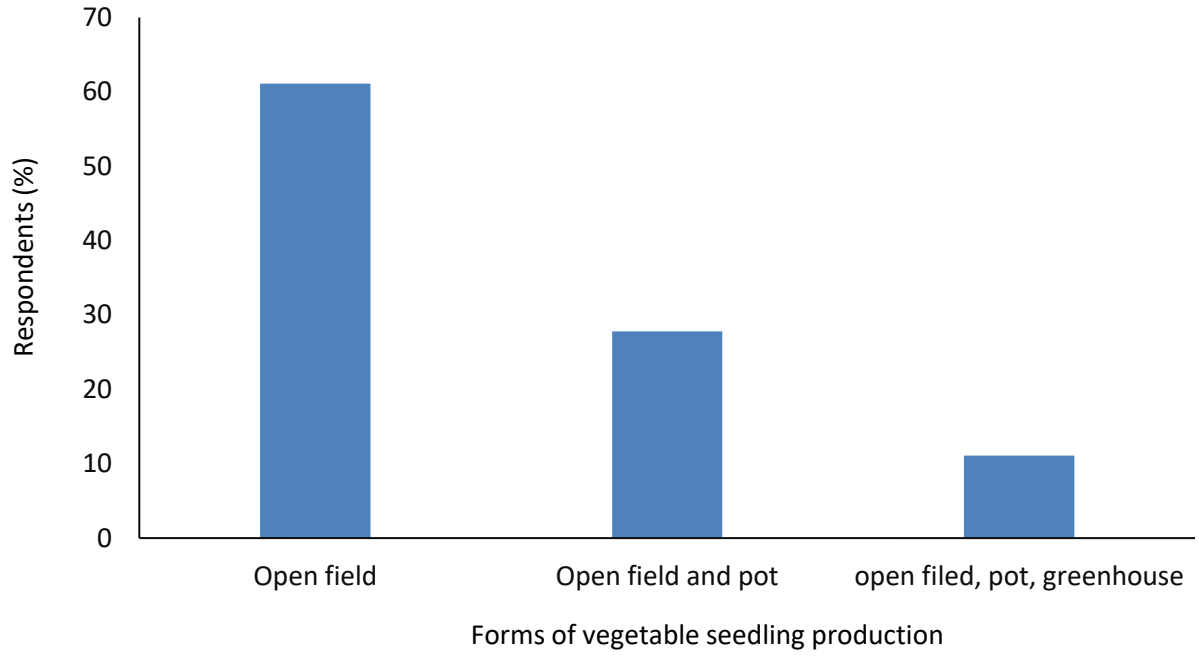

Figure 6. Forms of seedling production in urban and peri-urban areas of Addis Ababa (n=36)

Understanding the various land tenure systems provides insight into the challenges and opportunities faced by seedling growers in Addis Ababa, highlighting the importance of tailored interventions that address the unique contexts of these farmers. Land tenure security can greatly influence a farmer's willingness to invest. However, most vegetable/seedling growers did not have their own land and used rented-in (44%) and shared-in (14%) land tenure systems to grow vegetables/seedlings (Fig. 7). This indicates a high level of dependency on rental agreements, which may offer short-term access to land but can also lead to instability and insecurity. Farmers reported that only landowners have the legal right to access essential inputs such as fertilizer, seed, and agrochemicals. As a result vegetable and seedling growers rely on the landowners to access these resources and must pay additional incentives to secure these inputs.

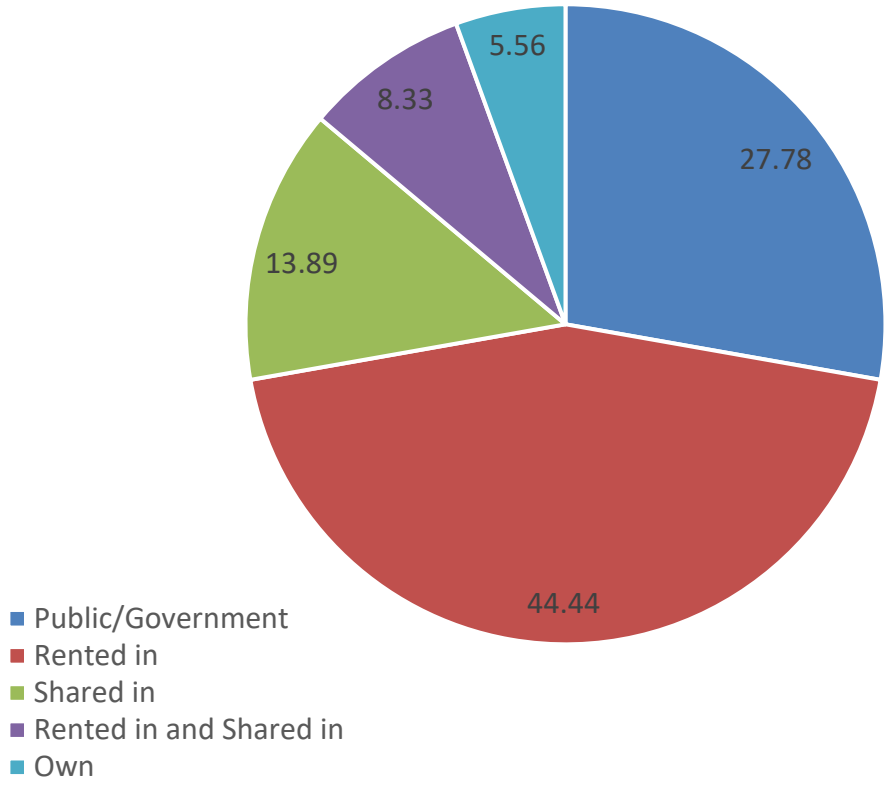

Figure 7. Land tenure of vegetable seedling growers in the urban and periurban areas of Addis Ababa (n=36)

4.1.3 Seed sources

In Addis Ababa, vegetable seeds are primarily found in urban shops in areas such as Atakilit Tera and Gojam Berenda (Table 2), which specialize in popular vegetables, such as onions, tomatoes, cabbage, lettuce, and spinach. These shops are in a central location for UPU farmers and gardeners, ensuring easy access to seed. Additionally, local open markets play a crucial role as informal sources for certain vegetables, such as garlic and mustard (Tikur Gomen). Hence, a combination of formal and informal seed sources support vegetable cultivation in the Addis Ababa urban environment. The data reflects the varying accessibility of seed sources for different vegetable types across Ethiopia. While well-defined sources for onions and commonly cultivated vegetables like tomatoes and cabbage exist in urban shops in Addis Ababa, kale is primarily sourced from rural areas, which may indicate regional agricultural practices or availability. The concentration of seeds for tomatoes, cabbage, lettuce, and spinach in specific shops suggests a higher demand for these vegetables in urban settings. Garlic and mustard seed, on the other hand, are more traded in rural, informal contexts. The reference to specific regions, such as Gurage for kale, emphasizes the significance of local agricultural practices and the potential for variations in vegetable cultivation and seed sourcing across different areas.

Table 2. Sources of seed by vegetable type in Addis Ababa

Vegetable types	Seed sources
Onion	Shops in Addis Ababa (Atakilit Tera, Gojam Berenda) and Meki
Tomatoes, cabbage, lettuce, spinach	Shops in Addis Ababa (Atakilit Tera, Gojam Berenda)
Kale	Gurage zone
Garlic, mustard	Local open market

Table 3 provides information on different vegetable types, highlighting the number of varieties released, registered, and recommended in Ethiopia. Peppers exhibit the highest level of diversity, totaling 64 varieties (19 released, 22 registered, and 23 recommended). Onions are the second most diverse vegetable, with 30 varieties (13 released, 12 registered, and 5 recommended). Overall, the data reveals variability in the development and registration of vegetable varieties. While many pepper and onion varieties indicate significant local breeding efforts, other crops, such as broccoli, cauliflower, carrots, and beetroot are not locally bred. Although research institutions recommend various vegetable types, vegetable producers in Addis Ababa often opt for imported seeds for several reasons. First, imported seeds frequently offer higher quality and better yields than locally produced seed, giving growers the potential for increased profits. Second, these seeds are often bred for specific climate conditions, diseases, and pests, making them more suitable for the diverse agro-ecological zones in and around the city. Third, access to modern varieties that are disease-resistant and have improved shelf life also plays a crucial role in producers' choices. Fourth, the growing demand for high-quality produce in urban markets drives farmers to use seeds known for superior performance. Fifth, the recent advancements in agricultural practices emphasize the importance of reliable seed sources, making imported seeds an attractive option for those looking to enhance their production efficiency and competitiveness in the market.

Table1 3. List of Major vegetable varieties recommended, registered and released to be produced in Ethiopia

Vegetable type	Number of varieties			
	Released	Registered	Recommended	Total
Pepper	19	22	23	64
Onion	13	12	5	30
Cabbage	5	11	9	25
Cauliflower	-	3	7	10
Broccoli	-	2	3	5
Lettuce	1	11	3	15
Carrot	-	1	10	11
Beetroot	-	1	4	5
Spinach	-	-	8	8
Radish	-	-	3	3

Source: Binalfew, 2018

4.1.4. Challenges and opportunities in commercial seedling production

4.1.4.1. Challenges

Key challenges of vegetable seed and seedling production in Addis Ababa (Table 4).

i) Pest/disease

More than 97% of the respondents reported that pests and diseases significantly affect vegetable/seedling production in Addis Ababa (Table 4). This challenge often necessitates the use of chemical pesticides. Farmers explained that the increased use of chemical pesticides leads to disease resistance against the pesticides. Sustainable pest/disease control practices, such as crop rotation, integrated pest management, and resistant varieties, are crucial for mitigating the adverse effects of pests and diseases on vegetable production.

Table 4. Key challenges of vegetable/seed production in Addis Ababa, % of respondents (n=36)

Challenges	% of respondents
Pest and disease	97.22
High costs of inputs (fertilizer, seed, pump, fuel, chemicals)	94.44
Limited access to inputs (fertilizer, fuel, seed, chemicals (pest and disease control)	83.33
Lack of quality seed	77.78
Unregulated movement of livestock in the city	52.78
Limited extension services	36.11
Land shortage	94.44
Insecure land tenure	88.89
Water shortage	83.33
Poor water quality	63.89
Output price fluctuation and volatility	27.78

ii) High costs of inputs (fertilizer, seed, pump, fuel, chemicals)

According to 95% of the respondents, the rising costs of inputs such as fertilizers, seeds, fuel, and irrigation pumps pose significant challenges for vegetable producers, impacting their profitability and overall viability. High fuel costs increase operational expenses for irrigation, further straining budgets. This financial pressure results in limited investment in sustainable practices, innovation, and farm maintenance, ultimately jeopardizing long-term productivity and resilience.

iii) Limited access to inputs (fertilizer, seed, fuel and chemical pesticides)

Over 80% of vegetable/seedling growers stated a limited access to key inputs, including fertilizer, seed, fuel and other agrochemicals. A lack of access to or use of adequate fertilizers affects optimal growth and yields of vegetables. Limited access and the absence of effective pest and disease control chemicals can permit disease proliferation, jeopardizing quality and productivity of the crop. Furthermore, limited access to high-quality seeds hampers the ability of vegetable

growers to grow resilient and high-yielding varieties, which are essential for meeting market demands and ensuring food security. Vegetable growers were restricted from accessing fuel for pumping unless a support letter was granted from the Farmers and Urban Agriculture Development Commission (FUADC). Generally, the lack of access to these vital inputs undermines the sustainability and viability of the agricultural sector.

iv) Lack of quality seed

Seed quality plays a crucial role in the success of vegetable and seedling production, directly impacting crop yields, resilience, and overall plant health. High-quality seeds provide better germination rates, uniformity, and vigor, which leads to robust plants capable of withstanding environmental stresses such as drought or disease. Additionally, using quality seeds can significantly reduce the time to harvest and enhance the nutritional value of the produce. In contrast, inferior seed may result in poor germination, irregular growth, and vulnerability to pests and diseases, ultimately diminishing yield and quality. Therefore, access to quality seeds is essential for maximizing productivity, enhancing food security, and supporting farmers' livelihoods in vegetable production.

v) Unregulated movement of livestock in the city

The unregulated movement of livestock in urban areas can have detrimental effects on vegetable and seedling production. When livestock roam freely, they are partial to grazing on unprotected/fenced vegetable plots, trample seedlings, and contaminate fields. Livestock can also introduce pests and diseases that further jeopardize the health of vegetables. Uncontrolled livestock movement can complicate urban planning and land use, hindering efforts to create sustainable agricultural practices within urban environments. Consequently, regulating livestock movement can be essential.

vi) Limited extension services

Limited agricultural extension services in Addis Ababa hinder vegetable and seedling production by restricting access to knowledge, resources, and support for vegetable growers. Extension services provide expertise on best practices in crop management, pest control, and soil health, which are crucial for optimizing yields and sustaining plant health.

vii) Water shortages

Water shortage and erratic supply in Addis Ababa poses a significant threat to vegetable and seedling production. Insufficient water supply can lead to stunted growth, reduced crop quality, and increased susceptibility to pests and diseases. Vegetables and seedlings, which are heavily reliant on regular irrigation for optimal development, can suffer stress during drought conditions, resulting in lower yields or complete crop failure. Moreover, limited water availability can force

farmers to adopt inefficient irrigation practices, further straining already scarce resources. This scenario jeopardizes food security and leads to economic challenges for growers who depend on successful harvests. Therefore, addressing water scarcity through sustainable management practices and innovative irrigation technologies is crucial for ensuring the health and productivity of vegetable and seedling types.

viii) Land shortage

Limited land availability in Addis Ababa significantly impacts vegetable and seedling production by limiting the available area for cultivation. As urbanization and industrial development encroach on agricultural land, farmers face increased competition for space, leading to smaller plots that may not support intensive farming practices necessary for high yields.

ix) Water pollution

Water pollution poses a significant threat to vegetable and seedling production in Addis Ababa, as it directly affects plant health and agricultural productivity. Contaminated water sources can introduce harmful pathogens, heavy metals, and chemicals, reducing growth and quality, and increasing risk of crop failure. Vegetables irrigated with polluted water may also accumulate toxins or pathogens, posing consumer health risks and undermining marketability. Additionally, polluted water can damage the soil ecosystem, affecting beneficial microorganisms crucial for nutrient cycling and soil health.

x) Insecure land tenure

Insecure land tenure in Addis Ababa significantly hampers vegetable and seedling production by creating an environment of uncertainty for urban farmers. With unclear ownership rights or short-term leases, farmers are often reluctant to invest in long-term improvements, such as soil fertility enhancement, infrastructure development, and advanced agricultural techniques. This insecurity leads to sub-optimal cultivation practices, resulting in lower yields and diminished crop quality. Without stable land tenure, farmers also struggle to access financing and resources necessary for scaling their operations. The lack of investment and commitment to land management exacerbates food insecurity and undermines the sustainability of urban agriculture.

xi) Output price fluctuation and volatility

Output price fluctuation and volatility significantly influence vegetable and seedling production in Addis Ababa, creating uncertainty for farmers and impacting their economic stability. When prices are unstable, producers may struggle to predict their earnings, leading to cautious planting decisions and potential underproduction. For instance, if prices are high, farmers might increase their cultivation efforts. However, if prices suddenly drop, they may suffer substantial losses, discouraging future investment and risking their livelihoods. This volatility can also affect the

demand for specific vegetables, making it difficult for farmers to decide which crops to cultivate. Furthermore, the inability to secure fair prices can push farmers towards subsistence farming, limiting their capacity to adopt modern agricultural techniques and undermining overall productivity.

xii) Divergent interest between vegetable growers and the government

This is a recent phenomenon where the interests of farmers producing vegetables and those of the government aiming to increase cereal production using irrigation frequently diverge. Farmers tend to focus on high-value vegetables that are more profitable than cereals. Vegetable production is often driven by local market demand, consumer preferences, and the opportunity to grow fresh, perishable products that can command premium prices. Conversely, the Ethiopian government prioritizes cereal production to ensure national food security and maintain a stable food supply, particularly in a country vulnerable to drought and food shortages. Balancing these interests necessitates careful consideration and thoughtful agricultural policies that address farmers' economic needs and government strategic objectives in the face of global food security challenges.

4.1.4.2. Opportunities

Despite the challenges mentioned above, vegetable and seedling production in Addis Ababa presents numerous opportunities:

The growing focus on urban agriculture allows residents to cultivate vegetables in available spaces, such as backyards, roadsides, riversides, and community land. Government initiatives, such as the promotion of '*Yelemat Turufat*,' motivate farmers to increase production by providing resources, training, and access to markets. This initiative is supported and encouraged by the Prime Minister and Mayor of Addis Ababa City Administration. With attractive prices for vegetables, farmers can benefit financially from growing in-demand vegetables in Addis Ababa. The rising consumption of vegetables presents an opportunity for producers to tap into a lucrative market, especially if they can ensure freshness and quality.

The growing interest in healthy eating among residents creates a demand for fresh vegetables. Marketing campaigns that highlight the nutritional benefits of vegetables can help encourage residents to choose them over costly food items, such as meat, further boosting consumption. The large population of Addis Ababa represents a significant market opportunity for vegetable producers. Focusing on local distribution channels, such as farmers' markets and cooperatives, enhanced accessibility for consumers while ensuring that producers receive fair prices. As perceptions shift towards viewing vegetables as essential components of a healthy diet, awareness campaigns further promote vegetable consumption in Urban areas. Leveraging

these opportunities in Addis Ababa can significantly enhance vegetable and seedling production. By combining community involvement, supportive policies, market awareness, and innovation in vegetable production, significant strides can be made towards ensuring food security and promoting a healthier lifestyle for urban residents.

Agricultural agencies, such as the Farmers and Urban Agriculture Development Commission (FUADC) played a crucial role in facilitating the growth of vegetable production by providing training, resources, and support for urban farmers. Collaboration between government agencies, NGOs, and the private sector can also enhance productivity.

4.2. Market demand for vegetable seedlings

4.2.1. Business characteristics of commercial seedling nurseries

In Addis Ababa's UPU areas, there are three types of seedling producers. The first type, consists of commercial vegetable producers cultivating their own seedlings. The second type includes commercial seedling and vegetable producers. Finally, the third type are specialized commercial seedling producers.

Urban Agriculture Input Multiplication, Demonstration, and Training Center (UAIMDTC)

UAIMDTC is a government-owned horticultural nursery in the Yeka sub-city of Addis Ababa. Spanning 3.5 hectares, the nursery cultivates various vegetable and tree fruit seedlings, including apples, guavas, avocados and plums and has been used for approximately 40 years. Only organic fertilizers, such as slurry, compost, and vermicompost are applied. The center is managed by a director and supported by three horticultural experts. It employs 15 permanent staff and 20 to 30 casual workers, including 75% women. Among the vegetables grown at the center are onions, tomatoes, cabbages, peppers, kale, lettuce, spinach, beetroot, cauliflower, and broccoli. The nursery also focuses on growing and distributing significant quantities of fruits, particularly apples, guavas, avocados, and plums. Additionally, forage crops such as tree lucerne and *Sesbania sesban* are cultivated and sold to users. On average, the center distributes or sells around 950,000 vegetable seedlings, 50,000 fruit seedlings, and 15,000 forage crop seedlings per year.

Joytech Fresh PLC

Joytech Fresh, an Israeli-owned farm established in 2013 in Bishoftu Town, 45 km from Addis Ababa. The farm specializes in a range of vegetable seedlings sold to customers nationwide. The

primary vegetable seedlings include tomatoes, cauliflower, cabbage, broccoli, and peppers. The farm employs two approaches to cultivate these seedlings. The first approach collects certified seeds from smallholder farmers, grows them under greenhouse conditions, and then distributes the seedlings back to these farmers at a minimal service charge. In the second approach, the farm uses its own certified seeds to grow seedlings, which it sells to anyone interested in vegetable cultivation throughout the country. The farm reports that its seedlings are sold as far away as 1,000 km, indicating a strong demand for quality seedlings in Ethiopia. The growing media used in the nursery is 60% cocopeat and 40% regular peatmoss, with vermiculite used as a cover. However, a significant challenge with this media is its high cost, as it is imported and requires foreign currency. Although the farm excels in producing high-quality vegetable and fruit seedlings, over 90% of its efforts are dedicated to growing and exporting various herbs, such as coriander (*Coriandrum sativum*), basil (*Ocimum basil* var. *thyrsiflora*), peppermint (*Mentha piperita*), rosemary (*Rosmarinus officinale*) and thyme (*Thymus capitatus*).

4.2.2. Demand for seedlings and pricing

Over 85% of vegetable and seedling growers reported either no or low demand for purchased seedlings (Fig. 8). While several factors influence the demand for vegetable seedlings in urban and peri-urban areas of Addis Ababa, the primary factor affecting this demand is the cost of seedlings. As a result, many farmers prefer to grow their own bare-root seedlings than buying them.

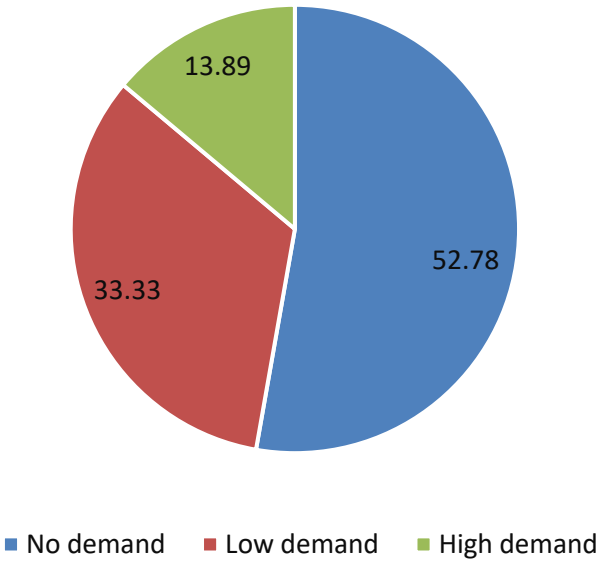

Figure 8. Demand for seedlings in urban and periurban areas in Addis Ababa

Almost all of the smallholder vegetable/seedling producers had no record of the number of seedlings produced, distributed or sold. Some nurseries, such as UAIMDTC showed that the

quantities and prices of vegetable seedlings varied by vegetable type. Accordingly, the most common vegetable seedlings grown by UAIMDTC were lettuce, onion, spinach, tomatoes, and cabbage (Fig. 9). In addition to vegetables, some nurseries such as UAIMDTC grow fruit and herb seedlings including guava, apple, moringa, avocado, and plum (Fig. 10).

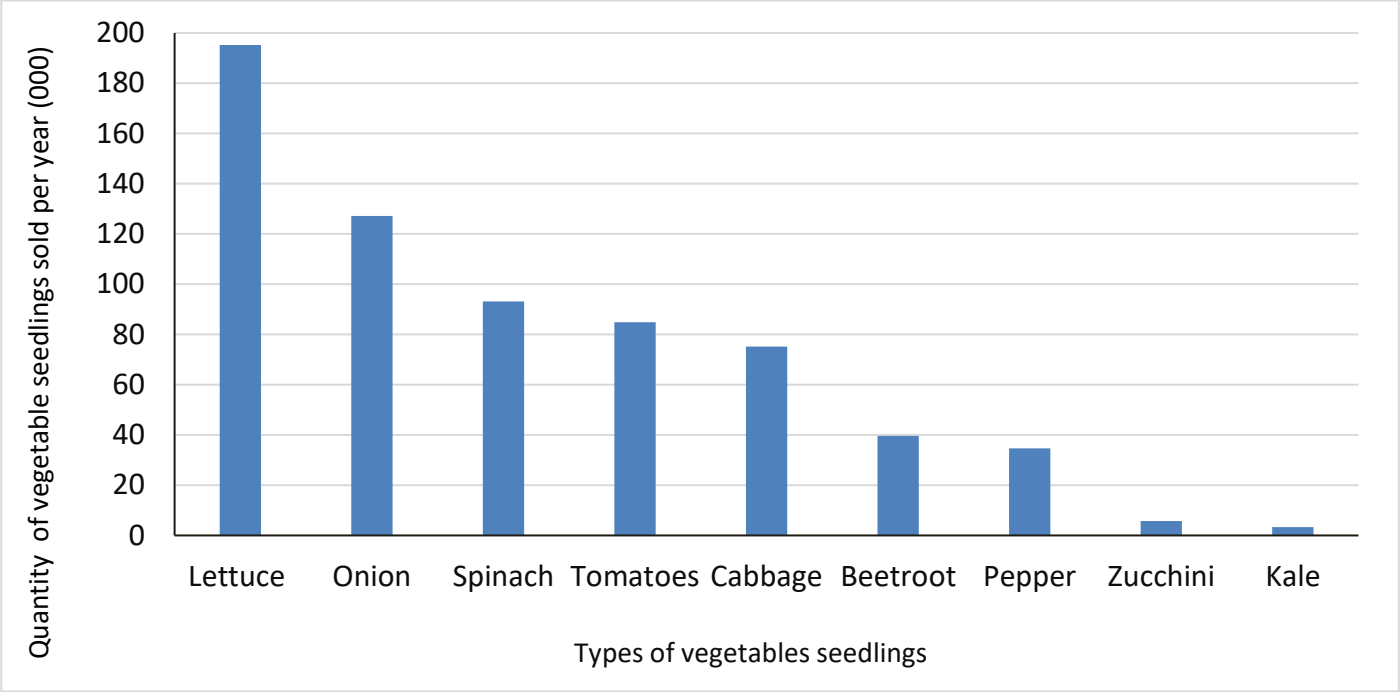

Figure 9. Quantity of vegetable seedlings produced and sold/distributed by Urban Agriculture Input Multiplication, Demonstration, and Training Center (UAIMDTC) in 2024, Addis Ababa.

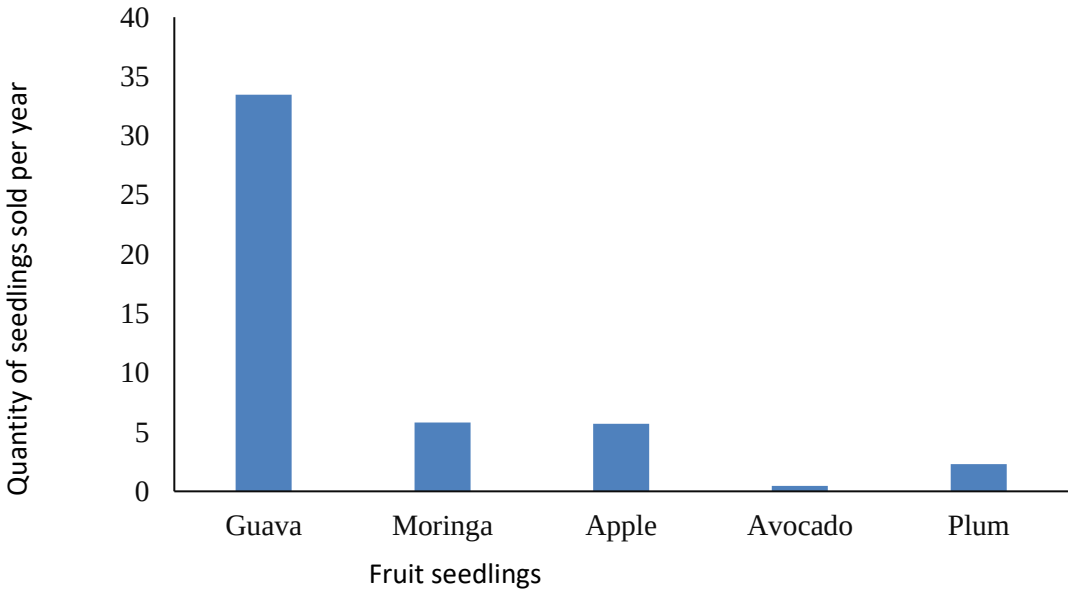

Figure 10. Number of fruit seedlings sold/distributed in 2024 from Urban Agriculture Input Multiplication, Demonstration, and Training Center (UAIMDTC)

While many farmers grow their own seedlings, some purchase them from commercial vegetable seedling producers. These farmers buy directly from the primary producers, bypassing any retailers. Figure 11 presents a list of various vegetable types along with their corresponding prices in Ethiopian Birr (ETB) per seedling. The price of vegetable seedlings ranges from approximately 0.235 ETB[2] for spinach (the cheapest seedling) to 1.176 ETB for beetroot (the most expensive seedling). Given the price variability, farmers may choose which vegetables to cultivate based on potential profitability. Additionally, investors or farmers looking to enter the market can use this pricing information to develop effective strategies for seedling production.

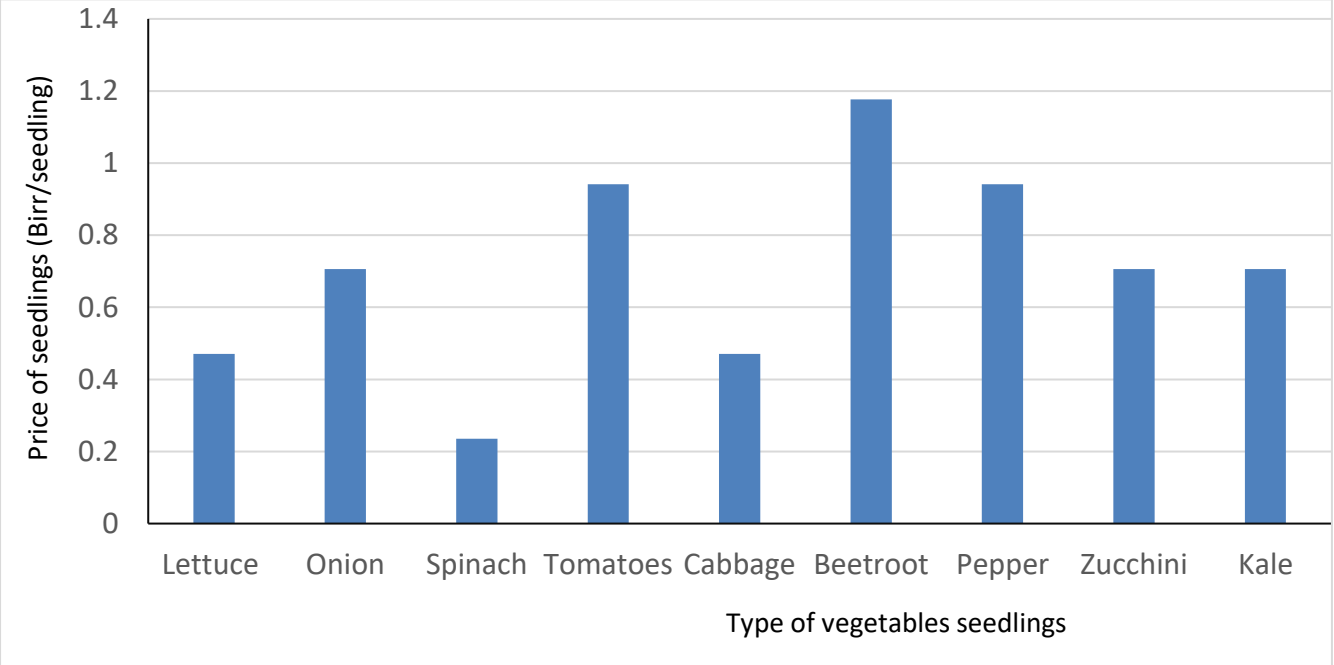

Figure 11. Seedlings prices of selected vegetables in Ethiopian Birr (ETB)

4.2.3. Key urban and peri-urban locations for commercial seedling production

Figure 12 presents the distribution of vegetable seedling nurseries across Addis Ababa. In general vegetable production fields, riverside, roadside and parts of the sub-city administration office are identified as key locations of vegetable nursery sites. Most vegetable nurseries are strategically located to enhance management and resource access. Almost half are found in active vegetable production fields, allowing farmers easy access to monitor and care for seedlings. About 28% are near riversides, benefiting from natural irrigation and nutrient-rich soil,

[2] 1 USD during this study (August 2024) was 56.65 ETB.

though this location poses potential flooding risks. Approximately 22% are situated alongside roads, facilitating market access but also exposing nurseries to traffic pollution. The smallest percentage (6%) is affiliated with sub-city administration offices, indicating a lack of governmental support and a reliance on private or informal practices.

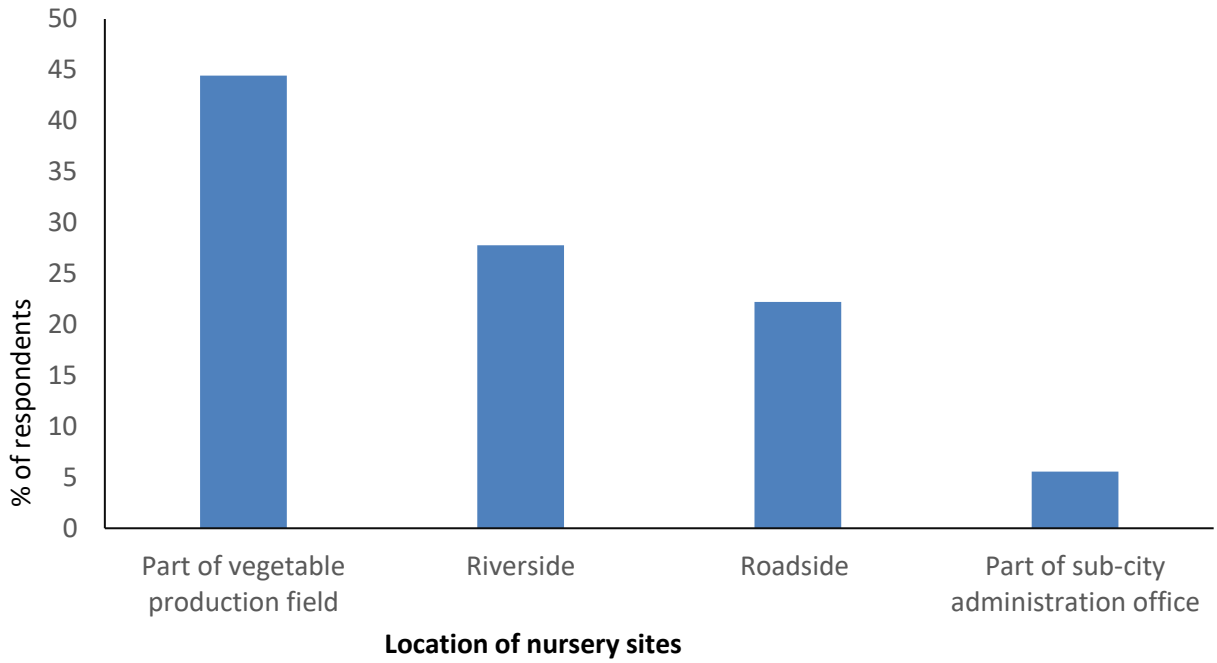

Figure 12. Location of nursery sites for vegetable/seedling production (n=36)

4.3. Agronomic considerations for quality seedling production

4.3.1. Characteristics of seedlings required

Farmers seek high-yielding varieties of vegetables that are resistant to pests and diseases, as well as those with a long shelf life after harvest. These varieties are specifically bred or selected to produce larger quantities of vegetables per unit area. By maximizing the yield from the same land, farmers can better meet the increasing food demand, enhance their profitability, bolster food security in their communities, and improve input use efficiency. Pest- and disease-resistant varieties reduce the risk of crop losses due to infestations or outbreaks, while also reducing reliance on pesticides and lowering pesticide costs. Additionally, farmers desire vegetable types and varieties that maintain their quality for extended periods after harvest, to help minimize food waste by allowing for longer storage and transportation without rapid spoilage. In addition to varieties, good agronomic practices are crucial to grow quality seedlings. Figure 13 illustrates the agronomic practices for cultivating quality vegetable seedlings in Addis Ababa, and the percentage of respondents employing each practice. Hand weeding and cultivation are universally practiced, highlighting the importance of manual labor in weed control and soil

preparation for optimal seedling growth. Up to 94% of farmers utilize integrated pest and disease management, demonstrating a commitment to sustainable farming by reducing chemical pesticide use. Over half of the farmers use inorganic fertilizers, especially NPS (Nitrogen, Phosphorus, and Sulfur), while nearly half practice composting and vermicomposting. Just 6% of farmers source seed from certified providers. Very few farmers maintain records of seedling information, which could hinder their ability to manage growth and make informed planting decisions.

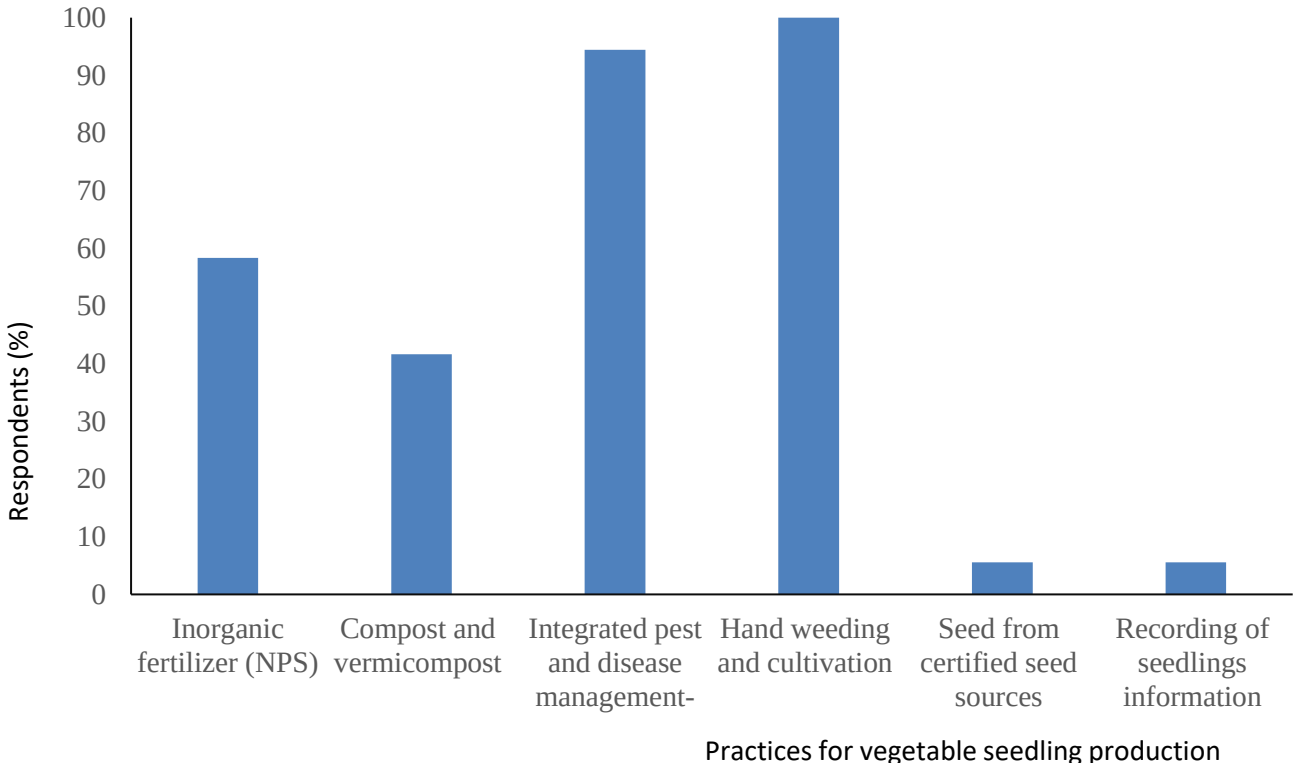

Figure 13. Practices for growing vegetable seedlings in the UPU areas of Addis Ababa (n=36)

Figure 14 illustrates the willingness of farmers to adopt various best practices aimed at enhancing the quality of seedlings, with 72% expressing support for using seeds from certified sources, demonstrating that farmers are aware of the importance of seed quality. Over half of the respondents (58%) favor establishing a recording system, which indicates that farmers value the importance of tracking data on seedling performance, planting schedules, and growth conditions. Such practices enable them to make informed decisions and refine their agricultural approaches over time. Approximately one-third of farmers are inclined to adopt drip irrigation, an efficient method that provides consistent moisture and can significantly enhance seedling quality. While this level of support is encouraging, it also suggests that many farmers may still depend on traditional irrigation methods or encounter barriers to implementing this practice. Support for vertical farming by 28% indicates some recognition of its benefits for optimizing land use where there is limited urban space. However, this also suggests that vertical farming may not be fully

understood or feasible for many farmers at this time. The relatively low levels of interest to use greenhouses (14%) and hydroponic systems (11%) indicate potential obstacles, such as lack of knowledge, financing issues, or spatial constraints, that farmers may face in adopting these practices.

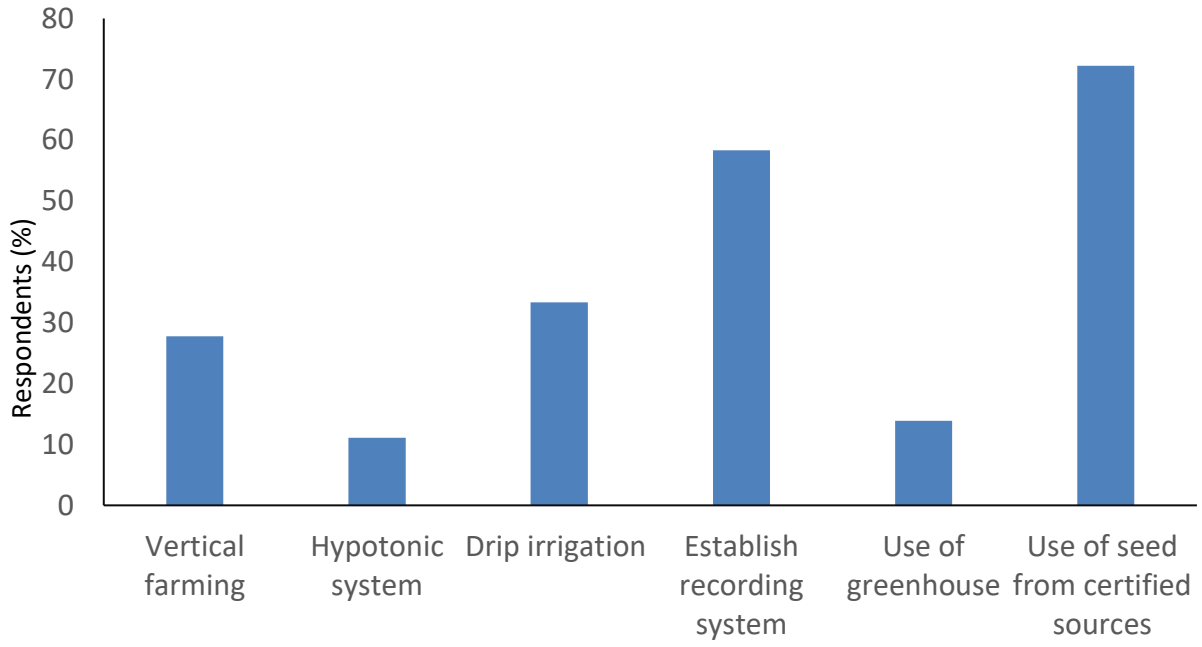

Figure 14. Willingness of farmers to invest in good practices for quality seedlings in urban and peri-urban areas of Addis Ababa (n=36)

As shown in Figure 15, the most commonly reported water source among respondents is from rivers, with 36% indicating they rely on this source; 33% of respondents utilize a combination of river and rainfall. Borehole water is reported by 25% of respondents, reflecting a significant but lower reliance compared to river sources. In contrast, tap water and rainfall is the least common source at 6%, which may indicate limited access to or preference for other water sources. Figure 16 presents the watering frequency of vegetable seedlings in the UPU areas of Addis Ababa. The result shows a variety of watering practices among respondents, which could be influenced by factors such as soil type, crop type, and water availability. A frequency of 3, 4 or 5 days intervals were relatively similar between the respondents. The three-day interval, used by 36% of participants, being more common may point to a perception of its effectiveness in maintaining healthy plant growth. However, 33% irrigate every five days, a choice forced by water conservation or for tending crops with less frequent irrigation needs. This preference may also result from environmental factors, such as lower temperatures or better soil moisture retention. The least common interval is every four days, reported by 31% of respondents. Although still a significant proportion, and similar to both the three-day and five-day schedules.

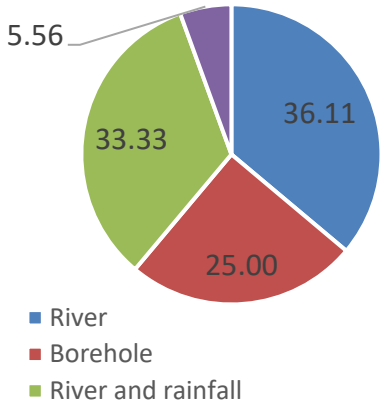

Figure 15. Water sources

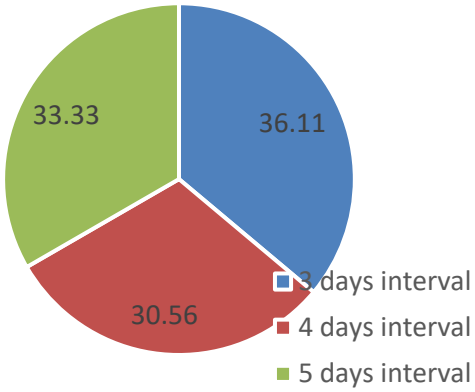

Figure 16. Frequency of watering

4.3.2. Packaging containers for seedlings

The packaging of seedlings during transportation is essential for ensuring their health, safety, and viability upon arrival at their destination. Proper packaging protects seedlings from physical shocks and pressures encountered during transit. It also reduces their exposure to light, temperature fluctuations, and changes in humidity, which is vital for minimizing stress during transportation and enhancing their survival rate and growth after planting. Furthermore, seedlings need a certain level of moisture to endure the journey. Well-designed packaging aids in retaining moisture around the roots and foliage, preventing dehydration, a critical consideration for young plants that are especially susceptible to drying out. Despite these benefits, more than half of seedling growers do not utilize any packaging materials when transporting seedlings from nurseries to planting sites, and just 56% employ pots and plastic bags for this purpose (Fig. 17).

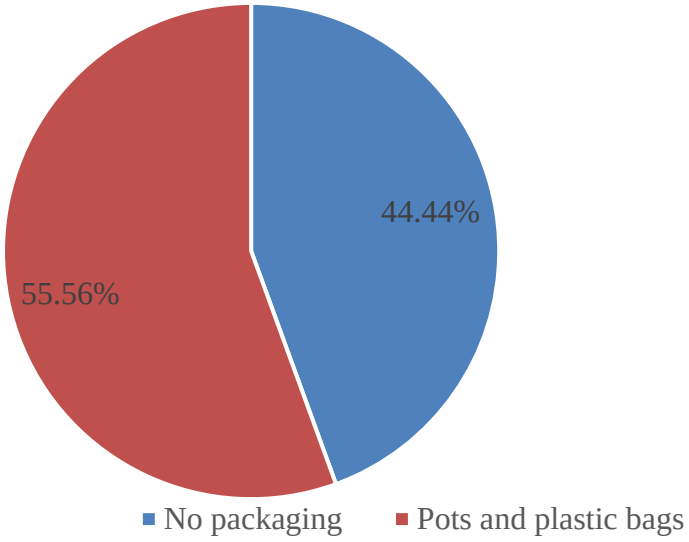

Figure 17. Packaging of seedlings in Addis Ababa (n=36)

4.3.3. Soil media that are commercially available for seedling production

Vegetable seedling growers in UPU areas of Addis Ababa do not generally utilize soilless media for seedling cultivation. Instead, they rely on natural soil mixed with inorganic and organic fertilizers in the open field. Approximately 60% of these farmers apply inorganic fertilizers, primarily nitrogen (N), phosphorus (P), and sulfur (S), while around 40% use organic fertilizers, mainly compost and vermicompost (Fig. 18). Key informant interviews with Joytech Fresh PLC in Debire Zeit revealed that they use cocopeat, regular peat (peat moss), and vermiculite for growing vegetable and fruit seedlings. Each of these growing media offer unique properties and benefits that promote healthy plant development. The combination of cocopeat and regular peat is strategically selected for its benefits, providing organic matter and ensuring excellent water retention, aeration, and drainage, all crucial for robust plant growth. Additionally, the use of vermiculite as a mulch layer helps retain moisture and regulate soil temperature. Crucially, these media are not contaminated with pests and diseases, which soil would invariably be infested with.

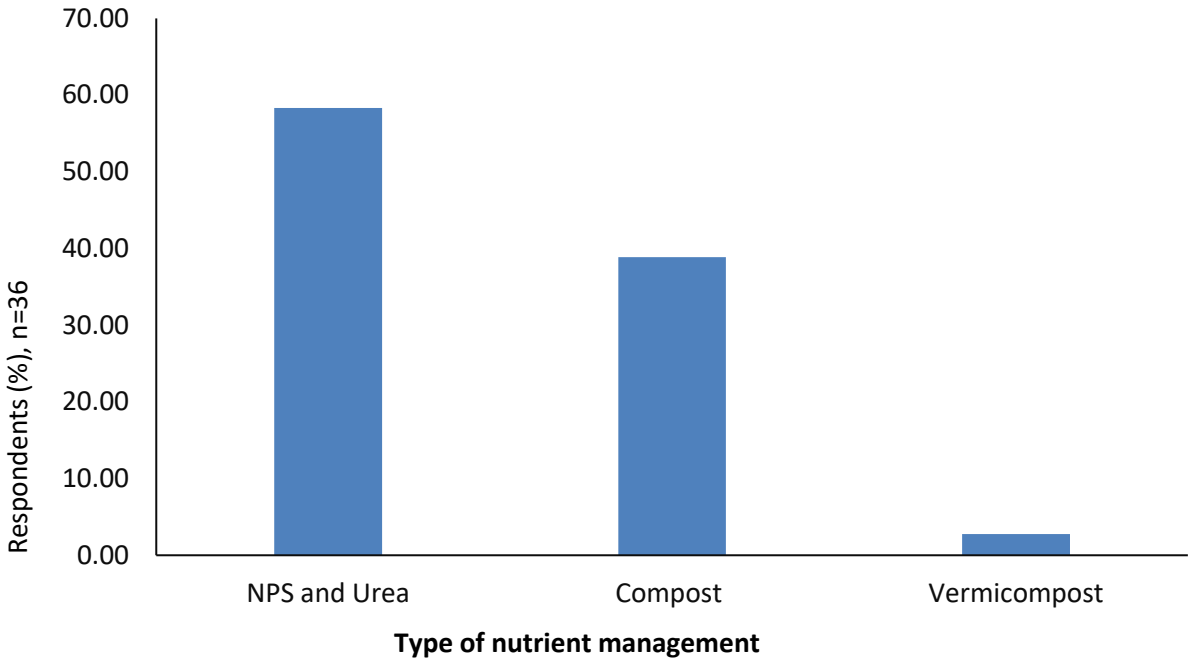

Figure 18. Inorganic fertilizers and organic fertilizers were applied to vegetable seedlings in urban and peri-urban areas of Addis Ababa. NPS: Nitrogen, Phosphorus, and Sulfur

4.4. Policy considerations for quality seedling markets

4.4.1. Seed laws and regulations in Ethiopia: a review

The Ethiopian seed system is governed by a framework of policies, strategies, proclamations, and regulations, as summarized in Table 5. Key policy documents guiding seed production include the 1992 Draft Seed Policy, the 2000 National Variety Release Policy, and the 2020 National Seed Policy. Strategies designed to improve the seed system encompass the 2021 Seed System Development Strategy and the 2019 initiative for Transforming the Ethiopian Seed Sector. Significant proclamations affecting seed production consist of Seed Proclamation 206/2000, which was repealed in 2013 to modernize legal standards, and Plant Breeders' Right Proclamation 481/2006. Furthermore, several regulations support the framework, with Plant Quarantine Regulation 4/1992 and Seed Regulation 375/2016 being the most critical regulations governing the seed system in Ethiopia. Seed laws and regulations in Ethiopia play a crucial role in the nation's agricultural policy framework, focusing on enhancing food security, boosting agricultural productivity, and promoting sustainable farming practices. These laws are specifically designed to support farmers and improve agricultural efficiency. However, challenges such as accessibility, affordability, and the need to integrate informal seed systems into formal regulations still require attention for effective implementation. To achieve sustainable development in Ethiopia's agricultural sector, it is essential to continuously update and adapt these laws and invest in research and farmer education.

Table 5. Policies and regulation of seed production in Ethiopia

Type	Title	Year enacted
Policy	Draft Seed Policy 1992, MoA	1992
	National Variety Release Policy and Mechanism, MoA 2000	2000
	National Seed Policy (in Amharic), MoA, 2020	2020
Strategy	Seed System Development Strategy: Vision, Systemic Challenges, and Priority Interventions. MoA, ATA, 2021	2021
	Transforming the Ethiopian Seed Sector: Issues and Strategies	2019
Proclamations	Seed Proclamation 206/2000 -Repealed by 782/2013	2000
	Plant Breeders' Right Proclamation 481/2006 -Repealed by 1068/2017	2006
	Seed Proclamation 782/2013	2013
	Plant Breeders' Right Proclamation 1068/2017	2017
Regulations	Plant Quarantine Regulation. 4/1992	1992
	Ethiopian Seed Regulation. 16/1997 -Repealed by 206/2000	1997
	Rate of Fees for Seed Competency and Related Services 361/2015	2015
	Seed Regulation. 375/2016	2016
Directives	DQS Directive (in Amharic). 001/2007	2015
	Provision and Management of Competence Certificate for Seed. 2/2010 (Amharic)	2017
	Seed Marketing Directive 001/782/2011	2018
	Provision and Management of Competence Certificate for Agricultural Input Marketing Centers (in Amharic) 002/782/2011	2019
	EGS Administration for Public Varieties (in Amharic) 005/782/2012	2019
	Directive for Import and Multiplication of Unregistered Varieties Exclusively for Re-export	2021
	Plant Breeder's Right Directive	2021

Sources: Binalfew, 2018; Hassena et al., 2017; Beko, 2017; Negarit Gazeta 1992, 2000, 2013, 2023

4.4.2. Institutional support

Based on in-depth interviews with the vegetable growers (N=36), various institutional supports are offered to enhance vegetable and seedling production in Addis Ababa UPU areas. These include training, extension services, the provision of materials, and facilitation of access to inputs for vegetable growers. As illustrated in Figure 19, just 17% of vegetable growers received extension service support from the Federal Urban Agriculture Development Council (FUADC). In addition to these extension services, approximately 40% of growers benefited from training provided by government institutions. This training is crucial for vegetable growers and covers essential topics such as land preparation, planting techniques, watering strategies, integrated pest management, and crop rotation. Such education equips farmers with the knowledge and skills necessary to potentially increase their yields and improve the quality of their vegetables and seedlings. Furthermore, 36% of respondents reported receiving support letters that facilitate access to inputs such as seeds, fertilizers, and fuel. This assistance ensures that farmers can

obtain essential agricultural inputs. Without these support letters, farmers struggle to access the necessary resources, leading to diminished productivity and lower-quality vegetables. Access to improved inputs can significantly enhance production efficiency and profitability. Additionally, 31% of the growers received material support, including seeds and gabions. However, it is concerning that 17% of the farmers reported receiving no institutional support. This lack of assistance could severely limit their capacity to produce vegetables effectively, leaving them with challenges such as inadequate knowledge of best practices and restricted access to essential inputs. These supports are provided by the FUADC at various levels. There are currently no other institutions supporting farmers with vegetable seedling production in the UPU areas of Addis Ababa.

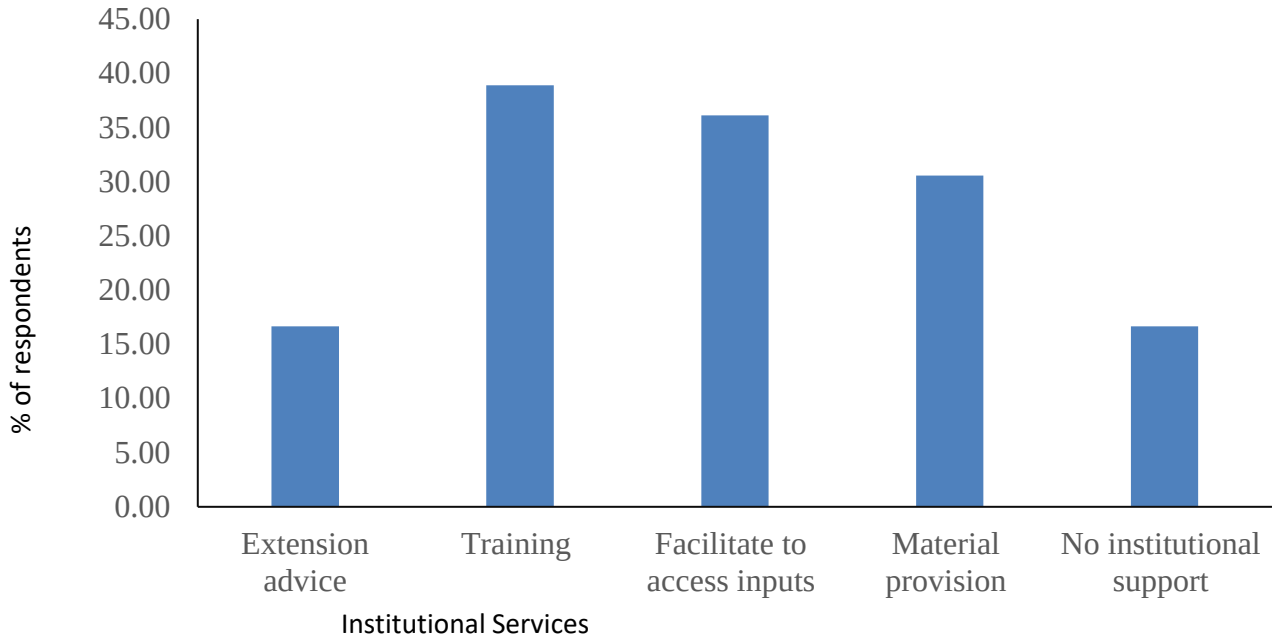

Figure 19. Proportion of farmers receiving institutional support for vegetable/seedlings production (n=36)

4.4.3. Initiatives/programs related to production in Ethiopia

According to the key informants, there are currently no initiatives/projects mandated to improve vegetable seedling production in the UPU areas of Addis Ababa. However, some related projects/initiatives contribute to the production of vegetables/seedlings:

Horticulture for growth (H4G) program

This is an Initiative of the Agricultural Commercialization Clusters (ACCs) program of the Agricultural Transformation Institute (ATI) being jointly implemented by TechnoServe and ATI.

The initiative is funded by Bill and Melinda Gates foundation with the main aim of accelerating the transformation of Ethiopia's horticulture sub-sector by leveraging the power of the private sector.

Yelemat turufat (the 'bounty of the basket') initiative.
This is a national initiative initiated and funded by the Prime Minister's Office Ethiopia to improve nutrition through diversification and intensification of animal as well as crop varieties including vegetable production.

Climate resilient green economy strategy
This is an ongoing national strategy to promote climate-smart agricultural practices, enhancing vegetable production sustainability and resilience against climate change. As a national strategy, this is funded by the government of Ethiopia (GoE).

Smallholder horticulture farmer empowerment project SHEP)
This is Japan International Cooperation Agency (JICA)'s funded scheme to support smallholder horticulture farmers to increase their income by changing the mindsets of farmers towards market-oriented agriculture.

The horticultural livelihoods, innovation and food safety in Ethiopia (Horti-LIFE) project
Aimed to increase rural income, jobs and diet diversity and reduce malnutrition by improving the productivity, diversity and *food safety* in the *horticultural* sector in Ethiopia. This project is funded by SNV and implemented in collaboration with the MoA

Urban agriculture in Addis Ababa
This is funded by FarmAfrica to increase income, and improving food security and nutrition in Addis Ababa with a special focus on women farmers and youth.

5. Summary of key results

Photo showing fruit tree seedlings alongwith vegetable seedling nurseries in Addis Ababa (photo credit: Zenebe Adimassu)

The following points are key results of the scoping study of vegetable seedlings in the UPU areas of Addis Ababa in Ethiopia.

1) The findings indicate a strong preference among farmers in UPU areas of Addis Ababa for cultivating leafy vegetables, particularly spinach, kale, and lettuce, alongside head cabbage, onions, and tomatoes, while less popular vegetables like leek and carrots show limited cultural significance, suggesting that agricultural practices and crop diversity could be enhanced through tailored support programs.
2) The socioeconomic characteristics of vegetable seedling growers in Addis Ababa reveal a predominantly male demographic with an average age of 36 years, a majority having completed secondary education, and a moderate level of experience, highlighting potential gender disparities, the need for targeted skill development, and inclusivity initiatives in the agricultural sector. The average age of vegetable nurseries was 8.3 years with a median of 6 years. Most of the nurseries were within the age of 5 (36.1) and 14 years (27.8), which accounts for more than 60% of the respondents.

3) The majority of vegetable seedling producers in UPU areas rely on family labor (66%), which offers flexibility, availability during crucial planting and harvesting periods, and a shared commitment to the success of the production. In contrast, about one-third of farmers opt for hired labor during peak seasons. However, while hired labor can alleviate demands during busy times, issues related to cost, commitment, and work quality have been raised, indicating that reliance on family labor may provide advantages in efficiency and output quality.
4) The study reveals that over 60% of respondents prefer the open-field system for seedling production, with about one-third using a combination of open-field and pot systems, while just 11% utilize an integrated approach that includes greenhouses, indicating a general lack of exposure and awareness of greenhouse technology among farmers. It also indicates a lack of understanding on the benefits of clean, healthy seedlings that are free of diseases.
5) The study highlights that many seedling growers in Addis Ababa depend on rented or shared land, which creates instability and discourages investment in long-term agricultural practices and infrastructure, as they lack land tenure security and must rely on landlords for access to essential inputs like fertilizers and seeds.
6) Urban shops are primary sources of seeds for popular vegetables such as onions and tomatoes, while local markets supply garlic and mustard, reflecting a diverse mix of formal and informal seed distribution, with specific vegetables like kale sourced mainly from rural areas, highlighting the regional agricultural practices and the need for tailored support in seed access.
7) Vegetable and seedling production in Addis Ababa faces significant challenges including prevalent pests and diseases, high and rising input costs, limited access to essential inputs, lack of quality seeds, unregulated livestock movement, inadequate extension services, water shortages and quality issues, land shortages and tenure insecurity, output price fluctuations, and conflicting interests between vegetable growers and government policies aimed at promoting cereal production, all of which undermine agricultural productivity and economic stability for farmers. Despite various challenges mentioned above, opportunities to enhance vegetable and seedling production in Addis Ababa include urban agriculture initiatives, favorable market dynamics, increasing consumer demand for healthy eating, support from the Farmers and Urban Agriculture Development Commission, and a large urban consumer base, all of which can drive improved agricultural outcomes and economic stability.
8) Over 85% of vegetable growers in Addis Ababa report low demand for purchasing seedlings, primarily due to the high cost, leading many to opt for growing their own instead of buying from commercial producers.
9) Most smallholder vegetable seedling producers lacked records of production, distribution, or sales, although nurseries like UAIMDTC reported varying quantities and prices for different vegetable seedlings, primarily growing lettuce, onion, spinach, tomatoes, and cabbage, along with fruit and herb seedlings such as guava, apple, moringa, avocado, and plum.

10) The significant price variation in vegetable seedlings, from 0.235 ETB for spinach to 1.176 ETB for beetroot, is vital for farmers, investors, and consumers to make informed decisions about cultivation, purchasing, and market strategies.
11) The study illustrates the distribution of vegetable seedling nurseries in UPU areas of Addis Ababa, highlighting that most nurseries are located in active vegetable production fields for easy management, with others near riversides (28%), alongside roads (22%), and in proximity to sub-city administration offices (6%), indicating a need for improved institutional support for local farmers despite effective strategies for growth and market access.
12) Farmers in the UPU areas prioritize high-yielding, pest- and disease-resistant vegetable varieties with long shelf lives to enhance productivity and food security, while also employing sustainable agronomic practices, such as hand weeding and integrated pest management. However, their reliance on inorganic fertilizers, minimal use of certified seeds, and lack of record-keeping highlight critical areas for improvement in seedling quality and overall farming outcomes.
13) The study reveals that a significant majority of UPU farmers are willing to invest and adopt the use of certified seeds to enhance seedling quality. Furthermore, 58% support establishing a recording system to track seedling performance, which can help inform future agricultural decisions. While about one-third are open to adopting drip irrigation, indicating some interest in modern irrigation methods, many still rely on traditional practices. Interest in investing in vertical farming, greenhouses and hydroponic systems was very limited due to a lack of knowledge and high cost of investments.
14) The predominant water sources among respondents are rivers and a combination of river and rainfall, while watering practices for vegetable seedlings vary, with the most common frequency being every three days, indicating an adaptation to environmental conditions and plant needs.
15) Proper packaging is crucial for the health and viability of seedlings during transportation, as it protects them from physical shocks, light, temperature fluctuations, and moisture loss, yet over half of seedling growers do not use any packaging materials, with only 56% utilizing pots and plastic bags.
16) Vegetable seedling growers mostly use natural soil with fertilizers instead of soilless media, with about 60% applying inorganic fertilizers and 40% opting for organic media. In contrast, Joytech Fresh PLC utilizes expensive, but disease-free cocopeat, peatmoss, and vermiculite.
17) Literature review shows that the Ethiopian seed system operates within a framework of policies, strategies, proclamations, and regulations, including key documents like the 1992 Draft Seed Policy, the 2000 National Variety Release Policy, and the 2020 National Seed Policy. The 2021 Seed System Development Strategy and the 2019 initiative aim to enhance the seed sector, while significant proclamations such as Seed Proclamation 206/2000 and Plant Breeders' Right Proclamation 481/2006 shape legal standards. Crucial regulations,

including Plant Quarantine Regulation 4/1992 and Seed Regulation 375/2016, underpin the framework that seeks to improve food security, agricultural productivity, and sustainable practices. Despite these efforts, challenges such as accessibility, affordability, and the integration of informal seed systems with formal regulations persist and necessitate updates to laws, research investments, and farmer education for effective implementation and sustainable agricultural development in Ethiopia.

18) While some vegetable growers receive training, extension services, and input support, a significant proportion lacks institutional assistance, which limits their ability to produce effectively and hampers their access to necessary agricultural resources.

6. Recommendations

A micro-greenhouse for vegetable production in Addis Ababa (Photo credit: Zenebe Adimassu)

Based on the key results outlined, a range of recommendations can be developed to enhance vegetable seedling production and overall vegetable production in Addis Ababa UPU areas.

1) Improve gender inclusivity

- This scoping study revealed that women make up a small percentage of vegetable seedling growers. To address this, it is essential to implement initiatives that support women in agriculture. This includes targeted training programs, access to resources, and financial assistance to encourage their participation in vegetable production. Additionally, skill development initiatives should be established to help female farmers enhance their production capabilities and business management skills.

2) Improving Seedling demand

- Conduct campaigns that educate farmers on the long-term benefits of purchasing quality seedlings versus growing their own. This includes showcasing the economic advantages of lower pest and disease issues, higher yields and better-quality vegetable types.

3) Enhanced record keeping:

- Collaborate with agricultural extension services to assist smallholders in developing simple record-keeping systems to track their production and marketing activities.
- Provide simplified tools or digital platforms to assist farmers in maintaining accurate production records.

4) Establish price monitoring system

- Establish a price monitoring system that provides farmers with information about seedling prices, enabling them to make strategic decisions regarding purchasing and production based on market trends.

5) Strengthening land tenure security

- Advocate for policies that provide land tenure security for UPU farmers to encourage long-term investment in agricultural infrastructure and practices.
- Facilitate community land-sharing initiatives that enable farmers to cultivate their produce without fearing losing access to land.

6) Investment in seed quality and access

- Support the establishment of local seed production and distribution centers, ensuring access to quality seeds at affordable prices to increase overall yield and sustainability.
- Promote awareness of certified seeds among growers through workshops and training sessions, emphasizing their benefits for seedling quality and crop productivity.
- Strengthen collaborations between local markets and urban agro-dealers to improve the distribution of seeds, particularly for high-demand vegetables. Local seed banks could also be established to provide a range of seeds that are both affordable and of high quality.

7) Strengthening the seed policy framework

- Advocate for updates to existing policies to improve seed accessibility, affordability, and the integration of informal seed systems into the formal regulatory framework. This can enhance the overall seed sector's reliability and effectiveness.

8) Improve adoption of modern technologies and practices

- Encourage the adoption of modern irrigation techniques, such as drip irrigation, by providing training and financial assistance to offset initial investment costs.
- Foster awareness and understanding of greenhouse technology and vertical farming methods through demonstrations and pilot projects, facilitating ease of access to these innovative practices. Farmers should be shown the potential benefits of these technologies to increase their resilience to pests and environmental challenges.

- Promote the use of proper packaging materials for seedlings, ensuring the health and viability of produce during transportation to market.
- Provide subsidized or affordable packaging solutions that small-scale farmers can utilize to protect their seedlings, reducing post-harvest losses.
- Educate farmers on the importance of proper packaging materials for transporting seedlings. Encourage the use of affordable and effective packaging options to maintain seedling health during distribution.

9) Enhancement of institutional support

- Increase the availability and accessibility of training and extension services to ensure all vegetable growers can benefit from essential agricultural knowledge and practices.
- Develop tailored support programs that address the specific needs of farmers, focusing on crop diversity and improving the cultivation of less popular vegetables.
- Collaborate with urban agriculture organizations and initiatives to harness shared resources, knowledge, and networks that can enhance local production capabilities.
- Engage local governments and policy-makers to advocate for solutions that support the needs of urban farmers and integrate urban agriculture into urban planning frameworks.

10) Training and capacity building

- Implement training programs on effective water management practices and alternative irrigation techniques, such as drip irrigation, to optimize water use, especially in areas experiencing shortages.
- Conduct workshops on the importance of soil health and the efficient use of fertilizers, emphasizing the advantages of organic fertilizers and soilless media to improve productivity and environmental sustainability.
- Establish regular training sessions and educational resources on various agricultural practices to ensure that all farmers have access to vital information and support, particularly those who currently lack institutional assistance.

11) Research on vegetable production

- Assess high-yielding, disease/pest-tolerant varieties with extended shelf life.
- Identify the prevalent pests and diseases affecting vegetable types in urban areas, and which management strategies are most effective.
- Understand how urban pollution affects pest and disease prevalence in vegetable production.
- Understand how to ensure the quality and safety of vegetable products in the UPU areas of Addis Ababa.
- Assess the costs and benefits of using modern technologies in vegetable/seedling production.

Scoping study of vegetable seedling systems in urban and peri-urban areas od Addis Ababa, Ethiopia

December 2024

References

Artmann, M., Breuste, J., Breuste, J., Artmann, M., Liu, Y., Breuste, J., Dilini, M. M. G. S. 2020. Urban agriculture—more than food production. In *Making Green Cities: Concepts, Challenges and Practice* (pp. 75-176).

Assefa Tuji, A. 2016. Constraints and opportunities in peri-urban and urban agriculture system in Addis Ababa, Ethiopia. *African Journal of Rural Development (AFJRD)*, *1*(1), 107-114.

Ayana, A., Afari-Sefa, V., Emana, B., Dinssa, F. F., Balemi, T., & Temesgen, M. 2014. Analysis of vegetable seed systems and implications for vegetable development in the humid tropics of Ethiopia. *International Journal of Agriculture and Forestry*, *4*(4), 325-337.

Beko, M. H. 2017. *Seed for change: the making and implementation of seed policies in Ethiopia* (Doctoral dissertation, Wageningen University and Research)., Wageningen, The Netherlands.

Binalfew, T. 2018. Vegetable Seed Systems of Ethiopia. *International Journal of Research in Agricultural Sciences*, *5*(6), 2348-3997.

Dassa, A. R., Lemu, B. E., Mohammad, J. H., & Dadi, K. B. 2019. Vegetable Production Efficiency of Smallholders' Farmer in West Shewa Zone of Oromia National Regional State, Ethiopia. *American International Journal of Agricultural Studies*, *2*(1), 39-51.

Gosa, A. S., Megento, T. L., Teka, M. A. 2023. Analysis of vegetable production status and marketing system in Ethiopia: The case of Sebeta Hawas Woreda, Oromia region. *Cogent Food & Agriculture*, *9*(2), 2286047.

Hassena, M., Alemu D., Dey, B. 2023. Quality Declared Seed Mechanism in Ethiopia. A Feed the Future Global Supporting Seed Systems for Development activity report.

Hunde, N. F. 2017. Opportunity, problems and production status of vegetables in Ethiopia: a review. *J Plant Sci Res*, *4*(2), 172.

Langemeyer, J., Madrid-Lopez, C., Beltran, A. M., Mendez, G. V. 2021. Urban agriculture—A necessary pathway towards urban resilience and global sustainability? *Landscape and Urban Planning*, *210*, 104055.

Laporte G., Mackie, J. 2010. Building the African Union: An assessment of past progress and prospects for the African Union's institutional architecture. (ECDPM Policy and Management Report.

Milkias, D., Degefu, S. 2024. Vegetables Production and Management Practices, Challenges, and Opportunities by Smallholder Farmers in Ethiopia. East African Scholars Journal of Economics, Business and Management 7 (2), 11-17.

Negarit Gazeta, 1992. Plant Quarantine Regulation No. 4/1992."

Negarit Gazeta, 2023. Seed production, proclamation No. 1288/2023.

Negarit Gazeta, 2000. Seed proclamation. Proclamation No. 206/2000.

Negarit Gazeta, 2013. Seed proclamation Proclamation No. 782/2013.

Nigussie, S., Liu, L., Yeshitela, K. 2021. Towards improving food security in urban and peri-urban areas in Ethiopia through map analysis for planning. *Urban Forestry & Urban Greening*, *58*, 126967.

Puigdueta, I., Aguilera, E., Cruz, J. L., Iglesias, A., & Sanz-Cobena, A. 2021. Urban agriculture may change food consumption towards low-carbon diets. *Global Food Security*, *28*, 100507.

Serbessa, H., Mekonnen, T., Abi, M. 2023. Opportunities and Challenges of Urban Farming in Ethiopia: Evidence from Vegetable Producers in Addis Ababa. *Journal of Developing Country Studies*, *7*(2), 1-16.

Shiferaw, B., Prasanna, B. M., Hellin, J., Bänziger, M. 2011. Crops that feed the world 6. Past successes and future challenges to the role played by maize in global food security. *Food security*, *3*, 307-327.

Tadesse, B., & Bekele, K. 2022. Scope of vegetable and root crops value chain in Ethiopia. Journal of Agriculture and Food Research, 10, 100402.

Tadesse, S. T., Oenema, O., van Beek, C., & Ocho, F. L. 2018. Diversity and nutrient balances of urban and peri-urban farms in Ethiopia. *Nutrient cycling in agroecosystems*, *111*, 1-18.

World Population Review, 2024. Addis Ababa Population. (https://worldpopulationreview.com/world-cities/addis-ababa-population) (available 15 July 2024)

World Vegetable Center, 2022. A scoping study of vegetable seedling systems in urban and peri-urban areas of selected major cities of Africa and Asia, May 2022.

Zikargae, M. H., Woldearegay, A. G., Skjerdal, T. 2022. Empowering rural society through non-formal environmental education: An empirical study of environment and forest development community projects in Ethiopia. *Heliyon*, *8*(3).

Annex I. Major vegetables and herbs grown in the UPU areas of Addis Ababa

English name/common names	Scientific name
Tomatoes	*Solanum lycopersicum*
Onion	*Allium cepa*
Cabbage (head)	*Brassica oleracea, var. capitata*
Lettuce	*Lactuca sativa*
Spinach	*Spinacia oleracea*
Kales	*Brassica oleracea L. var. acephala*
Mustard	*Brassica juncea*
Beetroot	*Beta vulgaris*
Leek	*Allium ampeloprasum*
Pepper	*Capsicum annuum*
Garlic	*Allium sativum*
Radish	*Raphanus sativus*
Carrot	*Daucus carota*
Cauliflower	*Brassica oleracea var. Botrytis*
Broccoli	*Brassica oleracea var.Italica*
Zucchini	*Cucurbita pepo*
Coriander	*Coriandrum sativum),*
Basil	*Ocimum basil var. thyrsiflora*
Peppermint	*Mentha piperita*
Rosemary	*Rosmarinus officinale*
Thyme	*Thymus capitatus*

Annex II. Some pictures from various study sites

Photo 1: Open field seedling seedling production in Addis Ababa (photo credit: Zenebe Adimassu)

Photo 2. Nursery site at the UAIMDTC (photo credit: Zenebe Adimassu).

Photo 3. Seedbed with compost ready at UAIMDTC (photo credit: Zenebe Adimassu).

Photo 4. Forage seedlings along with vegetable nurseries (photo credit: Zenebe Adimassu).

Photo 5. Vertical farming with a hypotonic system of a woman farmer (Ayat Mohammed) located at Bole sub-city office (photo credit: Zenebe Adimassu).

Figure 6. The vegetable field at Akaki Kality sub-city (photo credit: Zenebe Adimassu).

Photo 7. Women harvesting vegetables at Bole sub-city (photo credit: Zenebe Adimassu).

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