

# A Scoping Study on the Status of Seedling Systems in Metro Manila, The Philippines



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## World Vegetable Center

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## **Acknowledgement**

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## List of Abbreviations

BPI	Bureau of Plant Industry
CSJDM	City of San Jose Del Monte
DA	Department of Agriculture
DENR	Department of Environment and Natural Resources
HOA	Homeowners Association
HVCDP	High Value Crops Development Program
IPB	Institute of Plant Breeding
JOUF	Joy of Urban Farming
LGU	Local government unit
MMDA	Metro Manila Development Authority
MMFN	Mechanized and Modernized Forest Nursery
NCMH	National Center for Mental Health
NCR	National Capital Region
NGA	National government agency
NGO	Non-governmental organization
NGP	National Greening Program
NUPAP	National Urban and Peri-urban Agriculture Program
OP	Open pollinated
QC	Quezon City
ROI	Return on investment
UA	Urban agriculture
UPU	Urban and peri-urban

## Executive Summary

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**Background:** Manila and its surrounding metropolitan districts are among the most densely populated areas in the world. Residents of Metro Manila rely on provinces up to 500 km away for their vegetables. Vegetables are relatively expensive in Manila and consumption is below recommended levels for good health. The government of the Philippines recognizes urban agriculture as a means to increase food security. The efficient supply of good quality vegetable seedlings is important to realizing the potential of urban agriculture and overcome challenges in the use of vegetable seed. The objective of this study is to develop a thorough understanding of the current state of seedling systems in and around Metro Manila.

**Approach:** This scoping study surveyed gardeners, farmers, nursery operators, and government program officers to describe seedling systems in Metro Manila and to identify ways to build or strengthen the use of seedlings in vegetable production.

**Results:** In urban areas, almost all vegetable seedlings are provided by government organizations through various urban and peri-urban (UPU) programs that subsidize farming inputs for urban gardeners and low- and middle-income farmers. There are no commercial seedling nurseries in urban areas, but several nurseries operate in neighboring rural areas and serve relatively large commercial farms that supply vegetables to Metro Manila.

The various nurseries of national government agencies (NGA) and local government units (LGUs) obtain seed from dedicated government agencies and private seed companies. Seeds from private companies are purchased through agriculture dealers and suppliers located in both urban and rural areas. Some of the recurring problems that result in the low quality of free seedlings provided by the government are soil-borne diseases and abiotic stresses, such as poor water and light management.

Several LGUs organize plant markets to assist urban farmers in selling their produce, which consists primarily of popular vegetable species such as eggplant, tomato, pepper, bitter melon, and papaya.

**Recommendations:** The quality of seedlings supplied by government nurseries could be improved by training on good "nurserymanship," meaning proper nursery operation and seedling growing methods. LGUs could support nursery recipients by providing community training in natural farming and disease management to become self-sustaining, as well as enable avenues to sell their produce through farmer's markets. Private commercial nurseries, which are all located in rural areas, have the potential to provide higher quality seedlings, making them ideal partners.

# 1 Introduction

The Philippines is one of the most populous and rapidly urbanized countries in Southeast Asia (Statistica, 2022). More than half (54%) of the country's population of 110 million reside in urban areas (Philippine Statistics Authority, 2020), up from 45% just a decade ago (Philippine Statistics Authority, 2010).



Metro Manila, also known as the National Capital Region (NCR), is composed of one municipality and sixteen cities with the city of Manila as the capital city. Of the 17 administrative regions in the country, Metro Manila is the only one classified as 100% urban (Raflores and Regmi, 2015). Metro Manila has 12 million people on an area of 619.5 sq km (Philippine Statistics Authority, 2020). Metro Manila's vegetable needs are largely met by surrounding provinces, stretching from Laguna in the south to Bulacan and the Cordilleras in the north.

Until recently, the Philippine agricultural industry was focused on the export of fruit and vegetables rather than supplying the domestic market (Team Canada Market Research Centre and Canadian Trade Commissioner Service, 1998). However, the twin threats of rapid urbanization and rising urban poverty have spurred interest in urban agriculture to better supply urban consumers. As far back as two decades ago, when Metro Manila's population was only one-sixth its present size, the NCR government, currently named the Metro Manila Development Authority (MMDA), recognized the potential of urban agriculture (Campilan et al., 2001). Volatile food prices during the COVID-19 pandemic have again underscored the challenge of food security in urban areas such as Metro Manila (United Nations in Philippines, 2021) and stimulated further interest in urban agriculture.

Vegetable consumption in the Philippines is relatively low compared to neighboring countries (Gonzales et al., 2016). Vegetable production in and around Manila is very limited due to the regular occurrence of devastating droughts and powerful typhoons, compounded by the combined effects of climate change and urbanization (Dy, 2019).

One of the critical factors in ensuring stable vegetable production in urban and peri-urban areas is the year-round supply of healthy and high-quality seeds and seedlings. The use of seedlings is important to reduce the latent risks associated with growing vegetables from seeds and to make the best use of limited space.

Urban agriculture (UA) is at the forefront of the government's renewed effort to transition to a

post-pandemic economy. In Metro Manila, national and local governments promote gardening in any available space (street corners, backyards, and open spaces) by providing infrastructure (greenhouses, water facilities), site establishments, technology transfer and training, and agricultural inputs (soil media, seed, and seedlings).

Among the inputs provided by the government, seedlings tend to have a high rate of adoption among urban growers because they reduce the inherent difficulties gardeners face in growing a crop from seed. However as this study shows, only government programs currently supply seedlings to urban areas. Commercial nurseries do not target the urban market as they prefer to sell seedlings in bulk to commercial farmers in the main vegetable production areas which are located in rural and peri-urban areas like Bulacan.

The overall objective of this scoping study is to develop a thorough understanding of seedling systems in and around Metro Manila, including opportunities, challenges, and research needs. Interviews and surveys were conducted with vegetable gardeners, farmers, nursery operators and government staff. In doing so, the study aims to identify promising practices that could guide future efforts to strengthen agri-food systems in urban and peri-urban Manila.

## **2 Materials and Methods**

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### **2.1 Research questions**

The study is guided by the following research questions, that encompass both the socioeconomic and biophysical domains. The questions are organized into four larger subject areas.

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

- a. What vegetable species are commonly produced in and around the focus city? Which of these potentially lean themselves for seedling production in nurseries?
- b. 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)?
- c. What technical challenges do commercial producers and home gardeners typically encounter with regard to vegetable seed and seedlings?
- d. Do commercial producers and home gardeners already purchase seedlings from the market? How does this vary by location, crop or gender of the producer?
- e. Are some of the seedlings grafted? If so, describe existing root and scion combinations.

#### **B. Understanding market demand for vegetable seedlings**

- a. What are the names and contact details of commercial vegetable nurseries? Please characterize their business in terms of scale or operations, target markets, professionalism and expertise, use of technology, and employment of youth and women.



- b. Where are vegetable seedlings sold (e.g., wet markets, plant markets, supermarkets, online, by government offices)? Who are the main buyers?
- c. 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?
- d. What is the observed price and quality of the available seedlings? What is the diversity in terms of species and varieties?
- e. 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?
- f. Do commercial producers and home gardeners have any specific requirements about the appearance of seedlings, type of containers used, packaging, etc.?
- g. What key urban and peri-urban locations offer good potential to sell quality seedlings?
- h. What kind of retailers could be enticed to sell vegetable seedlings?

#### C. Agronomic considerations for quality seedling production

- a. What disease-resistance or tolerance characteristics must seedlings minimally have (e.g., bacterial wilt resistance, flood tolerance); and what other characteristics are desirable?
- b. What low-cost reusable or biodegradable containers are available to grow and sell seedlings (i.e., alternatives to non-recyclable plastic trays)?
- c. 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?
- d. What technical other constraints will need to be overcome when setting up local vegetable seedling nurseries?
- e. 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

- a. Are there any ongoing programs, projects or initiatives promoting the use of vegetable seedlings? (Specify names, describe existing activities, and provide contact details)
- b. 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)
- c. Is there any local government support (e.g., city governments) for commercial seedling production?
- d. Are local financial institutions interested in investing in seedling nurseries?
- e. What are strong public and/or private sector partners with whom the program can work to pilot the commercial production and marketing of vegetable seedlings? (Specify names, contact details, rationale)

## 2.2 Data collection and analysis

Data for this scoping study was collected through in-person interviews with stakeholders, as identified by the principal investigator. A Google Form-based survey questionnaire was developed and covered the four research areas outlined in Section 2.1. The questionnaire is available [here](#). Four types of stakeholders were interviewed: urban gardeners, commercial farmers, nursery operators, and government officers.

The relevant organizations and locations were initially identified through a desk review, mapping relevant government agencies, and plotting immediate localities north, east, and south of Metro Manila. Once a working list was established, the interviewer made contact through network referrals, emails, telephone calls, and initial site visits.

Most site visits were arranged in advance to facilitate in-person interviews. Respondents received a printed copy of the questionnaire while the interviewer administered the survey and recorded the answers either on a tablet computer or by hand. Photographs and audio recordings were retained. Data was analyzed using MS Excel and ChartExpo, the add-on for data visualization.

## 3 Results and Discussion

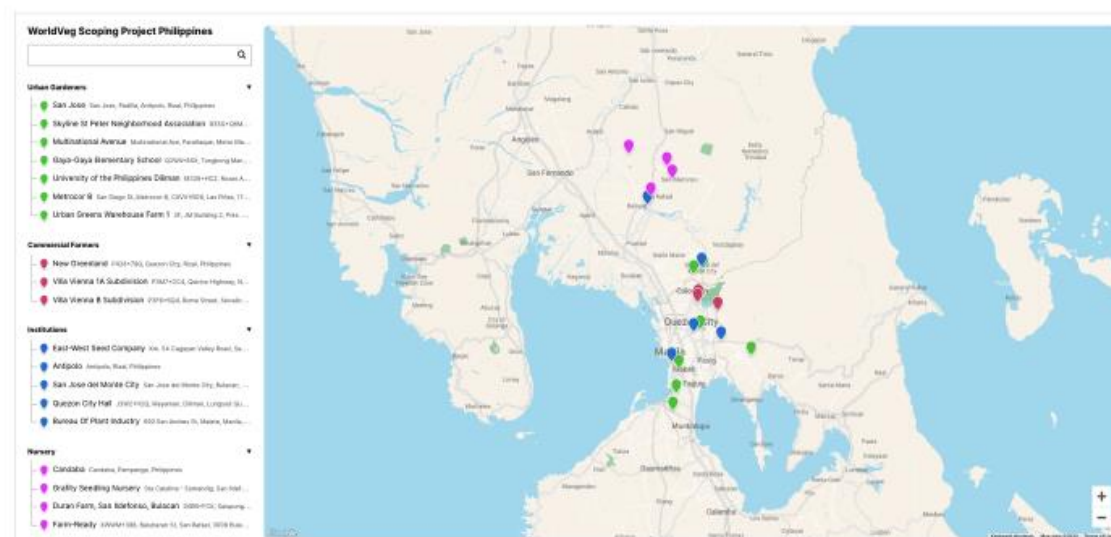
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### 3.1 Status of Urban and Peri Urban (UPU) Vegetable Production in Metro Manila

#### 3.1.1 Demographics of Respondents

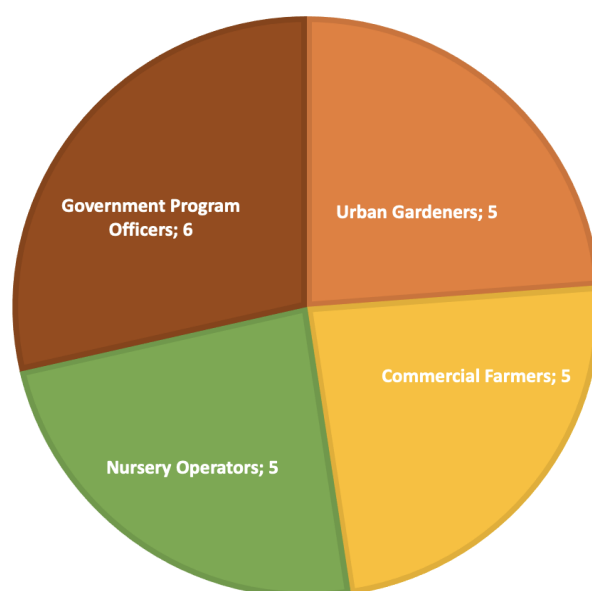
The survey included five urban cities within a 50km radius of Manila (Manila, Makati, Las Pinas, Paranaque, and Quezon) and three peri-urban areas within a 75 km radius of the metropolis (Rizal in the east, Bulacan in Quezon City, and Pampanga) (**Figure 1**).

LGUs and communities running agriculture programs were identified through desk research and personal conversations. We interviewed urban gardeners and urban commercial farmers that were loosely organized into groups of community gardeners or associations. All commercial nursery operators were in the peri-urban areas of the north from where most of the city's vegetables are sourced (Philippine News Agency, 2021; Department of Agriculture Communications, 2021). Government officers interviewed for this study were based in Manila or near the Metro Manila region.



**Figure 1** Locations of urban gardeners, commercial farmers, nurseries, and government institutions surveyed in the scoping survey (see [link](#)).

We interviewed 32 respondents. Of these, 21 clustered groupings were formed to represent a single entity (a farmer's association, nursery, or government agency) among the four stakeholders to provide standard trend and proportion analysis. These respondents represent workers, staff, mid-level managers, or CEOs in various capacities. Unless otherwise noted, subsequent profile analyses are based on this dataset of five (5) urban gardener groups, five (5) commercial farmer groups, five (5) nursery operators, and six (6) government unit officers (**Figure 2**).



**Figure 2** The 21 unique representative entities of the scoping study of the four stakeholders: urban gardener, commercial farmers, nursery operators, and government officers in UPU Metro Manila

**Table 1** shows the sample by gender and age. Among the respondents, 60% were women and the age ranged from 30 to 70 years.

**Table 1** Location, age and gender distribution among respondents

Location	Urban Gardeners					Commercial Farmers					Nursery Operators					Govt. Officers	
	Female			Male		Male			Female		Male			Female		Male	
	20-30	30-40	40-50	50-60	60-70	30-40	40-50	60-70	40-50	50-70	30-40	40-50	60-70	30-40	50-60	30-40	40-50
Bulacan	1	1							1	1	1		1		1		
Makati City						1											
Manila City														1			
Pampanga											1						
Paranaque City				2													
Quezon City	1					1	1	1							1		
Rizal				1			1									1	
Taguig City																	1

### 3.1.2 Urban Gardeners vs. Urban Farmers in Seedlings

There is no formal definition for the term "gardener" in existing UPU programs, but government respondents identified urban gardeners as belonging to Metro Manila's urban poor as they are the target beneficiary of UPU programs. Indeed, all six urban gardener associations interviewed for this study belonged to the low- and middle-income segments, one of which is composed of retired or semi-retired career individuals.

Although respondents were not asked about their income levels, members of low-income groups generally had low-wage jobs such as fish vending, and pedicab driving. Majority, however, have no other source of income and subsist on government support for their small gardens. Low-income gardeners normally form groups and associations to collectively manage their freely leased, protected community gardens of about 3,000 sqm (**Table 2**). The groups interviewed in the study consisted mainly of women 30 to 50 years of age (**Table 1**), who oversee the communal gardens as well as their own private gardens while their husbands typically work outside the home. Employing social networks through social media (Facebook and YouTube), these women have developed farming skills and share seed and seedlings and best practices with others.

Low- and middle-income households can be distinguished by their reliance on government support, with low-income households being far more dependent. Middle-income groups also tend to earn low wages but often have multiple jobs or side hustles (particularly the husbands). This allows them to be a bit more stable financially and less subsistent on farming. The middle-income urban gardeners interviewed in the study were mainly retired or partly retired men who had transformed vacant land plots into community gardens through their active membership in

the Homeowners Association (HOA).

**Table 2** Estimated farm area size (sqm) and water source among urban gardeners, commercial farmers, nursery operators and government nurseries

Farm Size Range (sqm)	Urban Gardener			Commercial Farmer				Nursery Operator		Government	
	Commercial metered	Impoundment	Irrigation	Commercial metered	Deep well	Impoundment	Irrigation	Commercial metered + Deep well + Impoundment		Commercial metered + Deep well + Impoundment	
20 - 30										1	
50 - 60										1	
140 - 150										2	
190 - 200						1					
290 - 300	1									1	
390 - 400	1										
690 - 700				1							
1990 - 2000		1						1			
2490 - 2500	1										
2990 - 3000			1		1						
3990 - 4000								1			
9990 - 10000							1	2			
19990 - 20000								1			
21990 - 22000	1										
23990 - 24000						1					

Finally, commercial farmers, most of whom hailed from poor communities and quit their low-wage side jobs to prioritize farming, demonstrated slightly higher land productivity. They were largely middle-aged men (30 to 60 years of age) with farming experience. Commercial farmers were organized in groups of 15-25 individuals. They preferred hiring male laborers and practiced conventional open-field agriculture on anywhere from 200-2400 sqm of land. The land is leased to them for free by the HOA to prevent these lots from becoming an eyesore, a garbage dump, or a haven for dangerous animals or criminals (personal communication; refer to audio notes). These urban commercial farmer groups exclusively produced short duration crops such as spring onion, kangkong, Chinese cabbage, lettuce, bok choy, and spinach.

Many urban gardeners use metered water; those with larger plots (> 1000 sqm) have impoundments and irrigation systems but only a small portion of their area is in use at any given time. Noteworthy is an indoor hydroponic vegetable farm (using LED lighting) in Metro Manila's business zone (Urban Greens, Makati City) that occupies only 700 sqm and uses metered water.

### 3.1.3 Market Demand for Seedlings

Urban vegetable grower associations are mainly composed of low- to middle-income communities, who are the target recipients of the government's urban farming assistance program, which includes free seedlings and other farm inputs. The urban commercial farmer associations, however, prefer growing short duration leafy vegetables from seed as it gives a higher return-on-investment (ROI). The crops they grow are also more suitable for direct seeding as seedling nurseries are more likely to produce seedlings of longer duration solanaceous vegetables (eggplant, pepper, and tomato). The use of staggered production cycles by commercial

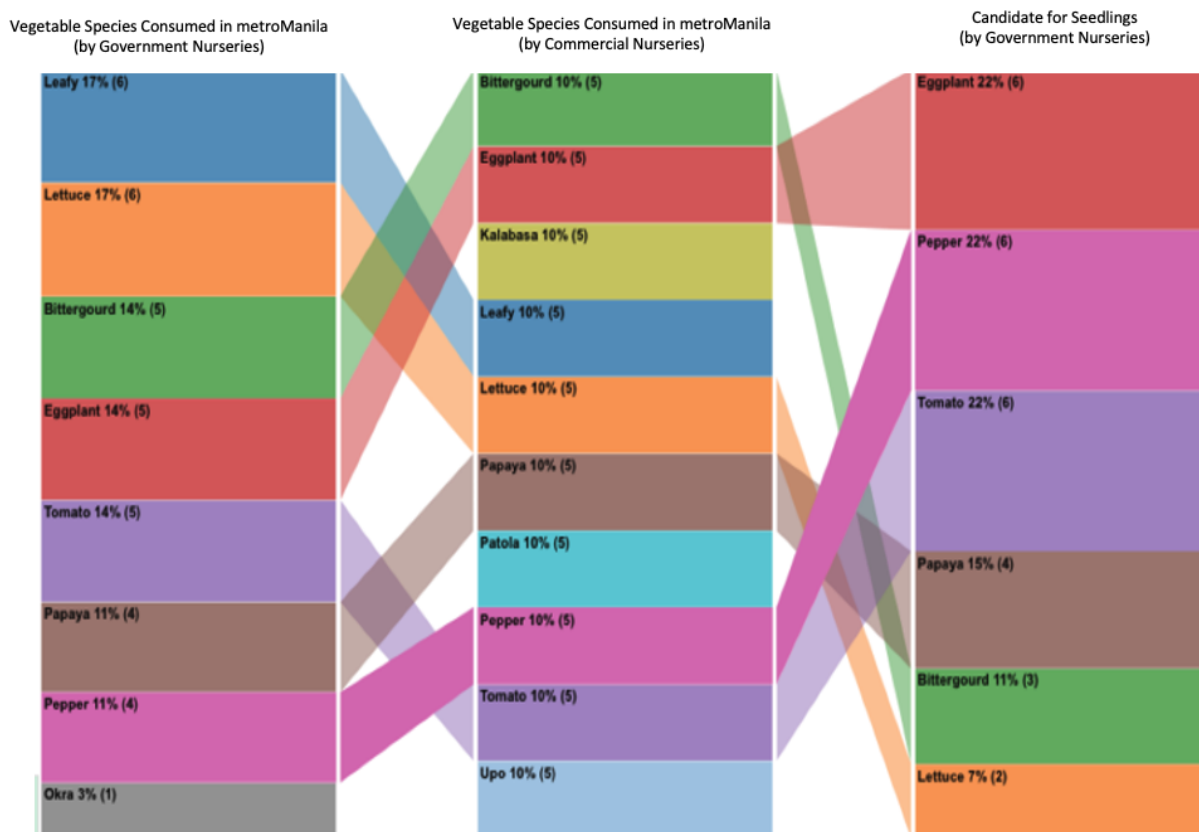
farmers also requires them to use seed all the time. Of the ten gardeners and commercial farmers interviewed for this study, five indicated that they do not use seedlings. Those using seedlings only used them in small volumes (**Table 3**).

**Table 3** Use-case of seeds versus seedlings by urban gardeners and urban commercial farmers

Location	Urban Gardeners					Commercial Farmers	
	Seeds, All the time			Seeds, sometimes		Seeds, All the time	
	Seedlings, All the time	Seedlings, sometimes		Seedlings, All the time		Seedlings, All the time	Seedlings, sometimes
	Women	Women	Men	Women	Men	Men	Men
Bulacan	1			1			
Makati City							
Manila City							
Pampanga							
Paranaque City			2				
Quezon City		1				1	2
Rizal					1		1
Taguig City							

Commercial nursery operators, who were all located in the peri-urban area of Bulacan about 50 km from Manila, explained that they occasionally deliver seedlings to Metro Manila in small volumes to plant markets and occasionally as part of the LGU programs and plant fairs. Nursery operators described that the commercial demand for seedlings in urban areas is small relative to the demand of farmers in rural areas in the north and south. The northern regions such as Bulacan are agroecological zones with longer duration of optimal temperature and moisture regimes suited for vegetables and corn (UNDP, 2013). Therefore, these nursery operators strategically locate themselves near their main clients.

Popular vegetable species for seedlings, as ranked by staff of government agencies and nursery operators, were solanaceous vegetables (eggplant, tomato, and pepper), bitter melon, leafy vegetables such as lettuce, and papaya (**Figure 3**). In the Philippines, papaya is eaten ripe as a fruit and green as a vegetable in local dishes such as “*tinola*” (Gascon and Orr, Kathryn J., 1981). Seedlings of squash, okra, and bottle gourd were also mentioned as having market demand.



**Figure 3** Vegetable species according to their market popularity by government program officers and nursery operators

### 3.1.4 Grafted Seedlings

Grafted seedlings are not available in urban vegetable production, perhaps because it is a premium feature that substantially adds to the cost of urban programs that mass produce seedlings for free distribution. These mass-produced seedlings are sometimes lanky, weak, and limited in variety and quantity (**Figure 4**).

Grafted seedlings are also rare among the commercial nursery operators interviewed in the study. Of the five commercial nursery operators, only two produce grafted seedlings (bitter gourd with luffa rootstocks) but this was only a small part of their production. Both nurseries employ women to perform the grafting. One large commercial nursery sold over one million grafted bitter gourd seedlings and tens of millions of non-grafted seedlings per year (personal communication). Most government agency nurseries, on the other hand, have provided hundreds of thousands of non-grafted vegetable seedlings annually (Section 3.4.1).





**Figure 4** Seedling quality between government urban programs **(a)** and commercial nursery operators **(b)**. Free seedlings in government urban programs are mass-produced and are often of lower quality. Nursery operators similarly mass produce seedlings but maintain higher quality standards to earn a premium price. They can also increase the quantity and variety of species based on expected demand from rural farmers.

### *3.1.5 Gardeners' and Farmers' Technical Challenges with Seedlings*

Urban gardeners and commercial urban farmers indicated that the free inputs, especially vegetable seedlings from the government, are a great resource. The 2-3 trays of free seedlings are good enough to get them started but supply is limited to tomato, eggplant, pepper, and some leafy vegetables.

The commercial farmers interviewed are all supported by Joy of Urban Farming (JOUF), a city government program in Quezon City. Farmers in Fairview, Quezon City, indicated that they do not use seedlings because they grow short-duration crops (30 days or less) that do not require seedlings. In New Greenland (Bagong Silangan, Quezon City), JOUF provides free vegetable seedlings of solanaceous crops (eggplant, pepper, tomato) and other crops like bitter melon. Given the current dynamics, the demand for a commercial nursery that can supply quality seedlings to urban farmers and gardeners is, to say the least, limited.

The topmost challenge in vegetable seedling production reported by urban growers and nursery operators (commercial and government) are pests and diseases. Both urban gardeners' and commercial farmers' seedlings, especially those that they grow themselves, are primarily beset by soil-borne diseases that exhibit typical symptoms of damping-off. This is a fungal disease that commercial nursery operators are aware of and take preventive measures against as the effect can be damaging. Closely related to this is the quality of the soil media, specifically the lack of



ways to ensure disease-free soil material. Another common disease mentioned by nursery operators is leaf spot. Common pests affecting seedlings are mites, whiteflies, and aphids. Water is another important technical constraint. Water evaporates quickly from seedling trays because of the small soil volume. Seedlings are vulnerable without a steady water source, as one commercial nursery experienced when the water supply broke down. Though water is crucial, too much watering can also be detrimental to seedling vigor, causing it to become lanky and weak. Yet, occasional flooding and destruction due to typhoons are by far the largest source of water-related problems for gardeners and farmers. A comprehensive list of challenges is provided in **Appendix B**.

### **3.2 Seedling Market Demand**

The commercial supply of vegetable seedlings is very limited in Metro Manila compared to those provided by LGU and other government programs. Even before the pandemic, the government distributed seedlings from their nurseries across the city. Through various national and local urban agricultural programs, several hundred thousand vegetable seedlings were given for free, along with soil media, seeds, and fertilizers among other inputs. This number may have increased with the most recent effort of the government to intensify urban agriculture in the post-pandemic economy.

Interviews with government officers revealed that big agricultural input dealers are one source of hybrid and open-pollinated (OP) seeds for LGUs. Other seed sources include government agencies such as the Bureau of Plant Industry (BPI) and the Institute of Plant Breeding (IPB), although, they provide mostly OP varieties. Most of the government's purchased seeds for their UPU programs are repackaged from sealed containers into small plastic sachets for distribution to a larger number of people. Agricultural supply shops, some of which are in urban areas, also provide a full range of other products such as fertilizers, seedling trays, and soil media.

Vegetable seedlings supplied by the government are grown in plastic seedling trays using various kinds of soil media. These seedlings are available to anyone who is interested, whether an individual, a group, or an organization. Local programs usually require recipients to be a local resident, whereas national programs are open to anyone. For larger requests that require proper planning, both national agencies and LGU nurseries require formal communication.

Program implementers are all aware of the significance of seedlings for the success of the programs. Since seedlings are already grown, recipients are more likely to immediately plant them whereas seeds may be stored for later use. The provision of seedlings also removes an otherwise inherent hurdle among the growers, such as germination trays, good soil media, and cropping cycle time, resulting in a higher success rate.

### *3.2.2 Distribution of Retail Outlets*

Commercial vegetable seeds were generally available to the interviewed respondents. Urban commercial farmers using seed traveled anywhere between 5 to 25 kilometers to buy seed and other inputs from agricultural input dealers. Commercial farmers preferred agricultural suppliers or distributors where they not only purchase farm inputs but also foster interactions with other farmers and dealer representatives to learn and exchange ideas. Urban gardeners and commercial farmers had explored online commerce at some point, but noted negative experiences with seed packets ordered online, including low germination and broken seeds. They therefore preferred traditional sales channels.

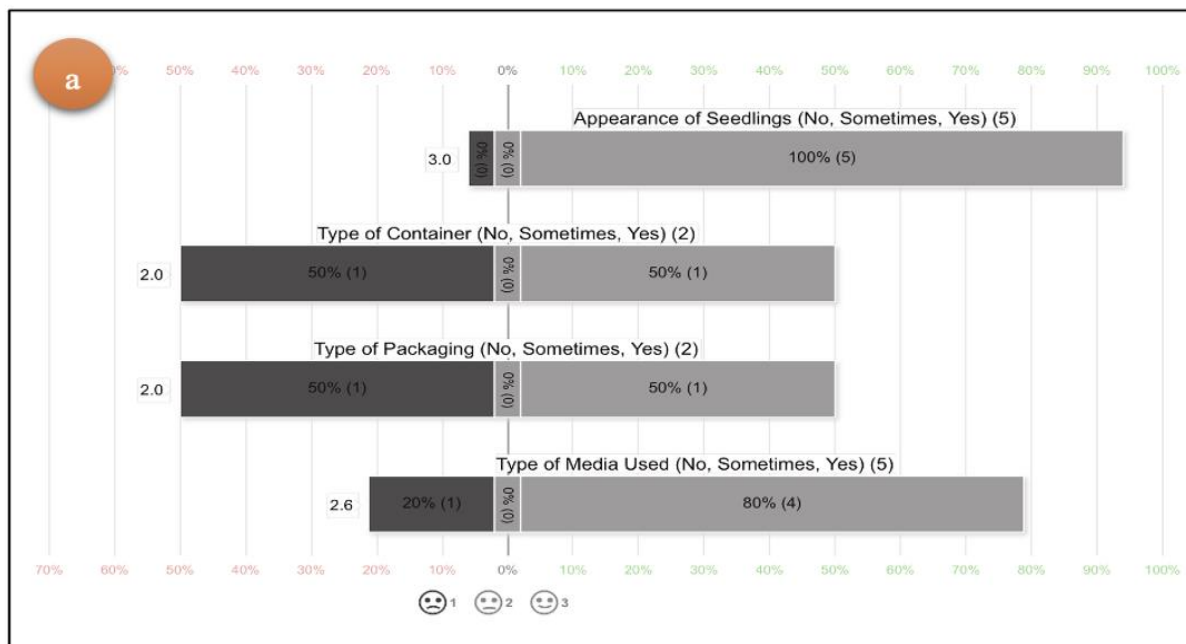
Free vegetable seedlings from government nurseries are normally picked-up on site. Except in cases where prior arrangements have been made, the government program implementers deliver seedlings and other materials to the site of events like community and school gardening launches. Some program administrators identified logistics as a challenge in distribution as they have only one truck to cover the whole NCR.

### *3.2.3 Quality of Available Seedlings*

The quality of the free seedlings distributed by the government is not always good as plants can be weak and lanky (**Figure 4**). This is because the nursery facilities of the government are not as good as commercial nurseries. Vegetable species distributed by government nurseries includes the most popular ones, the so-called "pinakbet" varieties and leafy greens. Pinakbet is a popular dish from the Northern Philippines made of bitter melon, eggplant, okra, tomato, squash, string beans, and red onion. Except for the last three, LGUs distribute seedlings for the other vegetables to communities. Also available are lettuce varieties, which have gained popularity in recent years.

### *3.2.4 Demand for Seedlings*

There is no viable niche for a commercial source of seedlings at present, but this does not mean that the presence of a commercial source of good quality seedlings will not be needed in the future to address the increased demand for urban agriculture. Our survey reveals that quality of seedlings is a valued feature among urban gardeners. Among the characteristics of seedlings that urban gardeners and farmers deem important and are willing to pay for are "Appearance of the Seedlings" and "Type of Soil Media Used" (**Figure 5**). In other words, the industry standard is a visibly healthy seedling growing in a good soil medium.

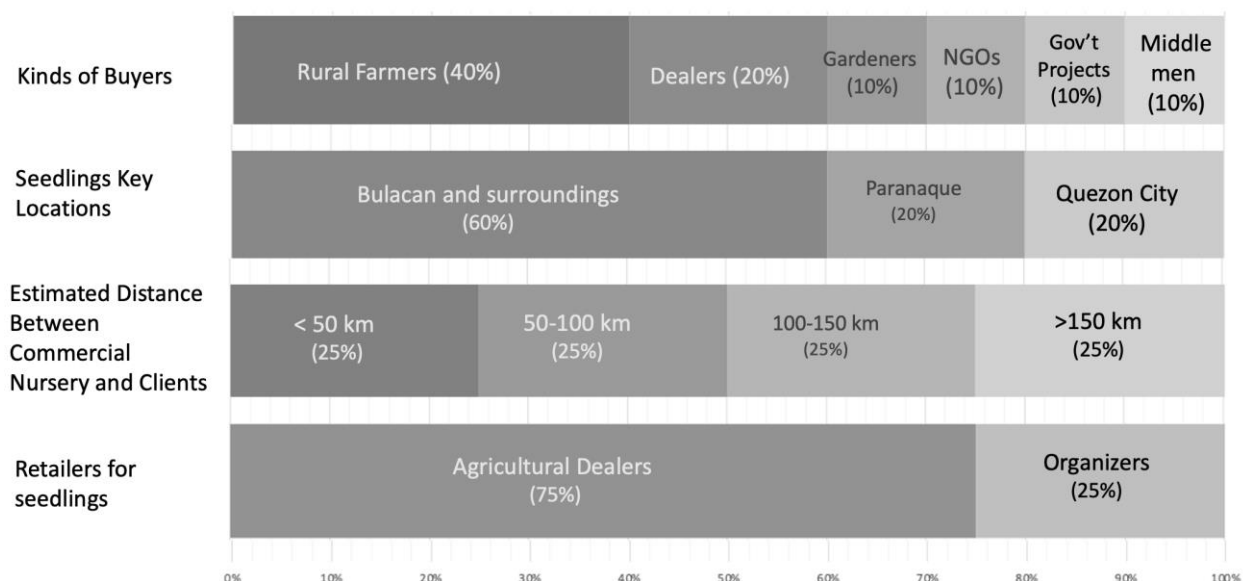


**Figure 5** Urban gardeners' and farmers' preference for seedlings. **a)** Appearance and type of media used are prime features that attract buyers; **b)** an example of vigorous seedlings grown in sterilized, mixed soil media.

### 3.2.5 Key Urban and Peri-urban Locations for Commercial Quality Seedlings

Only a small fraction of commercial nursery operators (1 out of 5 interviewed) allot seedlings for the needs of urban gardeners. This proportion is about the same for other buyers: non-governmental organizations, middlemen, and government projects involved in vegetable

production (**Figure 6**). Instead, almost all commercial operators cater their operations to the larger needs of rural farmers (40%) and agricultural dealers (20%), which is roughly many millions of seedlings per year in sales volume (personal communications). However, due to the sensitivity of the information, we were unable to determine the breakdown of actual sales volumes for each buyer group.



**Figure 6** Potential clients and promising locations for commercial nurseries

The provinces of Bulacan and their surrounding rural areas continue to be regarded as more profitable for seedling production and seedling sales (Figure 6), and even provinces over 100 kilometers away (Batangas, Laguna, Pangasinan) are considered viable markets with a high demand for seedlings. Within the urban areas, Paranaque and Quezon city have viable markets for seedlings, perhaps because of their progressive UPU programs.

There are more agricultural dealers and farm organizers that have seedling nursery depots that could provide the traits most valued by seedling buyers: vigorous seedling growth in good soil media. Because of their experiences, agricultural dealers are promising viable retailers in building commercial seedling nurseries in urban areas.

### 3.3 Agronomic Considerations for Quality Seedling Production

#### 3.3.1 Nursery Manpower Profile

The nursery personnel serving the seedlings distribution program of national agencies and LGUs acquire their knowledge through apprenticeships, training events, and workshops. Interdepartmental and interagency training and workshops that leverage the sharing of skills are a common avenue for skill development in the government. Urban programs derived from

existing national agencies such as BPI, NUPAP and DENR-MMFN manage their nursery operations with experienced personnel. LGUs employ temporary but experienced workers from local communities.

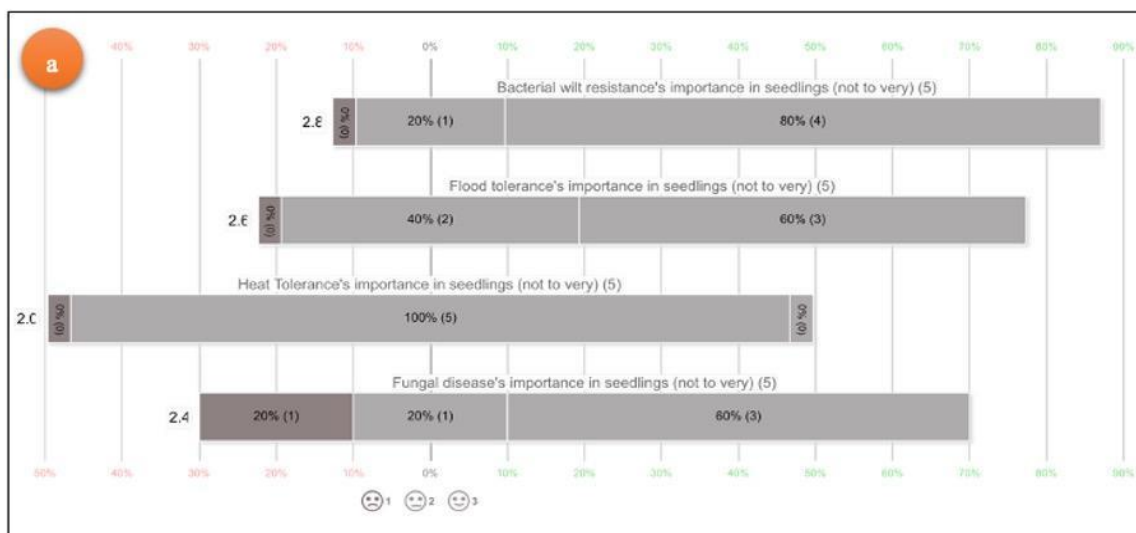
Among commercial nursery operators, some gained knowledge through training with international consultants who collaborated with local private company as business partners, while others through seminar and formal training from government agencies or private institutions such as East-West Seed Company's former Technology Transfer Department.

### *3.3.2 Pests and Diseases*

Both commercial and government nurseries face the same set of challenges, foremost of which are pest and disease problems. The ubiquitous problem of damping-off is at the top of the list for both operators. Commercial nurseries have a preventive chemical intervention schedule with appropriate chemicals as the losses incurred by damping-off to their business would be devastating. Some government nursery operators do heat sterilization of media whenever they have the chance to address the issues of damping-off. Leaf spot is another disease mentioned while for insect pests mentioned include mites, whiteflies, and aphids.

### *3.3.3 Desirable Varietal Traits of a Vegetable Seedling*

When commercial nursery operators were asked to specify desirable characteristics of a good seedling, disease resistance (particularly to bacterial wilt) was the unequivocal answer. This in turn was the desire of their customers indicating the seriousness of the disease in the field. Other desirable resistance traits include resistance to abiotic factors (e.g., floods and heat); and resistance to fungal diseases such as blight and leaf spot (**Figure 7**).



**Figure 7** Important abiotic and biotic resistance/tolerance traits to have for vegetable seedlings, as rated by commercial nursery operators: **a)** soil-borne bacterial wilt (*Ralstonia solanacearum*) is a top concern; **b)** bacterial wilt is prevalent in eggplant, tomato, and pepper<sup>1</sup>.

### 3.3.4 Nursery Facilities

The nursery facilities of both national agencies and LGUs are screenhouses with at least 18 sqm footprint in welded metal GI pipes frames and insect- and UV-proof nets (**Figures 8a, 8c & 8d**). In contrast to commercial nurseries, which have a larger area, these government nurseries often share limited space in government-owned office compounds, posing limitations when their operations require expansion, such as additional greenhouse and storage facilities (**Figure 8c**). Some greenhouses are also situated in shaded areas, reducing sunlight to the growing plants (**Figure 8a**), resulting in weak, lanky seedlings (**Figure 8b**). All government nurseries have stable

<sup>1</sup> Photo Credit: Plant Doctor by East-West Seed [<https://www.plantdoctor.eastwestseed.com>]



water sources that come from commercial metered and water impoundment (**Figure 8d**).



**Figure 8** Nursery materials and facilities. **a)** A government nursery constructed under the shade of a tree. **b)** Lanky and weak seedlings from government nurseries. **c)** Typical government nurseries use metal frames and high-quality nets. **d)** Support facilities of government nurseries using commercial metered water.

### 3.3.5 Soil Media

In general, the soil media used by government nurseries are of acceptable quality. The soil mix includes many suitable components considered to be good for seedlings, including sand, coco coir, carbonized rice hull, compost, and peat moss. However, the main challenge is the consistency and quality of these materials. As supplies vary, the relative proportions of these components are adjusted by the nursery operators, which may lead to the high variability in germination rate and inconsistent seedling growth that is typical of some of the free seedlings given by the government nurseries (**Figure 8b**).

### 3.3.6 Nursery Technical Constraints

Both national and local government nurseries could benefit from technical training to optimize their seedling production. First, basic training in sanitary protocols is needed, as some serious pests and diseases can be drastically reduced by practicing proper nursery hygiene. As is the case with commercial operators, most government nursery personnel lack clear preventive or

mitigation guidelines, such as restriction of entry and exit, reuse of seedling trays and soil media, and proper cleanup of chemical and solid waste. Furthermore, greenhouse supervisors and workers need to learn pest and disease management and control measures specific to seedling nurseries.

Second, a workshop on the fundamentals of “nurserymanship” that covers nursery operations and seedling growing, including nutritional requirements (importance of EC and pH), proper watering techniques, and real-time plant health monitoring. A particularly important topic is the need to regularly monitor moisture levels. We observed overwatering, which resulted in reduced seedling vigor visible in lanky and weak seedlings. Simple and inexpensive moisture meters can be used as precise tools for rudimentary real-time monitoring of moisture levels ensuring adequate watering of seedlings throughout the day.

#### *3.3.7 Nursery Seed Source*

Access to seeds is not a major constraint. The government nurseries source seed from other government agencies such as BPI and IPB, as well as from reputable seed companies through agricultural dealers. There is a vast network of existing agricultural dealers even in urban areas, though most of the larger dealers cater to commercial farmers in rural areas.

BPI and IPB provide primarily OP varieties, while seed companies offer hybrid and OP types. These seed companies offer the highest possible quality seeds for almost all popular vegetable varieties in the market (eggplant, tomato, pepper, bitter melon, papaya, and leafy vegetables).

#### *3.3.8 Sustainable Nursery Materials*

The government nurseries operate as typical seedling growing centers, with few provisions for biobased inputs. Some nursery operators are considering using soil media entirely made of locally available materials such as coco coir, rice hull, and vermicompost. There is also an initiative to retrieve plastic seedling trays by providing new seedlings in exchange for the old trays.

Some commercial nursery operators aspire to use partially biodegradable plastic trays, as they deliver several thousand plastic trays annually to farmer fields. One nursery has initiated a recycling program in which old and used trays are supplied to a local plastic company that molds them into new trays, which are then sold back to the nursery at a reduced price.

### **3.4 Seedlings-Centered Programs, Projects, and Initiatives**

#### *3.4.1 On-going seedlings-related urban agriculture programs*

The following are government urban agriculture programs that focus on vegetable production and the important role of seedlings in the endeavor.



## 1. Gulayan sa Pamayanan

- LGU
- City of San Jose Del Monte (CSJDM), Bulacan
- “Gulayan sa Pamayanan” is an LGU program established in 2004 and operating under the Office of City Agriculturist to assist urban gardeners and farmers in 95 municipalities of the city by offering seed, seedlings, and technical assistance. They were able to provide over 500,000 seedlings in 2020 and anticipate this to increase to 700,000 in 2022. The LGU has its own greenhouse producing tomato, pepper, eggplant, lettuce, bitter gourd, and papaya seedlings.
- They have two major challenges in their nursery operations. First, the availability and quality of its soil mixture, specifically coir dust and carbonized rice hull. Second, damping-off and other soil-borne diseases.
- The program also initiated and supported an offshoot called “Gulayan Sa Paraalan” for the local elementary and secondary schools. They have donated a greenhouse to one of the local schools, where vegetable seedlings are grown and subsequently distributed to those in need of planting materials.

## 2. Joy of Urban Farming

- LGU
- Quezon City (QC), Metro Manila
- Joy of Urban Farming (JOUF) is an LGU initiative founded in 2015. It is sponsored by the city's former vice-mayor and current mayor, Joy Belmonte, who lent her name to the initiative. JOUF's mission is to provide Quezon City's two million constituents access to fresh and nutritious food. The program provides seed, seedlings, garden tools, starter kits, greenhouses, and training. While giving priority to the urban poor, senior citizens, and those with disabilities, their office will help any resident asking for support.
- They have two 3m x 6m greenhouses dedicated to growing hybrid and OP seedlings using seed from Allied Botanical Corporation. Their seedlings include tomatoes, eggplants, peppers, and leafy vegetables such as mustard greens (*mustaza*) and Chinese cabbage (*pechay*). They have a good soil mixture that combines peat moss with premixed garden soil with sand and compost. Having recognized the need to supply the communities with more seedlings, they have built 20 additional greenhouses in various barangays (smallest administrative division) in Quezon City, further increasing their seedling capacity. When their greenhouses were damaged in 2017, they collaborated with DENR-MMFN to acquire vegetable seedlings, highlighting the importance of seedlings in maintaining the vegetable gardening program.

- The main challenge for their nursery team is the quality of the seedlings as their main greenhouse is shaded by a tree and does not receive direct sunshine, resulting in weak and lanky seedlings. They also have germination problems, most likely due to damping off.

### 3. National Greening Program (NGP) - DENR

- National Government Agency (NGA)
- DENR, Taguig
- NGP was founded in 2011 as a multi-sector convergence initiative between the Department of Environment and Natural Resources (DENR) and the Department of Agriculture (DA) to solve the challenges of the Philippines food security. It aims to eradicate poverty in highland, low-income, indigenous, and coastal areas.
- The initiative includes a component named the “Vegetable Seedling Production & Distribution Project” that aims to address urban food security. In 2017 they started distributing free vegetable seedlings to various groups such as the urban poor, local government units, schools, and various groups of home gardeners. Vegetable seedlings of eggplant, pepper, okra, bitter melon, and leafy vegetables were provided. During the COVID-19 pandemic in 2020 and 2021, the demand for seedlings increased and they utilized their automated seedling planter to meet the demand. In addition, they created their own version of the Community Pan-Tree (a replica of the Community Pantry sharing endeavor) which includes not only vegetable seedlings, but also fruit trees. They were able to provide 502,884 vegetable seedlings in 2021 and 386,723 vegetable seedlings in 2022 (January to October period) to 10 cities in the NCR and one city outside the NCR.

### 4. National Urban and Peri-urban Program (NUPAP)

- NGA
- Malate, Manila
- The National Urban and Peri-urban Agriculture Program (NUPAP) has become a banner program of the Department of Agriculture (DA) created through Executive Order 03 in February 2022. Its mission is “to develop urban and peri-urban agriculture across the Philippines in collaboration with local government units (LGUs), national government agencies (NGAs) and interested stakeholders, in order to foster food security, food safety and promote economic development by ensuring access to food and encouraging urban agriculture enterprises that are economically, environmentally and socially sustainable and resilient.”
- This was earlier an undertaking of the Bureau of Plant Industry (BPI) that supported several urban gardening projects with different partners around Metro Manila. They have given various types of support including equipment, machinery, greenhouses, aid in research grants, and basic items like seed and seedlings.

- In this study, NUPAP beneficiaries like Urban Greens and Quick & Responsible Teams Phils., were interviewed about the assistance they received for their urban gardening projects, and they were thankful for seed, and particularly seedlings, which made it much easier for them to start their project as they had little knowledge of planting at the time. Following that, they were given assistance in the form of greenhouses and materials to start their own nursery.

#### 5. High Value Crops Development Program (HVCDP)

- NGA
- Malate, Manila
- HVCDP is one of the priority programs of the Department of Agriculture (DA) with a mandate “to help address food security, poverty alleviation and sustainable growth.” It is built on Republic Act 7900 of 1995 mandated “to promote the production, processing, marketing, and distribution of high value crops.” (<https://hvcdp.da.gov.ph/overview-of-the-program>)
- One of the goals of HVCDP is to increase income, provide opportunities for sustainable livelihoods, and contribute to national advancement. The program supports urban agriculture as it aligns with this goal. HVCDP has provided training and supplied more than 30,000 bags of fertilizer and soil, as well as more than 2,000 kilos of seed and more than 121,000 seedlings. They have managed projects in partnership with other government agencies such as NCMH, harvesting eggplant, okra, radish, *pechay*, and *mustaza*, and supported schools with their community-based urban gardens. The program also promotes urban agriculture through indoor/rooftop gardening and vertical farming (“High Value Crops Development Program | Department of Agriculture,”).
- Presently, the same person chairs HVCDP, BPI, and NUPAP.

#### 6. Ynares Eco System (YES) Program

- LGU
- Antipolo, Rizal
- YES is a flagship program of the Rizal province government launched by the sitting Governor in 2013 (Gov. Nini Ynares who is the namesake of the program). The project has three components: “Greening the environment, Cleaning the environment and Recycling.”
- Urban gardening is one component of YES. All subdivisions of Rizal province are required to have a community garden and do composting. To support schools, *barangays*, and communities in urban gardening, the Office of the City Agriculturist gives free seed and vegetable seedlings of tomato, pepper, eggplant, papaya, and leafy vegetables. The seedlings are produced by the city plant nursery.

- The soil mixture they use in their nursery is a ratio of carbonized rice hull and vermi-compost, which they claim is a great combination. They claim they have few nursery related problems, as the nursery is managed by experienced agriculturists.

### *3.4.2 Support for Commercial Seedling Production*

The major demand and requirements for vegetable seedlings in urban Metro Manila are currently being supplied by the nurseries of government agencies and are given away free of charge. Based on the findings of this survey, there are currently no government programs that promote commercial seedling production. Instead, they intend to promote the use of seedlings by providing structures, materials, and training for communities and groups to grow their own.

## **4 Observations and Recommendations**

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### **4.1 Key findings**

- There are two main kinds of vegetable growers in urban and peri-urban Metro Manila: gardeners and commercial farmers. Urban gardeners often hail from low-income backgrounds, include both men and women, are age-diverse, and benefit from government UPU programs. Commercial urban farmers are generally low- to middle-income households with more experience in vegetable production. Commercial farmers sell their products in markets, but most urban gardeners use their produce within their own household or share it within their community.
- Seedlings in urban settings are almost entirely provided by the government who offer free seedlings and other agricultural inputs for urban gardeners through its various urban and peri-urban programs at national and local government levels. Most commercial urban farmers grow short-duration leafy vegetables and, therefore, prefer to use seed instead of seedlings. However, seedlings are preferred for solanaceous crops and other popular fruiting crops. There are no commercial seedling nurseries in the urban and peri-urban areas of Metro Manila.
- In general, seedlings from government nurseries are of lower quality than those from commercial nurseries. This may be attributed to an inadequate understanding and application of fundamental good nursery practices, such as proper sanitation and plant biology-based seedling management which are intrinsic in mass production.

### **4.2 Key Recommendations**

- The quality of government nursery seedlings could be improved by implementing and optimizing nursery operations such as basic sanitary protocols, seedling health monitoring, and basic seedling practices, such as watering.

- Although LGU leadership changes every few years, most urban agriculture programs have already been institutionalized and some have existed for more than five years. To increase the capacity of urban agriculture to achieve its goal of food security and nutrition, it is essential to strengthen the community's capacity to establish their own gardens, acquire high-quality input materials, and maintain their productivity through training on technical knowledge and sustainable and environmentally friendly practices.
- Due to decentralized governance in the Philippines, the most effective strategy for quality seedlings appears to be a national program such as NUPAP that facilitates the ability of LGUs to not only support subsidized inputs and access to trainings, but also to enable intervention policies on the marketing side, such as demand-price forecasting and/or ensuring venues for urban gardeners and farmers to sell their produce.

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## 6 Appendices

### Appendix A: Challenges of gardeners and farmers in growing seedlings

What are your challenges in growing seedlings?		
Commercial Farmer	01)	Weather - rainy;
	02)	Pest and disease, good soil mix,
	03)	Pest and diseases Soil is not good Too dry or too wet weather conditions
	04)	-
	05)	Not using seedlings
	06)	Not using seedlings
	08)	Not using seedlings
	09)	Not using seedlings
	07)	Not using seedlings
	10)	Not using seedlings
	11)	Not using seedlings
Urban Gardener	01)	-
	02)	Quality of Soil and germinate of seeds
	03)	-
	04)	Soil media mix is not good; no source of good media
	05)	Technology - we want to know how to grow better seedlings Soil media mix - supply of coir dust is inconsistent
	06)	Weather - I have an open greenhouse so wind and elements can destroy my seedlings Space - my greenhouse is small
	07)	Pest and diseases
	08)	Pest and diseases; poor soil media; hard time to buy soil media component (cow
	09)	-

## Appendix B. Narratives of urban gardeners and commercial farmers in vegetable production

*“What are some of the challenges, technical or otherwise, that you face in vegetable production”.*

Comments
Weather - our place is flood prone.
Technology, we have limited access to new technology & updates in agriculture.
Land is limited inside the subdivision; we know very little technically - on pest and diseases, technical knowledge. There is certainly a room for expansion in terms of growing seedlings; manpower in helping us in our garden, input materials for our soil media; quality of our soil;
Pest and Diseases; we need technical advice as we started almost zero knowledge in our gardening. We only learn from YouTube videos.
Soil media; climate - heavy rain and heat. We badly need also technical advice. limited area in the subdivision and sometimes when the area is sold, we can't use the area anymore.
Support from the Department of Agriculture of local government; we lack knowledge and technology know how; we have limited land, we only utilize those vacant areas in the subdivision; we lack water also during summer (good thing, we have already installed paid water meter from local water supplier); climate.
Budget esp. increasing price of inputs, Climate esp. typhoon season Price of vegetables sometimes can go so low,
Price in market, climate, inputs especially fertilizer are very expensive now.
Land conversion - areas for agriculture has been converted to mining site and subdivision Access to inputs like seeds and fertilizers Expensive cost of inputs
Land, we don't own our land; land conversion; pest and diseases;
Land - we don't own the land and we only request the owners for use of his idle land Stealing of our vegetables Manpower - few of us are only gardening, we have few youths also that helps. Training on how to grow better plants Pest and diseases training for better control
Typhoon and flood - we have a flood-prone area Climate - too hot then are plants are not good
Pest and Diseases
Weather and typhoon especially our area is flood prone Pest and diseases



Comments
<p>We also lack the knowledge in growing well our vegetables and what to do to manage and control pest and diseases</p> <p>Expensive input materials</p>
<p>Water - especially during summer months</p> <p>Limited land area and ownership - we don't own the land or rent, vacant land inside the subdivision and when the owner wants to use, our garden will be limited</p> <p>Pest and diseases - proper identification and control</p>
Pest and Diseases
<p>Middlemen in market - they are slashing a huge amount on the price of my produce</p> <p>Weather - challenging if typhoon season</p> <p>High price of inputs</p> <p>Availability of seeds in our area</p>
<p>Limited land inside the subdivision</p> <p>Pest and diseases</p> <p>High inputs especially gasoline (used in pumps for watering)</p> <p>Weather especially strong rains</p>
<p>Pest and diseases</p> <p>High prices of seeds and chemicals</p> <p>Gas prices for our pumps</p> <p>Weather especially strong rains</p>
<p>Pest and diseases</p> <p>High prices of seeds and other inputs especially chemicals</p> <p>Strong rains</p> <p>Middlemen who will get our produce but pays so late</p>
<p>Pest and diseases</p> <p>The high price of inputs including fuel for pumps, seed, and chemicals</p> <p>Weather patterns especially typhoons and strong rains</p>
<p>Strong rains</p> <p>Pest and diseases</p> <p>Up to date knowledge and technology - we only get our knowledge in the internet, best if we have some training and technician's help</p>