# TECHNICAL BULLETIN

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| Issue | **Food Safety in Urban Gardening** |
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| **Background** | The Department of Agriculture's efforts in urban agriculture date back to 1998 [1]. Through the leadership of Secretary William D. Dar, this previous effort was rebirthed through the DA Plant, Plant, Plant Program. Segments of the Program include household food security and urban agriculture.<br><br>The World Bank Group reported in 2017 that for the past five (5) decades, the Philippine urban population grew by over 50 million people, making it one of the fastest urbanizing countries in the East Asia and Pacific Region. By 2050, it is estimated that 102 million people, or more than 65% of the country's total population, will reside in the cities. In addition, Metro Manila is one of the fast-growing regions with a high overall urban density [2]. Manila City, with 73,920 persons per square kilometer in 2020, was the most densely populated city in the Philippines, followed by Mandaluyong City with 45,830 persons per square kilometer, and Pasay City with 31,543 persons per square kilometer [3].<br><br>Moreover, the COVID-19 pandemic exposed not only the serious limitations in the global food trade but also the functioning and resilience of the urban food system [4]. In a press release, Senator Cynthia A. Villar, the current chairman Senate Committee on Agriculture and Food, expressed the same concern. Senator Villar emphasized the need to shift government priorities in food production. She stated that 'growing food in one's backyard is the most effective way, especially for food-poor families, to ensure they will not go hungry during emergencies" [5].<br><br>As more and more urban dwellers respond to urban gardening, it is likewise vital to promote awareness of food safety practices in urban gardening. Thus, this Technical Bulletin is issued to guide urban gardeners in ensuring vegetables' safety. |
| **General Description** | Urban agriculture is the process of growing, processing, and distributing food crops and animal products within an urban environment and for the local community. The United States Department of Agriculture (USDA) considers urban agriculture to reduce food insecurity, poverty, and environmental problems.<br><br>In the Philippines, urban agriculture was promoted by the Department of Agriculture (DA) even before the COVID-19 pandemic happened. Previously, dwellers along the banks of the Pasig River were encouraged to grow crops. Since then, urban agriculture has been enhanced and promoted in Metro Manila and other urban cities [6].<br><br>In 2020, through the Agriculture Training Institute (ATI) and the Bureau of Plant Industry (BPI), the DA launched the Urban Agriculture Program aimed |

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| | at addressing food security through the distribution of planting materials and providing technical assistance in establishing urban garden sites. Urban agriculture may be in the form of community and backyard gardens, rooftop and balcony gardening, growing in vacant lots, right-of-ways, and parks, container gardening, aquaculture, hydroponics, fruit trees, and orchards, market farms, and raising livestock and beekeeping [7].<br><br>Similar to their conventional counterpart, agricultural products produced from urban gardens may be unintentionally contaminated in the production cycle. These contaminants can come from improperly composted manure as fertilizer, contaminated water, or poor or improper handling of produce during harvest. Urban gardeners are responsible for ensuring that the food they produce is safe for consumption since foodborne disease is a serious health concern [8]. |
| **Food Safety: Hazard** | <u>Chemical Contaminants</u><br>In urban areas, the most commonly found soil contaminants are lead (Pb) from paint and gasoline, arsenic (As) from historical pesticide use, and polyaromatic hydrocarbon (PAH) from residential heating and combustion engine exhaust and other fossil fuel sources [6]. A study in 2017 revealed that the concentration of heavy metals in urban soils within Quezon City, such as those in urban poor and residential areas, industrial areas, commercial areas, and landfill, were higher than those in protected forests and wildlife areas [9].<br><br><u>Biological Contaminants</u><br>In a study conducted in 2015 that evaluated the level of fecal contamination in the surface waters and surrounding production environment of urban farms in Metro Manila, results showed a high prevalence of fecal contamination in the production environment. Specifically, the study showed that out of 373 irrigation water, soil, and vegetable samples collected for one year, 62.2% were positive for *E. coli*, 57.26% for somatic coliphages, and 0.5% for *Salmonella spp*., respectively [10]. |
| **Adverse Health Effect in Human** | **Chemical Contaminants**<br>1. *Lead*<br>High levels of lead exposure can cause anemia, weakness, kidney and brain damage. Lead exposure can also be fatal in high doses. People exposed to lead for an extended period may develop high blood pressure, heart disease, kidney disease, and impaired fertility [11].<br><br>2. *Arsenic*<br>The first signs of acute Arsenic poisoning are vomiting, abdominal pain, and diarrhea. These are accompanied by numbness and tingling in the extremities, muscle cramps, and death in severe cases. Long-term exposure to high levels of Arsenic can cause skin lesions and hard patches on the palms and soles of the feet (hyperkeratosis). These appear after a minimum of five years of exposure. Hyperkeratosis is considered a precursor to skin cancer [12]. |

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| | **Biological Contaminants**<br>1. *Salmonella spp.*<br>*Salmonella* can cause two types of illness depending on the serotype: non-typhoidal salmonellosis and typhoid fever. The condition of non-typhoidal Salmonellosis is usually self-limiting in healthy people with a strong immune system. Typhoid fever is more severe than nontyphoidal salmonellosis and has a greater fatality [13].<br><br>2. *Escherichia coli*<br>Some strains of *E. coli* can cause urinary tract infections, respiratory illness, and pneumonia, while others can cause diarrhea. Shiga toxin-producing *E. coli* (STEC) can cause infections with varying symptoms such as severe stomach cramps, bloody diarrhea, and vomiting. Infections may be mild, but others are fatal [14]. |
| **Mitigating Measures** | The production environment of urban gardens is the source of contaminants, particularly the soil and water. To minimize the presence of contaminants in the production environment, the applicable provisions under Philippine National Standards (PNS) such as the *PNS/BAFS 233:2018 Code of Hygienic Practice (COHP) for Fruits and Vegetables,* and *PNS/BAFS 49:2021 Code of Good Agricultural Practices (GAP) for Fruits and Vegetables*, and the Department of Agriculture Administrative Order No. 05 Series 2022 *Food Safety Guidance Document for Urban and Peri-urban Farms/Gardens* should be followed [15], [16]:<br><br>**Water supply for production and harvesting**<br>1. Identify the water sources and assess its microbial and chemical quality and suitability.<br>2. Where necessary, growers should have the water tested for microbial and chemical contaminants. The testing frequency will depend on the water source and the risks of environmental contamination, including intermittent or temporary contamination (e.g., heavy rain, flooding, et.).<br>3. Minimize standing water in the area as it attracts pests and disease-carrying insects.<br>4. Ensure an adequate supply of potable water for washing or rinsing of produce. Favorably, the water Concessionaires tapped by the government to operate the water utilities within Metro Manila and nearby provinces distribute potable water.<br><br>***S*ite location**<br>1. Evaluate the site and its adjoining sites to identify potential sources of contaminants.<br>2. Prevent entry of animals to the site and to the water sources to avoid possible fecal contamination of the soils and water and the likelihood of contaminating the produce.<br>3. Soil should be evaluated for hazards. When necessary, have the soil tested for the contaminants of concern.<br><br>In addition, the recommendations enumerated below should also be followed to minimize the presence of chemical and biological contaminants and manage and maintain urban gardens: |

**1. Location**

- Consider a suitable urban gardening area that has access to adequate sunlight and is free from sources of contamination.

**2. Container**

- Thoroughly wash containers, especially recycled ones, before and after use.
- Select containers that are big enough to support the crop when fully grown hold a sufficient volume of planting medium, have adequate drainage, and are free of toxic materials to plants and humans.

**3. Planting material**

- Consider the following in selecting planting material: adaptability to the locality, prevailing temperatures, humidity, soil type, and nutrient needs.
- The following are not recommended for container gardening:
  - Large fruit trees. Small fruit crops such as calamansi may be planted.
  - Plants that yield too little per unit space per unit time, like watermelon.
  - Plants that require controlled growing conditions, like mushrooms.
- Choose high-quality seed and planting materials.
- Plant heat-tolerant crop varieties in case of a hydroponic system.

**4. Soil management and plant nutrition**

- Ensure that the growing medium is porous to allow good aeration of the plant roots and good drainage to minimize the risk of waterlogging and subsequent rotting of plant roots.
- Choose a fine soil medium to encourage maximum airflow around the roots to promote healthy root growth and better water and nutrient intake.
- When necessary, add fertilizers and soil additives for better growth and development.
- For hydroponic production systems, the nutrient solutions may contain calcium nitrate, potassium nitrate, and complete fertilizer (14-14-14) with calcium and micronutrients. The nutrient solution should be disposed of properly to minimize pollution.

**5. Water Management**

- Water the plant at least twice a day, i.e., once in the morning and the afternoon, especially during drier months.
- Use clean or potable water to water the crops.

**6. Pest and Disease Management**

- Use biological, physical, or mechanical control measures or combinations thereof to control pests. Growing herbs may help repel pests.
- Regularly remove and dispose of diseased plant parts and other physical contaminants (e.g., cigarette butts).

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| | • Place dried leaves to prevent the growth of weeds. Dried leaves also add organic matter to the soil, improving soil nutrients, water retention, and aeration.<br><br>**7. Harvesting and Post-harvest handling**<br>• Follow the appropriate maturity indices in determining the harvest time.<br>• Use clean harvesting containers, urban gardeners may use liners to protect the produce from rough surfaces.<br>• Do not place the harvested produce directly in contact with the soil or floor.<br>• Before storage, air-dry or wipe excess moisture from the surface of the harvested produce as this may cause rotting. Microorganisms thrive in moist conditions.<br>• Harvest produce based on the needed amount for consumption.<br><br>**8. Maintenance of Tools**<br>• Clean and sanitize tools used for gardening activities thoroughly before and after use [17], [18], [19]. |
| **Researchers/ Editors** | Editor:<br>Ms. Mary Grace Mandigma, Assistant Director-Designate<br><br>Researchers:<br>Mr. Jan Vincent Tecson, Science Research Specialist II<br>Ms. Katrina Maminta, Science Research Specialist II<br>Engr. Abraham Perez, Project Assistant IV |
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| **Annexes** | None |