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MARGARET R. TADEJA-CRUZ

School Gardening Practices in Metro Manila Public Schools

Thesis Adviser:

PROF. CONSUELO HABITO
Faculty of Management and Development Studies

7 December 2019

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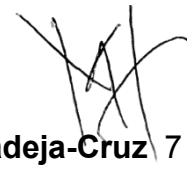

Margaret R. Tadeja-Cruz 7 December 2019

Acceptance Page

This Special Project titled "**School Gardening Practices in Metro Manila Public Schools**" is hereby accepted by the Faculty of Management and Development Studies, U.P.Open University, in partial fulfilment of the requirements for the degree Course.

Consuelo G Habito — 24 November 2022

PROF. CONSUELO HABITO (Date)
Faculty-in-charge, ENRM 290 (Special Problem)

Consuelo G Habito — 24 November 2022

PROF. CONSUELO HABITO (Date)
Program Chair

Joane V. Serrano

PROF. JOANE SERRANO
Dean
Faculty of Management and Development Studies

November 2022

DECLARATION

This is to certify that:

I. The special problem comprises only my original work towards the MENRM except where indicated in the Preface

II. Due acknowledgment has been made in the text to all other materials used.

III. The special problem is fewer than 25,000 words in length, exclusive of tables, maps, bibliographies, and appendices.

MARGARET R. TADEJA-CRUZ

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Abstract

This research explores the existing and prevalent school gardening practices in Metro Manila focused on Metro Manila Public schools. The urban capital of the Philippines is heavily threatened by global warming due to its fast declining breathing spaces so that reinforcement of thriving green practices will contribute to the possible mitigation of the impacts of climate change. Random sampling survey is conducted among Metro Manila Schools about their greening practices or conduct and maintenance of Gulayan sa Paaralan. All respondents indicated the presence of a school garden. The majority also listed cultivating trees in the schools aside from the standard vegetables to aide in their nutrition program. Mixed types of gardens were maintained including open ground, plant boxes, and receptacle or container gardens. Survey results showed that maintaining and sustaining gardens in the metro is highly probable, workable, and can be replicated to spread in the community level of sixteen cities and a municipality.

Chapter I

Introduction

Geographer Wolfgang Buermann of Boston University stated that "Plant growth can have a considerable effect on climate." Plants use energy from the sun to draw down carbon dioxide from the atmosphere via photosynthesis, cool the landscape through transpiration, where plants release excess water once the atmosphere heats up, and provide cloud cover in forested areas that block sunlight (NASA, 2019).

Vegetation has been hailed for a long time now to vastly contribute to the mitigation of the many problems of the Earth: cleaning against pollution of land, water, and air, for better health, improved ecosystem, energy-efficiency, and urban development in general.

But it seems "greening" or use of plants for environment and ecological efforts have been downplayed, instead replaced with "green" marketing hypes and campaigns that focus on "eco-consumption" and "awareness." As concerns on health, pollution, and carbon emission have become urgent around the world, planting and the real "greening" must be the center of actual greening methods.

Urban Philippines & Climate Change

The concerns on warming and pollution have, for several decades now, a priority of nations including the Philippines which is a party to the Paris Agreement, the United Nations Framework Convention on Climate Change (UNFCCC) dealing with greenhouse-gas-emissions mitigation, adaptation, and finance (United Nations, 2018). These countries need to inform the Convention of their accomplished climate pledges known as Nationally Determined Contributions (NDCs) by 2020. This is mainly to keep the global temperature increase "well below" two degrees Celsius or at 1.5 degrees.

But there is a need for the actuality of this goal. World Health Organization (WHO) reports that 9 out of 10 people in the world already breathe polluted air. The Economist Intelligence Unit (EIU) ranked Manila at 104th based on a score for over 30 qualitative and quantitative factors across five broad categories of Stability, Healthcare, Culture and Environment, Education and Infrastructure of the liveability index (EIU, 2018). The country's capital delivered worst in stability and healthcare, and best for education and infrastructure, factors that generally stunt the growth of Manila in terms of providing decent living for its inhabitants. Manila lags fifth in Southeast Asia behind Singapore, Malaysia's Kuala Lumpur, Brunei's Bandar Seri Begawan, and Thailand's Bangkok.

Increased use of air-conditioning units and refrigerators, as well as more frequent visits to artificially-cooled malls are the instant and prevailing solution in warming temperatures in the country (Algo, 2018). These methods, however, hardly address the more pressing and urgent need to reduce carbon emissions to achieve the 1.5-degree limit under the Paris climate agreement entered into by the Philippines.

The graph below indicates the Carbon Emission of the country:

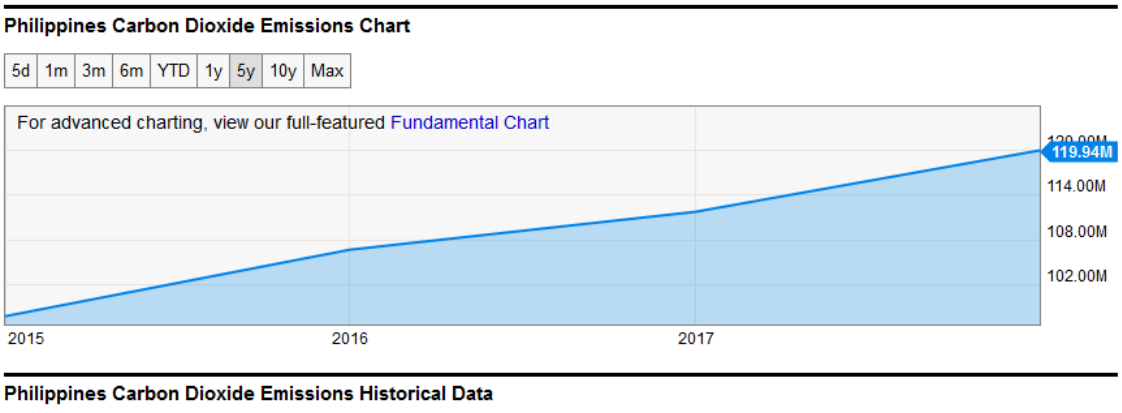

Figure 1: Carbon Emission in the Philippines

Source: British Petroleum, 2018

Meanwhile, by 2017, global carbon emission rose to 2 percent, a historic high of 32.5 gigatons after three years of being flat based on International Energy Agency

(IEA) report (Chestney, 2018). Projected increases in Philippine temperatures are indicated below:

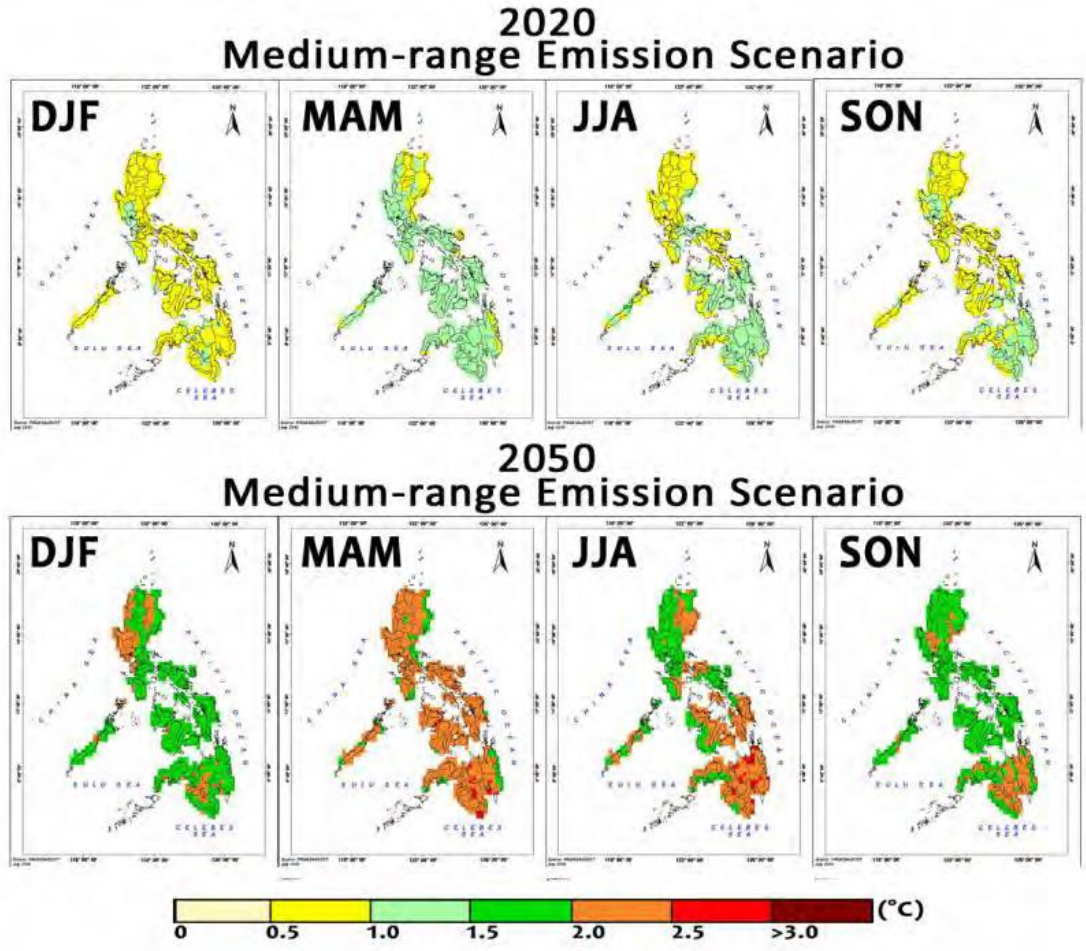

Figure 2: Projected Increase of Emissions

Source: British Petroleum, 2018.

Already, the increasing temperatures are already being felt during the dry season in the Philippines as record high to record high summers are noted. On the other end, flashfloods during rainy seasons have also been battering cities and lowland areas causing damages of properties, production, among others. These scenarios indicate that greening should be everybody's concern and that it should be increased to maximum levels in Metro Manila.

Greening in the form of planting is considered one of the best ways to clean air, land and water. However, the lack of available ground space and other mitigants for planting is a challenge especially in urban areas. This paper tabulates existing school gardens and trees in Metro Manila through random sampling survey. It

determines the existing prevalent gardening practices in Metro Manila schools to provide a basis for sustainable gardening practices in Metro Manila that can be spread or duplicated.

Objectives

Urban areas in the Philippines, specifically Metro Manila, faces troublesome times as water shortage and extreme heat are experienced during the dry season, while flooding and pollution peak during the rainy season, not to complicate these further with seasonal outbreak of diseases that are often related with the climate and environment. This paper hopes to

- ✓ Identify garden types in Metro Manila Public Schools
- ✓ Determine which garden types are common, rare, and useful or practical
- ✓ Determine plant profile of public school gardens
- ✓ Determine the possibility of duplicating such samples.

Conceptual Framework

The Garden City concept of urban design and planning was introduced by Sir Ebenezer Howard in his book ***Garden Cities of To-morrow*** (1898). This influenced and inspired the Garden City Movement as well as adoption of the Garden Cities in Great Britain by the start of the 20th century. It is a planned city where people live harmoniously with nature. The city center is a "magnet" where people conglomerate to live, work, study, and reside. While it was conceptualized to address the dirty industrial towns during that time, its adoption today is equally significant, a concept that is being reborn with the School in a Garden (SIGA) policy that DepEd is implementing (DepEd, 2018b). The program, however, requires the significant cooperation of local government units, communities, and the family in order to produce a "garden" (community) where the school is maintained with the big responsibility from youths or learners on their way to adulthood. GPP, then serves as the springboard towards establishing gardeners/farmers among the Filipinos who will go out of their schools to their

communities bringing with them skills, knowledge, and resources that they could use towards establishing SIGA.

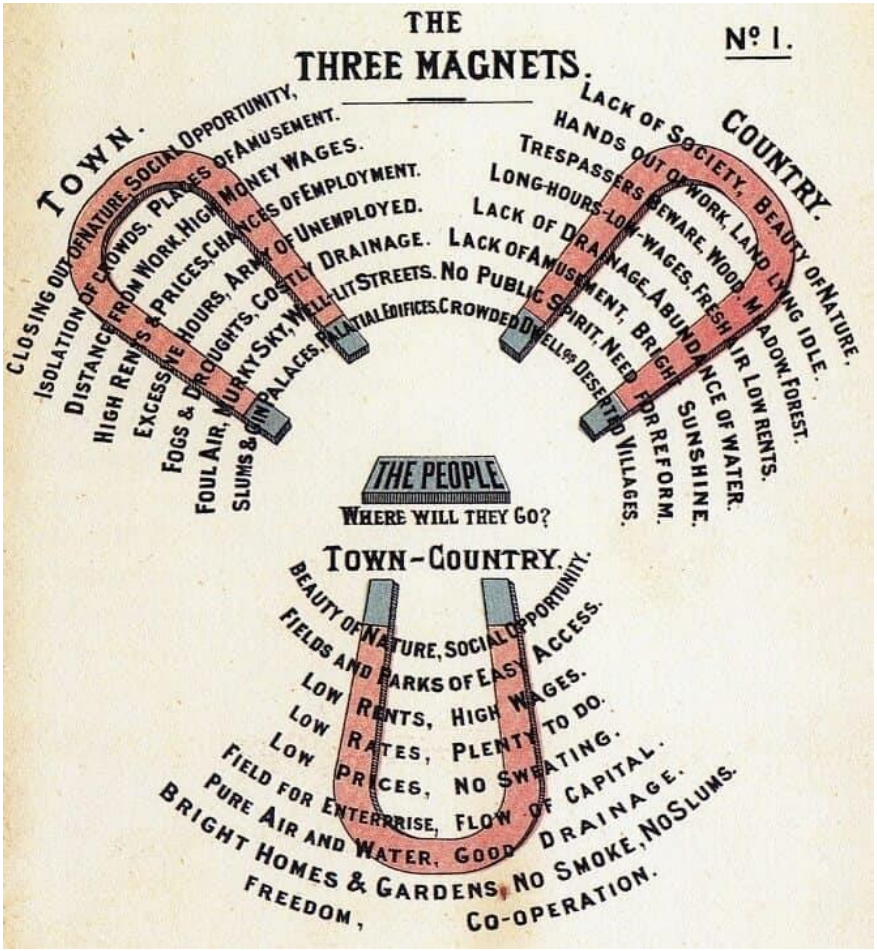

Figure 3: City Magnets

Source: Howard, 1902.

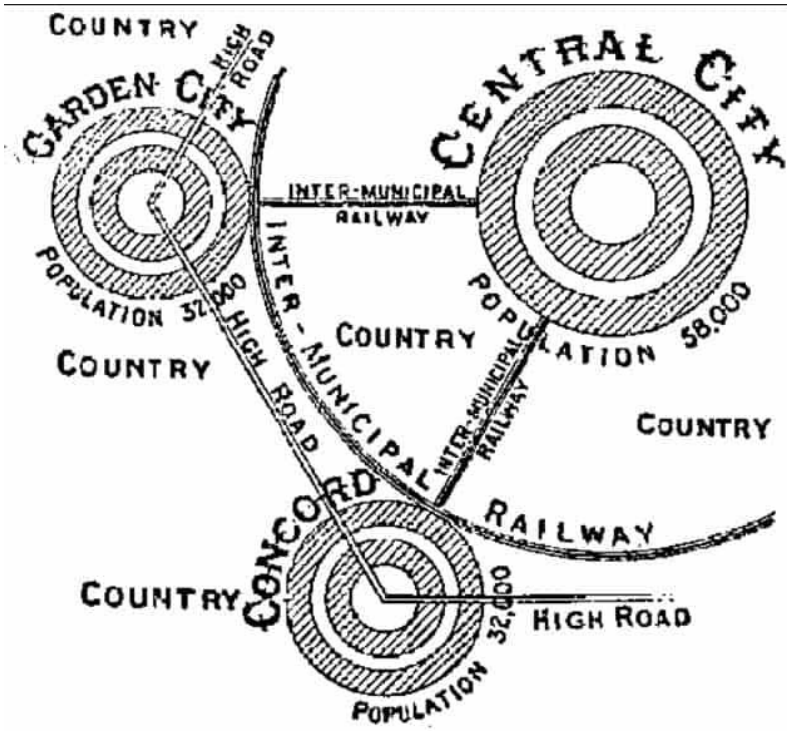

Figure 4: Garden City Concept

Source: Howard, 1902.

Quezon City has adopted the Garden City concept way back in its design of the city center with its Elliptical Park called Quezon City Circle, and road of which radiates various establishments for the people (Quezon City Government, 2018). However, discontinuity of planning and design of urban spaces become inevitable with the changes of leadership, priorities, and weak leaderships.

The adoption of the Garden City and SIGA through exploration and spread of the garden maintenance practice implemented in schools has never been more urgent than now (DepEd, 2018b).

Significance of the Study

Many political and economic greening methods are propagated and hyped in the advent of climate change. These methods, however, have proven to have minimal impact on mitigating global warming, or even affect the immediate environment of actors, assuming these are individuals, families, communities, and

organizations. This paper will reinforce the need to maximize greening efforts especially in crowded, polluted, and hot Metro Manila.

Current prevailing methods rely heavily on "organizational efforts" like public parks and upscale residential developments such as Makati's Forbes Park, Quezon City's Valle Verde, and Muntinlupa's Ayala Alabang, whereas need surges in all urban areas.

The Department of Education (DepEd), together with the Department of Agriculture (DA) and Department of Environment and Natural Resources (DENR) are national agencies that have been cooperating in the greening of schools. One particular cooperation is the *Gulayan sa Paaralan* program or GPP. It is a consolidated effort not only to revive or start school gardens but also to educate learners about cultivating and growing plants and to imbibe the importance of a green environment among stakeholders.

In determining existing and workable practices, there is a possibility of spreading these practices in a wider scale not only in schools but also in the wider community.

Chapter 2
Review of Literature

There are two definitions provided by Cambridge Dictionary (2019, p 1) of the word “greening”, the first is political: “the process of becoming more active about protecting the environment” and this paper will limit itself to the greening (noun) defined as “the process of making somewhere greener by planting grass, trees, and plants there.” It will focus on urban greening as a method of mitigating global warming and address related problems that come with it.

Greening in Cities

Greenspaces defined as “vegetated areas” (Sorensen, et al 1996, i) provide a lot of benefits to communities which residents can enjoy including increased property values (Conway et al. 2008, Crompton 2005, Hammer et al. 1974), better air quality, reduced storm water runoff, prevention of soil erosion, and decreased urban heat island effects (Jansson et al. 2006, Nowak et al. 2006, Xiao et al. 1998). Social benefits include increased relaxation, lesson retentions among students, better physical and mental health (Maas et al. 2009, Townsend 2006, Ulrich 1984), greater community cohesion (Coley et al. 1997, Kuo et al. 1998), and decreased crime (Branas et al. 2011, Kuo and Sullivan 2001).

These benefits should not only be the concern of city planners, but a collaboration of health, education, environment, community residents, and local governance officials especially in urban areas like Metro Manila. Several indications already point to the pressing need to green urban spaces.

A study conducted in Dubai indicates the need for plants and trees in urban planning and design especially in arid climates which is applicable also to tropical Philippines. It used a model to assess tree planting scenarios on school campus in Dubai and found that planting trees impact the day-to-day thermal comfort of the pedestrians with the use of shading structures, water bodies, and the promotion of natural ventilation – or green areas. It emphasized that trees not only provide shading but also improve the microclimate in urban areas, reducing the time of

discomfort. Through 3D urban energy modelling, it concluded that “native greening has a significant improvement in outdoor comfort conditions in the campus, reducing the "warm/hot" and "very hot" thermal sensations from 1,291 h (on average over the entire campus) to less than 300 h by planting Ghaf and Acacia trees,” (Coccolo et al, 2018, p 174).

Another study on mitigating Urban Heat Island (UHI) using greening strategies showed the connection between better health to reduced energy usage and pollution emissions. The study determined the impacts of building rooftop and façade areas, urban canyons, water bodies, vegetation, and solar radiation on UHI intensity in Columbus, Ohio. Various 2D and 3D inputs, as well as land surface temperatures estimated with remotely-sensed imagery captured within a spatial grid, and used in spatial regression analyses confirm the opposite effects of greenery, measured by the normalized difference vegetation index (NDVI), on summer and winter temperatures. Changes in temperatures due to potential urban greening strategy of green roofs, greening of parking lots and other vacant spaces, and vegetation densification showed reduced temperatures in summer and increases them in winter (Chun et al, 2018, p 165).

Greening in Metro Manila

In a report from the DENR, it is said that out of Metro Manila’s 55,922.22 hectares land area, only 12,152.79 hectares is green space — or only 21 percent in the National Capital Region. Based on the 2015 population data, these spaces serve some 12.8 million people living in the metropolis (Enano, 2019).

“If we look at the development here in the National Capital Region, especially under the ‘Build, Build, Build’ program, we really need to work double time to compensate for the loss [of green spaces],” said Jacqueline Caancan, DENR-NCR regional director. Some of the major green spaces in Metro Manila include La Mesa Eco Park, the Wild Life Park in Quezon City, and the protected Las Piñas-Parañaque Critical Habitat and Ecotourism Area (Enano, 2019, P5).

Out of 16 cities and one town in Metro Manila, the capital Manila has the biggest deficit, with only 140.4 ha of green space in a total area of over 3,800 hectares. The 2-ha Arroceros Forest Park in Ermita, dubbed as Manila's "last lung," was also threatened with the proposed building of a gymnasium during the previous administration. However, Mayor Isko Moreno did not allow grey development inside the riverside park (Enano, 2019) during his tenure but instead supported green landscaping.

According to the DENR, other cities that badly need breathing space based on their populations include Caloocan, Malabon, Mandaluyong, Navotas, Pasay, Pasig, Pateros and San Juan. To address the fast loss of plants due to rapid development, the DENR-NCR said it is working to cover every bit of available space, including the traffic medians, development of more mini-gardens and pocket parks, where trees and ornamental plants can provide a breathing space for Metro Manila. The National Greening program or NGP started in 2011 has planted trees in 1,110 ha of lands in 787 sites across Metro Manila (Enano, 2019).

Arroceros Forest Park

As mentioned earlier, the Arroceros Park is considered as one of the last bastion of green in Manila, the most vulnerable of the Metro cities. Ancheta, Membrebe, Santos, and Valeroso (2017) underscored the importance of urban forests highlighting the Arroceros Forest Park (AFP) in Manila in their 2017 study. They found out that despite collaborative efforts by government and non-profit organizations, the park remains neglected, poorly maintained, and seen as unsafe for public use. It endorsed the need to strengthen collaboration among interest groups managing the urban forest park. Mayor Moreno's tenure proved to be beneficial in the park's greening as actual visits indicated.

Gulayan sa Paaralan Program

Gulayan sa Paaralan Program (GPP) was created through DepEd Memorandum No. 293 s. 2007 with the goal to intensify school-based nutrition program to

combat malnutrition and promote self-help food production as agriculture is inculcated among children. It also serves to support the Nutritional Status Survey of teachers as children are fed with their school-produced vegetables and rootcrops (Rosales, 2019).

The Bureau of Learner Support Services – School Health Division or BLSS-SHD sustains the Implementation of the GPP (Department of Education, 2018). Its objectives include

- ✓ addressing malnutrition,
- ✓ promote vegetable production and consumption among children,
- ✓ encourage the establishment of school gardens,
- ✓ ensure continuous supply of vegetables for school feeding, and eventually
- ✓ lay the ground for establishing Schools in a Garden or SIGA concept.

To sustain the program, DepEd conducts an annual Search for Outstanding Implementers at the schools division and regional levels providing incentives and plaques of recognition to the winners (DepEd, 2018a).

The Department of Agriculture and the Department of Environment and Natural Resources are cooperating agencies on the implementation of Gulayan sa Paaralan. The agencies usually provide technical assistance and resources from tools, equipment, seeds, to seedlings and fertilizers. They also participate in recognizing best implementers as they encourage organic and traditional practices (Department of Agriculture, 2019).

Some developments of GPP have also been introduced. The Southeast Asian Regional Center for Graduate Study and Research in Agriculture (SEARCA) together with University of the Philippines Los Baños (UPLB), and the DepEd district of Laguna conducted the School-Plus-Home Gardens Project (S+HGP). It redesigned DepEd's GPP to an innovative approach focusing on nutrition, education, and economic well-being of school children, their families, and their communities piloted in six schools in the province. Harvests of fresh vegetables for the school-based feeding program were also extended to the gardening providing linkage to food gardens in school children's homes (Calub, Africa,

Burgos, Custodio, Chiang, Gale, Galang and Punto, 2019). The S+HGP was able to:

- ✓ help establish home gardens
- ✓ develop a greater sense of parental responsibility to ensure good nutrition for their children
- ✓ save on food expenses
- ✓ highlight the multi-functionality of school gardens as learning laboratories for educating pupils, teachers, and parents
- ✓ inculcate sustainability concepts and interconnections of food and nutrition, organic agriculture, edible landscaping, climate change, and solid waste management (Calub et al, 2019).

Other non-profit and business establishments through DepEd's BLSS-SHD and then main GPP coordinator Ferdinand Nuñez have also joined in helping maximize and improve GPP. The International Institute for Rural Reconstruction (IIRR) for instance, has linked with DepEd for GPP establishment of bio-intensive school gardening at Tinabunan Elementary School in Cavite to establish "crop museums" mainly for addressing biodiversity. This also will ensure that vanishing varieties can be searched, reproduced, and shared between schools. This seed exchange program is already on-going with the help of IIRR (DepEd, 2018b). Other NGOs like Dupay Seedbank and Bituen Volunteers generate and help collect seedling and seeds from various entities then deliver them to schools and GPP coordinators during workshops and seminars, where "waste gardening" and back-to-basics food production and consumption are also taught and promoted (DepEd, 2018b).

Chapter 3

Methods

This paper applied two methods in investigating current practices:

- ✓ Random Sampling Survey of public school gardens in Metro Manila to gather information on existing green spaces. Survey through questionnaire and photos of these existing "green spaces" called Gulayan sa Paaralan is provided together with descriptions with consideration of their "sustainability": length of existence through estimate of trees' age, area covered, maintenance, actors involved, and challenges.
- ✓ Secondary research on existing literature, studies, and information about current greening practices in Metro Manila, its public schools; use of published materials print or via internet posts, and others shall also be considered, provided that sufficient verifiable data is established.

Random Sampling Survey

Random sampling is considered "the purest form of probability sampling" as every member of the target population has an equal chance of being included. In this method, Metro Manila public schools are targeted as the focus population for this study relying on logic and judgment (Statpac, 2019) with the objective to present possible sample of greening practices in a seemingly impossible to green area.

A survey request was sent through the Metro Manila Regional Office of the Department of Education. This was disseminated to all schools through online Bulletin Post. Some 56 schools responded through email. However, only 35 schools provided sufficient or relevant data required for some of the survey questions as included in the data presented.

Chapter 4

Results and Discussion

There were 56 school respondents in all. Considering that the NCR city most threatened with global warming is Manila, majority of respondents, surprisingly, or not, are from Manila with 24 schools participating in the survey or about 42.86%. 19.6% came from Paranaque, 12.5% each from San Juan and Pasig, followed by 7.14% from Marikina, and with lone respondents from Mandaluyong, Caloocan, and Navotas. All schools have gardens of various types as indicated on second table.

City School Respondents

City	Number of Respondents	Percentage
Manila	24	42.86%
Paranaque	11	19.6%
San Juan	7	12.5%
Pasig	7	12.5%
Marikina	4	7.14%
Mandaluyong	1	1.8%
Caloocan	1	1.8%
Navotas	1	1.8%
TOTAL	56	100%

Table 1

Garden Type

	Type	No. of Respondents	Percentage
1.	Open Ground	32	57.143 %
2.	Mixed	14	25 %
3.	Plant Boxes	6	10.714 %
4.	Container / Receptacle	4	7.143 %
	TOTAL	56	100%

Table 2

In this study, the garden types are:

- Open ground – where there is ground space for planting especially suited for trees. More than half of the respondents or 57.143% have this type of garden.
- Plant Box – where limited space surrounded by concrete box is provided for planting or for already grown and matured trees. 10.7% of respondents

have plant box type of garden. This is employed to minimize span of tree spaces in limited ground space.

- Receptacle / Container – use of pots and other materials including those used in hydroponics, rooftops, and upcycled materials. Around 7% of school respondents have receptacle or containers only type of gardens. One school admitted to lacking tree plants.
- Mixed – where there is open ground, plant box or container used in the garden space. 25% of school respondents have mixed type of gardens. This may mean container and open ground, or boxed and container gardens.

Figure 5: Receptacle-type garden at San Dionisio Elementary School in Parañaque

The purpose is to determine the "greenspace", with "greening" as an action and verb. Through the determination of existing greenspaces, basis for adoption and expansion are confirmed. Not all of the respondents, however, indicate actual number of trees, as some left the space blank, and other respondents included months, 1, 2, or 3 year-old trees on their lists.

Based on the 56 schools that responded, it was found out that there exists a school garden or Gulayan sa Paaralan in every public school in Metro Manila. All 56 indicated an existence of a kind of a garden with just vegetables, or smaller plants,

and many with mature, full-grown trees. One respondent said they have no trees as they only have container gardens with vegetables.

Figure 6: Container-Type Gardens. Garden or greenspace in some schools like Laong-laan Elementary School (above) in Sampaloc, Manila do not have to be open ground spaces but includes containers such as plant boxes and upcycled plastic waste containers such as below:

Figure 7: Upcycled tire as container pot for plants

Figure 8: Plant Box. Centex Manila Elementary School have plant box of decades-old trees.

For the tabulation of Garden Size and Existing Trees, 35 schools are included for the sufficient data they provided although some schools like Kabayanan Elementary School in Pasig, Ramon Avanceña High School in Manila, Pinagbuhatan E.S. in Pasig, Laong-laan E.S. and Centex Manila E.S. in Manila failed to indicate their garden size in square meter.

Garden Size of City Schools

	School / City	Garden Size Sqm Est
1	Fernando Ma. Guerrero E.S., Manila	220
2	Francisco Legaspi Mem. S. Pasig	150
3	Bo. Obrero E.S. Manila	50
4	Industrial Valley E.S., Marikina	189
5	Sixto Antonio E. S. , Pasig	206
6	Dagat-Dagatan E.S., Navotas	500
7	Fortune E.S., , Marikina	168

8	Sto. Nino E.S., Marikina	20
9	Baclaran E.S., Parañaque	189
10	Ilugin E.S., Pasig	6
11	De Castro E.S., Pasig	72
12	San Joaquin E.S., Pasig	360
13	Palatiw E.S., Pasig	70
14	Corazon C. Aquino E.S., Manila	45
15	Andres Bonifacio Integrated School, Mandaluyong	40
16	Francisco Legaspi Memorial S., Pasig	150
17	F.G. Calderon E.S., Manila	300
18	Esteban Abada E.S., Manila	220
19	J. P. Rizal E. S., Manila	600
20	Sta. Ana E.S., Manila	817.546
21	Bacood E.S., Manila	80
22	Claro M. Recto H.S., Manila	120
23	Pinaglabanan E.S., San Juan	45
24	R. Almario E.S., Manila	60
25	Manila High School, Manila	23
26	Antonio Maceda Integrated School, Manila	200
27	San Juan E.S., San Juan	300
28	Rafael Palma E.S., Manila	80
29	Kabayanan Elementary School, Pasig	n/a
30	Ramon Avanceña High School, Manila	n/a
31	Pinagbuhatan E.S., Pasig	n/a
32	Centex Manila E.S., Manila	n/a
33	Laong-laan E.S., Manila	n/a
34	Parañaque National HS, Parañaque	20
35	Parañaque E.S. Unit 2, Parañaque	50
	Total SQM	5350.546

Table 3

The mean or average size of Metro Manila school gardens is 152.87 sqm. This number has been pulled higher by the large garden sizes of Sta. Ana E.S. and J. P. Rizal E.S. which are significantly larger than the rest of the schools.

Computation of the Median Garden Size:

Garden Size	0	0	0	0	0	6	20	20	23	40	45	45	50	50	60	70	72	80
	80	120	150	150	168	189	189	200	206	220	220	300	300	360	500	600	817.546	

Table 4

$x= (n+1)/2$

$X = (35+1) / 2$

$36/2 = 18$

18^{th} place is 80.

The median garden size is 80 sqm. Median and Mean represent two different center of a data set. The measure of central tendency that summarizes a whole data set with a single value is important in this instance in order to determine a specific representation for garden size available in Metro Manila schools. By determining the median size, this will indicate the possible public space that may also be alloted in a given community. Median is the middle value in the distribution as arranged in ascending order for both garden sizes and quantity of trees in school gardens. Median is important on both instances because it is less affected by outliers due to lack of symmetrical data (Australian Bureau of Statistics, 2019).

Median is obtained in this instance to indicate a closer representation of reality as many NCR schools hardly could afford spaces for gardening due to fast-increasing learner populations. Classrooms have become the priority as there is the need to accommodate pupils and students. City schools even adopted a 3-shift system where there are three classes in a day in order to provide education space to the huge minor population. Median garden size of 80 sqm is much lower than the computed mean or average garden size of 152.87 sqm, therefore, a closer representation of reality in Metro Manila: lacking or minimal open spaces for greening.

Est. Number of Trees in Metro Manila Schools

	School / City	Estimate Number of Trees
1	Fernando Ma. Guerrero E.S., Manila	34
2	Francisco Legaspi Mem. S. Pasig	17
3	Bo. Obrero E.S. Manila	6
4	Industrial Valley E.S., Marikina	5
5	Sixto Antonio E. S. , Pasig	46
6	Dagat-Dagatan E.S., Navotas	28
7	Fortune E.S., , Marikina	3
8	Sto. Nino E.S., Marikina	10
9	Baclaran E.S., Parañaque	34
10	Ilugin E.S., Pasig	4
11	De Castro E.S., Pasig	53
12	San Joaquin E.S., Pasig	34
13	Palatiw E.S., Pasig	104
14	Corazon C. Aquino E.S., Manila	3

15	Andres Bonifacio Integrated School, Mandaluyong	20
16	Francisco Legaspi Memorial S., Pasig	17
17	F.G. Calderon E.S., Manila	6
18	Esteban Abada E.S>, Manila	7
19	J. P. Rizal E. S., Manila	3
20	Kabayanan E.S., Pasig	23
21	Sta. Ana E.S., Manila	81
22	Bacood E.S., Manila	51
23	Ramon Avaceña H.S., Manila	7
24	Claro M. Recto H.S., Manila	12
25	Pinaglabanan E.S., San Juan	134
26	R. Almario E.S., Manila	11
27	Manila High School, Manila	8
28	Antonio Maceda Integrated School, Manila	7
29	San Juan E.S., San Juan	17
30	Rafael Palma E.S., Manila	46
31	Pinagbuhatan E.S.	64
32	Centex Manila E.S., Manila	4
33	Laong-laan E.S., Manila	7
34	Parañaque National HS, Parañaque	20
35	Parañaque E.S., Parañaque	20
	Total Number of Trees	946

Table 5

The total number of trees on the listed schools are 946. The mean number of trees is 27. The average number of trees in school gardens of Metro Manila based on the 35 school respondents is 27.

Computation of Median Number of Trees

Est. No. of Trees	3	3	3	4	4	5	6	6	7	7	7	7	8	10	11	12	17	17
	17	20	20	20	23	28	34	34	34	46	46	51	53	64	81	104	134	

Table 6

$x = (n+1)/2$

$X = (35+1) / 2$

$36/2 = 18$

18^{th} place is 17.

The median number of trees is 17. The Median was computed in order to establish a clearer or a more realistic representation of the quantity of trees in metro schools. As already mentioned earlier, disparities appear even in schools. Aside

from garden size where more generous community members may donate larger portions of land for schools, or having more affluent local government units that can afford to buy private lots for schools as DepEd has encouraged donation as the means of acquiring school land spaces, many communities cannot afford such, thus, they can only allot smaller spaces for schools and their gardens. This presents a parallel picture towards existence or cultivation of trees as trees often require more than a meter of distance from each other, unlike smaller plants such as vegetables. The lower median of 17 trees is more realistic than the computed average of trees at 27. This study would like to indicate the use of the median computations as nearer representations for Metro Manila schools' cultivated trees.

The survey also indicates a disparity between the quantities of trees as either explicitly indicated by the respondents, or implied as the only adult trees and thus, the listed trees in the survey (Annex, Survey Results Tabulation). For instance, Palatiw Elementary School in Pasig indicates that it has 104 trees. However, it only listed 28 varieties of trees with their estimate year old, height, and span without indicating how many trees are there in each variety or species. It is possible that some are still in their seedling stage. The year old (or months), and tree heights, however, were completely provided.

The span of trees has been mistakenly provided by many respondents to be the trunk size of trees when the target of this study has been the diameter span of branches and leaves that provide shade and cooling effect. Due to the misunderstanding of the majority, this study notes that it was included in the survey to determine possible green spaces size. This means that the garden size cannot exactly indicate the greenspace as pathways, paved spaces, toolshed, water system, garden decors, and others may be included in the raw data.

The data of estimated year old of trees shall be discussed briefly due to the limitations posed by the estimates as some respondents did not provide exact whole numbers but a range.

It should be noted that some trees are decades old, from 60, 50 or older, and 40 or older trees as indicated by the respondents and their corresponding photographs. However, some schools also included months-old, 1, 2, and 3 year-old trees, or saplings. This may indicate that planting has been influenced or motivated by the GPP. What is notable, however, is the variety of the trees' ages indicating a continuing cultivation in various years as well as maintenance of decades-old trees.

Expanding Schools-based Greenspaces

The Department of Education is one of the most challenged government agencies of the Philippines due to its budget and resources constraints against its needs and population demands: fast increasing birth and minor population, minimal social support, much dependence of allied agencies like the Department of Health, Department of Social Works and Development, Local Government Units, among others (Rosales, 2019).

Teachers are said to be the most overworked public servants as they are not only tasked at the academic skills of children but also of their mental and physical development (Rosales, 2019). The GPP, therefore, remains an excellent training ground for children as DepEd prepares them to go out and live in their communities with greenspaces.

The presence of greenspaces in schools that are replete with funds and resources is a solid indication that indeed, even in much-challenged urban spaces, greening is possible. Container gardening is adopted in many schools as much as boxed trees help maximize space use. Both complement one another in small garden spaces or even the lack of garden space.

Time is also of a big challenge for teachers as much as limited resources for garden tools, equipment, and supplies. If teachers and their students can sustain their gardens in very restricted situations, then, residents and their communities can replicate the same resourcefulness.
Educating learners and their adult counterparts about greening and the need for more greenspaces, however, remain a challenge. Policy-makers and the implementers are of the biggest challenge of all as Philippine system of governance remain one of the most problematic not only in the Asian region but of the global scale as already mentioned earlier.

Planning is an important component for expanding and sustaining greenspaces. Planners must have a grip of the direction of growth and anticipate challenges that will occur especially in crowded urban areas. It was suggested that zoning enforced properly and density should be factors to accommodate growth and development of environment and spaces. It will not only safeguard existing amenities, open spaces that are best for greening developments such as parks or reserves, but also to identify vulnerable areas like steep slopes, riparian corridors, flood plains, and watersheds (Sorensen et al, 1996). Likewise, provision of amenities can also serve as partnership between government agencies and local residents or communities as cooperation for use of available spaces can be exchanged with water systems or other needs. It should also be noted that biotic spaces also influence one another as interdependence is a necessity between them, where continuity is often encouraged rather than create islands of separated greenspaces (Sorensen et al, 1996).

The role of the government is also crucial in all stages of expansion and sustenance of greenspaces. Specific policies and regulations should be provided at all levels from the national to local government units. This will streamline not only roles but also responsibilities of all stakeholders. One example of this as applied to GPP is the lack of participation or actual gardens by some Mindanao-

based schools despite the utilization of the specific GPP funds by their respective beneficiaries (DepEd, 2018b).

Comprehensive greening programs also require technical capacity for skilled technicians in the various fields for urban greening such as sociology, hydrology, psychology, geology, economics, horticulture, forestry, landscape architecture, public administration, soil science, and others (Sorenson et al, 1996). However, with the grit and success shown by DepEd teachers, it is sufficient to say that they already have the basics covered by these experts as their gardens thrive despite the challenges.

Chapter 5

Summary and Conclusion

Urban greening is a vital development that should be embraced in Metro Manila. The role of the government at all levels cannot be set aside as policies and regulations are a must to establish roles and responsibilities of everyone in the community. Parks, reserves, greenbelts, and forests should be an integral part of cities not only for aesthetic purposes but for better quality of lives, better health, and improved communities.

Urban areas like Metro Manila with unmitigated growth and directionless development indicates a need for structured, guided, and yet challenged urban greening concepts like Gulayan sa Paaralan. The presence and persevering success of GPP despite its low-key character should be hailed and replicated at the community levels in order to finally meet agreements and contracts addressing climate change and global warming.

Recommendation

In order to sustain growth of greenspaces and make greening increase in the metropolis, the government at all levels should provide not only support and push for the adoption of GPP-like efforts in the community, at the cities, and national levels but also for the actual implementation of parallel laws that promote sustainable practices to keep our environments safer, cleaner, and liveable. One example is the strict implementation of the Clean Air Act and Ecological Solid Waste Management Act through imposition of penalties and collection from violators in order to fund laws and programs.

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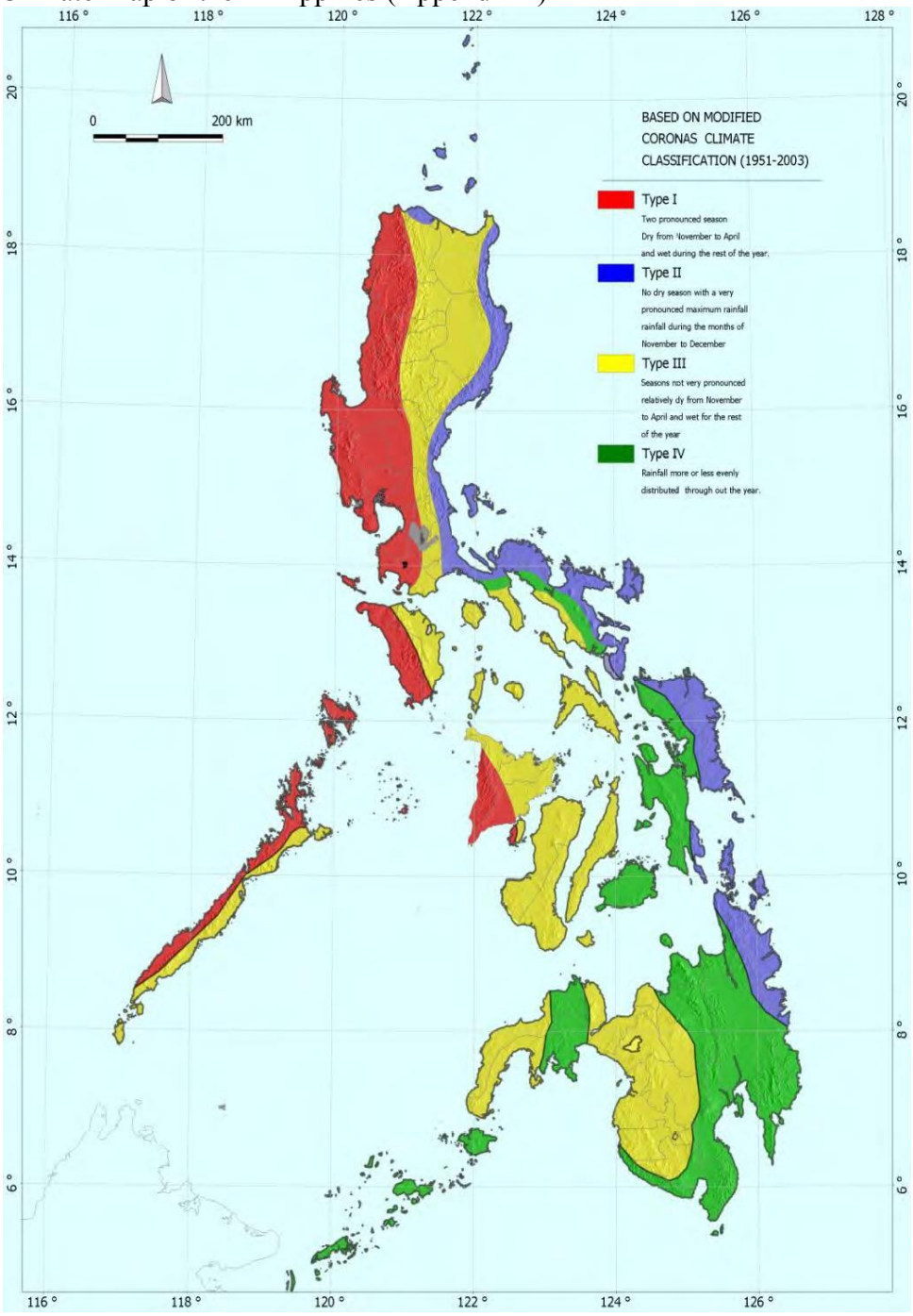
Appendices

Climate Map of the Philippines (Appendix 1)



Questionnaire (Appendix 2)

Gulayan sa Paaralan SURVEY (Elementary/Integrated/Memorial/ High Schools)

School: _____

Address/Location: _____
Size of Gulayan: _____
Existing Trees: Total number of Trees:

Tree	Year-old	Height Estimate	Span/Diameter Est.

(Add rows as necessary)
Please include at least 3 photos.
Coordinator: _____

Garden Type Based on Photos (Appendix 3)

	School	Garden Types
1	RAFAEL PALMA E. S.	Open Ground
2	NICANOR C. IBUNA E. S.	Open Ground
3	Antonio A Maceda Integrated S. (HS), Santa Mesa	Open Ground
4	San Juan E. S., NDomingo,	Open Ground
5	Manila H. S., Intramuros	Open Ground
6	R. Almario E. S., Tondo	Open Ground
7	Pinaglabanan E. S., Isabelita	Open Ground
8	Centex - Manila E. S., Tondo	Plant boxes
9	Pinagbuhatan E. S.	Mixed
10	Gen. Gregorio del Pilar E. S. Recto, Tondo	Open Ground
11	San Joaquin E. S.	Open Ground
12	A. Hernandez E. S. Magsaysay, Tondo	Open Ground
13	Salapan E. S.	Open Gorund
14	St.Lucia E. S.	Container
15	Palatiw E. S.	Open Ground
16	Pio del Pilar E. S., Sta Mesa	Open Ground
17	F. Legaspi Mem. S., Ugong	Open Ground
18	Manggahan H. S.	Mixed
19	Claro M.Recto H. S., Sampaloc	Open Ground
20	Dr. Sixto Antonio E. S.	Open Ground
21	Doña Teodora Alonzo H.S., Sta.Cruz	Mixed
22	San Perfecto E S. San Gabriel	Mixed
23	A. Bonifacio Integrated. S. Addition Hills	Open Ground
24	JP Rizal E. S., Tayuman, Tondo	Open Ground

25	Kabayanan E. S.	Open Ground
26	Justo Lukban E. S., Paco	Open Ground
27	C Aquino Senior H. S., Port Area	Open Ground
28	Ramon Avanceña H. S., Quiapo	Mixed
29	Bo. Obrero E. S., Tondo	Open Ground
30	Caloocan H. S., 10th Ave.	Open Ground
31	Esteban Abada H. S., Sampaloc	Open Ground
32	FG Calderon E. S., Manuguit,Tondo	Plant Box
33	Ilugin E. S., Pinagbuhatan	Plant Box
34	Bacood E. S., Sta Mesa	Open Ground
35	Sta.Ana E. S., Sta Ana	Open Ground
36	Manuel Luis Quezon H. S. Blumentrit St.Sta. Cruz	Plant Box
37	Industrial Valley ES	Open Ground
38	Dagat-dagatan ES,	Open Ground
39	Fortune ES.	Mixed
40	Sto. Niño ES	Mixed
41	KALUMPANG NATIONAL H. S.	Mixed
42	Baclaran ES	Open Ground
43	Parañaque ES U.2	Open Ground
44	Parañaque National H. S. - Don Galo	Mixed
45	Sampaloc Site II ES	Container
46	SAN AGUSTIN ES	Mixed
47	Fourth Estate ES	Mixed
48	Baclaran ES Unit 2	Mixed
49	San Antonio ES	Rooftop / Container
50	San Dionisio ES	Receptacle
51	San Antonio National H. S.	Mixed
52	San Isidro ES	Open Ground
53	Sta. Ana ES	Open Ground
54	F. Ma. Guerrero E.S.	Mixed
55	Centex - Manila E. S.,	Plant Box
56	Laong-laan E.S.	Plant Box

Survey Results Over-all Tabulation (Appendix 4)

School/ City	Garden Size Sqm Est	Quan-tity	Trees	Year-old	Height Estimate (meter)	Est Span / Diameter (m)
Fernando Ma. Guerrerro E.S., Manila	220					
(34 trees)		2	Lanzones	40	7 (m)	
		5	Mangoes	40, 60, 35, 90, 62	12, 15, 10, 20, 16	
		2	Santol	34, 55	21, 25	
		2	Caimito	57, 90	25, 55	

		7	Jackfruit	31, 20, 40, 19, 39, 12, 70	12, 6, 8, 4, 7, 4, 8	
		3	Camias	5, 40, 37	2, 5, 4	
		1	Atis	7	3	
		6	Narra	30, 30, 30, 34, 45, 55	20, 18, 20, 10, 15, 15	
		1	Banaba	57	7	
		2	Lanete	45, 50	8, 7	
		1	Alagao	40	3	
		2	Mahogany	39, 39	22, 22	
Francisco Legaspi Mem. S. Pasig	3 X 50	5	Manga	50	15	
(17 trees)		4	Narra	45	18	
		2	Acacia	60	13.7	
		2	Paper	60	24	
		2	Tamarind	35	11	
		1	Avocado	5	9	
		1	Rubber	5	9	
Bo. Obrero E.S. Manila	50	3	Mango	19	8.8, 8.2, 8.5	12, 12.8, 12.8
(6 trees)		1	Narra	45	3.9	10.3
		1	Langka	21	2.6	12.8
		1	Mahogany	43	3.6	12
Industrial Valley E.S., Marikina	189	1	Guava	5	1.3	1
(5 trees)		1	Money Tree	8	2.7	10
		1	Jackfruit	1	1.6	5 m
		1	Aratilis	4	5.1	5 m
		1	Malunggay	4 mos	.76	.5 m
Sixto Antonio E. S. , Pasig	206	18	Mahogany	20	13m	1 m
(46 trees)		9	Mango	20	19	7
		4	Acacia	50	11 m	10m
		3	Narra	30	11	8
		3	Indian Tree	15	6m	2m
		2	Tamarind	25	10	5
		2	Duhat	24	14	12
		1	Rubber tree	35	9m	8m
		1	Guava	7	5m	2m
		1	Santol	6	8m	3m
		1	Eucalyptus	40	15m	6m
		1	Orange Flower	50	14m	8m
Dagat-Dagatan E.S., Navotas	500		Mahogany	36	17	11.5
(28 species)			Duhat/ Java Plum	20	12	10
			Bugnay	20	16	10
			Guava	8	10	4
			Narra	11	15	12
			Mango	15	17	7

			Malunggay	15	15	6
			Chico	7	10	4
			Indian Tree	15	24	5
			Guyabano	3	6	3
			Tamarind	1/2	1/2	1
			Bimbli / kamias	10	12	3
			Starapple	7	15	6
			coconut	6	12	12
			Palm Tree	36	24	8
			Jack Fruit	15	9	6
			Eucalyptus	36	24	24
			Banaba	6	10	3
			Papaya	3	12	4
			Lemon	1/2	3	3/4
			Calamansi	6	2	3/4
			Pine Tree	3	12	4
			Kamagong	7	12	3
			Madre de Cacao	2	6	3
			Spanish plum	1	2 1/2	3/4
			Talisay	3	10	3
			Ipil-Ipil	3	8	2
			Alagao	5	9	3
Fortune E.S., , Marikina	3x 56 m		Bamboo tree	18-20 years	13.5	2-5
(3 trees)			Ipil tree	20-23 years	11	4
			Indian tree	16-17 years	12.5	1
Sto. Nino E.S., Marikina	2X10		Molave	4	3	
(10 trees)			Alagao	10	3	
			Banaba	3	2.5	
			Mabolo	3	1.8	
			Abocado	3	1.5	
			Mahogany	8	6	
			Fire Tree	1	1.5	
			Santol	1	.6	
			Caimito	1	.6	
			Sampalok	40	6	
			Acacia	35	6	
			Narra	35	6	
Baclaran E.S., Parañaque	13.5X 14	7	Madrecacao	4	3	
(34 trees)		7	Narra	10	6	
		3	Camias	5	1.5	
		3	Guyabano	1	1.5	
		2	Mango	8	6	
		2	Ylang-ylang	6	9	

		1	Katuray	4	5 m	
		1	Camachili	5	5.7m	
		1	Mahogany	8	7.6	
		1	Guava	1	1.2	
		1	Banaba	10	7.6	
		1	Alukon	3 mos	.7	
		1	Mulberry	7 mos	.9	
		1	Avocado	2	1.8	
		1	Acerola Barbados Cherry	3 mos	.9	
		1	Mabolo	4	10.6	
Ilugin E.S., Pasig	3X2	3	Talisay	10	1.7m, 1.7m, 1.3m	
(4 trees)		1	Guyabano	1	2.5m	
De Castro E.S., Pasig	9X8		Mango	15	4.8	
(53 trees)			Ylang-ylang	18	4.5	
			Langka	10	2.1	
			Buko	30	5.1	
			Narra	30	4.8	
			Chico	15	3.9	
			Malunggay	7	3.6	
			Camias	8	4.6	
			Star Apple	16	4.5	
			Hawaiian Palm	13	3.1	
			Grapefruit/Suha	3	3.1	
			Tamarind	6	3.9	
			Santol	2	3.1	
San Joaquin E.S., Pasig	360 sqm	7	Mangoes	48, 48, 50, 8, 4, 45, 40	15, 20, 20, 9, 4, 15, 15 m	15, 25, 15, 15, 12, 25, 15 m
(34 trees)		4	Narra	30, 25, 40, 45	15, 15, 15, 18	15, 20, 15, 30
		3	Acacia	50, 50, 50	20, 18, 15	28, 30, 40
		3	Mabolo	20, 20, 20	12, 15, 9	25, 10, 12
		3	Caimito	65, 65, 30	20, 15, 15	20, 25, 20
		3	Santol	30, 41, 20	20, 12, 9	15, 15, 8
		2	Atis	10, 4	10, 3	10, 2.5
		2	Talisay	30, 43	15, 15	25, 25
		1	Chesa	40	15	11
		1	Tamaribd	26	12	10
		1	Bignay	47	12	14
		1	Balete	29	12	30
		1	Chico	10	15	5
		1	Kalamansi	8	2.5	2
		1	Firetree	50	25	10
Palatiw E.S., Pasig	70 sqm		Narra	40 years Old	27	21
(104 trees)			Indian	5 years old	6	3

			Mango	25 years Old	24.3	20
			Jack fruit	10 years old	3.35	4
			Mabolo or kamagong	14 years old	5.4	5.7
			Avocado	2 years old	1.2	3
			Guava	38 years old	4.6	5.8
			Cacao	5 years old	3	2.5
			Kamias	4 years old	1.5	5
			Duhat	36 years old	30	6
			Coconut	13 years old	12.1	11
			Palm	10 years old	31.5	3
			Calamansi	7 years old	2-1.2	.2
			Ipil Ipil	38 years old	61.5	7
			Moringa	10 years old	21.5	7
			Macopa	25 years Old	11.88	7
			Sineguela	6 months	1.2	1
			Guyabano	1 year old	1.2	1
			Lemon	4 years old	.6	.95
			Swab	3 years old	1.2	2
			Atis	3 years old	1.5	1
			Doña Aurora	11 years old	1.5	1
			Banaba	2 years old	.9	1
			Pomelo	1 year old	1.8	.6
			Acacia	4 years old	3	1.5
			Tuba tuba	2 years old	1.5	1
			Alagaw	6 years	3	5
			Papaya	3 months	.9	0.5
Corazon C. Aquino E.S., Manila	45	1	Malunggay	3	3	-
(3 trees)		1	Coconut	1	1.2	
		1	Banana	1	1.5	
Andres Bonifacio Integrated School, Mandaluyong	40	5	Mango 1	9, 5, 7, 10, 10	15, 11, 13, 18, 19m	8, 4, 5, 8, 10m
(20 trees)		2	Mahogany	7, 7	19, 15	10, 6
		2	Jackfruit	7	6 m	3m
		2	Guava	10	15m	7 m
		1	Starapple	5	9 m	4m
		1	Avocado	6	9 m	3m
		2	Duhat	9	13 m	7m
		2	Macopa	8	13m	4 m
		3	Balimbing	8	9m	5m
Francisco Legaspi Memorial S., Pasig	3X50	5	Mangga	50 yrs	15.2	
(17 trees)		4	Narra	45 yrs	18.2	
		2	Acacia	60 yrs	13.7	
		2	Paper	60 yrs	24.4	
		1	Avocado	5 yrs	9.1	

		1	Rubber	5 yrs	9.1	
		2	Tamarind	35 yrs	10.66	
F.G. Calderon E.S., Manila	10X30	3	Calamansi	2, 2, 1	.6, .6, .3	
(6 trees)		2	Mango	1, 1	.3, .3	
		1	Duhat	15	6.1	
Esteban Abada E.S., Manila	15X10 X7	2	Chico	10, 7	3, 6.1	
(7 trees)		2	Ipil-ipil	2, 7	1.5, 3	
		1	Malunggay	10	4.6	
		1	Mango	10	4.6	
		1	Calamansi	12	3.6	
J. P. Rizal E. S., Manila	600	1	Malunggay	4	4.6	3m
(3 trees)		1	Papaya	3 mos	1.5	1.2
		1	Banana	3	4.5	3
Kabayanan E.S., Pasig			Mango Tree	40yrs	20 m	
(23 trees)			Star Apple/Kaimito	30yrs	20 m	
			Calamansi	3yrs	3	
			Banana	2yrs	12 m	
			Kamias	30 yrs	15 m	
			Palm Tree	5yrs	10 m	
			Jackfriut/Langka	6yrs	12 m	
			Papaya	2yrs	8 m	
			Malunggay	8 months	3	
			Neem Tree	10 yrs	9 m	
			Talisay	3 yrs	3.65	
			Avocado Tree	3yrs	3 m	
			Narra Tree	30 yrs	20 m	
			Madre de Cacao	2 yrs	3	
			Guyabano tree	5yrs	5 m	
			Balete Tree	40 yrs	20 m	
			Dita Tree	1yrs	1.5	
			Rambutan Tree	3yrs	2 m	
			Banaba Tree	1 yr	2.13	
			Guava Tree	2 yrs	2 m	
			Duhat tree	35 yrs	20 m	
			Alagao Tree	5 yrs	3 m	
			Chico Tree	20t yrs	10 m	
Sta. Ana E.S., Manila	817.5 46		CHICO	10-15	7.5	
(81 trees)			PALM TREE	15-20	8	
			POMELO	20	10	
			NARRA	30-60	15	
			KAMIAS	10-15	5	
			LANGKA	20-30	7.5	

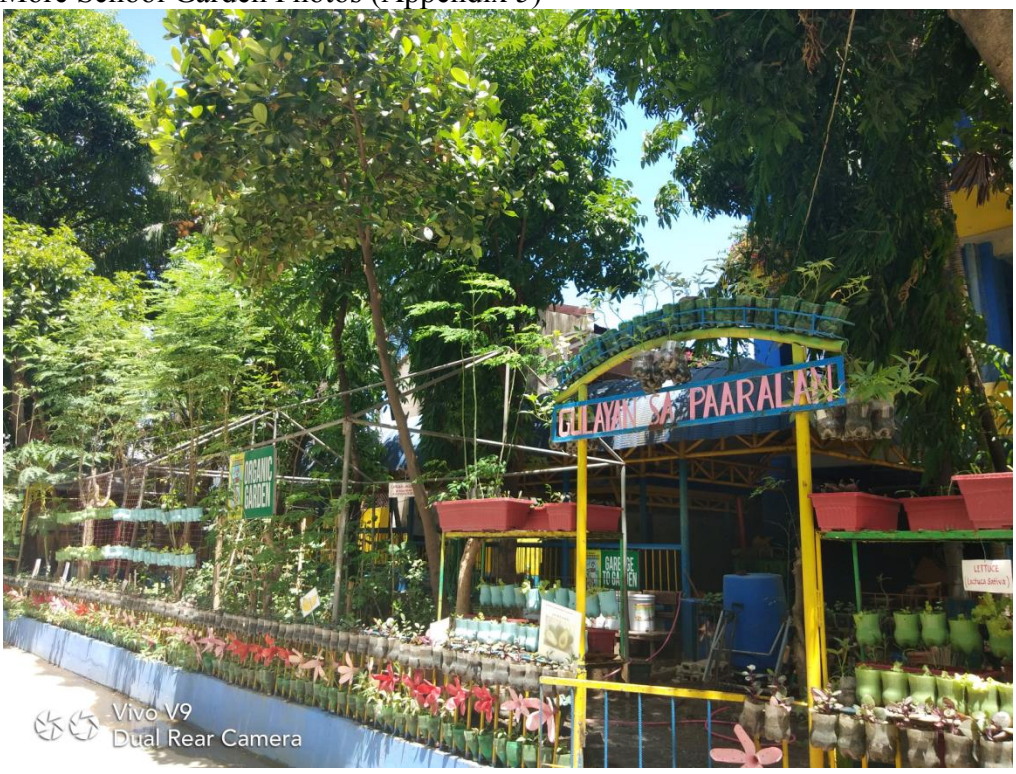
			MALUNGGAY	3-8	6	
			MANGO	40-50	15	
			NEEM TREE	8	5 M	
			DUHAT	20	8M	
			MINT TREE	30	15 M	
			STAR APPLE	30	12 M	
Bacood E.S., Manila	8X10	10	Acacia	50	12+	
(51 trees)		8	Mango	40	12+	
		8	Eucalyptu	35	12+	
		5	Narra	35	12+	
		5	Firetree	35	12+	
Ramon Avaceña H.S., Manila		1	Macopa	6		
(7 trees)		1	Guava	3		
		1	Longgan	2		
		1	Rambutan	3		
		1	Langka	5		
		1	Tamarind	4		
		1	Atis	2		
Claro M. Recto H.S., Manila	120		Mango	50	6	4.7 m
(12 trees)			Banana	5	2.4	2.3
			Tamarind	3	2.1	1.5
			Star Apple	5	5.18	3.7
			Coconut	5	7.6	2.4
			Malunggay	2	3	1.2
Pinaglabanan E.S., San Juan	15X9		NARRA	20	9.1	2.5
(134 trees)			MAHOGANY	20	12.1	2.5
			IPIL-IPIL	10	7.6	.5
			NAME TREE	8	7.6	1
			UMBRELLA TREE	10	9.1	2.5
			AGOHO	20	12.1	1
			PAPER TREE	15	12.1	2.5
			ILANG-ILANG	10	9.1	1
			ACACIA	5	4.6	.75
			GOLDEN SHOWER	5	4.6	.5
			BALETE	15	4.6	1
			FIRE TREE	5	3	.2
			STAR APPLE	20	9.1	1.5
			COCONUT	15	6	1
			MANGO TREE	20	10.66	2.5
			GUAVA TREE	15	3	.1
			TAMARIND	20	9.1	1.5
			SANTOL TREE	15	9.1	1

R. Almario E.S., Manila	60		BANABA	10	5.8	5.10
(11 trees)			KAMIAS	10	2.1	3.50
			MALUNGGAY	5	2.4	7.96
			SUHA	3	2.74	1.59
			SAMPALOC	30	5.48	7.00
			MABOLO	35	8.5	14.65
			NARRA	30	7.9	26.43
			MANGGA	52	9.44	28.66
			SAGING	1	2.74	9.24
			AVOCADO	52	5.48	4.14
			PAPAYA	3	6.4	5.10
Manila High School, Manila	23	4	Mango	90-100	15.24	5 m
(8 trees)		2	Narra	60-70	15.24	4
		1	Talisay	45-50	15.24	5
		1	Camias	15-17	3	3.5
Antonio Maceda Integrated School, Manila	5X40	1	Coconut	15	25m	1m
(7 trees)		1	Mango	10	25	1
		1	Santol	20	15	3 m
		1	Jackfruit	5	14	2
		1	Narra	40	40	8
		1	Camias	5	10	3
		1	Tamarind	10	20	3
San Juan E.S., San Juan	300	5	Camias	25	18.28	16
(17 trees)		3	Mango	20	12.19	
			Makopa Tree	15	12.19	
			Kaymito Tree	25	18.28	
			Kamias Tree	20	4.57	
			Paper tree	15	15.24	
			Coconut Tree	20	12.19	
			Golden Chain Tree	15	15.24	
			Duhat Tree	25	20	
			Fire Tree	20	15.24	
			Bangkok Santol Tree	15	12.19	
Rafael Palma E.S., Manila	80		Balete	35	11m	8m
(46 trees)			Mango	20	12	2
			Narra	40	12	2
			Talisay	25	10	1
			Banaba	25	5	1
Pinagbuhatan E.S., Pasig	n/a	1	CHICO	20	15 METERS	12 INCHES
(64 trees)		30	MAHOGANY	20	15 METERS	20 INCHES
		1	NARRA	17	20 METES	35 INCHES
		2	ILANG-ILANG	17	20 METERS	40 INCHES
		2	TALISAY	25	20 METERS	30 INCHES

		5	MANGGA	25	20 METERS	30 INCHES
		1	KAMIAS	9	10 METERS	12 INCHES
		1	AVOCADO	9		
		1	LANGKA	9		
		4	COCONUT	25		
		2	ANAHAW	19		
		1	SAMPALOK	25		
		2	EUCALYPTUS	25		
		4	INDIAN TREE	19		
		1	RAMBUTAN		2	2 METERS
Centex Manila, E.S., Manila	n/a	1	Acacia	21	20 feet	7 meters
		1	Narra	12	10 feet	3 meters
		1	Langka	4	5 feet	40
		1	Avocado	4	6 feet	60
		1	Malunggay	3		
Laong-laan E.E., Manila	n/a	7	Banana	5	5 m	
Justo Lukban E.S., Manila	9X30		Duhat	20	2.5 ft	
(16 trees)		2	Talisay	18	2.5	
		2	Narra	50, 25	40, 35	
			Rubber	15	40	
			Caimito	20	35	
			Indian Mango	30	30	
			Coconut	25	35	
			Mango	32	45	
			Langka	15	25	
			Santol	20	25	
Parañaque E.S. (20 trees, hydrophonics -24 sqm)	96+16 +12+2 4	1	Santol	25	40 ft	
		2	Gmelina	20	50	
		3	Jackfruit	10	15	
		7	Mango	25, 25, 25, 20, 20, 20, 20	35, 40, 30, 20, 35, 30, 30	
		7	Narra	30, 20, 20, 10, 40, 40, 10	30, 50, 50, 15, 15, 60, 60, 15	
Fourth Estate E.S., Paranaque	60		Umbrella	23	20 m	
(3 trees)			Indian	8	20 ,m	
Parañaque Natl. HS.	20	6	Calamansi (6)	2 yrs.	110cm.	
			Avocado	4 yrs.	170 cm.	
			Guyabano	1 yr.	40 cm.	
			Guyabano	3 yrs.	7 ft.	
			Malunggay	1 yr.	9 ft.	
			Dalandan	3 yrs.	65 cm.	
			Caimito	3 yrs.	50 cm.	
			Sampaloc	1 yr.	65 cm.	
			Suha	3 yrs.	65 cm.	

			Rambutan	2 yrs.	56 cm.	
			Lemon	2 yrs.	95 cm.	
			Tuba-Tuba	3 yrs.	10 ft.	
			Bayabas	2 yrs.	55 cm.	
			Calamansi (6)	2 yrs.	110cm.	
			Moras	2	150 cm	
Parañaque E.S. Unit 2, Parañaque	50		Langka	12	10 ft	
(12 trees)			Saging	1	3ft	
			Santol	5	10ft	
			Papaya	5	10ft	
			Mangga	6	6ft	
			Sambong	1	3ft	
			Kalamansi	3	5ft	
			Kamias	1	3 ft	
			Sampaloc	1	3ft	
			Bayabas	1	3ft	
			Chico	1	3ft	
			April Bloom	14	20ft	

More School Garden Photos (Appendix 5)



Pinagbuhatan E.S.

Pinagbuhatan E.S.

Plant Box Types

Ilugin E.S.

Pio del Pilar Elementary School

Gen. Del Pilar Elementary School

San Antonio National High School

San Antonio National High School