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Benefits of organic vegetables grown in Raisebeds: Experience of selected Urban Barangays in Zamboanga City, Philippines Amidst Covid 19 Pandemic

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Abstract The COVID 19 pandemic crisis had significantly caused disruptions on local food production and distribution, from local buying to wholesaling, and from cross-regional logistics to consumptions and this is felt across the highly urbanized barangays in Zamboanga City, Philippines. This paper presents the experienced of selected urban barangays amidst CoVid 19 pandemic. The Philippine Council for Agriculture, Aquatic and Natural Resources Research and Development or PCAARRD funded a project to evaluate the yield level and income of organic vegetables grown in raisebeds with 150 participating beneficiaries. Ten (10) raisebeds were required for each beneficiary where 1.0 sqm utilized for one vegetable crop per raisebed making a total of 1,500 raisebeds. A total of 5,446.1 kg of assorted vegetables were harvested in eight months period, of this total, leafy vegetables contributed 79.8% (4,347.5 kg), while fruit vegetables shared 20.2% (1,098.6 kg), respectively. The total vegetables produced generated PHP236,630.50 (~4,732.6 USD) in total sales or this is equivalent to PHP1,577.54 raisebed^{-1}. Vegetable grown in raisebeds also offered direct access to food where each beneficiary consumed about 40% of the total vegetables produced which provide a savings (indirect income) of PHP94,652.20 from the total food consumed, while 60% (PHP141,978.30) derived from direct sales of surplus vegetables (direct income). Direct access to healthy food and income are the potential benefits of vegetable grown in raisebeds in addressing food security and unemployment amidst CoVid 19 pandemic. Organic vegetable production in raisebeds is one initiative to further enhance the capability of urban communities to be resilient and self-sufficient. Expansion of this type of production system with improved soil mix using locally available organic substrates, home-based organic inputs and concoctions can be achieved if government interventions and community supports are in place.

Keywords: Organic vegetables, Raisebeds, Urban barangays, Direct income, Indirect income

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Introduction

The pandemic COVID 19 has crippled not only the Philippine economy but more so the local food supply system. Two dimensions of the food system that were significantly affected, these include the production and distribution systems, hence the pandemic crisis had significantly caused disruptions on local food production and distribution from local buying to wholesaling (Aday and Aday, 2020; Syfongxay *et al.,* 2022; Fei and Ni, 2020) and from cross-regional logistics to consumptions at city and down to barangay level in the City of Zamboanga. The risk of looming food crisis is becoming so uncertain since CoViD 19 crisis is yet to be contained, unless measures are taken fast to keep local food supply chains alive to address local food demand. The current population of Zamboanga City is estimated at 977,234 based on May 2021 census (PSA, 2021a). Of this total, more than 80.0 percent is confined within the highly urbanized zone where scarcity of food is hardly felt especially when lockdown in many places was imposed.

Prior to CoVid 19 pandemic, most of the supply of vegetables comes from the Province of Bukidnon and nearby municipalities in Region IX. During the enhanced and general quarantine periods, supply of vegetables was limited to meet the demand. Addition to this, the lack of access to technical support and limited assistance on the establishment of urban vegetable production worsen the limited supply of assorted vegetables in the city. This posed the need to address the production and sustainable distribution of vegetable produce within the urban communities. It is imperative for the local government units (LGU) of Zamboanga City to provide agricultural assistance to hasten the development of sustainable production and distribution systems of locally produce food through the establishment of organic urban agriculture (OUA) to help ensure access to adequate food supply in face of the pandemic crisis.

The OUA offers a multifunctional system combined with different production approaches within a given land unit – a solution to an increasing demand for safe and cheaper food, hence OUA may have a role in urban food security and self-provisioning on assorted vegetables (Porter *et al.,* 2014; Zezza and Tasciotti, 2010) grown in different approaches such as for self or household consumption, community gardens and edible landscapes (Eigenbrod and Gruda, 2015), utilizing rooftop as gardens, available backyards and open spaces (Thomaier *et al.,* 2015). OUA may also help reduce energy inputs on inorganic fertilizers, agrochemicals, packaging and transport to markets (Mendoza and Mendoza, 2016; Savuth, 2018; Tabal *et al.,* 2021a,b), improved physical and mental health, improved aesthetics, community building, employment opportunities, shortened supply chains, and waste recycling within the

community (Mok *et al.*, 2014; Asomani-Boateng, 2007). Its long-term impact includes food and income (Jansen *et al.*, 1996) and food security (Eigenbrod and Gruda, 2015). In the USA and Europe, raisedbed gardening is a popular technique for growing plants, where vegetables, fruits, flowers, trees and shrubs are grown with improved soil media, adding attraction in the landscape (Starbuck, 2003).

In this study, the use of raisebed frame in vegetable gardening was introduced and evaluated its benefits with 150 beneficiaries in the 12 selected urban barangays of Zamboanga City in partnership with the Philippine Council for Agriculture, Aquatic and Natural Resources Research and Development or PCAARRD.

Materials and methods

Selection of beneficiaries

The Office of the City Agriculturist (OCA) in Zamboanga City was a partner in the identification of beneficiaries in the 12 unban barangays located within the seven kilometer radius or also called the highly urbanized zone of the city that falls within the coverage. The barangays covered with their respective number of beneficiaries are shown in Table 1. In coordination with the OCA, the technical team set the dates and venue for the participatory learning appraisal (PLA) and training schedules. The barangay concern determines the beneficiaries prior to the conduct of PLA, training, orientation and field visits proper per barangay.

Table 1. Number of beneficiaries barangay^{-1}

Barangay	Barangay Captain	Beneficiaries
Calarian	Florencia A. Arcillas	10
San Jose Gusu	Joel H. Esteban	10
San Roque	Edgardo C. Delgado	12
Cabatangan	Antonio J. Saavedra	10
Sta. Maria	Los Eli B. Angeles	10
Pasonanca	Efigenio E. Julian, Jr.	30
Tumaga	Jacqueline J. Lim	10
Lunzuran	Joel E. Jose	15
Divisoria	Jesus F. Macrohon	10
Putik	Jerry E. Perez	8
Tugbungan	Abraham T. Rojas	10
Talon talon	Casmir O. Candido	15
	TOTAL	**150**

Participatory learning appraisal

Together with the OCA and barangay officials, a participatory learning appraisal (PLA) was conducted to assess the level of needs of the participating beneficiaries. The PLA facilitated suggestions and learning expectations of all stakeholders involved and helped the technical team to establish learning approaches and design appropriate techniques to a diverse beneficiary across the 12 urban barangays in Zamboanga City.

Conduct of trainings

A pool of experts from the OCA, Extension Services and Community Development Department (ESCDD) and WMSU-College of Agriculture were tapped as resource persons for the conduct of trainings/seminars on soil mix preparation and various organic concoctions such as fermented fruit and plant juices, organic pesticide tea and calcium phosphate concentrate. Practical methods from pre-planting activities to crop establishment, crop care and management, harvest and postharvest operations including the training to enhance entrepreneurial skill and record keeping formed part of the training activities.

The training was conducted in 12 batches designed to limit the movement of participants going to the Experimental Area due to restrictions related to CoVid pandemic. The basic record keeping was conducted to capacitate the participating beneficiaries in keeping track on the progress of their individual garden set-ups, postharvest activities, basic processing and marketing, which aimed at helping the beneficiaries in basic economic analysis and assessment on the viability of the project.

Area and crop requirement

An area of at least 12.0 m^2 formed part of the criteria for a beneficiary to qualify. The 12.0 m^2 area can make 10 raisebeds at 1.0 m^2 each utilized for the planting of identified priority crops such as: tomato *(Solanum lycopersicum L.)*, eggplant *(Solanum melongena L.)*, pole sitao *(Vigna unguiculata)*, pepper (*Capsicum annuum*), lettuce *(Lactuca sativa)*, okra *(Abelmoschus esculentus)*, pechay *(Brassica rapa)*, mustaza *(Brassica juncea)*, camote tops *(Ipomoea batatas L.)*, alugbati *(Basella alba)* and upland kangkong *(Ipomoea reptans).* Seeds were provided by the partner agencies: OCA and DA.

During the onset of lockdown in March 2020, the Department of Agricultural Sciences of the College of Agriculture, Western Mindanao State

University initiated a project on vegetable production in raisebeds to compensate suspension of classes. The initial results suggests potential contribution of raisebed gardening to local economy and can significantly provide additional income to the participating beneficiaries in two ways as savings or call this the *'indirect income'* by utilizing their own produce instead buying it and *'direct income'* refers to the amount in sale from surplus vegetables sold within the community or call this the *'lako-lako system',* where the beneficiaries-gardeners are involved in the marketing activities.

Individual set-ups, data gathering and analysis

Part of the training activities was the establishment of organic urban garden in raisebeds for the individual participating beneficiaries to manage. The type of set-ups depends on the specific landscape of the area, environmental and climatic considerations. Economic viability of the organic vegetable production is key to sustainability of the project in the urban communities. Collection of data on yield and its income equivalent per harvest per site per beneficiary were collected, tabulated and analyzed using descriptive statistics. Sums, means and percentages of yield and income per commodity were compared.

Provision of farm inputs

Planting materials (assorted vegetable seeds) formed part as subsidy from the OCA and DA. A start-up soil conditioner like the mechanically accelerated compost (MAC), molasses and Effective Microorganism (EM_1) were provided to beneficiaries per barangay. The soil conditioner served as the base mixture along with other organic substrates available in the locality for the production of improved soil mixes in raisebeds since quality garden soil is scare in highly urbanized areas.

The EM technology has been used to improve soil health and fertility by the actions of photosynthetic bacteria, lactic acid bacteria and yeasts (Higa and Wididana, 1991; Higa and Parr, 1994; Higa, 2003). The proportional mixture of EM_1 and molasses made the effective microorganisms activated solution or the EMAS which is also used a mixture component for the production of fish amino acids (FAA), fermented fruit juice (FFJ) and fermented plant juice (FPJ). Various researches on the use of EMAS yielded positive results (Saidia and Mrema, 2017; Jusoh *et al.,* 2013).

Organic concoctions such as vermitea and calcium phosphate (CalPhos) were also introduced. Other agricultural supplies include 2.0 litre capacity

sprayer and 200.0 litre capacity plastic drum were provided to each of the 150 beneficiaries.

Results

The total harvest and income sq.m^{-1} raisebed is shown in Table 2. A total of 5,446.1 kg of assorted vegetables were harvested from June 2021 to January 2022, of this total, leafy vegetables contributed 79.8% (4,347.5 kg), while fruit vegetables 20.2% (1,098.6 kg), respectively. The total vegetables produced generated a total sale of 236,630.50 or this is the computed sales, which translates to 1,577.54 in total sales per 1.0^{-m2} raisebed. The total computed sale is also the total distribution derived from the total vegetable consumed (40%) by each beneficiary, hence a saving of 94,652.20 (indirect savings), while 60% (141,978.30) derived from direct sales (Table 2).

Among the leafy vegetables, pechay gave the highest yield at 1,061.4 kg contributed 19.5% of the total vegetables produced and 20.2% share in total sales, followed by mustasa (982.5 kg), alugbati (825.9 kg), upland kangkong (787.2 kg), camote tops (683.0 kg), while lettuce yielded the lowest at 7.5 kg. Of the fruit vegetables, okra gave the highest yield at 443.1 kg compared to pole sitao (279.8 kg), eggplant (246.0 kg) and tomato (129.7 kg), respectively (Table 2). In general, the average yield for leafy and fruit vegetables ranged from 0.41-0.71 and 0.86-2.95 kg per raisebed planted and harvested in wet season under Zamboanga City, Philippine condition.

Discussion

Self-reliance on food is characterize by non-dependence to government subsidies, in this case, the beneficiaries experienced food secured household amidst the pandemic crisis. To measure the impact of the project, the technical team extended the activity to profile each partner beneficiaries to determine the extent of demographic and socio-economic information. For example, the gathering of information on household size per family, the capita consumption and sources of income to facilitate deeper appreciation of their involvement in organic vegetable production in raisebeds.

Table 2. Total harvest and income from 1.0 sqm beds

Type of vegetable	Harvest									Price	Total	Average	Income from sales	
	JUN	JUL	AUG	SEPT[1]	OCT[2]	NOV	DEC	JAN	TOTAL	KILO^{-1} (PhP)	Sales		Direct[3]	Indirect[4]
Leafy vegetable														
Pechay	26.5	85.5	267.4	178.8	137.4	135.0	122.3	108.5	**1,061.4**	40-50	42,456-53,070	47,763.00	28,657.80	19,105.20
Mustasa	18.5	69.6	253.4	183.4	129.4	121.9	111.5	94.8	**982.5**	40-50	39,300-49,125	44,212.50	26,527.50	17,685.00
Lettuce	-	-	-	7.5	-	-	-	-	**7.5**	300	2,250	2,062.50	1,237.50	825.00
Alugbati	36.4	96.4	203.8	171.1	124.8	92.0	62.1	39.3	**825.9**	30-40	24,777-33,036	28,906.50	17,343.90	11,562.60
U. Kangkong	23.2	79.0	219.3	207.1	113.6	76.1	41.1	27.8	**787.2**	50-60	39,360-47,232	43,296.00	25,977.60	17,318.40
Camote tops	29.4	84.1	171.0	144.8	105.5	77.4	41.5	29.3	**683.0**	20-30	13,660-20,490	17,075.00	10,245.00	6,830.00
Total leafy	**134.0**	**414.6**	**1,114.9**	**892.7**	**610.7**	**502.4**	**378.5**	**299.7**	**4,347.5**			**183,315.50**	**109,989.30**	**73,326.20**

Table 2. (Con.)

Fruit vegetable													-	-
Eggplant[4]	5.5	37.4	87.5	74.0	24.4	9.4	7.8	-	**246.0**	40-60	9,840-14,760	12,300.00	7,380.00	4,920.00
Tomato[5]	1.2	28.7	53.4	36.1	5.8	3.5	1.0	-	**129.7**	50-80	6,485-10,376	8,430.50	5,058.30	3,372.20
Pole sitao[6]	0.8	17.7	127.3	108.1	16.0	7.6	2.3	-	**279.8**	50-80	13,987-22,380	18,183.75	10,910.25	7,273.50
Okra[7]	8.2	35.2	174.4	146.4	48.4	19.9	10.6	-	**443.1**	25-40	11,077-17,724	14,400.75	8,640.45	5,760.30
TOTAL FRUIT	**15.7**	**119.0**	**442.6**	**364.6**	**94.6**	**40.4**	**21.7**		**1,098.6**			**53,315.00**	**31,989.00**	**21,326.00**
GRAND TOTAL	**149.7**	**533.6**	**1,557.5**	**1,257.3**	**705.3**	**542.8**	**400.2**	**299.7**	**5,446.1**	**-**	**-**	**236,630.5**	**141,978.30**	**94,652.20**

[1,2] affected by typhoons: Jolina and Kiko; Low pressure: Lannie and Maring.

[3]Direct Income = 60% of the produce sold within the community - lako-lako system.

[4]Indirect Income = 40% of the produce utilized for household consumption.

August-December - rainy months, most visited by typhoons and low pressures, January-March – extended rainy months.

The added information may help to be deepened the analysis in relation to total vegetable produced per 1.0 m^2 raisebed, vegetable consumed and benefit from sales. Results showed that the average rice and vegetables consumption reached 122.4 and 70.3 kg beneficiary^{-1} annum^{-1}, respectively, but this is higher compared to the Department of Agriculture (DA) estimates at 118.8 kg for rice, while DOST-FNRI (2022) recommends for adult individuals (ages 19-59 years) 58 grams of daily vegetable intake or this is equivalent to 21.17 kg capita^{-1} consumption of vegetables to achieve nutrition. Results further showed that majority of the beneficiaries are females (88.67%) and age ranged from 41-50 years (46%) and mostly unemployed (40.67%), while those employed, the monthly income ranged from PHP2,000.00-3,000.00. Majority of beneficiaries with more than six members in the family (45.33%).

The interest is in the per capita consumption of rice and vegetables, and income. With high rate of unemployment and very meager income, these alone can serve as indicator placing the household below economic threshold based on the criteria set by the PSA (2022). While this is true, the involvement of these fortunate beneficiaries in raisebed method experienced direct access to vegetables for household consumption and this is savings from not buying their vegetable needs or call this the *'indirect income'*, at the same time, there is income derived from sales on surplus vegetables sold to neighbors or this is the *'direct income'. The sum total of indirect and direct income is the total income of the combined computed sales.*

The project ran for one year, but the first four months (February-May 2021) were utilized for various pre-establishment activities such as the inception and consultative meetings, conduct of participatory learning appraisal (PLA), identification and final listing of beneficiaries; profiling, establishment of a tech-demo farm in the experimental area of the College of Agriculture, Western Mindanao State University; field visits and orientation, initial distribution of farm inputs to capacitate the project beneficiaries.

The average yield for leafy and fruit vegetables that ranged from 0.41-0.71 and 0.86-2.95 kg per raisebed planted and harvested in wet season was low compared to 0.52-2.6 and 1.8-4.2 kg harvested in dry season (Tabal *et al.,* 2020; Tabal and Pedroso, 2016), respectively, which is also a common trend in abroad (Alagöz *et al.,* 2020; Adeel, 2023; Dodson, 2011). On the other hand, low yield results were attributed to frequent typhoons and low pressures and extended rainy days until the months of November 2021 to January 2022. No enough scientific evidences to relate this phenomenon to climate change, however of the two types of crops planted, the results further suggests that leafy vegetables grown in raisebeds technique under rainy conditions is suitable compared to fruit vegetables across the 12 urban barangays in the city.

Observations related to growth performance include the improvement of soil structure due to observed improvement in water absorption, retention and drainage especially during heavy rains. The raisebeds technique using wooden frames has a direct benefit on the control of soil erosion, easy weed control and soil fertility management as the general consequence of improved soil media with the application of effective microorganisms activated solution or EMAS (Saidia and Mrema, 2017; Raja Namasivayam and Bharani, 2012).

Plant-based concoctions also offered safe and easy help for crop nutrition and the prevention of pests and diseases. Homemade fermented plant juices (FPJs) and organic insecticide were utilized as foliar spray, while the Fish Amino Acid (FAA) was applied as drenched, although majority of the beneficiaries complained on strong fishy odor of FAA and suggested if the product can be deodorized or at least reduce the strong fishy odor. Observed in most areas were added vegetables crops and herbs such as lemon grass *(Cymbopogon citratus, Stapf)*, basil *(Ocimum basilicum)*, oregano *(Origanum vulgare)* and mayana *(Coleus blumei Benth)* planted surrounding the gardens utilized as companion plants.

Lettuce is a new commodity that was introduced in raisebeds to the project beneficiaries. Production was low and only few had ventured in growing lettuce. Other constraints include the variety of lettuce, poor germination, and the amount of irradiance were some of the major factors identified that affected the growth performance of lettuce. Lettuce is a potential income earner due to the presence of institutional buyers and it command a good price at 250.00 to 300.00 kg^{-1}. The case of fruit vegetables, the effect of high rainfall events across all the areas especially the months from August 2021 to March 2022 (Zamboanga City condition), when typhoons and low-pressure climate systems frequent the city with extended rainy months from January to March 2022 or this is suppose the entry of dry season. Of the four fruit vegetables, okra and eggplant yielded 443.1 and 246.0 kg, respectively, contributed 14,400.75 in total sales, but this is small compared to leafy vegetables. However, regardless of the type of vegetable crop, the accounting of produce or yield level was in per raisebed basis across all crops covering the period of eight months harvest. The reason was determined the potential carrying capacity of the 1.0 sqm size raisebed being observed and its economic equivalent in a given time. The price ranged from 25.00-80.00 $kilo^{-1}$ from June 2021 to January 2022, lettuce is exceptional.

The yield performance of each vegetable crop indicates a strong potential of urban farming in addressing food insecurity issue (and malnutrition) in the City of Zamboanga. In bigger scope, for instance, pechay and eggplant can give a potential yield of 106.14 and 49.0 t/ha, respectively.

This is a lot of vegetables, what needed is government intervention and policy measures at meeting the goal of urban agriculture and its role to food security and not just for the niche market, and potentially can be an alternative option to produce food sustainably (Maghirang *et al.,* 2011). In 2016, organic farming was envisioned to be practiced in at least 5% or this is about 483,550 hectares of the total agricultural farm areas in the Philippines but only 191,770 hectares were utilized to organic agriculture (OA) in 2020 (Schlatter *et al.,* 2022), achieving only 39.6% of the target. Despite this, there was success in cascading its principle down in the urban communities, where urban agriculture is seen to have a key role to play in addressing urban food insecurity problems and becoming significant in the fight against malnutrition and poverty (Guzman, 2017).

Prior to the establishment of raisebed garden setups, the established demonstration farm or call this the techno-demo farm was needed to capacitate the urban beneficiaries. In fact, it served as the learning facility during the weekly orientation and tour visits from February to March 2021. The field visits were part of the series of activities where the project beneficiaries will have their actual experience on organic vegetable production in raisebeds. It was conducted in 12 batches representing the 12 identified urban barangays. It was also a venue for interactive discussions to address their questions as 95% of them are housewives and beginners in vegetable production under urban condition. During their field visits, the technical team had the opportunity to discuss and explain to them the various locally available organic substrates and resources which they could utilize in their individual garden setups including the potential benefits of EM technology.

The estimated population of Zamboanga City reached 971,234 based on May 2020 census (PSA, 2021b) not counting the transients coming from neighboring municipalities in region IX and from Basilan and Jolo provinces. To account the increase at 1.78% growth rate per annum, the population is up by now to more than a million people, where more than 80% packed in the urban areas in the City of Zamboanga. Recent data showed that the average rice sufficiency ratio went down from 17.0% in 2010 to 11.0% in 2021, while vegetable and fruits combined is 40.0%, respectively (OCA, 2021), but food insufficiency issue is also attributed to other compounding factors such as land use change (LUC), agricultural land conversion (ALC), lack of financial and technical assistance, and policy interventions to develop the upland environments into productive agricultural systems blended in upland ecosystems.

Recognizing the role of agricultural system in addressing the food insecurity issue in Zamboanga City, this is where urban vegetable production in

raisebeds to improve soil mixes that can come in as one of the solutions that is fully aligned to the organic agriculture program and the comprehensive food security plan of the City of Zamboanga, Philippines.

Moreover, the techno-demo farm has not only provided the 150 beneficiaries and barangay officials the learning experiences but it also provided sufficient information to faculty researchers for deeper scientific analysis. In the crafting of sound policy measure, scientific information plays a vital role. The information gathered from the techno-demo learning site has served as a science-based reference in the crafting of policy on the adoption of Local Food System Approach or the LFSA for Zamboanga city. The underlying principles of LFSA is suggested to be a solution in the achievement of food security comprehensive plan for the next 20-25 years, where at present the city is faced with continued substantial decline of agricultural lands due to land conversion, while population continuously rises. Added benefits include reduce usage on direct energy on fuels and indirect energy in the form of inorganic fertilizers, agrochemicals, postharvest process, labor and transport (Tabal *et al.,* 2021a,b). The most recent Ukraine and Russia war is a wakeup call for the City's legislators, urban planners and chief executive to accelerate innovations in order to enhance production of food with lesser energy costs.

Partly, there have been meetings with the partner agencies especially the OCA and with these meetings, theoretical framework for the LFSA developed by Tabal *et al.* (2020) has been presented to the City Council represented by City Councilor Joselito "LitLit" Macrohon for possible passage of legislation. It was proposed for adoption and measures be executed to expedite the development of a sustainable food system approach in urban communities. The initial plan was to harmonize the food security comprehensive plan of city government and the proposed LFSA. This seem to be a pivotal development in support to the sustainable food production programs in agreement with the City Council and OCA. This development aimed at meeting the policy guidelines so that the food sustainability plan of the city government can be achieved to meet the food demand for more than a million people. Crafting the concept as proposed by Mount (2012) and Martinez *et al.* (2010), the localized version of LFSA can help provide the initial direction to policy makers and legislators in support to Zamboanga City's organic agriculture program and its 10-year comprehensive food security plan. The end goal of LFSA is to sustainably supply food in the urban communities with the following benefits.

Reduce energy inputs in the form of inorganic fertilizers, pesticides, insecticides, labor, packaging and transportation, hence reduces greenhouse gas (GHG) emission - a good mitigating measure to address global warming that drive climate change. Planting of vegetables in raisebeds and other plants

surrounding the raisebeds increases the number of carbon sinks (Tabal *et al.*, 2021a,b), and a good mitigating measure to address high soil erosion rates (Garan *et al.*, 2022).

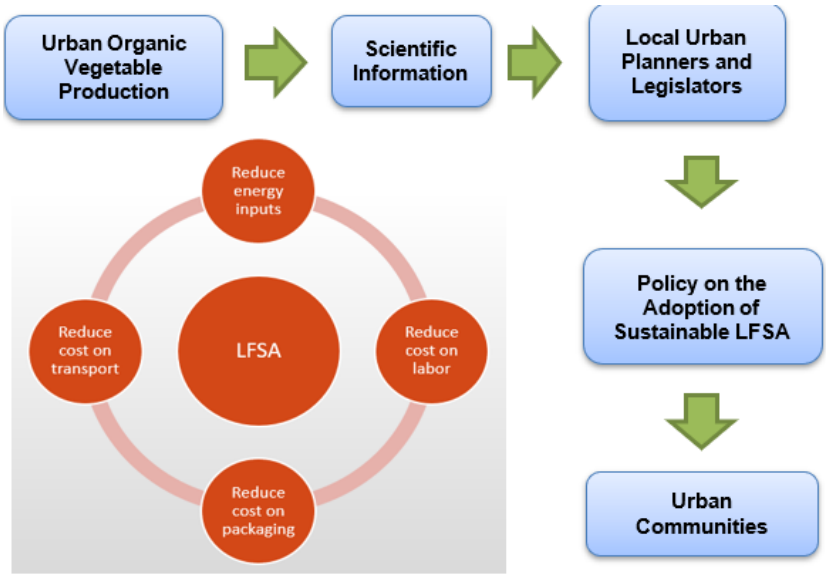

Figure 1. Theoretical Framework of Local Food System Approach (LFSA) Source: Tabal *et al.* (2020)

The amount of time individuals spends in buying food for consumption in the household is affected by earnings and labor. Reduced cost on labor enables the household to save and complete access to healthy food supply, which can translate to direct and indirect income from consumption and sales. Selling of fresh vegetables within the community can substantially reduce the cost on packaging than buying pre-packed vegetables in the department stores and supermarkets, hence lessens the use of plastics and other non-degradable materials used in packaging. Reduce cost on transportation and logistics by not buying vegetable in the nearby market or town will help lessen the use of direct fuel and indirect energy usage, hence reduces GHG emissions (Tabal *et al.*, 2021a,b). Although there was limited movement of visitors coming in to visit the techno-demo site due to the strict observance of health protocol, this site however has served as the exhibit area and a learning facility where collection of important data for the students on practicum courses, on-the-job trainees and faculty researchers. Initially, the data collected has served as important science-based information in relation to the organic vegetable production in rasiebeds since most of the techno-demo farms on organic vegetable production implemented by the DA are located outside the city.

In the urban areas, garden soil and organic fertilizers are scarce. Outside the 7.0 km radius, vegetable growers can source out chicken dung but this is costly in terms of the price per bag and transport cost. This is the reason why farmers rely largely on government assistance for organic fertilizers, where in the absence of grants and subsidies, farmers resolved at utilizing readily available inorganic fertilizers and agrochemicals. This constraint has been addressed through the introduction of organic urban gardening in raisebeds to the 150 beneficiaries. These technologies include the use of Mechanically Accelerated Compost (MAC) being incorporated as component in soil media in their raisebeds.

The MAC is a product characterized and developed by Tabal and Pedroso (2012) from 'happy soil' – a product produced in the material recovery facility (MRF) being managed by the Office of the City Environment and Natural Resources (OCENR), Zamboanga City. The MAC was introduced especially in areas where animal manures are scarce. Introduced MAC as soil amendment improved soil available nutrient and water holding capacity (Tabal and Pedroso, 2012). The use of various plant and fruit-based concoctions, vermicast and other waste composts were also introduced to improve soil media. Others resolved at sourcing organic matter such as dried leaves and floor litter collected under tree and bamboo canopies so that the beneficiaries can produce the needed organic materials for their raisebeds. And to some extent, kitchen wastes were utilized and other organic materials instead ending these degradable resources in dumpsites.

Teaching beneficiaries to produce their own soil media brought consciousness to themselves the importance of recycling and proper waste disposal and management. Despite the passage of Solid Waste Management Act of 2000 or the RA 9003, little has been accomplished, in fact dumpsites continued to expand and modernized in the City of Zamboanga. Achieving greater heights for organic vegetable production in urban areas, efforts should be in place on the side of barangay officials especially in urban areas to bring this consciousness to all.

Organic fertilizers such as animal manures, compost, kitchen wastes were also used in their garden as source of nutrients, some bought garden soil for their raisebeds – an indicator that trained community are becoming resourceful and self-reliant than relying often to government subsidies. In return, these decomposed plant and animal materials can potentially supply up to 5-10% combined NPK in soil (PNS, 2021). The Philippine National Standards (PNS) provide these criteria for solid and liquid organic fertilizers to qualify as organic fertilizers. Liquid fertilizers are homemade concoctions such as fermented fruit juice (FFJ), fermented plant juice (FPJ) and fish amino acid

(FAA). But due to lock down imposed in most of the urban areas, soil samples were not collected in timely manner, while the Bureau of Soils and Water Management (BSWM) laboratory facility based in Zamboanga City was not equipped yet to analyze liquid concoctions. Expansion of the project is seen to be implemented by the concerned LGU and analyses of various products may be addressed as added components in future data gathering.

Training was also conducted together with the selected technical experts from the OCA on the production and utilization of various organic concoctions. During sessions there have been opportunities for open discussions which enhances the technical skills of the partner beneficiaries. Taking baby steps in learning the process on different cultural practices and approaches from pre-land preparation (PLP) to crop establishment (CE), crop care and maintenance (CCM), harvest and postharvest (HPH) operations. The training included the production of various organic concoctions where technical experts gave the beneficiaries the time for hands-on activities on the production of effective micro-organism activated solution (EMAS) used as a component in the production of fermented plant juice (FPJ), fermented fruit juice (FFJ), fish amino acids (FAA) and organic pesticides. Continued skill enhancement the project beneficiaries have deepened their understanding on the role of nature and food production. Assured of their enhanced ability in vegetable production and management on raisebed technique, they become more confident, resourceful and self-reliant organic practitioners utilizing their own produced soil mixes, use of animal manures and other locally available organic substrates as fertilizers, utilizing plant-based concoctions as foliar or applied as drench, hence reducing their dependence down to zero on the use of inorganic inputs and subsidies from the local and government.

Urban gardening in raisebeds has created an impact in the lives of the project beneficiaries, it gave an income and additional source of income for some. A group of women beneficiaries in Sitio Luyahan, barangay Pasonanca is an example of a successful organic vegetable gardening in raisebeds in the city. Organic vegetable production project gave them the opportunity to sell, save and utilize the vacant spaces in their community. Based on the statement of Ms. Hilda Mercado, a Subanen and the leader of the group, sharing her views during the interview, said: *"to PCAARRD-WMSU and OCA, it may be a project, but to us this is a life in face of lockdowns brought by CoVid 19 Pandemic"*. The project also encouraged other housewives to engage on organic urban gardening as they witnessed the changes in the area, the bond between the beneficiaries and the amount of money they can save by not buying the vegetables and be able to sell and gain some income from it. According to the project beneficiaries, this project gave them the opportunity to

value the dignity as a working wife. It gave them the chance to provide for their family and opportunity to engage to other activities given by the OCA, DA and Agricultural Training Institute (ATI).

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