

Container Gardening: A Way of Growing Vegetables in the City^{*}

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1 Introduction

Man in his effort to satisfy his hunger discovered that domestication of animals and the cultivation of crops are better ways of securing food for his family. Today with the rapid urbanization rate, when there is not much space to grow crops in the city, we are challenged to find alternative, simple and practical ways of growing crops.

The Philippines has gone through extensive urbanization nationwide. This has given rise to many urban problems such as slums, garbage, malnutrition, social alienation, poverty and food insecurity.

Today - whether we admit it or not - we are confronted with exorbitant costs of food, especially for vegetables. Studies say that the average Filipino household spends more than 40 % of its income for food also, while the poorest Filipinos have to allocate almost 60 % of their available household budget to feed their families (PHILIPPINE ASSOCIATION OF NUTRITION, 1997). What makes an ordinary vegetable cost too high? Firstly, there are the high production inputs in terms of fertilizers and other agro-chemicals, labor and transportation. So-called organic vegetables, grown without agro-chemicals, are even higher priced due to the increased labor inputs needed and the lower yields usually obtained. Aside from the cost, we here in the city can seldom avail freshly picked vegetables. This is because most of these vegetables displayed and sold in the market today were grown from distant places, such as Bukidnon, Claveria and Balingasag in Misamis Oriental, and Marawi, Lanao del Sur, to name a few.

This paper presents a way to offer accessibility and affordability of fresh and highly nutritious vegetable for family consumption through "container gardening". It is a concept modified according to the publication of the Central Luzon State University "Urban Agriculture: A Step-by-step Guide to Successful Container Farming in the City" (UNDAN, R. C., et al. 2002).

2 Definition of Container Farming/Gardening

Container Farming can be defined as follows:

A micro model of farming where a family unit or household is producing fruits and vegetables in special containers for personal consumption to help improve the income, health and well-being of its family members.

3 Advantages of Container Gardening

3.1 Maximum utilization of space

With the right growing containers and growing media, many fruits and vegetables can be produced in all types of spaces: vertical or horizontal. With proper planning and design vegetables can even be grown inside the house. Another possibility is to practice *multi-story cropping* even in a very limited space. For example, vegetables can be grown in a high rise balcony as long as there are have six hours of sunlight.

3.2 Convenience and Time

Most city people will agree that food tastes better in the provinces. That is because rural folks do not have to travel to get their food. They pick their vegetables fresh from their backyard gardens a few minutes before cooking. Everybody knows too that the fresher the vegetable the better it is in terms of nutritional content aside from its taste. One can just imagine how wonderful it is to have in an arm's length, fresh ingredients every time you wish to cook a delicious and nutritious menu.

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3.3 Environment friendly

Container gardening has many plus factors aside from the obvious ones of saving money for the person growing the vegetables. It can help "green" the city and reduce air pollution. It can prevent irresponsible disposal of discarded containers and reduce the volume of garbage by reusing these as recycled planting containers. Organic garbage such as kitchen scraps and anything that decays may be processed into compost, which shall be incorporated into the growing medium. This will beautify the city since waste products are transformed into reusable containers and growing media. With container gardening people will not just talk about improving the environment but are actually doing something about it.

3.4 Economical

As earlier mentioned, most of the food consumed in the cities has to be transported from the far-off provinces. This explains why prices for vegetables are getting increasingly higher. The National Statistics Office's 1997 survey on family income and expenditures reveals that of the total household expenditure, 43.9 % comprised for food consumed at home. Assuming that for minimum wage earners income equals expenditures (since the National Statistics Office claims that the difference between income and expenditure is 1%), then a conservative estimate for the average monthly expenditure for fruits and vegetables would be P 1,000.00 (P 33.33/day) or a total of P 12,000.00 annually. Every vegetable that is produced by container gardening can reduce the amount of money spent for buying it from outside.

3.5 Personal growth and development

Any person who pursues container farming will be spiritually and emotionally invigorated. It will foster a calmer nature and will give the grower a sense of purpose. Container gardening can convert extra time into a leisurely productive one.

3.6 How to establish a container garden

As in any other agribusiness venture, establishing a container garden will start with careful planning. Emphasis should be given to the following areas:

3.6.1 Location

Any location will do as long as it has access to a minimum of 6 hours of sunlight each day. It can be either morning or afternoon sun. As long as the total sunlight received is a minimum of six hours of direct sunlight daily, plants will grow healthy.

3.6.2 Choosing what to plant

After having decided on the garden location, the next step is to decide on what to plant. In determining the type and kind vegetables and fruits to plant, we should take the number, respective ages and the nutritional needs of family members as our basis for decision making. Vegetables as a group constitute an important component in human diet. However, vegetable consumption in developing countries is often much less than the minimum intake of 200 g of vegetables recommended by FAO for a sufficient micronutrient and vitamin supply. Surveys show that the average daily consumption of vegetables in the Philippines reaches only 100 g. The following information can be a basis for decision making on what kind of vegetables to plant:

Vegetables as source of calories

The higher the water content of a vegetable, the lower is the calorie content. Roots, tubers and seeds of plants have a higher starch and sugar content and less water than the other parts and, hence, provide more calories per unit weight.

Vegetables as source of proteins

Vegetables are generally poor sources of protein, except legumes. Many legume seeds ("beans") contain 20 to 40 % protein. On a dry weight basis many of the leafy vegetable contain as much protein as bean. However, the moisture content is 80 to 90 % in leaves against 10 % in beans. For example, kangkong contains 1.4 % protein on a fresh weight basis and 20 % protein on a dry

weight basis. When eaten regularly in adequate quantities, leafy vegetables can substantially contribute to protein nutrition.

Vegetables as source of minerals

Vegetables, along with fruits, constitute the most important source of minerals. Of the minerals needed by the body, calcium and iron deserve the most attention. Calcium is necessary for the development and proper functioning of bones and teeth, while iron is needed to prevent anemia. Calcium from vegetables is better bio-available to the human body than calcium from fresh milk.

Vegetables as source of vitamins

Vegetables are excellent sources of Vitamins A, C, and B complex (which includes Vitamins B1, B2, B6, B12, niacin, panthothenic acid, biotin and folic acid). Lack of Vitamin A causes poor growth and night blindness, or the inability to the eyes to adapt to normally to dim light. As deficiency progresses, night blindness develops in further deterioration of the eyesight until eventually, complete blindness occurs. Lack of Vitamin A is a common nutritional problem in many developing countries. If it accompanies protein and calorie malnutrition, the mortality may be as high as 80 %.

Scurvy is a disease of the gums characterized by sponginess and bleeding caused by lack of Vitamin C. A single serving of vegetables (91 g) daily, even if badly cooked, will usually provide at least 10 mg of ascorbic acid, an amount known to prevent scurvy. Vitamin C also increases the resistance of the body to clods, coughs and other respiratory diseases. A six-fold increase in iron absorption has been observed with the addition of 70 mg ascorbic acid in a corn meal.

The B vitamins are necessary for the utilization of carbohydrates and proteins as well as in the prevention of anemia.

Vegetables as source of fiber

The contribution of vegetables as source of fiber is very important. Although edible fiber is not considered a nutrient and is not absorbed by the body, it is the component of vegetables that assist in moving food through the alimentary canal by aiding the muscular action of the intestines, thus preventing constipation.

The beneficial effect of fiber on blood cholesterol level and consequently high blood pressure and heart disease, in preventing gall stones and cancer of the colon has received increasing attention in recent years. Its large bulk and low energy value makes it also useful in preventing and treating obesity (fatness). Its role in effective control of diabetes is also significant.

Vegetables as source of phytochemicals

With names like anthocyanins, lycopenes, xanthenes, isothiocyanates and sulphoraphane, these newly identified plant chemicals seem to belong more in a test tube than in a salad. They are often lumped together under the term "phytochemicals" - phyto from the Greek word for plant, denoting their plant origins. Vegetables (and fruits) contain hundreds of biologically active compounds, some of them thought to ward off disease. But much more research work remains to be done before their true value can be determined and the validity of health claims assessed.

- **Isoflavones**

The emerging benefits of soya. Isoflavones, found in soya beans, garbanzo beans, chick peas, and liquorice have effects somewhat similar to those of the female hormone estrogen and may help protect against heart disease and possibly breast cancer. In Eastern cultures, soya is considered both a nutritious food and medicinal agent. In China, the word for soya bean, "ta tou," means "a great bean," and according to ancient folklore it helps fight heart disease. Recent research has shown that diets rich in soya help to reduce blood levels of LDL ("bad") cholesterol - by an estimated 12 to 15 percent. The isoflavones in soya are converted in the gut to phytoestrogens ("plant estrogens") that may help reduce LDL blood cholesterol. Isoflavones may also protect against breast cancer by acting as estrogen blockers.

- Sulfur compounds

Besides its popularity as a recipe seasoning, garlic has long been promoted as a medicinal agent. Garlic and other allium vegetables - onions, chives, leeks and scallions - contain allylic sulfides, thought to stimulate enzymes that inhibit bacterial growth. More than a century ago, Louis Pasteur suggested that garlic could kill bacteria, and during World War I the British used it as a local antiseptic. Studies in Greece, China and Hawaii have suggested that a high consumption of garlic may reduce risks of stomach cancer; other studies claim it lowers blood pressure and strengthens immune defenses. However, the claims for the reputed health benefits of garlic in humans remain to be substantiated.

- Indoles and isothiocyanates

Antioxidant compounds in cruciferous vegetables are believed to inhibit the DNA damage that triggers some forms of cancer. Two potent chemical groups in those vegetables - the indoles and isothiocyanates - are formed in some way when cruciferous vegetables are cooked or chewed, account for some of the "bite" in their taste and are believed to rank high on the cancer-prevention scale. Broccoli is also rich in soluble fiber, which may help regulate blood sugar.

- Beta-glucan (a soluble form of fiber)

It is contained in legumes, oats and some other grains, and may be helpful in diabetes control by delaying stomach emptying and slowing glucose absorption in the small intestine.

- Saponins

These are carbohydrate molecules abundant in plant foods such as spinach, potatoes, tomatoes and oats are thought to suppress the growth of cancers and benefit the heart.

- Lycopene

In December 1995, the Journal of the National Cancer Institute published the results of a study conducted by Harvard University researchers, which showed an association between consuming a diet rich in tomato-based foods and a decreased risk of prostate cancer. The researchers surveyed the eating habits of over 47,000 men between the ages of 40-75 for six years and found that the consumption of tomatoes, tomato sauce, tomato juice and pizza was associated with a reduced risk for developing prostate cancer. Researchers theorize that lycopene, an antioxidant nutrient found in large amounts in tomatoes, may be responsible for this possible protective effect.

Table 1 gives an overview of some "super foods" and their effects on human health. The following are some tips for a healthier diet:

- eat enough to maintain a healthy weight;
- reduce fat intake, especially the consumption of animal (saturated) fats;
- eat a well-varied mix of plant foods including grains, nuts, seeds and legumes -- all of which contain a multitude of phytochemicals;
- have at least five to 10 servings of fruit and vegetables a day. Go for one or two fruits at breakfast, one fruit and two vegetables at lunch and dinner, and a fruit or vegetable snack between meals. Note, however, that people with diabetes should watch their fruit intake;
- consume many differently colored fruit and vegetables. For color variety, select at least three differently colored fruit and vegetables a day. The red pigment in tomatoes has different bioactive properties than the orange pigments in carrots, melon or squash;
- put fruit and sliced veggies in an easy-to-use, easy-to-reach place - sliced vegetables in the fridge, fruit out on the table;
- keep frozen and canned fruit and vegetables on hand to add to soups, salad or rice dishes;

- increase fiber intake by eating plenty of whole grain cereals and breads; for soluble fiber, increase consumption of oats, legumes (such as peas, lentils, beans, broccoli); and remember that supplements, such as broccoli pills, cannot give you the many other benefits of whole foods.

3.6.3 Soil Mixture

One of the keys to "container gardening" success is the planting medium. Container gardening requires a specific soil mixture to be used. Ordinary garden soil on its own may not be sufficient if it lacks the properties necessary for healthy plant growth. First and most important, the growing medium must be porous in order to allow good aeration of the plant roots. A porous structure will also allow a good drainage, which will minimize the risk of waterlogging and subsequent rotting of plant roots.

The ideal soil mixture is dark brown in color and looking much like chocolate cookie crumbs. The ideal growing medium is a mixture of 3 part loam soil, 1 part compost or composted manure and 1 part rice hull or coconut coir dust or washed river sand. Clayey soil requires 3 parts clay soil to 2 parts of compost to 1 part rice hull (or its substitute).

4 Choosing Containers

The design of the containers to choose and use is a manifestation of the design goals set by the grower depending on his/her bias as well as on the availability of these materials. If for instance the goal is to showcase the containers, glazed ceramic pots, porcelain pots, plastic pots in all shape and sizes may be used. With a little talent, indigenous materials available in the locality may be converted into beautifully looking containers such as cut bamboo poles or others. Only the fantasy of the grower is setting the limits.

If the goal is recycling and finding long-term use of objects that are normally thrown into the garbage, then old tires, sacks, tin cans, plastic containers for mineral water, oil, milk, catsup, and etc can be used.

5 Planting, Care & Maintenance

5.1 Sowing and planting

For each crop the grower wishes to plant or grow in the container farm, recommended standard operating procedures, from soil sterilization, sowing and transplanting techniques should be followed. These are available from different government, non-government and private organizations.

5.2 Watering needs

During rainy season when plants receive enough water from the rain, there might be not need to water the containers at all. However, during the drier months, watering should be done, preferably between 8 to 9 o'clock in the morning. If the weather is not too hot, one watering in the morning is enough for the plants to grow healthily. If it very hot and the plant demand is high, one additional watering should be done around 3 - 4 o'clock in the afternoon.

5.3 Cultivating and weeding

Cultivating the soil at a depth of 2 to 3 inches below the surface of the potting medium will encourage maximum air flow around the roots, which encourages bigger and healthier root growth and subsequently better water and nutrient uptake.

Weeding allows the plants to benefit the nutrients and water that is provided by the medium without having to compete with other non-productive plants. It has to be considered that weeds being native to the environment, usually grow bigger and faster, than cultivated crops.

5.4 Feeding the plants

For fertilizing, the containers may be top dressed with well-composted manure or compost every two weeks. Alternatively, rice washings and water used to rinse meat and fish may be used. Instead of throwing them, those can be collected and used to water your plants. You may also use other forms of fertilizers (such as complete 14-14-14) as the need arises and if extra money is available.

5.5 Controlling pests and diseases

Increasing the bio-diversity of the container garden is already a way of preventing the occurrence of pests and diseases. This may be done by growing vegetables from different botanical families including herbals which may act as repellants to certain pests. For more information hereto, please refer to the paper of GUANZON & HOLMER, 2002. If there is an occurrence of infestations, appropriate biological, physical, mechanical, and - in severe cases - chemical control measures may be used.

6 Conclusion

Now that you know how to start a container farm-garden, get the whole family together and JUST DO IT! Remember, the family that plants together grows healthy together. We look forward that this simple model of container gardening becomes widespread, then the general well-being and morale of the nation will improve commensurately.

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8 References

CHEN, JAU-FEI, 1999. Organic Matters. Plant Foods and Nutritional Immunology: A scientific Approach. Oct -Dec 1999 p. 22.

GUANZON, Y. B., HOLMER, R. J., 2002. Basic Cultural Management Practices for Vegetable Production in Urban Areas of the Philippines. Paper presented at the Urban Vegetable Gardening Seminar, Sundayag Sa Amihanang Mindanao Trade Expo, Cagayan de Oro City, Philippines, August 30, 2002.

PHILIPPINE ASSOCIATION OF NUTRITION, 1997. Fourth National Nutrition Survey, Philippines, 1993. Part A: Food Consumption Survey. Philippine Journal of Nutrition, Vol. XLIV Nos. 1 & 2.

UNDAN, R. C., NITURAL, P.S., ROQUE, A.S. & LIBAN, D.V. 2002 . Urban Agriculture: A Step-by-step Guide to Successful Container Farming in the City. Central Luzon State University, Science City of Muñoz, Nueva Ecija.

9 Tables and Figures

Table 1: Some fruits and vegetables and their benefit to human health

Food	Serving Size	Properties/Benefits
Bananas	1 medium	Rich in magnesium (helps protect circulatory system), potassium and slowly-absorbed sugars. Good source of pectin (a soluble fiber). Prevents radical swings in blood sugar
Beans	1 cup	High in protein and complex carbohydrates. Contains both soluble and insoluble fiber. Contains phytochemicals and protease inhibitors that may help prevent cancer
Carrots	2 medium	2 carrots every other day provide enough beta carotene to reduce stroke risk by half for men who already have symptoms of heart disease
Chili Peppers	1 or more peppers	The heat source in chilis, capsaicin, is an antioxidant. Contains blood thinning properties to prevent strokes, lowers cholesterol, protects DNA against carcinogens, may stimulate release of endorphins ("natural high" chemicals)
Citrus Fruits (Calamansi etc.)	50 grams or more	Contains vitamin C which helps your body fight cancers (lung, cervical, esophagus & stomach). Rich in bioflavonoids.
Garlic	2-3 cloves fresh or 1 tsp. Garlic Powder	May lower cholesterol and blood pressure. May contain chemicals capable of destroying cancer cells
Kangkong & Saluyot	1 cup uncooked	Contains vitamins A and C, folic acid and magnesium which help control cancer, reduces heart disease and stroke risk, blocks free radicals and may help prevent osteoporosis.
Tomatoes	1 med. tomato	Contain lycopenes - an antioxidant more potent than vitamin C. Stimulates immune function and may slow degenerative diseases
Papaya & Pineapple	one papaya, 1 cup pineapple,	High amounts of enzymes that help combat autoimmune diseases, allergies, and cancer
Soybeans/Tofu	100 grams tofu or equivalent soy product	Lowers "bad" LDL cholesterol levels in bloodstream which reduces heart disease risk. Studies have shown that people who regularly eat soy products have reduced risk or lower rates of prostate, colon, lung, rectal and stomach cancers.

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