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Research Article

Roof Garden- A Small Approach towards Feed the City

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Abstract

The study was conducted at roof top of Mushroom laboratory, Horticulture Research Centre (HRC), Bangladesh Agricultural Research Institute (BARI), Gazipur during July 2016 to June 2017 to evaluate the suitable model for year round vegetable supply to the city dwellers. Nine Treatments viz., T1= Plastic box 1, T2= Plastic box 2, T3= Plastic box 3, T4= Plastic box 4, T5= Plastic box 5, T6= Plastic box 6, T7= Plastic box 7, T8= Half drum, T9= Sac/Multilayer box and three roof top garden models viz., Model 1, Model 2, Model 3were included in the study. Each model consists of 22 type vegetables. Considering the 3 models, there were a narrow difference in term of vegetable yield and prices. The main cause behind it was the number of vegetables were same (22) in all models. Just rearrange the vegetables within the treatments and type of production system viz., single cropping, inter cropping and relay cropping. So, on a roof garden from a 10 m^2/100 ft^2 area, anybody can follow any model preferably Model 1 and Model 2, which vegetable price (2270 tk) and yield (73 kg) were higher, respectively. This study was just 1-year result, so after another year trial it may be concluded which model is best in terms of yield and price to feed the city dwellers.

Keywords: Roof Garden; Nutrition Supply; Vegetables and Urban Agriculture

Introduction

Urban agriculture is the practice of cultivating, processing, and distributing food in or around a village, town, or city. Urban agriculture can also involve animal husbandry, aquaculture, agroforestry, urban beekeeping and horticulture. These activities occur in peri-urban areas as well urban areas [1]. Rooftop garden is a part of urban agriculture. A rooftop garden is a garden on the roof of a building. Besides the decorative benefit, roof plantings may provide food, temperature control, hydrological benefits, architectural enhancement, habitats or corridors for wildlife, recreational opportunities, and in large scale it may even have ecological benefits [2]. Roof gardening as a strategy of urban agriculture for food security. Urban agriculture in the cities of developing countries are growing rapidly which also means the number of low-income consumers is increasing [3]. In Bangladesh ornamental plant, fruit trees, flowering plants and vegetables are mostly growth on rooftops. Temperatures around the building can be lowered in the summer. It can be further insulated from the cold in the winter. The roof life can be extended by protecting it from various weather. This trend will continue as the need to reduce carbon emissions increases. It's found in a research that 60% space of total Dhaka city occupied with bare roof with no other extensive usage. However, these benefits are difficult to realize because the lands which have traditionally been used for agriculture within our urban areas are in high demand and vulnerable to development. As a result, rooftop agriculture, in containers or on flat roofs has become an attractive possibility (Wikipedia) [4].

Roof top gardening is suitable for vegetable cultivation in our country. Vegetable play an important role in balance diet of human beings. Vegetables are rich sources of vitamins and minerals and also a good source of carbohydrates. Vegetable of Bangladesh are grouped into summer, winter and year round on the basis of growing season. Total production of vegetable meets up to 35-40% of the requirement of the country. Due to practice of proper model for vegetable production on rooftop garden food production will be increased which meet the demand of urban people and also reduce the meal costs of transport as well as increase the safe, fresher and healthy food production. However, the practically of green roof agriculture has not been extensively tested. This is a new research

work that ever performed. In this research work the suitability of three models for vegetable production on rooftop conditions is evaluated. Considering the above factors, the present experiment was undertaken to study the following objectives:

- Development of suitable model on roof top for vegetable production
- To accommodate maximum vegetable in a small unit area (10 m^2/100 ft^2); and
- To get year round nutrition supply.

Materials and Methods

The experiment was conducted at roof top of Mushroom laboratory, Horticulture Research Centre (HRC), Bangladesh Agricultural Research Institute (BARI), Gazipur during July 2016 to June 2017. Three roof top garden models were included in the study. Nine Treatments viz., T1= Plastic box 1, T2= Plastic box 2, T3= Plastic box 3, T4= Plastic box 4, T5= Plastic box 5, T6= Plastic box 6, T7= Plastic box 7, T8= Half drum, T9= Sac/Multilayer box and three model viz., Model 1, Model 2, Model 3were included in the study. Each model consists of 22 type vegetables. The seeds were sown or seedling were transplanted on the plastic box, half drum, sac, multilayer box according to season of concern vegetables. The planting methods were single cropping, intercropping or relay cropping to accommodate maximum vegetables within a year. The unit plot size 10 m^2/100 ft^2 and 9 treatments were accommodated in a model. The soil was fertilized with cowdung, cocodust and vermicompost @60:50:5:2 in weight basis, respectively. The intercultural operations (weeding, irrigation etc.) were done as and when necessary. Data on yield (kg/treatment) was recorded from each model and calculated product value with local retail price (1 USD = 85 Tk). The information on different quantitative characters was statistically analyzed.

Results and Discussion

The result revealed that there were variability's among the three models.

Model 1

In model 1, Twenty two types of vegetables were produced in nine treatments during the season. The vegetables in nine treatments were T1-Plastic box 1 (Red amaranth, Radish, Brinjal, Gimakalmi, Cucumber), T2-Plastic box 2 (Gimakalmi, Cauliflower, Red amaranth, Stem amaranth), T3-Plastic box 3 (Red amaranth, Turnip, Tomato, Red amaranth, Okra), T4-Plastic box 4 (Red amaranth, Radish, Carrot, Indian spinach, Okra), T5-Plastic box 5 (Gimakalmi, Bottle gourd, Spinach, Cucumber), T6-Plastic box 6 (Gimakalmi, Country bean, Spinach, Bitter gourd, Gimakalmi), T7-Plastic box 7 (Year round Chilli, Coriander), T8-Half drum (Aroid (Kochu), Gimakalmi), T9-Sac (Red amaranth, Lettuce, Bottle gourd leaf, Indian spinach, Bunching onion). In respect of yield maximum yield was produced from the Treatment 3 (10.9 kg) followed by Treatment 5 (9.9 kg) and Treatment 6 (8.5 kg), while the lowest yield was by Treatment 7 (3 kg). The low yield was produced from this treatment due presence of less number of vegetables. In terms of price, the highest price was obtained by the Treatment 3 (413 tk.) followed by Treatment 5 (313 tk.), Treatment 6 (305 tk.), while minimum was from Treatment 9 (128 tk.) which was sac. The sac mainly produced leafy type vegetables which prices were low compare to other vegetables.

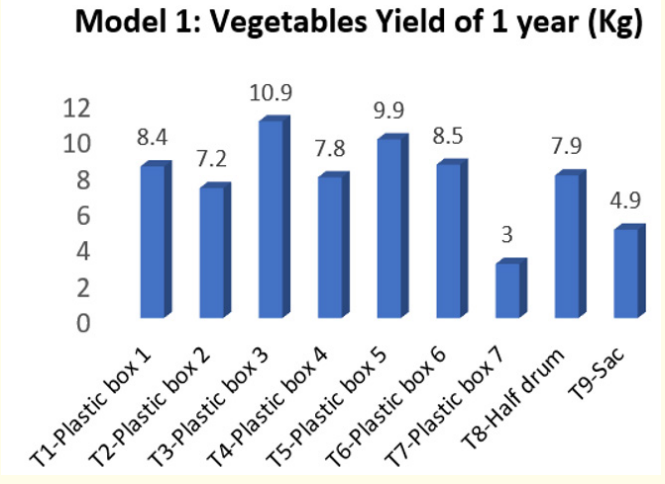

Figure 1: Vegetables Yield from 9 treatments (Kg).

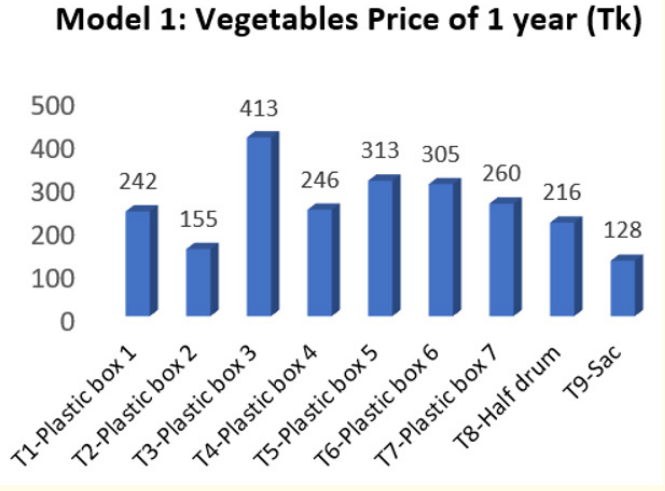

Figure 2: Vegetables Price from 9 treatments (Tk).

Model 2

In model 2, Twenty two types of vegetables were produced in nine treatments during the season. The vegetables in nine treatments were T1-Plastic box 1 (Red amaranth, Knolkhol, Tomato, Gimakalmi, Okra), T2-Plastic box 2 (Red amaranth, Radish, Brinjal, Red amaranth, Cucumber), T3-Plastic box 3 (Gimakalmi, Broccoli, Red amaranth, Stem amaranth, Gimakalmi), T4-Plastic box 4 (Red amaranth, Capsicum, Carrot, Indian spinach, Okra), T5-Plastic box 5 (Gimakalmi, Bottle gourd, Spinach, Red amaranth, Yard long bean), T6-Plastic box 6 (Gimakalmi, Country bean, Red amaranth, Bitter gourd, Gimakalmi), T7-Plastic box 7 (Year round Chilli, Red amaranth, Coriander), T8-Half drum (Aroid (Kochu), Red amaranth, Lettuce), T9-Multilayer box (Coriander, Gimakalmi, Indian spinach, Bottle gourd leaf, Red amaranth). In respect of yield maximum yield was produced from the Treatment 9 (11.7 kg) followed by Treatment1 (10.4 kg) and Treatment 5 (9.9 kg), while the lowest yield was by Treatment 7 (3.6 kg). In terms of price, the highest price was obtained by the Treatment 1 (396tk.) followed by Treatment 9 (310tk), while minimum was from Treatment 3 (190tk) which was Plastic box 3. The treatment 3mainly produced leafy type vegetables (Gimakalmi, Broccoli, Red amaranth, Stem amaranth, Gimakalmi) which prices were low compare to other vegetables.

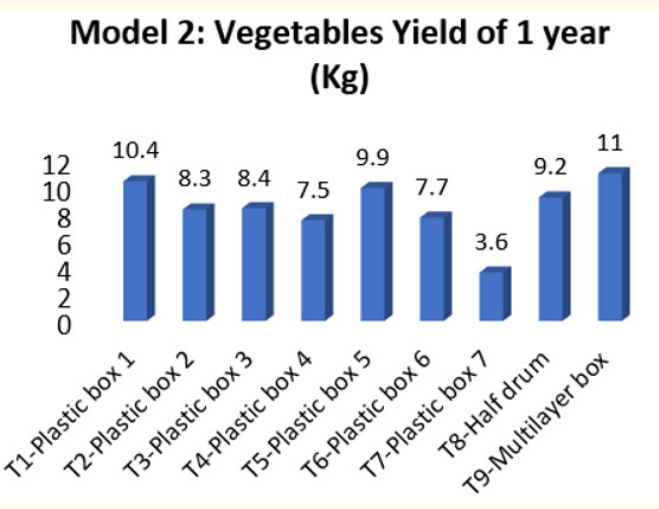

Figure 3: Vegetables Yield from 9 treatments (Kg).

Model 3

In model 3, Also twenty two types of vegetables were produced in nine treatments during the season. The vegetables in nine treatments were T1-Plastic box 1 (Red amaranth, Turnip, Brinjal, Gimakalmi, Okra), T2-Plastic box 2 (Red amaranth, Radish, Tomato, Red amaranth, Cucumber), T3-Plastic box 3 (Gimakalmi, Broccoli, Red amaranth, Stem amaranth, Gimakalmi), T4-Plastic box 4 (Red amaranth, Carrot, Capsicum, Okra), T5-Plastic box 5 (Gimakalmi, Country bean, Spinach, Red amaranth, Yard long bean), T6-Plastic box 6 (Gimakalmi, Bottle gourd, Coriander, Indian spinach, Gimakalmi), T7-Plastic box 7 (Year round Chilli, Coriander, Red amaranth), T8-Half drum (Aroid (Kochu), Red amaranth), T9-Multilayer box (Lettuce, Gimakalmi, Indian spinach, Bottle gourd leaf, Red amaranth). In respect of yield maximum yield was produced from the Treatment 6 (9.5 kg) followed by Treatment 9 (8.9 kg) and Treatment 2 (8.2 kg) and Treatment 8 (8.2), while the lowest yield was by Treatment 7 (3.2 kg) which was similar to other two models. In terms of price, the highest price was obtained by the Treatment 9 (377tk) followed by Treatment 1 (295tk) and Treatment 6 (280 tk), while minimum was from Treatment 3 (180tk) which was Plastic box 3. This treatment mainly produced leafy type vegetables (Gimakalmi, Broccoli, Red amaranth, Stem amaranth, Gimakalmi), which prices were low compare to other vegetables.

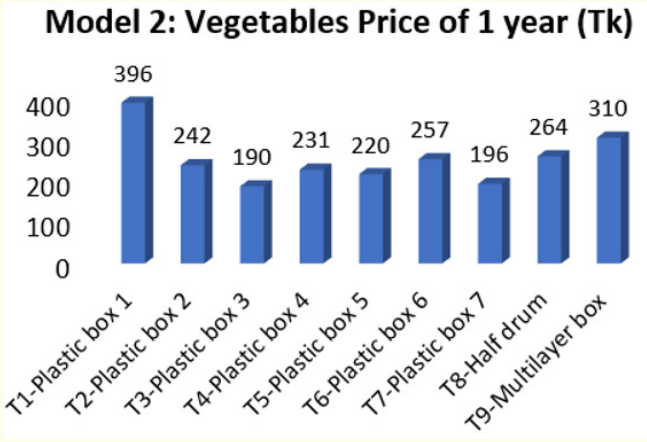

Figure 4: Vegetables Price from 9 treatments (Tk).

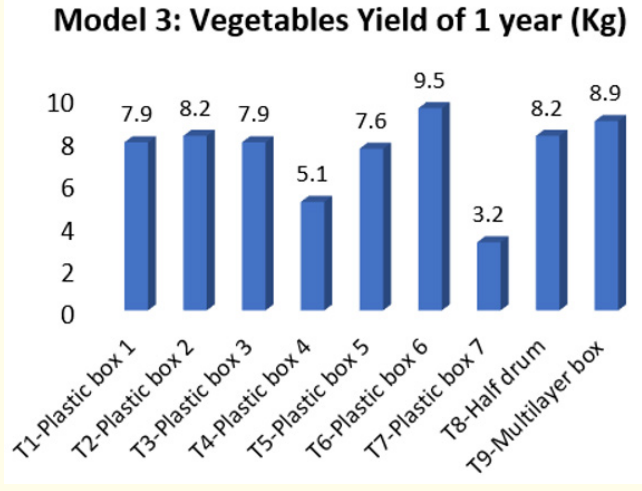

Figure 5: Vegetables Yield from 9 treatments (Kg).

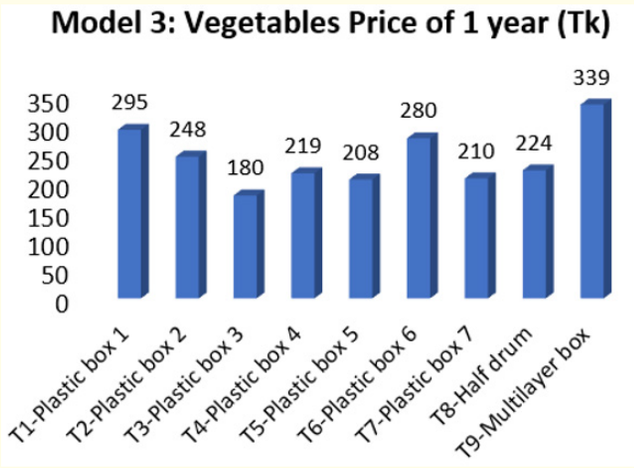

Figure 6: Vegetables Price from 9 treatments (Tk).

Comparison of 3 Models

In terms of vegetables yield during one year from a 10 m2/100 ft2 area, Model 2 produced the maximum yield (76 kg) followed by Model 1 (68.5 kg), while lowest by Model 3 (66.5 kg). The yield variation was very narrow due to maximum vegetables were same in among 3 model, while only 2-3 vegetables were differed. In terms of vegetable price, Model 2 obtained the maximum (2306tk) followed by Model 1 (2278tk), while minimum was from Model 3 (2003tk).

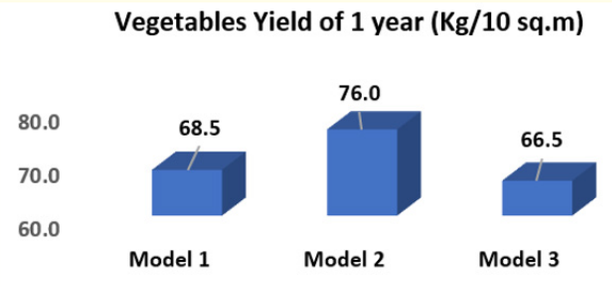

Figure 7: Vegetables Yield from 3 Model (Kg).

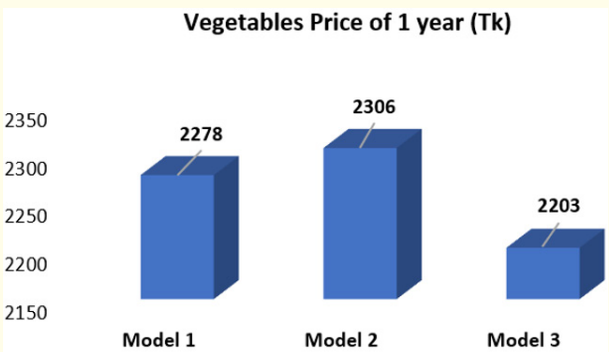

Figure 8: Vegetables Price from 3 Model (Tk).

Conclusion

Considering the 3 models, there were a narrow difference in term of vegetable yield and prices. The main cause behind it was the number of vegetables were same (22) in all models. Just re-arrange the vegetables within the treatments and type of production system viz., single cropping, inter cropping and relay cropping. So, any city dweller can follow any model preferably Model 2 and Model 1, which vegetable price (2306 tk, 2278 tk, respectively) and yield (76kg, 68.5 kg, respectively) were higher. This study was just 1-year result, so after another year trial it may be concluded which model is best in terms of yield and price. Thus, city dwellers, who can afford for small area on roof by providing a significant amount of vegetables production with diversified choice of vegetables.

Acknowledgement

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