A Seminar Paper
On

HOMESTEAD GARDENING AND NUTRITION SECURITY IN BAGLADESEH

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ABSTRACT

HOMESTEAD GARDENING AND NUTRITION SECURITY IN BANGLADESH

By

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Homestead garden has been playing an important role in production of horticultural crops of Bangladesh. Malnutrition and demand of vegetables, fruits, are increasing in Bangladesh day by day. With the continuous increase in population, new houses are being built on the homesteads thereby reducing the land area available for agricultural activities. Homestead vegetable, fruits, spices cultivation are especially important in overcoming seasonal availability of foods and promotes household self- sufficiency. This seminar paper aims at highlighting the economical and nutritional benefits of the homestead garden. Population pressure and subsistence economy have forced the households to utilize all the sites of a homestead as individual production units. It combines all farming components and forms a highly intensive and multi-strata integrated production system depending on household's needs, preferences and knowledge. The homestead garden provides multiple products to the household and meets the diversified needs including food, nutrition and energy securities producing a wide variety of fruits, vegetables and spices. It also contributes to household income and saving through sales of vegetables and fruits. Planting improved plant species, optimum management of the homestead resources for production of fruits, vegetables, and spices could contribute significantly to the nutrition and livelihood of the poor.

Keyword: Homestead, Homestead gardening, Nutrition security.

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INTRODUCTION

Homestead is a dwelling with its land and buildings, occupied by the owner or any dwelling with its land and buildings where a family makes its home. Homesteading is a lifestyle of self-sufficiency. It is characterized by subsistence agriculture, home preservation of food, and it may or may not also involve the small scale production of textiles and clothing, for household use or sale. A home garden is a micro-environment composed of a multi-species (annual to perennial, root crops to climbers etc), multi-stored and multi- purpose garden situated close to the homestead (Eyzaguiree *et al.,* 2004). A home garden refers to the traditional land use system around a homestead, where several species of plants are grown and maintain by the household members and their products are primarily intended to the family consumption. Several terms has been used to describe these garden production systems such as homestead garden. Kitchen garden, mixed garden, garden culture etc. (Mictchell *et al*., 2004).Home garden is the most complex multi-strata integrated production system that combines all farming components (tree, crop, livestock and occasionally fish) and provides household food security, employment and income generation opportunity to the million of households (Miah *et al*., 2004). Nutrition security requires simultaneously food, health and care. Food security and Nutrition security are closely interrelated. There is no way to achieve nutrition security without food security at household level. Nutrition security is more than food security as it is about a community's access to essential nutrients, not just calories. Zinc, selenium, iron and all kind of vitamins should be present in human diets. Multiple social benefits of home gardens include enhancing food and nutritional security in many socio-economic and political situations, improving family health and human capacity, empowering women, promoting social justice and equity, and preserving indigenous knowledge and culture (Mictchell *et al*., 2004). The inadequate access of the poor

to protein, vitamin and mineral rich food items is the main reason for such situation. Homestead gardening especially production of horticultural crops can perhaps most effectively help ensure food and nutritional security in addition to self-employment, poverty-alleviation and income generation of poor farmers(Ahmad, 1999). In Bangladesh nearly 40 % of the population lives below the food consumption-based poverty line, lacking sufficient resources to afford diet of 2,122 kilocalories (kcal) per person per day, along with other basic necessities (Hossain *et al*., 2005). Home garden, the most, stable resource, plays an important role in Bangladesh economy and provides nearly 50 percent cash flow to the rural poor (Ahmed, 1999). Collectively, home garden production system contributes about 70 percent fruit, 40 percent vegetable, 70 percent timber and 90 percent firewood and bamboo requirement of Bangladesh (Miah *et al*., 2003). Homestead gardening, especially vegetable production is an important household activity contributing to both economic welfare and family diets (HKI, 2001). The Government and relevant non-government organizations (NGOs) have included homestead development programs for improving homestead production and income to ensure nutrition security particularly involving poor groups and women.

Objectives

Considering the facts, the objectives of the seminar papers are: -

1) to know about homestead, homestead gardening and nutritional condition in Bangladesh;

2) to know the benefits of homestead and horticultural crops in nutrition aspect by proper utilization of homestead garden and

3) to know the economical benefits of the household members through homestead gardening.

MATERIALS AND METHODS

This seminar paper is exclusively a review paper so all of the information has been collected from the secondary sources. During preparation of this paper I went through various relevant books, journals, proceedings, reports, publications etc. Findings related to my topic have been reviewed with the help of the library facilities of Bangabandhu Sheikh Mujibur Rahman Agricultural University (BSMRAU). I have also searched related internet web sites to collect information. I got valuable suggestion and information from my major professor, course instructors, friends and other resource personnel. After collecting all the available information, I my self compiled and prepared this seminar paper.

REVIEW OF FINDINGS

Homestead in Bangladesh

Homestead is the center of socio-economic activities and traditional cultural heritage of villages in Bangladesh. The homesteads-in which the people live in are locally known as *'Bari',* which occur in linear, cluster or individual pattern (Hussain *et al*., 2004). Homestead perhaps the most important production unit in Bangladesh, which accounted about 25.36 million in the country with 21.90 million in the rural areas (BBS, 2011). These homesteads occupied about 0.54 million hectares of land (BBS, 2011). The average size of the rural homestead is very small (0.02 ha), which varies widely according to region and socioeconomic status of the households (Basak, 2002).

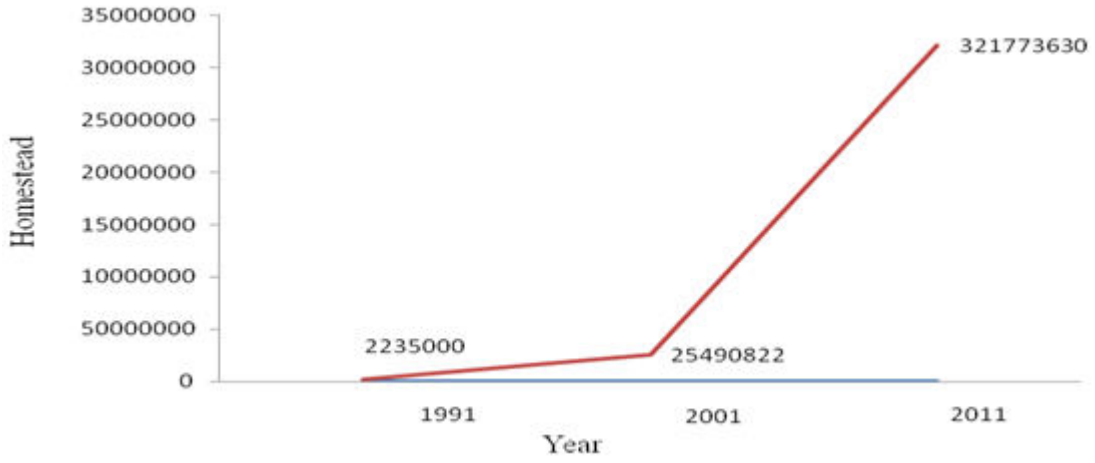

Figure1. Homestead in Bangladesh.

Source: BBS 2011.

Depending on the locations, the homestead is raised above the f1ood level from the surrounding fields. Generally, a homestead possesses at least a living room, a kitchen room and few tree species. Besides, there are some vacant spaces for different production purposes.

A typical homestead accommodates a single or several houses of single or joint families and has space for vegetable gardens, yard for threshing ground and communal activities, cattle shed, ponds, trees, shrubs and bamboo (Haque, 1996). Homestead in Bangladesh is increasing day by day, during 1991 it was 22,35000 (Figure 1) where as in 2001 it was 254,90822(Figure 1)and in 2011 it was 321,773630 (Figure 1).

Homestead vegetable production model

Most of all resource poor farmers utilize local variety and traditional practice in homestead gardening. So they are obviously obtained low yield that is not adequate for escaping of malnutrition. The On-Farm Research Division (OFRD) of Bangladesh Agricultural Research Institute (BARI) initiated homestead vegetable production model known as "Kalikapur model" in 1984.

Table 01. Homestead vegetable production models developed by OFRD of BARI

SL.No	Name of Model	Region and AEZ
1	Goyeshpur model	Pabna (AEZ 11 & 13)
2	Palima model	Tangail (AEZ 8)
3	Lebukhali model	Patuakhali (AEZ 13)
4	Syedpur model	Rangpur (AEZ 3)
5	Barind model	Rajshahi (AEZ 26)
6	Faridpur model	Faridpur (AEZ 12)
7	Atkapalia model	Noakhali (AEZ 18)
8	Golapjang model	Sylhet (AEZ 20)
9	Narkeli model	Sylhet (AEZ 20)

Source: Ali *et al*., 2006

Later on it was felt to modify the model based on the existing eco-systems (niches) of each homestead, along with vegetables different fruits were also included (Ali *et al*., 2006) Thus

nine niches/eco-systems based homestead vegetable production models were developed in different agro-ecological regions of the country and henceforth recommended for scaling-up. The names of 9(nine) homestead vegetable production models are shown in table 01.

Nutritional condition in Bangladesh

Rates of malnutrition in Bangladesh are among the highest in the world. More than 54% of preschool-age children, equivalent to more than 9.5 million children, are stunted, 56% are underweight and more than 17% are wasted. Although all administrative divisions were affected by child malnutrition there were important differences in the prevalences of the three anthropometric indicators. The prevalence of underweight ranged from 49.8% in Khulna to 64.0% in Sylhet which also showed the highest prevalence of stunting (61.4%) and wasting (20.9%). Despite the high levels, rates of stunting have declined steadily over the past 10 years. (FAO, 2010). Malnutrition is not only major health problem, but also a serious impediment to national socio-economic development. One third of fewer than five deaths are associated with malnutrition (Briend, *et al.,* 1990). Though rate of underweight, stunting and wasting children are decreasing science 2007 to 2014 (Table 2) but it is still higher in term of percentage.

Table 2. Underweight, Stunting and Wasting of children under age five, 2007-2014

Year	2007	2011	2014
Underweight	41.0	36.0	32.6
Stunting	43.2	41.3	36.1
Wasting	17.4	15.6	14.3

Source: (Samsul, 2015)

About 88% of the Bangladeshi households have deficient intake of vitamin A. The existing 1.78% prevalence of night blindness is well above the WHO cut-off level. The peak age of children for severe vitamin-A deficiency is 2-3 years. Blinding from malnutrition among pre-

school children from village in Bangladesh is near the highest level in the world (Talukder *et al,.* 1995). The causes of the problems of health and nutrition of the vast majority population of Bangladesh are poverty, ignorance, illiteracy, lack of awareness about the potential solution, imbalance inter-family food distribution, etc. Since the main source of micronutrients including vitamin-A is all types of vegetables, particularly the carotene-rice vegetables and fruits, the increased production and consumption of those vegetables and fats and oils can help reduce the micronutrient deficiency. Homestead garden is the excellent source of vitamin and mineral.

Impact of homestead vegetable cultivation on food and nutrition security

Nutrition problem is key issue along with food security in Bangladesh today. A small percentage of the people have access to nutritious food, whilst the majority is forced to survive on subsistence diets that are unbalanced and devoid of essential food ingredients (MoA-UNDP, 2000). Generally, landless and marginal farmers are at more risk nutritionally than larger households. These households have lower per capita grain availability and higher rates of child malnutrition (Talukder *et al.,* 1995).Of all the options available to tackle national malnutrition problem, the most practical and sustainable option would be to promote both cultivation and consumption of horticultural crops (fruits, vegetable and spices) that could provide basic requirement of the essential vitamins and minerals. Production of crops especially vegetable and fruits may well be the answer to the potential problems of hung and malnutrition in Bangladesh (Ahmad, 1999). Daily intake of two spoonfuls – about 30 g of colored leafy vegetables can protect a child from vitamin A deficiency (Hussain, 1992). Homestead gardening in Bangladesh provides an excellent opportunity for farmers to produce a wide range of horticultural crops. These crops are ideal for the home garden (Talukder et al., 1995). All micro sites of homestead from home-yard to kitchen garden, and even roofs of

houses help diversify household's diet through the production and consumption of sore of the vegetables they produce (Miah and Hussain, 2003). Dietary supplies from home gardens in studied areas in Bangladesh accounted for 3 to 44 percent of the total calorie and 4 to 32 percent of the protein intake (Torquebiau, 1992). Home garden programs of Hellen Keller international in Bangladesh has been found effective in increasing the production and consumption of vitamin A-rich plant foods and in increasing the diversity of the diet, while one half of pre-school-aged children and pregnant women of those countries are affected by micronutrient malnutrition (HKI, 2003). Therefore, it is imperative that effective efforts are to be made for producing more fruits and vegetables through intensification of their homestead production system if severe malnutrition's to be overcome. In Bangladesh, there are more than 150 fruits and vegetables are being cultivated in the homestead and farmer's fields, hose availability is far behind from the requirement.

Changes in Awareness on food and nutrition

Awareness development is very important for a respondent to establish a home garden and consume vegetable for household food and nutritional security. Different food and nutrition related awareness was developed through homestead vegetable gardening. Awareness development of respondent was changed after homestead vegetable gardening as shown in Table 03. Table 03 revealed that awareness about balance food changed from not aware to moderately aware, awareness about nutrition and calorie uptake changed from not to moderately, and awareness about amount of vegetable consumption developed not at all to moderately awareness. Rest all other awareness development issues changed from partial to moderate. After starting vegetable demonstration, respondent's awareness on balance food and vegetable consumption were expected. In some cases they had no awareness at all but

after homestead vegetable gardening they were more or less developed in all the cases, which may be helpful for food and nutritional security.

Table 03. Changes in awareness on food and nutrition related issues (Kalikapur model)

Awareness issues	Extent of change	
	Before	After
Food and nutrition	Partially	Moderately
Balance food	Not at all	Moderately
Nutrition and calorie	Not at all	Moderately
Amount of rice consumption	Partially	Moderately
Amount of vegetable consumption	Not at all	Moderately
Quality maintaing of vegetable	Partially	Moderately
Vegetable production technology	Partially	Moderately
Post harvest technology of vegetable	Partially	Moderately

Source: Rahman, 2007

Average vegetable and rice consumption

Consumption of rice and vegetable are very important for food and nutrition. Only cereals or vegetables cannot fulfill the requirements of balance food. Vegetables can improve the nutritional value of other food items. It was observed that (Table 04) the respondents' average vegetable consumption increased from 46 g to 83g after homestead vegetable gardening i.e. consumption increased by 80%. At the same time per day rice consumption changed from 475g to 411 g i.e. rice consumption decreased 13%. It is interesting to note that after homestead vegetable demonstration respondents' vegetable consumption increased but their rice consumption decreased. It might be increased due to awareness about balance food and vegetable consumption(Rahman, 2007).

Table 04. Average changes in rice and vegetable consumption (Kalikapur model)

Items	Consumption per day/person (g)		Amount change (g)	Percent change (%)
	Before	After		
Vegetables	46	83	37	80
Rice	475	411	(-)64	13

Source: Rahman, 2007

Per day vegetable consumption and calorie distribution

Calculated amount of calorie uptake from different vegetables were presented in Table 15. Before demonstration overall per day vegetable production was 318g and after demonstration it was 553g. Per day consumption was 202g and 364g in before and after demonstration, respectively.

Table 05. Average vegetable production, consumption, and calorie contribution (Kalikapur model)

Homestead vegetable gardening	Production (EX day	Consumption (g)/ day	Calorie uptake (K.cal)/day
Before demonstration	318	202	73
After demonstration	553	364	111
Amount change	235	162	48

Source: Rahman, 2007

It was observed that (Table 05) production and consumption increased in both the cases. Total calorie uptake from different consumed vegetable was 73.0 k.cal. and 111.0 k.cal.in the before after condition, respectively. Calorie uptake was also increased by 38.0 k.calorie after demonstration. It was found that after demonstration average vegetable consumption and calorie uptake were increased near to fulfilled the recommendation

Nutrient contribution from homestead vegetable gardening

Vegetables are the important source of essential nutrients for human. Particularly leafy vegetables are rich in these nutrients. In the homestead vegetable gardening, respondents were grown 13 different kinds of leaf oriented vegetables. Different essential nutrient

contribution from these vegetables were presented in Table 06. It was found that different essential nutrients such as protein, vitamin A, Vitamin C, calcium and iron contribution from different vegetables increased after homestead vegetable gardening. In consideration to Recommended Dietary Allowance (RDA), the vegetables grown in home garden fulfilled the 100 % requirement of vitamin A, vitamin C, and iron. It also fulfilled 47% of protein and 87 % of calcium requirement. Vegetables are not rich in protein but improve the protein nutrition status if taken with the cereals and pulses. Table 06, showed that selected essential nutrient contribution was changed significantly after demonstration(Rahman, 2007).

Table 06. Changes in nutritional status through homestead vegetable production (Kalikapur model)

	Edible yield/		Nutrient yield/day									
			Protein (g)		Vitamin		Vitamin C		Calcium(m		Iron (mg)	
	Befor	Afte	Befor	Afte	Befor	After	Before	After	Befor	Afte	Befor	Afte
Consumption	318	553	49.28	70.14	51223	95312	1607	2914	1450	2689	122	210
RDA			149	149	2625	2625	140	140	3100	310	49	49
% Of RDA contributio			33.1	47.1	1951.4	3630.9	1147.9	2081.4	46.8	86.7	249	428.6

Source: Rahman, 2007

Data contained in Table 07 indicate that nutrition uptake also increased in all resources poor farmer than before due to intake more vegetable in food menu. About forty thousand children are going to blind for shortage of vitamin A. It is a positive sign that targeted family take more different vitamin everyday near to standard mark. It has been possible for acceptance of modern vegetable technology in homestead gardening.

Table 07. Nutrient uptake by a family member of resources poor farm family (Barind model)

Farmers group	Nutrition				
	Food energy (kcal)	Vit-A/Carotene (µg)	Vit-C (mg)	Vit-B1 (mg)	Vit-B2 (mg)
Before					
Landless	23470	2159732	12480	32	65
Marginal	32088	3455351	16060	40	74
Small	29958	3336354	15262	46	66
After					
Landless	65135	10254040	48632	201	295
Marginal	70589	11049024	60014	228	320
Small	73349	11107784	68339	334	420

Source: Faruk *et al.,* 2001

Nutritional value of Horticultural crops (grown in homestead area)

Homesteads regardless of ecological and socioeconomic diversities own at least a few fruit crops. Fruit crops cover an area of about 100,000 ha, nearly 80 percent of which are grown in home gardens (MoA-UNDP, 2000). Based on growing seasons, vegetables are categorized into summer/rainy season, winter and all-season types. Summer vegetables covering an area of 94,000 hectares and winter vegetables covering 154, 000 hectares are cultivated mainly in homesteads (MoAUNDP,2000).Homestead gardening, especially vegetable production is an important household activity contribution to both economic welfare and family diets (HKI, 2001). Like fruit crops, vegetables, which are recognized as nutrition-givers of the highest order, are grown in Bangladesh mostly in homesteads from time immemorial. As in the case of fruits, vegetables belong to the group of 'protective foods', which provide essential vitamins and minerals (Tsou, 1992).

Table 08. Different type of vegetables and containing elements (Per 100gm edible portion)

Vegetable	Caloric (k.cal)	Vitamin A (μg)	Vitamin C (gm)	Iron (mg)	Calcium (mg)	Protein (gm)
Red amaranth	44	5520	99	25.5	397	3.72
Spinach	18	11000	50	8.0	200	2.82
Cabbage	63	1200	124	0.8	39	3.20
Radish	32	5295	81	3.6	265	0.62
Carrot	48	5700	79	8.8	340	-
Bitter gourd	116	126	96	2.0	23	1.18
Tomato	32	351	27	0.4	48	0.18
Okra	35	52	13	1.6	66	2.52
Brinjal	24	74	12	0.9	18	1.79
Bean	48	187000	27	2.6	210	2.93
Indian spinach	27	5580	28	11	73	-
Sweet gourd	25	5000	2	0.7	25	4.10
Bottle gourd	66	6502	12	7.2	282	3.82
cauliflower	33	258	93	0.17	93	1.69

Source: IFNS (1992).

Among the studied vegetables Bitter gourd and Bottle gourd contain higher amount of caloric (Table o8) , in case of vitamin- A Bean and Spinach higher amount vitamin –A(Table08), Cabbage and Red amaranth contain large amount of vitamin –c among the studied vegetables, Red amaranth and carrot maximum amount of iron and calcium where as (Table 08) Sweet gourd and Bottle gourd contain maximum amount protein. (Kabir, 2004).

Homestead garden– a platform for employment and economic security

Homesteads are multipurpose entities with dwellings, vegetables, spices, fruits and fuel wood/timber species. Historically, homesteads have been providing multiple products to the households and meet their diversified need through the production of a wide variety of fruits, Vegetables, spices and different tree products (Miah *et al.,* 2003). The prevailing climatic and edaphic conditions of Bangladesh are the key factors for providing such a unique opportunity of producing a wide range of products. It has been reported that homestead production system collectively contributes about 70 percent fruits, 40 percent vegetables, 70 percent timber and 90 percent firewood and bamboo requirement of the country (Miah and Ahmed, 2003). A vast majority of rural people in Bangladesh who cultivate land for crop production remains unemployed for a considerable period of the year because of seasonality of production activities and labor requirements. Homestead farming is the best answer to such unemployment situation through both vegetable growing, and culture of quick growing fruits enabling the people to remain employed round the year (Ahmad, 2007). It has been found that over the decades, small-scale homestead activities have become the most significant income generating activities of poor households. For example, over 5 million people in Bangladesh live in the revering sand and silt landmasses (known as char in Bengali). These areas are highly prone to sudden flooding and erosion of land, and makes living in the chars hazardous and insecure. The Helen Keller International's homestead food production program was found to provide support to the fragile livelihood in the chars and improved the well-being of the entire household by promoting low cost technologies for gardening and livestock-raising, improving food security and dietary practices, providing employment for women and a source of income for the household (HKI, 2003). *Artocarpus heterophvllus* (Jackfruit)based system (a century old homestead

production system in Bangladesh particularly in terrace ecosystem in the central part and hill ecosystem in east and Southeast part) provides diversified outputs to the growers. The jackfruit is consumed almost as the main food during the main harvesting periods (July-August) and the seeds are used in various cooked forms (Miah and Ahmed, 2003). Homestead being the dwelling place, enables the women for efficient management of homestead activities. Use of family labour, especially women labour in the production process not only satisfies a wide range of domestic needs more economically but also ensures lowering of production costs and ultimately promotes more income. Average return per decimal of homestead land is far more than that of large farm-households, possibly due to the more intensive labor inputs on the part of women in poor households (Ahmad, 1995).Therefore, homestead farming activities are keeping busy the entire households particularly the women who have minimum opportunities to be involved with other than homestead activities and ensuring the economic security especially to the poorer.

Fruit tree products: Income from trees

Fruit trees in the homestead generate income to the farmers. The study showed that the average income generated during the last five years from homestead trees was 116500 Tk. / farm. The income of the landless farmers from trees was much lower than the income of the other farm categories. The lower income of the farmers from tree products was probably due to lower number of trees in the homestead.

Table 09. Total income from fruit tree products

Farm category	Farm		Income (Tk / farm)
	Number	%	
Landless	10	56	6180
Marginal	13	72	6354
Small	13	72	8700
Medium	15	83	14560
Large	17	94	22458
Mean	14	77	11650

Source: Basak, 2002.

Employment opportunity for women by homestead gardening

Women - the vulnerable group of the society and half of the population have the great opportunity for self-employment in the income-generation activities through the practice of vegetable and fruit production in the homestead. The possibility of gender equality for participating in home garden management and sharing of benefits is perhaps one of the major stimuli for continued household food security enjoyed by home gardeners (Kumar *et al.*, 2013). Family labour was mostly used in home garden and was managed mostly by the idle family labour of male, female, and children. Male farmers participated more in vegetables bed preparation, planting, weeding, staling, fencing, crop protection and marketing while female members participated more in applying irrigation, mulching and harvesting of vegetables .Children were also participated in all the works and helped their parents. (Islam *et al.,* 2003) reported that participation of male and female labour was almost equal while (Khan *et al*.,2009) reported more participation of male compared to female. The higher participation of women in agricultural activities made positive impact on equity issues within the family and also in the community as well. Almost 34% of gardening works were managed by women (Figure 2) and children and in fact, women were the main decision-makers regarding

gardening practices. They used income to spent school fees, tiffin fees, buying pens and writing pads etc. for their children that were earned by selling garden produce.

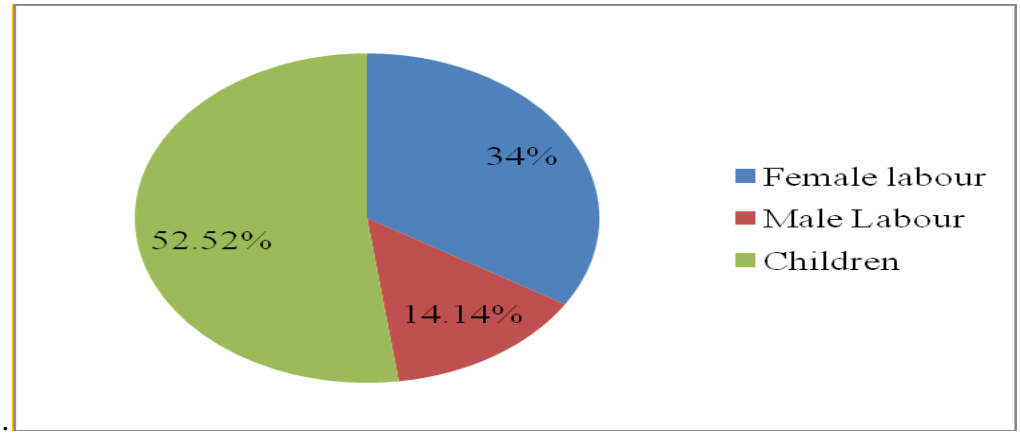

Figure 2. Involvement of family members in the homestead production activities.
Source: Shaheb *et al.*, 2014.

Although every Member of the family has some contribution in homestead farming, the major labour input is contributed by women. Their roles vary widely depending upon the socioeconomic and religious factors. It has been shown that female labours of landless families gave the maximum time compared to other categories of families (Nessa *et al.*, 1998). They spend about one-fourth of their total time in homestead production activities and increase family income. As women play significant role in homestead production and management, still there remains immense opportunity for improvement of homestead production by enriching their knowledge and skill. Women, therefore, need to be empowered in skills and knowledge that will enable them to more active and meaning participation in the homestead production activities. Homestead gardening plays vital role in income for small and marginal farmer. It increases family income.

Vegetable production and cost and return analysis

The production of vegetables in the homestead is presented in Table 10. The mean yield of vegetables was higher at open sunny space (206 kg) followed by that under trellis (58 kg). Among the vegetables cropping pattern in four bed, radish-tomato-amaranth vegetable pattern (Bed-1) produced the highest yield (91kg) followed by French bean-red amaranth (51kg) (Bed-2). It was observed that more crops and production units were covered in rabi season than kharif. Analysis of benefit-cost ratio revealed that among the eight production units, the highest gross return (Tk. 4315) and gross margin (Tk. 2999) were recorded in open place of the homestead while the other production units altogether contributed the gross return (Tk. 5752) and gross margin (Tk.3616). The benefit cost ratio (BCR) is also found the highest (3.28) in the vegetables cultivation at open space. However, the mean yield of vegetables harvested from the homestead was 423 kg and the gross return and gross margin were Tk.10067 and 6615, respectively and the BCR was 2.92 (Table 10). By growing their own vegetables, households were able to supplement their income by lessening the need to purchase food from the local market and used this extra income for other purposes.

Table10. Performance and cost and return of year round vegetables production

Place		Crop	Price (TK)	Amount Harvested (Kg)	Gross return (TK)	Total Variable cost (TK)	Gross Margin (TK)	BCR
Open place	Bed-1	Radish	15	40	600	170	430	3.53
		Tomato	22	35	770	236	534	2.26
		Amaranth	14	16	216	80	136	2.70
	Bed-2	Lalshak	30	10	300	70	230	4.29
		Cabbage	15	26	390	140	250	2.79
		Okra	30	15	450	150	300	3.00
	Bed-3	Brinjal	25	19	475	180	295	2.64
		Lalshak	20	10	200	75	125	2.67
		Gimakalmi	18	13	234	80	154	2.93
	Bed-4	French bean	40	12	480	60	420	8.00
		Lalshak	20	10	200	75	125	2.67
Sub-total(A)				206	4315	1316	2999	3.28
Trellis		Yard long bean	20	25	500	450	50	1.11
		Country bean	28	24	672	408	264	1.65
Under Trellis		Turmeric	25	20	500	100	400	5.00
		Mukikachu	20	20	400	175	225	2.29
		Ginger	60	18	1080	194	886	5.57
Marsh land		Lotiraj	20	25	500	150	350	3.33
Shady place		Ginger	50	20	1000	309	691	3.24
Roof		Ash Gourd	15	40	600	250	350	2.40
Tree		Potato Yam	20	25	500	100	400	5.00
Sub total (B)				217	5752	2136	3616	2.69
Total				413	10067	3452	6615	2.92

Source: Shaheb *et al.,* 2014

The findings of the present study are also conformed the finding of Islam *et al.* (2003) and Khan *et al.* (2009) reported that the number of varieties and vegetable production was three times higher in the developed garden than traditional garden and child consumption was also 1.6 times higher. Alam (2011) documented that farmers obtained their main staple root crops from home gardens in Bangladesh. Resource-poor families often depended more on home gardens for their food staples and secondary staples than those endowed with a fair amount of assets and resources such as land and capital (Wiersum, 2006).

CONCLUSIONS

- Nutrition can only be achieved through a strong homestead garden programme. This practice will help to increase vegetable production and its consumption.

- Homestead gardens represent an especial useful strategy for promoting sustainable livelihood objectives of the poor people.

- Due to intervention with appropriate vegetable cultivation the productivity and income of homestead has increased. The unutilized and underutilized homestead areas were brought under intensive production.

- By proper management homestead area it is helpful to improved financial security, leverage in wage bargaining, nutrition, improved social status , political status and better access to basic infrastructure.

- Farmers are using different home garden models for vegetable production developed by OFRD of BARI (Bangladesh Agricultural Research Institute) like Kalikapur, Barind, Labukhali, Kalapara, and Tangail Model etc. GO and NGO should take necessary steps to expand these models to the farmers through different projects

REFERENCES

.Ahamad, M. N. 2007. Determination of beta carotene content in fresh vegetables using high performance liquid chromatography. Sarhad Journal of Agriculture, Pakistan. 23(2):63-183.

Ahmed, M. F. U.1999. Homestead agroforestry in Bangladesh: A case study of Gazipur District. AMaster of Science dissertation in Agroforestry and environment, Dept. of Agroforestry and Environment, Bangabandhu Sheikh MujiburRahman Agricultural University, Gazipur, Bangladesh.

Alam, M. 2011. Tropical Homegardens in Bangladesh: Characteristics and Sustainability. In Sustainable Agriculture Reviews 6: Alternative Farming Systems, Biotechnology, Drought Stress and Ecological Fertilisation. Lichtfouse E. Dordrecht, (eds.). The Netherlands: Springer Science.

Ali, M. A., M. A. Momin, M. R. Alam, M. S. H. Mollah, F. I. Ivy and M. A. Hossain. 2006. Goyespur vegetable production model (a Bengali booklet), On-Farm Research Division, Bangladesh Agricultural Research Institute, Pabna.

Basak, N. R. 2002. Study oil composition of trees in homesteads at different ecological zones in Bangladesh. A Master of Science dissertation in Agroforestry and Environment. Dept. of Agroforestry and Environment, Bangabandhu SheikhMujibur Rahman Agricultural University, Gazipur. Bangladesh.

BBS (Bangladesh Bureau of Statistics). 2011. Statistical Yearbook of Bangladesh, 2012. Ministry of Planning, Government of People's Republic of Bangladesh, Dhaka.

Eyzaguirre, P. and Linares, O. 2004. Homegardens and Agrobiodivercity. Smithonsian Press, Washington DC, USA. P. 254.

FAO (Food and Agricultural Organization). 2010. Nutrition Country Profiles, Agriculture and Consumer Protection Department. FAO, Rome.

Faruk, M.A. M.A Ali and M.A. Ali.2001. Homestead Vegetable Gardening in barind model: A Means of Household Food and Nutritional Security for different categories of Farmers. Bangladesh Journal of Agricultural Research. 28(2): 261- 270,

Haque, M. A. 1996. Homestead agroforestry in Bangladesh. In: Agroforestry Bangladesh. Village and Farm Forestry Programme, SDC, Dhaka and BAU. Mymensing.

HKI (Helen Keller International). 2001. Monitoring of activities in village nurseries and household gardens. A Summary Report of Surveys 14-17 under NGO Gardening, and Nutrition Educational Surveillance Project, Helen Keller International, Bangladesh.

HKI (Helen Keller International). 2003. Life in the Chars in Bangladesh: Improving nutrition nutritional and supporting livelihoods through homestead food production. Nutritional Surveillance Project. Helen Keller International, Bangladesh.

Hossain, M., F. Naher and Shahabuddin, Q. 2005. Food Security and Nutrition in Bangladesh: Progress and Determinants. Journal of Agricultural and Development Economics. 2(2): 103-132.

Hussain, M. H. 1992. Horticulture and nutrition. In: Horticulture in National Development. BSHS/Department of Horticulture, Bangladesh Agricultural University, pp. 36-47.

Hussain, M. J.and Miah, M. G. 2004. Homestead agroforestry production and management manual. The small farmers and agroforestry development programme (SADP), GTZ and DAE, Rangpur, Bangladesh.

INFS (Institute of Nutrition and Food Science). 1992. Nutritional values of Bangladeshi foods (in Bengali). University of Dhaka, Bangladesh.

Islam, F., M. Akkas Ali and Ashraf, M. 2003. Homestead Vegetable Gardening: A Means of Homestead Food and Nutrition Security for Marginal Farmers. Bangladesh Journal of Agricultural Research. 28 (2): 261-270.

Khan. M. A. H., Ali, M. Y., Nazrul, M. I. and Quayyum, M. A. 2009. Year Round Homestead Vegetables Production: A Means of Reducing Poverty and Nutritional Deficiency for Small Farm. Journal of Bangladesh Agricultural Research. 34(1): 169-174.

Kumar, V., Kumar k. and Patel, R. 20013. Determination of vitamin C in some fruits and vegetables. International Journal of Pharmacy and Life Sciences. India .

Miah, M. G. and Hussain, M. J. 2004. Homestead agroforestry in Bangladesh: potential resource for rural households.An Abstract Accepted for the Poster Presentation in the First World Congress of Agroforestry, 27-02 July, 2004, Orelando. Florida, USA.

Miah, M. G. and Ahmed, M. M. 2003). Traditional agroforestry in Bangladesh: Livelihood activities of the rural households. A Poster Presented at the XII World Forestry Congress, held in September 2003, Canada.

Mictchell, R. and Hanstad, T.2004. Small home garden plots and sustainable livelihoods for the poor. Rural Development Institute(RDI). Livelihood Support Programme (LSP), FAO, pp. 1-43.

MoA (Ministry of Agriculture)-UNPD. 2000Integrated horticulture and nutrition development project. BGD/97/041/01/99. Implementing Agency: Department of Agricultural Extension, Ministry of Agriculture and Food and Agriculure Organization of the United Nations.

Nessa, J. S. K., Hossain, S. M. A. and Fouzder, S.K. 1998. Participation of family members in homestead and off-farm activities according to gender differences. Bangladesh Journal of Extension Education. 10 (1 and 2):81-85.

OFRD (On-Farm Research Division). 1993. Homestead vegetable production: Training Manual. Published by OFRD of Bangladesh Agricultural Research Institute, Gazipur.

Rahman, F.M.M. 2007. Food Security Through Homestead Vegetable Production In The Smallholder Agricultural Improvement Project Area, MS (AER) Thesis, Department of Agricultural Extension and Rural Development, Bangabandhu Sheikh Mujibur Rahman Agricultural University, Salna, Gazipur.

Shaheb, M. R., Nazrul, M. I. and Sarker A. 2014. Improvement of livelihood, food and nutrition security through homestead vegetables production and fruit tree management in Bangladesh. Journal of Bangladesh Agricultural University. 12(20): 377-387.

Shamsul, A. 2015. Addressing malnutrition through nutrition-sensitive social protection. The Financial Express, pp. 1-13.

Talukder, A., Tabibul A. K., Baker, S. and Bloem, M.W. 1995. Resource and technology requirement for ensuring household food security through homegarding. Paper Presented at the Workshop on Vegetable Crops Agribusiness, held during 2-4 May, 1995, AVRDC/BARC-BARI Vegetable Project, Bangladesh.

Torquesbiau, E. 1992. Are tropical homegardens sustainable? Journal of Agriculture, Ecosystem and Environment. 41: 189-207.

Tsou, S.C.S. 1992. Vegetable production and marketing. In: Proceddings of a National Procedding and Planning Workshop. AVRDC/BARI/BARC-USAID, Bangladesh.

Wiersum, K.F. 2006. Diversity and Change in Home Garden Cultivation in Indonesia. In Tropical Home gardens: A Time-Tested Example of Sustainable Agroforestry volume 3. Edited by Nair BMKPKR. Dordrecht, Netherlands Springer Science.