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YEAR ROUND HOMESTEAD VEGETABLE PRODUCTION: A MEANS OF REDUCING POVERTY AND NUTRITIONAL DEFICIENCY FOR SMALL FARM

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Bangladesh has about 12 million farm households of which 9.4 millions are small (BBS, 2005). In Tangail District, small households are about 3.3 lac. In Bangladesh, per capita vegetable consumption is only 28 g against the daily requirement of 200 g (Chadha *et al.*, 1994). Over 30 thousand infants become blind every year due to vitamin 'A' deficiency (BARC, 1 990). Vitamin C, iron, and other mineral nutritional deficiency are widespread resulting in different types of diseases, hampering physical growth and retarding brain development. This situation aggravates when any natural disaster occurs in any areas. Approximately 5% area (0.45 million hectares) of the total 8.4 million hectares of cultivable land is occupied by homesteads. The size of homestead varies depending on agro-ecology and farm size. There are about 18-20 million families in Bangladesh, most of them live in rural areas having a homestead for each. Their homesteads are the most effective and common production units for supplying food, fuel, timber, and other family needs and employing family labours.

Homesteads include vegetables gardening, livestock rearing, poultry raising, fish culture, homestead forestry, post-harvest processing and alike activities. The actual area of homestead devoted to vegetable cultivation is very small. Hussain *et al.* (1988) reported that about 13% of the total homestead area was under vegetable production. Small farmers have some crop field. Usually they are to maintain their livelihood by utilizing the homestead and crop field. However, many small homestead areas of Bangladesh remain unutilized, which could be brought under round the year vegetable cultivation for reducing the above mentioned problems. In the context of ever increasing problems of malnutrition and smaller farm size for field crops production, the only feasible option for small households is to grow vegetables intensively in the homestead, which can provide household food security and nutrition for those farmers. Research on homestead vegetable gardening in Palima FSRD site, Tangail was initiated to develop a model for year-round vegetable production in the homesteads to improve the household food security and nutrition of poor farm family through increased intake of home-grown vegetables, to generate additional income for farmers by selling surplus vegetables; and to create employment opportunity for women and children of the family.

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The participatory farmers under researchers' active supervision from 1999-2001 at FSRD site, Palima, Tangail, conducted the trial. In designing the vegetable production package, year-round supply of locally adaptable and culturally acceptable vegetable crops having better nutritional value and market potential were taken into consideration. Four small farmers were selected for testing the vegetable patterns. The tested vegetable cropping patterns and their planting and harvesting times are given in Table 1. Some quick growing fruits like papaya were also grown around the gardens. They were trained on important aspects of crop management. The size of the vegetable garden was 2.5 decimal (100 sq.m). This area was divided into five beds, leaving 25 cm between the beds for irrigation and drainage furrows. Also, 50 cm space was left around the garden for fencing and drainage. Bamboo made fencing or live fencing and one hand tube-well was ensured to each of the participatory farmers'. Farmers were encouraged to use organic manures from their own sources in the gardens. Inorganic fertilizers for N, P, and K were applied in each crop at recommended rates (Handbook of Agril, 1999). Irrigation was applied as and when necessary. Insects were controlled mainly by mechanical means unless there were severe infestations. Data on yield, consumption, distribution and selling of different types of vegetables were collected by using a pre-designed schedule and through continuous monitoring. The nutrient yield per day was calculated by converting the total edible yield into standard units. Means and averages were used for interpretation of the data.

Table 1. Planting and harvesting time of vegetable cropping pattern under each bed at Palirna, Tangail.

Bed	Vegetable pattern	Planting/Seeding time	Harvesting time	Variety
1	Lady's finger—	15-25 March	May-July	BARI Dherosh-I
	Stem amaranthus-	25-30 July	August-September	BARI Danta- I
	Red amaranthus-	10-15 September	October-November	BARI Lalshak- 1
	Brinjal/chilli	10-15 October	February-March.	BARI Begun-I
2.	Indian spinach -	15-20 March	May-August	BARI Puishak-l
	Red amaranthus-	15-20 August	September-October	BARI Laishak - BARI
	Radish-	20-25 October	December-January	Mula- I
	Batisak	25-30 December	February-March	BARI Batishak-I
3.	Indian Spinach-	15-20 May	May-August	BARI Puishak-l
	Radish-	25-30 September	November-December	BARI Mula- 1
	Tomato-	10-15 November	January- February	BARI Tomato-2
	Red amaranthus	12-15 March	April-May	BARI Lalshak -1
4.	Kangkong-	15-20 March	May-August	BARI Gimakalmi-1
	Red amaranthus-	01-05 September	October-November	BARI Lalshak 1
	Garden pea-	15-20 October	January-February	BARI Motorshuti-2
	Red amaranthus-	20-25 January	March- April -	BARI Laishak -I
5.	Indina spinach	15-20 May	July - August	BARI Puishak-l
	bushbean-	05-10 September	November- December	BARI bushbean-1
	Tomato-	20-25 November	January- February	BARI Tomato-2
	Red amaranthus	12-15 March	April-May	BARI Lalshak-l

The harvesting period, edible yield and yield/day of different tested vegetable patterns are presented in Table 2. The highest edible yield (111 kg) was obtained from pattern No.-3 which was followed by pattern No.4. Yield variation among the patterns was mainly due to the variation in number and types of vegetable grown. In homegarden of Palima, the highest harvesting period was 220 days with tested pattern 1 though the edible yield was the lowest (88 kg). The second highest harvesting period (142 days) was recorded from the tested pattern No.3 which was 78 days shorter than pattern No.1, but edible yield was 26 % higher than pattern No. I. Brinjal and lady's finger of the pattern were harvested for longer duration, while the total yield of radish and tomato of pattern No. 3 of module No.3 yielded more than that of brinjal and lady's finger. Fokhrul *et al.* (2003) also obtained similar result. The lowest harvesting period (117 days) was recorded from the tested pattern No.5 which pattern produced the second lowest (90 kg) edible yield. As vegetables were grown in sequence, the harvesting period overlapped in different patterns. However, variation exists among the tested modules in supply of year-round vegetables.

Table 2. Harvesting period and yield of different vegetable cropping patterns tested at Palima. Tangail (2.5 dec.).

Patterns	Harvesting period (days)	Edible yield (kg)	Yield/day (kg)
1.	220	88	0.40
2.	130	102	0.76
3.	142	111	0.78
4.	122	108	0.89
5.	117	90	0.77
Total	-	499	3.60

Table 3. Nutrient contribution from different vegetable patterns tested at Palima, Tangail.

Pattern No.	Nutrient yield/day				
	Protein (g)	Vitamin A (I.U)	Vitamin C (mg)	calcium (mg)	Iron (mg)
1	14.56	765	31	475	6.24
2	19.18	104	82	470	4.41
3	21.15	409	42	1574	11.06
4	34.23	900	53	923	20.44
5	19.55	846	43	434	16.97
Total	108.67	3024	251	3876	59.12
RDA	149	2625	140	3100	49
% of RDA contribution	73	115	179	125	121

RDA= Recommended Dietary Allowance for a family of five (Uddin, K. 1986. and PCARRD, 1988)

Nutrient contributions from the vegetables grown in different patterns in homegarden of Palima are presented in Table 3. In consideration of Recommended Dietary Allowance (RDA) for a family of five, the vegetable produced in 2.5 decimal area fulfilled the requirement of vitamin 'A', vitamin 'C', calcium, and iron. It also fulfilled 73 % of protein requirement. In considering nutrients, vegetables grown in pattern No. 4 contributed the highest total nutrient yield, while second highest in pattern No. 5.

Gross return, gross margin of different pattern with variable cost are presented in Table 4. Pattern No.2 was found the most profitable among the patterns tested at Palima, Tangail. Gross margin of that pattern was the highest (Tk. 350) with the lowest variable cost (Tk. 160). The lowest gross margin (Tk. 267) was calculated from the pattern No. 4 with the variable cost (Tk. 179). Total income of 2.5 decimal area was about 3 times higher than production cost (Table 4), therefore, homestead vegetable production was economically viable. In addition, farmers get nutritious food and buildup relationship with neighbours. In the case of production cost assessment, the price of seeds, seedlings, fertilizers and pesticide were considered. Labour cost was not considered as the garden was maintained mostly by the idle family labours.

Table 4. Cost and return *(2.5* dec) of different tested vegetable cropping patterns at Palima, Tangail.

Pattern No.	Gross return (Tk)	Total variable cost (Tk)	Gross margin (Tk)	BCR
1	473	187	286	2.53
2	510	160	350	3.18
3	465	164	301	2.83
4	446	179	267	2.49
5	460	185	275	2.48
Total	2354	875	1729	2.70

All of the farmers distributed a portion of their produce to the neighbour and relative to maintain social relationship (Table 5). Farmers consumed about 62, distributed 9 and sold 29 % among the average yearly production of vegetables (499 kg). For a family of five, each small farm produced a good amount of vegetable in all the months except February and March. Maximum vegetable was produced in June to August and November to January (Table 5) as the later two months were driest part of the year and also the time of new plantation of *kharif*-1 vegetable.

Table *5.* Round the year vegetables production and utilization at FSR&D site, Palima, Tangail (April 1999 to March 2000).

Name of months	Total production (kg)	Vegetables utilization (kg)		
		Intake	Distribution	Sell
April 1999	33	20	3	10
May1999	41	*25*	*4*	12
June1999	*45*	28	4	13
July1999	55	34	*5*	16
August 1999	42	26	4	12
September1999	35	22	3	10
October 1999	29	18	3	8
November 1999	53	33	5	15
December 1999	62	38	6	18
January 2000	55	34	5	16
February 2000	26	16	2	8
March 2000	23	14	2	17
Total	499	308 (62)	46 (9)	145 (29)

Figure in parenthesis indicate percent utilization of vegetable round the year

Family labours are mostly used in homegarden and homegarden was managed mostly by the idle family labour of male, female, and children (Table 6). Male members participated more in land preparation, planting, mulching, fencing and marketing, etc. while female members participated in applying irrigation, weeding, plant protection, and harvesting. Children members also participated in stalking, weeding, and harvesting.

Table 6. Family labour utilization (%) in round the year vegetable production at Palima, Tangail (average of 4 farmers).

Operations	Male	Female	Children
Land preparation	74	14	12
Planting	47	39	14
Weeding	35	40	25
Mulching	64	20	16
Irrigation	34	42	24
stalking	43	28	29
Fencing	70	19	11
Plantprotection	26	51	23
Harvesting	18	62	20
Marketing	76	05	19
Mean	49	32	19

The constraints to the adoption of vegetable production by the farmers were non-availability of good quality seed and seedlings. Indigenous knowledge of vegetable seed production, collection and preservation can be improved by future research. In consideration of monetary advantage, homestead vegetable production could not increase farmers' wealth in substantially, but can be efficient means of household food security and nutrition to the small and marginal farmers.

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