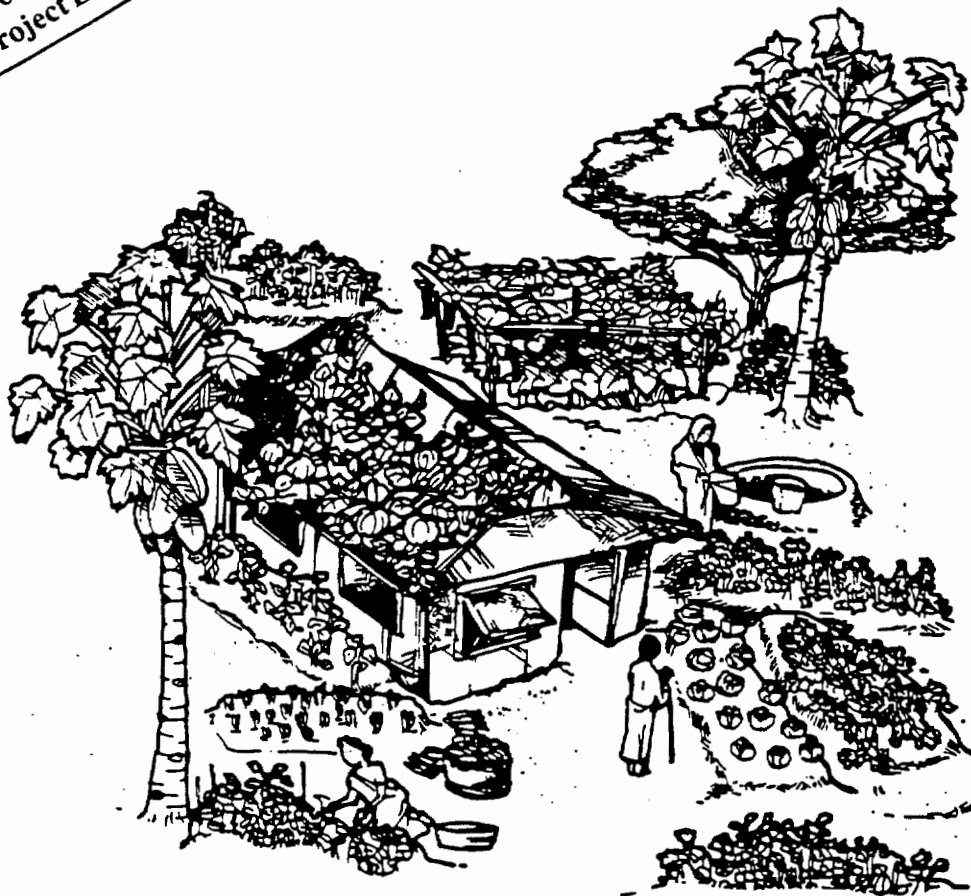# Home Gardening in Bangladesh

Reprint of the Home Gardening
Pilot Project Evaluation Report

HKI/AVRDC

Helen Keller International, Bangladesh
Asian Vegetable Research and Development Center, Taiwan

Summary: results show that the project was very effective in improving agricultural, economic, and consumption aspects of the target groups. The results on health and nutritional status were less impressive but promising.

INTRODUCTION

HKI conducted a midterm evaluation two years after initiating a home garden and nutrition education project in 81 villages in northern Bangladesh. There are also data available from a baseline survey and five monitoring rounds. Target (n = 1000), control (n = 200) and interaction (n=100) households were interviewed for the baseline and midterm evaluation surveys but only the target group was included for the monitoring rounds. The research design of the project, therefore, allows comparison between

Table 1.
HKI Home Gardening Project: Panchagaor District, Bangladesh Midterm Evaluation: Home Garden Characteristics of Target Group Baseline and Midterm Compared

Variables	Baseline (BL) Dec. '90-Jan. '91		Midterm (MT) Nov.-Dec. '92		MT/BL
garden last year (%)	49.1 n=491		100 n=980		
	mean	SD	mean	SD	
size of garden (m²)	61	37	138	113	2.3
# of vegetable varieties / year	6.2	2.4	33	4	5.3
# of veg varieties / year /m²	0.122		0.354		2.9
# of vegetable varieties currently	3.1	2	17	4	5.5
# of veg varieties currently / m²	0.061		0.178		2.9
	%		%		
use of garden produce last month					
consumption	96		47		
consumption + sold	4		53		

baseline and midterm (changes over time) and among the target, control and interaction groups at one point in time (baseline and midterm).

Target households were selected based on specific criteria: land ownership not to exceed 0.32 hectare, at least one child under six years and willingness of the mother to engage in gardening activities. Control households were selected from nearby villages. Interaction households were selected from target villages as a basis for assessing "demonstration effects" resulting from indirect exposure to HKI assisted gardens and nutrition education efforts. At the baseline, the three groups were very similar with respect to basic socioeconomic variables such as family size, education levels, access to homestead land and principal occupation, with the exception that the interaction group was somewhat better off in land ownership. Of the target households, 48

Table 2.
HKI Home Gardening Project: Panchagaor District, Bangladesh Midterm Evaluation: Basic Home Garden Characteristics [1]

Variables	target group n=980 %	control group n=194 %	interaction group n=95 %
garden last year	100	25	87
		n=48	n=83
type of garden:			
scattered	3	27	24
fixed	49	46	18
both	48	27	58
garden caretaker:			
wife	54	48	66
wife+husband	33	36	16
both+children	10	4	1
main purpose of garden:			
home consumption	39	52	82
income	0.2	0	1.2
cons.(1)+income (2)	54	29	1.2
income (1)+cons. (2)	7	19	16

	mean	SD	mean	SD	mean	SD
size of garden (m²):						
mean	138	113	130	157	146	450
median	120		40		40	
# of vegetable varieties / year [a]	33	4	9	5	15	6
# of vegetable varieties currently	17	4	4	2	5	3
# of tree varieties	8	2	3	2	4	2

(1) For households with garden last year: target n=980, control n=48, interaction n=83.
(2) At time of evaluation : Nov. - Dec., 1992
(3) All cases included.
a. Comparing target and control groups with two sample test, sign. level = 0.001.
b. . sign. level = 0.001.
c. . sign. level = 0.001.

percent had no agricultural land, and among those that did possess land, the mean size was just 996 meters square or 0.1 hectare. Homestead land was available to every household for gardening, with mean and median size equal to 412 and 320 meters square, respectively.

Table 3.
HKI Home Gardening Project: Panchagaor District, Bangladesh Midterm Evaluation: Estimated Impact of Home Garden Project on Target Group for Selected Variables

Variables	Target			Control			
	BL(2)	MT(3)	MT/BL=1	BL	MT	MT/BL=2	1-2(4)
garden last year (%)	56	100	1.79	43	25	0.58	1.21
	mean	mean		mean	mean		
Garden size (m²)	51	138	2.71	67	130	1.94	0.77
# of varieties last year / m2	0.122	0.354	2.9	0.103	0.156	1.51	1.39
# of varieties currently / m²	0.061	0.178	2.92	0.042	0.064	1.52	1.4
Selected garden vegetables and fruits (% of households [1]):							
vegetables							
carrot	1	94	94	2	2	1	93
spinach	2	99	49.5	1	4	4	45.5
taro	4	58	32.67	5	9	1.8	30.8
cabbage	3	41	13.67	2	2	1	12.67
Indian spinach	10	98	9.8	6	14	2.33	7.47
tomato	10	74	7.4	12	4	0.33	7.07
red amaranth	17	100	5.88	12	19	1.36	4.52
eggplant	19	69	3.63	21	15	0.71	2.92
yardlong bean	24	94	3.92	17	20	1.18	2.74
green amaranth	40	100	2.5	37	11	0.3	2.2
bottle gourd	38	99	2.61	36	47	1.31	1.3
radish	40	99	2.48	34	24	0.71	1.77
sweet gourd	29	99	3.41	20	50	2.5	0.91
lala (indg.)	49	99	3.02	37	49	1.32	0.7
fruit trees							
papaya	7	92	13.14	3	17	5.67	7.47
mango	60	87	1.45	46	57	1.24	0.21
jackfruit	59	58	0.98	50	42	0.84	0.14
banana	79	96	1.22	67	73	1.09	0.13

(1) For households with garden last year.
(2) Baseline survey (Dec. 1990 - Jan. 1991)
(3) Midterm evaluation (Nov. - Dec. 1992).
(4) 1-2 = estimated impact of home garden project on home garden varieties.
(5) Growth in garden during one or more seasons last year (Dec. 1991 - Nov. 1992).

Table 4.

HKI Home Gardening Project: Panchagaor District, Bangladesh, Midterm Evaluation, Home Garden Production Practices [1]

	target group n=980	control group n=48	interaction group n=83
	%	%	%
Main fertilizer:			
organic	99	90	81
chemical	1	6	1
none	0	4	18
Soil fertility practices:			
compost	89	23	8
green manure	22	0	1
legume crop	41	2	4
crop rotation	83	15	7
chemical fertilizer	17	35	10
other organic matter [2]	98	90	88
Pest/disease control:			
mechanical	98	40	28
biological	9	0	
organic	90	92	88
chemical	7	15	5
Produced vegetable seed last year	100	73	94
# varieties of seed produced			
mean	24	3	6
median	25	2	5
Seed storage:			
indigenous	3	60	72
improved	97	17	23
NA	0	23	5

(1) For households with home garden last year.
(2) Organic materials such as mustard cake, bone meal rice bran, ash and others.
(3) Use of organic pesticides, defined as mixtures of different plant parts, water, soap, ash, kerosene and others.

MIDTERM EVALUATION SURVEY

The midterm evaluation was carried out by teams of four professionals: a medical doctor, a sociologist, an agriculturist and someone skilled at taking anthropometric measurements. The

Table 5.

HKI Home Gardening Project: Panchagaor District, Bangladesh, Midterm Evaluation, Home Garden Production, Target Group [1]

	MR1 Oct-Nov'91	MR2 Dec'91-Jan'92	MR3 Feb-Apr'92	MR4 May-July'92	MT[4] Nov-Dec'92	Average
Households with zero garden production (%)	48	13	21	0	0	
	mean	mean	mean	mean	mean	
Vegetable varieties currently available(#)	7	6.5	6.2	9.3	17	9
Production [2] (kilos)	17.6	19.3	24.8	30.3	64.6	
median	6	13	18	26		
SD	79.3	47.3	54.1	34.4		
Per capita production [3] (grams/day)	44	53	69	82	158	81
median	16	33	43	65	143	60
SD	181	160	184	95	79	

(1) Data from monitoring rounds 1, 2, 3 and 4

(2) Sum of quantities produced for all vegetables harvested during current season (60 to 90 days), for production > 0

(3) Based on an average production period of 75 days, for production > 0

(4) Based on estimated home garden production of 6.04 kilos per week prior to midterm evaluation. See table 17

---

survey instrument was long and detailed in order to capture as complete data as possible for assessing production, consumption, health and nutrition impacts. Team members received intensive training from HKI, including pre-testing of the questionnaires, to ensure a high degree of data reliability. Local HKI extension agents assisted throughout the evaluation as well as staff from headquarters in Dhaka.

The data were processed and "cleaned" by the HKI data processing team in Dhaka. Dr. Robin Marsh, leader of the Home Garden Program at the Asian Vegetable Research and Development Center, carried out the production and socioeconomic analyses of the data in coordination with HKI. The health and nutrition data were analyzed by the HKI research team.

Table 6.

HKI Home Gardening Project: Panchagaor District, Bangladesh, Midterm Evaluation, Income Earned from Sale of Home Garden Produce, Target Group

	MR2[1] Jan.'91-Jan.'92	Midterm Nov.-Dec. '92
	%	%
Taka / month ($X2):		
0	91.7	45.6
1-24	4.3	15.7
25-49	2	14.1
50-74	1	9.5
75-99	0.2	1.8
100-124	0.3	4.6
125-149	0.2	0.6
+150	0.3	8.1
	100	100
		% increase
mean	38	71	87
median	20	40	100

(1) Monitoring Round 2.
(2) 1 US $ = 40 taka

AGRICULTURE

Production

At the time of the baseline survey, 50% of the target households reported having a home garden, with mean size of 61 meters square and an average of 6 varieties of vegetables grown during the year. Two years later, the midterm survey shows 100% of the households with gardens, as expected, with the mean size 130% larger at 138 meters square. The average number of varieties grown throughout the year increased five fold to 33 while the number of varieties in the ground at the time of the evaluation averaged 17 (table 1).

Table 7.
HKI Home Gardening Project: Panchagaor District, Bangladesh, Midterm Evaluation, Household Income and Food Expenditures

Income sources(1)	none (%)	Target mean taka	median	none (%)	Control mean taka	median	none (%)	Interaction mean taka	median
Cash	9	694	500	13	621	480	12	637	460
In-kind (non-food items)	96	9	0	94	11	0	96	6	0
Food(2)	78	51	0	82	32	0	70	54	0
Loan	57	259	0	50	370	23	73	131	0
Distress sale	52	248	0	52	390	0	69	248	0
Total		1,261	500		1,424	503		1,075	460
US$[3]		33	13		37	13		28	12
Expenditures[4]									
Food	0	492	400	0	505	400	0	412	335
Children's food	71	11	0	72	19	0	69	12	0
Total		503	400		524	400		424	335
Food exp./cash income		72	80		84	83		67	73
Home garden income/ cash income[5]		10.2	8						

(1) Last 30 days prior to midterm evaluation.
(2) Food received from labor, food-for-work programs or any other sources.
(3) US$ 1=38 taka.
(4) Last 30 days prior to mid-term evaluation.
(5) See table 7 for home garden income 30 days prior to midterm evaluation. Figures not given for the control and interaction groups because number of households that sold garden produce were only 7.5% and 13%, respectively.

Comparing the target, control and interaction groups at the midterm survey, the most important finding is that only 25% of control households reported having a garden (n=48), whereas 87% of interaction households had gardens (n=87). In terms of average number of varieties grown throughout the year, the control and interaction households with gardens reported 9 and 15 varieties, respectively (table 2). Thus, it seems as if there is a "demonstration effect" on interaction households exposed to the HKI target gardens. These households can be considered "indirect" beneficiaries of the project.
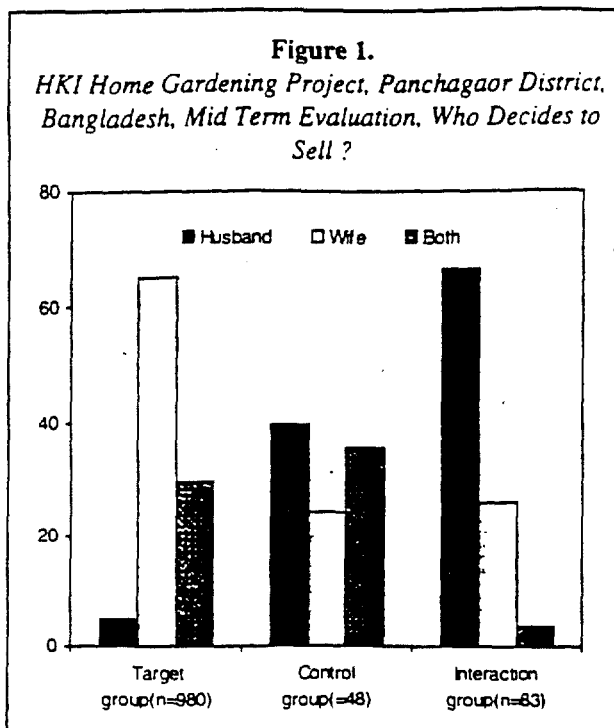
Diversity in number and types of vegetables grown in the garden is considered an important indicator of success because diversity is correlated with higher vegetable consumption levels, especially among children, and higher aggregate nutritional value. Furthermore, from an agronomic point of view, garden diversity is important for suppressing pest populations and enhancing soil fertility. Finally, where income generation is an objective, a small but diverse supply of vegetables can command higher prices in local markets, especially during "off" seasons.

It is important, from a nutrition point of view, to note the types of vegetables that HKI has promoted through provision of seed and technical assistance, that were uncommon in the region at baseline. For instance, carrots, spinach, amaranth and papaya, all high in vitamin A content, were grown by more than 90% of target households

Table 8.
HKI Home Gardening Project: Panchagaor District, Bangladesh, Midterm Evaluation Household Vegetable Consumption, Baseline and Midterm Evaluation Compared

Variables	Target BL (1)	Target MT(2)	MT/BL=1	Control BL	Control MT	MT/BL=2	Interaction BL	Interaction MT	MT/BL=3	1-2	1-3
Consumed vegetables last week (%)	98	100	1.02	100	100	1	99	100	1.01	0.02	0.01
by children (%)	93	97	1.04	99	97	0.98	98	100	1.02	0.06	0.02
Quantity consumed last week (kilns)											
mean	5.8	7.36	1.27	5	5.03	1	5.9	4.78	0.81	0.27	0.46
median	5	7	1.4	4	4	1	5	3	0.6	0.4	0.8

Figure 1.
HKI Home Gardening Project, Panchagaor District, Bangladesh, Mid Term Evaluation. Who Decides to Sell ?

during the year prior to the midterm evaluation (table 3). The number of control and interaction households growing vitamin A-rich vegetables and fruits also increased over the baseline, but by much smaller numbers.
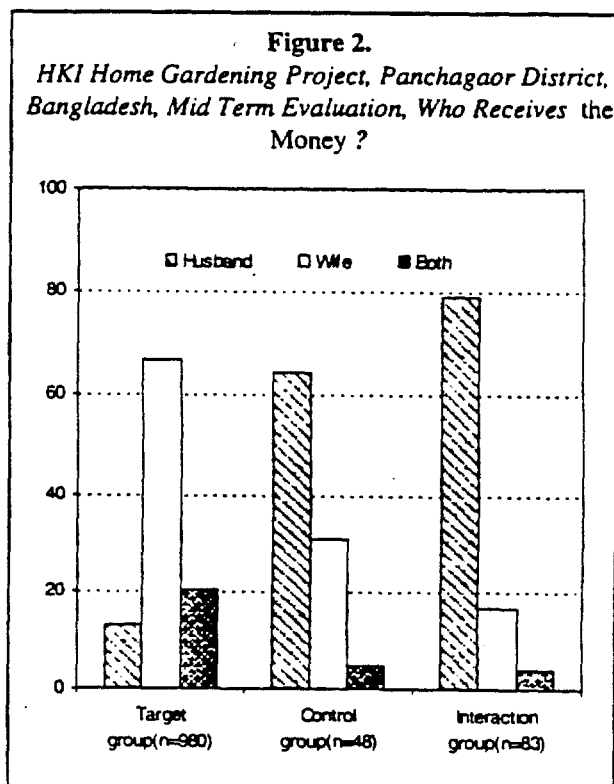
The increase in garden production, both in terms of number of varieties and production per unit of land, was possible because of changes in garden production practices (table 4). HKI, through its extension agents, recommends a LISA (low input sustainable agriculture) type of home gardening. Both for economic and ecological reasons, use of agrochemicals is discouraged. Soil fertility practices include use of compost, green manuring, legume cover crops and crop rotation. Pests are controlled through mechanical means and with botanical pesticides made from local materials. Although seeds and seedlings were provided during the first two years (at a subsidized cost), technical assistance was given on seed production and storage techniques to ensure sustainability once the gardeners are on their own.
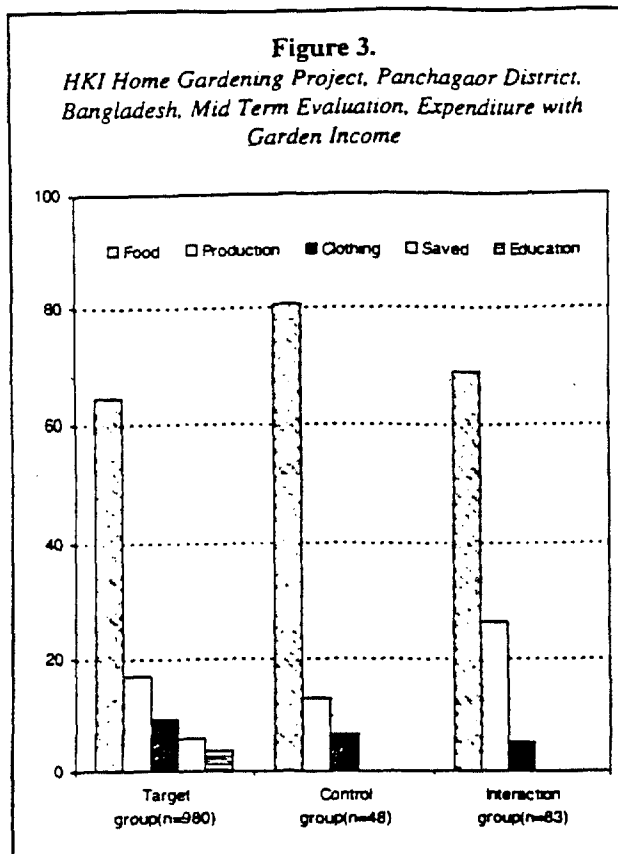
Information on time allocation indicates that most of the gardening is done in the late afternoon, which does not seem to conflict with other important daytime activities of the mother. Evidence from a separate study on female time

allocation among target households shows that an average of one hour per day is spent on gardening.

When asked about the principal gardening problems that households face, it is interesting to note that target households do not mention lack of technical knowledge nor seed/seedlings, whereas these are major concerns for the control and interaction groups. Likewise, soil fertility and control of pests/diseases are less frequently mentioned by target households as compared with control households. On the other hand, target households are very concerned about lack of fencing, and to a lesser degree, about land and irrigation constraints. Now that target households are managing productive gardens they are more concerned about protecting these "assets" with fencing and perhaps expanding production through access to more land and a year-round water supply. HKI has had limited impact on these constraints, with the exception of promoting "live fences" in some villages.

Data on vegetable yields and total production were collected during the monitoring rounds for the target group. The midterm survey asked for

Figure 2.
HKI Home Gardening Project, Panchagaor District, Bangladesh, Mid Term Evaluation. Who Receives the Money ?

Figure 3.
HKI Home Gardening Project, Panchagaor District, Bangladesh, Mid Term Evaluation, Expenditure with Garden Income

time of the midterm survey was 71 Taka (table 6), which is equivalent to 10.2% of total average cash income (table 7).

Interesting, it is primarily the women in the target group who decide what vegetables should be sold (or consumed at home), and how the income earned should be spent. The husbands are more likely to make these decisions in the control and interaction groups (figure 1-2). Thus, the gardening project, by focusing its attention on women both in terms of technical assistance and nutrition education, may have had an important "empowering" impact on these women. Also, when women decide how the money should be spent, typically a greater portion is spent on basic needs for the family, primarily food (figure 3).

Consumption

Household vegetable consumption increased significantly for the target group over baseline levels, from an average of 5.8 kilos per week to an average of 7.4 kilos per week (27% increase). During the same time period, vegetable consumption for the control group did not change, remaining at 5 kilos per week, while vegetable consumption for the interaction group declined by 20 percent to an average of 4.8 kilos per week (table 8). There is no clear explanation for this decline. Calculating average daily per capita vegetable consumption, the figures are 193, 119 and 118 grams for the target, control and interaction groups, respectively (table 9). Median figures are somewhat lower. Again, since data were collected during the high vegetable production season, these figures overstate vegetable availability on a year-round basis.

garden production during the week prior to the evaluation. Average total garden production increased from about 18 kilos during the season prior to Monitoring Round 1 to 30 kilos during the season prior to Monitoring Round 4. Median production figures show an increase from 6 kilos to 26 kilos during the same period, and a decreasing coefficient of variability (sd/mean) (table 5). Thus, while only the "best" gardeners were producing well at the beginning of the project, most gardeners were producing well by Monitoring Round 4. Production was especially high during the midterm survey because of its coincidence with the high vegetable production boro season.

Most of the garden produce is for home consumption (the focus of HKI education efforts). However, there has been a shift toward increased sale of garden produce as surpluses become available. At baseline, only 4% of target households reported selling some garden vegetables, which increased to 53% at midterm (table 1). Among the households selling garden produce, average monthly income earned at the

Nevertheless, year-round vegetable availability -at some level- is one of the clear positive impacts of the HKI Project. In no season do target households report vegetables "not available" at all, whereas the control group, and to a lesser degree the interaction group, report lack of availability as a major problem in the *aus* and *aman* seasons. Target households report that

Table 9.
HKI Home Gardening Project: Panchagaor District, Bangladesh, Midterm Evaluation. Household Vegetable Consumption[1]

	Target	Control	Interaction T/C	T/I
Consumed vegetables last week (%)	100	100	100		
Quantity consumed (kilos):				
mean	7.36	5.03a	4.78	
median	7.00	4.00	3.00	
	mean	mean	mean	
Source of vegetables (kilos):				
home garden	6.04	0.86	2.00	
market	1.20	3.6	2.40	
others(2)	0.18	0.93	0.24	
	7.42	5.39	4.64	
Average (kilos)(3)	7.39	5.21	4.71	1.42	1.57
Daily per capita vegetable consumption (grams)[4]:				
mean	193	119	118	
median	179	107	95	1.67	1.88
supplied by home garden	158	20	50	

(1) During week previous to mid-term evaluation.
(2) Exchange, gift, madside, others.
(3) Average of the two estimates: mean quantity consumed and mean total by source.
(4) Calculated from quantity consumed previous week. Estimated weight before cooking. Intra-household vegetable consumption not accounted for.
a. Comparing target and control groups with t test for equality of means, sign. level = 0.001.
b. sign. level = 0.001.

vegetables are "available and adequate" in the *aman* and *boro* seasons and either "adequate" or available but "not adequate" during the dry *aus* season. Year-round availability of vegetables is a very important indicator of success for any home garden promotion effort.

More than 80% of vegetables consumed by the target households came from their home gardens at the time of the midterm survey, as compared with 37% for the control group and 47% for the interaction group. Thus, although vegetable consumption declined somewhat for the interaction group over baseline levels, a higher percent of the vegetables consumed are coming from their home gardens (table 10). Preliminary figures on intra-household consumption indicate that the home gardening and nutrition education aspects of the project have had a positive impact on vegetable consumption by infants and very young children (figure 4.). Young children are particularly susceptible to vitamin A deficiency and associated illnesses.

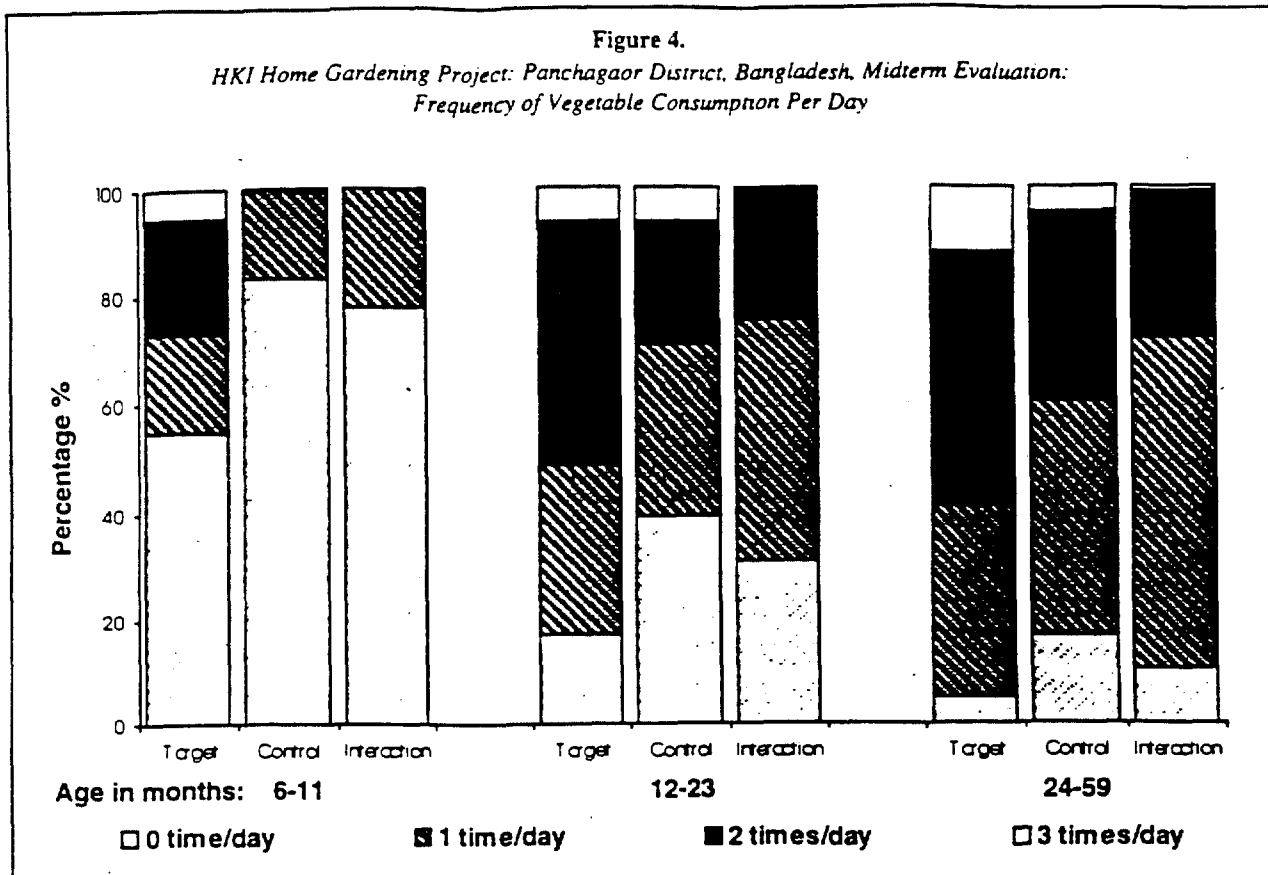## HEALTH

Night Blindness, Diarrhea, Anemia, and ARI

Figure 5 shows that night blindness has declined from 2.3 % to 1.2% in the target group. The prevalence in the control group at baseline was already quite low and did not change over the time of the project. This reduction in night blindness seems to be plausible since the intake of green leafy vegetables increased considerably among preschool children. The monitoring of the intervention group already had shown a pattern of steady decline of night blindness. However, despite the decline in prevalence of night blindness, the prevalence remains above 1%, which is still considered as a level of public health significance. There was a difference in the prevalence of diarrhea between the intervention group (10.6%) and the control group (14.3%). However, similar results were found at baseline and therefore no conclusions can be drawn about whether this was due to the intervention. At the mid-term evaluation, data were collected on ARI, angular stomatitis, and anemia. Lower rates of severe symptoms of ARI (e.g. chest indrawing, etc.) but higher rates of minor symptoms (e.g., nasal discharge/sore throat) were observed. These are very interesting findings because similar results were observed in Bangladesh in an analysis on the impact of VAC on ARI (3). Clinical diagnosis by physicians, however, showed lower rates of URTI, pneumonia, as well as asthma in the intervention group compared with the control group. Both anemia and angular stomatitis were less prevalent among the children in the target group (15.3%, 24.4%) than in the control group (21.1%, 33.2%)

Table 10.
HKI Home Gardening Project: Panchagaor District, Bangladesh Midterm Evaluation: Household Vegetable(1) Supply Sources, Baseline and Midterm Compared

	Target		Control		Interaction	
Source(2)	BL(4)	MT (5)	BL	MT	BL	MT
			% households			
home garden	47	82	38	37	45	47
market	93	16	96	57	99	47
received form others(3)	16	2	29	6	20	6
		100		100		100

(1) Ten most frequently mentioned types of vegetables, in order of greatest frequency: radish, eggplant, red amaranth, lafa, black arum tubers, bao shak, beans, kangkong, spinach and black arum leaves. The list varies only slightly between the target, control and interaction groups.
(2) Previous week in baseline survey (Dec. '90 - Jan. '91) and midterm evaluation (Nov. - Dec. '92) respectively.
(3) Exchange, gift, neighbors, others.
(4) Households can mention one or more sources.
(5) Principal source of vegetables.

Figure 4.
HKI Home Gardening Project: Panchagaor District, Bangladesh, Midterm Evaluation:
Frequency of Vegetable Consumption Per Day

Age in months: **6-11**   **12-23**   **24-59**

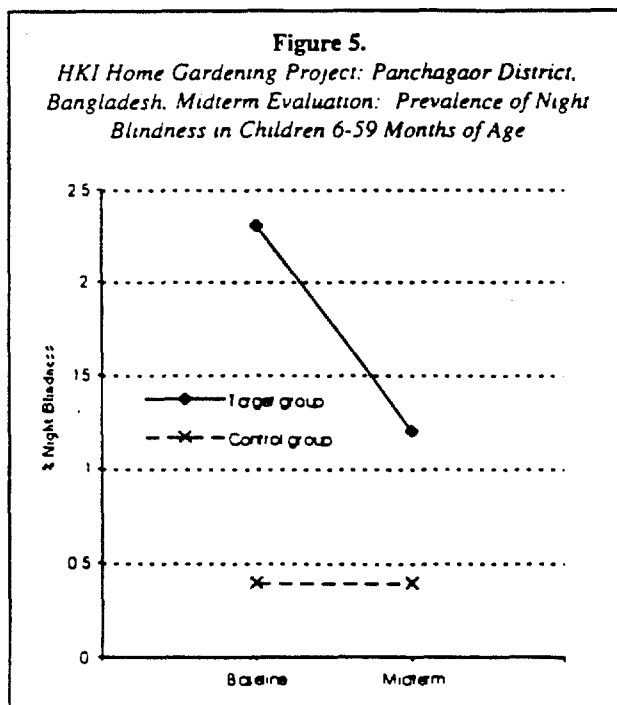□ 0 time/day   ▨ 1 time/day   ■ 2 times/day   ▫ 3 times/day
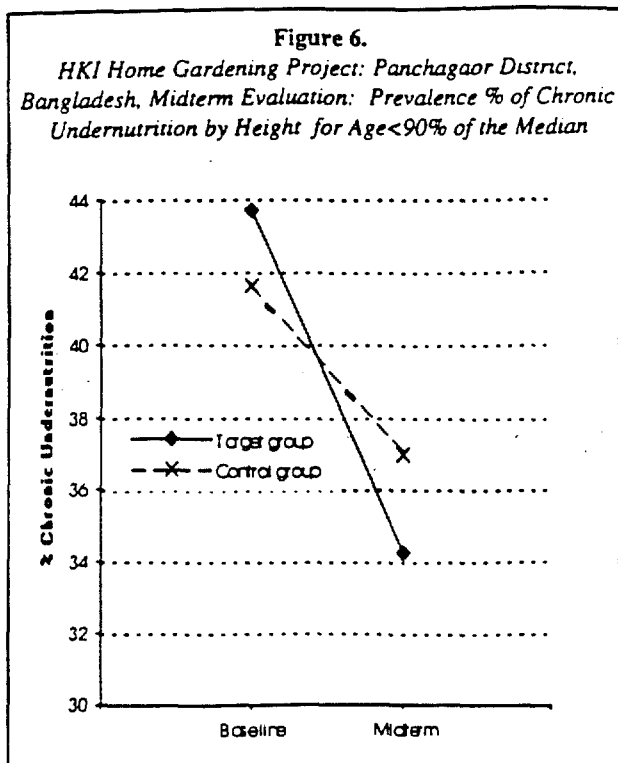
Night blindness among mothers

Recent studies have shown that the prevalence of night blindness among mothers is also a sensitive indicator for vitamin A deficiency. While no baseline information is available, data collected

Figure 5.
HKI Home Gardening Project: Panchagaor District, Bangladesh. Midterm Evaluation: Prevalence of Night Blindness in Children 6-59 Months of Age

during the mid-term evaluation showed that night blindness among mothers in the target group (1.4%) was significantly (p<0.05) lower than in the control group (3.4%).
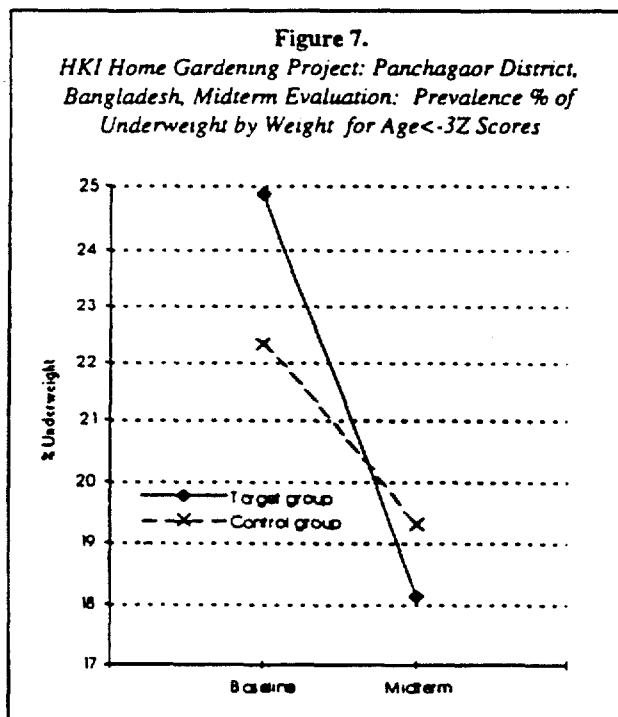
Growth

While there have been a number of reports that show that vitamin A is important for growth, intervention studies have come up with conflicting results. Figures 6-7 show that children in the intervention group were less underweight as well as less stunted than children in the control villages. Similar trends were found using other anthropometric indicators. However, besides the possible direct effects of vitamin A on growth, a more plausible explanation for the decrease in malnutrition among the target group is an indirect effect of the income generating impact of the project. The agro-economical data shows that the households in the target groups had an increase of 10% in their income as a result of selling vegetables. Besides this, they also spent less on buying vegetables on the market, which gave them another 10% increase in their income. These

Figure 6.

HKI Home Gardening Project: Panchagaor District, Bangladesh, Midterm Evaluation: Prevalence % of Chronic Undernutrition by Height for Age<90% of the Median

households spent 63% (Taka 94.5) of their earned income on food. Every month an extra 10 kilogram of rice (the staple food) was bought per household. In the target groups, an increase per household-member of about 210 kcal/day took place. This explains the more pronounced decrease of undernutrition in the target group.

Figure 7.

HKI Home Gardening Project: Panchagaor District, Bangladesh, Midterm Evaluation: Prevalence % of Underweight by Weight for Age<-3Z Scores

CONCLUSIONS

1. Decrease in purchased vegetables over baseline equal to 3.30 kg/week. Given an average value of vegetables sold in local markets of 6 taka per kilo (range: 3 to 12 taka, depending upon the vegetable and the season), this provides a weekly savings of 20 taka.

2. Increased percentage of households selling garden produce from 4% at baseline to 53% at midterm.

3. Average monthly income from sale of home garden vegetables equal to 71 taka per month, or 10.2 percent of average total cash income.

4. Adding benefits from savings on purchased vegetables (1) and income earned from sale of vegetables (3) together, the total benefit is estimated at about 150 taka per month for the average target household. This is equal to just over 20 percent of total cash income reported for the month prior to the midterm evaluation.

5. Although there was a decline in the prevalence of night blindness in the target group, the prevalence remains at a level of public health significance.

6. A very positive and interesting side effect is that the home gardening project was able to increase the calorie intake of the target families by about 15%. In a country like Bangladesh where food security and the total grain (rice and wheat) consumption is one of the key determinant factors for undernutrition, this finding may be of even greater importance.

Note: For details, see articles:

1. Marsh, R. et al . Home gardening as a strategy for improving nutritional and income levels among the rural poor: a case study from Bangladesh. (in prep.)
2. Bloem. MW, et al. The impact of homegardening on health in Bangladesh. (in prep.)
3. Bloem, MW et al. Nutritional Surveillance in Bangladesh: the impact of VAC on ARI. (in prep.)