



HOMESTEAD FOOD PRODUCTION MODEL CONTRIBUTES TO IMPROVED HOUSEHOLD FOOD SECURITY, NUTRITION AND FEMALE EMPOWERMENT – EXPERIENCE FROM SCALING-UP PROGRAMS IN ASIA (BANGLADESH, CAMBODIA, NEPAL AND PHILIPPINES)

Malnutrition, particularly micronutrient deficiencies, contributes significantly to the high rates of maternal and child mortality in Asia. In Bangladesh, Cambodia, Nepal and the Philippines at least half of preschool children and pregnant women are affected by micronutrient deficiencies. To combat these deficiencies and resulting negative health outcomes, Helen Keller International has been implementing homestead food production programs (HFPP) coupled with nutrition education in these countries for more than a decade. The main objective of the HFPP is to increase and ensure year-round availability and intake of micronutrient-rich foods in poor households, particularly by women and children. This bulletin highlights the impact of HFPP among nearly 30,000 households in Bangladesh, Cambodia, Nepal and the Philippines from 2003 to 2007. Outcome indicators measured included household food availability, consumption and income, as well as anemia prevalence in women and children 6 to 59 months. Overall, the evaluations showed improved availability and consumption of vegetables, fruits and animal products such as egg and liver in participating households. Anemia among women and children 6 to 59 months decreased during the course of the program in some countries. Household income increased as a result of the homestead food production activities. Women's involvement in household decision making improved. Therefore HFPP has the potential to improve dietary intake and nutritional status of women and young children and likely improves household food security and nutritional status of all household members.

Introduction

Malnutrition, including micronutrient deficiencies, is a serious public health problem among women and children throughout Asia. Underweight among preschool children in Bangladesh, Cambodia, Nepal and the Philippines is 41%, 36%, 39% and 21% respectively (recent DHS). Anemia and vitamin A deficiencies are also widespread, with anemia affecting over half of children 6 to 59

months and pregnant women in these countries¹. Macro- and micronutrient malnutrition have lasting and devastating consequences for individual health and national development, as malnutrition early in life often leads

¹ World Health Organization. Vitamin and mineral nutrition information system (VMNIS). [online]. 2009. [cited 2010 Mar 14] Available from: URL www.who.int/en/

to stunted growth², poor cognitive and physical development, and is associated with increased episodes of infection throughout an individual's lifetime. In addition, maternal nutrition has a significant effect on nutritional status of young children: during pregnancy, small variations in maternal diets, particularly reduction in micronutrient content, can have a significant impact on fetal growth and development^{3,4}, which will later affect the child's growth potential and adult height⁵. Anemia during pregnancy also has significant carry-over effects on anemia and iron status of infants and young children. These health outcomes will ultimately hinder development at a national level.

Recent studies estimate that the food price and economic crises have had a considerable impact on nutritional status of the poor, particularly women and young children. Experience from previous financial crises in Asia showed a reduction in non-staple food consumption, which was associated with increased prevalence of anemia in women and children⁶. Estimates also suggest the number of malnourished women and children will continue to increase globally as households continue to face less real household incomes. The recent Global Hunger Index, an indicator that reflects the negative household affects of high food prices and economic recession, named Bangladesh, Cambodia and Nepal as having "alarming" levels of hunger, and ranked hunger levels in the Philippines as "serious"⁷.

Agricultural interventions to improve household food availability and dietary diversity are considered one of the most sustainable solutions to addressing

2 ACC/SCN (2000) Fourth Report on the World Nutrition Situation: Nutrition Throughout the Life Cycle. ACC/SCN in collaboration with IFPRI, Geneva (online)

3 Ruowei L, Haas JD, Habicht J-P. Timing of the influence of maternal nutritional status during pregnancy on fetal growth. *American Journal of Human Biology*. 1998; 10:529-539.

4 Bukowski R, Smith GC, Malone FD, Ball RH, Nyberg DA, Comstock CH, Hankins GD, Berkowitz RL, Gross SJ, Dugoff L, Craigo SD, Timor-Tritsch IE, Carr SR, Wolfe HM, D'Alton ME. Fetal growth in early pregnancy and risk of delivering low birth weight infant: prospective cohort study. *FASTER Research Consortium*. *BMJ* 2007; 334 (7598):836

5 Cole T. Secular trends in growth. *Proc Nut Soc* 2000; 59:317-324

6 Block SA, Kiess L, Webb P, Kosen S, Moench-Pfanner R, Bloem MW, Timmer CP. Macro shocks and micro outcomes: child nutrition during Indonesia's crisis. *Econ Hum Biol* 2004; 2(1):21-44

7 IFPRI. 2009 Global Hunger Index: The challenge of hunger: focus on financial crises and gender inequality. [online]. 2009. [cited 2010 Mar 14] Available from: URL www.ifpri.org

Brief description of the Homestead Food Production Program (HFPP)

HKI has been implementing and adapting the HFPP model in Bangladesh, Cambodia, Nepal and the Philippines since the late 1990s through strategic partnerships with over 200 local non-governmental and governmental organizations. The HFPP model targets women from poor households as the primary beneficiaries, placing farming inputs, knowledge and skills in their hands. HKI works in collaboration with local partner NGOs and government structures to establish Village Model Farms (VMF) and also helps household to establish home gardens (cultivation of vegetables and fruit crops around the house) and small animal husbandry, mainly poultry. Home gardens are classified into three types: "traditional", "improved" and "developed" gardens. HKI and partners promote "developed gardens", which produce a wide variety of vegetables and fruit on a fixed plot of land throughout the year. This model relies on the dedication of participating households, particularly owners of Village Model Farms (VMF). The model also builds linkages with local health and agriculture structures to provide additional services to participating households and builds capacity of local partners to provide sustained technical assistance on both agriculture and nutrition to both VMF owners and beneficiary homestead food producers after the life of the three year project cycle.

The VMF serve as a place for training and demonstrations on improved agricultural techniques, technologies and poultry production activities for households participating in the program. The VMF is also used as a production center, as it is a source for inputs, like low cost quality seeds, seedlings, saplings and chicks. VMF owners are responsible for sharing these new practices and low cost inputs with other households in the village and providing ongoing support in collaboration with HKI and local partners. Typically about 20 households are supported by one VMF and households are divided into two smaller groups (Women's group) to best facilitate collaboration among households.

Nutrition education is a core component of the HFPP. HKI and local NGO partners train health

staff and volunteers working at the village level, who in turn host nutrition education sessions for mothers. These sessions emphasize the importance of eating nutritious food during pregnancy and lactation, as well as educate mothers on optimal feeding of infants and young children, including breastfeeding and complementary feeding. Mothers learn how to improve their household's dietary diversity and micronutrient consumption through cooking demonstration sessions using locally grown foods. More recently, the basic nutrition education component has been enhanced to include essential nutrition actions and behavior change negotiation for improved nutrition practices among mothers.

HKI and local partners provide all necessary inputs at baseline to VMF and households, including: 10 – 14 vegetable and fruit seed, seedlings, and saplings, chicks, poultry vaccinations, and training on optimal crops and cultivation, composting and organic pest control, water management and conservation, garden fencing, chicken shelter construction, vaccines and feed production.

these problems of high household food insecurity and malnutrition by increasing household's access to diverse foods and consumption of micronutrient rich food⁸. Such programs can also lead to reduced household poverty⁹, improved nutritional status of household members¹⁰ and potentially empower women beneficiaries¹¹.

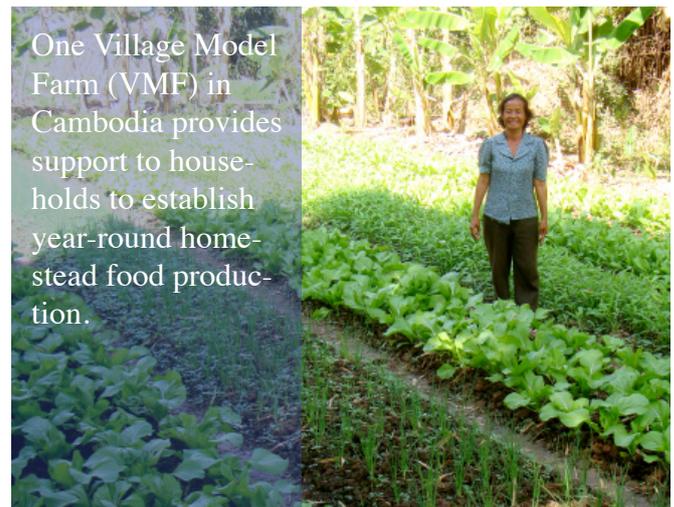
Nevertheless, in many countries in Asia, a diet consisting of mainly staples, with vegetables and fruits

8 HKI/Cambodia. Nutrition Bulletin, Homestead food production program improves food and nutrition security by increasing consumption of micronutrient-rich foods and family income in households with HIV/AIDS and other chronic diseases. HKI/Cambodia 2007 (7); 1.

9 Bloem MW, Moench-Pfanner R and Kiess L. Combating micronutrient deficiencies – an important component of poverty reduction. *Biomedical Environmental Science*. 2001; 14: 92-97.

10 De Pee S, Bloem MW and Kiess L. Evaluating food-based programmes for their reduction of vitamin A deficiency and its consequences. *Food Nutrition Bulletin*. 2000; 21; 232-238.

11 Bushamuka VN, de Pee S, Talukder A, Kiess L, Panagides D, Taher A and Bloem MW. Impact of a homestead gardening program on household food security and empowerment of women in Bangladesh. *Food Nutrition Bulletin*. 2005; 26: 17-25.



One Village Model Farm (VMF) in Cambodia provides support to households to establish year-round homestead food production.

as the main source of vitamin A, is unlikely to deliver enough of the vitamin to young children and pregnant and lactating women with increased metabolic needs. Studies have suggested low efficiency of intestinal carotenoid-to-retinol conversion ratio, at best a 12 to 1 conversion¹². This ratio reflects a conversion efficiency that is about half what was previously thought, leading to greater appreciation for why VAD may exist in cultures that depend heavily on vegetables and fruits as their main dietary source of vitamin A. For this reason HKI initiated pilot projects in Bangladesh, Cambodia, Nepal and the Philippines beginning in 2003 to integrate poultry and other small livestock production and nutrition education into existing home gardening programs, naming the interventions the Homestead Food Production Program (HFPP).

This bulletin highlights the impact of the HFPP on availability of vegetable, fruits and animal source foods like eggs and liver at the household level and consumption of such foods by household members, particularly women and children. Results on the HFPP's impact on anemia prevalence among children and women are also presented, along with the impact on household income and women's empowerment. These findings suggest that the HFPP model can potentially mitigate the combined adverse consequences of high food prices and economic instability on food security and nutritional status of poor households through improving household production and consumption, income and women's social status.

12 De Pee S, and Bloem MW. The bioavailability of (pro) vitamin A carotenoids and maximizing the contribution of homestead food production to combating vitamin A deficiency. *Int J Vitam Nutr Res*. 2007;77(3):182-92.

Evaluation methodology

HFPP was implemented among approximately 30,000 households in various project sites across Bangladesh, Cambodia, Nepal and the Philippines during 2003-2007. Data collected from a representative sample (10 -20% of program households and a similar number of control households) for the impact evaluations of the HFPP in these countries was analyzed for the results presented in this bulletin. For most of the results presented here, we did not pool the raw data and re-analyze it, but rather reviewed the findings presented in the various reports and bulletins and present these consolidated findings to illustrate the impact of the HFPP across different countries and varied contexts. In cases where the raw data from the different countries was available for a particular indicator, the raw data was re-analyzed separately for each country and also pooled together and re-analyzed to verify and clarify the findings obtained from the already published reports and bulletins.

For each of the evaluations, households were randomly selected through a multi-stage cluster sampling procedure. Control villages were separate yet demographically similar to program villages. Baseline data were collected in 2003 and end line surveys took place from 2006 to 2007, after 3-4 years of HFPP implementation. In each country (except Cambodia), the baseline and end line surveys were conducted around the same time of the year to reduce normal seasonality production influences. Pre-coded, semi structured questionnaires were used to collect data on household food production, food consumption and income, along with health, nutrition and other socio-economic indicators.

Weight, height and mid-upper arm circumference (MUAC) of all children and MUAC of all mothers were measured in all the countries. However, this bulletin does not provide the results for these anthropometric measurements because the impact evaluations presented in this bulletin were not designed to assess the impact of the HFPP program on anthropometric indicators. However, current efforts are underway to test the impact of the model on growth indicators in several countries.

A finger prick of blood was collected from a sub-sample of ~ 1,000 chil-

dren aged 6 to 59 months and ~ 1,200 non-pregnant mothers in all four countries to determine anemia prevalence. Anemia was defined as hemoglobin < 110g/L in children 6 to 59 months and hemoglobin < 120 g/L in non-pregnant mothers. A 24-hour vitamin A semi-quantitative food frequency questionnaire (developed by HKI) was used to assess vitamin A intake.

Results

Changes in vegetable production and consumption

Consolidated results from Bangladesh and Cambodia demonstrate that the HFPP had a significant impact on vegetable production and consumption (Fig 2). It should be noted that this data was available only in the end line evaluation so that the assessment focuses on the difference between households with the three types of gardens at the end point of the project in these two countries. Information was collected on consumption of vegetables and fruits in the HFPP evaluations in Nepal and the Philippines but the data was not available for this review.

For Bangladesh and Cambodia, the total number of varieties and volume of vegetables produced at the end line evaluation was highest among households with developed gardens compared to households with no garden or traditional or improved gardens. Households with developed gardens grew three times more varieties of vegetables, and total vegetable production (kg) was four times greater than households

Note that: *Traditional gardens* are seasonal and are often maintained on scattered plots with a few traditional fruits and vegetables such as pumpkins and gourds. *Improved gardens* are gardens maintained on fixed plots with increased vegetable varieties, though gardens are seasonal (not year-round). *Developed gardens* are year round production with more varieties and in a fixed plot.

Fig. 2. Type of garden related to production and consumption of vegetables in Bangladesh and Cambodia at endline

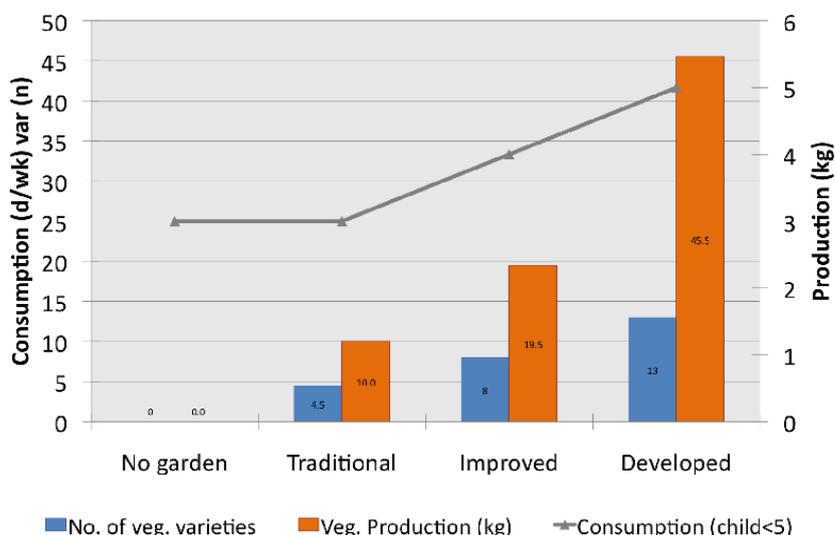


Table 1. Consumption of chicken liver and eggs in Bangladesh and Cambodia at baseline and end line

	Baseline		End line	
	%	N	%	N
<i>HH that consumed chicken liver within one-week of the survey</i>	24	720	46	720
<i>Median egg consumption within one week of the survey</i>				
Household	2	720	5	720
Mothers	1	254	1.5	402
Children	1	266	2	407

with seasonal gardens or no garden at all. These greater varieties and volumes of vegetables produced also impacted vegetable consumption by household members. Children living in households with developed gardens consumed a median of 13 types of vegetables in the week before the survey compared to a median of 4 types of vegetables consumed by children in households with traditional gardens during the same period. Moreover, children from a family with a developed garden ate vegetables 1.6 times more frequently than children from households with a traditional garden. The high variety and frequent consumption of vegetable was associated with higher intake of vitamin A rich foods such as green leafy and yellow and orange vegetables and fruits among

children from households with developed gardens compared to children from households with no garden or a traditional garden.

Impact on animal food consumption

Consumption of chicken liver and eggs by household members in program areas increased significantly from baseline to end line. Combined results from Bangladesh and Cambodia showed a 22% increase in the number of families that consumed chicken liver in the week before the survey. The median number of eggs consumed by families in the week before the survey also doubled. In line with this finding, the median number of eggs consumed by children and mothers in the week prior to the survey doubled between baseline and end line (Table 1). Eggs and chicken liver have high bioavailability of vitamin A, and chicken liver is also an excellent source of iron.

Income generation and utilization

Income generated from the sale of surplus vegetables, fruits and poultry products from HFPP increased among program households from baseline to end line in Cambodia and Bangladesh. In Cambodian household income earned from vegetables and fruits increased from average two-month earnings of US\$3.75 to US\$17.50 and income (over 2 months) from the sale of chicken and eggs increased from US\$9 to US\$9.75. Increases in income (over 1 month) in Bangladeshi households were much

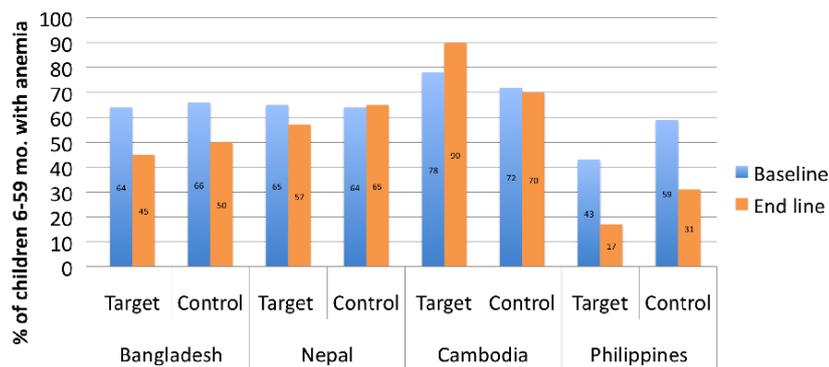
Table 2. Household (HH) uses of income earned from HFPP activities in Bangladesh and Cambodia at baseline and end line

Commodity	Bangladesh +		Cambodia*	
	Use of income from vegetable sales (%HH)	Use of income from poultry product sales (%HH)	Use of income from vegetable sales (%HH)	Use of income from poultry product sales (%HH)
Food	70	46	92	82
Education	30	26	1	3
Production	22	25	1	3
Clothes	14	22	0	3
Savings	11	24	0	0
Medicine	8	0	2	6
Housing	1	3	0	0
Social activities	1	3	1	2
Other	0	0	3	1

+ Over a two-month period; multiple responses were allowed

* Over a one-month period; HH selected only the primary item purchased or financed with surplus income

Fig. 3. Anemia prevalence among children aged 6-59 months from HFPP target and control households in Bangladesh, Cambodia, Nepal and the Philippines at baseline and end line



smaller but still doubled from an average of US\$0.62 to US\$1.25 for vegetable product sales and increased from US\$1.62 to US\$2.16 for poultry product sales. As demonstrated in past studies, the majority of income earned through HFPP is used to purchase additional food. More than two thirds (70%) of households in Bangladesh and 92% of households in Cambodia used the surplus income from sale of HFPP products to buy additional foods such as fish, beef, pork, chicken, rice and cooking oil for their households. The next most commonly mentioned uses of this surplus income were for children’s education, purchasing medicine and for investment in other activities such as reinvesting in the household’s food production activities (Table 2).

Impact on anemia among children 6-59 months

Anemia prevalence among children 6-59 months decreased in all HFPP communities in all four countries from baseline to end line (Fig 3). However, decrease in anemia prevalence was significant only in Bangladesh (63.9% at baseline compared to 45.2% at end line: (p<0.001))and the Philippines (42.9% at base-

line compared to 16.6% at endline (p<0.001)). Among control households, anemia prevalence among children remained unchanged in Nepal, decreased slightly in Cambodia, but showed significant decreases in Bangladesh and the Philippines (Fig 3). In all four countries, the magnitude of decrease in anemia prevalence among children was higher in program households compared to the control households, although the inter-group difference was not statistically significant.

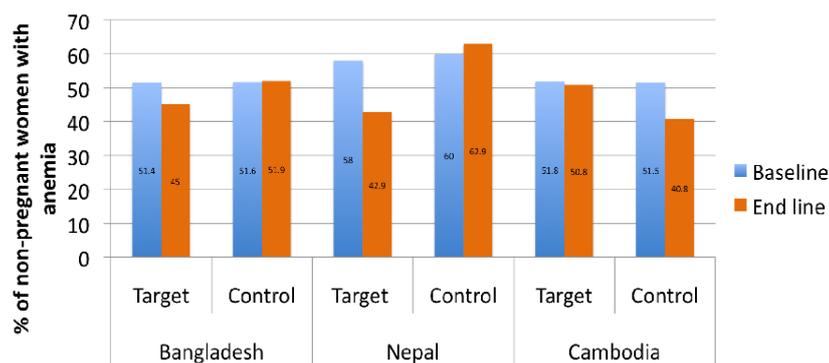
Impact on anemia among non-pregnant mothers of children 6-59 months

Anemia prevalence among non-pregnant mothers of children 6-59 months decreased by a magnitude of 26% (p<0.009) in Nepal and 12% (p<0.075) in Bangladesh between baseline and end line, while anemia prevalence remained relatively unchanged in control communities in both countries. There was however no significant change in anemia prevalence among non-pregnant mothers in either target or control communities in Cambodia (Fig 4).

Women’s Empowerment

Consolidated results from programs in Bangladesh, Cambodia and Nepal showed that at end line, women managed homestead food production activities in almost three quarters (73%) of beneficiary households. Through targeting women as HFPP managers, the program empowered women, giving them more control over household resources from the income generated from their homestead food production activities. In most of the HFPP communities, women decided which crops would be planted and when, which foods would be eaten at family meals, and how income earned from surplus produce would be spent. Such control over HFPP resources and income is likely a key factor in how the HFPP program has enhanced women’s participation in household decision-making. This also has a potential positive impact on overall household spending, food preparation, food choices and intra-household food allocation as well as care-seeking behavior of the women.

Fig. 4. Anemia prevalence among non-pregnant mothers of children 8-59 months from HFPP target and control households in Bangladesh, Cambodia and Nepal at baseline and end line



Conclusion

The HFPP increased diversity of vegetables and fruits at the household level both in terms of production and consumption. There was a positive association between the presence of a developed garden at the household with access to a greater variety of vegetables and fruits (kg) and increased consumption of such foods among children 6 to 59 months. In addition, the model improved consumption of animal products like chicken liver and eggs among participating households. Such increased dietary diversity is important to ensure adequate intake of essential vitamins and minerals for optimal growth and development, as liver and eggs are good sources of micronutrients and increasing dietary diversity is proven to improve micronutrient intake¹³. Findings suggest that HFPP successfully transfers knowledge on appropriate homestead production techniques and the importance of dietary diversity. In addition, income generated from HFPP also increased household access to other high quality foods since most households used the surplus income to purchase more food for the household. These findings suggest that HFPP offers multiple pathways for increasing the dietary diversity of household members and can therefore be a potential intervention for reducing macro- and micronutrient deficiencies.

The HFPP appears to have a positive impact on anemia in women and children 6 to 59 months. The model's impact on anemia reduction among children 6 to 59 months and non-pregnant women (mothers of these children) looks promising, as the magnitude of decrease in anemia prevalence among children was higher in target households compared to control households, although intergroup differences were not statistically significant. Greater decreases in anemia prevalence in women were also observed in target households in the two countries studied. Although not presented in this bulletin, the HFPP has been shown to improve vitamin A intake in children through increased consumption of vitamin A rich fruits and vegetables, as well as eggs and liver. A previous study in Bangladesh showed that the HFPP reduces the prevalence of night blindness, a clinical sign of vitamin A deficiency, in children 0-59 months who do not receive regular vitamin A



A woman in her garden in Nepal

capsules¹⁴.

The benefits of HFPP are not limited however to improving food security and nutritional status. By selecting women to manage HFPP activities the program empowers women to take responsibility for their families' consumption through production activities and educated consumption choices. This review of HKI's HFPP evaluation results showed significant changes in household dynamics after the introduction of the HFPP, as women are overwhelmingly the primary decision makers regarding production activities. Such changes have a positive impact on overall household spending, food preparation, food choices and intra-household food allocation as well as care-seeking behavior for women¹⁵. Through the HFPP, women who are usually the first in the household to sacrifice the quantity and quality of their own meals during financial strain are empowered and provisioned to increase their families' and their own access to and consumption of quality foods rich in micronutrients despite high prices and economic uncertainty. Thus HFPP becomes a coping strategy in times of stress and is also a potentially sustainable solution to combating hunger, poverty, and related negative health outcomes in poor and vulnerable households.

13 De Pee S, Bloem MW and Kiess L. Evaluating food-based programmes for their reduction of vitamin A deficiency and its consequences. *Food Nutrition Bulletin*. 2000; 21; 232-238.

14 HKI/Bangladesh. National vitamin A survey in Bangladesh. Helen Keller International/Bangladesh; 1999.

15 Bushamuka VN, de Pee S, Talukder A, Kiess L, Panagides D, Taher A and Bloem MW. Impact of a homestead gardening program on household food security and empowerment of women in Bangladesh. *Food Nutrition Bulletin*. 2005; 26: 17-25.

Some key points to consider

- In order to achieve nutrition results, HFPP must be an integrated comprehensive nutrition education and homestead food production intervention, as they work synergistically to increase household consumption of micronutrient rich foods, particularly among the more vulnerable household members.
- HFPP can complement programs aimed at improving gender equality through its positive effect on women's control of household resources and therefore indirectly impact on women's empowerment.
- HFPP is community-based and has the advantage of being economically feasible and culturally acceptable, making the model sustainable. Furthermore, the process empowers households to take ultimate responsibility over the quality of their diet through their own production of micronutrient rich foods and educated consumption choices.
- HFPP has the potential to improve dietary intake and nutritional status of preschool children and women through various pathways, and therefore can likely mitigate the impact of high food prices and economic instability on household food security and nutritional status of household members, particularly children and women. The HFPP model can conceivably contribute to the achievement of poverty reduction and act as a coping strategy for vulnerable households in time of stress as well.
- Given the demonstrated multiple benefits of the program, it is important that the program is expanded to reach other poor households as soon as possible. While expanding, it is important to design programs and program evaluations to better understand program impact and the pathways that lead to improvements in food security and nutritional outcomes. Additional data should be collected using appropriate designs, standardized tools and procedures for monitoring and evaluating the HFPP programs across countries wherever they are implemented so that evidence compels others to replicate the model or similar models that marry nutrition and agriculture for the nutrition and food security benefit of poor households.

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