

# Homestead Food Production with or without Aquaculture Improves Women's Dietary Diversity, Household Food Security and Income in Prey Veng Province, Cambodia

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## Background

- 80% of Cambodian households experience some form of poverty, and 20% are severely impoverished.<sup>1,2</sup>
- There is an urgent need to develop more diverse and environmentally sustainable food production systems.
- Helen Keller International has implemented a program of Homestead Food Production (HFP) in Cambodia, and elsewhere.
- HFP fosters year-round production of nutrient-rich fruits, vegetables and animal-source foods.
- No rigorous studies on the efficacy of HFP in improving nutritional outcomes.<sup>3,4</sup>

## Objectives

Determine the impact of plant-based HFP with or without fishponds on women's dietary diversity, household food security, and income in Prey Veng province, Cambodia.

## Methods

This was a three-arm cluster randomized control trial; 900 households in 90 villages were randomized to one of three groups:

- plant-based HFP only
- plant-based HFP plus fishponds (HFP+F)
- control

Surveys at baseline and end-line assessed:

- Individual Dietary Diversity Score (IDDS)<sup>5</sup>
- Food security using the Household Food Insecurity Access Scale (HFIAS)<sup>6</sup>
- Money earned from selling HFP outputs in last 2 months

Women were categorized into one of three groups based on their IDDS score:

- Low ( $\leq 3$  food groups in the previous 24 hours)
- Medium (4 or 5 food groups)
- High ( $\geq 6$  food groups)

Households were categorized to one of four groups according to their degree of food security from food secure to severely food insecure. Data were analyzed as intent-to-treat. Missing values were handled using the maximum likelihood method, which takes all available data for each subject to construct the maximum likelihood function and estimates parameters in relevant models. To address the clustering effect, changes from baseline to endpoint were analyzed using generalized linear mixed models with multinomial distribution, using cumulative logit link for categorical variables.

## Results

**Table 1. Unadjusted baseline characteristics of households and women by treatment group**

	Control (n=300)	HFP (n=300)	HFP+F (n=300)
<b>Households</b>			
Size, mean $\pm$ SD	4.8 $\pm$ 1.6	4.6 $\pm$ 1.5	4.6 $\pm$ 1.5
Wealth Index Quintiles, n (%)			
Lowest	78 (26.0)	53 (17.7)	49 (16.3)
Second	59 (19.7)	60 (20.0)	58 (19.3)
Middle	54 (18.0)	62 (20.7)	67 (22.3)
Fourth	67 (22.3)	51 (17.0)	58 (19.3)
Highest	42 (14.0)	74 (24.7)	68 (22.7)
<b>Women</b>			
Age, yrs, mean $\pm$ SD	29.6 $\pm$ 6.7	29.8 $\pm$ 6.5	29.4 $\pm$ 6.3
Underweight, (BMI < 18.5 kg/m <sup>2</sup> ), n (%)	46 (16.6)	37 (13.4)	40 (14.2)
Parity, n (%)			
1 child	108 (36.0)	98 (32.7)	110 (36.7)
2-3 children	142 (47.3)	148 (49.3)	145 (48.3)
$\geq 4$ children	50 (16.7)	54 (18.0)	45 (15.0)
Children < 5yrs, mean $\pm$ SD	1.2 $\pm$ 0.5	1.3 $\pm$ 0.5	1.2 $\pm$ 0.4
Completed years of school, mean $\pm$ SD	3.8 $\pm$ 2.9	4.6 $\pm$ 2.6	3.8 $\pm$ 3.0

Pregnant women included: Values are mean  $\pm$  SD, n (%). HFP: Homestead Food Production; garden only; HFP+F: Homestead Food Production plus pond; BMI: body mass index; Wealth index is a weighted estimate of the economic status of a household based on ownership of assets such as agricultural produce, vehicle, TV/DVD player, boat, bicycle, refrigerator, diesel generator, type of cooking fuel (kerosene, wood, electricity, natural gas), bicycle, and other assets; parity, number of children ever born; underweight, weight for height < 10.4 kg/m<sup>2</sup>; completed years of school, number of formal and non-formal schooling years (migrant, hand pump, tap water, rainwater, bought water for drinking, a slow release fertilizer, cow/buffalo pig, chicken, duck).

- HFP and HFP+F groups more likely to have consumed  $\geq 6$  foods groups vs 4-5 food groups and  $\leq 3$  when compared to control group (OR: 2.28 95% CI: 1.38-3.77; P<0.001; and OR: 1.85, 95% CI: 1.13-3.05; P=0.015, respectively).
- HFP+F group were more likely (OR: 1.73; 95% CI: 1.02-2.94) to be food secure as compared to control (P=0.044)
- Similar non-significant trend among HFP group when compared to control (OR: 1.34, 95% CI: 0.79-2.27; P<0.282) for food security measures.
- Income (USD) from HFP 30.0 and 39.3 times greater in HFP and HFP+F groups, when compared to control (P< 0.001).

**Table 2. Women's dietary diversity score and level of household food security by treatment group**

	Control n (%)	HFP n (%)	HFP Effect <sup>1</sup> OR (95% CI)	P value	HFP+F n (%)	HFP Effect <sup>1</sup> OR (95% CI)	P value
<b>Levels of Household Food Insecurity</b>							
<b>Baseline</b>							
Food Secure	48 (16.0)	61 (20.3)	---	---	57 (19.0)	---	---
Mildly Food Insecure	90 (30.0)	104 (34.7)	---	---	101 (33.7)	---	---
Moderately Food Insecure	114 (38.0)	103 (34.3)	---	---	116 (38.7)	---	---
Severely Food Insecure	48 (16.0)	32 (10.7)	---	---	26 (8.7)	---	---
<b>End-line</b>							
Food Secure	43 (24.0)	48 (26.0)	1.34 (0.79-2.27)	0.282	64 (34.0)	1.73 (1.02-2.94)	0.044
Mildly Food Insecure	66 (36.9)	89 (48.1)	---	---	70 (37.2)	---	---
Moderately Food Insecure	55 (30.7)	40 (21.6)	---	---	47 (25.0)	---	---
Severely Food Insecure	15 (8.4)	8 (4.3)	---	---	7 (3.7)	---	---
<b>Women's Dietary Diversity</b>							
<b>Baseline</b>							
Low ( $\leq 3$ food groups)	97 (32.3)	83 (27.7)	---	---	90 (30.0)	---	---
Medium (4 - 5 food groups)	175 (58.3)	194 (64.7)	---	---	177 (59.0)	---	---
High ( $\geq 6$ food groups)	28 (9.3)	23 (7.7)	---	---	33 (11.0)	---	---
<b>End-line</b>							
Low ( $\leq 3$ food groups)	37 (20.7)	21 (11.35)	---	---	19 (10.1)	---	---
Medium (4-5 food groups)	100 (55.9)	96 (51.89)	---	---	115 (61.2)	---	---
High ( $\geq 6$ food groups)	42 (23.46)	68 (36.76)	2.28 (1.38-3.77)	0.001	54 (28.7)	1.85 (1.13-3.05)	0.015

HFP: Homestead Food Production; garden only; HFP+F: Homestead Food Production plus pond; OR: Odds Ratio; 95% CI: 95% Confidence Interval; HFP Effect<sup>1</sup>: HFP and control groups when multivariate logit function is fitted to food security levels and dietary diversity levels from generalised linear mixed models adjusted for baseline clustering; HFP Effect<sup>2</sup>: HFP+F and control groups when multivariate logit function is fitted to food security levels and dietary diversity levels from generalised linear mixed models adjusted for baseline clustering; HFP Effect<sup>3</sup>: HFP and control groups when multivariate logit function is fitted to food security levels and dietary diversity levels from generalised linear mixed models adjusted for baseline clustering.

## Conclusions

HFP with or without fishponds is an efficacious means of improving women's dietary diversity, household food security and livelihoods of poor, rural women farmers' in Prey Veng province, Cambodia.

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