FISH ON FARMS

INTEGRATION OF SMALL-SCALE AQUACULTURE WITH HOMESTEAD FOOD PRODUCTION FOR IMPROVED HOUSEHOLD FOOD SECURITY & NUTRITION IN RURAL CAMBODIA

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A Cluster Randomized Controlled Trial On The Effect Of Plant Based Homestead Food Production (HFP) With And Without Small-Scale Aquaculture On Nutritional Outcomes In Rural Cambodia

Limitations of Agricultural Interventions

- Lack of adequate control
- Lack of statistical power
- Lack of baseline surveys
- Lack of proper outcomes
  - Lack of biochemical indicators beyond hemoglobin and serum retinol
  - Poor measures of dietary intake
- Insufficient duration

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Research Objective

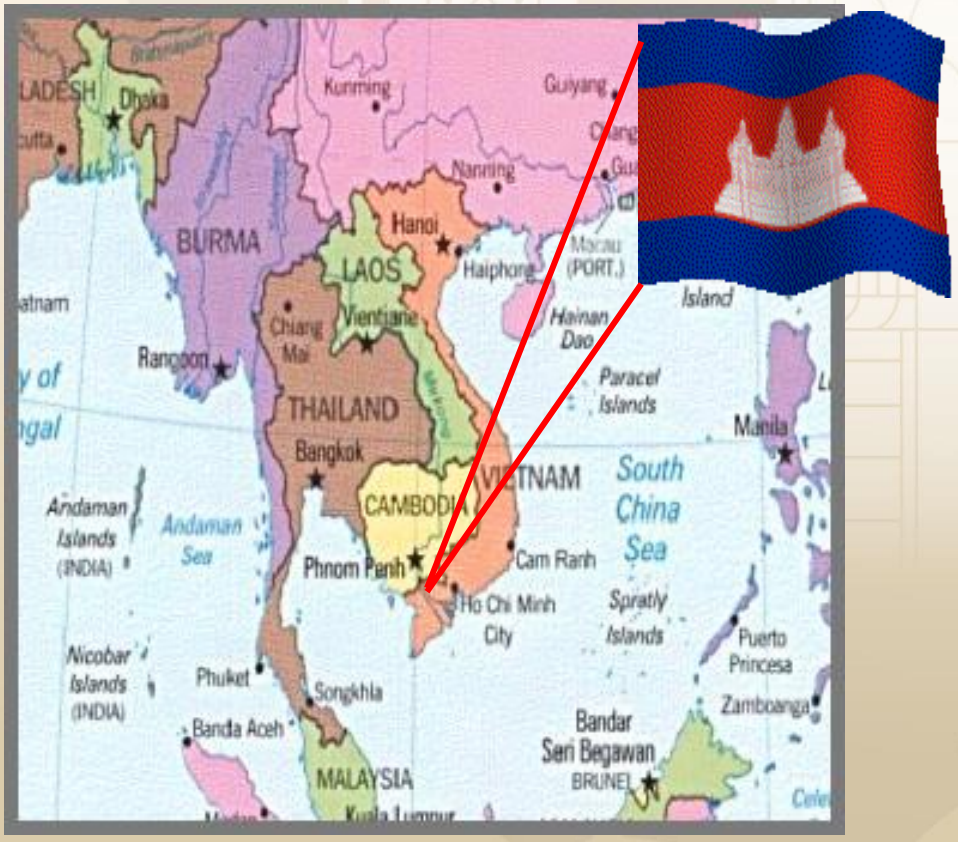
To improve household food security and nutrition outcomes, livelihoods and women's empowerment through an integrated homestead food production model.

Objective

To demonstrate the effectiveness of HFP with and without aquaculture using a cluster- randomized controlled trial

Emphasis on Women and Young Children

Cambodian Key Demographics



- **Population: 14 million**
- **Life Expectancy: 64 (female), 61 (male)**
- **Provinces: 24**
- **Villages: 14,073**
- **Health Centres: 960**
- **Hospitals: 82**
- **47% households with access to safe water**

Background: Food Security

Cambodia is RICE secure

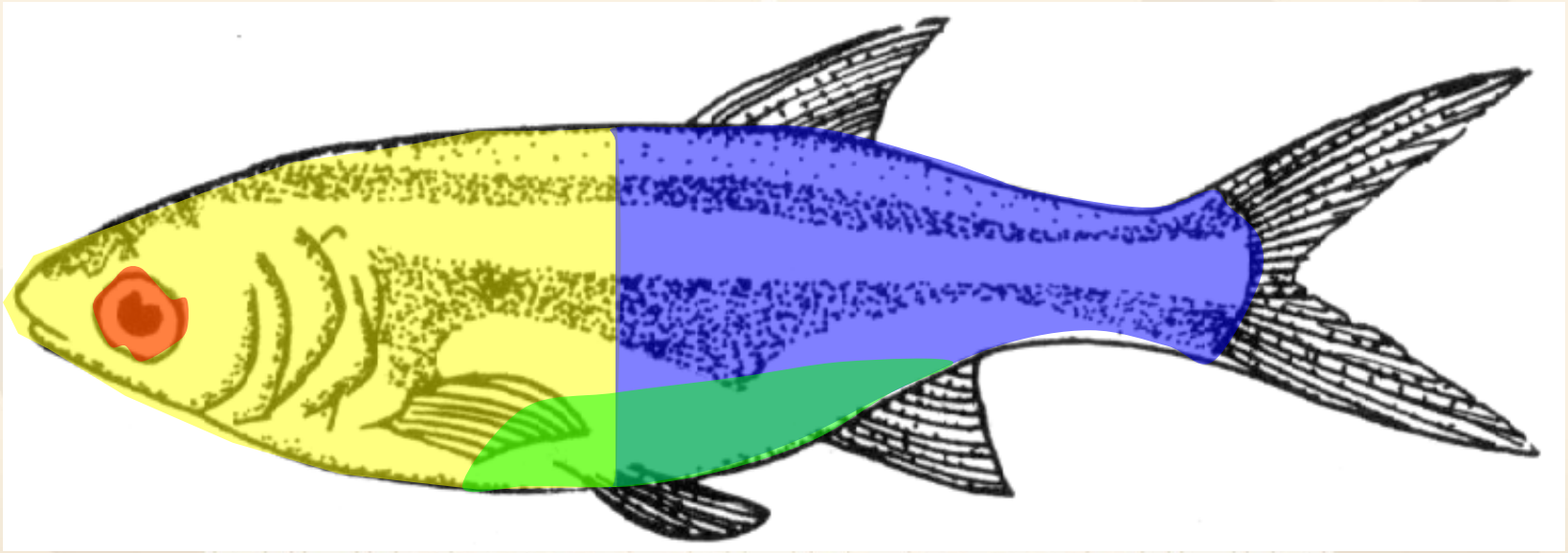
- 5% of children <5 years die
  - 30% due to undernutrition
- 40% of children <5 years are stunted
- 55% of children <5 years are anemic
- 44% of women are anemic

Why Fish Ponds?

Vitamin A, calcium and iron content in some small and large fish (per 100 g raw edible parts)

Fish species	Vitamin A (µg)	Calcium (mg)	Iron (mg)
Small fish, whole			
Mola (*A. mola*)	1,960±214	1,071±41	7±4
Darkina (*E. danricus*)	1,457	-	-
Dhela (*O. cotio*)	937	1,260	-
Chanda (*Chanda* sp.)	341	1,162	-
Kaski (*C. soborna*)	93±8	-	-
Punti (*Puntius* sp.)	37±16	1,059±161	-
Large fish, adult			
Hilsa (*Hilsa ilisha*)	69	126	3
Rohu (*Labeo rohita*)	27	317	-
Silver carp (*H. molitrix*)	17	268	-
Tilapia (*O. niloticus*)	19±15	-	5

Source: Thilsted *et al.* (1997)



53 %

7 %

39 %

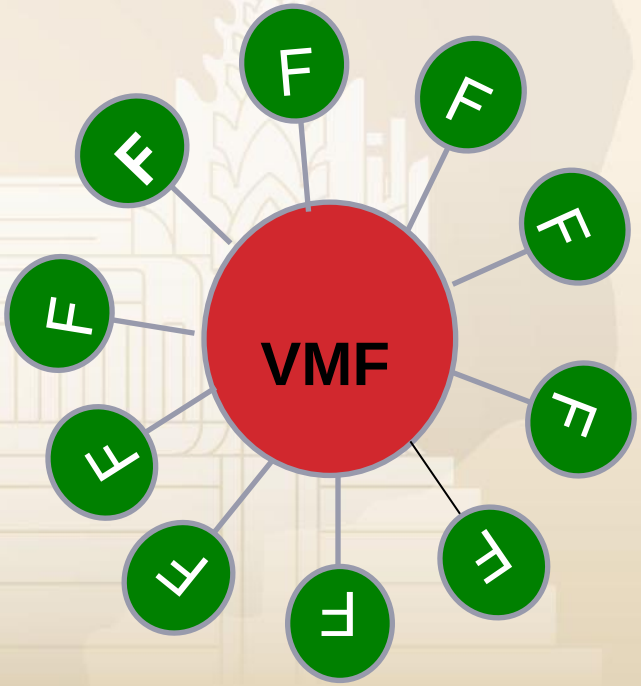
1 %

Vitamin A content in mola: 2,680 Retinol Activity Equivalent (RAE)/ 100 g raw, edible parts

Selection of Fish Species

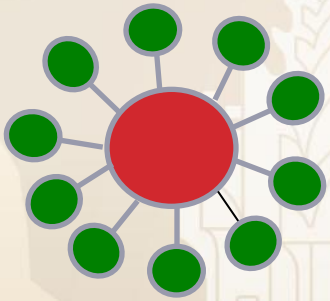
Type of culture	Species	Stocking density (Number/100 m^2)	Comments
Carp-small fish Polyculture	*Barbonymus gonionotus*	70	3-4 cm
	Hypophthalmichthys molitrix	80	5-6 cm
	Labeo rohita	100	5-6 cm
	Cirrhinus cirrhosus	80	5-6 cm
	Esomus longimanus *Trichopsis vittata* *Rasbora aurotaenia*	400 gm	

Study Design

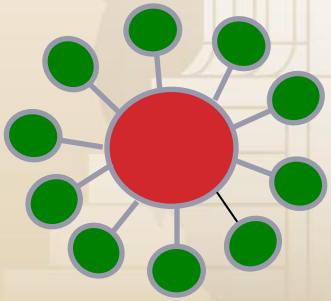


Cluster:
1 Village Model Farm
10 Village Farmers

Study Design (N=990 households)



n=30



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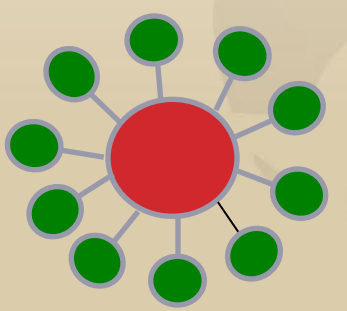
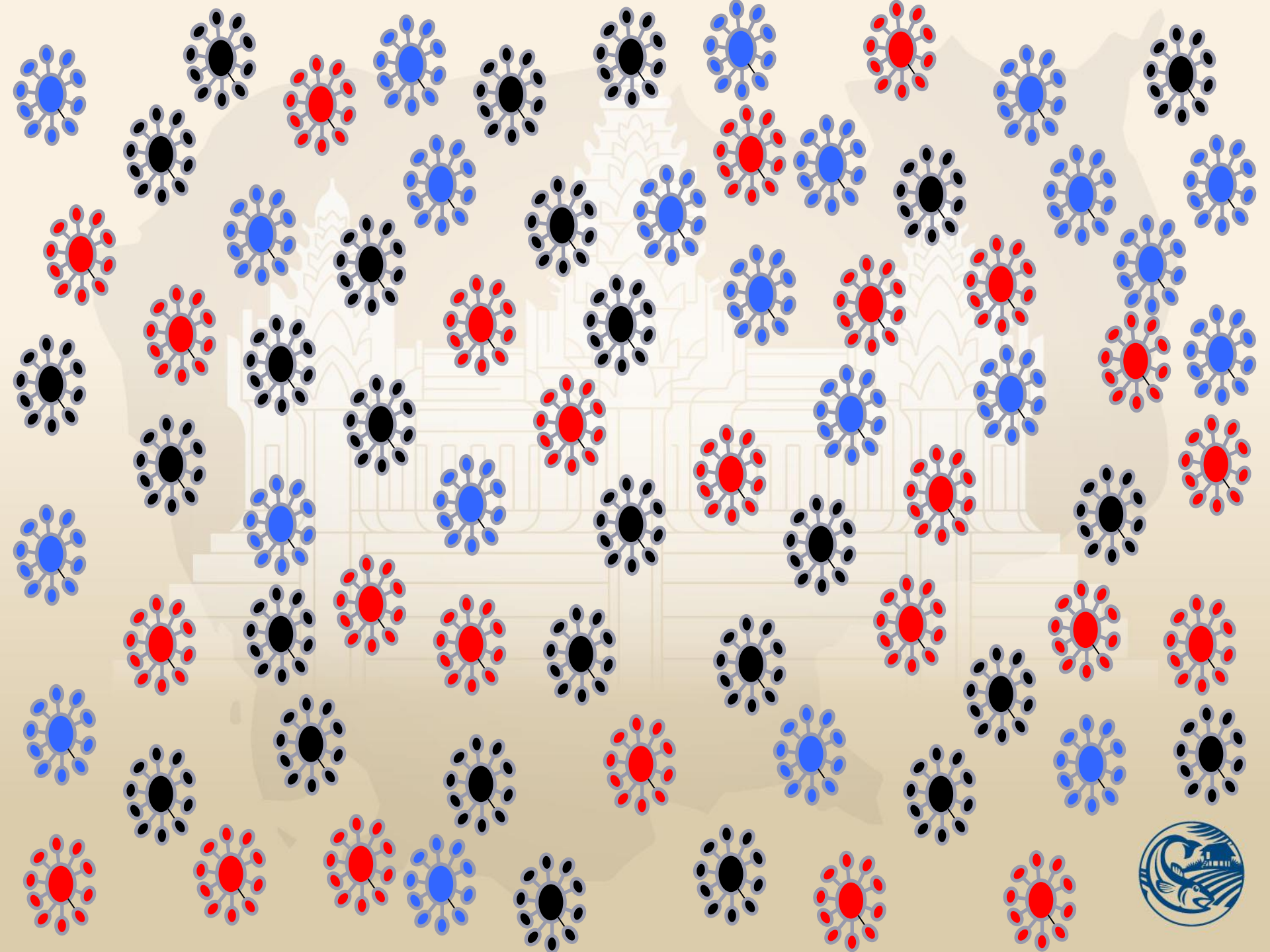


n=30 Comparison Arm

Total = 990 beneficiaries



Study Design

Household Inclusion Criteria:

- Represented by a woman
- Fall within the “poor” category
- Have access to land
- Have a child <5 years of age
- Have suitable land for pond

Outcomes

- Income
  - All sources of income
- Diet composition/ diversity
  - Food production
  - HDDS

Short term Outcome – Dietary Intake

- 24 hour recall on mother and youngest child under five
  - Measurement of nutritional composition of fish

Medium term Outcome – Biochemical assessment

- Hemoglobin
- Ferritin/ CRP
- Transferrin saturation
- Hemoglobinopathies
- Vitamin B12
- Retinol Binding Protein
- Thiamin and riboflavin
- Zinc
- Fatty acids

Only on 450 women
Hemocue on children

Long term Outcome – Anthropometrics

- Height
- Weight
- Stunting
- Wasting
- Study will not be long enough to assess changes

Other Components

- Environment
- BCC
- Hygiene and Sanitation
- Fisheries Technology (mixed pond aquaculture)
- **Gender**
- Cost/Benefit

Newly constructed pond

Newly constructed pond

Newly constructed pond

Newly constructed pond

Fish pond and garden

– Establishment of Community-based support services system – Village Model Farm, Nursery ponds and Hatchery

“A Fishpond in Every Cambodian Household”

- Small and large fish (polyculture) raised together
- Evidence
  - Income generation
  - Increased production
  - Increased consumption
  - Increased women’s empowerment
  - Improved nutrition??
- Include polyculture in government fisheries strategy

Preliminary Results

Figure 1. Homestead gardens

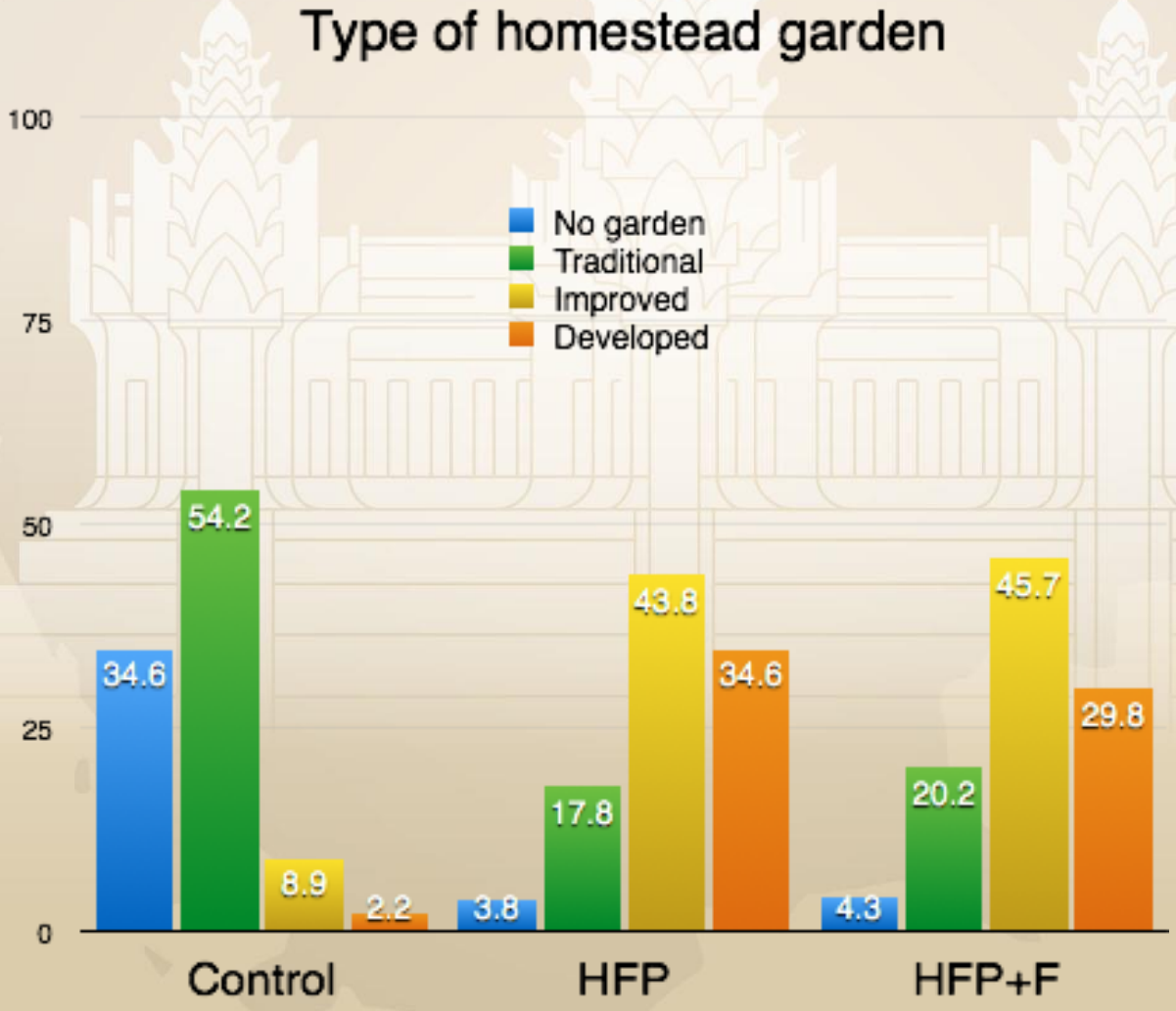


Figure 2. Food Security

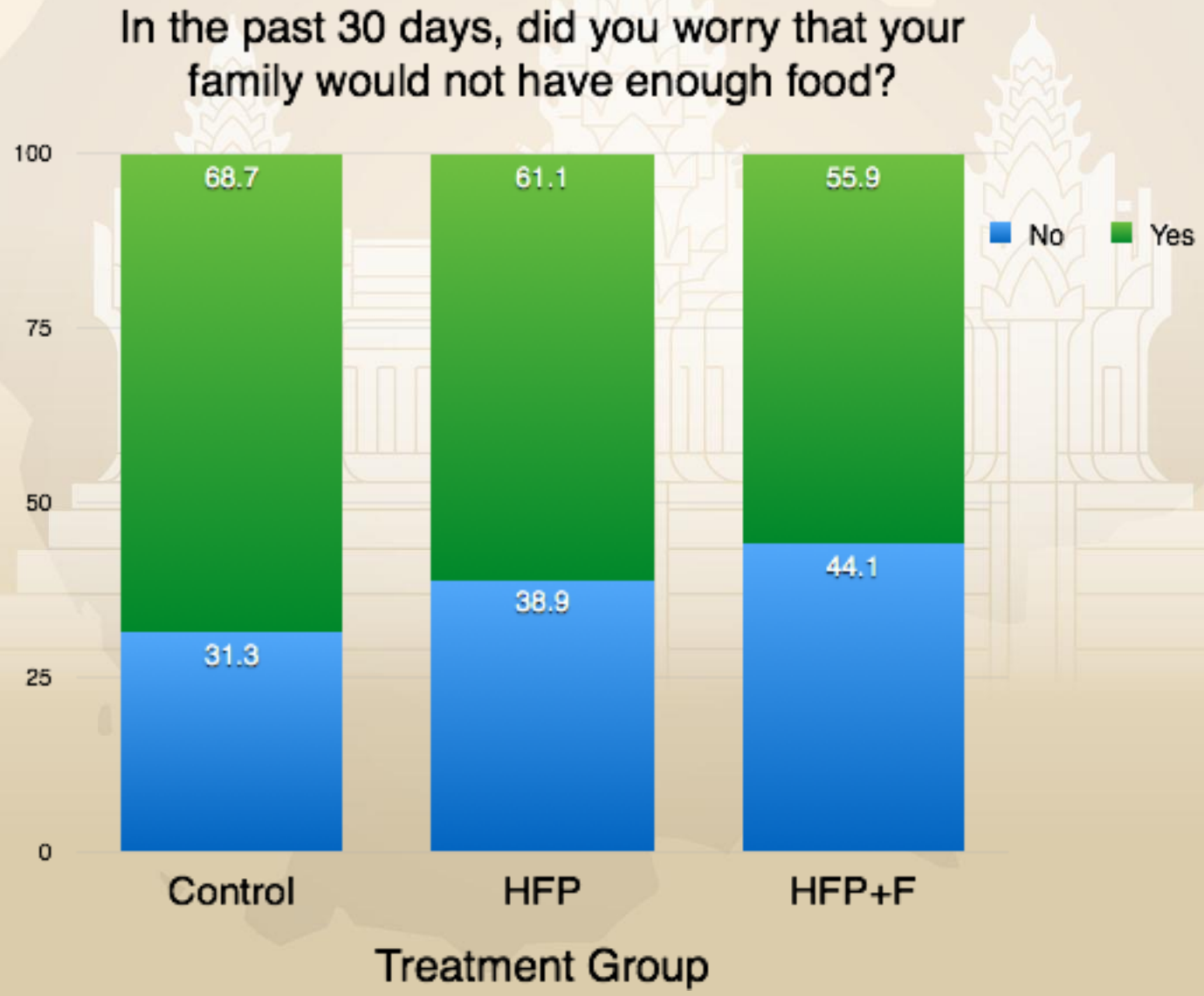


Table 2. Money earned from fruit & veg produced in homestead garden

	Control			HFP			HFP+F		
	n	Mean	Range	n	Mean	Range	n	Mean	Range
Money earned (USD)	179	1.10	0 – 77.50	185	8.22	0 – 130.50	188	12.05	0 – 375.00

Table 9. Average Household Food Security Access Score by treatment group

	mean ± SD	Range
Control	3.9 ± 3.33	0—16
HFP	3.2 ± 2.74	0—14
HFP+F	2.9 ± 2.79	0—16
Total	3.3 ± 2.98	0—16

Table 10. Household income (USD)

	Control			HFP			HFP+F			Total		
	n	mean ± SD	Range	n	mean ± SD	Range	n	mean ± SD	Range	N	mean ± SD	Range
HH income: home garden (2 mo)	27	8.7 ± 14.72	0.75—77.50	130	17.8 ± 22.47	0.75—130.50	121	24.1 ± 49.50	0.38—375	278	19.7 ± 36.59	0—750
HH income: fish (2 mo)	54	4.5 ± 14.93	0—75.00	92	3.5 ± 11.51	0—75.00	249	11.8 ± 52.61	0—750	395	8.9 ± 42.63	0.38—375

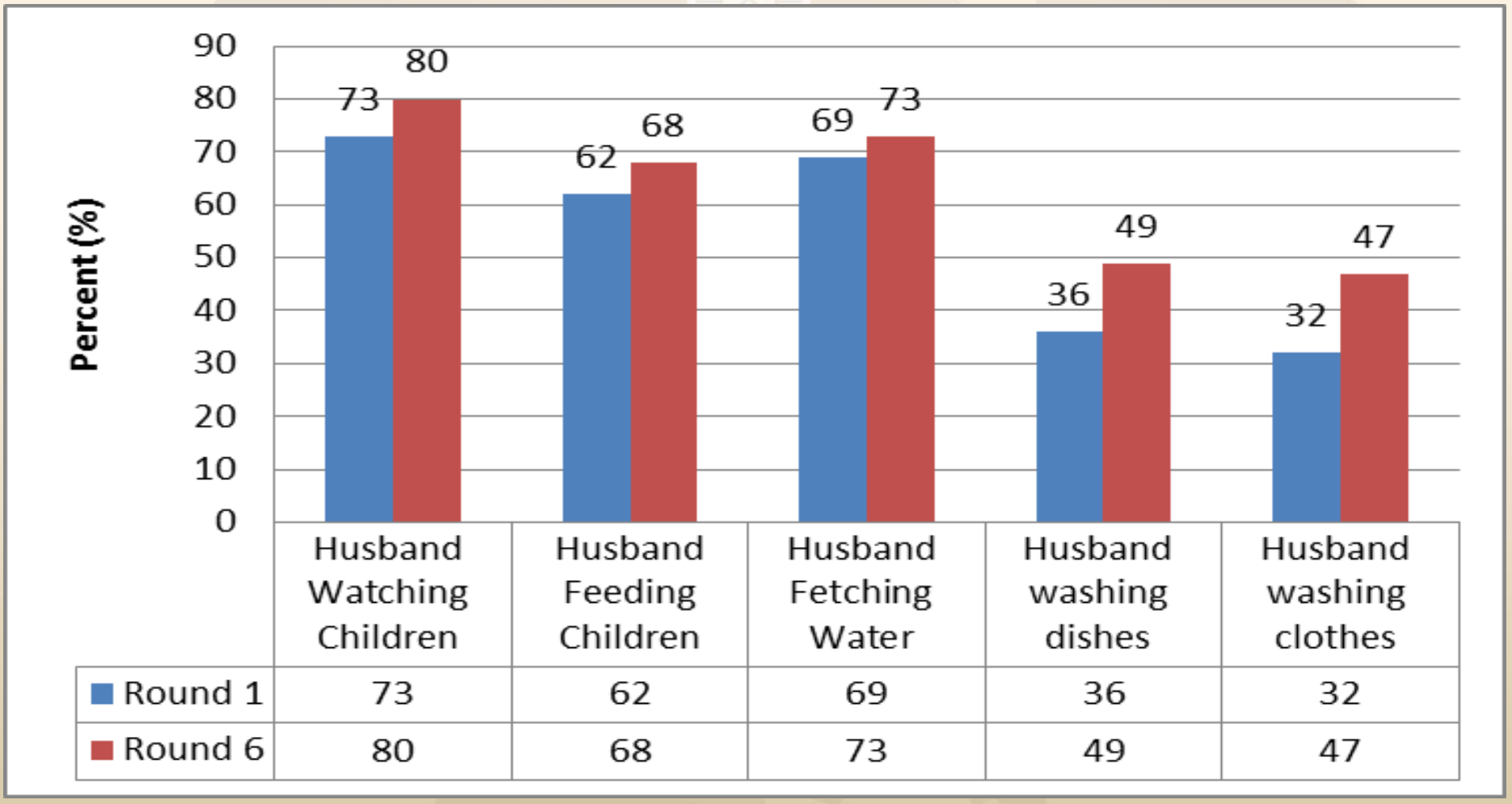
Empowering Women

Women report improved confidence in spending decisions (40%)

Income earned used for food, seeds and children's education

As a result of men's gender training women report men share housework more (30%)

Husband Shared Tasks with Wife (Round 1 vs. 6)



	Husband Watching Children	Husband Feeding Children	Husband Fetching Water	Husband washing dishes	Husband washing clothes
Round 1	73	62	69	36	32
Round 6	80	68	73	49	47

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Thank you!