



# Cambodia HARVEST Aquaculture Program Evaluation

## Research Team

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# Cambodia HARVEST Aquaculture Program Evaluation



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- Fish is a major protein source for Cambodian people.
- Cambodians are among the highest consumers of freshwater fish in the world (per capita fish consumption estimated at 52.4 kg/year).
- Growing concern that declining natural fish catches will have immediate consequences for rural food security.

## Cambodia HARVEST Aquaculture Program Evaluation

- Pond aquaculture occurs in Kandal and Phnom Penh provinces in Southern Cambodia
- Small-scale pond aquaculture has the potential to yield profitable results
- It has the potential to enhance the sustainability of rural livelihoods in the Tonle Sap region by providing rural smallholders a key source of **protein** and **household income** to vulnerable populations.
- **Cambodia/HARVEST initiated in 2011**
- **Aquaculture is a major component of Cambodia HARVEST**

## Evaluation Objectives

- Identify and characterize aquaculture clients
- Understand how aquaculture technologies are being promoted
- Assess potential for adoption of aquaculture technology
- Identify the barriers and constraints to aquaculture technology adoption
- Ascertain opinions about technical support from Cambodia/HARVEST

# Study Design

## Part A: Qualitative Study

Focus Group Discussions -- to understand the operation and management of aquaculture program.

## Part B: Quantitative Study

Household survey using stratified cluster sample:

Pursat: 15 clusters

Battambang: 15 clusters

Siem Reap: 7 clusters

Kampong Thom: 8 clusters

## Part A: Focus Groups – Research questions

- How are small-scale aquaculture technology adoption patterns evolving? What is the level of continued practice of small-scale pond aquaculture by farmers after they complete the HARVEST interventions?
- What are the main challenges associated with small-scale pond aquaculture? What are the barriers to adoption of small-scale pond aquaculture technologies?
- What are the perceived needs of farmers to increase aquaculture production and income? What are the main challenges associated with increasing aquaculture production and income?
- Who provides aquaculture extension services to farmers? How adequate are these services?
- What are the major sources and channels of information used by farmers? What information sources are credible?

## Focus Groups – Data Collection

- One focus group discussion in each of the four target provinces in February 2015

Province	Clients	Graduated	Active	Fish seed producer	Community fishery members
Pursat	8	2	5	0	1
Battambang	11	7	3	1	0
Siem Reap	9	2	4	1	2
Kampong Thom	7	2	4	1	0
total	35	13	16	3	3



## Part B: Household Survey – Research Questions

- What are the characteristics of HARVEST client households?
- What are the primary sources of information and extension services?
- What are the primary drivers of adoption of small-scale aquaculture practices?
- What are the barriers to adoption of small-scale aquaculture practices?
- What are the primary reasons for disadoption of aquaculture practices?

## Household Survey - Sample Selection

- Study Population: 1,571
- Aquaculture clients 45 clusters (villages) with 10 households each would provide a sample to detect MDES of  $.35*SD$  with a statistical power of 80% (i.e., Beta=0.8)
- 45 out of 211 clusters were selected using proportional random sample within each province
- 10 Households randomly selected from each cluster. Some clusters included more than one village
- A total sample of 450 clients/households was included in the study

# Survey Questionnaire Development

- Draft was developed based on literature and Cambodia HARVEST reports
- Focus Group Discussions results conducted in mid-February were integrated
- Questionnaire was translated into Khmer
- It was reviewed by a panel of experts

## Selection and Training of Enumerators

- Ten senior/junior students from Fishery Faculty of RUA were recruited to be enumerators
- They received training on fieldwork (July 4 and 5)

# Field Data Collection

July 18 – 26, 2015

- Enumerator Organization: 2 teams (one team = 5 enumerators + 1 team leader)
- For Pursat and Battambang provinces—both teams work together from Battambang
- Team 1 -- Siem Reap
- Team 2 -- Kompong Thom

# Survey Data Collection



# Survey Data Collection



# Survey Data Collection





# Fieldwork



# Fieldwork



# Survey Data Collection



# Data Entry and Data Cleaning

- Data entry template: Microsoft Access
- Data were entered by two staff: RUA and RUPP
- Data were cleaned by examining frequency, cross-tab, and cross-checking hard copy data
- 11 HHs declined to be interviewed, 2 indicated never participating in Cambodia HARVEST, and 1 raised fish on his own.
- A total sample of 436 was used for data analysis

## Findings: Aquaculture Clients

Province	Poor 1		Poor 2		Non-Poor		Total (N)
	Frequency	Percent	Frequency	Percent	Frequency	Percent	
Battambang	12	8.60%	11	7.9%	116	83.5%	139
Kampong Thom	1	1.30%	5	6.3%	74	92.5%	80
Pursat	12	8.10%	11	7.4%	125	84.5%	148
Siem Reap	0	0.00%	8	11.6%	61	88.4%	69
<b>Total</b>	<b>25</b>	<b>5.70%</b>	<b>35</b>	<b>8.0%</b>	<b>376</b>	<b>86.2%</b>	<b>436</b>

Province	Poor		Non-Poor		Total (N)
	Frequency	Percent	Frequency	Percent	
Battambang	23	16.5%	116	83.5%	139
Kampong Thom	6	7.5%	74	92.5%	80
Pursat	23	15.5%	125	84.5%	148
Siem Reap	8	11.6%	61	88.4%	69
<b>Total</b>	<b>60</b>	<b>13.8%</b>	<b>376</b>	<b>86.2%</b>	<b>436</b>

## Household Characteristics

Province	Household Size		Children < 14 years		Female HH Head		Average age of HH Head	HH head attended school
	Freq.	Average	Percent	Average	Freq.	Percent		
<b>Battambang</b>	137	6.11	79.6%	2.1	13	9.6%	48.43	86.8%
<b>Kampong Thom</b>	80	5.91	80.0%	1.9	5	6.3%	46.26	96.3%
<b>Pursat</b>	148	5.48	65.5%	1.9	21	14.3%	46.07	93.9%
<b>Siem Reap</b>	69	5.20	73.9%	2.1	7	10.9%	44.95	87.5%
<b>Total</b>	434	5.71	74.0%	2.0	46	10.8%	46.69	91.1%

# Household Assets

Type of Assets	Poor		Non-Poor		Total	
	Percent	Average	Percent	Average	Percent	Average
Mobile phone	90%	2.2	97%	2.7	96%	2.6
Radio	30%	1.1	41%	1.1	62%	1.1
Television	60%	1.2	84%	1.1	24%	1.1
Bicycle	80%	1.8	86%	1.6	85%	1.7
Motorbike	55%	1.2	89%	1.3	84%	1.3
Car or truck	2%	1.0	11%	1.1	10%	1.1
Solar panel	2%	1.0	14%	1.1	12%	1.1
Improved cooking stove	25%	1.2	27%	1.4	27%	1.4
Refrigerator	0%		2%	1.0	2%	1.0
Sofa	0%		1%	1.0	1%	1.0
<b>Total (N)</b>	<b>60</b>		<b>376</b>		<b>436</b>	

## Household Assets -- Livestock

Type of Livestock	Poor		Non-Poor		Total	
	Percent	Average (SD)	Percent	Average (SD)	Percent	Average (SD)
Cattle	35%	3.1 (2.0)	53%	4.1 (3.4)	51%	4.0 (3.3)
Buffalo	8%	1.2 (0.4)	8%	3.0 (1.5)	8%	2.7 (1.5)
Pigs	20%	2.2 (1.2)	25%	6.9 (10.6)	24%	6.3 (10.1)
Chicken	82%	14.5 (16.2)	87%	19.8 (58.3)	86%	19.1 (54.7)
Ducks	28%	25.8 (48.2)	28%	73.8 (267.6)	28%	67.1 (249.3)
Other (goose)	0%	<i>n.a.</i>	4%	4.2 (4.2)	3%	4.2 (4.2)
<b>Total Number (N)</b>	<b>60</b>		<b>376</b>		<b>436</b>	



## Source of Household Income

	Primary source		Secondary source	
	Poor	Non Poor	Poor	Non Poor
Sales	11.7%	6.4%	26.7%	17.6%
Sales of rice from own farm	25.0%	44.4%	5.0%	19.7%
Sales from vegetable gardens	16.7%	13.0%	18.3%	16.0%
Wage labor	23.3%	10.6%	21.7%	11.7%
Small business/self employed	8.3%	15.2%	8.3%	13.3%
Remittances	8.3%	2.4%	3.3%	3.7%
Retirement funds	3.3%	1.6%	0.0%	0.3%
Salary	1.7%	2.7%	0.0%	0.5%
Sales of other crops	1.7%	2.1%	6.7%	2.7%
Sales of livestock	0.0%	1.1%	6.7%	13.6%
Others	0.0%	.5%	3.3%	0.8%
<b>Total Number (N)</b>	<b>60</b>	<b>376</b>	<b>60</b>	<b>376</b>

## Household Participating in HARVEST Activities

<b>Wealth Group</b>	<b>Poor (N=60)</b>	<b>Non-Poor (N=376)</b>	<b>Total (N= 436)</b>
Aquaculture	100.0%	100.0%	100.0%
Horticulture	46.7%	38.0%	39.2%
Rice Production	8.3%	18.1%	16.7%

## Fish Production During the Last 12 Months

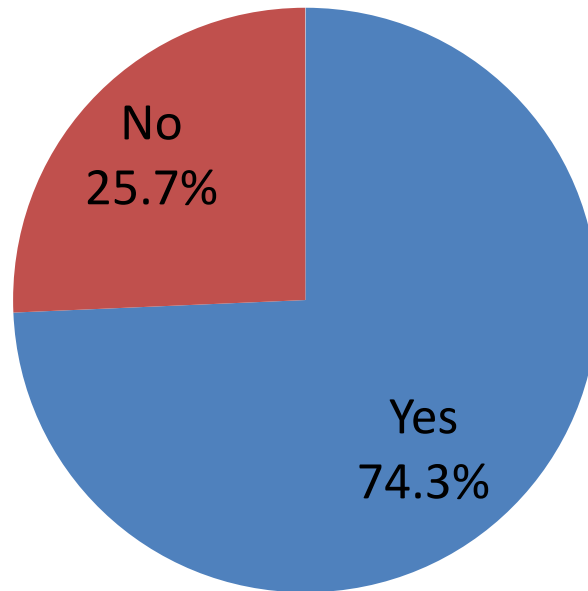
Wealth Group	Farmers currently raising fish		Number of cycles	Fish produced in last 12 months (kg)	Pond size (m <sup>2</sup> )
	Freq.	Percent	Average	Average (SD)	Average (SD)
Poor	50	83.3%	1.64	607.0 (645.4)	342.3 (326.8)
Non-Poor	274	72.9%	1.63	524.9 (542.8)	355.6 (690.3)
Total	324	74.3%	1.63	537.4 (559.4)	353.5 (647.3)

Province	Farmers currently raising fish		Number of cycles	Fish produced in last 12 months (kg)	Average pond size (m <sup>2</sup> )
	Freq.	Percent	Average (SD)	Average (SD)	Average (SD)
Battambang	108	77.7%	1.69 (0.68)	581.0 (582.4)	382.0 (324.6)
Kampong Thom	58	72.5%	1.55 (0.54)	384.3 (468.4)	238.3 (270.9)
Pursat	107	72.3%	1.71 (0.73)	545.2 (499.1)	272.2 (424.3)
Siem Reap	51	73.9%	1.43 (0.67)	602.0 (693.2)	595.1 (1387.5)
Total	324	74.3%	1.63 (0.68)	537.4 (559.4)	353.5 (647.3)

## Household Income from Fish Production

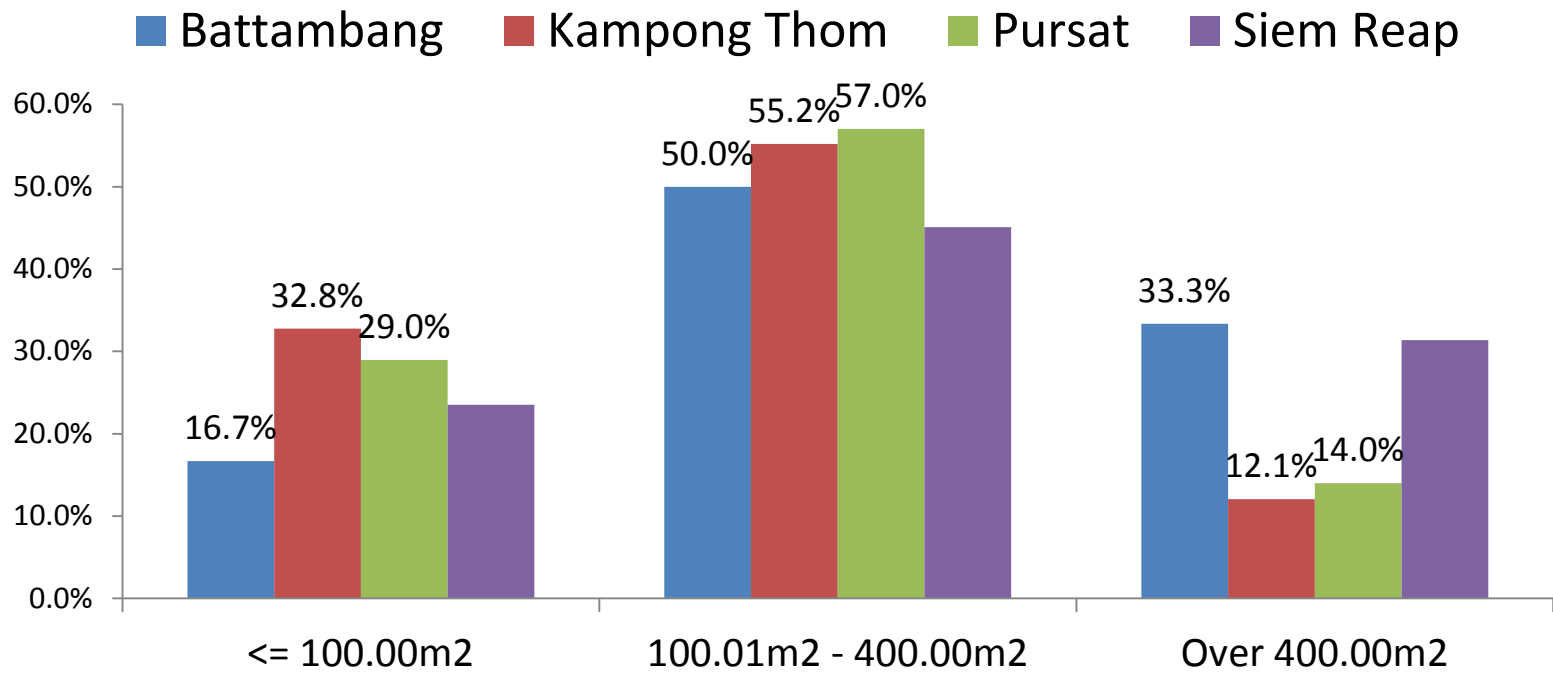
<b>Income</b>	<b>Poor (N=60)</b>	<b>Non-Poor (N=376)</b>	<b>Total (N= 436)</b>
Almost all	3.3%	2.7%	2.8%
Most of it	20.0%	16.8%	17.2%
Some of it	38.3%	43.4%	42.7%
A small amount	26.7%	26.9%	26.8%
None	11.7%	10.4%	10.6%

Does the household currently raise fish? (N=436)



Those who said yes indicated farming 1.63 cycles  
Those who said no indicated farming 1.4 cycles

# Households by size of fish pond (N=324)



## Fish produced by pond size (N=315)

Province	<= 100.00m <sup>2</sup>		100.01m <sup>2</sup> - 400.00m <sup>2</sup>		Over 400m <sup>2</sup>		Total	
	Freq.	Average	Freq.	Average	Freq.	Average	Freq.	Average (SD)
Battambang	18	230.7	51	407.7	35	938.5	104	555.7 (558.6)
Kampong Thom	19	161.4	30	339.2	7	911.4	56	350.4 (401.2)
Pursat	30	373.2	59	502.6	15	979	104	534.0 (499.3)
Siem Reap	12	157.7	23	414.3	16	1219.9	51	598.8(689.9)
Total	79	257.0	163	430.4	73	1006	315	518.7 (543.1)

## Type of fish raised (%)

Fish Species	Battambang	Kampong Thom	Pursat	Siem Reap	Total
Climbing Perch	7.4	31.0	1.9	25.5	12.7
Walking Catfish	25.0	37.9	14.0	41.2	26.2
Nile Tilapia	8.3	5.2	17.8	3.9	10.2
Pangasius Catfish	35.2	22.4	62.6	5.9	37.3
Silver Barb	4.6	5.2	0.9		2.8
Indian Carp	0.9				0.3
Red Tilapia	23.1	1.7	7.5	23.5	14.2



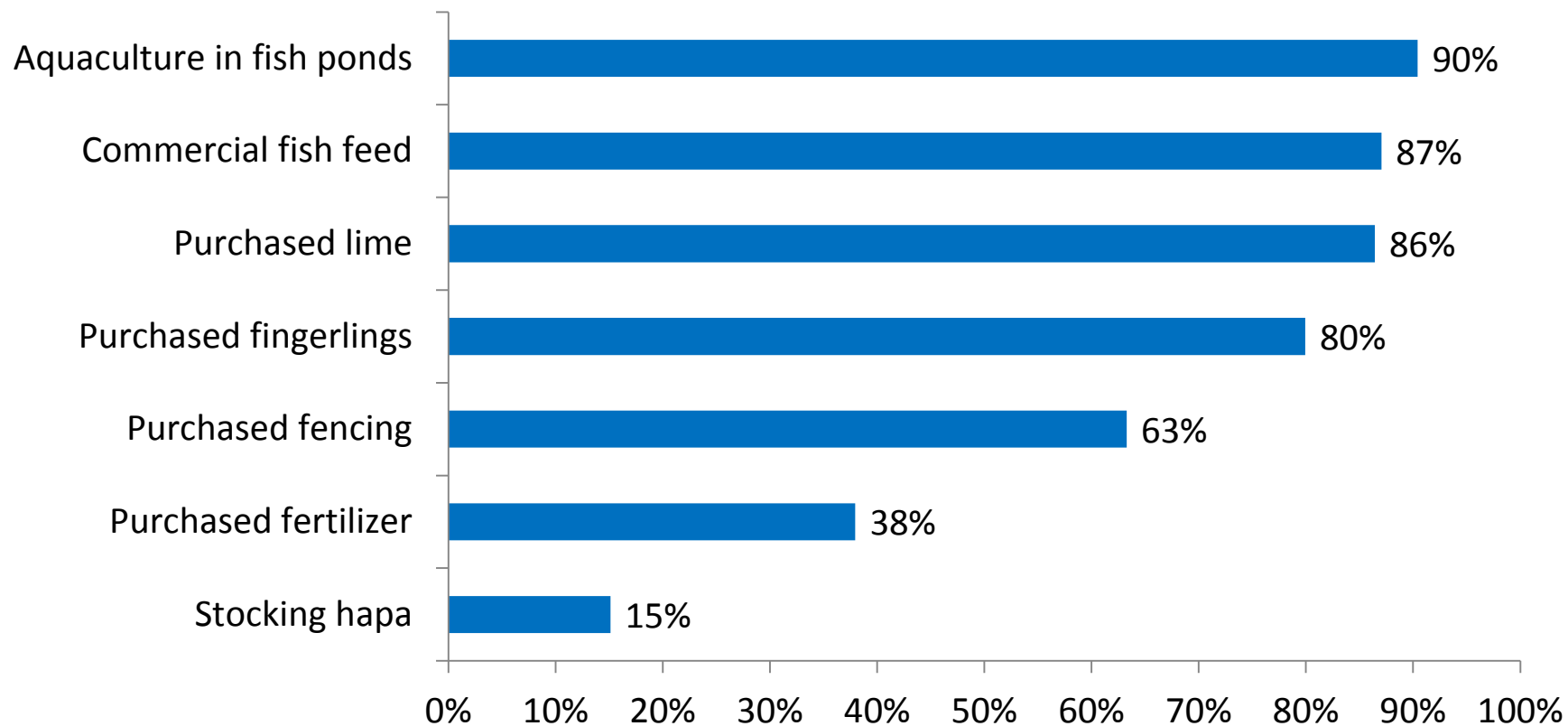
## Fish production by species

Fish Species	Total fish produced (kg)		HH reported to have sold fish		Average fish sold (kg)	Revenue received (US\$)
	Freq.	Average (SD)	Freq.	Percent	Average (SD)	Average (SD)
Climbing Perch	41	417.1 (403.5)	41	100%	355.7 (372.3)	631.0 (680.3)
Walking Catfish	85	360.1 (479)	82	97%	292.5 (373.1)	446.4 (622.4)
Nile Tilapia	30	378.2 (541.9)	26	79%	251.1 (455.4)	411.4 (678.2)
Pangasius Catfish	115	763.6 (587.6)	108	89%	707.7 (537.7)	834.0 (613)
Silver Barb	8	181 (138.5)	7	78%	148.1 (124.5)	276.9 (243.5)
Red Tilapia	43	362.1 (415.3)	42	91%	296.9 (383.4)	575.8 (733.8)
<b>Total Number</b>	<b>315</b>	520.3 (543.1)	298	92%	451.2 (488.8)	631.6 (676.5)

## Average fish production, by species and province (kg/m<sup>2</sup>)

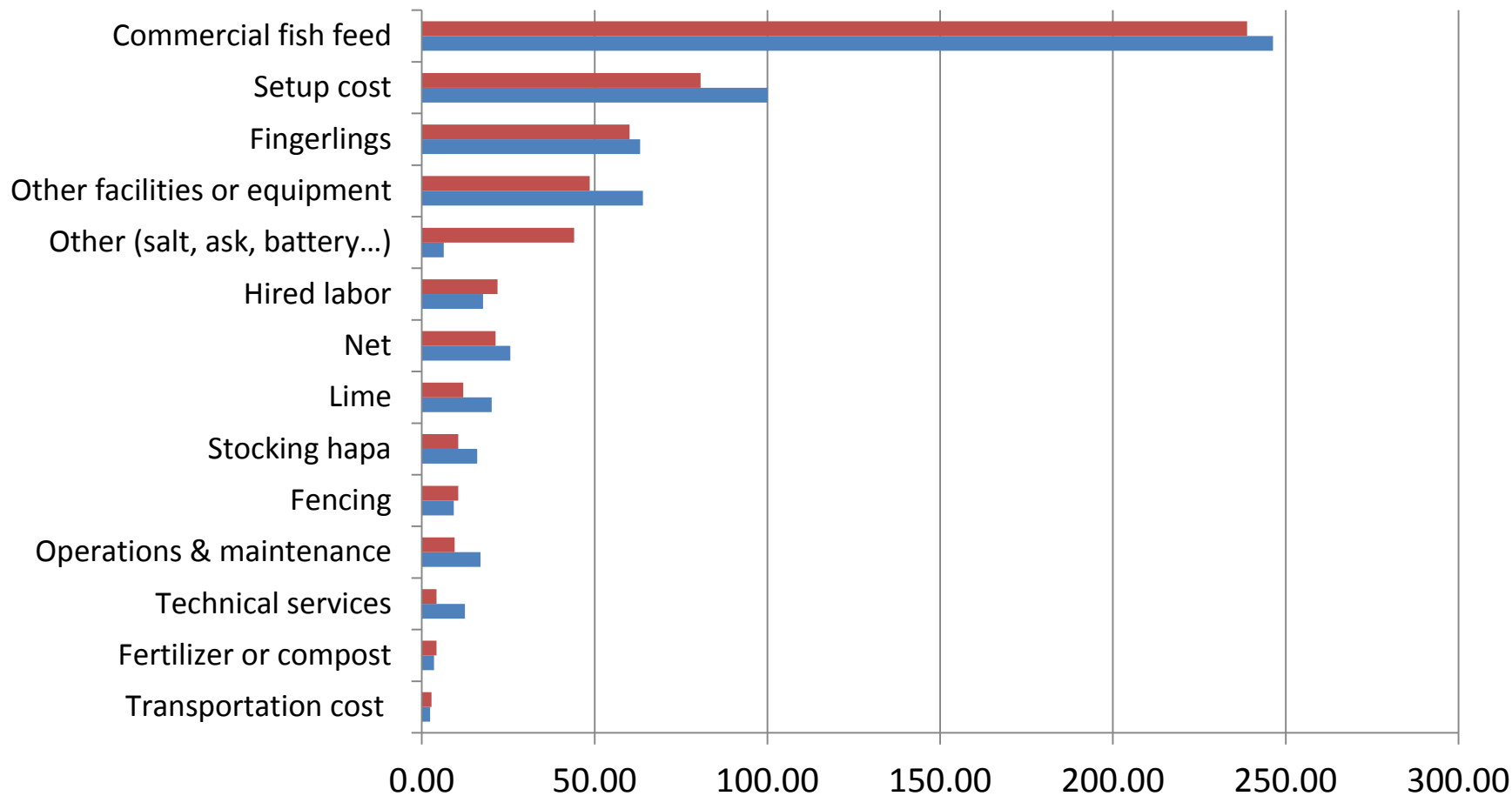
Fish Species	Mean, in kg/m <sup>2</sup> (SD)				
	Battambang	Kampong Thom	Pursat	Siem Reap	Total
Climbing Perch	2.03 (2.20)	1.30 (0.78)	1.90 (1.71)	1.90 (1.71)	1.69 (1.51)
Walking Catfish	1.53 (0.98)	1.56 (1.41)	2.05 (1.15)	2.05 (1.15)	1.66 (1.11)
Nile Tilapia	0.76 (0.49)	0.49 (0.22)	3.99 (6.72)	2.20 (0.02)	2.67 (5.24)
Pangasius Catfish	2.39 (1.79)	3.66 (1.52)	3.76 (4.63)	3.31 (1.97)	3.33 (3.72)
Silver Barb	0.54 (0.29)	0.36 (0.19)			0.58 (0.37)
Red Tilapia	1.94 (2.69)	0.61 (0.00)	1.19 (1.48)	1.11 (1.05)	1.57 (2.17)

## Percentage of household who are “Very Likely” to adopt fish farming technology (N=324)



# Use of input in fish production in the last production cycle (\$)

■ Non Poor ■ Poor



## Perception of major barriers to the adoption of new/improved farming practices or technologies (N=228)

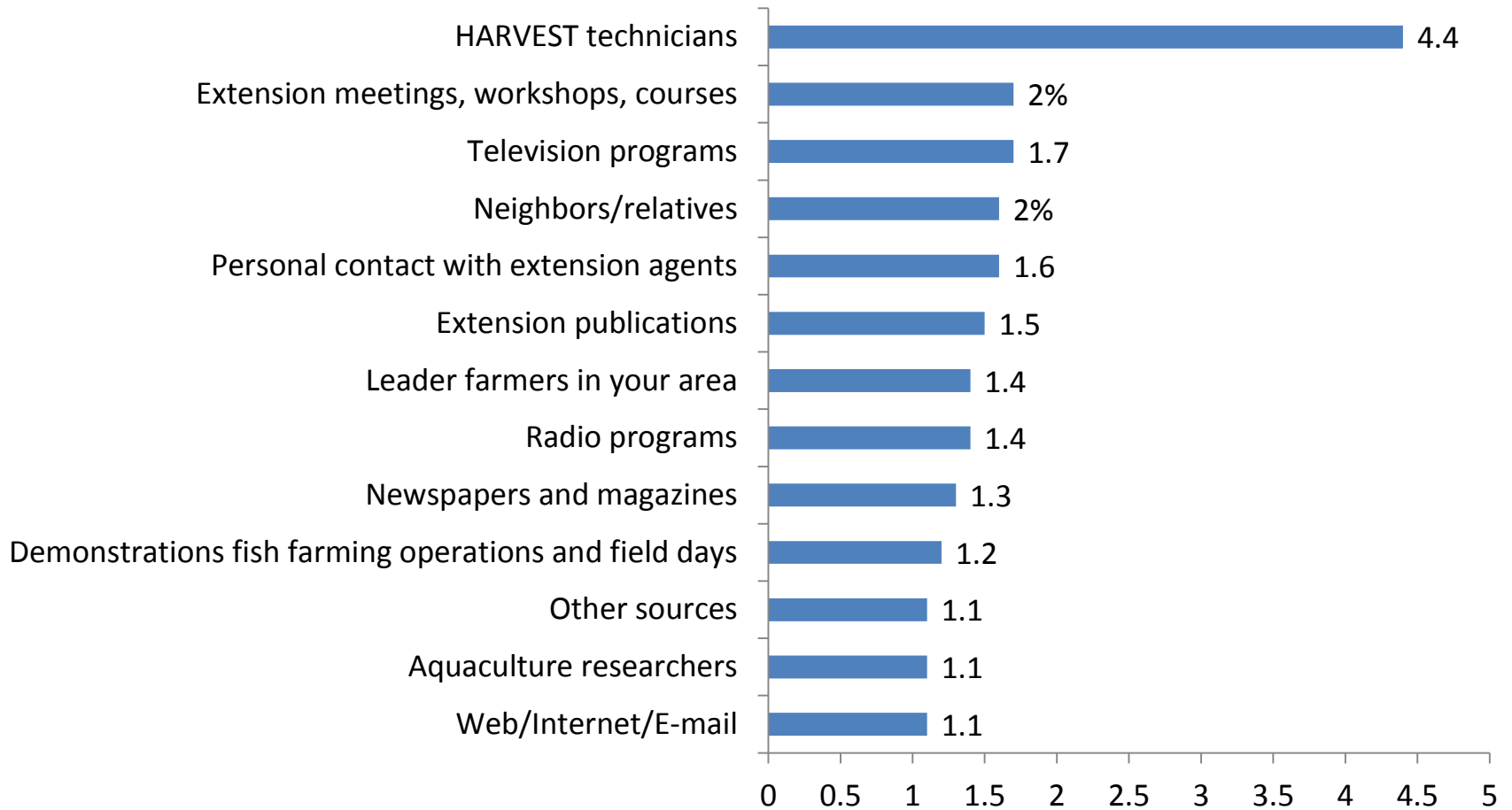


## Source of extension services received during the last cycle (%)

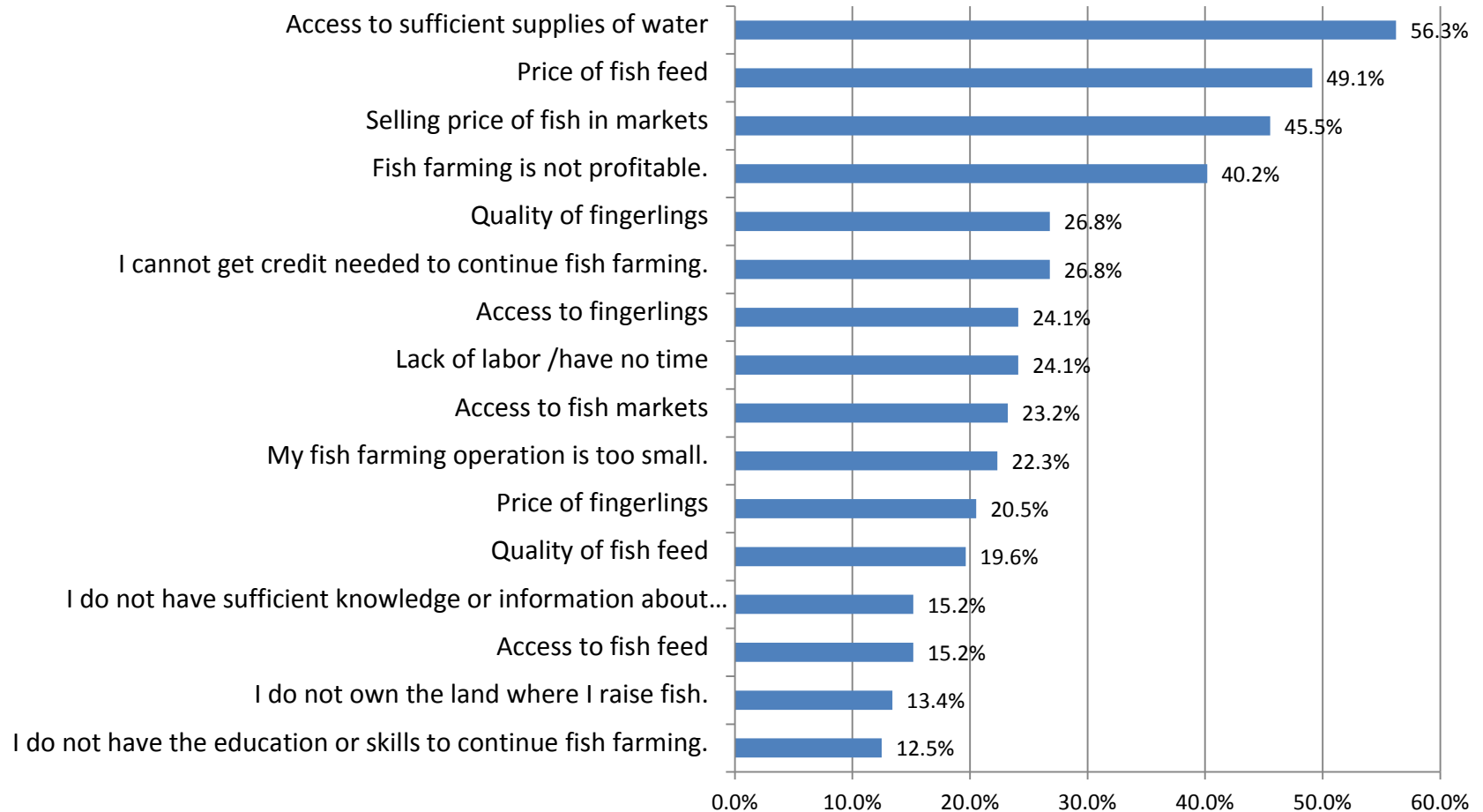
Sources	Battambang (N=106)	Kampong Thom (N=58)	Pursat (N=107)	Siem Reap (N=51)	Total (324)
HARVEST program	98.1	96.6	100.0	100.0	98.8
Neighbors or friends	17.6	12.1	18.7	19.6	17.1
District agricultural service center, extension agent	3.8	8.6	8.4	7.8	6.8
Other program or project (besides HARVEST program)	3.8	8.6	3.7	13.7	6.2
Local village/commune office	8.5	0.0	6.5	3.9	5.6
Fish trader	6.6	3.4	3.7	7.8	5.3
Other (Radio, TV)	5.7	10.3	4.7	0.0	5.3
Fertilizer or Input supply dealer	2.8	0.0	2.8	2.0	2.2

## Source of information (average)

1=Nothing at all, 2= A little, 3= Some, 4= A fair amount, 5= A great deal

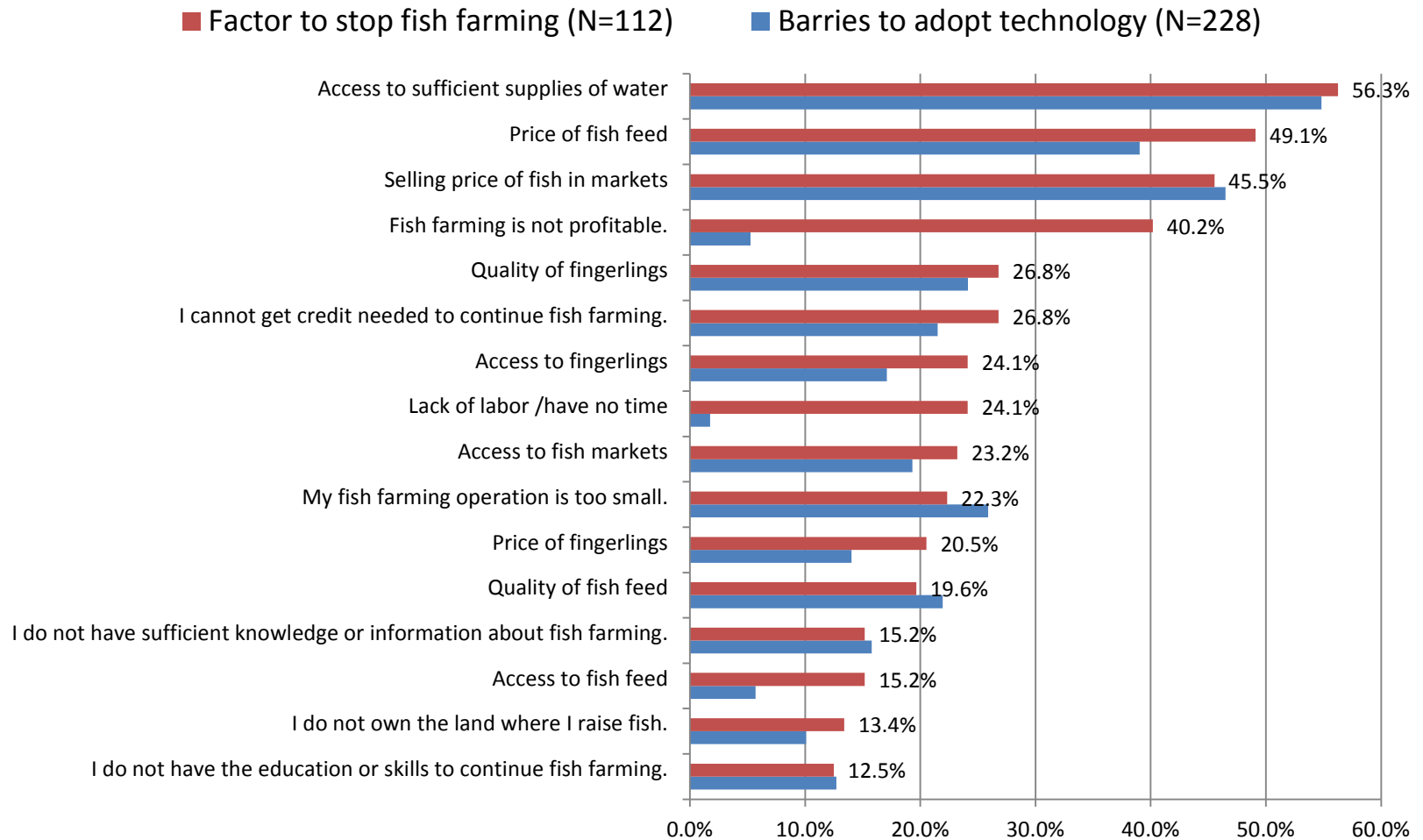


## Factor related to decision to stop fish farming (N=112)





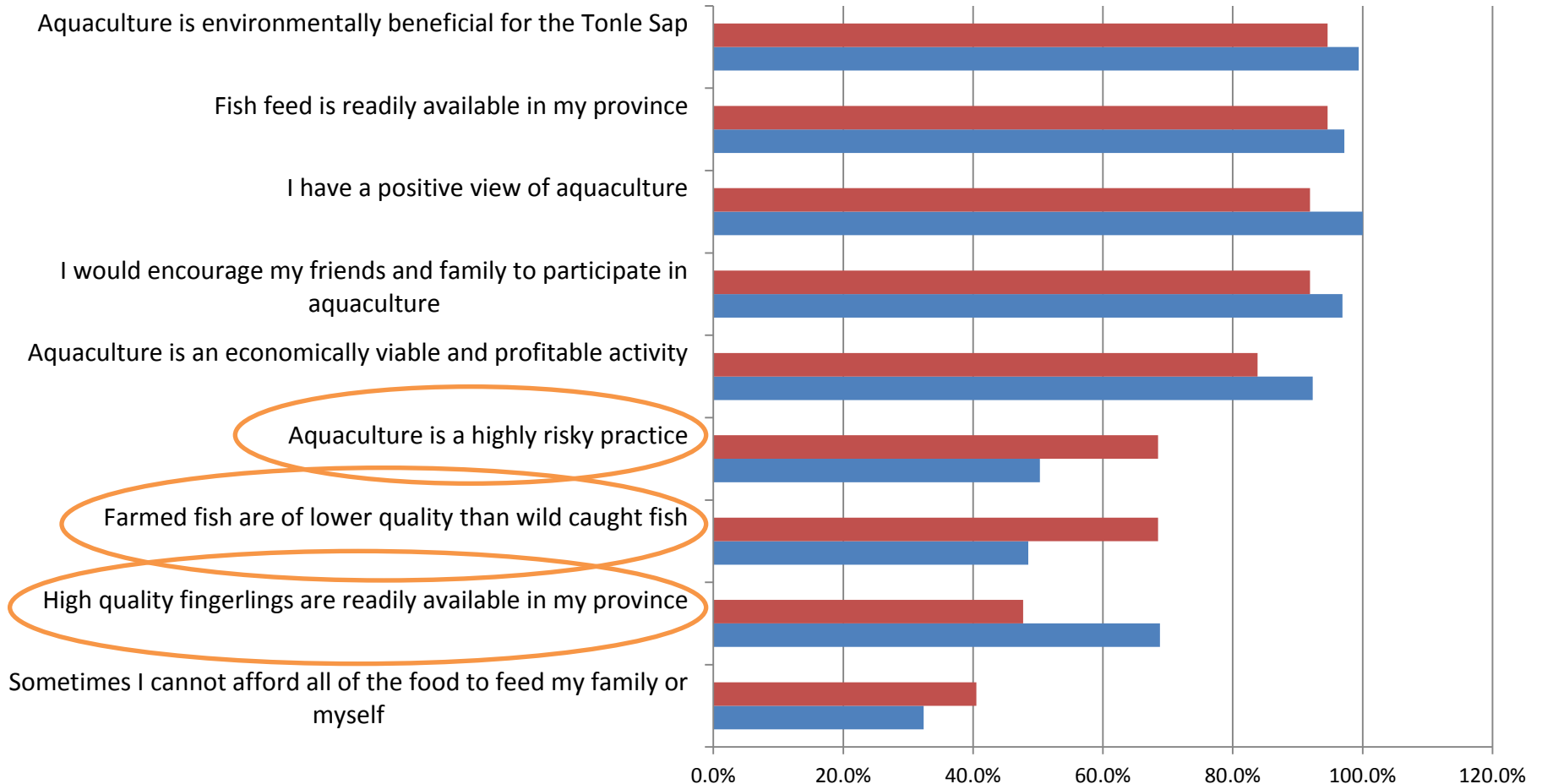
## Does the household currently raise fish? (N=436)



# Comparison discontinued and continuing farmers

■ Fish farmer who dropped fish farming

■ Fish farmer who still practice fish farming



# Conclusions

- Cambodia HARVEST has successfully introduced aquaculture in the Feed The Future provinces
- Both male and female fish farmers are benefitting from practice of aquaculture technologies
- There is no differences between poor and non-poor clients in income from aquaculture
- There is no differences between poor and non-poor in the level of fish productivity
- There is a significant number of discontinuation of aquaculture practices (25% of sampled HARVEST beneficiary farmers not involved in aquaculture at the time of survey)
- Higher % of females indicated discontinuing aquaculture

# Conclusions

- Except for sex, farmers discontinuing aquaculture farming are not different (in observable characteristics) from farmers who continue adopting these technologies
- However, there may be differences in unobservable characteristics (e.g., risk attitudes, perceptions, motivation, etc.) that need further research
- Major barriers to adoption of improved technologies or practices include:
  1. Availability of water
  2. Price of fish feed
  3. Selling price of fish in the market
  4. Less profitable
  5. Quality of fingerling and
  6. Availability of credit

# Implications and recommendations

- Aquaculture technology has potential to contribute to food security, nutrition and household income
- Aquaculture policy addressing the provision of credits, supply of inputs and market is needed
- Aquaculture development should be expanded in area where there is abundance of water supply
- Aquaculture extension services need to be strengthened; farmer field schools or use of lead farmers could promote aquaculture technologies to neighboring farmers
- Develop agribusinesses to produce quality fingerlings locally
- Further research needed to understand the discontinuation decision by beneficiary farmers; and gender differences in this decision

Thank you

Welcome questions and feedback

# Acknowledgement



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