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# Results from the dengue integrated vector management (IVM) project

John Hustedt

# Dengue

- 3.6 billion at risk with 390 million infections each year, of which 96 million are symptomatic (70% in Asia).
- Cambodia reported approximately 15,000 dengue cases in 2015 through its surveillance system. 13% of these were registered in Kampong Cham province.
- Not confined to urban areas or children, with outbreaks in rural areas and non-endemic areas in north-east provinces (12% of symptomatic cases in Cambodia are over 18 years of age).
- No vaccine or therapeutic treatment available at scale in Cambodia, so prevention relies on vector control.

# Background



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# What should be targeted?

## Container surveys in Kampong Cham, Cambodia

Container Type	Baseline (297)		Baseline (251)	
	No.	Pupae	No.	Pupae
	Drum	120	148	173
Concrete water jar	896	9,804	595	7,496
Concrete tank	162	692	73	550
Small pot	165	284	123	490
Flower vase	51	29	76	24
Tires	79	251	75	158
Tin can	189	129	47	2
Broken pot	283	72	121	12
Other	293	290	191	127
<b>Total</b>	<b>2,238</b>	<b>11,699</b>	<b>1,474</b>	<b>9,106</b>

**Pupal biomass:**

**Water jars, drums, and concrete tanks (>50L): ≈90%**

**Small containers (<50L): ≈10%  
8293**

# What should be targeted?

## Interventions

- Larvivorous fish (guppies) (>50L)
- Communication for behavioral impact (COMBI)
- Slow-release juvenile hormone analogue (Pyriproxyfen) (<50L)

## Pupal biomass:

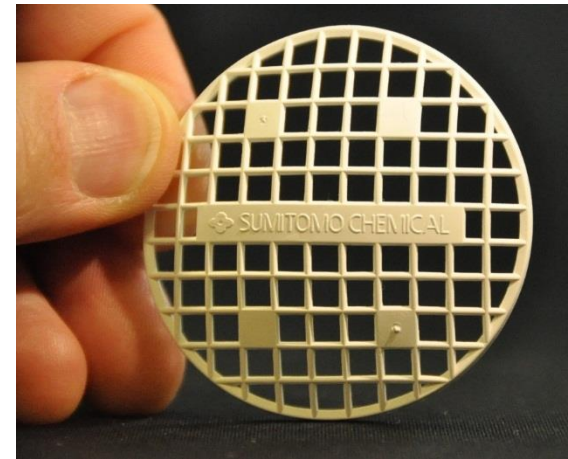
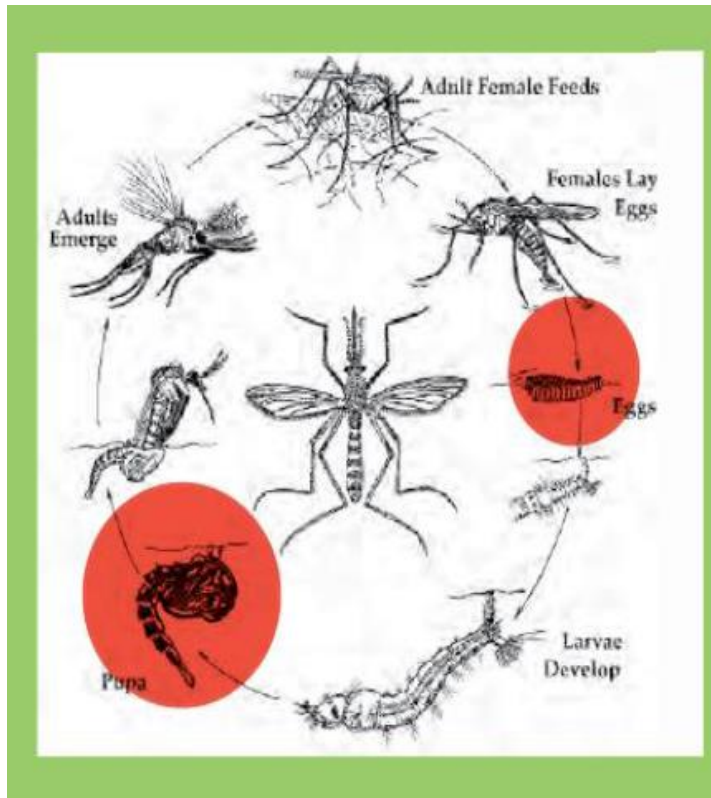
**Water jars, drums, and concrete tanks (>50L): ≈90%**

**Small containers (<50L): ≈10%**

# Challenges in vector control



# Pyriproxyfen – Sumilarv<sup>®</sup> 2MR



Source: Sumitomo

Vanney Keo (វ៉ានី គេ) (វ៉ានី គេ)

# Communication for behavioural impact (COMBI) activities



Vanney Keo (វ៉ែនធី) ៧៧



Vanney Keo (វ៉ែនធី) ៧៧



Vanney Keo (វ៉ែនធី) ៧៧



Vanney Keo (វ៉ែនធី) ៧៧



# COMBI activities



Vanney Keo (វណ្ណឌី)



Vanney Keo (វណ្ណឌី)



Vanney Keo (វណ្ណឌី)

# Methods



Vanney Keo (វណ្ណី គី)

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# Methods

## Study design

The cluster randomised trial aimed to evaluate the efficacy of three interventions over 12 months (October 2015-September 2016) and will have three arms:

1. Guppies + PPF resin matrix + COMBI
2. Guppies + COMBI
3. Control

Each arm had 10 clusters of approximately 200 HHs



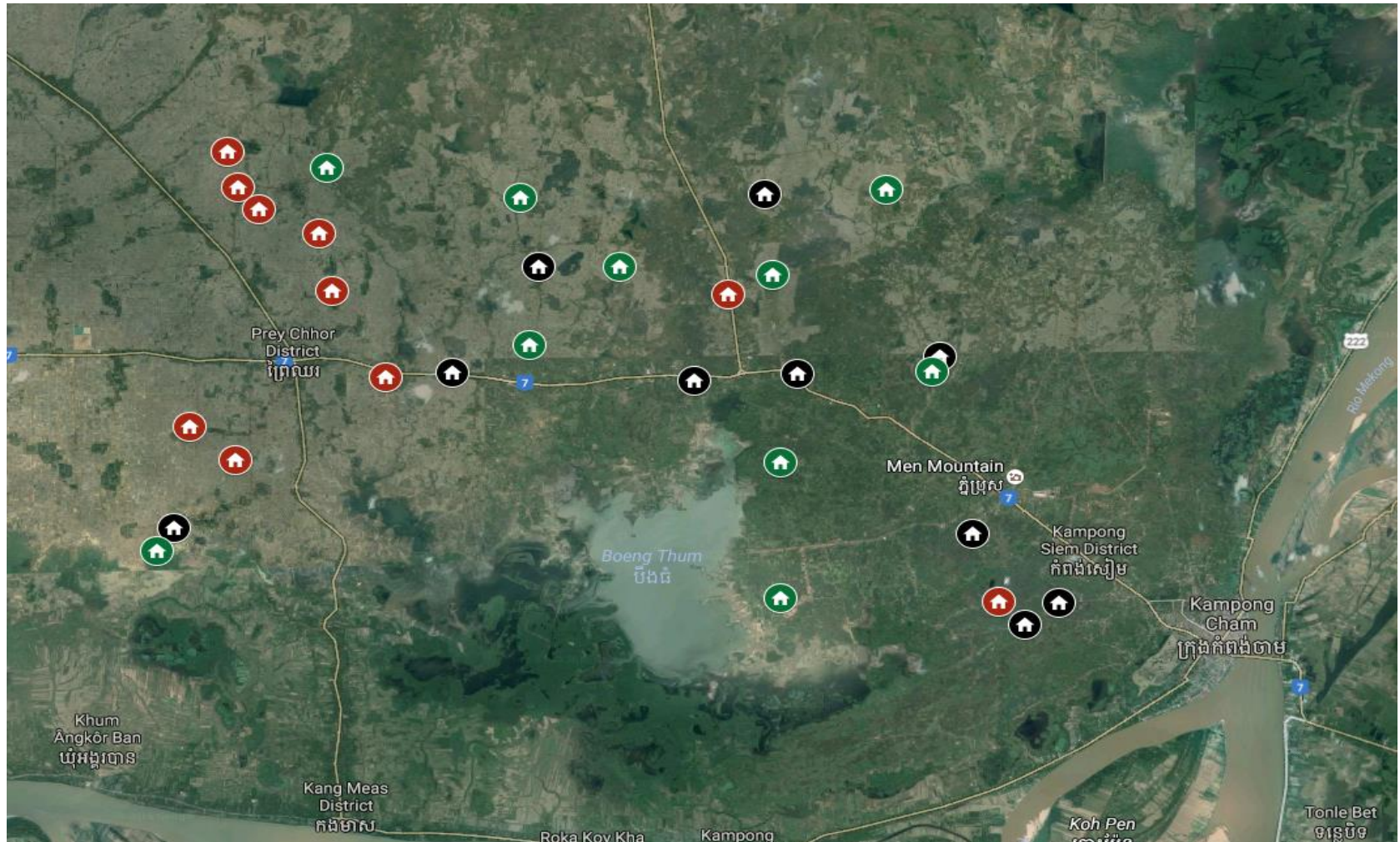
# Methods

## Hypothesis:


- Use of guppies, pyriproxyfen (PPF) and communication for behavioural impact (COMBI) activities will reduce numbers of *Aedes aegypti* by reducing its breeding through larval control and source reduction
- COMBI activities will improve the community's knowledge, attitudes, and behaviour around water use and vector borne disease prevention
- Guppies and Pyriproxyfen are acceptable among the target villages


# Methods

## Study location



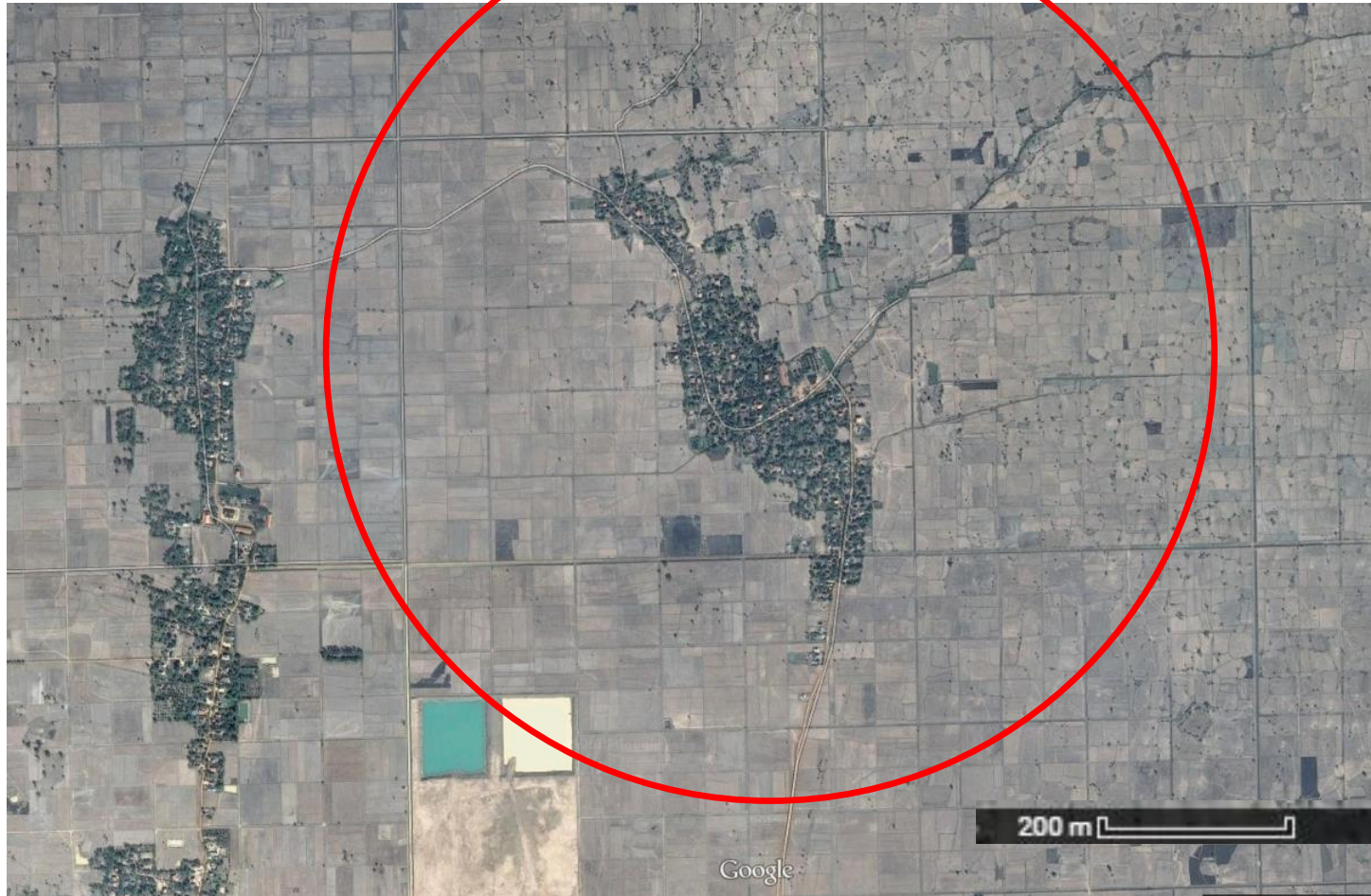
 Arm 1: G + PPF + COMBI

 Arm 2: G + COMBI

 Arm 3: Control

# Methods

Study location

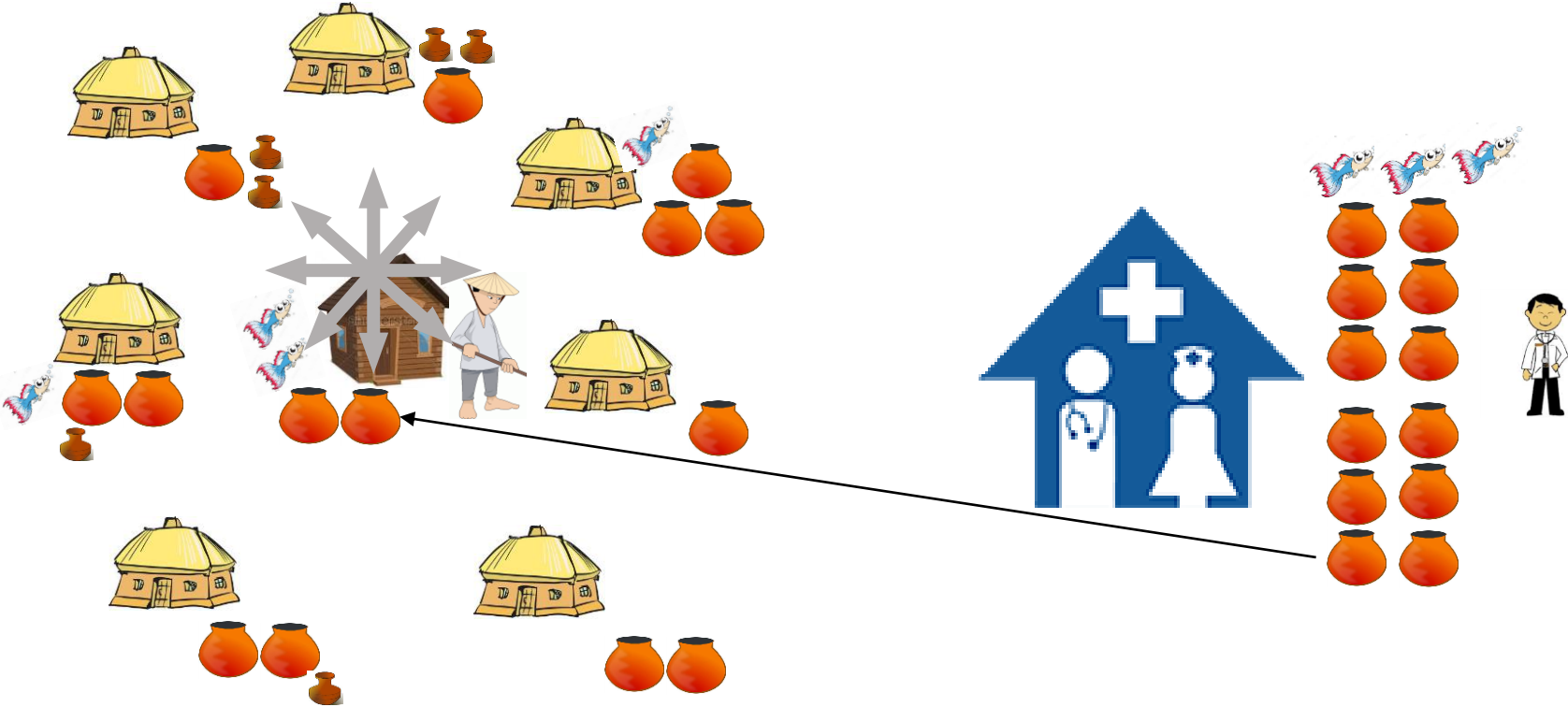


# Methods

## Distribution and coverage

Intervention village

Health Centre guppy bank



# Methods

## Distribution and coverage

### Intervention village



### Health Centre guppy bank





# Methods

## Outcome measures

### *Primary outcome measure:*

Density of resting adult female *Aedes aegypti* in the household as measured by entomology surveys at BL, 4, 8, 12 months after start of intervention.

### *Secondary outcome measures:*

- House index
- Container index
- Breteau index
- Pupae per house
- Pupae per person
- Percentage of indoor resting mosquitos positive for dengue virus

# Methods

## Data collection

- Entomology Survey (every three months)
  - Adult mosquito collection
  - Larvae and pupae collection
  - Container survey
  - Premise condition Index
- Knowledge, Attitudes, and Practice Survey (baseline and endline)
- Acceptability Survey (endline)
- Adult Emergence Inhibition Assays
- CHW monthly monitoring (coverage)



# Results

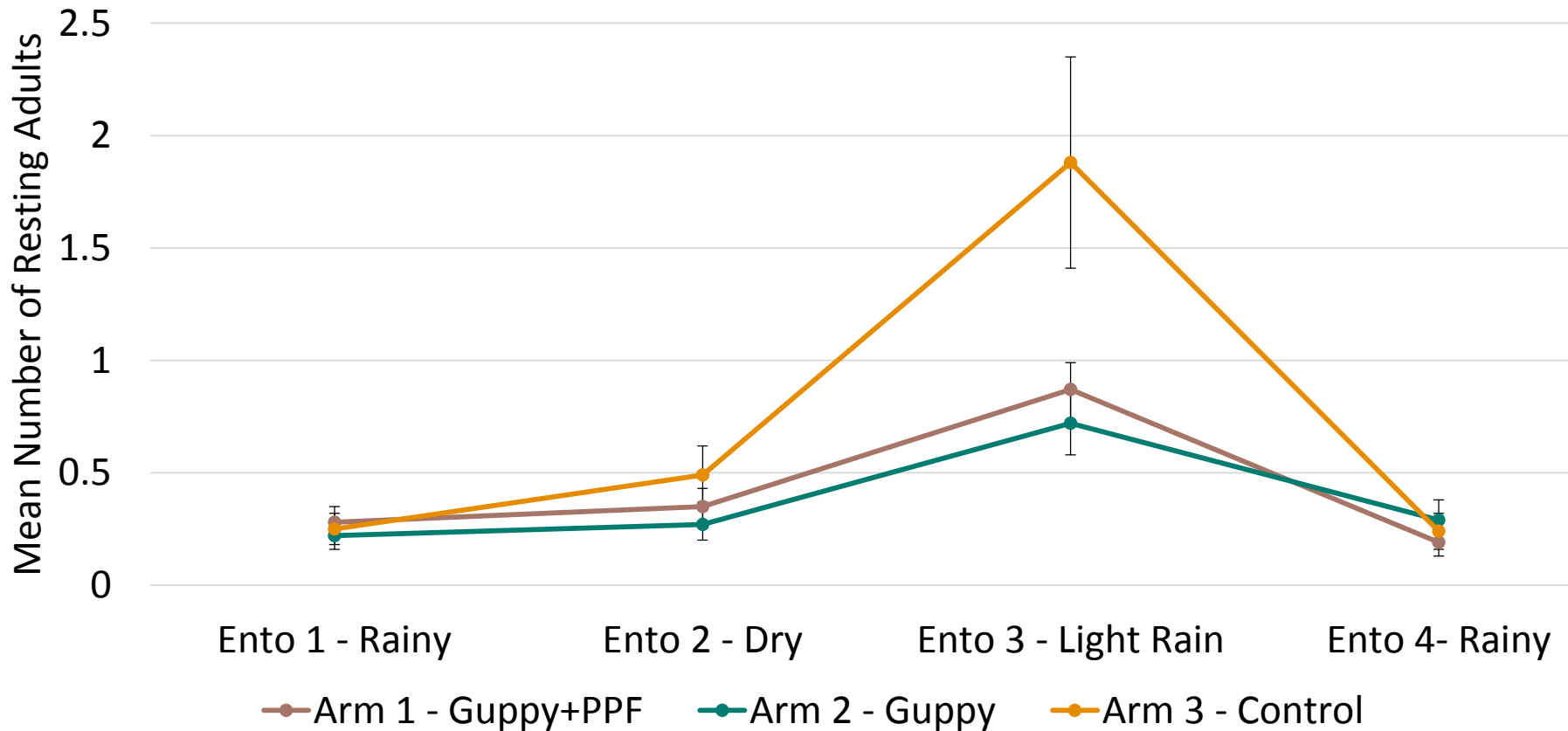


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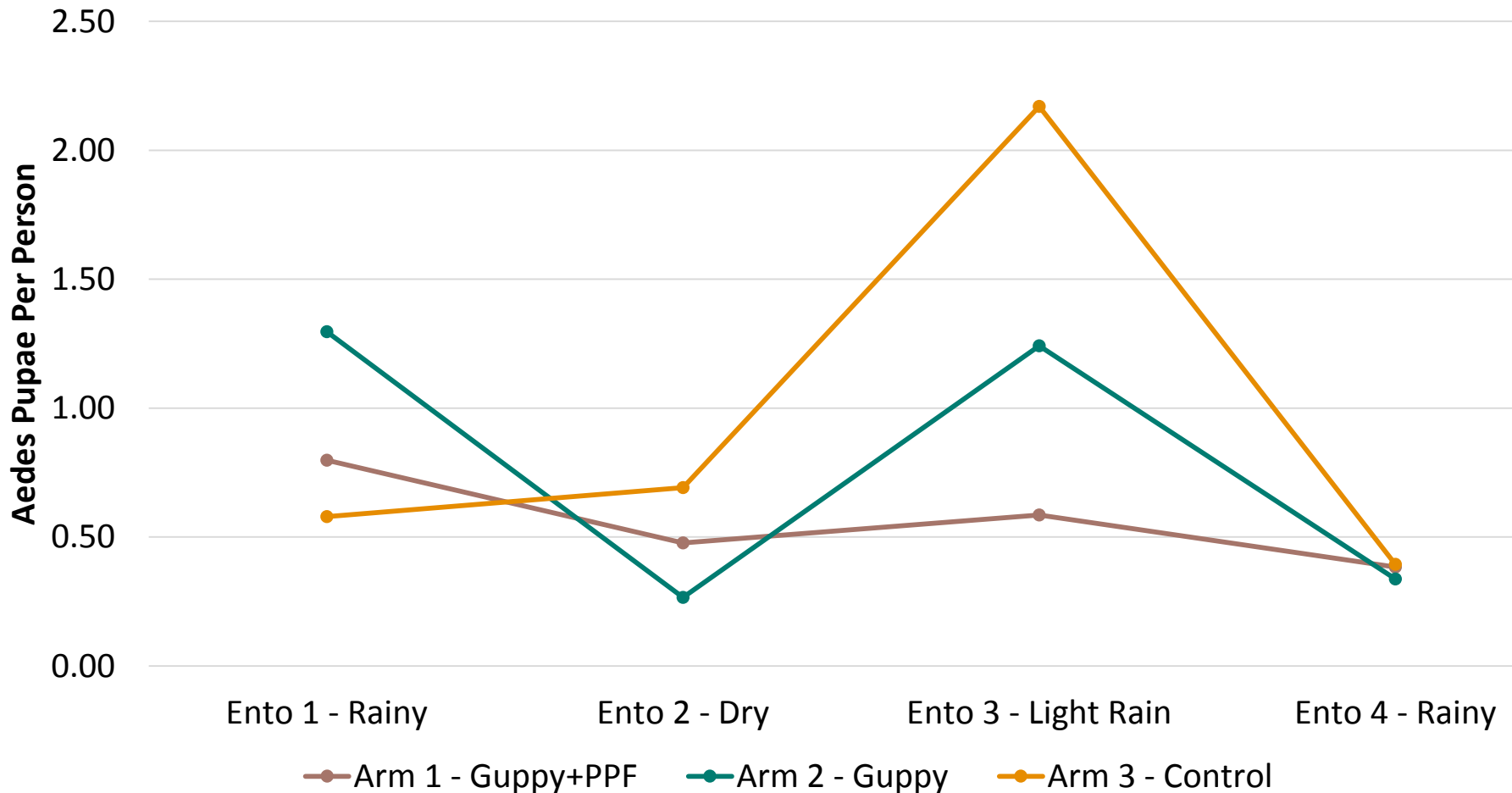
# Entomology survey

Figure 1: Mean number of adult *Aedes* females per household by arm and survey



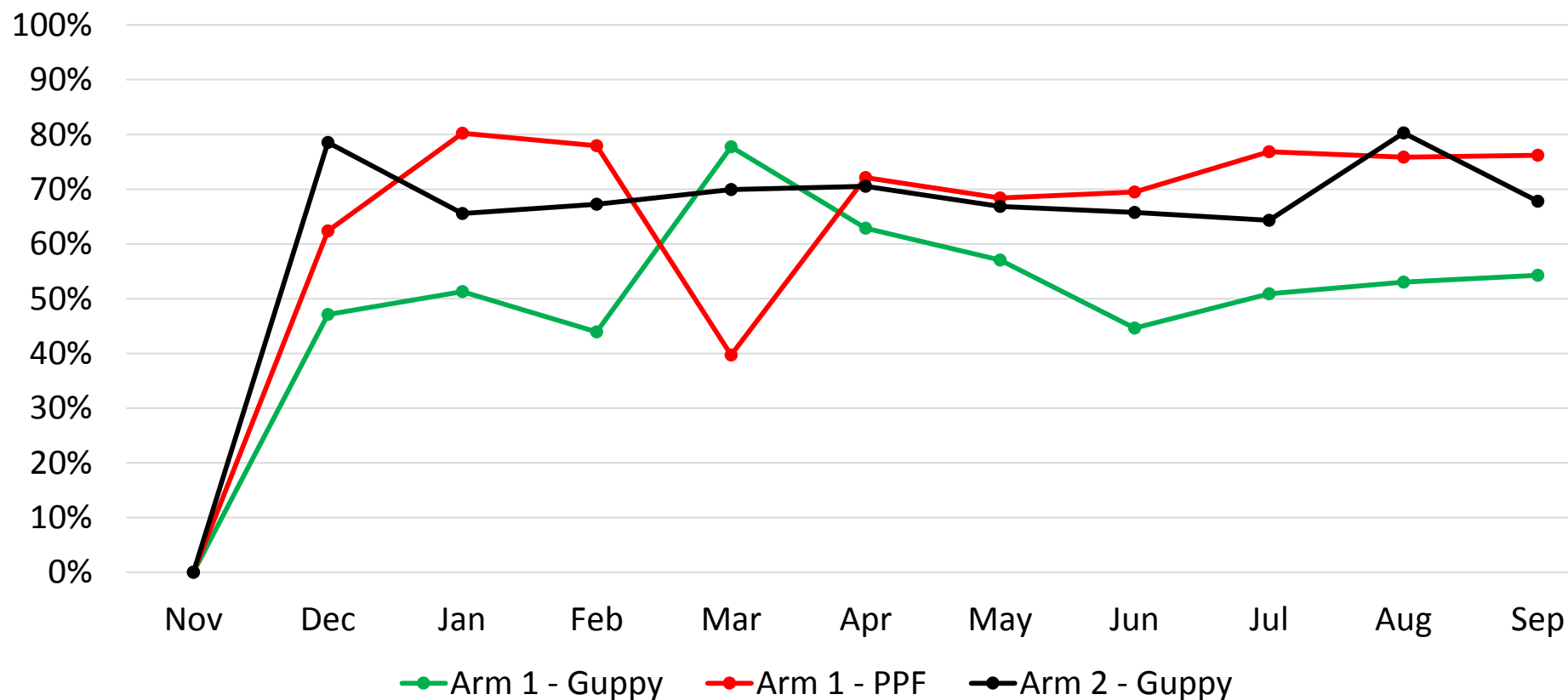
# Entomology survey

Figure 2: Mean number of *Aedes* pupae per person by arm and survey



# Community health worker monthly monitoring form

Figure 3: Percentage of water containers  $\geq 50L$  in intervention villages with two or more guppies or containers  $< 50L$  with at least one Sumilarv<sup>®</sup> 2MR by arm and month, November 2015-September 2016



# Discussion

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# Limitations

- Lack of epidemiological outcome. Reduction in vector biomass correlates with reduction in dengue infections?
- Important to assess how the intervention is sustained after project ends.
- Intervention focused on households only. May be important to target public spaces (e.g. schools, religious centers, and open public places).



# Discussion

- Both intervention arms significantly reduced the number of pupae and adults when compared to a control arm.
- Keeping high coverage of interventions through community engagement is essential. Adding additional interventions that require behaviour change in the community may not add value.
- Interventions did not reach all breeding sites. A small number of mosquitoes may cause outbreaks. How to target these (is it possible, feasible and/or worth it?).

# Acknowledgements



World Health Organization



LONDON SCHOOL OF HYGIENE & TROPICAL MEDICINE



SUMITOMO CHEMICAL



កិច្ចសហប្រតិបត្តិការ  
អាល្លឺម៉ង់  
DEUTSCHE ZUSAMMENARBEIT

អនុវត្តដោយ: **giz** Deutsche Gesellschaft für Internationale Zusammenarbeit (GIZ) GmbH



**Thank you**

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