Portable Mosquito-Proof housing for itinerant rice farmers in Rural Tanzania

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BOLD IDEAS FOR HUMANITY

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Morbidity and mortality at Kilombero, Tanzania, 1982-88.

Author:
Tanner M; De Savigny D; Mayombana C; Hatz C; Burnier E; Tayari S; Degremont A
Source:
In: Disease and mortality in Sub-Saharan Africa, edited by Richard G. Feachem, Dean T. Jamison. Oxford, England, Oxford University Press, 1991. 286-305.
Abstract:

- Malaria infections and parasitemia ranged from about 50-86% in 2-9 year old children

- Malaria was the principal cause of death in <5 year old children

Tanner et al 1991

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ITN's, case treatment and diagnostic tools

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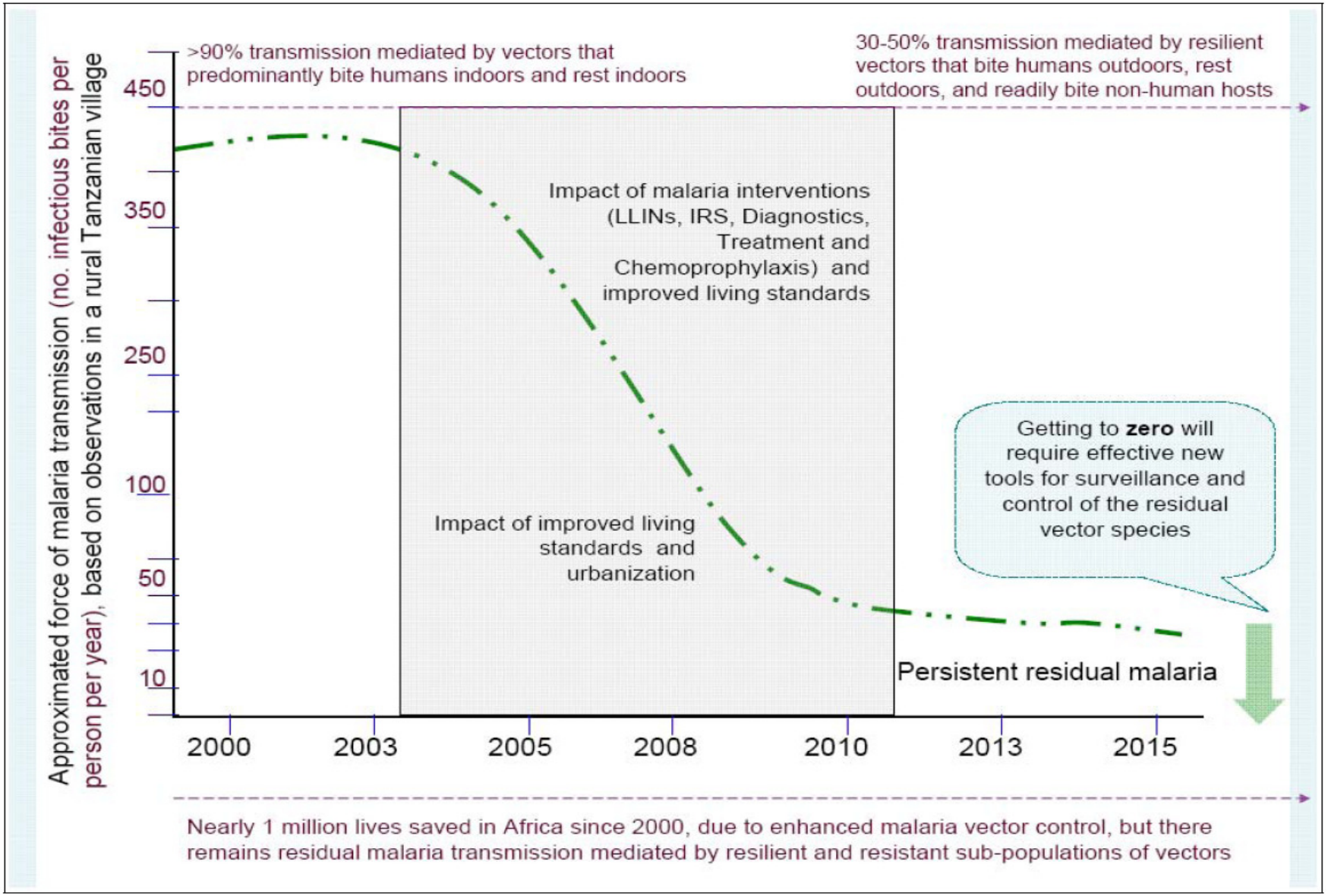

Okumu et al 2014

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Housing and Mosquito indoor densities

A longitudinal survey done in two villages of the Kilombero region by Lwetoijera et al from 2008 - 2011

- Showed that even at high ITNs coverage levels there was still a limitation in reducing the entry of mosquitoes into the house
- Poor house characteristics like unscreened open eaves, lack of screening and ceiling, holes in the walls etc were associated with increased indoor vector abundance
- These findings emphasize not only on the insufficiency of LLINs to control indoor vector densities but also improving house design to prevent indoor vector abundance"

Lessons From the past

- Celli's work with railway workers that resulted in 92% of control group infected while only 4% of the treatment group got infected

Ferroni et al 2012

- Manson's work in a malaria endemic region in England where a wooden hut with net screened windows doors and bed nets that resulted in none of the research team members falling ill of fever

Manson et al 1900

Rice Farming in Kilombero

- Subsistence rice farmers in rural south east Tanzania are mostly itinerant, sometime spending up to 6 months in distant river valley rice fields.

- Despite, high risk to mosquito bites and mosquito borne illnesses, common vector control methods are not always applicable

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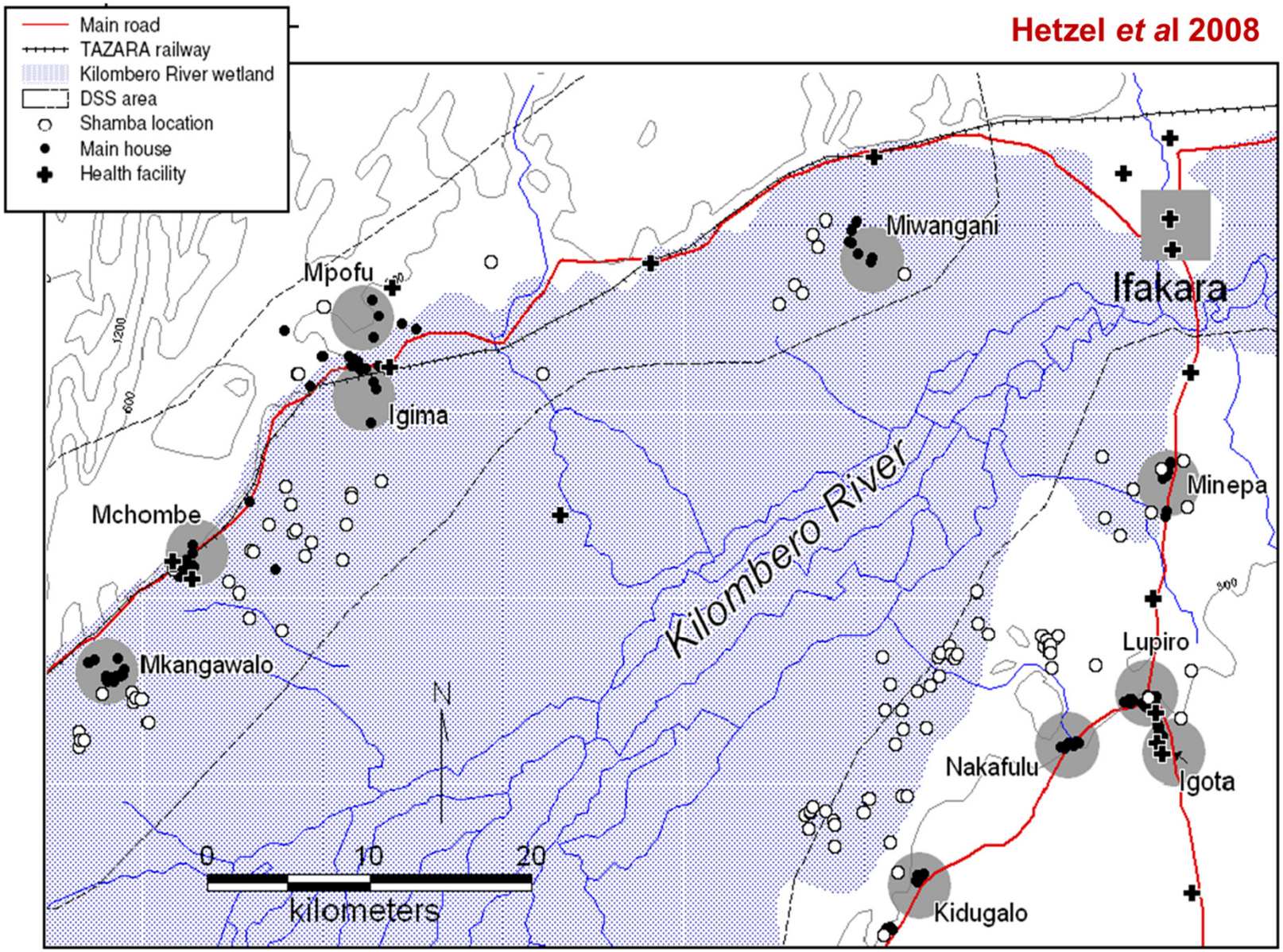
Hetzel *et al* 2008



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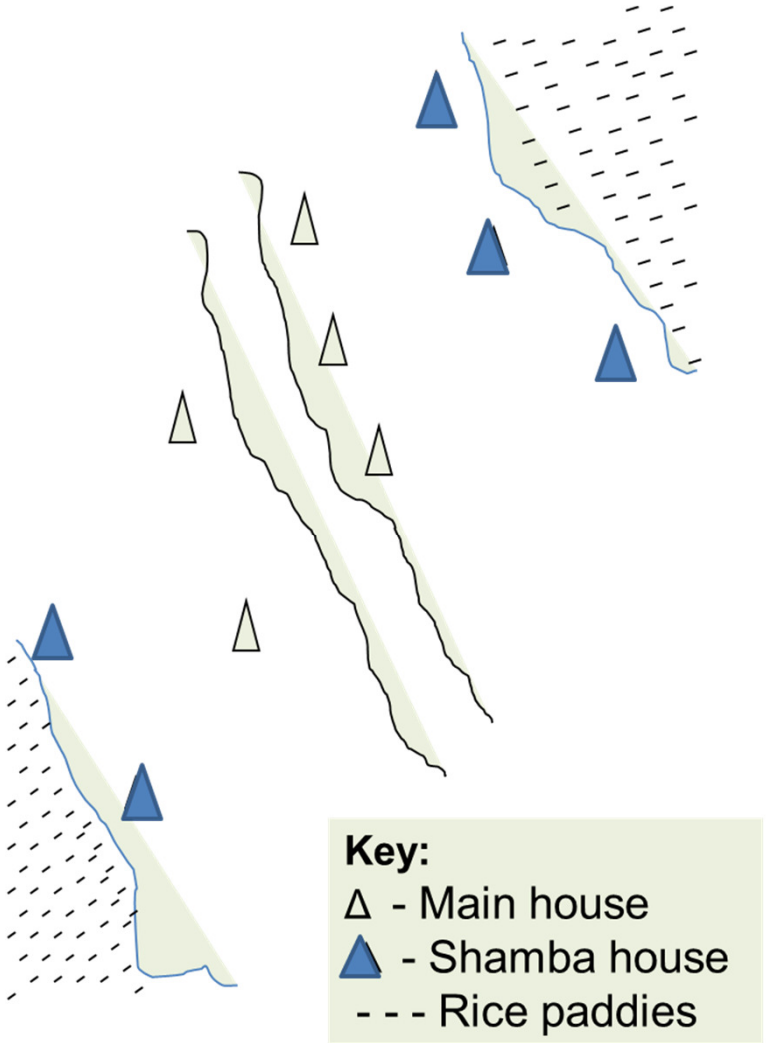
Develop a portable and low-cost mosquito-proof hut design that can protect itinerant rice farmers from infectious mosquito bites and mosquito-borne illnesses, during the period when they are at their rice fields

Quantifying biting exposure in main houses and *Shamba* houses



1.Listed of all households from HDSS

2.Randomly selected 20 Main houses

3.Identified 20 *Shamba* houses adjacent

4. CDC light trap for indoor collections M-trap for Outdoor

5.Species ID by PCR and parasite detection by ELISA

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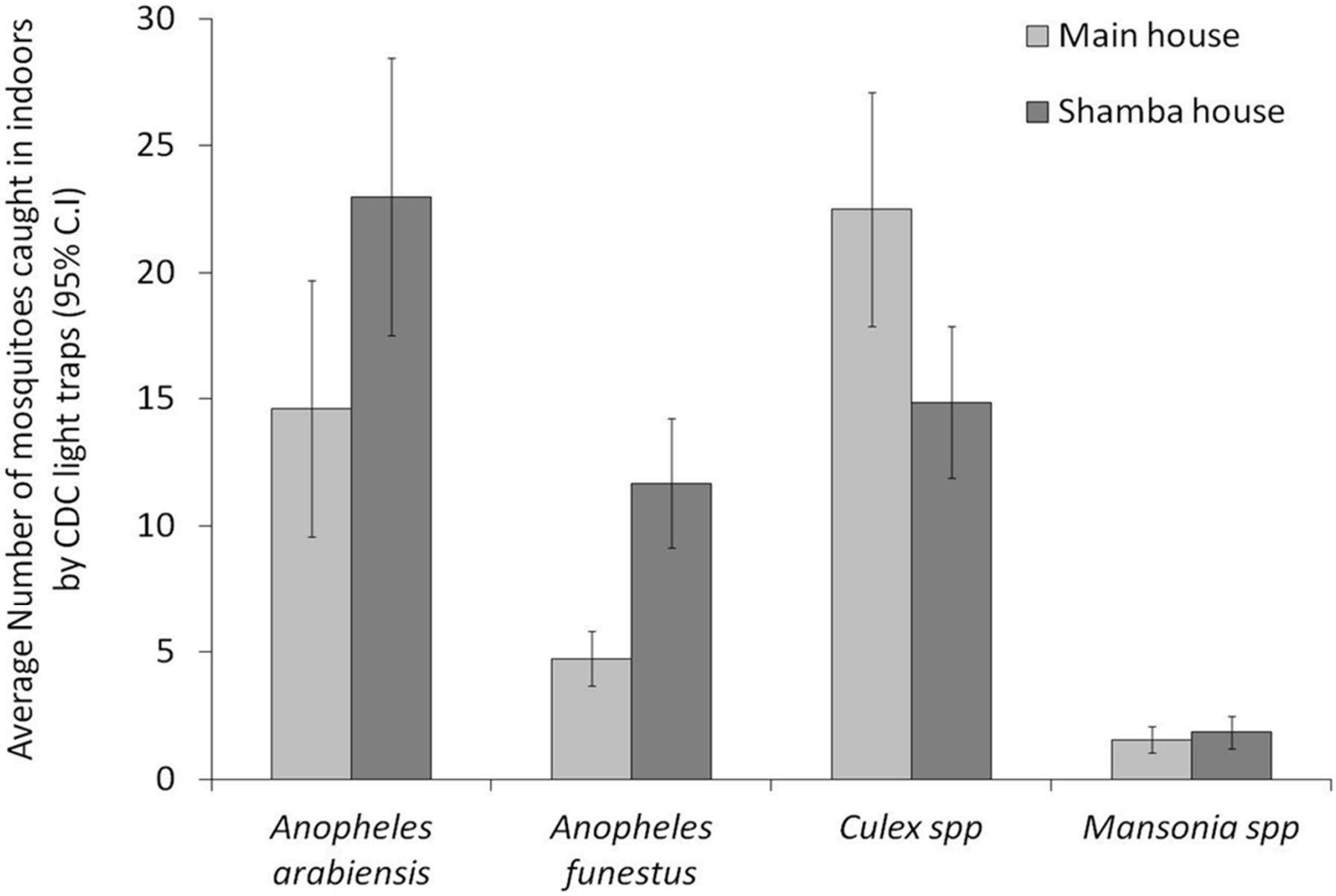
CDC light trap for indoor mosquito collection

M-trap for outdoor mosquito collection



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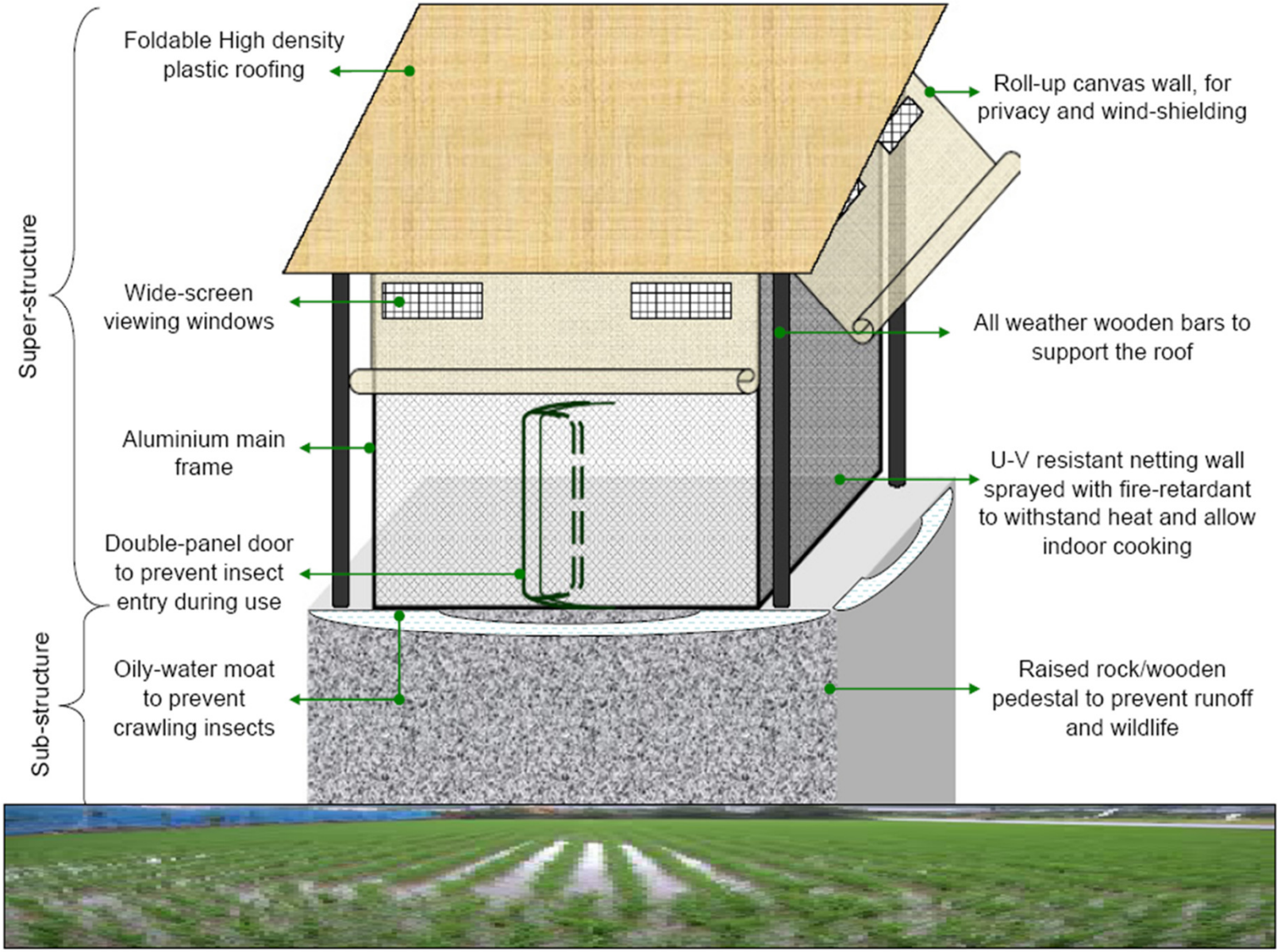
Design and construction of prototypes that are low-cost, portable and exposure-free hut.

Desirable characteristics

To be effective, these new farm houses must be:

- Easy to transport and assemble,
- Fitting other vector control tools
- Durable (lasting at least 3 years)
- Accommodate an average itinerant family size
- Well ventilated and comfortable
- Manufactured locally
- Fire-proof
- Affordable



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First Portable mosquito proof prototype hut for itinerant rice communities

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i) Semi field tests

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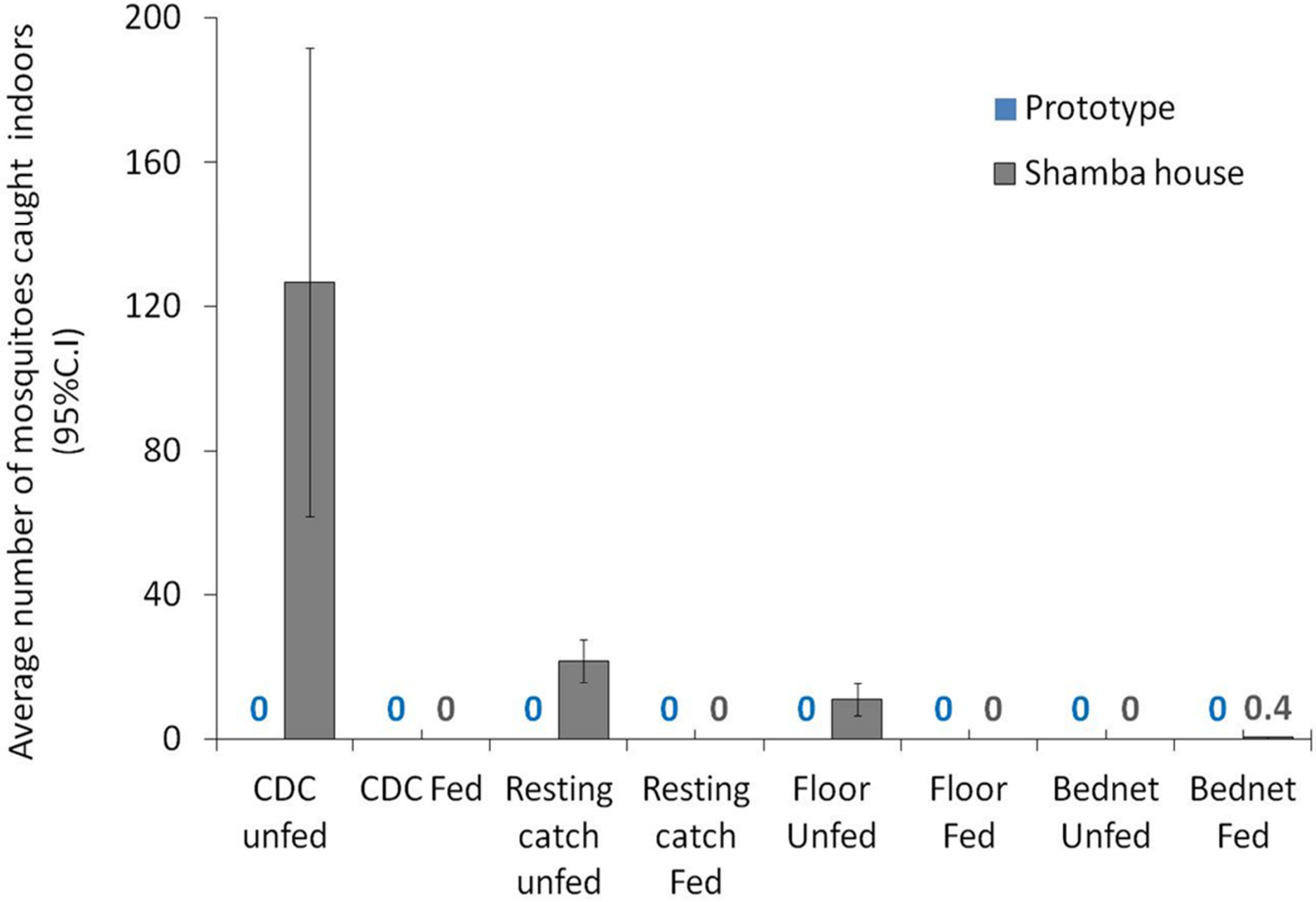
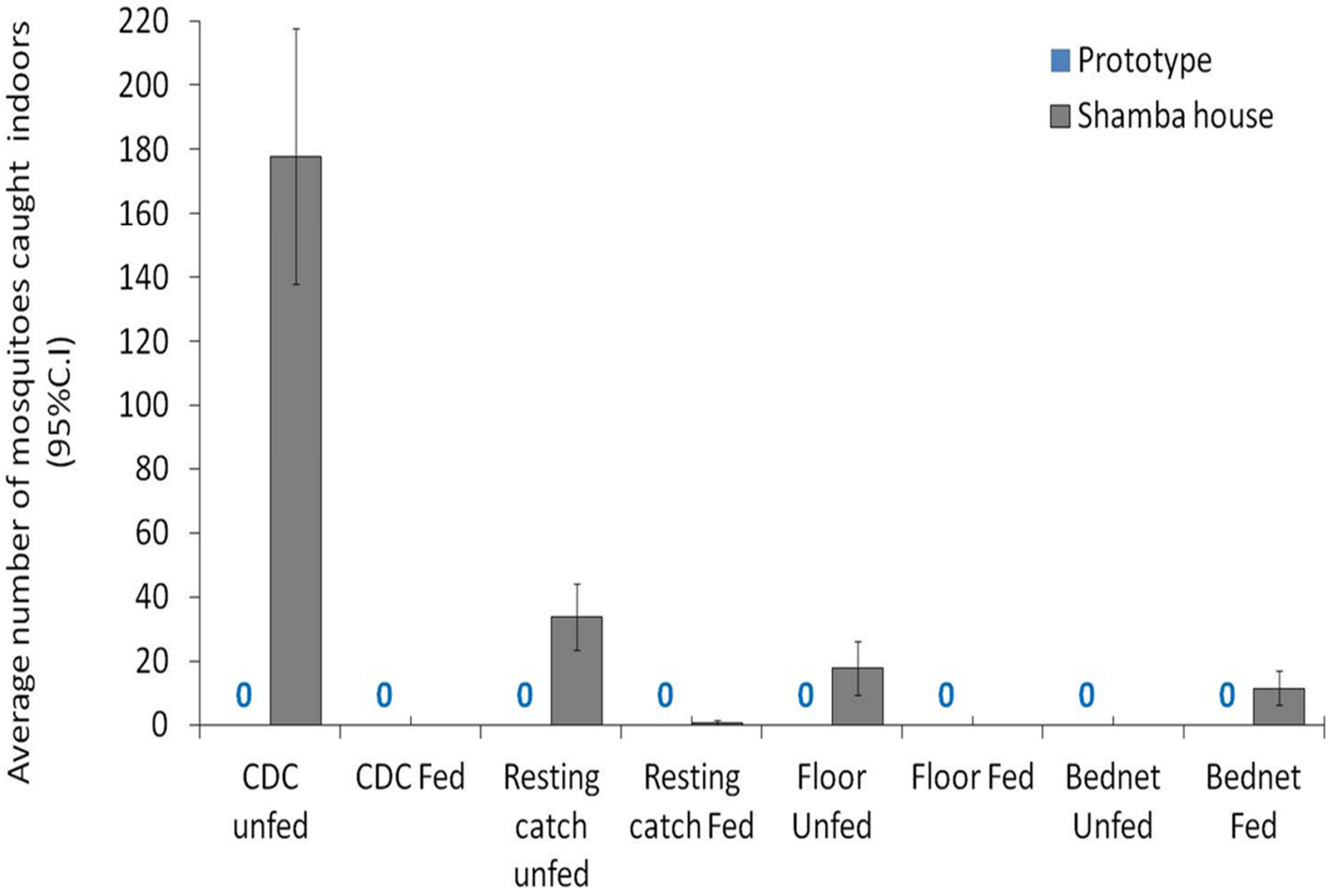
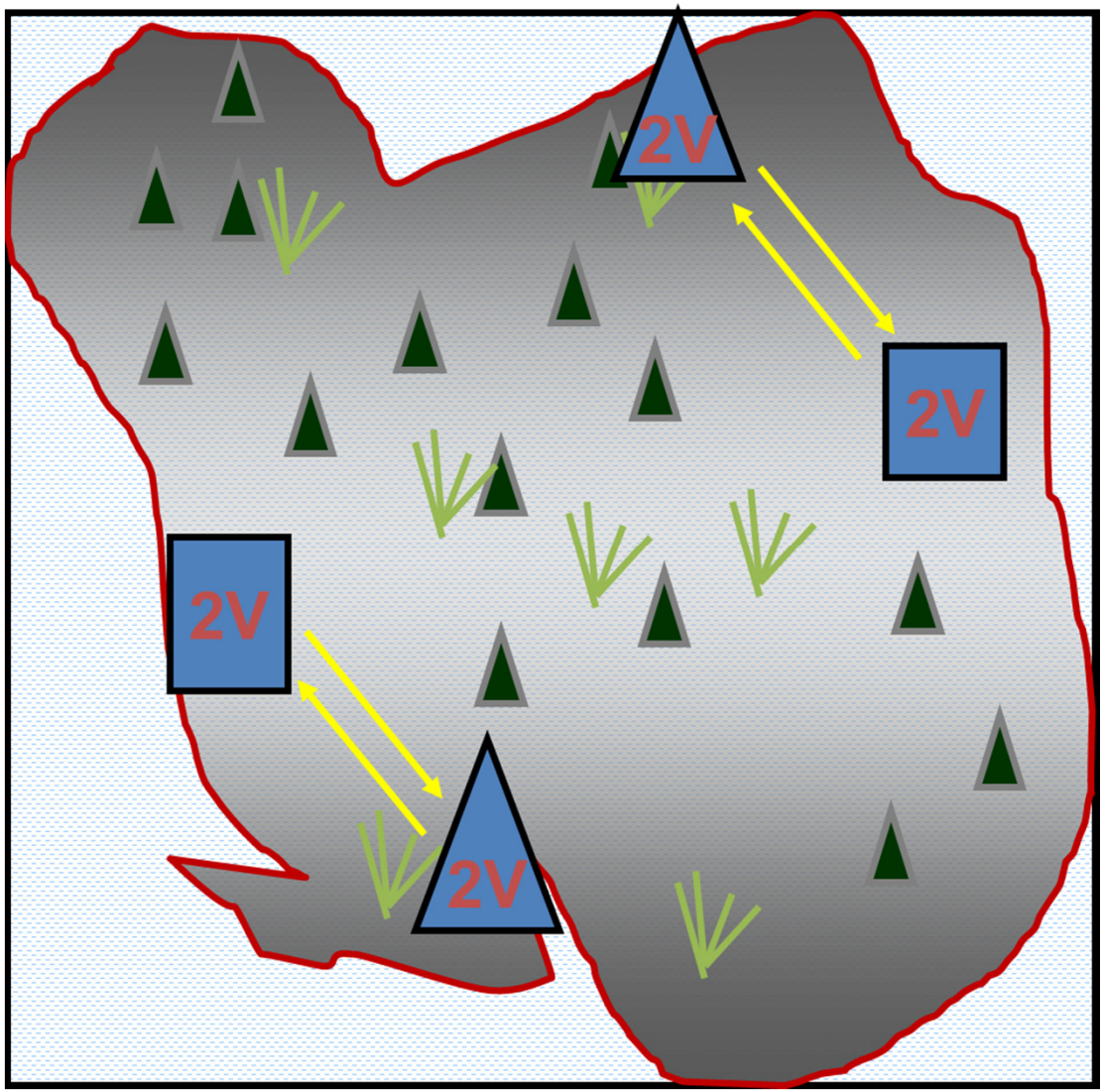
Volunteers using intact nets

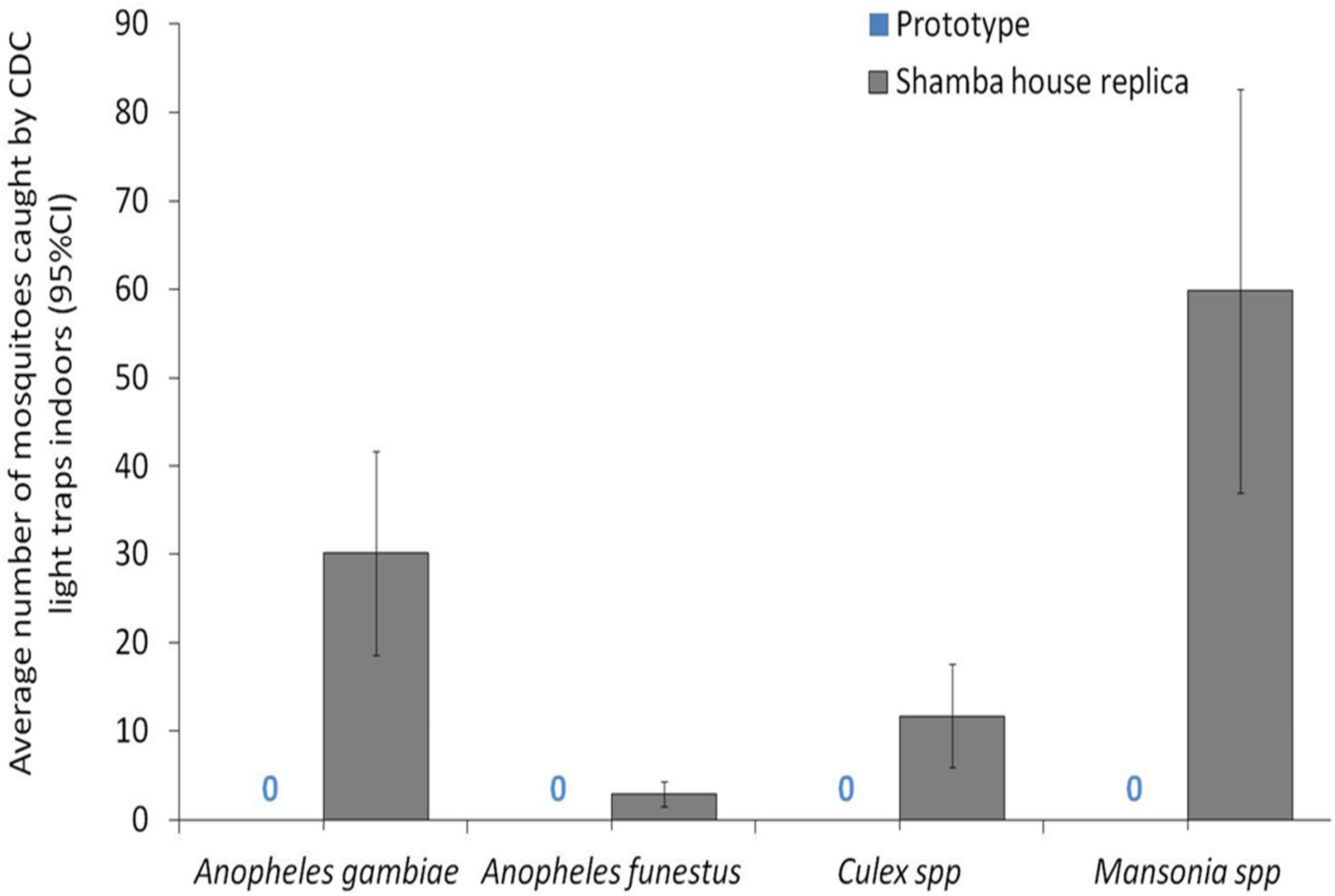


Volunteers using torn nets

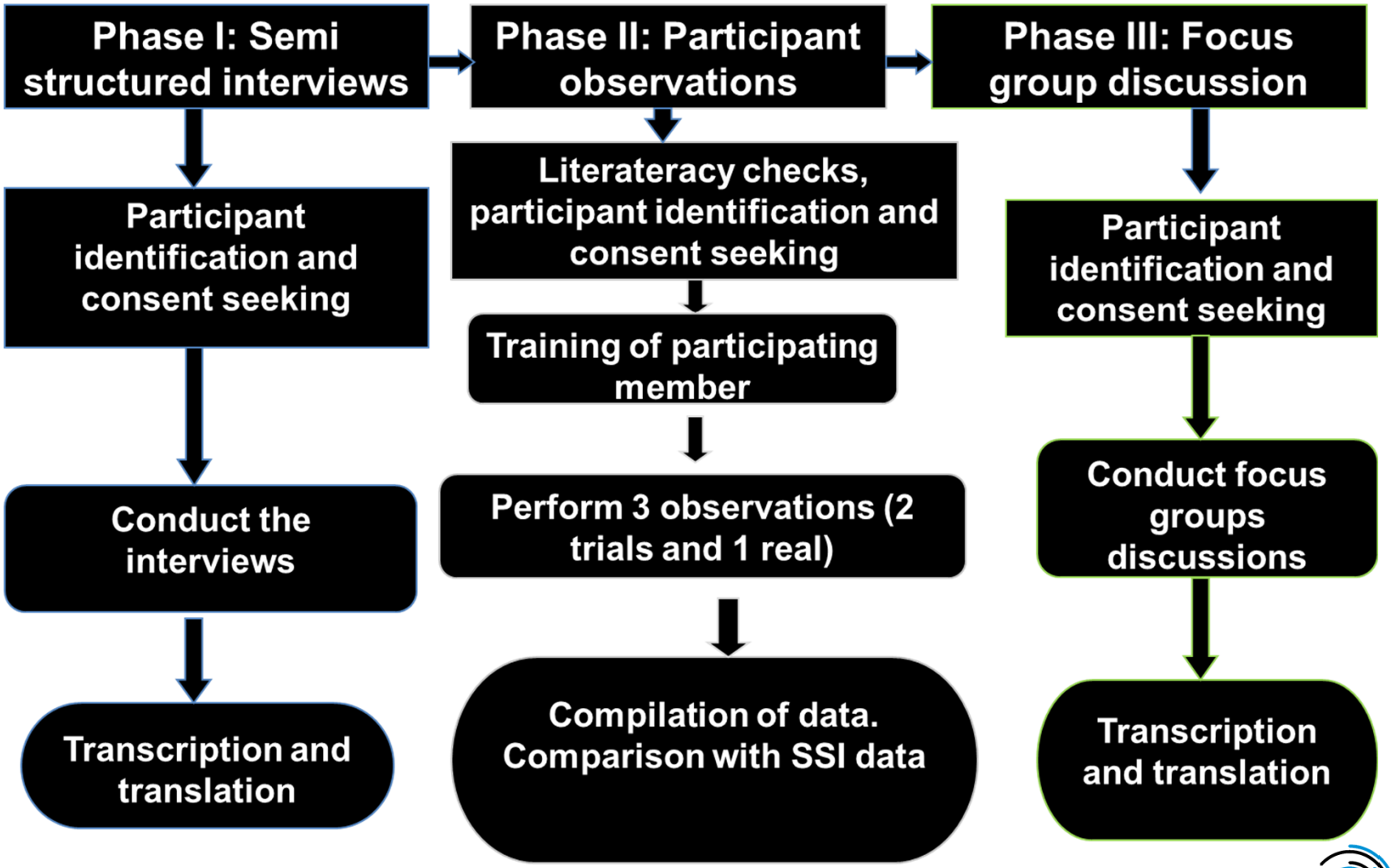




Outcome measures: 1) No. mosquitoes of different species entering each hut type, 2) % blood-fed, 3) microclimate measurements and 4) *Plasmodium* infection rates


Average number of mosquitoes caught by CDC light traps indoors (95%CI)
90
80
70
60
50
40
30
20
10
0
Prototype
Shamba house replica
0
0
0
0
Anopheles gambiae
Anopheles funestus
Culex spp
Mansonia spp

Assessed views, experiences and behaviors of itinerant farmers and their views on the prototype



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Responses from itinerant rice farmers from qualitative study

Views from farmers:

On current *Shamba* houses

❖"There is no protection without sleeping inside the bed net, mosquitoes easily enter inside and bite us."

- female interviewee from Lupiro

On the mosquito proof prototype

❖"I am ready to use it. Even the day after tomorrow, I will go to the farm and prepare a place to put that good house."
- male interviewee from Minepa

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What's next

- To ascertain the protective efficacy when in actual use
- Commercialization of the prototypes into products
- Identify means of reducing the costs of the final product
- Nomadic communities

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