

Wedge Sampling: QGIS Mapping to Assess Protocol Compliance during Household Survey Data Collection in Rural Tanzania

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Introduction

- Mama na Mtoto (Mother and Child) is a Canadian government-funded initiative working to increase maternal, newborn, and child health in rural Tanzania.
- ‘Gold Standard’ household coverage survey protocols commonly used in low and middle income countries employ cluster-sampling strategies which require a listing of all households in a geopolitical unit.
- In many rural African communities most in need of interventions, household lists are unavailable; mapping of households is very costly and time-consuming.
- The Mama na Mtoto study team designed/used an alternative sampling strategy, “Wedge Sampling”, for a recent household survey (Sept. 2016) which used purposeful household selection for 2nd stage sampling.

Objectives:

- Map Global Positioning Systems (GPS) data from the 2016 household survey using Quantum Geographic Information Systems (QGIS) software.
- Analyze QGIS maps to evaluate “Wedge Sampling” protocol compliance.

Methods

Mapping:

Geospatial data collected in the field was mapped using QGIS software. Multiple layers were created to depict cluster center, boundary, households, directional line, enumeration route, and swept wedge area.

Compliance Score:

A scoring matrix was created to evaluate protocol compliance and all selected hamlets were assigned a score out of 4.

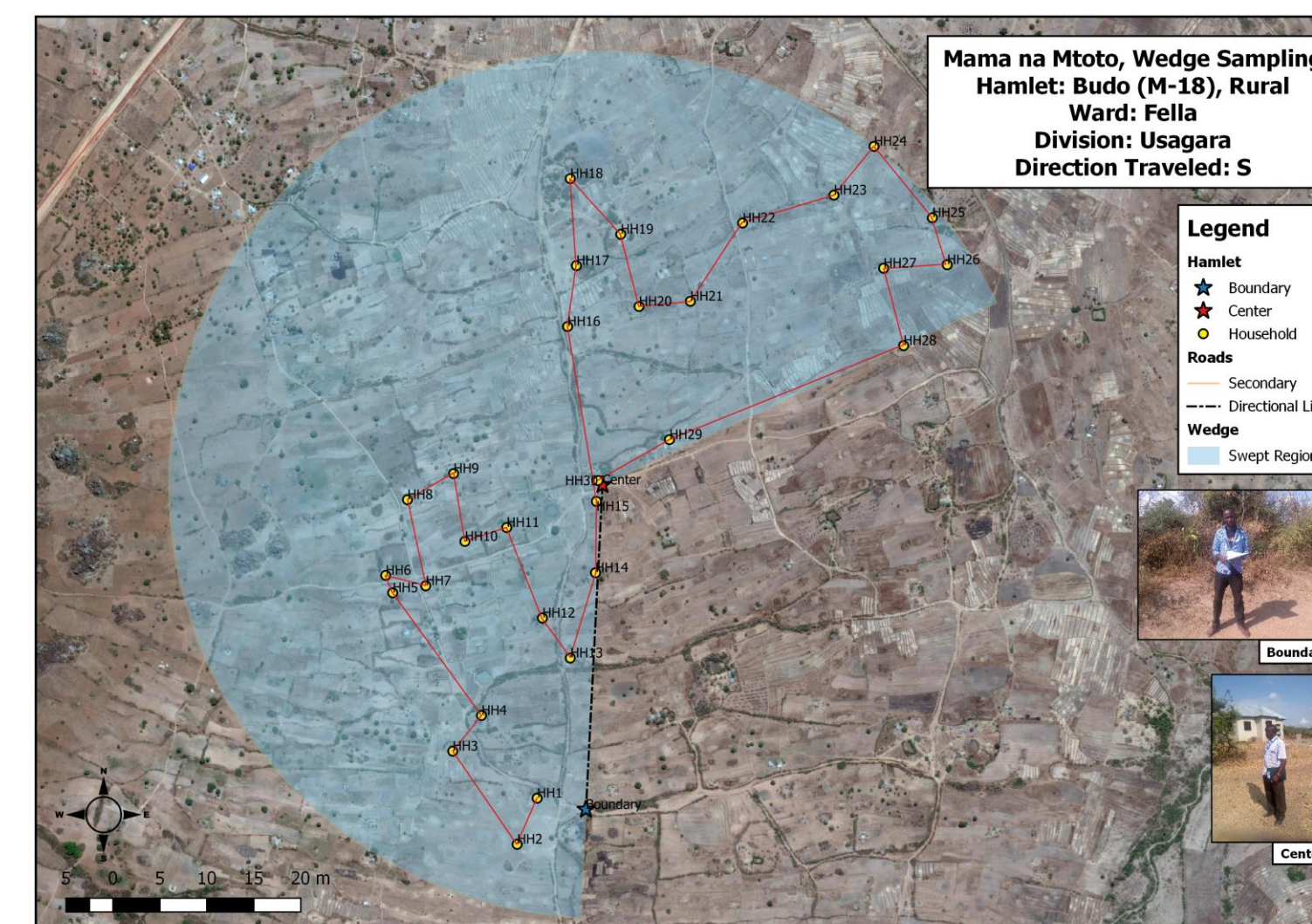
Criterion	Compliance
Direction of Directional Line (DIR)	Within 22.5 degrees of error
Sweep Direction (SW)	Swept to the RIGHT of Directional Line
Wedge Coverage (COV)	Exclusively clockwise sweep, furthest outliers within 22.5 degrees of error
Enumeration Tally (TAL)	Enumerate 30 households when total>45 whole hamlet when total ≤45

Barrier Assessment:

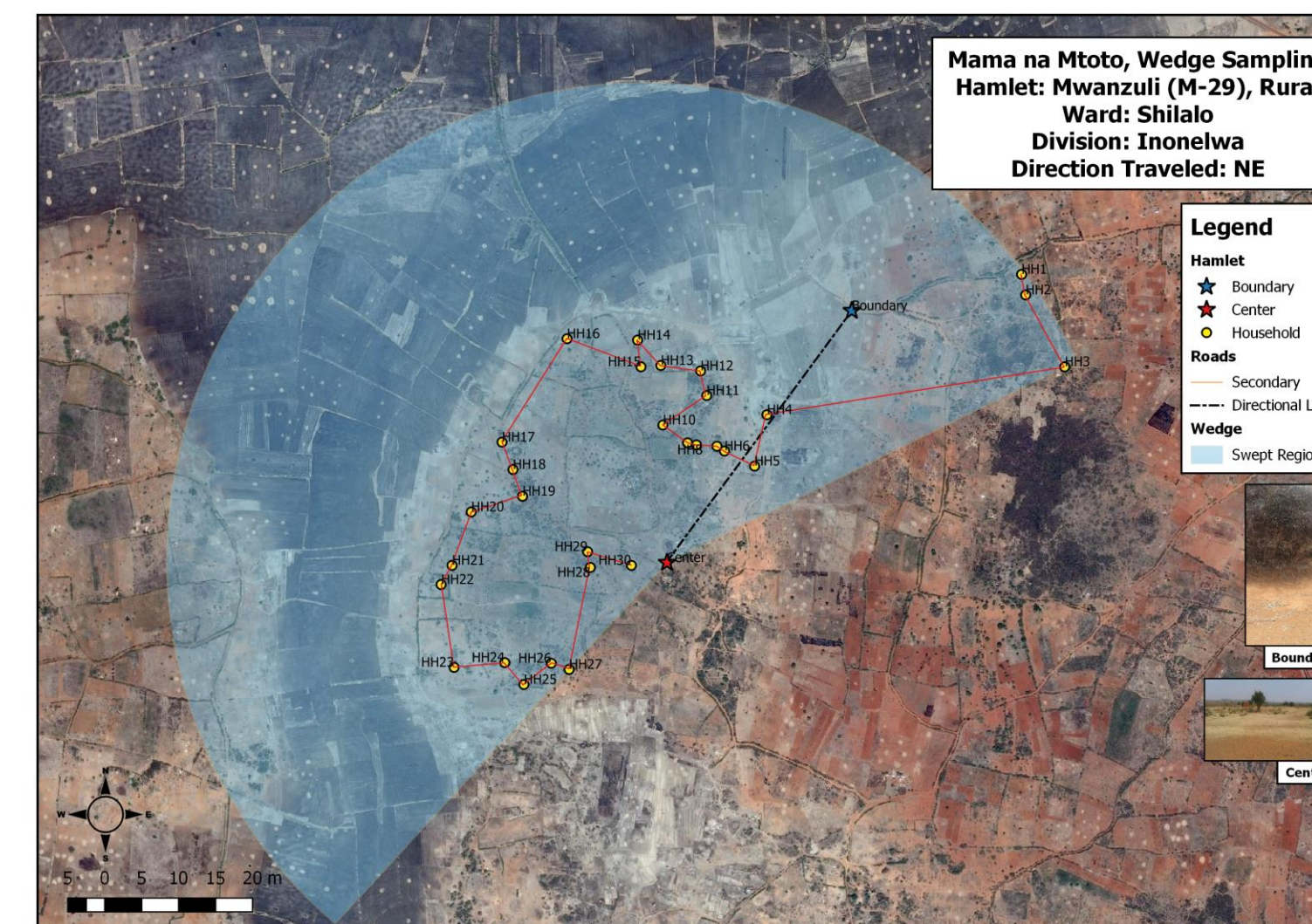
Study team members reviewed all individual maps and described potential barriers to protocol compliance and implementation.

Results

Mapping: A total of 67 hamlet maps were created, identifying 2042 enumerated households (40.1% of hamlet households).

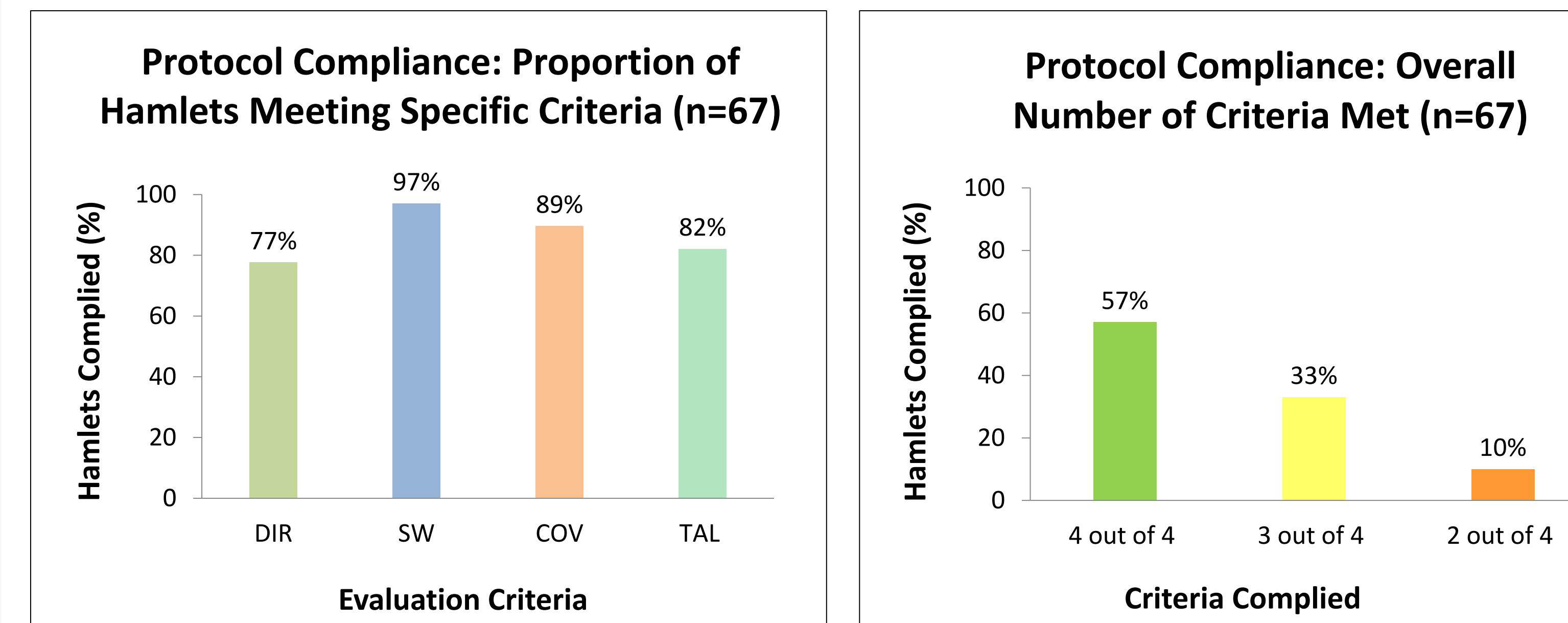


Hamlet # 18: achieved full compliance (4/4 criteria)

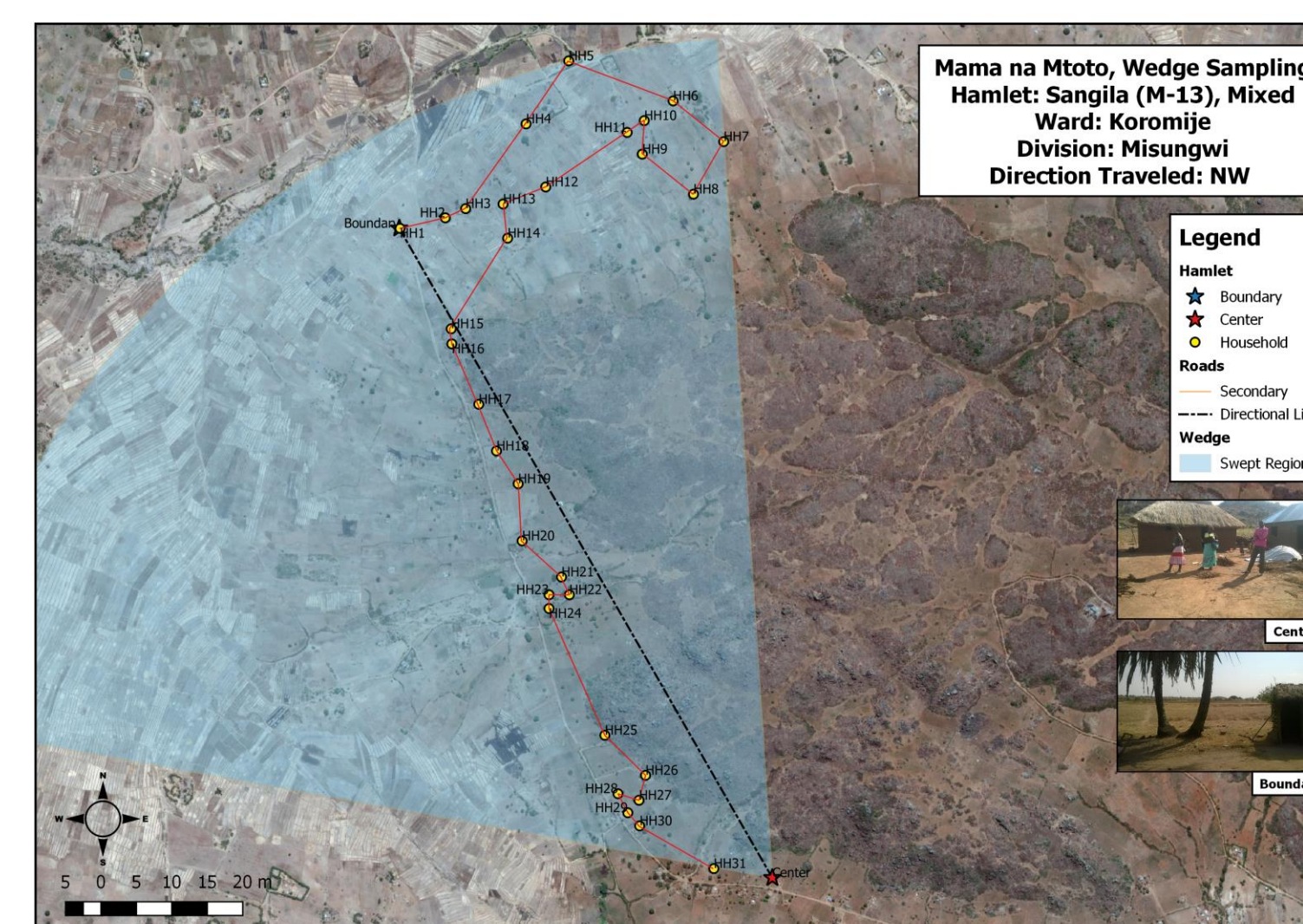


Hamlet # 29: achieved limited compliance (2/4 criteria) . Failed to comply with ‘Sweep Direction’ and ‘Wedge Coverage’.

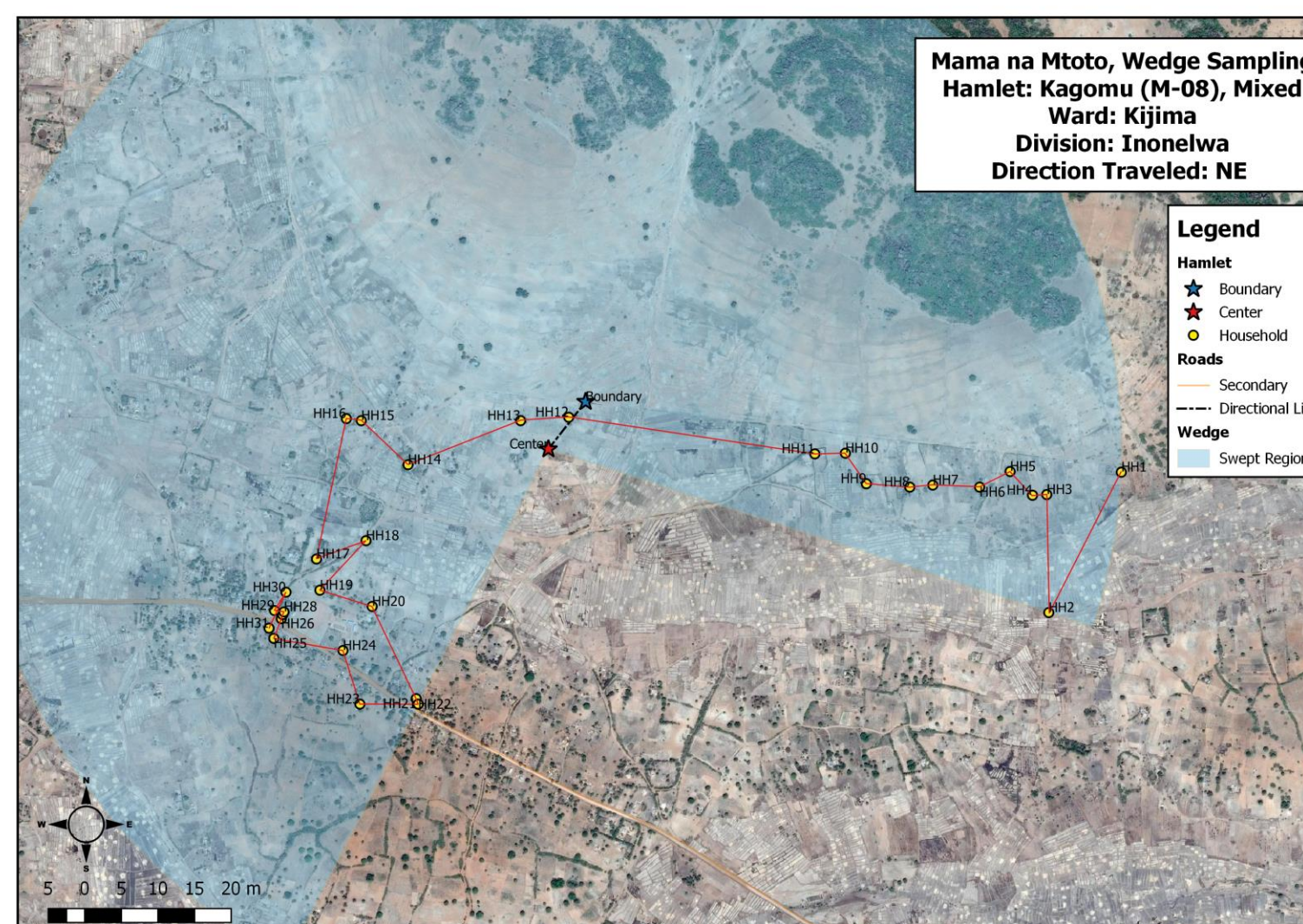
Compliance Scores :



Barrier Assessment: Common barriers included faulty GPS devices/incorrect usage, large obstructive geographic features, and irregular cluster shape



Hamlet # 13: exemplifies a large geographic land feature which influenced the enumeration route



Hamlet #8: exemplifies irregular hamlet shape and is fully enumerated



Hamlet # 13: photograph taken at hamlet boundary

Discussion

- Reasonable compliance and practical feasibility suggest that ‘Wedge Sampling’ may pose a viable alternative to mapping all households for coverage surveys in rural communities in low–resource settings.
- Modifications to the proposed ‘Wedge Sampling’ protocol and/or training procedures may alleviate potential barriers to compliance.
- Study limitations include satellite image quality, GPS device reliability, and lack of a standardized compliance measurement tool.
- Further studies are recommended to measure ‘Wedge Sampling’ data quality and reliability.

References

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