

# A cluster-randomized home gardening program improves dietary diversity and food security among rural Tanzanian women

Mia Monique Blakstad  
PhD Student

Harvard T. H. Chan School of Public Health



SOKOINE UNIVERSITY OF AGRICULTURE



**HARVARD T.H. CHAN**  
SCHOOL OF PUBLIC HEALTH

# Outline

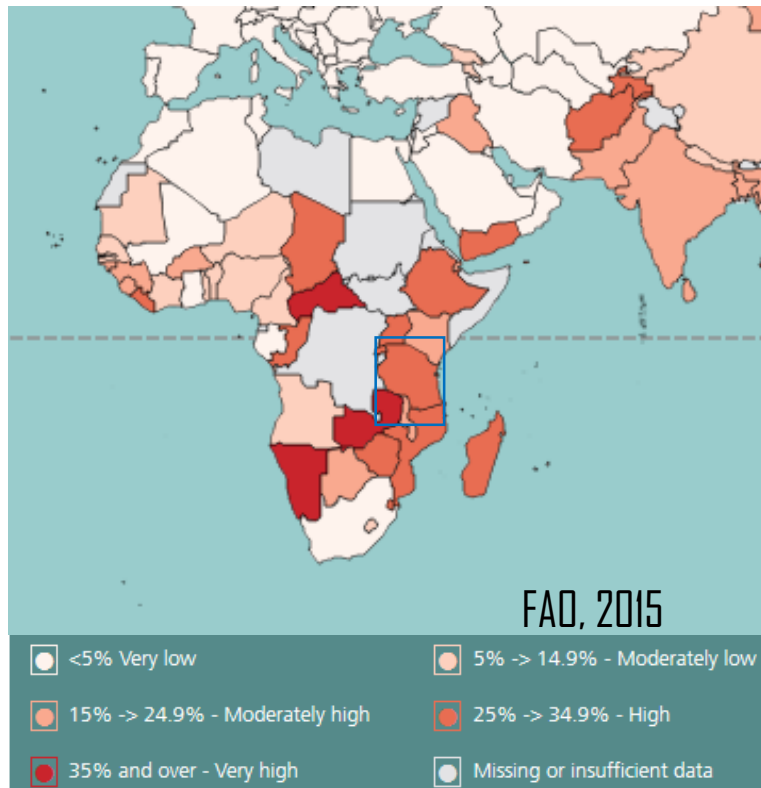
- Introduction
  - Diet and nutrition in Tanzania
  - Homestead food production (HFP)
- Methods
  - Study design
  - Statistical analysis
- Results
- Discussion



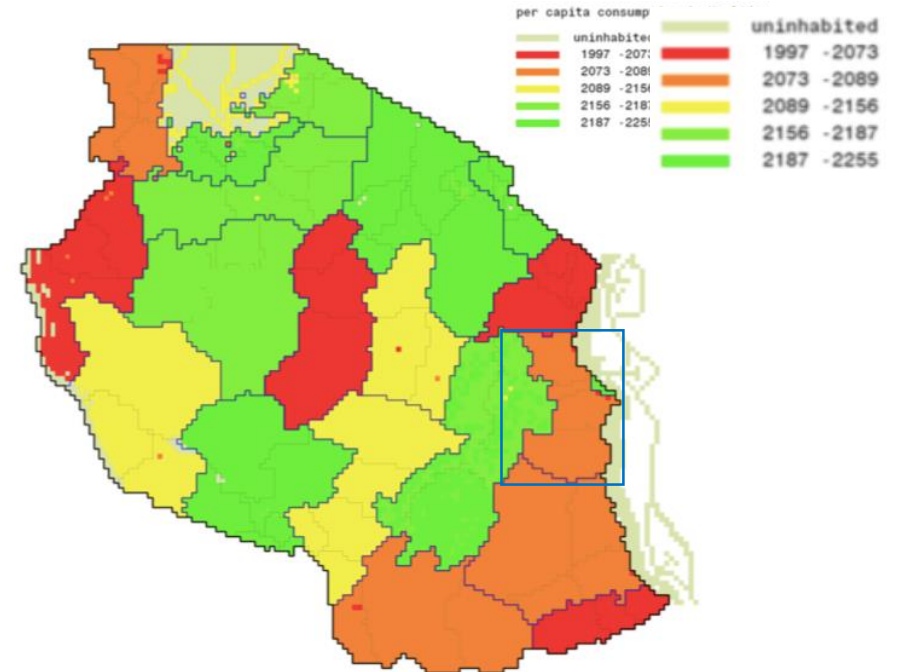
# Introduction

Tanzania experiences high levels of hunger, Pwani region among the hardest affected

Hunger across the African continent



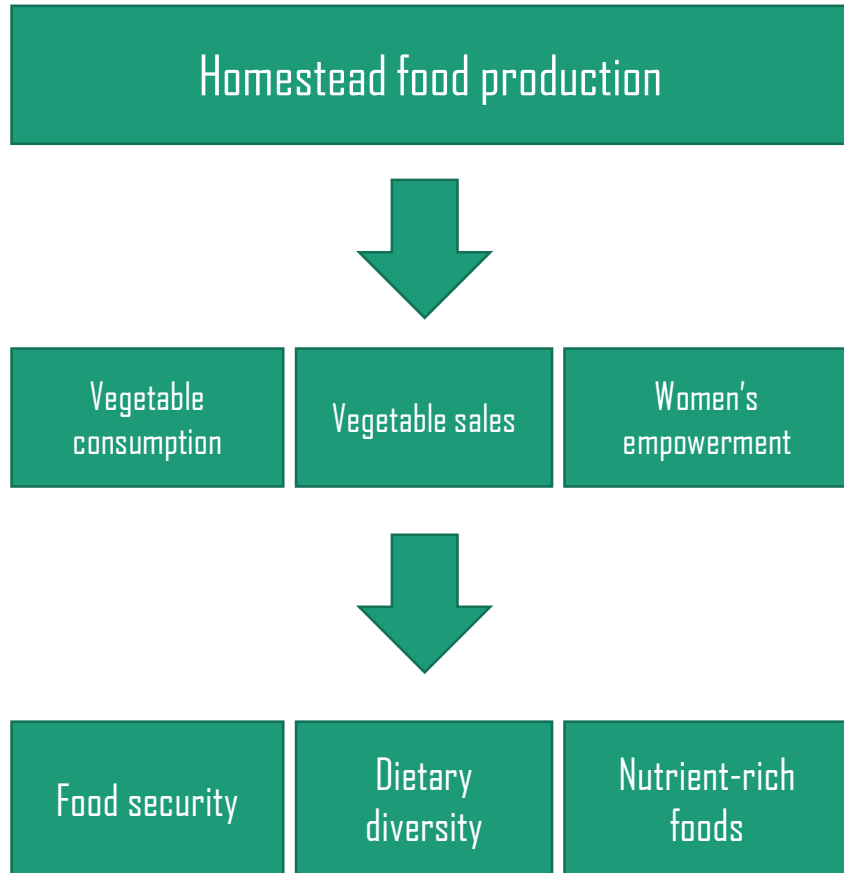
Tanzanian total per capita daily caloric intake



Van Wesebeeck, 2012



# Homestead Agriculture and Nutrition Initiative (HANU)



- Cluster-randomized trial of homestead food production in Rufiji, Tanzania
- Main household eligibility criteria:
  - Woman of reproductive age and one child under 36 months
  - Access to plot of land or containers for growing vegetables
- Goals:
  - Enhance production of nutrient-dense vegetables
  - Provide messages on nutrition and health→ Improve nutrition and health of participating households



# Research questions

Primary:

1. Does homestead food production improve **dietary diversity** among participating women?

Secondary:

1. Does homestead food production improve **consumption of nutrient-rich food groups** among participating women?
2. Does homestead food production reduce **food insecurity** among participating women?

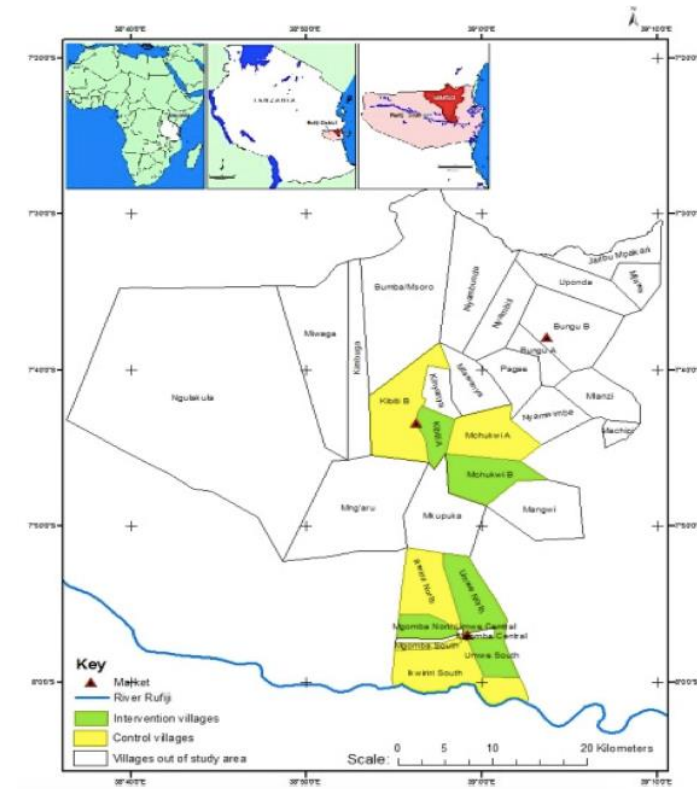


Home garden in Rufiji, Pwani, Tanzania



# Methods: study design

- Pair-matched cluster-randomized trial in 10 villages (n=1,006)
- The intervention included:
  - Provision of small agricultural inputs and garden training support, delivered by AEWs
    - Seeds: African eggplant, amaranth, spinach, tomato, okra, and Chinese cabbage (x 3)
  - Nutrition and health counseling, provided by CHWs
  - Delivered via home visits and farmer field schools every 2 weeks
- Control villages received standard of care
- Data collection: 0, 12 months (and 36 months)



Rufiji, Tanzania



# Methods: outcomes of interest

- Women's dietary diversity (DD):
  - DD Score: Number out of ten food groups consumed at least once per day
  - MDD-W: proportion of women consuming at least 5 out of 10 food groups every day
- Household Food Insecurity Access Scale (HFIAS):
  - HFIAS score: Severity of food insecurity across nine domains on a scale from 0-27
  - HFIAS categories: none, mild, moderate, severe FI



# Methods: statistical analysis

- Linear regression and probability models
- Baseline covariate imbalance
  - Inverse probability of intervention weights
- Differential loss to follow-up
  - Inverse probability of censoring weights
- 16 hypotheses tested
  - Bonferroni p-value: 0.0003





# Results: baseline household characteristics

- Total enrolment: 1,006 caregiver-infant pairs
- 58% of women received primary education
- Majority of income from informal employment activities
- Women spend 1300 TSH (0.57 USD) per person/day on food
- Women consumed 3 food groups/day
  - Ugali, fried fish, okra, fresh fish, and rice most common
- On average, households grow about three crops
  - Maize, rice, sesame, cassava, and cashews most common



Table 1: Differences in dietary diversity score and household food insecurity scores between intervention and control households after 12 months of follow-up

Outcome	Unadjusted			Adjusted with intervention and censoring weights		
	Mean difference	95% CI	P-value	Mean difference	95% CI	P-value
Dietary diversity score	0.53	0.33, 0.74	<0.001	<b>0.73</b>	0.41, 1.05	<b>&lt;0.001</b>
Household food insecurity access scale	-0.39	-1.14, 0.37	0.312	<b>-1.92</b>	-3.05, -0.78	<b>0.001</b>



Table 2: Risk differences between intervention and control households after 12 months of follow-up

Outcome	Unadjusted				Adjusted with intervention and censoring weights			
	Risk difference	Risk among control	95% CI	P-value	Risk difference	Risk among control	95% CI	P-value
Moderate food insecurity	-0.03	0.06	-0.07, 0.01	0.143	0.01	0.03	-0.04, 0.05	0.820
<b>Severe food insecurity</b>	-0.04	0.15	-0.09, 0.01	0.156	<b>-0.22</b>	<b>0.25</b>	<b>-0.32, -0.12</b>	<b>&lt;0.001</b>
<b>Minimum dietary diversity</b>	0.14	0.29	0.08, 0.20	<0.001	<b>0.18</b>	<b>0.25</b>	<b>0.08, 0.28</b>	<b>0.001</b>



Table 3: Risk differences between intervention and control households after 12 months of follow-up

Outcome	Unadjusted				Adjusted with intervention and censoring weights			
	Risk difference	Risk among control	95% CI	P-value	Risk difference	Risk among control	95% CI	P-value
Beans and peas	0.12	0.17	0.06, 0.18	<0.001	0.11	0.20	0.01, 0.22	0.038
Dairy	0.01	0.06	-0.02, 0.03	0.501	0.04	0.06	-0.01, 0.10	0.146
Eggs	0.00	0.01	-0.01, 0.01	0.651	0.01	0.01	-0.01, 0.02	0.349
Flesh foods	0.06	0.75	0.00, 0.11	0.041	0.04	0.75	-0.04, 0.13	0.332
Nuts and seeds	0.01	0.00	-0.01, 0.02	0.282	0.00	0.00	-0.01, 0.02	0.540
Other fruits	0.10	0.40	0.03, 0.16	0.002	0.13	0.33	0.02, 0.24	0.017
<b>Dark green vitamin A-rich vegetables</b>	0.13	0.29	0.07, 0.19	<0.001	<b>0.20</b>	<b>0.28</b>	<b>0.09, 0.31</b>	<b>&lt;0.001</b>
Other vitamin A rich vegetables & fruits	0.07	0.08	0.02, 0.12	0.007	0.09	0.07	0.01, 0.17	0.031

\*Bonferroni corrected critical p-value is 0.003



# Discussion

- We found large improvements in dietary diversity and food security
- Quasi-experimental on HFP
  - HKI in Bangladesh, Cambodia, Nepal and Philippines (Talukder, 2010)
  - Bangladesh (Schreinemachers, 2014 and 2016)
- RCTs on HFP
  - Burkina Faso (Olney, 2015)
    - Increased consumption of certain food groups, diversity scores
  - Nepal (Osei, 2015 and 2017), Zambia (Kumar, 2017)
    - Mixed results on child anthropometry
    - Reduction in anemia

marginal effect on dietary



# Strengths and limitations

- Strengths:
  - Rigorous methodology: cluster RCT
  - Conservative analysis and estimates
- Limitations:
  - Covariate imbalance from small number of clusters
  - Seasonal patterns not assessed



HANU woman helping neighbor with HFP



# Next steps

- Endline at 36 months of follow-up
- Longitudinal assessment for both women and children:
  - Dietary diversity
  - Anthropometry
  - Anemia
- Potential mediators:
  - Role of income, water access, and women's empowerment





# Acknowledgements

- Jarvis T. Chen, Wafaie Fawzi, Alexa Bellows, Chelsey Canavan, Killian Mlalama, Dominic Masha, Joyce Kinabo, Ramadhani Abdallah Noor, and Honorati Masanja
- Ifakara Health Institute and Sokoine University of Agriculture
- The livestock-, agriculture, and nutrition officers, AEWs and CHWs
- The women who participated in the study

