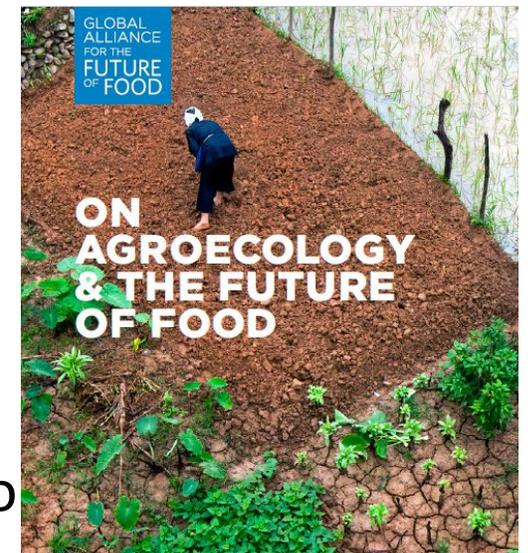


What is Agroecological Research?

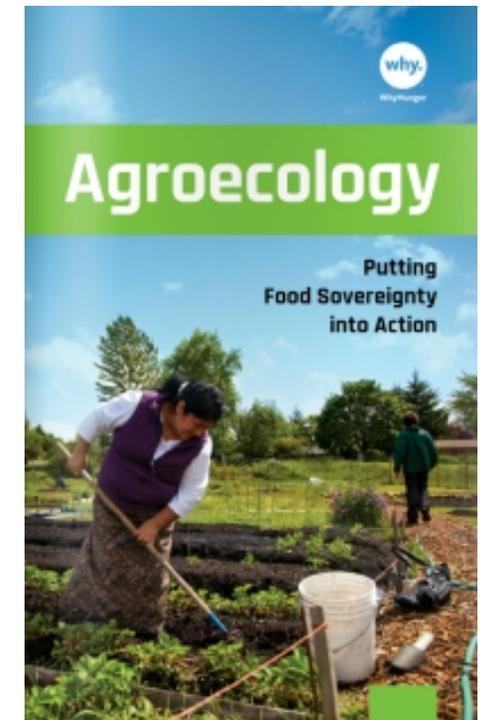




Agroecology



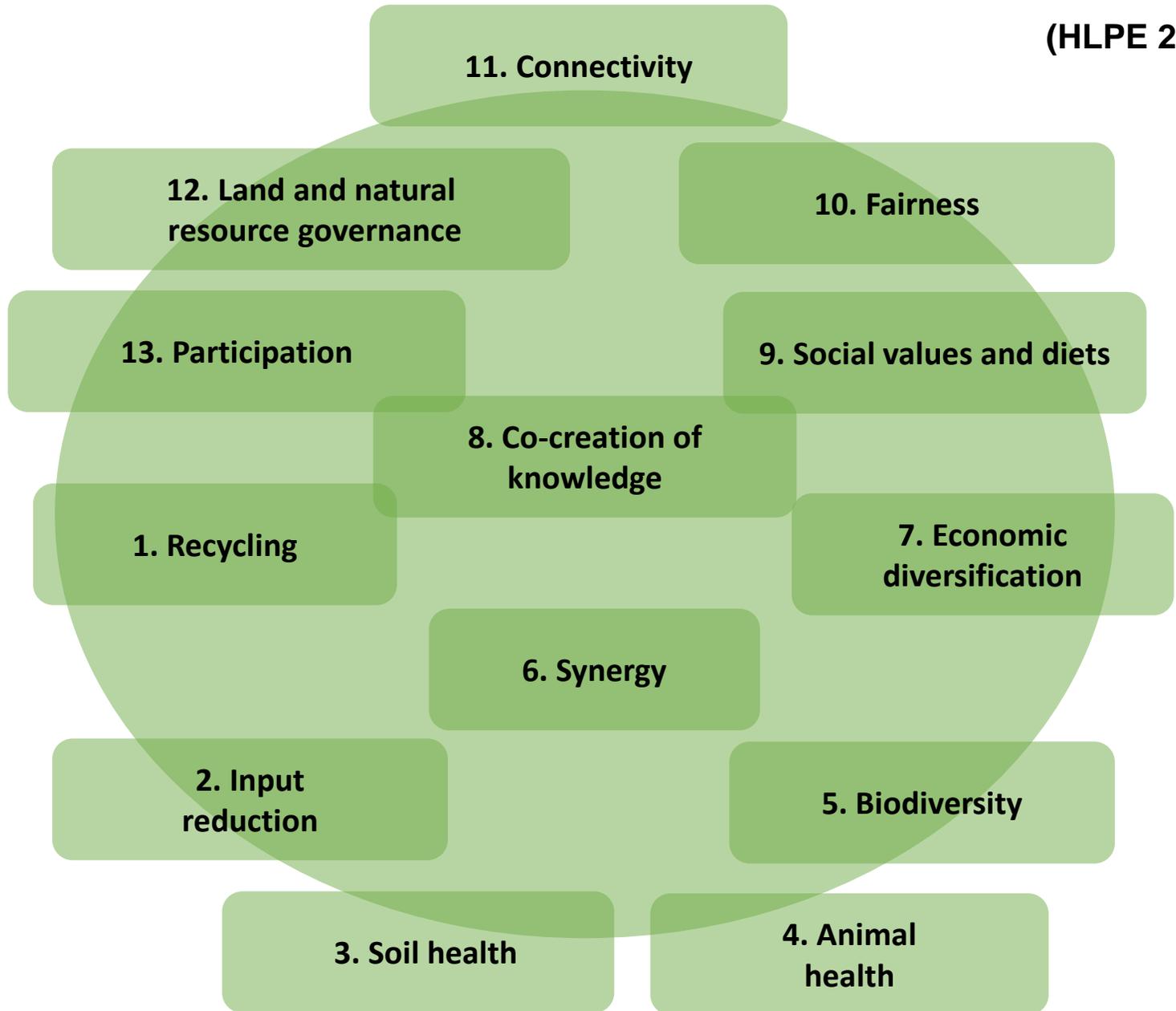
- **Dynamic concept**, expanded from field and farm to whole food system:
- **Science**: transdisciplinary.
- **Set of practices**: harness ecological processes in agricultural production – generic principles, applied locally - no prescribed set.
- **Social movements**: political, assert collective rights for smallholder farmers, holistic approach to food system, and advocate diversity in agriculture and food systems.
- **HLPE 2019 report identifies 13 consolidated principles**



Food system transformation level and agroecological principles

(HLPE 2019)

Transformational	<p>Level 5: Build a new global food system, based on participation, localness, fairness, and justice</p> <p>Level 4: Reconnecting the two most important parts of the food system - consumers and producers, through the development of alternative food networks</p>	Food system
	<p>Level 3: Redesign the agroecosystem so that it functions on the basis of a new set of ecological processes that provide system resistance</p> <p>Level 2: Substitution of conventional inputs and practices with alternatives</p> <p>Level 1: Increase input use efficiency, reducing the use of costly, scarce, or environmentally damaging inputs</p>	



Agroecological Research in Practice: Research Project 1 in Malawi

Level 5: Build a new global food system, based on participation, localness, fairness, and justice

Level 4: Reconnecting the two most important parts of the food system - consumers and producers, through the development of alternative food networks

Level 3: Redesign the agroecosystem so that it functions on the basis of a new set of ecological processes that provide system resistance

Level 2: Substitution of conventional inputs and practices with alternatives

Level 1: Increase input use efficiency, reducing the use of costly, scarce, or environmentally damaging inputs

Participatory research with legume intercrops by Farmer Research Teams in 7 villages + 183 households,

In-depth interviews...
Brainstorming across disciplines...
Seeking ecological solutions..
Participatory research design



Pigeonpea

Groundnut
(peanut)

Research Questions & Methods

- Are farmers interested in legume diversification?
- What are some of the social factors that influence use of legume diversification?
- Can legume diversification under smallholder farmer conditions improve food security & child nutrition in Malawi?



- **Longitudinal**, on-farm, **transdisciplinary + participatory** research, qualitative + quantitative
- Farmer Research Teams selected by communities, test on their farms and teach other farmers
- Semi-structured interviews + Focus groups
- 10 surveys: pre/post, control-intervention of 350+ households; 9 anthropometric surveys (2001-2007); Annual agricultural data from 100+ farms
- **Iterative process**: Annual participatory workshops, changes to research and activities changed based on results.



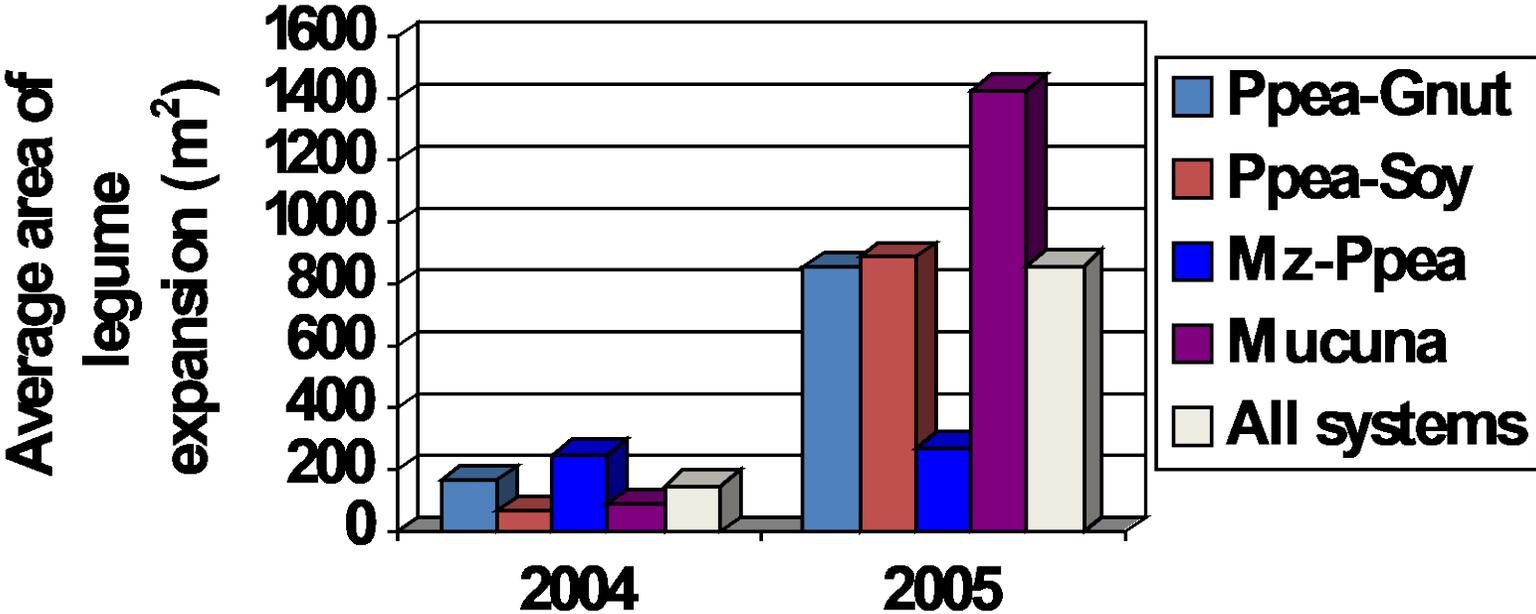
Field scale: Q 1: Farmers willing to expand area devoted to legumes

1. Recycling

3. Soil health

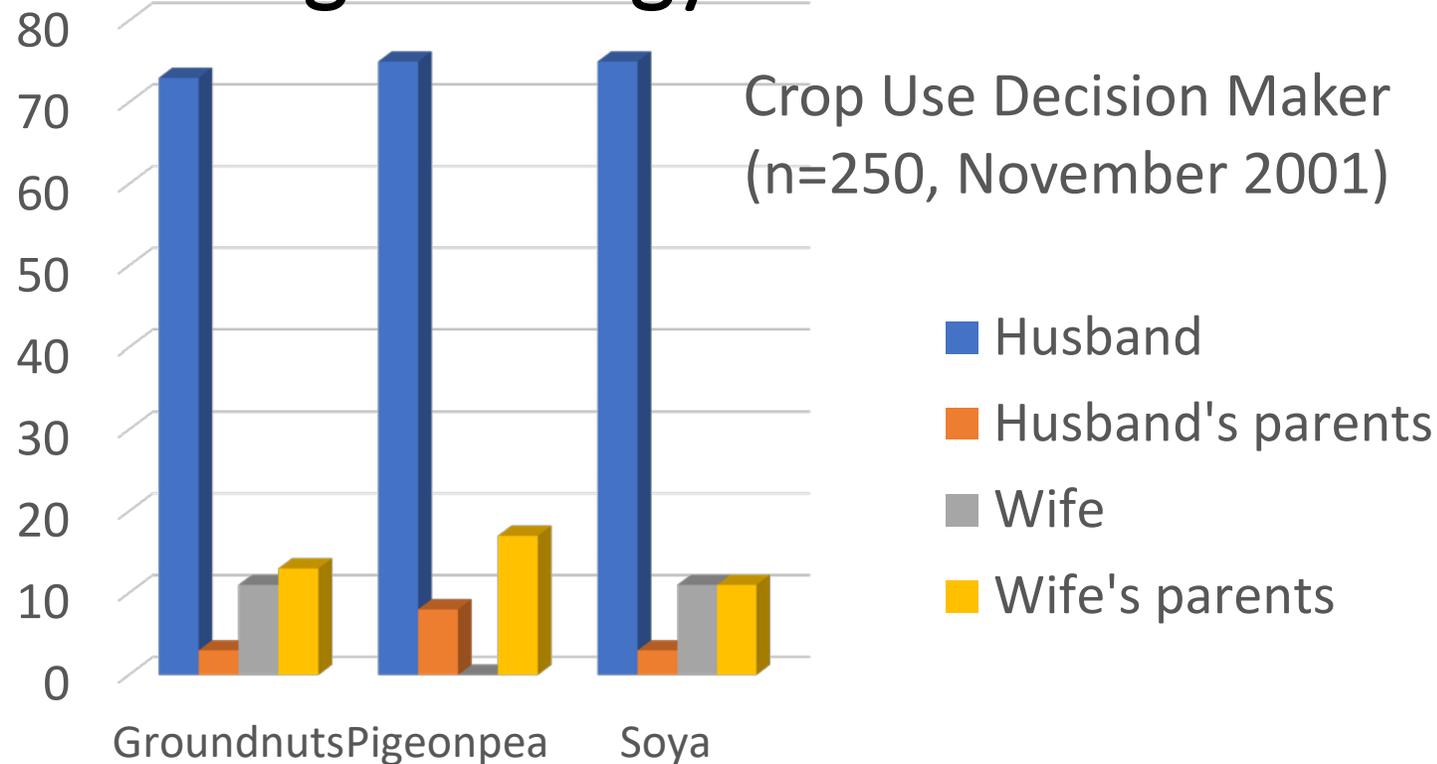


Average area of expansion of legumes (Field data 2004, n= 134 and 2005 n= 110)



Bezner Kerr, R., S. Snapp, M. Chirwa, L. Shumba and R. Msachi. 2007. "Participatory Research on Legume Diversification with Malawian Smallholder Farmers for Improved Human Nutrition and Soil Fertility." *Experimental Agriculture* 43 (4): 1-17

Moving from field to farm: RQ2 – gender inequity key if agroecology to lead to food security & nutrition



- Lack of men's involvement in child care;
- Women's workload and crop residue incorporation.
- Unequal control and decision-making about crop use;
- Unequal gender dynamics shaping food security and health

“My main worry is my husband. I do all the farming... there is no peace at the house. My biggest worry is when he sells the farm harvest, because I worry, what am I going to feed my children? I don't even know where the money goes... I'm very worried because nowadays life is difficult.

Interview 3, August 2009, 31 year old woman with 5 children.

8. Co-creation of knowledge

Testing community-based educational strategies *devised by farmers*

- Crop residue incorporation days;
- Recipe days;
- Agriculture & nutrition discussion groups

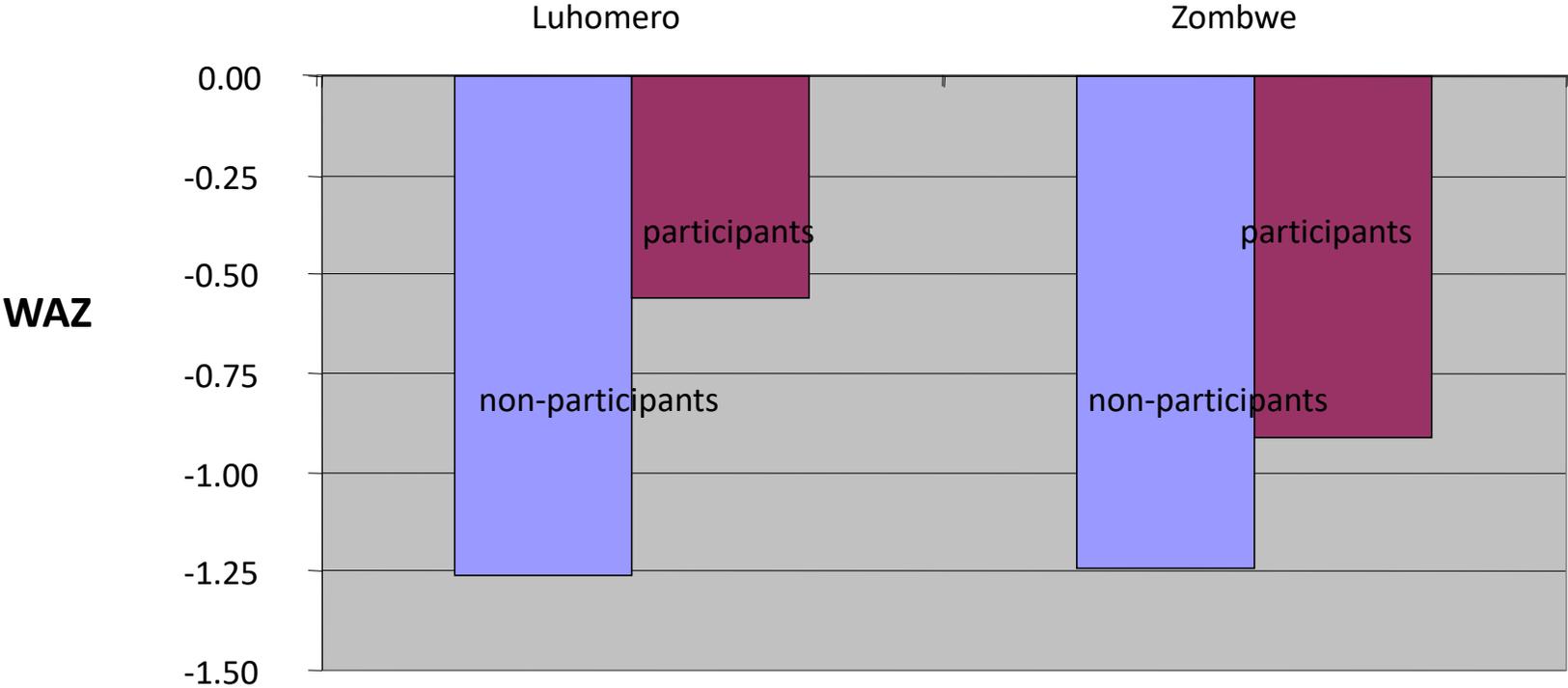


Satzinger, F, R. Bezner Kerr and L. Shumba. 2009. "Farmers integrate nutrition, social issues and agriculture through knowledge exchange in northern Malawi." *Ecology of Food and Nutrition* 48 (5): 369-82.

Beyond the field: Improved child growth for households growing legumes & participating in community education

9. Social values and diets

Child growth in first year participating villages, participating households vs non-participating households

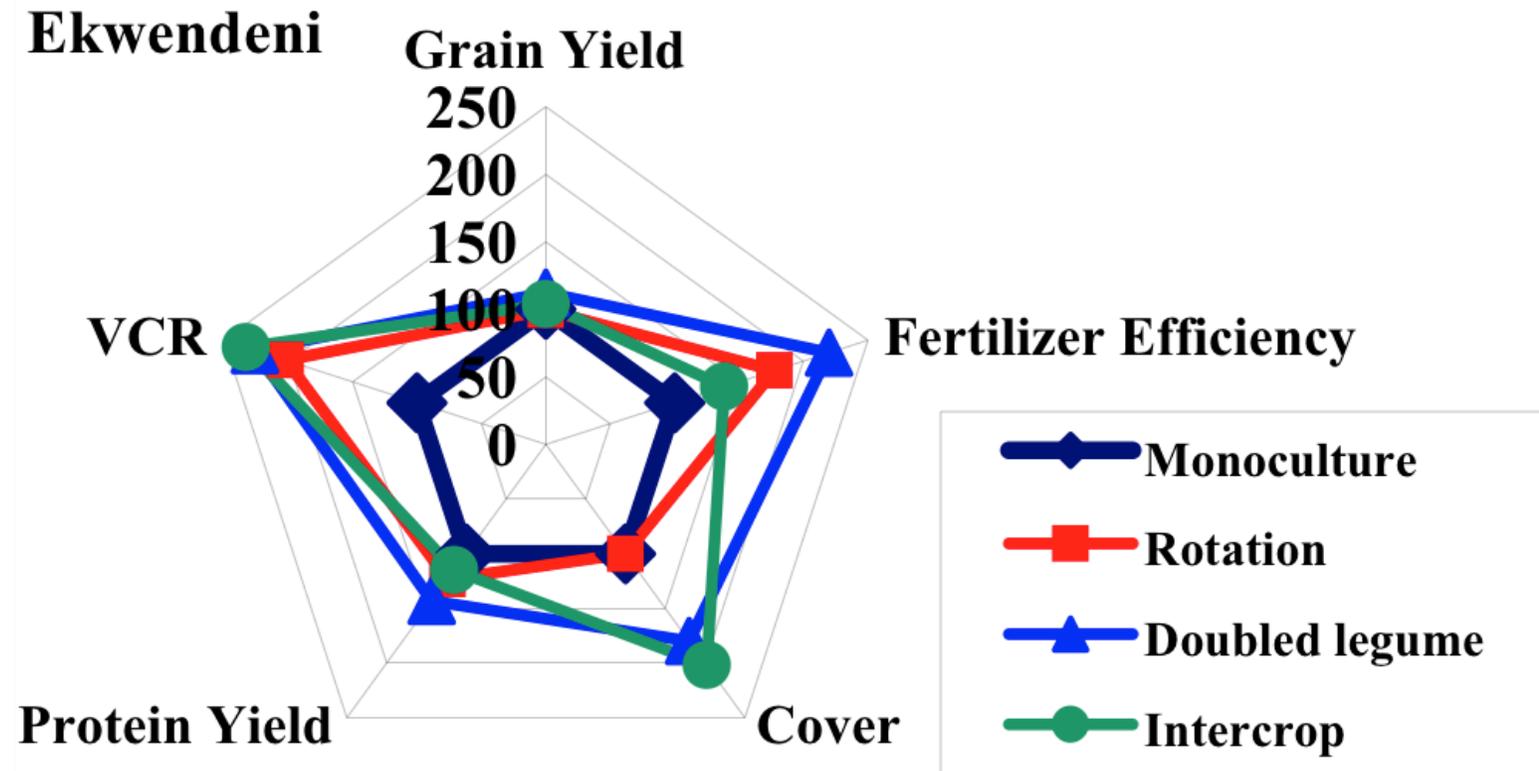


Source: Bezner Kerr, R., Berti, P.R. and Shumba, L. (2010) 'Effects of Participatory Agriculture and Nutrition project on Child Growth in Northern Malawi' *Public Health Nutrition* 14(8):1466-1472

6. Synergy

2. Input
reduction

Legume diversification had multiple impacts on ecosystems and livelihoods



Source: Snapp, S. S., M.J. Blackie, R.A. Gilbert, R. Bezner Kerr, G.Y. Kanyama-Phiri. 'Biodiversity can support a greener revolution in Africa' *Proceedings of the National Academy of Sciences* 107(48):20840-20845

Sustained crop diversity over time

- Surveyed 198 farms in 2010 (10 years after the initial project), 757 rainfed fields
- Average # of crop species was 4 per farm, almost twice the national average
- Farmers maintained both local landraces and hybrid varieties.



Snapp, S.S. Rachel Bezner Kerr, Valerie Ota, Dan Kane, Lizzie Shumba and Laifolo Dakishoni. 2019. Unpacking a crop diversity hotspot: Farmer practice and preferences in Northern Malawi. *International Journal of Agricultural Sustainability*.

Project 2: Participatory Research on Agroecological Climate Change Adaptation

Level 5: Build a new global food system, based on participation, localness, fairness, and justice

Level 4: Reconnecting the two most important parts of the food system - consumers and producers, through the development of alternative food networks

Level 3: Redesign the agroecosystem so that it functions on the basis of a new set of ecological processes that provide system resistance

Level 2: Substitution of conventional inputs and practices with alternatives

Level 1: Increase input use efficiency, reducing the use of costly, scarce, or environmentally damaging inputs

Research Question: Can participatory agroecological research be used to foster climate change adaptation for food insecure smallholder Malawi households?

400 households selected
20 villages, 10 per region
Pre-post experimental design

Dialogue and learning
about climate change
perceptions and
knowledge exchange
Agroecology training
Working at village scale



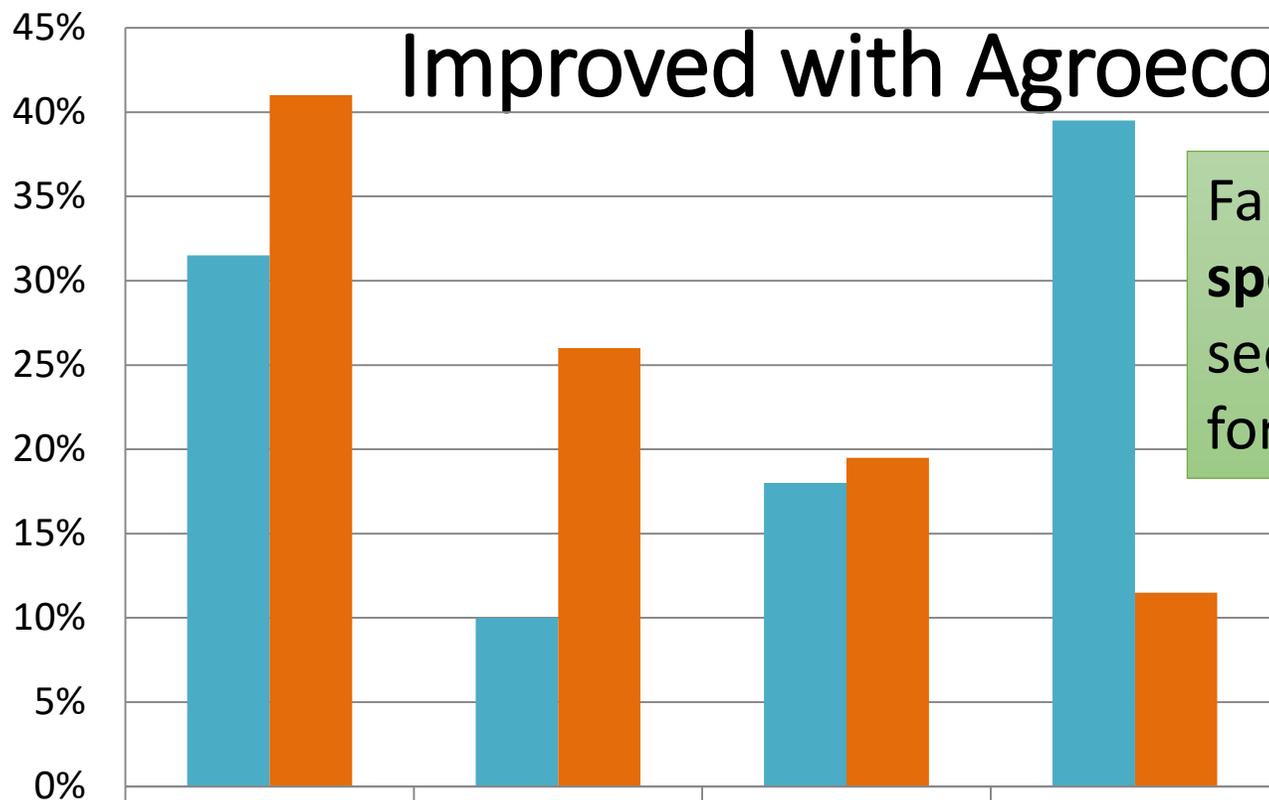
Agroecological Farmer Experiments

- Agroforestry (fruit & leguminous trees)
- Intercropped legumes, residue dug into soil
- Intensive application of animal manures
- Crop diversification e.g. sorghum, finger millet, cowpea, cassava & sweet potatoes.
- Livelihood diversification: Small-scale irrigated gardens, livestock integration

Added compost or legume residue to soil **was a significant determinant of household dietary diversity** after controlling for other variables.



Household Food security & Dietary diversity Improved with Agroecological Practices



Farmers who **discussed farming with their spouse** were 2.4 times more likely to be food secure & have diverse diets, after controlling for education, land size & wealth.



* Significant percentage change @ $p < 0.05$

Malawi Farmer-to-Farmer Agroecology

Level 5: Build a new global food system, based on participation, localness, fairness, and justice

Level 4: Reconnecting the two most important parts of the food system - consumers and producers, through the development of alternative food networks

Level 3: Redesign the agroecosystem so that it functions on the basis of a new set of ecological processes that provide system resistance

Level 2: Substitution of conventional inputs and practices with alternatives

Level 1: Increase input use efficiency, reducing the use of costly, scarce, or environmentally damaging inputs

Research question: Can agroecological farmer-to-farmer methods work at a larger scale in rural Malawi to improve food security, nutrition, livelihoods and social equity?

Longitudinal mixed methods design; Measured food security, dietary diversity, gender relations, farmer knowledge.

6000 farming households trained in agroecology, social equity and nutrition
Selected AE practices
Farmer-to-farmer training & support
Cooperative training
Community events to highlight equity issues



7. Economic
diversification

9. Social values and
diets

Longer term change: Agroecology transitions to improve food security, income & land use

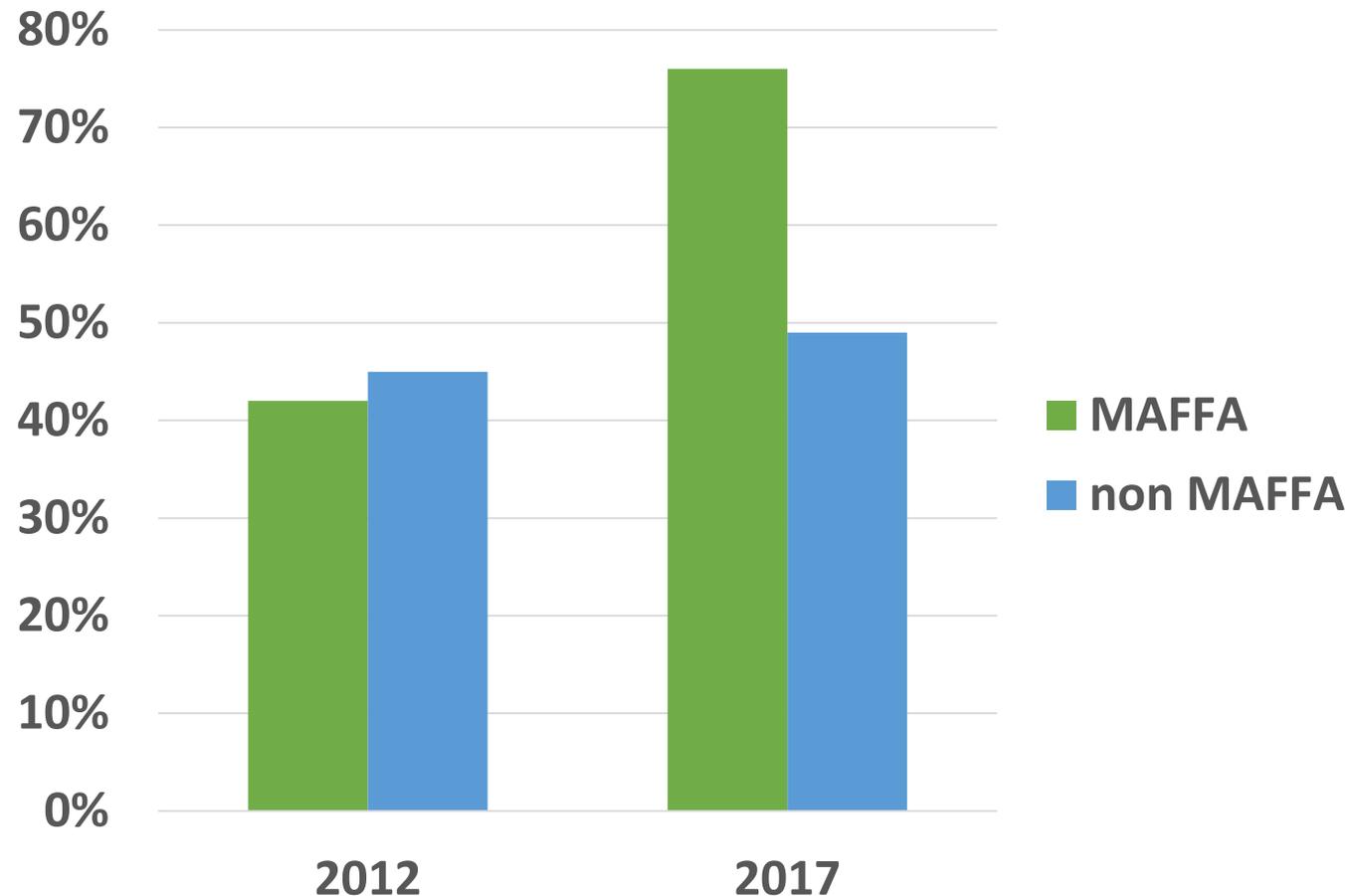


- Out of random sample of 702 households, **68% of MAFFA households** moved from food insecurity to food security over 5 years;
- Significant link between # of agroecology practices and likelihood of becoming **food secure** and with modestly **higher income**;
- Key practices linked to food security include crop diversity, compost, legume intercrops.
- **Participation in MAFFA and crop diversity** positively impacted child intake of vitamin A rich foods after controlling for other covariates.

Kansanga, Moses, Isaac Luginaah, Rachel Bezner Kerr, Laifolo Dakishoni and Esther Lupafya. Beyond ecological synergies: examining the impact of participatory agroecology on social capital in smallholder farming communities. *International Journal of Sustainable Development and World Ecology*. In press; Kangmennaang, J., R. Bezner Kerr, E. Lupafya, L. Dakishoni, M. Katundu, I. Luginaah. 2017. Impact of a participatory agroecological development project on household wealth and food security in Malawi. *Food Security* 9: 561-576.

Changes in Gender Relations

Mean change in Women's
Empowerment in Agriculture, 2012 –
2017

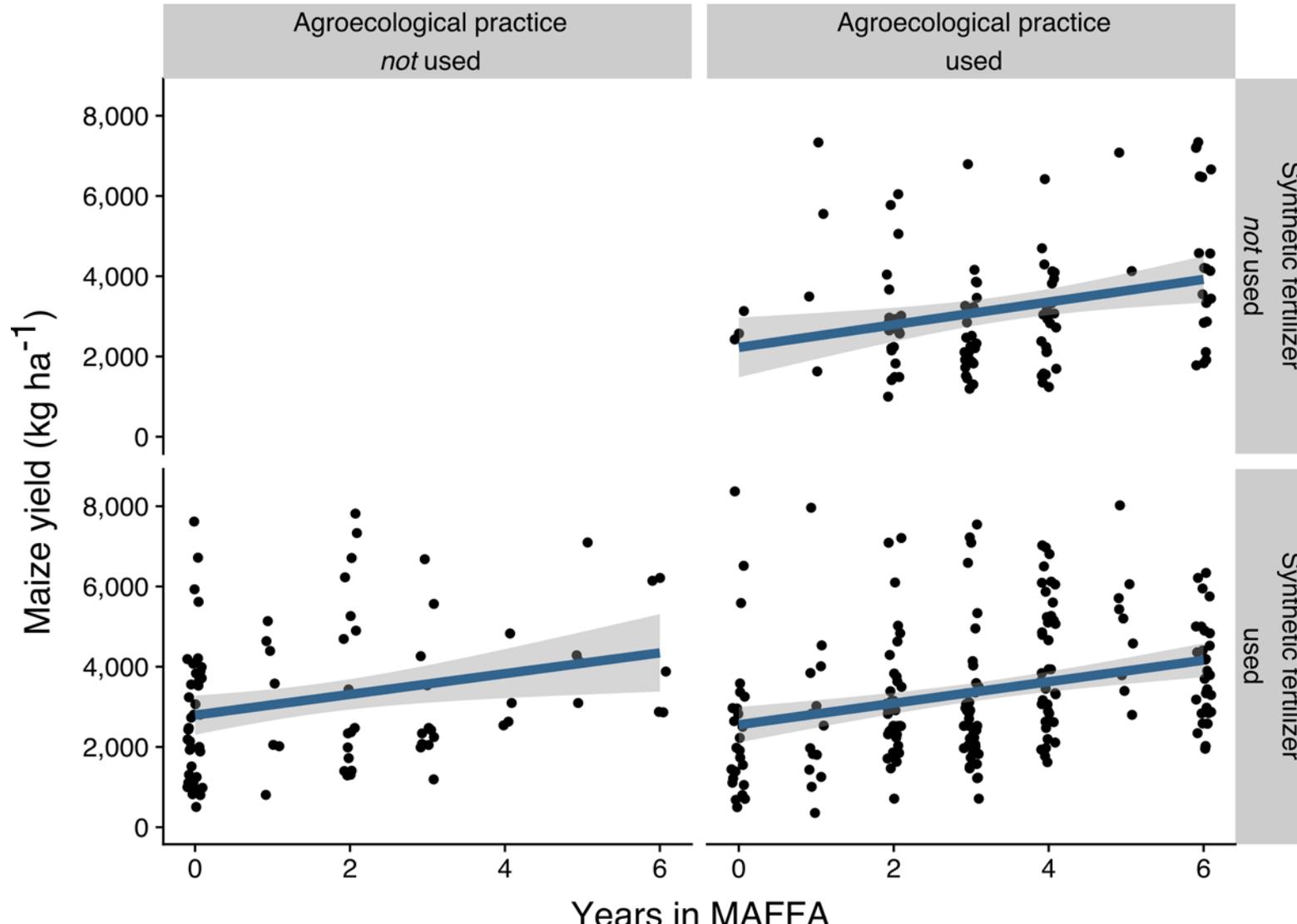


Women's Empowerment in Agriculture measure includes:

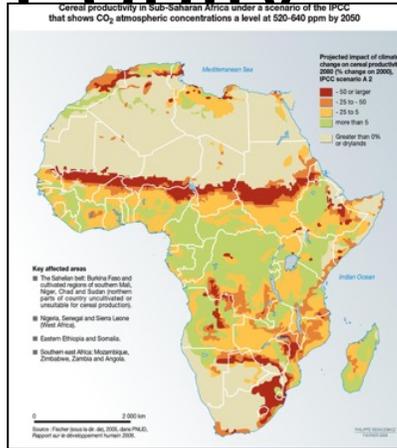
- Input in agriculture decisions
- Ownership & decision-making over assets
- Control over income
- Involvement in Groups
- Speaking in public
- Workload and leisure

Preliminary analyses: Significant effect of agroecological methods on maize yield over time at landscape scale

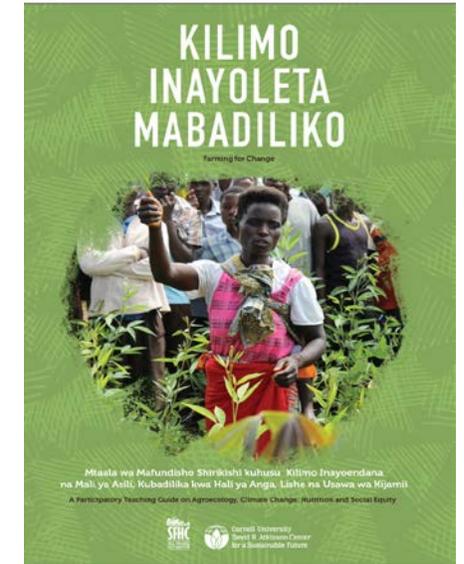
Maize yield (2015-2018)



Research Project 4: Farmer-led Curriculum on Agroecology, Climate Change, Nutrition & Social Equity



- Developed integrated curriculum aimed at farmers in southern Africa;
- Use of theatre, hands-on activities, story-telling
- Developed with a team of farmers, scientists, NGO staff
- Provided 2 week training with 500 households in Malawi; 400 households in Tanzania
- Tested for change in nutrition, food security, equity, farmer knowledge & sustainable land management



Bezner Kerr, R., Sera Young, Carrie Young, Vicky Santoso, Mufunanji Magalasi, Martin Entz, Esther Lupafya, Laifolo Dakishoni, Vicki Morrone, David Wolfe and Sieglinde S. Snapp. 2019. Farming for change: Developing a participatory curriculum on agroecology, nutrition, climate change and social equity in Malawi and Tanzania, *Agriculture and Human Values* 36 (3): 549-66.

Crop diversity and social support significantly improved food security

Change in crop diversity distribution:
Northern region



A household was 32% less likely to be severely food insecure per additional food crop grown.



A household was 50% less likely to be severely food insecure if they had social support.

Multiple Pathways to Food Security

7. Economic
diversification

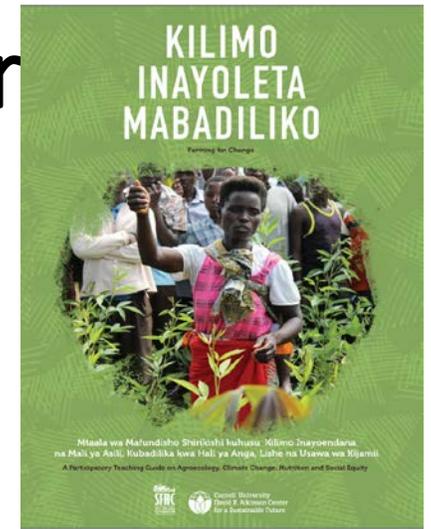


- Increased crop diversity reduced labor in weeding
- More crop diversity increased dietary diversity
- Saved money on fertilizer and foods previously purchased
- Invested in animals as a source of savings
- No longer had to work on other people's farms, instead could invest in own farm and in dry season vegetable gardens
- Increased food security allowed more food and seed sharing – community-wide benefits from crop diversity

Research Project 6: Singida Nutrition and Agroecology Project (SNAP) in Tanzania

Can a participatory, agroecological peer farmer education intervention improve legume production, food security, and infant and young child feeding in Singida District, Tanzania?

- 588 households, 20 villages
- 4 year project
- Delayed intervention design
- Peer mentors received training from Malawi & supported participating farmers
- Legume seeds provided in year 1 based on farmer interest.



Intervention households significant increased food security, dietary diversity, crop diversity and had more equitable gender relations in 3 years, compared to delayed intervention households.

Current project: *Farmer-led Agroecology Research in Malawi (FARMS) for Biodiversity*



Farmer promoters Innocent Mahone and Mwapi Mkandawire capturing bees
Photo credit: Aaron Iverson

Photovoice to learn about farmer perceptions of and knowledge of wild biodiversity.

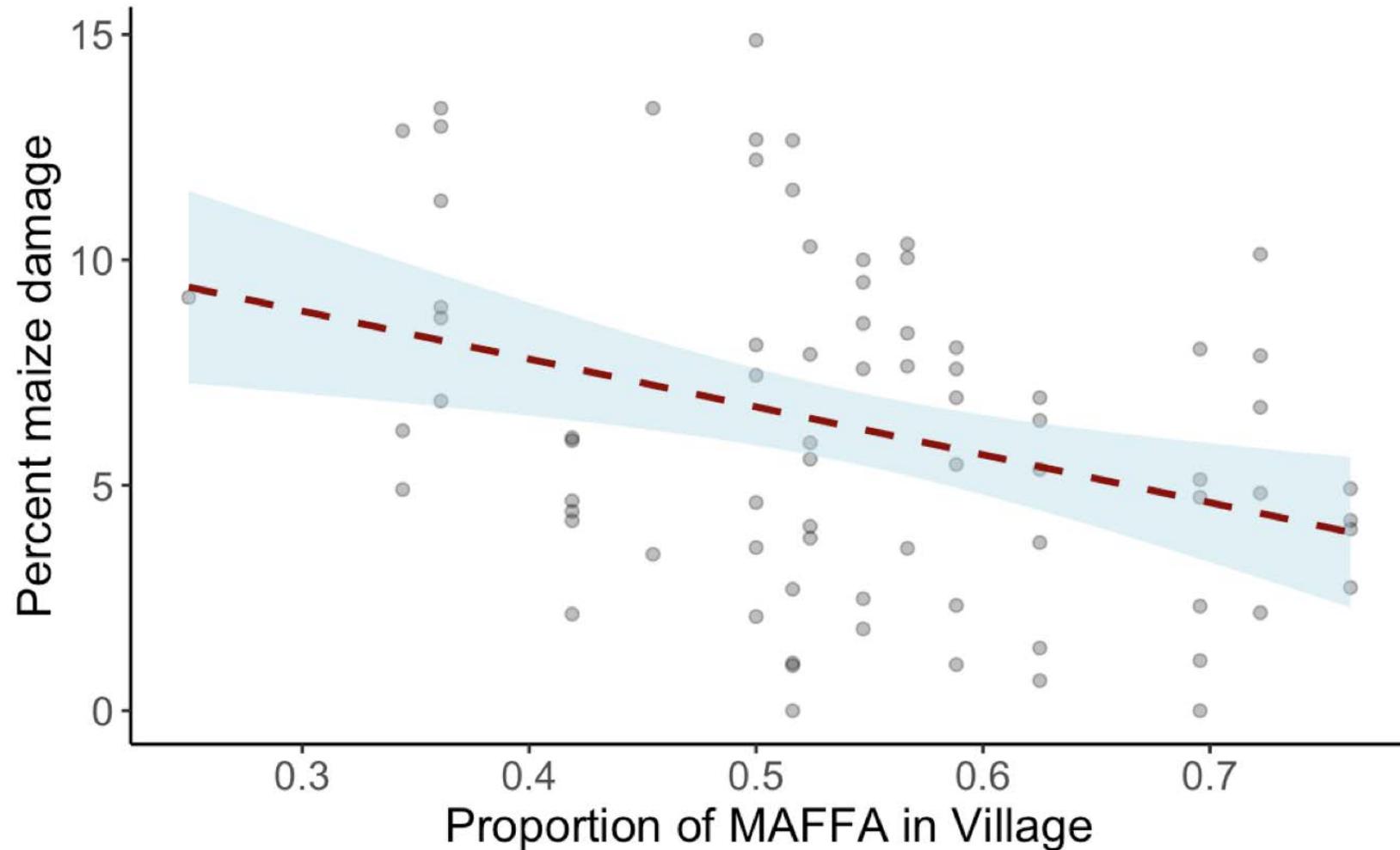
Research question: Can agroecological practices at a landscape scale support biodiversity and other ecosystem services?

- 24 villages with a gradient of agroecological practices and forest cover.
- 63 agricultural fields, measuring pest damage, presence of pollinators and birds.
- **Farmer researchers doing ecological data collection**
- Participatory scenario planning at village level
- Multi-stakeholder platforms with government, farmers unions, conservation groups



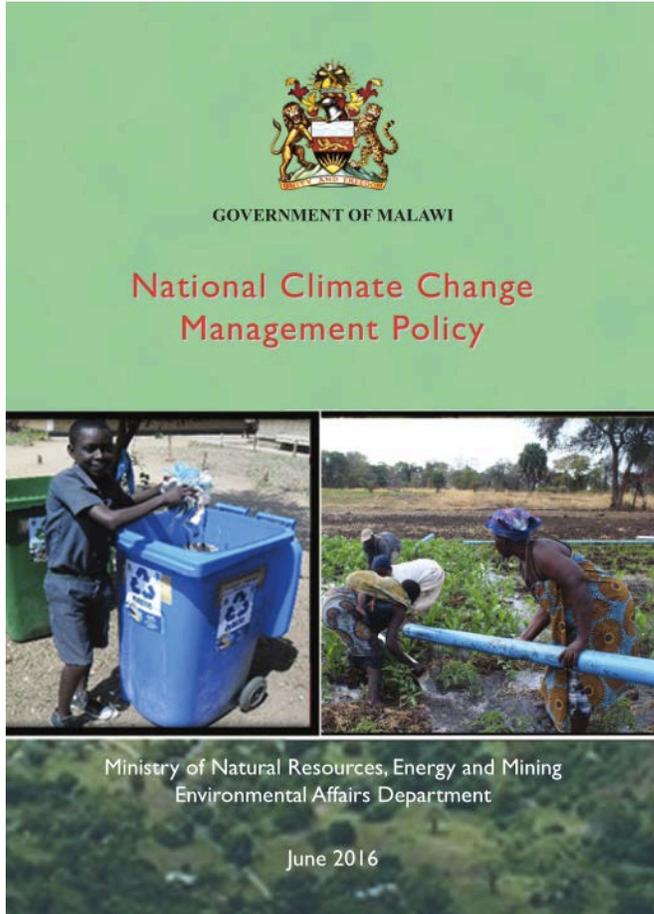
Photo credit: Gloria Phiri, Edundu

Pest damage of maize declined as agroecological practice adoption increased, with outliers removed



GLMM logistic regression, $z=-2.39$, $p=0.017$,

Policy and media discourse analysis on agriculture and food strategies in Malawi



*Research Question:
What are common narratives or themes in policy circles for agricultural policies that affect AE practice?*

Research Methods:

- interviews with government, international, non-governmental officials;
- Qualitative analysis of media stories, documents and interviews

Malawi launches long-awaited Seed Policy

Written by Faith Mwafuilirwa

Malawi has a new seed policy that has incorporated farmer's rights and other emerging issues in the sector, replacing the 1993 policy. Speaking when he launched the policy in Lilongwe the Minister of Agriculture, Irrigation and Water Development Joseph Mwanamvekha said the policy is key for the growth of the seed industry.



Current Research Projects: Mapping Agroecology Scaling Out

Research Questions:

1. What types of agroecological, nutrition and gender equity practices are sustained by smallholder farming households over time?
2. What kind of information and seeds do they share?
3. What social networks support the maintenance of these practices?
4. What are some key gaps in agroecological knowledge and training?

Methods:

- large-scale survey
- In-depth interviews
- Spatial data



8. Co-creation of
knowledge

Agroecological Training and Research Sites: SFHC Farmer Research & Training Centre

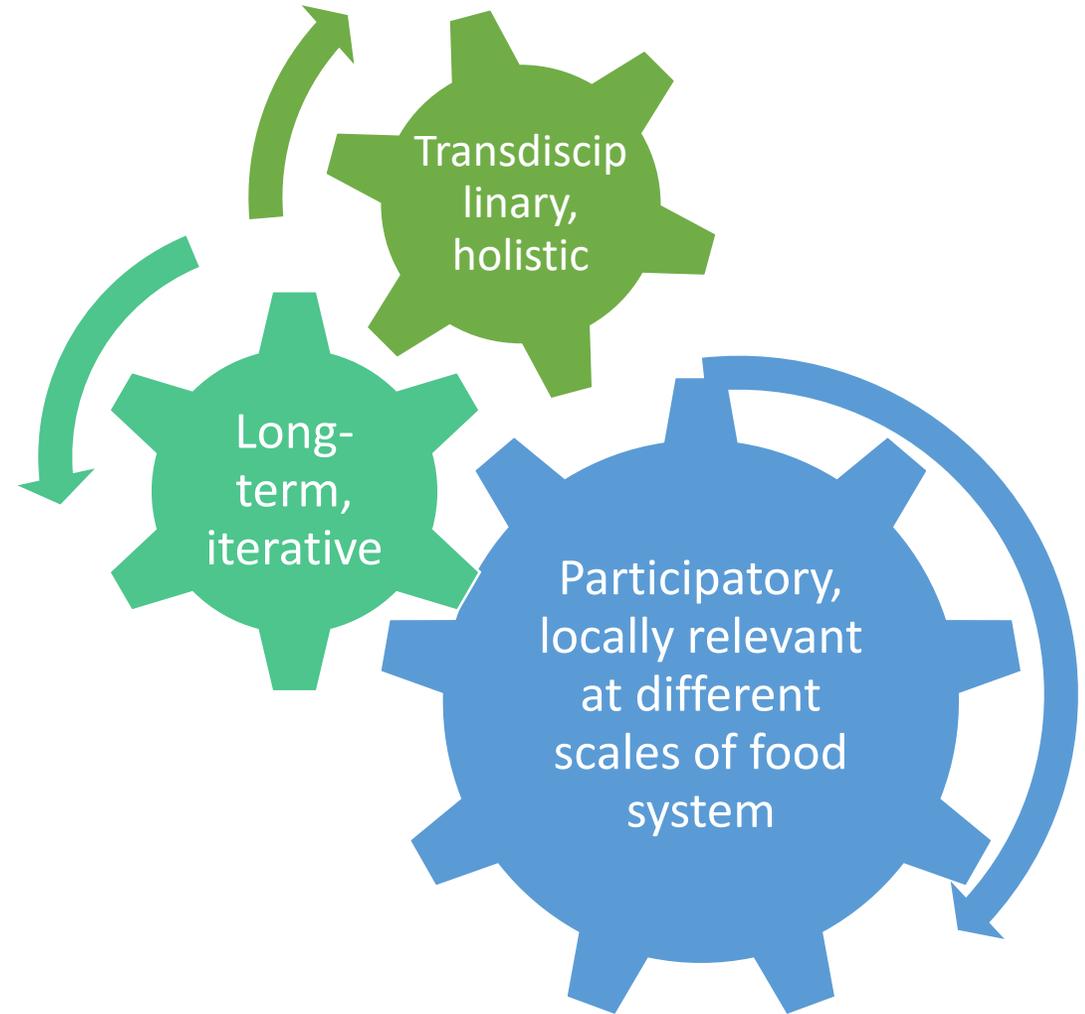


- On site experiments with different agroecological practices;
- workshops on agroecological issues in communities
- Community space for farmers to learn and teach one another



Conclusion: What Is Agroecological Research?

- Long-term, transdisciplinary partnerships
- Locally relevant, participatory: questions drawn from communities based on needs, issues specific to agroecosystem and social-political context
- Iterative – questions change over time
- Research methods at different scales
- Holistic: Examining environmental, social, health dimensions, not just food production.



Research

- Soils, Food
- Western U
- Chancello
- Michigan S
- University
- Cornell Un
- Northwes
- Nelson Ma
Technolog
- Würzburg
- Norwegian
- University
- Lilongwe U
Resources



- Canada
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