Farmer-led Agroecological Research in Malawi using Scenarios for Biodiversity and Ecosystem Services' (FARMS4Biodiversity)

Media briefing, January 2023

Key Findings

- The FARMS4Biodiversity project was carried out in Mzimba District, Malawi to research whether agroecological (AE) practices can improve biodiversity, ecosystems while supporting food security and farm livelihoods.
- AE practices adopted by farmers such as **intercropping, crop rotations, increased crop diversity with legumes, mulching, and composting** have increased bee and butterfly diversity, pollination, biological pest control, crop production and improved soil health.
- Natural enemies like **predatory beetles, spiders, ants and birds** provide biological pest control on pests such as Fall Army Worm, thereby reducing reliance on use of synthetic pesticides and damage to biodiversity and ecosystems.
- **Botanical sprays** made from plants (such as Tephrosia) can **reduce pest damage** in beans and maize.
- Forest and shrublands that are next to farmlands increased flower availability, which are used as food source for pollinating bees and butterflies.
- Farmers' adopting AE practices were better off than non-AE farmers in terms of food security and seed security.
- AE farmers set aside more land for forest regeneration and fallowing, compared to non-AE farmers.
- Communities have a strong interest in seeing a future where there is increased tree planting and forest regeneration. People also hope for a future with agroecology farmers' markets to sell surplus produce from agroecology farms

Figure 1: A group of ants hunting a FAW on maize plant. Photo credit: Georg Küstner

Natural enemies are used as biological -pest control

- Excessive use of synthetic pesticides can kill natural enemies as well as pests, which can make a pest problem worse in some cases and reduce pollinators and/or below ground biodiversity (Mijatović et al., 2018).
- Natural enemies are insects like predatory beetles, spiders, ants, and wasps. They eat or lay their eggs in pests like caterpillars, termites, aphids, and leaf beetles. Figure 1 shows a group of ants attacking a fall army warm on maize plant (Figure 1).

Figure 3: Farmer applying compost to her diverse set of crops. Photo credit: Rachel Bezner Kerr

Agroecology: the application of ecological concepts and principles to design and management of sustainable food systems. As a set of farm practices, agroecology seeks to improve agricultural systems by using natural processes, creating beneficial biological interactions and synergies amongst the components of agroecosystems, minimizing synthetic and toxic external inputs and using ecological processes and ecosystem services in farming. (Adapted from Wezel et al. 2020, Gliessman 2007; Wezel et al. 2014).

Background and Context

Malawi suffers from food insecurity, malnutrition, deforestation, soil degradation and climate change, and these have threatened biodiversity and ecosystems (such as forests) despite various initiatives taken so far. The reasons include lack of appropriate technology, investments, enabling institutions and policy frameworks.

Several policy initiatives and instruments are already in place that could support biodiversity and food security. For example, the National Biodiversity Strategy[1] of Malawi calls for reduced usage of pesticides to prevent damage on terrestrial and aquatic biodiversity.

From a technology perspective, a growing body of research results suggest that AE practices (such as the use of *pesticidal plants as botanical sprays, crop diversification through intercropping/crop rotation, composting/mulching and growing many crops*) can support food security, biodiversity and ecosystem services. However, there is a lack of information and knowledge on **how AE practices and land use change influence biodiversity and ecosystems on farmlands.**

Figure 3: Tapiwa Mkandawire, SFHC community promoter, tracking birds as part of data collection.

Participatory Research: The project used a participatory research approach, in which farmers learned how to collect ecological data, and carried out experiments in the farms. They were active at all stages of the project. A Multi-stakeholder Platform, represented by four organizations, including, public, private and community organizations, also informed the project design and activities.

FARMS4Biodiversity Project

The project *'Farmer-led Agroecological Research in Malawi using Scenarios for Biodiversity and Ecosystem Services' (FARMS4Biodiversity)* was aimed to address biodiversity conservation, support ecosystems and improve food security under future changes in climate and land use. It was implemented in Northern Malawi (Figure 1) in Mzimba district across 24 villages covering an area of 500 km^2 during 2018-2022. The Mzimba District is rich in biodiversity and ecosystems. The project consortium consisted of partners from United States of America, Germany, Canada, Norway and 2 local institutions from Malawi. The project used past research work and experiences on agroecology in the area, for e.g., the Malawi Farmer to Farmer Agroecology (MAFFA) project, and other earlier initiatives.

Figure 4: Location map of the study area: Kpienbaareh, D.

Figure 5: Butterfly species found in the project region. Butterflies pollinate food crops such as pigeonpea & pumpkins Photo credit: C.Vogel

Project Scientific Publications to date:

Kpienbaareh, D., Bezner Kerr, R., Nyantakyi-Frimpong, H., Amoak, D., Poveda, K., Nagothu, U.S., Vogel, C., Iverson, A., Tesfai M., Luginaah, I., Steffan-Dewenter, I., Wang, J. , Küstner, G., Enloe, S., Mayer, V., Dakishoni, L., Lupafya, E., Shumba, L., Chunga, T., Kanyimbo, P., Munthali, P., Gondwe, T., Mhoni, I., Mkandawire, M., Mkandawire, T., Moyo, P. and, Tembo, Y. (2022) Transdisciplinary agroecological research on biodiversity and ecosystem services for sustainable and climate resilient farming systems in Malawi; *Advances in Ecological Research*; ISSN 0065-2504.

Kpienbaareh, D., Kamaldeen Mohammed, Isaac Luginaah, Jinfei Wang, Rachel Bezner Kerr, Esther Lupafya and Laifolo Dakishoni. 2022. Estimating Groundnut Yield in Smallholder Agriculture Systems Using PlanetScope Data. *Land*. *11*(10), 1752. Published online Oct. 9 2022. https://doi.org/10.3390/land11101752.

Kpienbaareh, D., I. Luginaah, R. Bezner Kerr, J. Wang, K. Poveda, I. Steffan-Dewenter, E. Lupafya and L. Dakishoni. 2022. Assessing Local Perceptions of Deforestation, Forest Restoration, and the Role of Agroecology for Agroecosystem Restoration in northern Malawi. *Land Degradation and Development* 33(7): 1088-1100. https://doi.org/10.1002/ldr.4238

Kpienbaareh, Daniel, Xiaoxuan Sun, Jinfei Wang, Isaac Luginaah, Rachel Bezner Kerr, Esther Lupafya, Laifolo Dakishoni. 2021. Crop Type and Land Cover Mapping in Northern Malawi Using the Integration of Sentinel-1, Sentinel-2, and PlanetScope Satellite Data. *Remote Sensing* 13 (4). doi:10.3390/rs13040700

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Holland, J.M., Douma, J.C., Crowley, L. et al. Semi-natural habitats support biological control, pollination and soil conservation in Europe. A review. Agron. Sustain. Dev. 37, 31 (2017). https://doi.org/10.1007/s13593-017-0434-x

Mijatović, D., Sakalian, M. and Hodgkin T. (2018) Mainstreaming Biodiversity in Production Landscapes, United Nation Environment Programme, ISBN 978-92-807-3727-1

Wezel A, Casagrande M, Celette F, Vian JF, Ferrer A, Peigné J (2014) Agroecological practices for sustainable agriculture. Review Agron Sustain Dev 34(1):1–20. https://doi.org/10.1007/s13593-013-0180-7

Wezel, Alexander, Barbara Gemmill Herren, Rachel Bezner Kerr, Edmundo Barrios, André Luiz Rodrigues Gonçalves, Fergus Sinclair. 2020. Agroecological principles and elements and their implications for transitioning to sustainable food systems. A review. *Agronomy and Sustainable Development* 40, https://doi.org/10.1007/s13593-020-00646-z

Project Contact:
Dr. Rachel Bezner Kerr, Professor
Department of Global Development
Cornell University, Ithaca NY USA
Email: rbeznerkerr@cornell.edu
+265 98-385-0156

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