ECOLOGICAL INTENSIFICATION OF SMALLHOLDER FARMS IN KENYA

Locations Kenya

Dates 15/11/2018 - 15/11/2019

Summary

There is limited knowledge on the agronomic potential of biodiversity-based ecosystem services such as natural pest control and pollination in smallholder systems. To sustainably intensify production, there is an urgent need to develop safe, sustainable and affordable methods to reduce pest burdens whilst increasing yields. The ecological intensification opportunities identified in this project will underpin future research to help provide an economic benefit to farmers' incomes and reduce health risks, contributing to ecologically, economically and socially sustainable agriculture.

The problem

Smallholder farmers who do not have access to or knowledge of ecological pest management solutions have to invest in expensive inorganic inputs which affect food quality and if farmers cannot afford these or they are unavailable, crop losses occur. Indiscriminate use of pesticides also poses environmental threats, particularly water quality, diversity of beneficial organisms including pests' natural enemies and pollinators, all of which affect crop productivity.

Implementation of the findings of this project, and projects which develop from it, will not only support sustainable increases in the production of nutritionally important food crops, but also have the potential to provide significant economic

benefit to smallholder farmers, all in support of Sustainable Development Goal (SDG) two.

Furthermore, the majority of farmers in Sub-Saharan Africa (SSA) are women, and because of this, they are in the strongest position to benefit, financially, from the outcomes of this project. As a result, broader welfare improvements will occur because women are more likely to apply increased financial allocations to children, education, health and nutrition, helping to achieve, SDGs one and two.

What we are doing

This project will facilitate the formalization of an effective research partnership between key sustainable agriculture research organisations across SSA and University of Reading.

The aim is researchers from the UK and SSA to collaborate, to provide pilot data (both socio-economic and ecological) to inform the implementation of 'Ecological Intensification' (EI) for smallholder vegetable farmers.

EI is a novel approach to sustainable intensification which utilizes biodiversity-based ecosystem services to support greater yield and reduce reliance on agrochemicals. EI approaches are beginning to transform agriculture, globally, but little progress has been made in SSA. Considerable research investment is therefore required.

Working alongside other partners, CABI will lead socio-economic interviews of smallholder farms in Kiambu and Muranga counties, Kenya. The survey will gather data on the challenges facing farmers, considering primary pests (supported by information from CABI's Plant Doctor network) and crop pollination, and identify possible EI management solutions including incentives and barriers to adoption.

Partners, will together, deliver:

- A biological survey which will gather baseline pilot data on the abundance and diversity of functionally important invertebrates that will underpin a future proposal
- Workshops that will engage other stakeholder and policy makers to review data gathered during the project and develop a 'Policy Brief'
- Collaborative project proposals.

Key project outputs include:

- A list of candidate EI solutions to inform intervention strategies to be tested in a future proposal
- Baseline pilot data on abundance and diversity of functionally important invertebrates which will underpin a future proposal and publications

A 'Policy Brief' outlining the key challenges and opportunities facing smallholders in SSA and specific targeted EI practices.

Results so far

The aim of the socio-economic study was to assess the diversity of smallholder farming systems in two counties in Kenya – Muranga and Kiambu – and farmer knowledge and practices for ecological intensification. Respondent farms were selected along an intensification gradient of farming systems. The selected counties and farms to a greater extent captured the broad socio-economic and biophysical demography of Kenyan farms ranging from commercial to subsistence, and forested to cropland and grasslands. A total of 118 farming households (57% male) were surveyed.

The study showed that farmers cultivated an average of 0.89ha of which about 0.67ha was owned. Farmers grew a range of crops, often in intercrops, including key cash crops (coffee, tea, bananas), food crops (maize, beans and

vegetables), fruit trees (avocado, mango and pawpaw), and agro-forestry trees. However, the maintenance of natural habitats and barriers was not common amongst surveyed farms.

Knowledge of pollination was moderate (57%) and many farmers actively maintain pollinators such as bees and butterflies but knowledge of natural pest control was low at 37%. The most common natural enemy mentioned was birds (44%) followed by ladybird beetles and ants.

The most common pests and diseases encountered included maize smut, banana weevil, drying of tea bush and stem and blight of tomato. Though the key pests under study were Fall armyworm on maize, *Armillaria* root rot on tea, aphids on kales, *Tuta absoluta* on tomatoes and coffee berry disease on coffee.

When asked about practices employed to manage pests, the study showed 47% of farmers used chemicals in isolation, even though they perceived them as harmful, 41% used cultural practices such as mechanical removal, planting resistant varieties and crop rotation, and only 6% used biological controls. Significantly more men than women farmers applied pest management practice, particularly the use of pesticides.

The farmers' lack of knowledge on identifying pollinators and natural enemies and increased chemical use, due to the absence of alternatives, are two of the main challenges faced when trying to effectively manage pollinators and natural enemies. Some opportunities identified through this study to counteract these challenges include practices at farm level to maintain plant diversity, access to sources of agricultural advice and possible targeted technological innovations for EI. The differences shown in knowledge and practice by gender suggest there is a need for gender-focused research and communications.

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CABI Project Manager	Monica Kansiime

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