Agroecological pest management in Lake Ziway, Ethiopia

PESTICIDE ACTION NETWORK UK

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Agroecological pest management in Lake Ziway, Ethiopia

Summary

In 2018, PAN Ethiopia and PAN UK initiated an IPM research and farmer training project in Lake Ziway area, Oromia, Ethiopia. The aim of the project was to reduce pesticide use and consequent health and environmental impacts by promoting agroecological methods for pest management among vegetable farmers through Farmer Field Schools (FFS) and farmer-participatory learning plots. Since 2018, over 700 farmers have been trained via season-long FFS, plus a further 500 farmers have been trained via peer mentoring. From a survey of 78 trained farmers in 2021, many farmers had significantly reduced their use of HHPs, with only 5.5% reporting acute health incidents compared to 20% recorded at the baseline. Initial uptake assessments showed that 92% of trained farmers adopted at least one agroecological method.

Background

- Lake Ziway area is an important location for vegetable production in Ethiopia's Central Rift Valley.
- Overuse of agrochemicals in the area threatens human health and the environment.
- A baseline survey of 75 smallholder onion farmers and 15 casual farm workers from five villages near Batu Town, revealed that 64% of the pesticides used by farmers are Highly Hazardous Pesticides (HHPs).
- The frequency of pesticide applications ranged from 12 to 22 applications per season, with no field monitoring for pests or diseases, nor consideration of integrated pest management (IPM) or agroecological principles.
- Alarmingly, 20% of smallholders and 73% of farm workers reported pesticide poisoning incidents within the previous year.

Lead organisations: Pesticide Action Nexus Ethiopia (PAN Ethiopia), Pesticide Action Network UK (PAN UK)
Partners involved: District Agriculture Office
Donors: Traid, JJ Charitable Trust, the Dutch Sustainable Trade Initiative (IDH)
Location: Lake Ziway, Central Rift Valley of Ethiopia, Ethiopia

General information:

Total and productive surface area of the property: Mean farm size= 1ha

Legal link with the land: Land owners

Access to water for irrigation (rivers, lakes, other): Lake-fed irrigation using pumps

Number of workers (including family members): Range = 5-10 (varies by household)

Link with national and district public policies:

- National Nutrition Sensitive Agri-food systems strategy (2024-2030)
- National Food Safety and Quality Strategy for Primary Agricultural Produce (2024-2030).

Type of biome / natural vegetation systems: Semi-arid mixed cropping system

Climate of the area (temperatures, rainfall, etc.): Annual temperature ranges between 15-29°C and annual rainfall varies between 400-1000mm

Pesticides of concern: DDT, profenofos, endosulfan, chlorpyrifos and malathion

Key indicators: Pesticide reduction, farm productivity, net income, acute pesticide poisoning.

Agroecological approaches introduced (see Annex)

- Since 2018, over 700 farmers have been trained via season-long FFS, averaging 11 weekly sessions, plus a further 500 farmers have been trained via peer mentoring.
- Specific efforts were made to invite women with their husbands which, along with a gender awareness workshop with government staff, helped to recruit 33% women to FFS training.

Adoption and uptake

- From a survey of 78 trained farmers (14% women) in 2021, many farmers had significantly reduced their use of HHPs. For insect pests, farmers reported applying an average of 5 insecticide sprays per season (range: 2-12 times), compared with their recalled average of 9 applications before training (range: 4-18 times).
- Of these surveyed farmers, 85% reported they still apply food spray and sow habitat strips of alfalfa or maize, while 60% of farmers reported they avoid HHP insecticides harmful to natural enemies and 60% leave natural vegetation/ weeds in around fields for natural enemies.
- 31% of farmers reported that they had stopped use of specific HHPs (including DDT, profenofos, endosulfan, chlorpyrifos and malathion).
- Initial uptake assessments showed that 92% of trained farmers adopted at least one agroecological method.

Extension agents receiving training in agroecological pest management methods in an onion field, Ziway. Credit PAN UK.

Benefits observed

Climate mitigation

- 76% reduction in synthetic pesticide spray frequency (average over three seasons of FFS field trials versus non-FFS farmers). Thereby reducing greenhouse gas emissions involved in their production and distribution.
- 50% reduction in synthetic fertilizer use.

Climate adaptation

- Increase in crop rotation and crop diversification leading to increased climate resilience.
- Incorporation of compost and vermicompost into the soil increases organic matter and helps to conserve soil moisture and can reduce drought stress in plants.

Economic Benefits

- 8% reduction in production costs (average over three seasons of FFS field trials versus non-FFS farmers).
- Slight yield increase (average over three seasons of FFS field trials versus non-FFS farmers).
- 9% increase in net income (average over three seasons of FFS field trials versus non-FFS farmers).

Biodiversity

- Significant increase in beneficial insects (natural enemies of pest insects) due to application of the food spray method, an increase in vegetation diversity and a decrease in pesticide load.

Gender and gender equity

- 33% FFS participants were women.
- Agroecologically-produced vegetables are being sold to local hotels and restaurants by a women farmer group which is currently being supported to establish a Participatory Guarantee System.

Community organization

- 4 women farmer groups were established by the project and are collectively producing and selling bio-inputs and vegetables.

Health

- 5.5% surveyed farmers reported acute pesticide poisoning over the previous 12 monhts compared to 20% recorded at the baseline.

Lessons learned

- Ethiopian agri-supply stores provide almost no biorational alternatives to HHPs. In Ziway, one commercial neem-based product is available (Nimbecidine). National availability of biopesticide and biorational products registered for vegetables is extremely limited.
- Overall, field trial results and feedback from participating farmers and government extension agents demonstrated and provided confidence that agroecological pest management practices for onion cultivation in Ethiopia can match or exceed conventional farming yields, while achieving better health and environmental outcomes.

Vermicomposting trials in Ziway. Credit PAN Ethiopia.

Recommendations for policymakers and government agencies

- The testing and dissemination of agroecological methods is needed, particularly to find alternatives for fungicides.
- Validating and testing different combinations of agroecological methods with farmers and government extension agents helps both groups to understand their efficacy and economic feasibility under different conditions.
- Mainstreaming agroecological approaches in vocational training is critical for scaling up changes in practices. PAN Ethiopia has made a good start with recent inclusion of organic practices in Ethiopia's Technical Vocational and Education Training (TVET) curriculum. This could be complemented with vegetable-specific ecological pest management modules at university level.
- Priority registration of biopesticides and biorational products would be a very positive step to support the Ethiopian horticulture sector to reduce reliance on HHPs, with benefits for farmer and worker health and consumer safety.
- Despite good demand and premium prices, the logistics for farmer groups to reach these markets is challenging. More policy support and practical help for farmers, including marketing, is needed. Public and private resources for farmer training and logistical support must be directed towards agroecological methods that protect farmers' health and the natural resources on which they depend.

SUCCESS STORIES OF AGROECOLOGY FARMERS

Ms Rukya Dedu's Story

Ms Rukya Dedu, a smallholder farmer from Abine Germama village, is one of the founding members and chair of the Abine Germama vegetable producers' women self-help group. She initially joined FFS training in 2018 in an effort to reduce the use of pesticides and synthetic fertilizers. Now she is supporting her family with the income generated from producing and selling vegetable seedlings and agroecological inputs to other farmers and by selling vegetables to restaurants and hotels with the other self-help group members.

During the FFS trainings, homemade recipes for pests and disease management and vermicomposting for soil health management were the topics that caught Rukya's attention. She started producing extracts from garlic, ginger, chilli and onion to use for pest management purposes, and set up a vermicomposting unit in her backyard. She has now cut the use of pesticides and synthetic fertilizers and replaced them with agroecological methods.

In 2023, Rukya produced surplus vermicompost and vermiwash and started selling it to other farmers in her village. Rukya typically produces 40 litres of vermiwash per month and sells a 5-liter container for 100 Ethiopian Birr (USD 3.5), providing an additional source of income for her and her family.

Ms. Rukya Dedu applying homemade vermiwash and vermicompost to her diversified market garden in Abine Germama village

Annex: Agroecological pest management methods introduced to onion farmers in Ziway via the FFS learning plots

Method	Further information	Agroecology principles
Habitat borders	Alfalfa or maize planted around the crop borders to increase habitat diversity and to maintain natural enemies.	Synergy, biodiversity, economic diversification
Food spray	Brewery yeast-based food spray applied on crop foliage approx. 2-6 times per season to attract natural enemies into sprayed vegetable fields.	Input reduction, diversification, biodiversity, synergy
Decision support	Simple counting method for monitoring levels of pests and natural enemies (take action when pest levels rise above 1 predator to every 2 pests). Actions include: a further food spray (either alone or mixed with neem); neem only spray; insecticide as last resort.	Input reduction, biodiversity, participation
Wider spacing of plants	Mainly a disease management method and to enable farmers and workers to move more easily through the crop for better monitoring and better targeting of any applications.	
Application of neem seed extract	Added with a food spray or as a stand-alone application if pest numbers are outstripping natural enemy control (i.e., when predator to prey ratio considerably < 1:2). Neem seedlings were provided to farmers to grow in their field borders as a medium-term solution to overcome dependence on neem seed from other regions.	Input reduction
Avoiding HHP insecticides harmful to natural enemies	Many insecticides are broad spectrum and kill natural enemies or interfere with their performance. Only using insecticides as a last resort and selecting those such as spinosad, which are somewhat less harmful to natural enemies helps protect the natural enemies attracted by the food spray method.	Input reduction, soil health
Applying vermicompost at transplanting and/or as a side dressing in mid-season	Helps grow a healthier, more robust crop better able to withstand pest attack and reduces volume of synthetic fertiliser needed. Helps conserve soil moisture and can reduce drought stress in plant.	Recycling, input reduction, soil health, economic diversification
Roguing (hand pulling) of individual wilt or virus affected plants	Removes infective material from the field and reduces risk of disease spread.	Input reduction
Sanitary pruning of badly diseased and older and yellowing tomato leaves	Reduces level of disease spores able to spread to clean tissue. Opens up lower crop canopy for better air circulation and reduces humid microclimate which favours disease.	Input reduction
Application of baking powder solution (sodium bicarbonate)	Makes the foliage surface less favourable for disease spore germination.	Input reduction
Thorough clean-up of all crop waste after harvest and removal from field	Reduces survival of pests which pupate or shelter as adults in crop waste. Crop waste can be composted, buried or fed to livestock or vermicompost units.	Input reduction, recycling
Farmer field schools	Season-long farmer-participatory training involving learning plots for hands-on group learning and decision making.	Knowledge co-creation, participation

Key resources

- PAN UK (2016). Using the Food Spray Method to enhance biological control in cotton: a trainers' guide. https://www.pan-uk.org/food-spray
- PAN UK (2024). Phasing out highly hazardous pesticides in vegetable farming (Ethiopia). https://www.pan-uk.org/vegetable-farmers-in-ethiopia
- S. Williamson et. al. (in review)Transitioning from harmful insecticides to agroecological IPM with smallholder vegetable farmers in Ethiopia. Frontiers in Agronomy
- Watts, M. Williamson, S. (2015) Replacing Chemicals with Biology : Phasing Out Highly Hazardous Pesticides with Agroecology. PAN Asia and the Pacific : Penang. https://www.panna.org/wp-content/uploads/2022/12/Phasing-Out-HHPs-with-Agroecology.pdf

This case study was produced by Pesticide Action Network (PAN UK) in collaboration with Pesticide Action Nexus Ethiopia and PAN International. It is one in a series of PAN case studies from around the world showcasing the benefits and contributions of agroecology to climate resilience, food security, health and biodiversity protection. The series is produced by members of the PAN International Agroecology Workgroup. The full series is available in a number of languages via the QR code. Funding to develop this case study was provided by Traid, IDH (the Sustainable Trade Initiative) and The JJ Charitable Trust.

Pesticide Action Network International (PAN International) is a network of over 600 participating nongovernmental organizations, institutions and individuals in over 90 countries working to replace the use of hazardous pesticides with ecologically sound and socially just alternatives.

Web: pan-international.org
Facebook: PesticideActionNetworkInternational
BlueSky: @pesticideaction.bsky.social

Pesticide Action Nexus Ethiopia is a non-profit organization that focuses on promoting sustainable farming, reducing pesticide risks, and protecting both the environment and human health by promoting agroecological alternatives in Ethiopia. It works closely with smallholder farmers, farmer cooperatives, and communities to support agroecological practices like organic cotton farming, ecological vegetable production, and pollinator conservation.

Atalo Belay
Email: feelatalo@gmail.com
Tel: +251-116-186774
Web: panethiopia.org

Pesticide Action Network UK (PAN UK) is the only UK charity focused solely on tackling the problems caused by pesticides and promoting safe and sustainable alternatives in agriculture, urban areas, homes and gardens at home and overseas.

Alex Stuart
Email: alex@pan-uk.org, admin@pan-uk.org
Tel: +44 1273 964230
Web: pan-uk.org
Facebook & Instagram: @PesticideActionNetworkUK