

CONSERVING BIODIVERSITY ON FARMED LANDSCAPES OF UGANDA



This brief is an output of the COBA project which was implemented with funds from the Darwin Initiative UK. Conserving Biodiversity on Agricultural Landscapes of Uganda (COBA) was a research/sensitization drive that was implemented for 3 years to show stakeholders that birds, bees, butterflies and trees are a vital component in agriculture yields. This brief hence highlights findings and recommendations from the research that was carried out. Other project partners were British Trust for Ornithologist, Uganda Wildlife Society, NatureUganda and Makerere University Institute of Environment and Natural Resources. More results on this research are still being analyzed, for more information on pollinators and biodiversity-agriculture win-win situations please contact Theodore Munyuli and Dianah Nalwanga at MUIENR.



POLLINATOR DIVERSITY AND AGRICULTURE IN UGANDA

Farmland comprises 35% of the land surface in Uganda and it supports a wealth of other animals and plants such as birds, insects, mammals, reptiles and trees. This diversity of life (biodiversity) is important in maintaining the health and productivity of agricultural land. Therefore finding space for wildlife in and around crops is likely to increase yields. How? Trees, for example, help in soil and water conservation, insects (e.g. bees) and birds pollinate plants and enhance fruit production. Birds can also act as organic pest control and seed dispersal agents. Insects and micro-organisms like earthworms, dung beetles and bacteria decompose waste leading to increased soil fertility and increasing crop yields.

POLLINATORS AND THEIR IMPORTANCE FOR AGRICULTURE PRODUCTION

- ☞ The economic significance of pollination in Uganda is high. It has been observed in pollinator-dependent crop species that pollinators increase yield of more than 99% of total crop production registered per annum (Theodore Munyuli's PhD research).
- ☞ More than 60% of crop species grown in Uganda are likely to yield poorly in the absence of pollinators in the farm landscape. Among them are all fruits and almost all vegetables grown. Commonly grown are coffee, all legumes like beans, peas and groundnuts (some varieties), tomatoes, mangoes, avocados, passion fruits among many others. For example, the value of pollination services delivered to coffee is the equivalent of 2-3% of the national GDP for the whole country
- ☞ Pollinators like bees provide free services so humans must provide suitable habitats for them to feed, nest and shelter.
- ☞ Without bees a farmer will get less than 1% of his/her potential coffee yield, (other factors like soil fertility and low risk of pest attacks, remaining constant)



Picture 1: Coffee flowers (Photograph by Theodore Munyuli)



Picture 2: Many different kinds of bees all found in Uganda (Photographs by Theodore Munyuli)

- ☞ Diverse habitats are necessary in maintaining these bees on and near farmland. These include planted trees on farm land, hedges within and along farmland, inter-crops, fallow land and forests as well as woodlots etc.
- ☞ The value of pollinators for the East African region is 2.5m \$ p.a (FAO data)

What are Pollinators?

- ☞ The transfer of pollen grains from anthers to stigmas is pollination and is accomplished by pollinators usually insects (bees, wasps, beetles, flies, and moths), vertebrates (birds, bats), that are on the hunt for nectar, pollen or other floral rewards. Some plants like maize are however pollinated by wind.
- ☞ Pollination is a crucial stage in the reproduction of most cultivated and wild flowering plants which is critical in fruit and seed production
- ☞ In fact, animals provide pollination services for over three-quarters of the staple crop plants that feed human kind and for 90% of all flowering plants in the world
- ☞ Bees comprise the dominant taxa providing crop pollination services, but birds, bats, moths, flies and other insects can be important as well for some crop/plant species.
- ☞ More than 500 bee species belonging to the families of Colletidae, Andrenidae, Halictidae, Melittidae, Megachilidae and Apidae have been identified in Uganda.

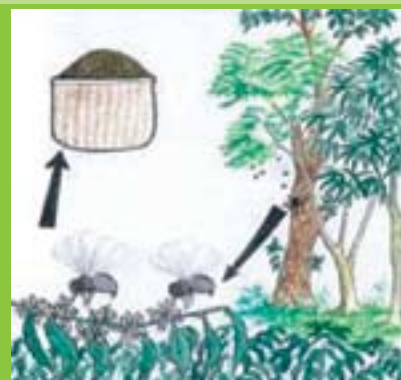


Illustration 1: Bees at work!!!

☞ Pollinators are beneficial to farmers in that more than 60% of cultivated crops in Uganda rely upon animal pollination for reproduction (to set fruit/seeds). Even if a farm is well managed, the crops grown may not produce yields if there are no pollinators in the surrounding

☞ Pollination services are those services delivered to wild and cultivated plant species. Pollination is a keystone process in both human-managed and natural terrestrial ecosystems. It is critical for food production and human livelihoods, and it is in the frontier of ecology and the environment by directly linking wild ecosystems with agricultural production systems.

It should be noted that pollinator deficits have multiple effects on the price of a commodity. In economic terms the price of that commodity reflects the costs of production, distribution and marketing plus profit. Thus pollinator deficits may increase the cost of production as the cost of providing pollinator services rises owing to the greater demand for that service. Pollinator deficits may also cause a shift in the supply function which may in turn result in a higher market price (Kevan and Phillips 2001).

Threats to pollinators are

- Agriculture expansion leaving no habitats for pollinators within farmlands (We can manage by keeping a certain portion (>10%) of the farm uncultivated as habitat for pollinators)
- Monocultures, which is almost sterile habitat is bad for most biodiversity
- Deforestation literally destroying all habitat

Will the decline of pollinators affect crop productivity and food security in Uganda? Is food security threatened by potential decline of pollinators in Uganda?

Yes, because Uganda grows more than 60% of crops that require animal pollination to set their fruits/seeds. With increasing agriculture intensification, there is a high risk of pollinator depletion which might lead to failure of crops.

Pollinators are small animals that rarely appear on policymakers' agendas. Yet the challenge to protect them and to ensure stable and lasting pollinator-plant relationships is important to the survival of human beings and the ecosystems on which we depend. A policy environment that recognizes the fundamental role pollination plays in food security, safety and biodiversity conservation is needed.



Illustration 2: Model biodiversity friendly farm

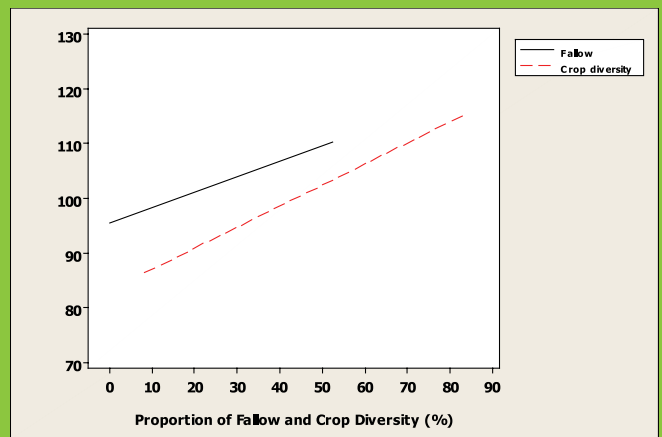


Figure 1: Relationship between the number of bird species, crop diversity (the ratio of the number of crop types on the site to the crop types in all sites of the study) and the proportion of fallow on the farmlands in 26 sites surveyed (Dianah Nalwanga's Phd Research)

In general farmland with a greater diversity of crops and more fallow is associated with greater species richness of birds hence the potential for increased crop yields.

Apart from pollinating, birds on farmland also:

Provide insect and rodent control and seed dispersal which result in tangible benefits to people.

Outbreaks of crop pests can annually destroy hundreds of millions of shillings of agricultural and forest products. Birds play a critical role in reducing and maintaining populations of pests in natural systems. Birds eat up to 98% of budworms and up to 40% of all non outbreak pest species. These services have been valued at as much as \$5,000 per year per square mile of forest, potentially translating into literally billions of shillings in environmental services.

Birds have long been known as one of the most effective mosquito repellents and can substantially reduce the pest population without the health and environmental costs (not to mention the economic costs) of harmful pesticides.

Many farmers know the role birds play in helping to control agricultural pests. Birds can destroy up to 98% of over-wintering codling moth larvae, a major pest of apples worldwide.

Birds further act as efficient agents of seed dispersal especially for fruit trees like figs that are key providers of suitable habitat for farm biodiversity.

Measures below can be practiced to help improve levels of biodiversity on farmland hence leading to potential increase in agriculture productivity

Agricultural development is a major cause of biodiversity loss and continues to result in rapid reduction and degradation of terrestrial habitats. At the same time, two major policy initiatives in Uganda (the Poverty Eradication Action Plan or PEAP and

the Plan for the Modernization of Agriculture (PMA)) agree that sustainable and productive land use is the key to economic growth and poverty eradication in rural Uganda.



Illustration 3: Advise farmers to put into practice actions (noted below)

- ☞ The retention of tall trees, ie increasing the on-farm cover of agroforestry trees.
- ☞ Increased diversity of non-crop habitats, keeping >10% of the farm (uncultivated) as on-farm habitat or reservoir for pollinators.
- ☞ Protecting the current forest fragments found within farmed landscapes
- ☞ Provision of suitable habitats for instance woodlots for honey-producing systems, will contribute to improved sustainable livelihoods and provide habitat for biodiversity. Other suitable habitats are hedges along boundaries and within the gardens. These habitats will also contribute to reducing erosion and increasing the diversity of products that can be harvested by farmers (e.g. fuel wood, honey, medicine and bush meat).
- ☞ The identification of livelihood options, such as, certified shade-grown coffee that simultaneously enhances producer prices and provides habitats for tree-dependent birds is another integral approach that can be used.

It is only through this integrated approach to land use planning and agricultural development that environmental conservation can be successfully strengthened. There is thus an urgent need for improved livelihood options that are genuinely sustainable and that involve integration of biodiversity conservation with agricultural development and economic growth.

CONCLUSION

The diversity and presence of life (biodiversity) on agricultural land like birds, bees, trees and other organisms is important for maintaining the health and productivity of farm lands. However, agriculture as practiced today threatens wild plant and animal species and the natural ecosystem services upon which both humans and biodiversity depend. One of the current environmental related challenges facing agriculture today is the trend of shifting from mixed cropping to monoculture, which greatly affects the abundance and richness of pollinator agents on farmland.

Nowadays with the increasing demand on land in Uganda due to population pressure and the influence of market economy for food in the area, farmers are more and more relying on shorter fallow periods for food production. This in turn may lead to continuous degradation of soils, increasingly poor yields and irreversible deforestation.

Hence, researchers should set protocols for monitoring the status (population density and dynamics) of ecosystem services like pollinators in different farm landscapes.

Policy-makers should design and advise farmers to implement farming practices that are biodiversity-friendly such as retaining patches of uncultivated land near farmland and practicing agro-forestry

All stakeholders interested in enhancing agricultural productivity in Uganda should learn about the role of biodiversity especially pollinators in increasing crop yield and learn how to protect them in the farm landscapes

Farmers should be made aware of what pollinators are and their role in crop yield increase; and they should be informed on how to manage their gardens wisely for the conservation of pollination services and hence increase food productivity.

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