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Landscape levers to enhance natural pest control services in France

The natural pest control service stems from trophic interactions between often mobile organisms in the landscape. The intensity of this control in a plot at a given time depends on local management initiatives, as well as those carried out in other parts of the agricultural area over the same period or on different time scales. Levers for boosting this service must therefore be considered at several spatiotemporal scales. This principle has underpinned research on the pest control service since 2014 in France, involving long-term monitoring while explicitly taking the properties of the landscape surrounding monitored plots into account. Data collected on 120 annual and perennial crop plots located in five French regions over several years on different types of pests (sentinel prey) have highlighted a generic effect of landscape levers on observed control levels. The analyses have also revealed that **the impacts of these landscape levers vary depending on the agricultural management strategy implemented in the monitored plot. The control service is more efficient when seminatural habitats are abundant, when the annual crops are more diversified or when there is a higher proportion of organic farming in the landscape. These impacts tend to be greater when pesticide treatments in the target plot are limited.** In the light of these results, scenarios of practical changes at the landscape level are currently being developed with stakeholders in each studied area. They will be used to determine landscape management options that could enhance natural pest control.

▲ ***Landscapes.*** *© INRAE*

◀ **Lepidoptera** ***egg sentinel prey on wheat.*** *© INRAE*

◀ **Poecilus cupreus** ***beetle preying on aphids.*** *© INRAE*

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Leveraging ecological processes and knowledge to recover banana production in BBTD-affected areas in sub-Saharan Africa

Guidelines and new scientific challenges

Rural communities in 14 sub-Saharan African countries are abandoning banana production due to banana bunchy top disease (BBTD) caused by the BBTV virus. BBTD is efficiently transmitted by the banana aphid (*Pentalonia nigronervosa*) and spreads in asymptomatic infected suckers. No sources of resistance are known for potential use in cultivar substitution or breeding. However, the well-documented ecology of banana aphids provided a starting point to test an agroecological approach to recover banana production lost to BBTD. First, aphids feed almost exclusively on banana mats, suggesting that area-wide mat eradication for 2-3 months where BBTD is present could minimize local sources of new infection. Second, the use of BBTV-free planting material would avoid the introduction of new infections. Third, aphid movement sharply falls from 50-100 m, so a banana-free buffer zone of this width around fields to replant would minimize aphid invasions.

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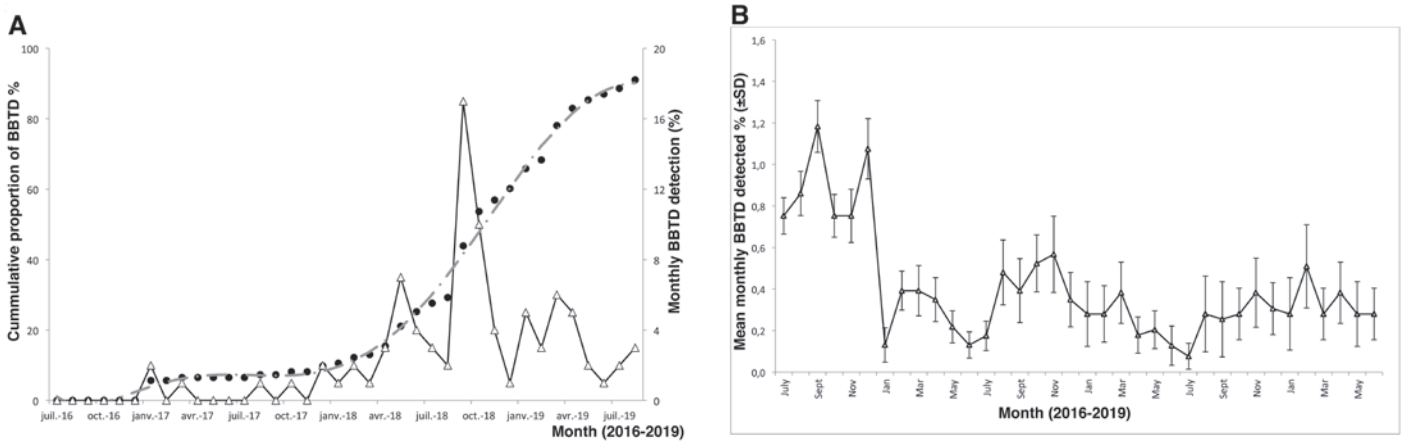
Since 2014, scientists from Bioversity International and IITA (CGIAR centers), CIRAD, and national institutes in 8 sub-Saharan countries have worked with pilot communities on three banana systems—perennial gardens and rotations with bush fallow or forest fallow with over 50 different cultivars in cultivation. Four results for application in banana recovery projects have emerged to serve as guidelines: (i) rigorous implementation of the complete banana aphid ecology-based model led to reduced field re-infection rates, increased banana yields and more BBTD-free suckers; (ii) community and household engagement—both men and women and different generations—and understanding of ecological management led to more effective peer pressure, more rigorous monitoring and more effective BBTD control; (iii) different seed production options—tissue culture and macropropagation with virus-free source material, sucker sourcing from BBTD-free areas and from recovered fields were useful to address the community demand for seed cultivar diversity; and (iv) rigorous early detection of initial BBTD symptoms and roguing in replanted fields contributed to very low disease levels and availability of low-risk suckers for further planting. Further studies are needed on early symptom expression and detection in local cultivars, ecological intensification strategies for greater productivity to support the field recovery process and landscape diversity to boost the effectiveness of buffer zones and curb BBTD and aphid build-up.

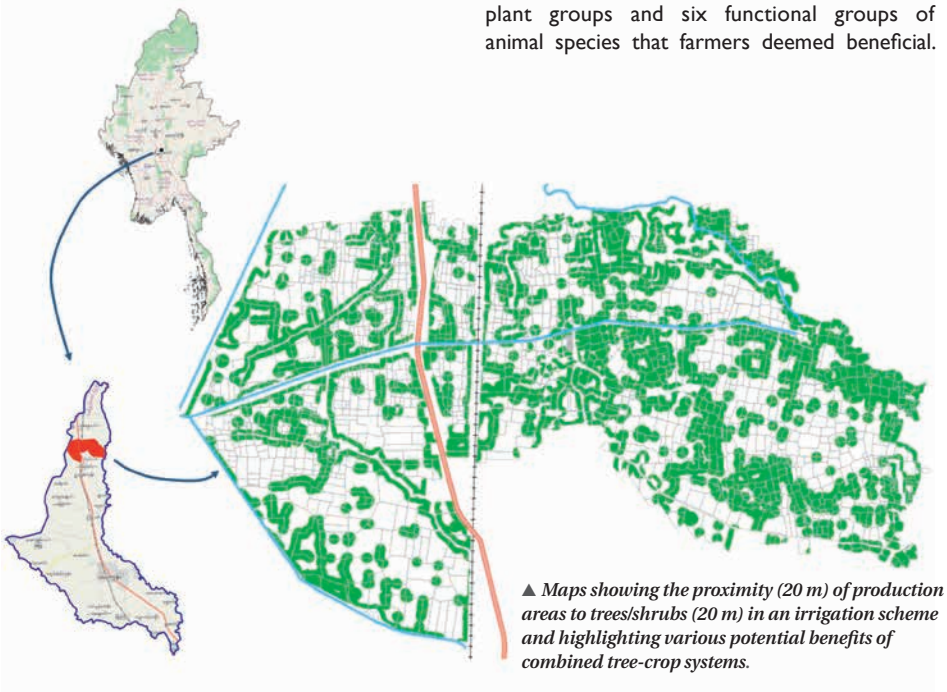


▲ *The incidence (%) of banana bunchy top disease (BBTD) increased from 2% to total plot infestation in 3 years in an unmanaged experimental field (Fig A). Under farmer cooperative roguing, an initial disease rate of 5% was reduced and maintained below 2% for 3 years (Fig. B).* Source: *Omondi* et al. *(2020)*

Characterizing landscape and diversity of food systems in Myanmar to analyze trade-offs and guide the agrifood system transition

Economic growth, land-use and livelihoods form a close-knit nexus. Myanmar—with 28.5 million ha of forest, representing approximately 42% of its total land area—is one of the largest countries in Southeast Asia untapped for agricultural intensification. With agriculture and agroforestry practices as dominant livelihood activities among smallholder farmers, the country is at a crossroads of land-use transition, agricultural intensification and environmental degradation. While many countries have lost significant forest areas and biodiversity, Myanmar could achieve a balance between human and ecosystem wellbeing by adopting an agroecological approach to guide the agrifood system transition.

In collaboration with the Swiss Agency for Development and Cooperation, we characterized the food system landscape and diversity, analyzed synergies among ecosystem functions, and developed pathways for food system transition. We monitored a watershed to gain insight into the cropping intensity, land cover, proximity to trees, and community perceptions on ecosystem services. Maps (covering ~ 339 ha) highlighting the proximity of crop production areas to trees showed that 13%, 25%, 49% and 89% of the area came within a proximity zone of 5, 10, 20, and 50 m, respectively. The cropping intensity (138%, mainly based on cereal, oilseed and vegetable crops) was low in 2019-2020. However, a survey of 210 farmers highlighted 13 functional plant groups and six functional groups of animal species that farmers deemed beneficial. Farmers cultivated up to 31 different species, thereby exemplifying potential diversification opportunities. Most farmers identified food provision (food-61%, medicinal-20%, livestock-3%) as a major ecosystem benefit, yet they also listed cultural (9%), and regulating (5%) services. Substantial food was sourced from trees. Achieving greater diversification within agrifood systems will require changes across value chains, supported by novel institutional arrangements and policies. **This will enable Myanmar to increase the resilience of its farming communities. Taken together, this assessment provides a framework to guide decisions on diversification towards a successful agroecological transition in Myanmar.**



▲ *Maps showing the proximity (20 m) of production areas to trees/shrubs (20 m) in an irrigation scheme and highlighting various potential benefits of combined tree-crop systems.*

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