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News from the Field

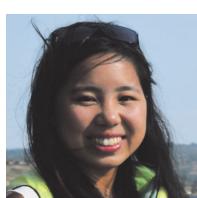
Local knowledge reveals the important roles that trees play in smallholder farming systems in Eastern Uganda

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Research has recently been carried out and is ongoing in Eastern Uganda under the *Trees for Food Security* and *VIP4FS* projects, funded by the Australian Centre for International Agricultural Research (ACIAR) and led by the World Agroforestry Centre (ICRAF). Through Bangor University's close collaboration with ICRAF, two Masters students (Tam Le Thi and Matia Agaba) and a PhD student (Genevieve Lamond) conducted fieldwork in Manafwa District of Eastern Uganda between April 2015 and March 2016. Their findings demonstrate the importance of understanding smallholder farmers' knowledge about the trees they plant and/or retain on their farms and management practices, and using this as a basis for further research and development work.

In many instances, farmers had detailed explanatory knowledge about native trees and the livelihood benefits they derive from them, whether indirectly through their leaf litter and roots (Figure 1), or directly through fruit production and fodder for livestock (Figure 2). Trees such as *Cordia africana* and *Albizia coriaria* were recognised by farmers as suitable for incorporating into the agricultural landscape because of the important roles they play in nutrient cycling and soil erosion prevention. Farmers explained that these benefits are determined by biological attributes of the trees, for example, these two species were said to produce high biomass from their leaves and added valuable green manure to the soil, valuable in sloping areas faced with soil erosion problems. Farmers also

mentioned that trees such as these, with both a strong and deep root system and wide crown, served multiple purposes by holding together a large amount of soil and reducing the rate of heavy rainfall hitting the ground.



Figure 1. A farmer on a steep plot of land has retained many species to restore soil fertility, control soil erosion, provide shade for her coffee, and provide fruits for home consumption (Photo: Genevieve Lamond).

Shade was cited as a particular benefit provided by specific tree species to coffee farms, particularly *Cordia africana*, *Albizia coriaria* and *Spathodea campanulata*. Farmers stated that these trees have broad crowns and only a few need to be planted to have enough shade for the coffee plants (Figure 3). Carefully spacing them reduces the competition with coffee plants in terms of water, nutrients and rooting space.



Figure 2. Cows and goats browsing freshly chopped branches of a *Ficus natalensis* tree outside an interviewee's house (Photo: Genevieve Lamond).

These three trees were also said to store water, which they would share with crops during the dry season (observed by farmers during land preparation when they had cut the tree roots to see water released into the soil).



Figure 3. The wide crown of *Albizia coriaria* makes it a highly valued coffee shade tree (Photo: Matia Agaba).

While wide crowns were preferred in coffee plots, it was not the case on land planted with annual crops. In order to integrate trees into other areas of the farm successfully, management practices, and pruning in particular, need to be carefully considered. Farmers said that even coffee shade trees should be pruned annually to provide good shade (not too dense or too light) for the coffee underneath. Although this was well understood, in practice pruning of these trees was often not taking place regularly because of the intensive labour involved (Figure 4).



Figure 4. *Cordia africana* with coffee. A farmer said that the lower branches of the tree in the picture should be pruned to provide more sunlight for coffee and avoid contact with coffee branches and berries (Photo: Tam Le Thi).

Farmers generally had more detailed knowledge of native than exotic species in terms of their ecosystem services and agro-ecological interactions within the farm. However, there appeared to be limited knowledge on propagating and raising native species in nurseries and improved management of these species. This seemed to affect how they were perceived in comparison to exotic species promoted in the local area (Figure 5). Most native seedlings were naturally regenerating in the area and then being transplanted by farmers from one farm to the other. There were very few farmers who would buy native species from nurseries. Exotic species were often chosen because of their fast-growing characteristics. *Eucalyptus* spp and *Grevillea robusta* were planted more in the lowlands, where the soil is moist, than on the upper slopes. Some fodder species like *Calliandra calothyrsus* and *Sesbania sesban* were known by a few farmers, but they had limited experience with them so lacked confidence in growing them on their farms. An important fodder tree was *Ficus natalensis* that was often planted near the house to provide fodder for cows and goats. However, it was said to have many lateral roots in the top soil layer so was more likely to be planted on farm boundaries than within fields.



Figure 5. A farmer talking about *Sesbania sesban*, and its benefits, in particular as good quality fodder for his cows (as advised by extension officers), although he could not give the name of the tree (Photo: Tam Le Thi).

Knowledge gaps exist on the types of pests and diseases affecting trees, as well as methods for managing them. Pests which can be observed by the naked eye were well-recognised, for example, ants, caterpillars and rats. However, farmers had difficulties in explaining the causes of symptoms represented on the leaves of trees such as leaf distortion, yellow leaves or yellow spots, and larvae inside the stem of a tree. Most farmers mentioned using pesticides, but they did not know which types of pesticides should be used to kill specific pests. Non-chemical based pest and disease control methods included traps and using cow urine to treat banana bacterial wilt.

In summary, while there was evidently local knowledge that could be harnessed to inform future research and development activities, the findings also demonstrate the need to teach people how to propagate and manage native species in order not to lose diversity and to enhance resilience of the agricultural system. Scientific knowledge could also be disseminated to farmers about key pests and diseases and relevant control methods.



Figure 6. *Artocarpus heterophyllus* is an important fruit tree in the area, appearing in home gardens and around homesteads. Its fruits are often available to harvest during the 'hunger months' (Photo: Matia Agaba).

On-going research is establishing whether there is a direct link between household food security and reliance on on-farm tree products throughout the year. Initial findings have already brought to light the important role that fruit trees play during the hunger months of March-June (the planting and weeding season in the study area). Many trees like *Artocarpus heterophyllus* (Figure 6) are fruiting at this time, while agricultural crops are yet to be harvested. What we do not know yet, and want to ascertain, is whether there are any differences in the on-farm tree species used by the poorer households in comparison to wealthier households, and how central they are in providing food, fuel, building materials, fodder, and medicine for these smallholder families.