

## **Integrating Wildlife Conservation into the Management of Cameroon's Cacao Agricultural Landscapes**

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Although agriculture is often listed as a major threat to tropical biodiversity conservation, researchers are starting to rethink this view by examining traditional forest gardens that have been adapted for modern crops like coffee and cacao. These unique farming systems incorporate habitat for birds and other biodiversity that may make them a useful addition to integrated conservation strategies. Ensuring the survival of wildlife in human-dominated landscapes, which surround and connect intact forest reserves, may help maintain the ecological processes that keep these forests healthy. In particular, avian seed dispersers are known to require large home-range areas to provide adequate food resources throughout the annual flowering and fruiting cycle. In recent years, the Center for Tropical Research (CTR) researchers have shown that many of these large-bodied frugivores, particularly hornbills, move significant distances outside of reserve areas to track available fruit resources. These movements provide the opportunity for long-distance seed dispersal events that are important for maintaining genetic connectivity of valuable forest tree species. They also highlight the critical role that managed forested landscapes outside of reserves may play in maintaining healthy populations of seed dispersers inside forest reserves.

The potential for conservation in tropical agricultural systems has been well established for some commodities, especially for coffee in Latin America. Researchers have shown that maintaining shade trees on coffee farms adds considerably to the abundance and diversity of birds and other taxa found on the farm. However, cacao agriculture (cacao trees produce cocoa beans used to make chocolate) has received little attention, especially in Africa. In southern Cameroon, farmers have incorporated cacao trees into the traditional management of their forest gardens. These agroforests are known for their tree diversity and are seen as a potential model for sustainable cocoa production systems across West Africa. There is an interest in identifying the ecosystem services these agroforests provide at a larger landscape level. Baseline data are needed to understand which birds are ecologically important in cacao agroecosystems. In addition, documenting management practices and resource availability for birds is an important first step to evaluating the conservation potential from cacao agriculture.



*Cacao trees produce seed pods that contain the beans used to make chocolate.*



*The shade canopy on this Cameroonian cacao farm dwarfs the understory cacao and banana trees.*

In January 2006, I traveled to Cameroon to establish a collaboration with colleagues at the Africa-based Sustainable Tree Crops Program (STCP) to study the birds and wildlife found in Cameroon's cacao agroforests. The STCP coordinates an extensive ongoing research network with the goal of improving the quality and sustainability of cacao farms in Central and West Africa. They have initiated farmer field schools throughout the region to train farmers in new methods to increase productivity and quality during cocoa bean processing. These schools provide an educational opportunity to reach farmers on other issues, such as biodiversity conservation. I spent four months in Cameroon working closely with a botanical team from the STCP and several ornithological field assistants. We visited cacao-growing villages in the region where hornbills had been observed moving from the Dja Reserve, the largest protected area in Cameroon.

During the course of this research, I used mist nets to capture birds in seven villages located in the area where the STCP is actively involved in research and farmer education, situated near the Dja Reserve (Figure 1). Birds were sampled on four cacao farms in each village. In addition, an area search was conducted to assess which wildlife and birds using the shade canopy were found within each farm. Comparisons were made with data from a field season earlier in the year when a CTR research team sampled birds in nearby primary and secondary forests (Figure 1). The vegetation was measured on each farm to allow characterization of cacao management practices. Each farmer was also interviewed to determine the types and amount of wildlife hunted for household consumption and sale. The study found that bushmeat hunting continues to be an important protein source for all 28 households interviewed and that subsistence hunting has taken a heavy toll on wildlife near village sites (Table 1).



*Dr. Thomas Dietsch at the base of a shade tree typical of the cacao farms visited for the study.*



*Dr. Denis Sonwa (on right), from the Sustainable Tree Crops Program, explains vegetation sampling methods to the field team (from left: Frances Forzi, Jean Joel Moneye, and Dennis Anye Ndeh).*

In most areas of Cameroon, farmers continue to use traditional agroforests to produce their cocoa. By visiting farms in the region, I confirmed that traditional management is widespread. More importantly, the shade trees on these farms provide important habitat for Cameroon's diverse bird community, including the large fruit-eating hornbills, nectar-feeding sunbirds, distinctive wattle-eyes, eye-catching paradise-flycatchers, and the haunting Senegal coucal. On the farms for this study, I observed or captured 150 bird species, with most species found in the tall shade trees characteristic of farms in this region. Most bird species were observed in the shade layer (124 species in the shade vs. 76 in the understory, with some species observed in both layers), indicating the value of shade trees to birds. These results were not surprising since more than 112 tree species were found in the shade canopy on these cacao farms. In general, the cacao farms of Cameroon contain a high diversity of mature shade trees with good canopy

cover that provides valuable habitat for birds. This diversity of trees supplies important resources for many forest birds, including hornbills.



*Senegal Coucal (Centropus senegalensis)*



*Common Wattle-eye (Platysteira cyanea)*

Twenty percent of the shade trees found in these cacao agroforests were also observed being used by hornbills in previous research by CTR in the nearby Dja Reserve. Many tree species useful for farmers also provide fruit for African hornbills and other frugivores (Figure 2). During food-lean times, hornbills from the protected forests may move into cacao agroforests in search of food. Without fruit outside of protected areas, these important seed dispersers, which help maintain the incredible tree diversity found in African rainforests, might have trouble surviving the dry season. Furthermore, with the steady elimination of primate seed-dispersers from these heavily hunted agroforests, the regeneration of high-value shade trees may require the presence of hornbills to disperse seeds. By maintaining a well-developed shade canopy on their farms, Cameroonian cacao farmers may help maintain healthy hornbill populations in the forest while also improving the household economic benefits from their agroforests. This creates the possibility of a “win-win” scenario, where farmer economic interests are in line with conservation (Figure 2). This research helps demonstrate the potential value of cacao agroforests for biodiversity conservation.

Further examination of the ecological function of the birds found on these cacao farms would be worthwhile to determine if these birds could help control insect outbreaks. Roughly 65% of the understory birds I captured in mist nets are at least partially insectivorous and could possibly help contain insect outbreaks (Figure 3). While the ecological composition of the cacao bird community is similar to that found in the secondary forests sampled as part of this study, there were significant differences from primary forests. Previous research on Latin American coffee farms has shown that understory insectivore specialists are one of the most sensitive groups to disturbance, and many species disappear with conversion to shade coffee. The same seems to be true with the transition of Africa primary forests to cacao (Figure 3), indicating that there are limits to conservation in cacao agroforests. Nonetheless, in Panama, researchers from the Smithsonian Institution, using bird exclosures on cacao trees, found that the presence of birds significantly reduces leaf damage and cacao pod damage. Conducting similar experiments in Cameroon could help explain why Africa has greater problems with insect pests than other parts of the world.

Africa contains one-fifth of all known species of plants, mammals, and birds. Although cacao agroforests cannot replace protected areas needed for Africa’s most endangered wildlife, this research has shown that they support significant levels of tropical forest bird diversity. Encouraging farmers to manage for the long-term sustainability of these trees is one way to help conserve Africa’s rich natural heritage.

## Tables and Figures

**Table 1. Number of cacao farmer households (out of 28 households interviewed) that reported hunting each species in the previous year.**

Common Name	Scientific Name	Family	Number of Households
African pouched rat	<i>Cricetomys eminis</i>	Sciuridae	28
African-striped squirrel	<i>Funisciurus squirrel</i>	Sciuridae	26
Blue duiker	<i>Cephalophus monticola</i>	Cephalophinae	14
African brush-tailed porcupine	<i>Atherurus africanus</i>	Hystricidae	11
Greater cane rat	<i>Thryonomys swinderianus</i>	Tryonomyidae	6
Bates's pygmy antelope	<i>Neotragus batesi</i>	Neotraginae	2
Tree pangolin	<i>Phataginus tricuspis</i>	Manidea	1

**Figure 1. Cacao-growing villages visited in southern Cameroon for this research (in red). Primary and secondary forest sites previously visited by a CTR research team are also shown (in green).**

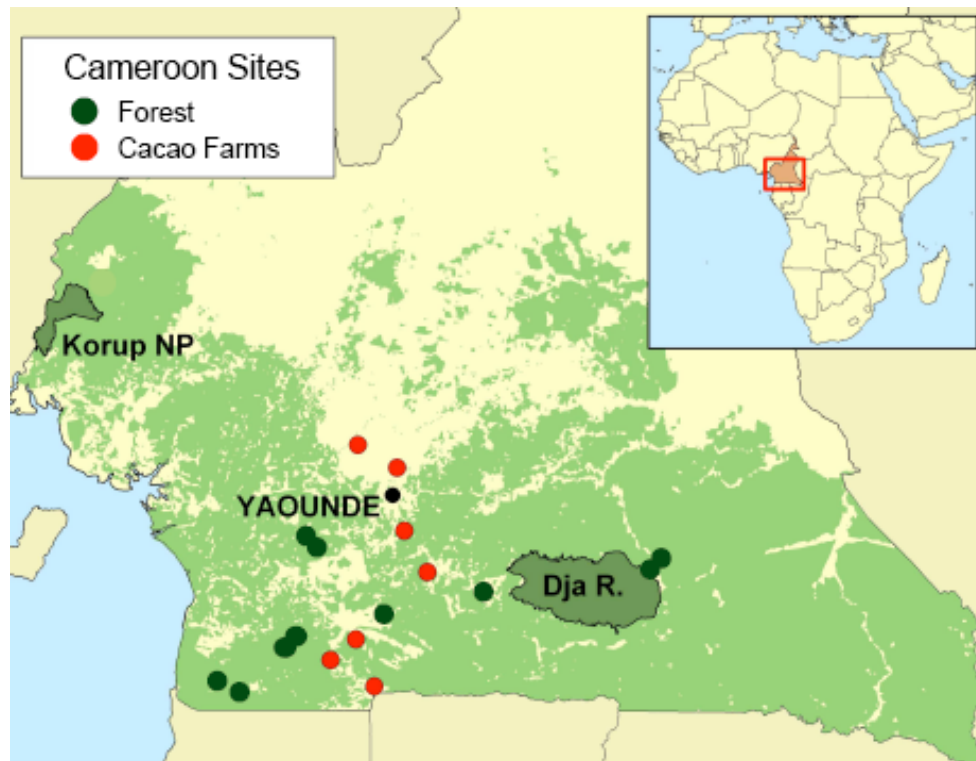


Figure 2. The number of tree species observed being used as shade on Cameroonian cacao farms (by this study and in the compiled STCP database) that CTR researchers also found to provide fruit to foraging hornbills in the Dja Reserve. The value of these shade species for farmer households is also shown.

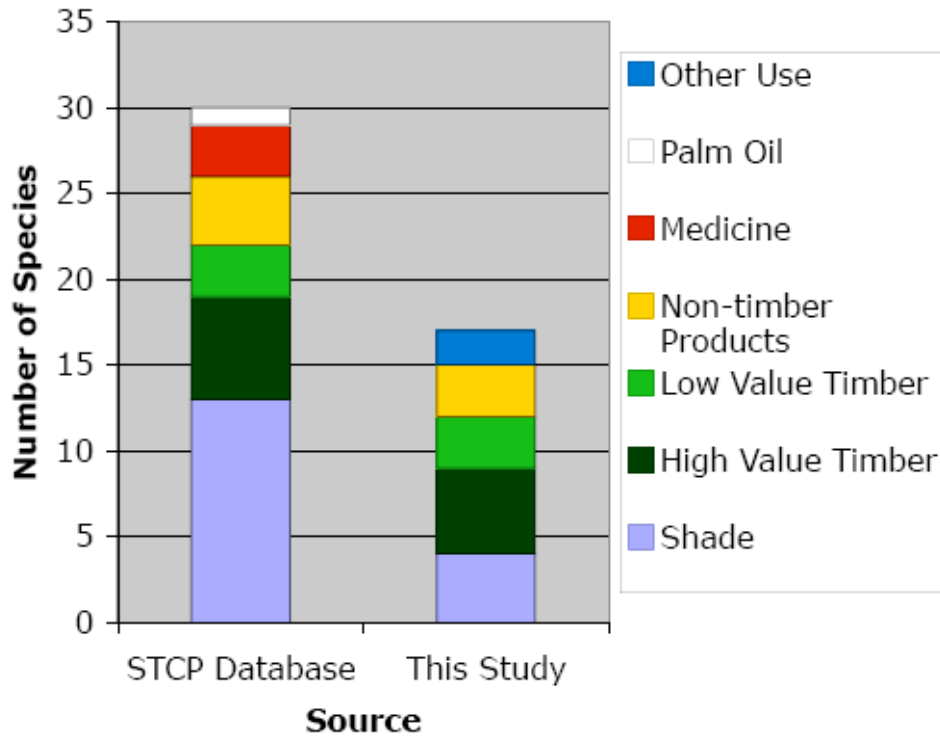


Figure 3. The percentage of the total birds in each ecological feeding guild captured in primary and secondary forests and on cacao farms.

