

Your ECOLOGICAL footprint



Biodiversity-Friendly Coffee

In many coffee shops it is possible to spend a few extra cents for a cup of “biodiversity-friendly” or “bird-friendly” coffee. Already about 10 percent of the U.S. coffee market consists of biodiversity-friendly coffee that is grown in a way to protect migratory birds. Does the type of coffee you drink matter?

An understanding of the potential benefits of biodiversity-friendly coffee begins with an explanation of how coffee is cultivated. Coffee beans are grown on small trees. Nearly all coffee comes from two tree species, *Coffea arabica* and *Coffea robustus*. Both species evolved in Africa and, in the wild, grow on the forest floor. As such, coffee is shade adapted. (What does this imply about its light compensation and light saturation points?) Consistent with this adaptation, agricultural studies indicate that coffee trees grown in shade produce up to 50 percent more beans than trees grown in full sunlight. In addition, coffee trees grown in the shade have larger, tastier beans.

Nonetheless, coffee can be grown under a variety of conditions (Figure 1). At one extreme coffee trees can be grown in rows in full sunshine. At the other extreme coffee trees can be grown in full shade under a nearly unaltered forest canopy. Between these extremes are various cultivation techniques, which vary according to the density and types of shade trees. Traditional polyculture (growing more than one species) simplifies the forest canopy but retains many native tree species. Commercial polyculture uses commercially valuable species, such as citrus or banana plants, for shade. Alternatively, shade can be provided by a very simplified canopy of nitrogen-fixing tree species.

Over the last decade the fraction of coffee that is grown in full sun has increased dramatically. In Mexico, Colombia, the Caribbean, and Central America about 40 percent of the 2.8 million hectares of shade coffee has been converted to full-sun production. This conversion has been stimulated by higher coffee prices, which make it economically viable to increase the application of agricultural inputs such as fertilizers. With these additional inputs, yields of full-sun coffee can exceed those for shade coffee.

The change to full-sun coffee exacerbates the loss of biodiversity associated with coffee production. In general, full-sun coffee reduces the structural complexity of the ecosystem, reduces leaf litter, and increases

the incidence of disease. Consistent with these differences, conversion to full-sun cultivation reduces the diversity of invertebrates, mammals, and local and migratory bird species. Among these species are pollinators, which are critical to yield. Without pollinators the fruit does not set, and yields are reduced. In Indonesia, fruit set rises from 60 percent to 90 percent as the number of bee species increases from three to twenty.

The degree to which biodiversity can be preserved is not an all-or-nothing proposition. Much of a forest’s original biodiversity can be preserved depending on the type of shade trees used and how those trees are managed. Trees that have a complex structure and lots of flowers, such as the ice cream bean tree, support higher levels of biodiversity than simpler species such as the gliricidia.

Given these advantages, how much extra does biodiversity-friendly coffee cost? To ensure that the “biodiversity-friendly” label is meaningful, several U.S. conservation organizations have set up the Conservation Principles for Coffee Production. Economic analyses indicate that all growers can satisfy these principles if they charge a small fee. This fee varies from 3 percent (for expensive coffees) to 25 percent (for inexpensive coffees). Given the small fraction of the price of a cup of coffee that goes to the grower, the biodiversity fee adds little to what you pay. So a small investment in biodiversity-friendly coffee could preserve biodiversity in much of the world’s coffee-growing regions, where most of the world’s biodiversity is located.

ADDITIONAL READING

- Donald, P.F. “Biodiversity Impacts of Some Agricultural Commodity Production Systems.” *Conservation Biology* 18, no. 1 (2004): 17–37.
- Gobbi, Jose A. “Is Biodiversity-Friendly Coffee Financially Viable? An Analysis of Five Different Coffee Production Systems in Western El Salvador.” *Ecological Economics* 33 (2000): 267–281.

STUDENT LEARNING OUTCOME

- Students will be able to explain how the method used to cultivate coffee affects biodiversity and why high coffee prices may either reduce or preserve biodiversity.

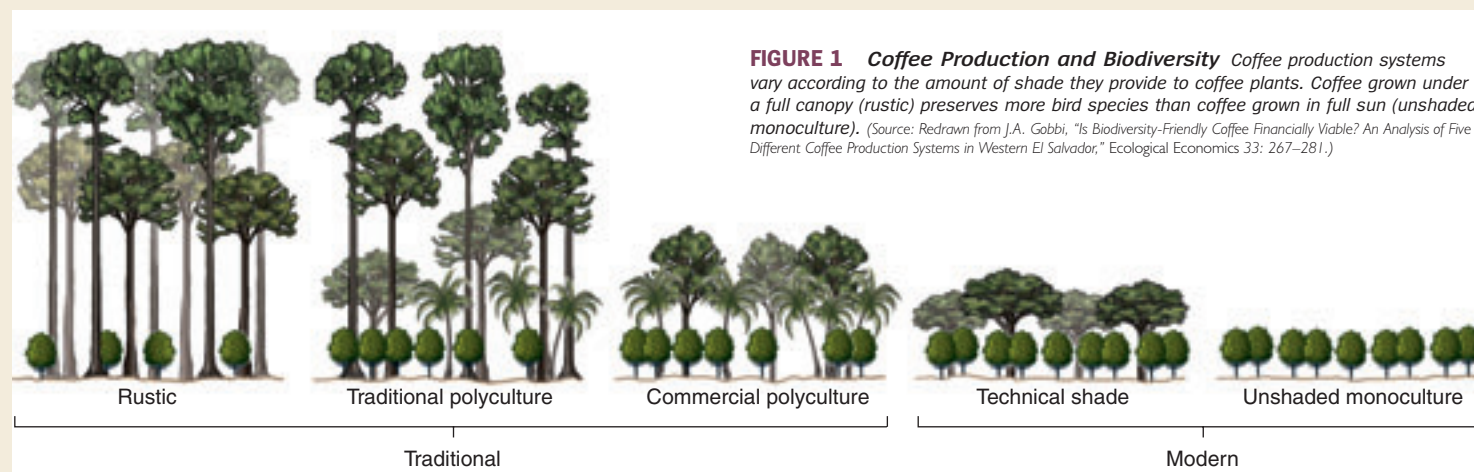


FIGURE 1 *Coffee Production and Biodiversity* Coffee production systems vary according to the amount of shade they provide to coffee plants. Coffee grown under a full canopy (rustic) preserves more bird species than coffee grown in full sun (unshaded monoculture). (Source: Redrawn from J.A. Gobbi, “Is Biodiversity-Friendly Coffee Financially Viable? An Analysis of Five Different Coffee Production Systems in Western El Salvador,” *Ecological Economics* 33: 267–281.)