



Tropentag 2010  
ETH Zurich, September 14 - 16, 2010

Conference on International Research on Food Security, Natural  
Resource Management and Rural Development

---

**Conservation and Use of Wild Populations of *Coffea arabica* in the Montane Rainforests of Ethiopia: From Research to Action**

Holger Hindorf<sup>1\*</sup>, Manfred Denich<sup>2</sup>, Tadesse W. Gole<sup>2</sup>

<sup>1</sup>University of Bonn, Institute for Plant Diseases, Germany

<sup>2</sup>University of Bonn, Center for Development Research (ZEF), Germany

\*Contact author: Nussallee 9, D-53115 Bonn, Germany, [h.hindorf@uni-bonn.de](mailto:h.hindorf@uni-bonn.de)

**Abstract**

*Coffea arabica* originates from Southwest Ethiopia, where its wild populations naturally occur in the understory of the montane rainforests at altitudes between 1,000 and 2,100 m. Wild Arabica coffee is not only consumed by local people, but it is also a cash crop for the local as well as the international speciality market. Above all, it is a unique gene pool for national and international coffee breeding due to its high genetic diversity. As forest land is increasingly converted to agricultural land, the wild coffee populations and their habitat, the montane rainforest, are highly threatened.

To bridge the gap between research during 2002 to 2008 and practice, the NGO “Environment and Coffee Forest Forum (ECFF)” was founded. Based on the research findings, ECFF and its German partners work on (1) the establishment of a protected area for wild coffee and its forest habitat, (2) the development of guidelines for the use of wild coffee and the coffee forests, (3) the establishment of an in situ gene bank for the conservation of wild coffee genetic resources, and (4) concepts for environmental and conservation education and raising public awareness. The way from basic research to implementation-oriented and participatory activities will be described and discussed with the aim of establishing an UNESCO-MAB biosphere reserve at Yayu/Southwest Ethiopia.

**Introduction**

Wild coffee differs genetically from landraces and cultivars, grows and regenerates spontaneously in its natural habitat, the montane last rainforests of Ethiopia. Local people collect the crop for consumption representing a source of income for them. In addition wild coffee is a specialty on the international coffee market and a national and international genetic resource for coffee breeding. Today most of the montane rainforests have been converted into agricultural land, only 25,000 km<sup>2</sup> (~2.5%) of forest fragments remain. Consequently the wild coffee disappears with the forest. The montane rainforest has a multiple sustainable effect on the environment and for the people. It serves as a source for fire and construction wood, it regulates the water flow and controls erosion. Furthermore the rainforest habitat is an additional source for food like spices (cardamon, pepper, chillies etc.) and honey production.

## **Research and development objectives**

To assess the diversity and economic value of the wild coffee gene pool and the montane rainforest, a concept for conservation and use of wild coffee populations and its forest habitat was developed. The idea was, that rainforest conservation becomes conservation of the coffee gene pool and vice versa. The following project activities were carried out during the research phase from 2003 -2007:

### **1. Vegetation studies**

The plant diversity of the montane rainforests existed of >700 plant species in the study sites. The forests in general showed regional differences in their species composition, but "Coffee forests" were floristically similar across regions. The abundance of wild coffee depends on altitude, rainfall and management by forest users modifying the forest structure.

### **2. Molecular-genetic studies**

Molecular-genetic analyses on the diversity of wild coffee showed regional differences among wild coffee samples and differences within regions. The genetic diversity of wild coffee reflected in its variability regarding drought tolerance and quality features.

### **3. Ecophysiological and quality studies**

Investigations on drought tolerances were carried out in greenhouse and field experiments with different origins of wild coffee resulting in a large diversity. Quality studies of cup tests in Ethiopia and Germany resulted in highest standards of some localities (Bale Mountains, Bonga, Yayu and Sheko).

### **4. Phytopathological studies**

Disease assessments in the field were carried out for Coffee Leaf Rust (CLR), *Hemileia vastarix*, Coffee Berry Disease (CBD), *Colletotrichum kahawae* and Coffee Wilt Disease, *Gibberella xylarioides* (*Fusarium xylarioides*). No site of wild coffee was free of diseases, but the intensity varied tremendously. Compared to conventional plantation coffee wild coffee never failed to produce a reasonable crop. CLR existed in Ethiopia since centuries, but never eradicated trees like for instance in Asia. The diversity of susceptible, tolerant and resistant plants proved to be high in each region, so that individual plants could be selected and transferred to the gene-bank.

### **5. Economic studies**

The value of coffee forests for farmers is still not recognised and lower than converting it into arable land. The value for the society taking all values into account (timber, wild coffee, ecosystem services, etc.) with a sustainable forest management achieves higher net benefits. The economic value of the wild coffee gene pool as a resource for breeding provides benefits due to disease and pest tolerant material. A partly low caffeine content of some finding could save costs during decaffeinating process: ~200 million US\$ per year. The potential global economic value of wild coffee in Ethiopia could be estimated to 0.4 - 1.5 billion US\$ (Hein and Gatzweiler, 2006).

### **6. Institutional research**

A cooperation with local governmental institutions were started to find partners continuing the proposed conservation of rainforests including wild coffee.

- National (AAU) and international universities (Bonn) and research institutes (EIAR, IBC)
- Private sector (national and international coffee business, roasters)
- Regional (NTFP) and local forest enterprises
- National and regional authorities (Ministries)

- National and regional development organisations
- National and international NGOs

## **7. A web-based Coffee Forest Information System (CoFIS)**

## **8. Education, communication and implementation support for conservation strategies**

### **Action**

The potential aim of the project was the transformation of the potential value of the coffee-genetic resource and of the forest into real benefits for the rural population. A first step was the bridging of the gap between research and practice with the establishment of the “Environment and Coffee Forest Forum (ECFF)” by Ethiopian and German scientists as a non-governmental organization in 2005 linked science and politics, lobbies for the conservation and use of coffee forests and wild coffee and organization of practical conservation measures for the coffee forests and wild coffee. A second step was the idea that the UNESCO-MAB Biosphere Reserve approach is the most suitable option to combine the conservation of the montane rainforests with wild coffee and human development.

Accordingly to that previous steps ECFF and stakeholders at village, district and zonal level identified an area in southwestern Ethiopia to be nominated as Yayu Coffee Forest Biosphere Reserve and developed the respective concept to be submitted to UNESCO-MAB for approval. Biosphere reserves are sites recognized under UNESCO's “Man and the Biosphere Programme (MAB, 1971)”, which innovate and demonstrate approaches to conservation and sustainable development. They are operating under national sovereign jurisdiction, but share their experience and ideas nationally, regionally and internationally within the World Network of Biosphere Reserves. At the moment there are 553 biosphere reserves worldwide in 107 countries. The biosphere reserves work in conservation of landscapes, ecosystems, species and genetic variation; in economic and human development socio-culturally and ecologically sustainable and provide a logistic support in research, monitoring, environmental education and training.

The biosphere reserves are organized into three geographical zones:

- Core areas must be protected by law. Core areas protect sensitive and valuable species and biotopes natural or anthropogenic biotopes.
- Buffer zones surround core areas. Activities and use of resources in these areas must be consistent with protection in the core areas.
- Transition areas are the outer zone of a biosphere reserve. Priority is given to sustainable economic and social development supported by the local community.

Why we have chosen Yayu out of four other rainforest regions in Ethiopia? Yayu forest is the largest remaining coffee forest fragment worldwide with its unique genetic diversity in wild coffee. The region comprises an extraordinary landscape mosaic of forest, agricultural land and wetlands. 70% of the local income is directly linked to coffee production (mostly managed forest coffee and garden coffee). The region harbours a historical site: the Gada Assembly of the Iluu Oromo – a key landmark in Oromo people's sophisticated political culture. The ongoing action comprises:

- Establishing the research, conservation and development program "Darara Buna"
- Development of management guidelines for wild coffee and its forest habitat
- Establishing in-situ gene banks for the conservation of wild coffee genetic resources
- Exploration of unknown coffee forest areas in Ethiopia
- Training of para-ecologists
- Conservation education and public awareness raising
- Development of fund-raising approaches for financing the conservation activities
- Briquetting of coffee pulp for fuel and fodder

- Fermenting coffee pulp for fertilizer
- Developing a manual coffee pulping machine