



Environmental Sustainability and Coffee Diversity in Africa

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INTRODUCTION COFFEE IN AFRICA

- All coffee species are indigenous to Africa
- About 103 species of genus *Coffea* are identified
- Arabica and Robusta coffees adapt and thrive best in the tropical highland and lowland areas, respectively.
- Coffee plays a decisive role in livelihoods of millions of people and national economy of several African countries including
- Ethiopia, Côte d'Ivoire, Uganda, Zimbabwe, the Democratic Republic of Congo, Angola, Rwanda, Tanzania, Cameroon, Burundi and others (ICO, 2009).
- Coffee is smallholder's crop, most affected by coffee crisis and climate change.

INTRODUCTION

☐ **Coffee** : ORIGIN IN THE NATURAL FORESTS

- Evergreen, perennial, shade-loving tree = carbon sinks.
- African coffee producing regions are most vulnerable to global climate changes & market price.

☐ **COMPONENTS OF SUSTAINABILITY- INTERLINKED WITH IMPORTANCE AND RISKS**

- ✓ **ECONOMICAL**
- ✓ **SOCIAL**
- ✓ **ENVIRONMENTAL**

INTRODUCTION

☐ **Sustainable coffee production:**

Aims to achieve benefits for LONG-TERM development

☐ **Concepts of sustainable coffee includes:**

- Organic coffee growing
- Shade-grown coffee
- Fair-trade.

☐ **Africa is special in diversity:**

- Fauna & flora-wildlife & wild plants
- Plant species (trees, shrubs, spices...)
- Coffee gene pools (wild & cultivated)
- Ecological zones
- Traditional practices
- Technological innovations
- Enable it to meet all sustainability criteria.

OBJECTIVES

- To emphasize on the links between healthy environments and coffee diversity
- To indicate the existing opportunities, challenges & risks affecting the natural ecosystem and coffee genetic resources in Africa
- To present an overview of coffee research and conservation experiences in Ethiopia, birthplace for Arabica coffee
- To draw conclusions about the need for urgent implementation of conservation measures of coffee genetic resources for the future development of the coffee sector

COFFEE GERMPLASM IN AFRICA

- ❖ **Genetic diversity and heterosis related to:**
 - Diversity in origin (geographical separation)
 - Gene frequencies
 - Ancestral relationships
 - Morphological variations.
- ❖ **CONSERVATION:** Two approaches-complementary
 - *In-situ* (in their natural habitats)
 - *Ex-situ* (out of their areas of origin).
- ❖ In Africa, about 21,407 coffee germplasm (Dullo et al., 1998; Bachew & Labouisse (2006)
 - Arabica = 10,573
 - Robusta = 8,000
 - Mascaro *coffea* = 1,282
 - Arabica or robusta = 1,552
 - Around 89.85% of the Arabica gene pools is found in Ethiopia.
 - ✓ Surendra (2008) also reported about 99.8% Arabica germplasm in Ethiopia.

OPPORTUNITIES & CHALLENGES IN AFRICA

❖ Opportunities:

- ✓ Geographical location (tropics & subtropics)
 - ✓ Diverse & suitable ecology
 - ✓ Richest biodiversity centres
 - ✓ Wildlife & wild crop relatives
- ❖ The diversity in coffee germplasm, soil types and climate
- Supplying superior coffees
 - Breeding for any desirable traits.
- ❖ Different coffee-based agroforestry systems
- Promote conservation agriculture
 - Organic coffee farming system
 - Maintain ideal environments and maximum biodiversity
 - Enhance sustainable use of natural resources
 - Provide free ecosystem services and high biodiversity- coffee diversity.



CHALLENGES & RISKS AFFECTING COFFEE SECTOR IN AFRICA

- Inefficient policy frame works
- Inadequate access to improved technologies
- Inadequate services
- Poor market access
- Lack of incentives
- Coffee is predominantly smallholders' crop
- ✓ Limited and fragmented land holdings
- ✓ Little access to farm inputs/credit
- ✓ Low price shares to producers.

CHALLENGES & RISKS...

In Africa, coffee species are endangered mainly due to:

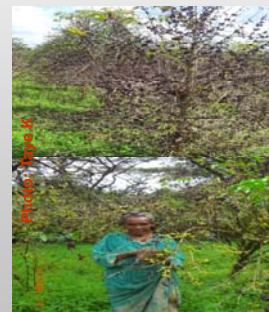
- Increasing population
- Deforestation & land degradation
- Uncontrolled exploitation of forest resources
- Expansion of large farms
- Crop replacement
- Non-forestry investment
- Mining and new settlements
- **Climate change**



CHALLENGES & RISKS...

Nowadays, additional stress imposed from **climate change** is aggravating the problems in Ethiopia, particularly under open sun conditions.

- Continuous flowering/crops
- Unbalanced growths
 - ✓ Physiological disorders/drying
 - ✓ Diseases & insect pests
 - ✓ Droughts
- Inefficient use of natural resources
- Require intensive cares/inputs
- New problem = New solutions.



CHALLENGES & RISKS...

- Increasing demand for high quality coffees
- Increasing costs of coffee production, picking and processing



- Beyond the reach of the poorest coffee producers in Africa
- Low profitability to the coffee farmers
- ✓ **Lack of economic development & competitiveness in the coffee sector**

CHALLENGES & RISKS...

INTENSIFICATION:

- Hamper efforts to protect, maintain ideal habitats and species diversity
- Narrow coffee gene pools
- Short-term advantages
- High risks to climate change and price volatility
- Expensive to poor coffee producers

Hence, ecological sustainability = viable option

- ❑ Despite the challenges, Africa is endowed with huge opportunities to be conservation and breeding centres for COFFEE.

EXPERIENCES FROM ETHIOPIA HOME OF ARABICA COFFEE



☐ Major coffee growing areas in southwest, west, south, east, southeast.

- Yirgacheffe
- Sidamo
- Harar
- Djimma/Limu
- Lekempti/Gimbi
- Several other coffees.



- ✓ Four major production systems
- ✓ 90 % comes from smallholders
- ✓ Coffee-based agroforestry/intercropping

- Estimated total area = 700,000 hectares
- Estimated annual production = about 350,000 tons
- Of this 40 – 45% is consumed domestically
- New marketing systems = ECX.

EXPERIENCES... Major Research Achievements

- 26 coffee varieties (23 pure line & 3 hybrids)
- 12 specialty coffees (3 Sidama/Yirgacheffe, 4 Gimbi, 5 Harar)
- Several other promising coffee genotypes identified
- Improved package technologies (nursery, forest & garden/agroforestry based coffee management)
- Low yield, but sustainable & superior quality.
- Location specific processing methods
- Multiplication & distribution of coffee seedlings/seeds/cuttings.
- **Coffee Diversity & Knowledge (Girma et al., 2008)**

EXPIENCES... COFFEE GERMPLASM

- ❑ Up to now, a total of 11,691 Arabica coffee germplasm accessions collected and *ex-situ* conserved in field genebanks in Ethiopia.
- Jimma Research Center and its sub-centers = 5,960+190 = 6,150
- Institute of Biodiversity Conservation = 5,731
- ❑ Coffee conservation efforts (www.coffee.uni-bonn.de)
 - Eight coffee forest areas identified and delineated –EU/CIP project
 - Four studied (CoCE = six-sub projects)
 - Two proposed as UNESCO Biosphere Reserves
 - The Yayu Coffee Forest
 - The Kafa Coffee Forest.



IN SUM:

- ❑ Africa is SPECIAL: opportunities & challenges
- ❑ Environmental sustainability & conservation of coffee genetic resources requires strong international collaborative partners
- Immediate measures are required to identify and design ways of conservation strategies against the possible risks of climate change on coffee ecology and its production in Africa.
- Urgent implementation of global coffee genetic resources conservation as proposed by Belachew & Sacko (2009) and other coffee sustainability initiatives.
- Identification of options to deliver incentive mechanisms and equitable benefit sharing from the ecosystem services, landscapes and natural resources
- Support coffee marketing and promotion/educational works (new markets, value addition, promotion of eco-tourism...)
- Enhancing productivity & quality- Proper incentives to increase household incomes & life style of the rural people
- SUSTAINABLE COFFEE ECONOMY AND DEVELOPMENT OF THE COFFEE SECTOR.

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Thank You !!