



# **PERSPECIVES ON COFFEE RESEARCH IN AFRICA**

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# I. Introduction

- **The beginning of coffee research in Africa**

<b>Old name</b>	<b>Current name</b>	<b>Country</b>	<b>Year est.</b>
1. Lyamungu Res. Station	TaCRI	Tanzania	<b>1934</b>
2. Coffee Res. Station	CRF	Kenya	1944 <b>(1908?)</b>
3. Coffee Res. Institute	COREC	Uganda	1949
4. Coffee Res. Station	CRS	Zimbabwe	1964
5. Jimma Res. Station	JARC	Ethiopia	1967



- **The purpose coffee research was:**

To improve the crop through

- improving management practices
- developing high yielding varieties with good quality and resistant to diseases and pests, and
- dissemination of research results

- **Considerable achievement recorded in improving basic husbandry practices**

- variety improvement
- improvement of nursery and field magmt

- On the other hand, declining production and export values recorded**

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Production share	1970s & 1980s	26%	
	2000	15%	
	2005 - 2008	12%	
Export volume	1977	15m bags	31.5%
	2007	11.5m bags	12.1%
	2008	10.3m bags	10.5%
Value	1977	US\$3.5b	30%
	2007	US\$1.54b	12%
	2008	US\$1.61b	10.5%

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- **Major reasons for the decline of African coffee production and export:**
    - inadequate extension services
    - price crises against rising cost of production
    - political instability (civil war)
    - old age of coffee trees and use of traditional Vrs.
    - diseases and insect pests
    - limited fund for research and development
  - **The problems appeared to seek policy support and research solutions**
  - **But, what is the capacity and capability of National Research Centers?**



## **Objective of the present report**

1. To provide a brief account of the current status of coffee research in Africa
2. Identify constraints to research delivery
3. Identify production constraints that seek immediate research intervention, and
4. Suggest the way forward towards having viable coffee research centers that are competent enough to tackle the challenges and contribute to African coffee sector revitalization endeavors



## **2. Current status of national Coffee Research Centers (NCRC)**

### **Factors considered to examine current status of NCRC:**

- a. Availability of skilled human power
- b. Research structure (disciplines/divisions)
- c. Laboratory facilities
- d. Research fund
- e. Communication facilities (Tel., Fax, internet system)
- f. Transportation facilities (Vehicles)
- g. Achievements and impacts



## **a. Availability of skilled human power**

In adequate skilled human power [JARC- Eth., COREC- Uganda (only 6), CRF- Kenya, and Divo Res.St- Cote d'Ivoire ]

## **b. Research disciplines or divisions**

- Disciplines required for package recommendations  
(1) Agronomy and crop physiology, (2) Breeding and genetics, (3) Crop protection, (4) Coffee processing, (5) Soil fertility and plant nutrition, (6) Agricultural economics and (7) Research and extension linkage
- Almost complete at JARC, TaCRI and CRF
- Other research centers are incomplete, e.g. CRS of Zimbabwe has only three (agronomy, pathology, Entomology)

## **c. Laboratory facilities**

- **Basic laboratories:**
  - **Protection lab.: disease testing and screening**
  - **Processing lab.: quality test**
  - **Soils lab.: soil and tissue analysis and fertilizer determination**
  - **Biotech. (Tissue Culture) lab.: mass propagation planting of materials**
- **Not fully available or complete at most centers,**
- **CRF (Kenya) and JARC (Ethiopia) in better condition**
- **Coffee Tissue Culture available only in Ethiopia, Uganda and Kenya**

## **d. Research Fund**

**Research fund is the major constraint**

- **Some centers (e.g. JARC- Ethiopia) depend on very limited Government fund**
- **Some centers (e.g. TaCRI- Tanzania, CRF- Kenya) are incorporated as company Ltd and derive their budget from membership fee, donors, sales and services charges, collaborative activities, levy, etc**

## **e. Communication (Tel., Fax, internet)**

- **From ACRN years of experience, specially fax and internet are usually non-operational**
- **Only TaCRI & CRF possess their own website, and**
- **JARC, COREC and CRS (Zimbabwe) indirectly**



## **f. Transport**

- **In agricultural research, transport is a critical element**
- **New technologies require verification under multi-locations before release, need of sub-stations**

<b>JARC</b>	<b>5 sub-centers + 3 testing stations</b>
<b>TaCRI</b>	<b>6 sub-stations</b>
<b>CRF</b>	<b>4 sub-stations + Several dem. Sites</b>
- **Dependable vehicles are needed for effective supervision, but in most centers, major bottleneck**
- **Most Centers obtain Vehicles through donation or externally funded projects**

# 3. Achievements and its impact

## 3.1 Variety development

Varieties released and those in pipe line

Country	Res. Center	Released	Pipe line
Cote d'Ivoire	Divo Res. St(CNRA)	8	-
Ethiopia	JARC	26	12
Kenya	CRF	4	1
Tanzania	TaCRI	10	-
Uganda	COREC	6	1+8
Total		54	21
Brazil		66	?



## • **Notable varieties among released**

- 3 hybrids and 13 CBD resistant selections- Ethiopia
- Ruiru 11 – Kenya
- Arabusta hybrid – Cote d'Ivoire

## **Varieties in pipe line**

- 12 selections for Wollega, Harerge and Sidamo proper – Ethiopia
- One Vr. that combines Ruiru 11 & SL Vrs – Kenya
- One Arabusta and 8 CWD resistant clones - Uganda

# Impact of released Vr.

- **CBD – yield loss + fungicide cost**

Ethiopia	20 – 25% loss	US\$30m/year
Kenya	30%	30-35% mgt cost
Tanzania	31 – 68%	
Cameroon	≤ 80%	

- **Increased yield and reduced chemical cost in areas improved varieties released**
- **Problem – multiplication and distribution of planting materials has not been done effectively**

## 3.2. Development improved management practices

### a. Available recommended management practices

Management type	Major practices
1. Nursery management	Seed and seed-bed preparation, seed sowing , and seedling management
2. Field management	Field preparation, layout, digging holes; transplanting, field management (weeding, pruning, fertilization, irrigation, etc)
3. Pest management	Recommended chemicals and rate and method of its application, cultural and biological control methods, integrated pest management (IPM)
4. Processing	Method of harvesting, dry and wet processing, storage , quality test

## **b. Production manuals prepared based on research recommendations: Examples**

<b>Country</b>	<b>Title of the manual</b>	<b>Prepared by</b>
Kenya	Coffee production recommendations (hand book)	Coffee Res. Foundation
Uganda	Arabica coffee production hand book Robusta coffee production hand book	Uganda coffee Dev't Authority (UCDA)
Ethiopia	Recommended production technologies for coffee and associated crops	Institute of Agr. Research (IAR)
Zambia	Coffee production; principles and approved practices	Coffee Board of Zambia (CBZ)



## ◦ C. Management practices: Impact

- Plantation coffee (>2 ton/ha in Zambia under complete package recommendation)
- Wet processing practices (account for 20% in Ethiopia)
- Effectiveness of recommended chemicals in controlling pests (diseases, insects, weeds)

**Small scale farmers did not benefit much.**

### **Why?**

- Weak extension services
- Unaffordability to apply package recommendation



## 4. Constraints to coffee research development

### a. Inadequate facilities

- basic laboratories are not well equipped or does not exist
- TC lab only available in Ethiopia, Kenya, and Uganda and molecular lab. does not exist

### b. Inadequate skilled manpower

- No manpower development plan
- Advanced studies are through personal effort

### c. Limited budget and Gov't support

- despite its economics, coffee res. is marginalized
- largely considered as any one of agricultural crops



#### **d. Frequent structural changes**

- The name, status and structural set up changes from time to time
- Considerable implications on:
  - budget allocation
  - research approach
  - staff assignment and management

#### **e. Staff attrition - high staff turn over due mainly to:**

- under payment (low salary)
- lack of incentives and/or rewarding system for best performance
- inconvenient working atmosphere



**f. Limited linkage and experience sharing**

- exchange of information and experience, knowledge sharing and collaborative activities with other research institutions limited
- participation in international and regional workshops, conference, etc. very little - e.g. ASIC

**g. Political instability**

- Coffee research centers in most war torn countries destroyed, not yet reestablished

## 5. Research challenges

Three key challenges to research that need immediate attention:

### I. Low coffee yield

<b>National yield average in Africa</b>	<b>&lt; 600 kg/ha</b>
<b>Brazil ( National avg 2002)</b>	<b>1008kg/ha</b>
<b>Brazil (National avg 2005/06)</b>	<b>907 kg/ha</b>
<b>Vietnam</b>	<b>1700 kg/ha</b>

## ° **Major factors contributing to low coffee yield**

- **Old age of coffee trees and use of traditional Vrs.**
- **Poor adaptability of improved varieties to the very diverse coffee agro-ecology**
- **Poor agronomic practices owing to weak extension services**
- **Diseases and insect pests – CBD, CWD, CLR, CBB, etc.**



## II. Low coffee quality

### Major factors for low coffee quality:

- Poor processing practices owing to weak extension services
- Unaffordability of the wet processing method by the small holder growers (responsible for >80% production)
- Inadequate promotion of specialty coffee prodn.
  - **opportunities** – high genetic and ecological diversity
  - **Research need** - terroir classification and characterization



# III. Climate change

## Effects of climate change:

- Recurrent drought (Ethiopia, Kenya and others)
- Land degradation in Eastern mountainous countries of Africa (erratic rainfall, deforestation)
- Fast expansion of Sahara desert to neighbouring countries
- Change in disease and pest type and pressure, modification in host-pathogen interaction, evolution of new races, etc

**Resilience to all these changes is critical research challenges**



## 6. The way forward

### The need to revitalize coffee development

- Coffee will continue to be most important commodity
- 14 countries generate over 10% of their foreign revenue
- Based on previous 30% market share, Africa annually loses over two billion dollars
- To recover the previous position:
  - Production > 31 million bags
  - Export > 29 million bags

The way forward....

# Proposed intervention measures

## I. Management perspective

### I.1 Restructuring an autonomous coffee organization

- in view of its economic role, fusing coffee with other crops and putting under NARO that caters the entire Agr. Sector is very unwise
- An autonomous national coffee organization responsible for:
  - Research
  - Development
  - Marketing
  - national and international coffee matters



# Proposed intervention measures

I.management perspective...

## I.2 Building the capacity of National coffee Res. Centers

- effective research set up (disciplines, laboratories) with adequate facilities and management system
- well planned human power development
- establishment of incentive mechanisms
- establishment of dependable budget sources



# Proposed intervention measures

## 2. Research Perspective

### 2.1 Establishment of viable research and extension linkage

- Small holders responsible for > 80% production
- How many of the farmers know how to raise seedling, proper stumping and pruning, proper harvesting and processing, and other practices
- Research technologies are largely shelved

**Effective research and extension linkage and intensive extension services are mandatory**

# Proposed intervention measures

## 2. Research perspective...

### 2.2 Development of varieties suited to each agro-ecology

- The ecology under which coffee grows in Africa is highly diverse
- coffee quality, pest incidence and severity, performance of improved varieties show variations under different ecology
- The need to develop varieties for each agro-ecology

**Advantage:** adaptation easy, maintains typical quality

# Proposed intervention measures

## 2. Research perspective...

### 2.3 Improvement of quality & specialty coffee promotion

- Quality = Genetic + Environment
- Three ways to improve:
  - i proper processing through effective dissemination of improved practices
  - ii Use of terroir (=  $G \times E$ ) concept and promotion of specialty coffee
  - iii Genetic improvement through breeding

# Proposed intervention measures

## 2. Research perspective...

### 2.4 Rehabilitation of coffee sector (war torn)

- destruction of coffee farms due to civil unrest is one of the major factors for declining production

Country	Production ('000 bags)	
	1980/81	2008/09
Angola	721	55
D.R.Congo	1498	400
Liberia	147	50
Sierra Leone	154	20

- Rehabilitation of the coffee sector through strong research technical back stopping is indispensable

## 2. Research perspective...

### ◦ 2.5 Establishment of effective Farming Systems Research.

- study adoption rate and impact of technologies
- assess socio-economic conditions
- conduct cost-benefit analysis of new technologies
- identify research problems & provide feed back
- conduct marketing and policy analysis

### 2.6 Improvement of management and processing practices

All nursery, field and processing management practices need to be continuously fine tuned and verified to fit to changing env't



# Proposed intervention measures

## 2. Research perspective...

### 2.7 Introduction of Advanced research methods

- new research tools such as biotechnology did not start in national coffee research centers in Africa
- it reduce time, increase precision and efficiency; and complement conventional methods

### 2.8 Linkage with regional and international institutions

- exchange of information, experience and knowledge
- Mobilize research fund (common projects)
- share resources (facilities, skilled personnel)



## 6. Conclusions

- a. Despite its age old, coffee research in Africa is not well advanced compared to other continent
- b. The major coffee producers, the smallholders, did not benefit much from the available improved coffee research technologies due mainly to weak extension services and considerable improvement is required in this regard
- c. To enhance the competitiveness of African coffee industry, intensive coffee farming practices and improvement of coffee research system are mandatory.



**THANK YOU**

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