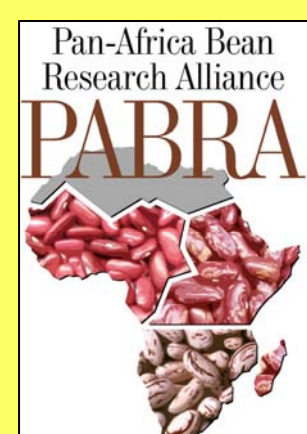


CIAT'S BEAN BREEDING STRATEGY IN PABRA REGION

Paul Kimani, Rowland Chirwa, Robin Buruchara, Steve Beebe and Matthew Blair

IMPROVED BEANS FOR THE DEVELOPING WORLD



From single Units to Strong Networks

- Before 1985, there were few active bean improvement programs in East, Central and Southern Africa despite the importance of bean in this region. Virtually all programs had activities limited to their countries and had limited access to global bean genetic resources and expertise. There was little cross-border sharing of germplasm, information, experiences and technologies.
- Breeding programs were strengthened by entry of CIAT scientists into the region and across border activities not only within Africa but also with the broader bean research community commenced.
- To strengthen regional collaboration and facilitate sharing of germplasm and experiences, three regional networks have been developed: ECABREN for 9 countries in east and central Africa, SABRN with 10 countries in southern Africa and WECABREN with 12 member countries for west and central Africa

Major production constraints of beans in Africa

Type	Constraint	Yield loss (t/year)
Abiotic	Drought	396,000
	N deficiency	389,900
	P deficiency	355,900
	Al/Mn toxicity and exch. bases	383,900
Biotic	Angular leaf spot	384,200
	Anthraxnose	328,000
	Bean stem maggot	297,100
	Root rots	221,100
	CBB	220,400

Objectives

- To provide clients with well adapted, high yielding bush and climbing bean cultivars with resistance/tolerance to major biotic and abiotic constraints, acceptable culinary qualities and preferred grain characteristics by consumers and the processing industry

Evolution of Bean Breeding Strategy

Breeding strategy before 2000

- Phase I: The 1980's:** Constraint resistance breeding
- Regional disease nurseries developed for angular leafspot, anthracnose rust, common bacterial blight
 - Participatory breeding starts in Rwanda and spread to other countries
 - Development of networks: ECABREN and SABRN
 - Advanced lines from CIAT evaluated by NARS and releases made. More than 60 new lines released especially in Rwanda, DRC, Burundi where mixtures were acceptable
 - Rapid growth in human and physical capacities: short courses, degree training, multidisciplinary workshops, equipment resulting in enhanced publication record

Phase II: The 1990's

Three major developments:

- Screening for tolerance to low soil fertility
 - Bean Improvement for Low Soil Fertility Soils (BILFA) in Africa formed in 1994
 - Focus on low soil P, N, Al/Mn toxicities and acid soils
- Introduction of climbing beans
 - Mainly in Rwanda and later DRC and other countries
- Drought tolerance
 - Bean Improvement for Water Deficit areas in Africa (BIWADA)
- Regional Breeding strategy since 2000

Phase III: Market class breeding

Phase IV: New Directions: opportunities and challenges

Market-led Breeding Strategy

Rationale

- Shift from centralized to decentralized breeding
- Enhance efficiency in development and dissemination of cultivars
- Develop programs more responsive to farmer and consumer needs
- Strengthen breeding capability of NARS

Our Goal

- Develop improved, universal bean cultivars with wider, domestic, regional and international market appeal to serve as basis for commercial bean production for the benefit of people in the region.

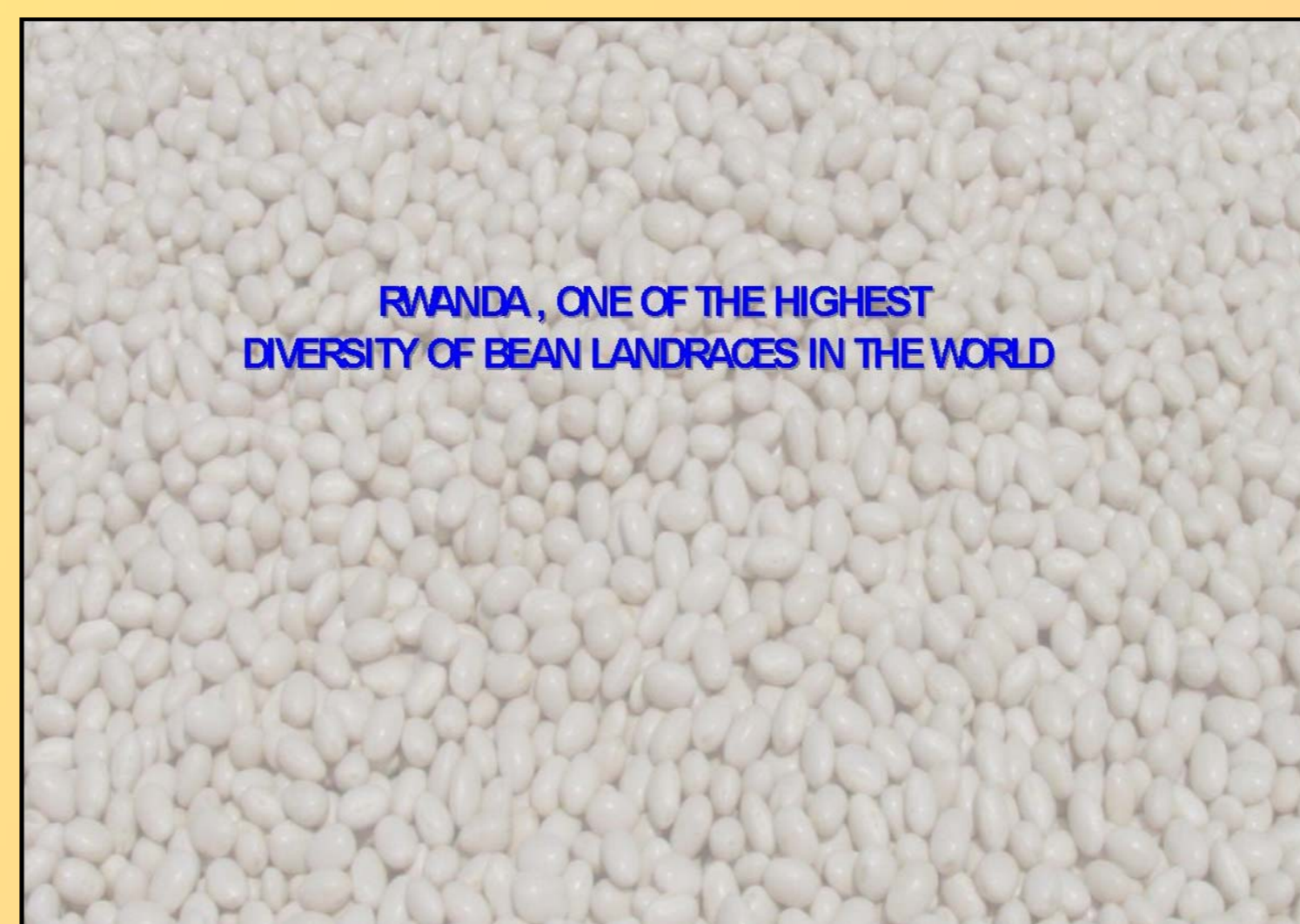
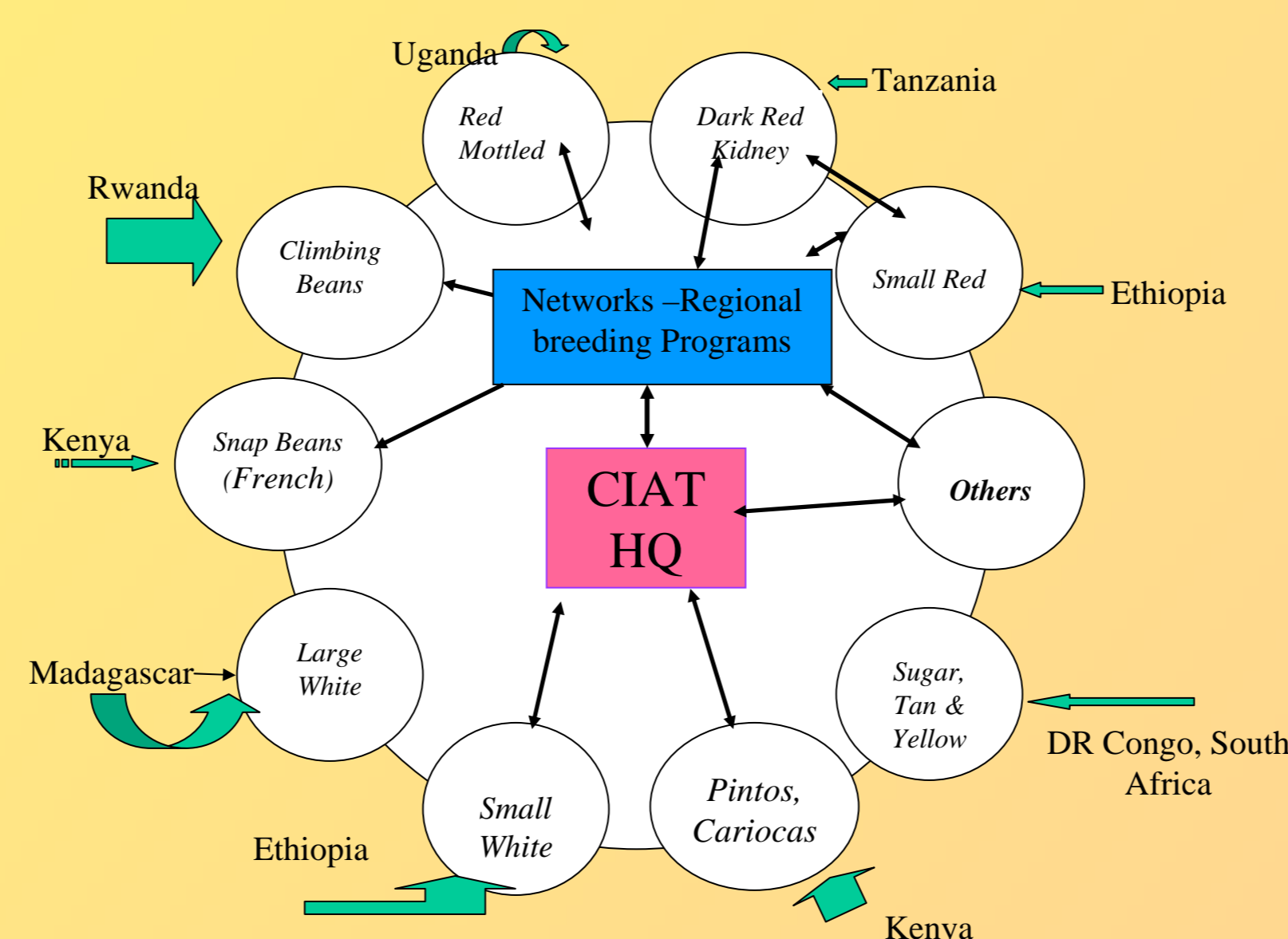
- Contribute more effectively and sustainably to improved productivity, incomes and nutrition of resource poor farmers

Area and Distribution of Major Bean Market Classes in Africa

Andean	Area (Ha)	Countries
Red Mottled	740,000	KE, UG, CD, RW, MD, TZ, MW, MZ
Red kidneys	350,000	RW, KE, MD, TZ, BU, CD, ZW
Sugar	100,000	CD, MD, ZM, ZW, ZA, SW, LE, MW
Large white	220,000	MD, TZ, SU, ET, ZA, SW
Purples	270,000	TZ, KE, CD, UG, ZM
Meso		
Small red	670,000	RW, ET, KE, UG, CD, TZ
Navy	310,000	ET, KE, SU, UG, TZ, CD, ZA, ZM, ZW
Creams: pinto	360,000	KE, ET, UG, MD, CD, RW, LE, AO
Brown, yellow, tan	280,000	AO, TZ, ET, CD, MD, ZM
Blacks	130,000	CD, UG, ET, SU, RW, AO, MZ
Climbers	300,000	RW, BU, KE, UG, ET
Snaps	80,000	KE, UG, TZ, ET, MD, BU, ZA
Runners	15,000	KE, UG, TZ, ET

KE=Kenya, UG=Uganda, CD=Democratic Republic of Congo, MD=Madagascar, TZ=Tanzania, MW=Malawi, RW=Rwanda, BU=Burundi, SU=Sudan, ET=Ethiopia, MZ=Mozambique, AO=Angola, LE=Lesotho, SW=Swaziland, ZW=Zimbabwe, ZA=South Africa

Sharing Responsibilities



Learning to make crosses at Awassa, Ethiopia, 2001

A well developed breeding program in → 2008



Achievements and Impacts

Varieties released in PABRA region 2003-2008

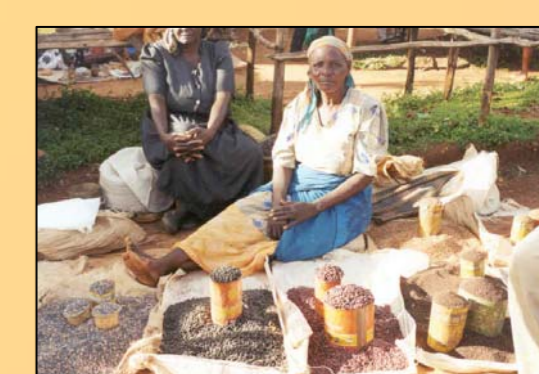
Market Class	Number Released	Countries
Red mottled	17	CD, KE, RW, ET, UG, ZW, SW, TZ, MZ
Red Kidney	15	CD, MD, KE, RW, TZ, UG, ET, ZM, TZ
Sugars/speckled	31	KE, CD, ET, UG, ZW, SW, TZ, MZ, MW, LE
Climbing beans	26	CD, KE, TZ, MD, RW, ET, UG
Small & Medium Red	9	ET, KE, MD, CD
Navy & Large White	22	TZ, MD, ET, SU, ZW, ZM, SW, CD, ZA, LE
Brown and Tans	24	RW, BU, DRC, ET, ZM, ZW, TZ, DRC, MW
Purples & Others	3	ZM, CD, LE
Total	147	



- Double or triple yields
- Focus on small plots-rural and urban
- Heat tolerant and broader adaptation in medium altitudes and humid tropical regions
- Grain and snap types
- More than 28 climbing varieties were released in PABRA countries between 2003 and 2008



Participatory breeding is now integrated in breeding programs in more than 15 countries in east, central, west and southern Africa



In Kakamega, Kenya root rot resistant varieties are widely adopted, consumed and marketed

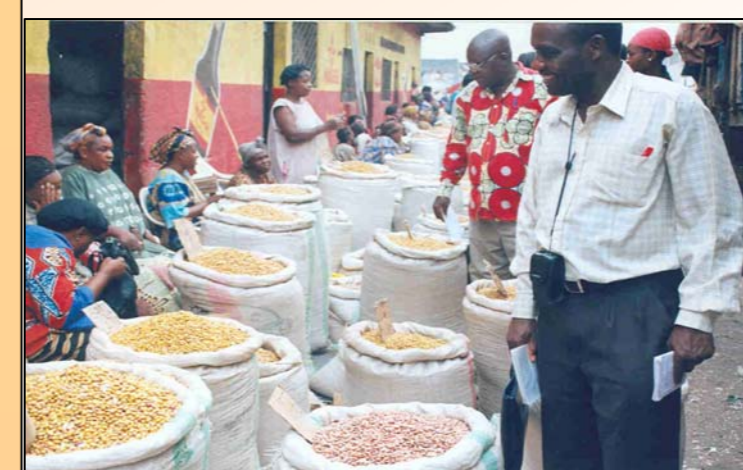
Bean is often referred as womens' crop: they not only grow and cook it, but is ready source of household income

MORE THAN 7 MILLION HOUSEHOLDS IN PABRA REGION WERE REACHED with IMPROVED BEAN VARIETIES BETWEEN 2002 AND 2008

New Directions

- Develop micronutrient dense (biofortified) bean varieties with 50% Fe more and 30% zinc than normal beans
- Develop snap bean varieties that meet domestic and export market demands
- Develop and disseminate high yielding canning bean varieties that meet demands for canning industry
- Develop short day snap and dry grain runner bean varieties with traits preferred by growers and consumers in domestic and export markets
- Develop and disseminate drought tolerant bean varieties
- Develop and disseminate bean varieties adapted hot humid tropical lowlands and tolerance to low soil fertility acid soils

Acknowledgements



Women are the dominant traders in bean markets such as this in Kinshasa, DR Congo

- CIAT- PABRA
- SWISS - SDC
- CANADIAN - CIDA
- BILL AND MELINDA GATES FOUNDATION
- ROCKEFELLER FOUNDATION
- ASARECA
- SADC-FANR
- MCKNIGHT FOUNDATION

Reference: Kimani, P.M. 2004. Ciat in Africa Highlights No.14, Cali, Colombia