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Global Network for Cacao Genetic Resources

Securing Our Future:
Why Cocoa Diversity Matters

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CacaoNet & Bioversity International

World Cocoa Conference, 19th – 23rd November 2012
Abidjan, Côte d'Ivoire

Bioversity International

Cacao diversity in CATIE, Costa Rica. Credit: A. Mata/ W. Phillips

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Cocoa diversity is necessary

- We cannot grow the same varieties everywhere
- There are different
  - Pest and disease pressures
  - Environmental conditions
  - Cultivation practices: organic, shade, inputs, etc.
  - Markets: quality bulk, fine flavour, single origin, etc.
  - Flavours
  - Farmer preferences
- There isn't a perfect cocoa plant for everybody!

Why diversity matters?

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- Demand is increasing rapidly with emerging countries consumption
- We need to increase production in an environmentally sustainable way (reduced inputs).
- New and improved planting material is an important part of the solution, optimized by good agricultural practices.
- Good quality, locally adapted planting material are continuously required, whatever country, region or farming system.

So…

- Access to a wide range of genetic diversity is critical to the success of breeding programs.
- It provides the variability needed to find solutions for:
  - Pests and diseases
  - Changing markets requirements
  - Adaptation to climate change
  - Need for environmental responsibilities
- The “Green Revolution” demonstrated the tremendous impact that genetic resources can have on increasing crop production.
- Breeding accounted for 50% of yield gain in the world’s major crops since the 1930’s (OTA 1987)

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We don’t know the future

- What will be the characteristics required for the next generations of planting material?
- What will be the future concerns of the demand?

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- What will be the future concerns of the demand?

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The future…

Pests and diseases will continue to evolve and spread…

- Affecting new cocoa growing areas
- With more aggressive strains
- New species will appear

Health safety will continue to put pressure…

- Residue levels
- Heavy metal uptake

Climate change

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H. Alves

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- Climate change
  - Current growing areas are already experiencing:
    - Droughts
    - Flooding
    - Higher temperatures
    - Higher CO_2 levels
  - Growing regions will vary
- Agricultural practices will change, such as uptake of modern / mechanized methods
- Cocoa diversity is crucial for developing the future varieties needed for all and different cocoa production systems

Where is the diversity?

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In the wild - *the Amazon basin is the centre of diversity*

C. Lanaud, Ecuador

Where is this diversity?

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In farmers' fields - *landraces and populations selected by farmers over generations for specific properties*

K. Maharaj, Trinidad

Where is this diversity?

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In the many genebanks around the world:

- Seeds of cacao cannot be dried and frozen like most other crops.
- Individual trees need to be maintained as living collections

E. Arevalo, Peru

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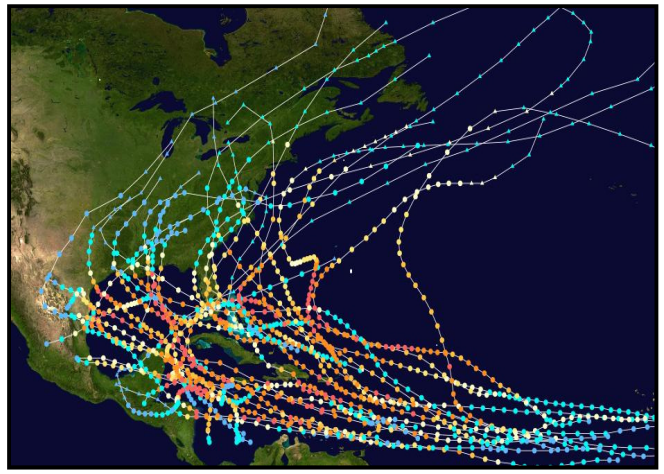
Cocoa diversity is threatened

- Destruction of the Amazonian rainforests - the centre of unique diversity
- Spread of pests and diseases
- Changing patterns of land use
- Climate changes causing shifts in production (areas and crops)
- Natural disasters and extreme weather
- Forest fires
- Civil unrest
- Vandalism



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Urgency

- Every year we lose materials
- Collections in developing countries are at risk
- Lack of funding for adequate management standards
- Long-term funding basis for the management of the international collections is not secured, including the safe movement of germplasm, evaluation and use in breeding.
- Local varieties replacement is happening at a fast pace, in Ecuador, Peru for example.
- Little investment in research to improve cocoa compared to many crops.
- What if the well-known disease resistant clones (e.g. SCA 6) had been lost?
- Where will the next SCA 6 come from?

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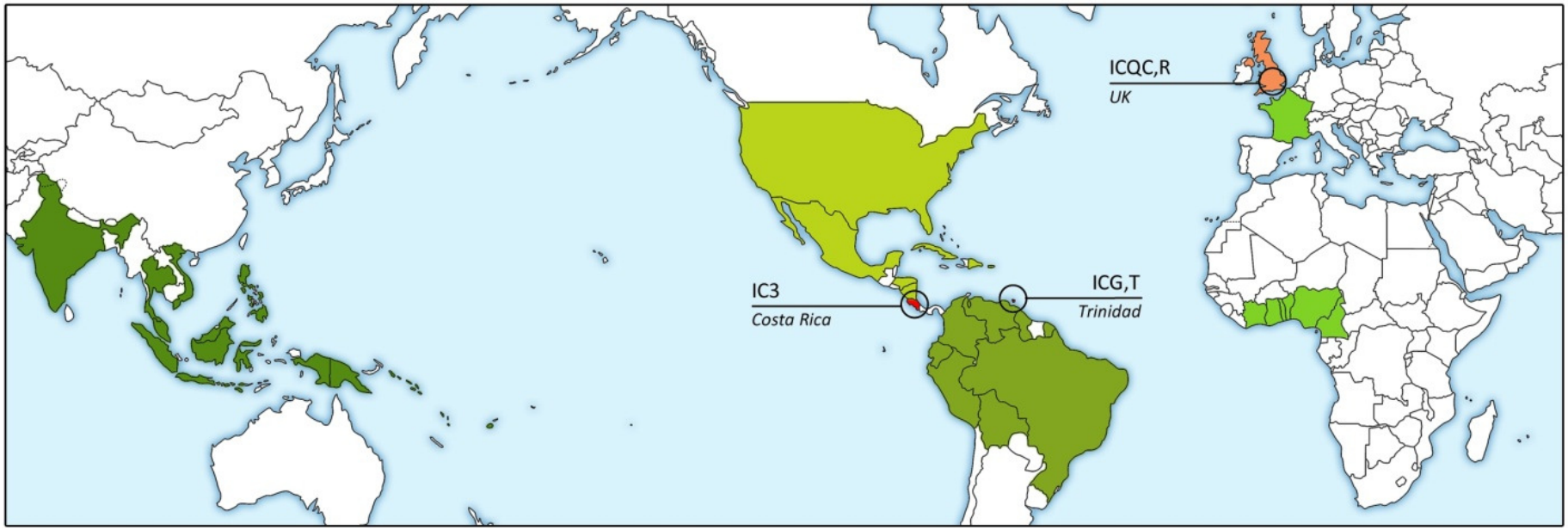
Where are we today?

- Over 35 collections maintain more than 24,000 samples of cacao diversity
- Wide variation for disease resistance and quality exists in *ex situ* collections and in farmers' fields

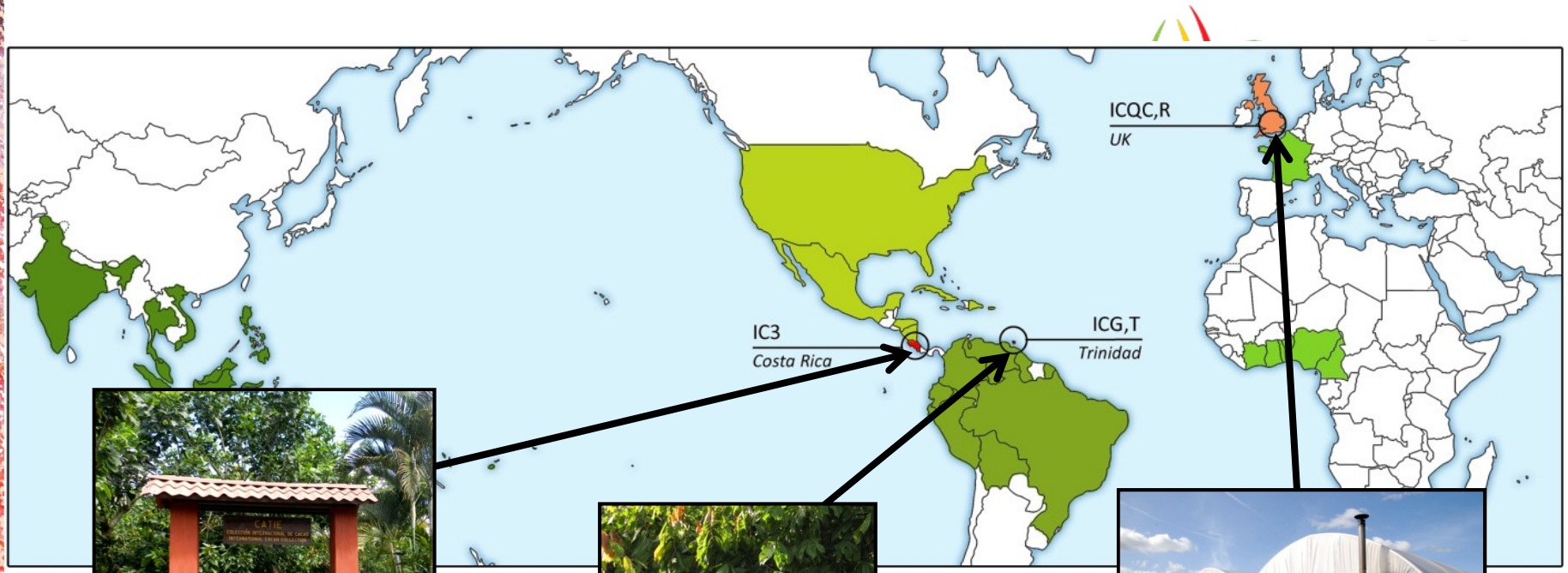


Fiji	Dobuilevu
India	CPCRI
Indonesia	Bah Lias ICCRI
Malaysia	MCB
Papua New Guinea	PNGCCI
Philippines	USMARC/PICRI
Solomon Islands	BPCU
Thailand	Chumphon
Vanuatu	VARTC
Vietnam	Nong Lam University

Costa Rica	IC3 (International)
Cuba	EIC-ECICC
Dominican Republic	IDIAF
Honduras	FHIA
Mexico	INIFAP
Nicaragua	UNAN
Trinidad & Tobago	ICG,T (International)
USA	USDA

Bolivia	El Ceibo Cooperative
Brazil	CEPEC SUEPA SUERO ICA
Colombia	*ICA* *CORPOICA*
Ecuador	INIAP
French Guiana	CIRAD
Guyana	MHOCGA
Peru	CEPICAFE ICT UNAS UNSA
Venezuela	INIA

Benin	CRA-SB
Cameroon	IRAD
Côte d'Ivoire	CNRA
Ghana	CRIG
Nigeria	CRIN
Togo	CRAF
France	CIRAD
UK	ICQC,R (Quarantine)



Centro Agronómico Tropical de Investigación y Enseñanza (CATIE), Costa Rica (*W. Philipps*)

Cocoa Research Centre of the University of the West Indies (CRC/UWI), Trinidad and Tobago (*M.Gilmour*)

International Cocoa Quarantine Centre (ICQC), UK (*A. Daymond*)

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But…

- Conservation is not secured
- Few collections have safety duplication of unique materials
- Use is not always optimized
- Access is often restricted by lack of legal & policy framework
- Most collections have duplications internally and with other collections
- Misidentification of trees within collections can be as high as 30%
- No targeted *in situ* and on farm conservation plans

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Securing diversity for all, forever

All countries involved in the improvement and production of cocoa are highly dependent on genes and varieties conserved and evaluated in other countries and regions.

The efforts necessary to ensure the:

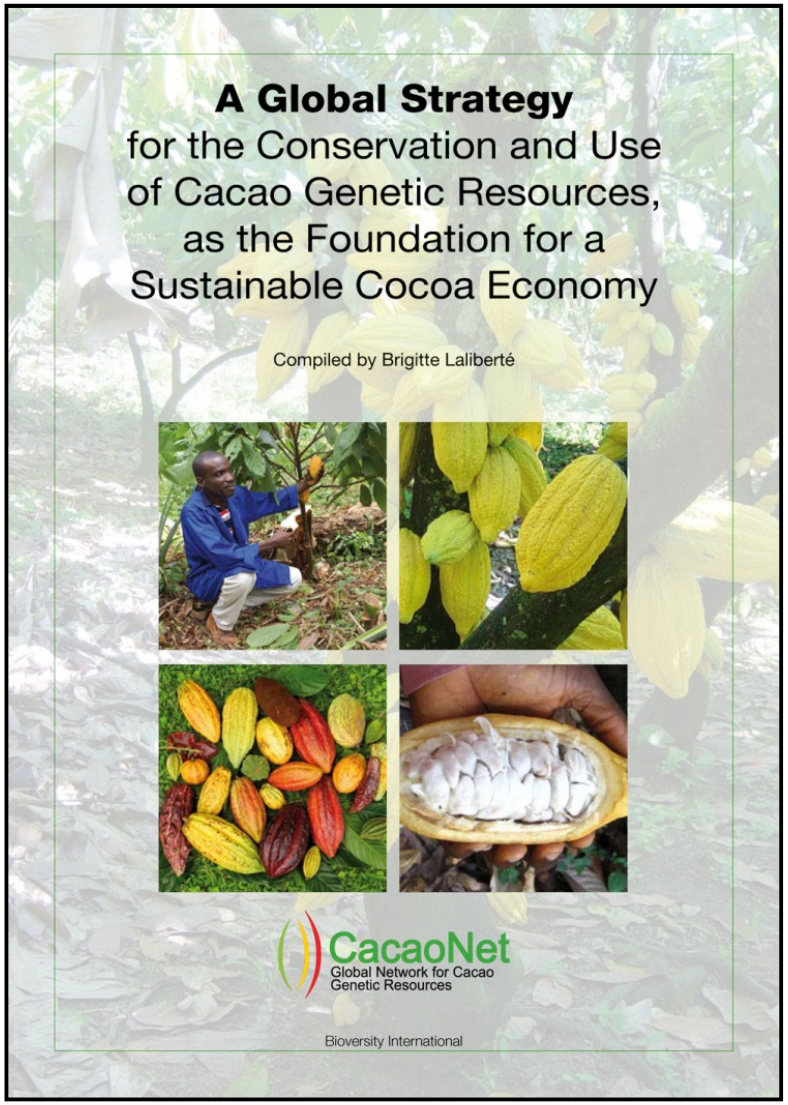
- effective conservation of the entire range of cacao diversity *in situ* and *ex situ* for the long term
- global system for the safe exchange of germplasm
- optimised use of diversity in improvement programmes

… can only be achieved and carried out:

- through international (inter-regional) collaboration
- by bringing together players in public and private sectors

A Global Strategy

- Developed by CacaoNet (Global Network for Cacao Genetic Resources)
- Result of a consultation process, drawing upon the global cocoa community's expertise in all aspects of cacao genetic resources (*over 75 individuals from 26 institutes contributed*)
- Provides a clear framework to secure funding for the most urgent needs to ensure that cacao diversity is conserved, used and provides direct benefits to the millions of small-scale farmers around the world



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Global Network for Cacao Genetic Resources

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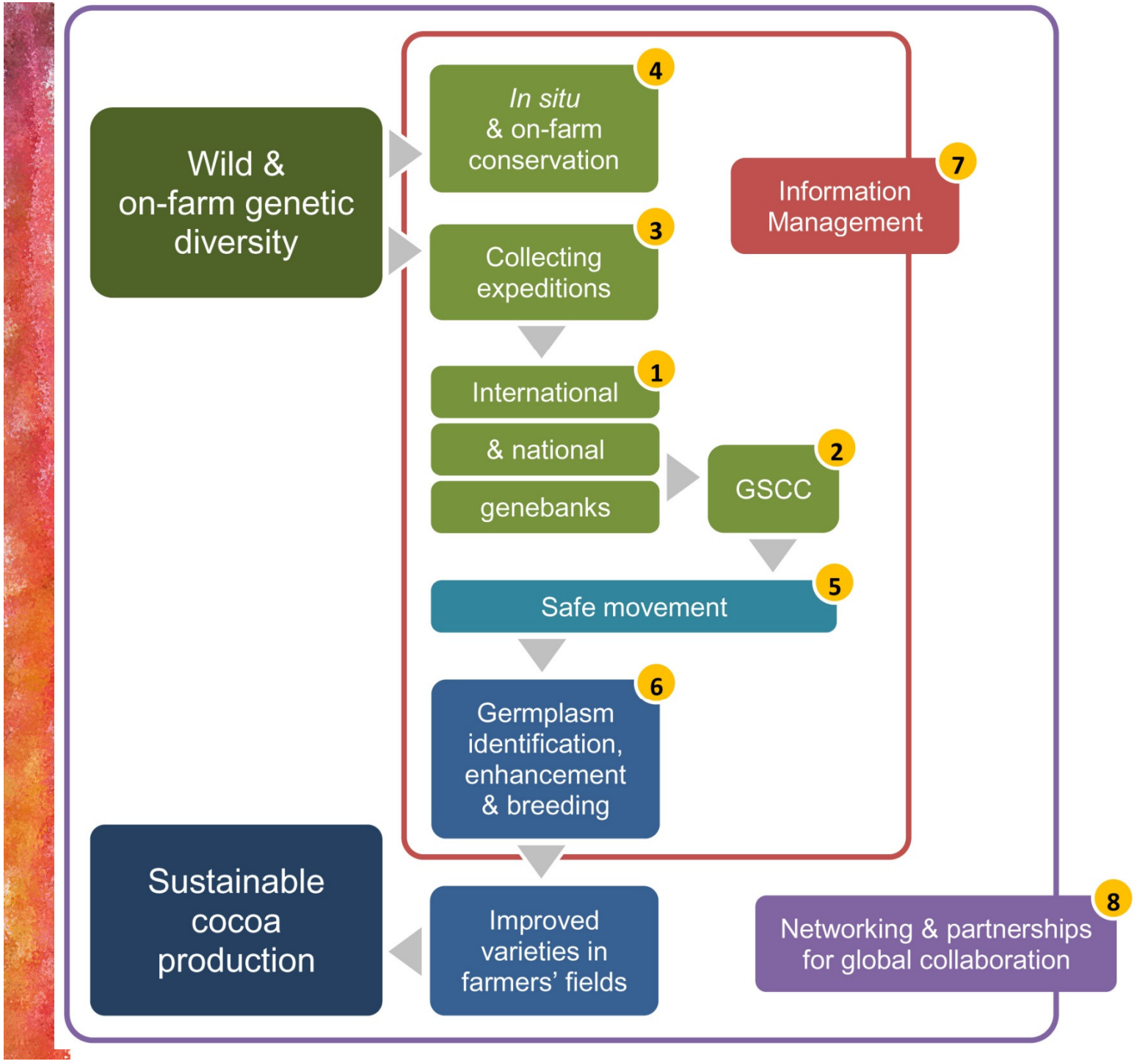
Wild &
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In situ
& on-farm
conservation
3
Collecting
expeditions
7
Information
Management
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International
& national
genebanks
2
GSCC
5
Safe movement
6
Germplasm
identification,
enhancement
& breeding
Sustainable
cocoa
production
Improved
varieties in
farmers' fields
8
Networking & partnerships
for global collaboration


Wild & on-farm genetic diversity
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Information Management
Securing existing ex situ cacao genetic resources, particularly those held in the public domain, and their distribution
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Germplasm identification, enhancement & breeding
Sustainable cocoa production
Improved varieties in farmers' fields
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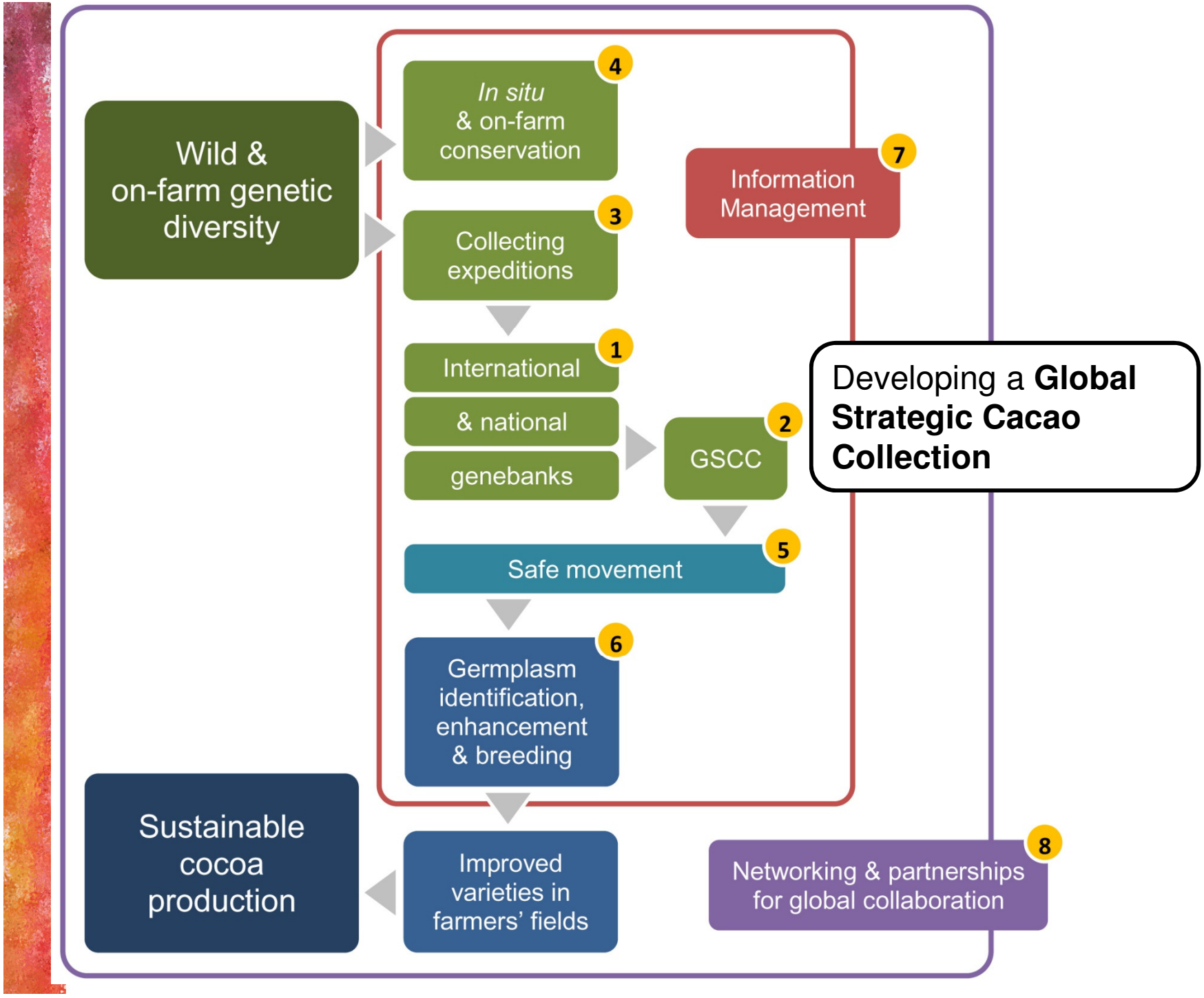
Networking & partnerships for global collaboration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Developing a Global Strategic Cacao Collection
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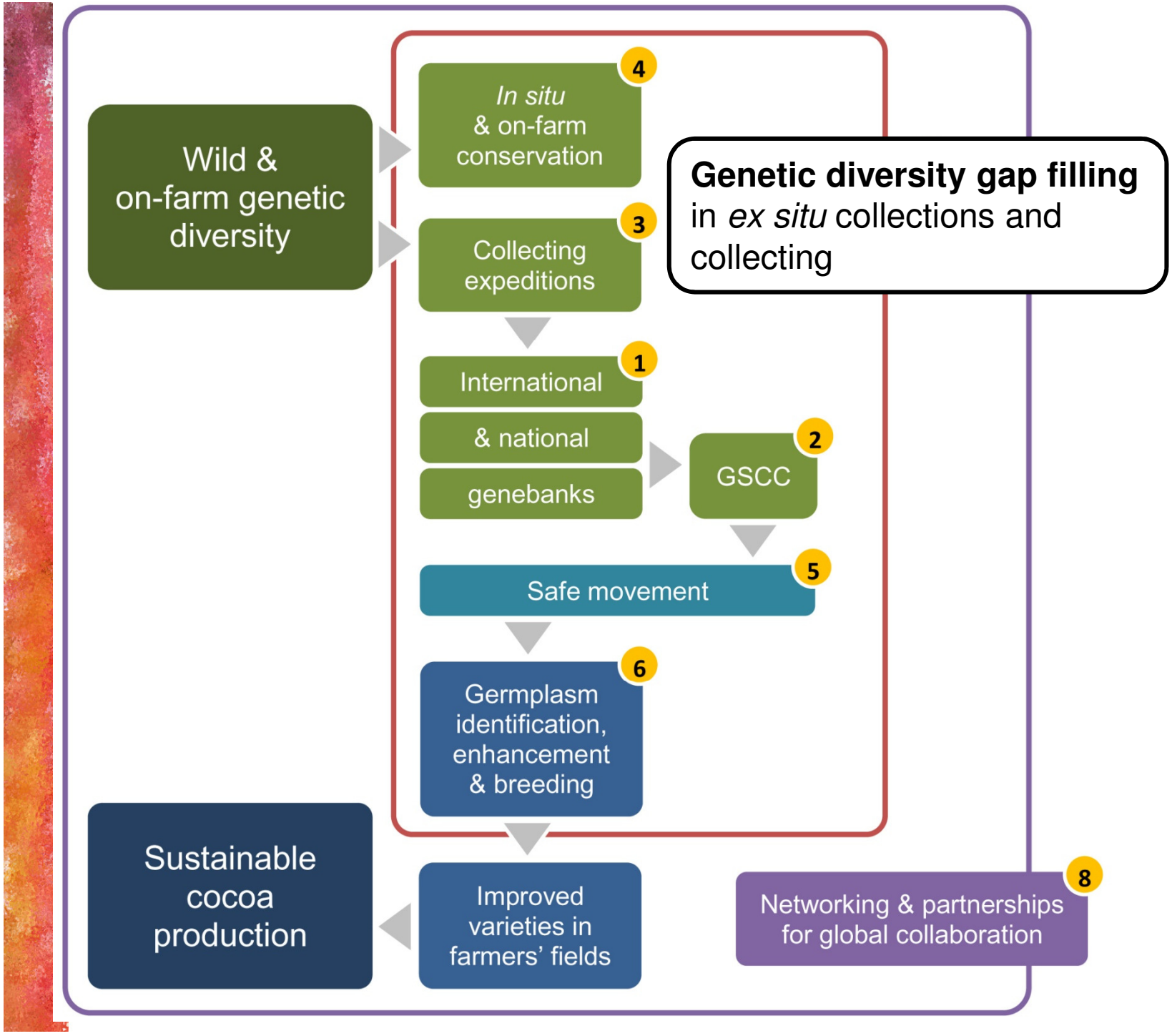
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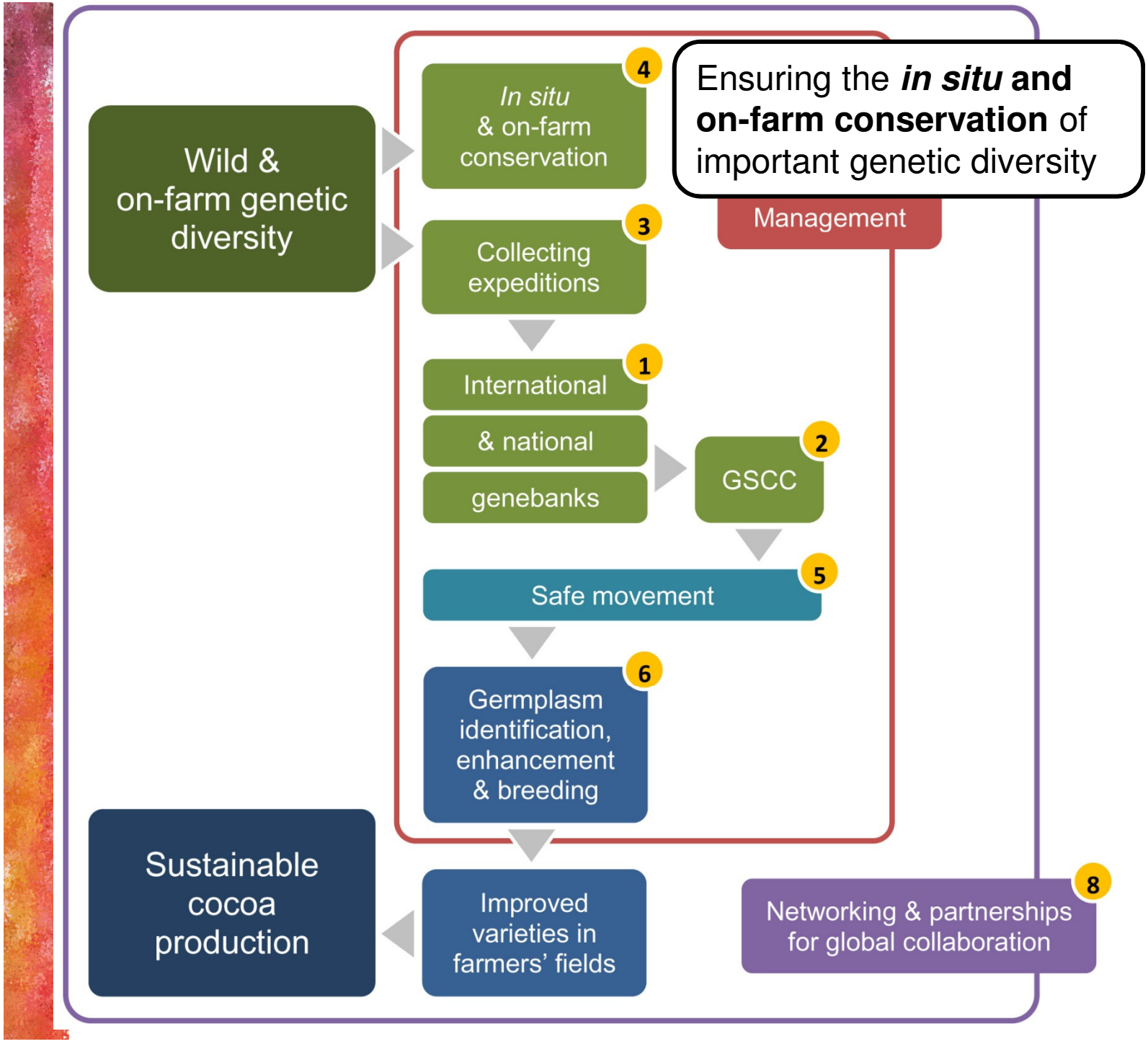
Genetic diversity gap filling
in ex situ collections and
collecting


Ensuring the *in situ* and **on-farm conservation** of important genetic diversity
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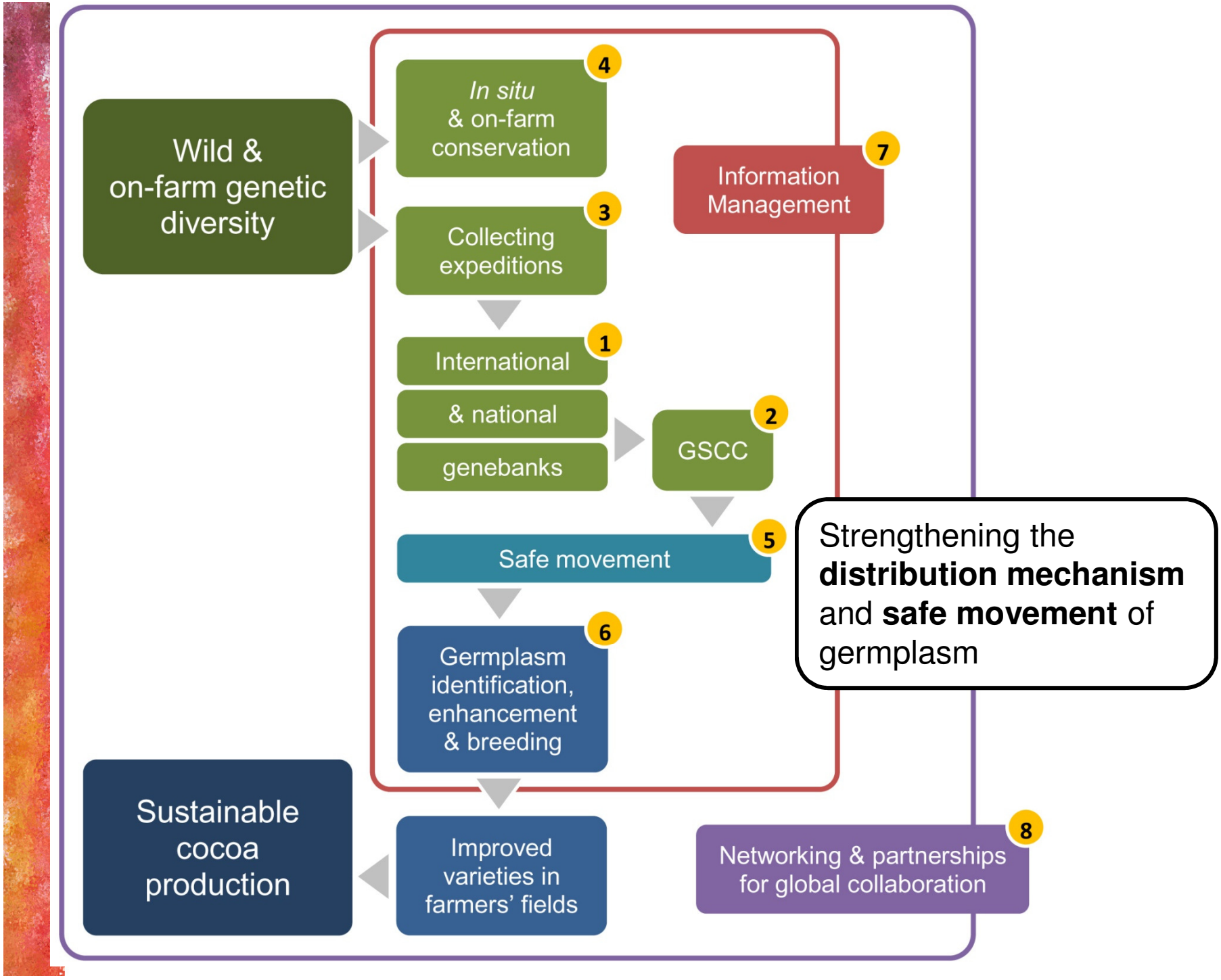
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Germplasm identification, enhancement & breeding
Strengthening the **distribution mechanism** and **safe movement** of germplasm
Sustainable cocoa production
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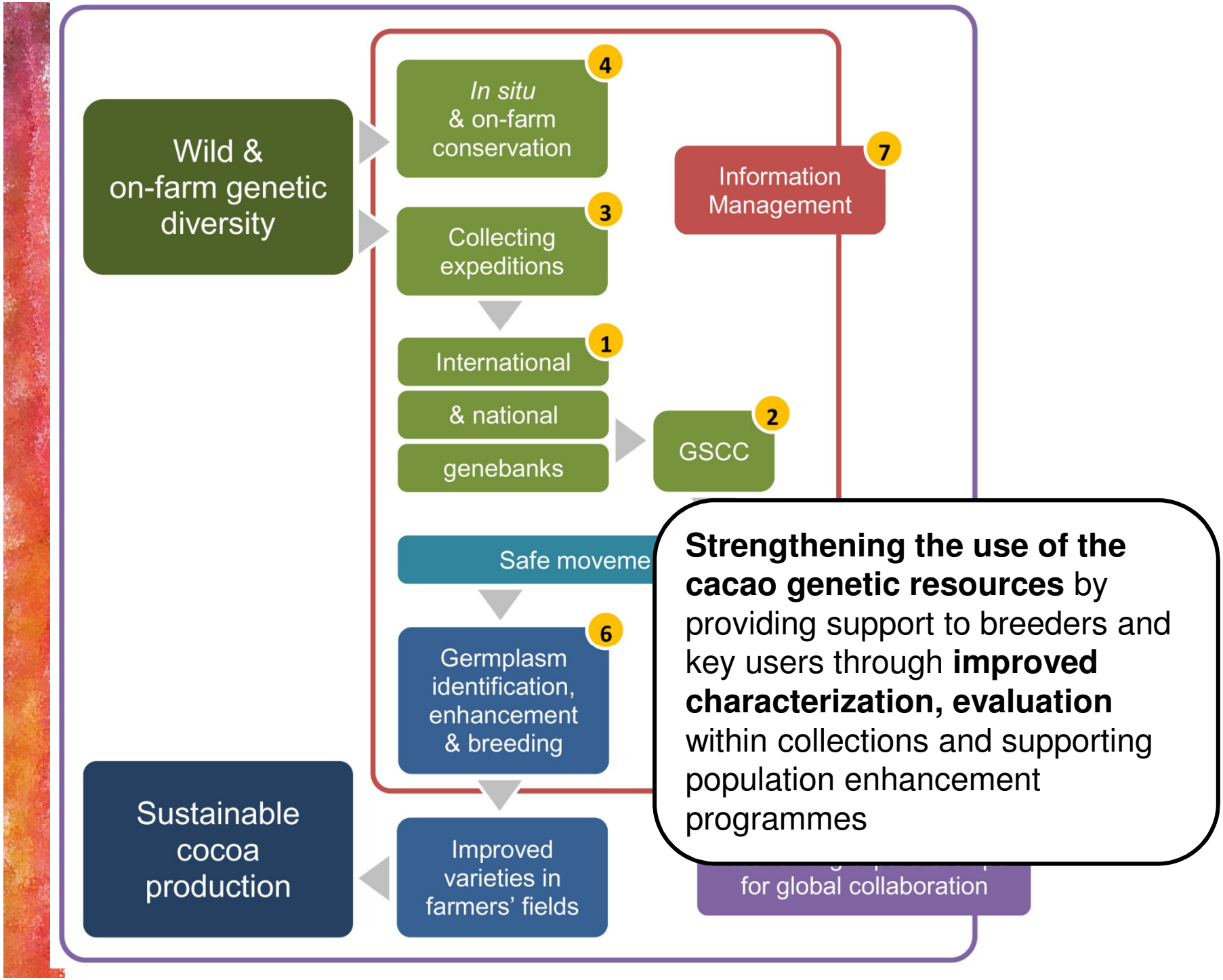
Networking & partnerships for global collaboration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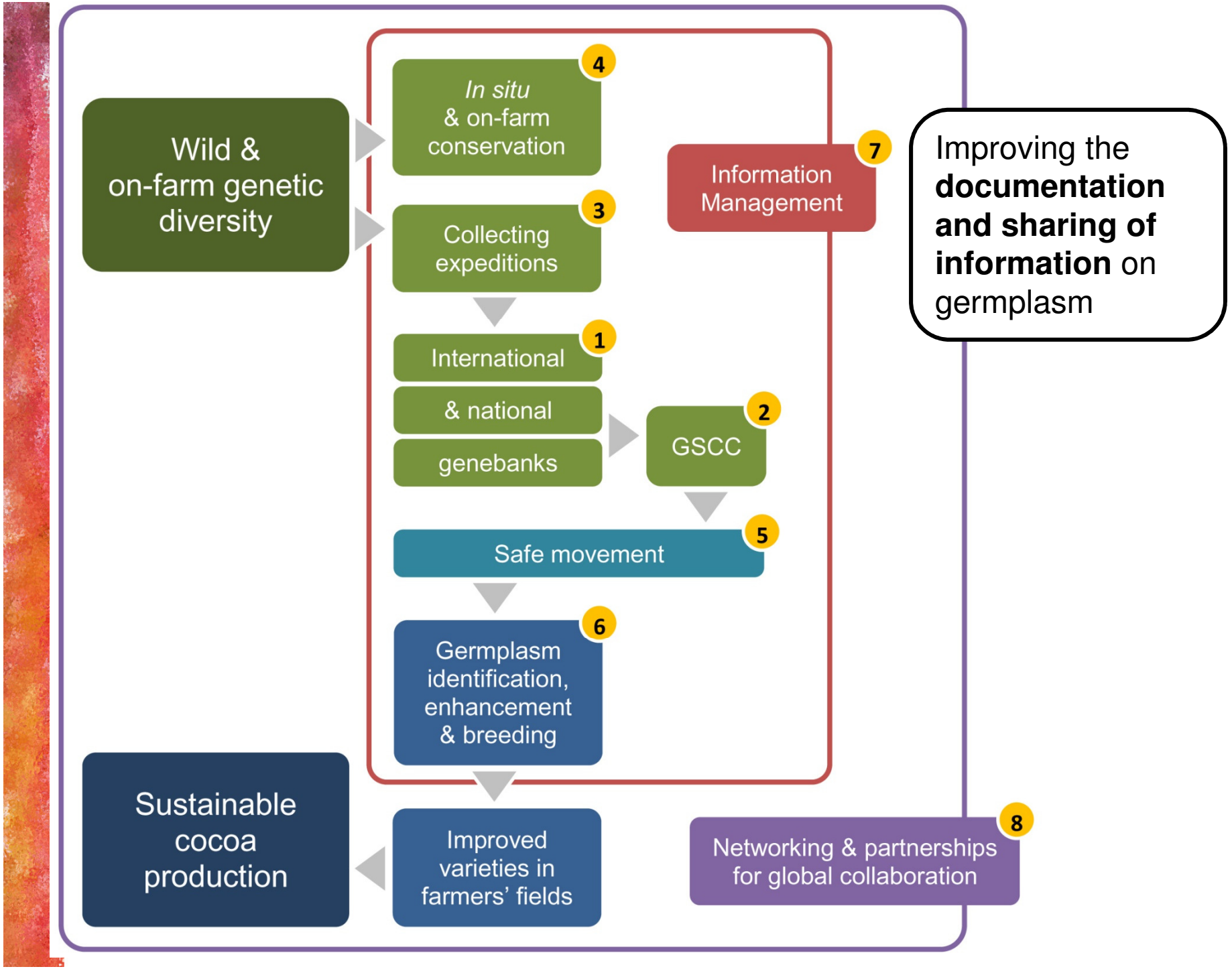
for global collaboration
Strengthening the use of the cacao genetic resources by providing support to breeders and key users through improved characterization, evaluation within collections and supporting population enhancement programmes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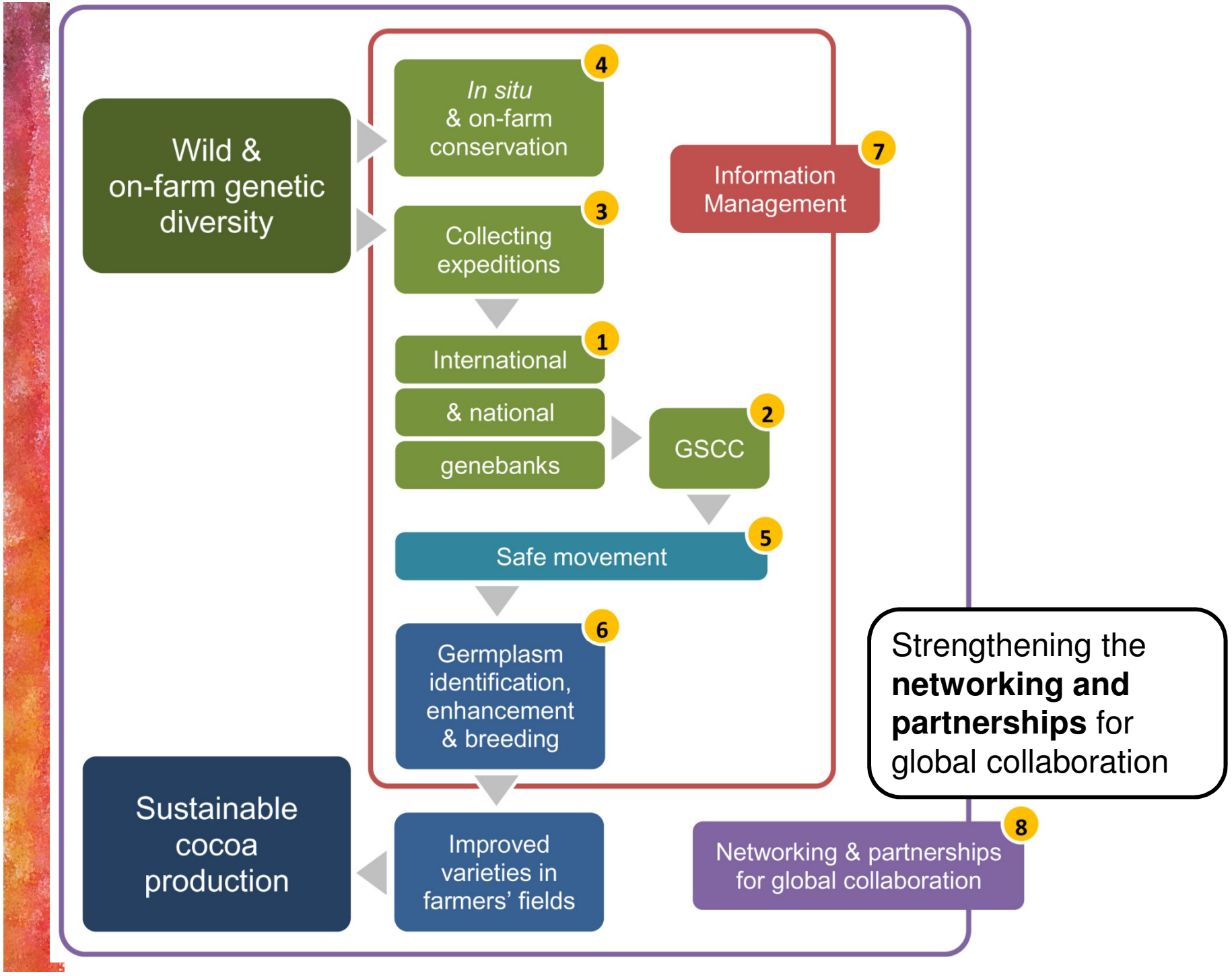
Improving the
**documentation
and sharing of
information** on
germplasm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Strengthening the **networking and partnerships** for global collaboration

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We are not starting from scratch

Many components are present:

- 2 international collections part of the multilateral system of exchange (International Treaty):
  - More than 3,500 accessions freely available for use in research, breeding and training
  - Long-term commitment to conservation and use
  - Benefits arising from their use shared in a fair and equitable way

G. Lockwood

But… not complete, securely funded or linked to all the other key collections around the world.

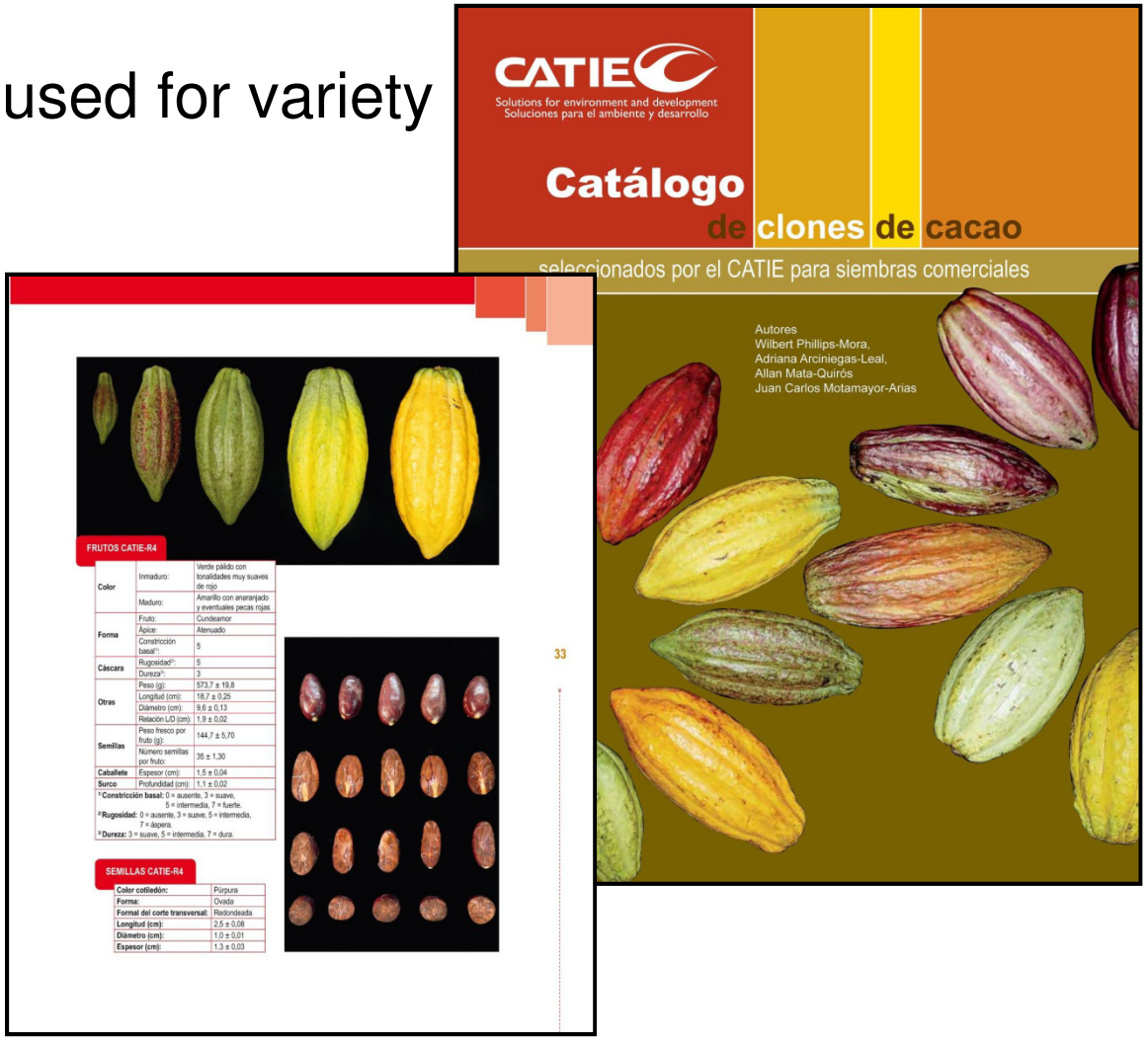
Success stories

- In 2008, a storm damaged an important part of the international collection maintained by CRC/UWI
- Although some material was lost, the majority was safely duplicated (locally or internationally) and most of the varieties were recovered

D. Sukha, Trinidad

Success stories

- Genetic resources used for variety releases
  - CATIE
  - CRC/UWI
  - Cote d'Ivoire
  - Nigeria
  - Brazil
  - Peru
  - Ecuador
  - India
  - Indonesia



Success stories

Wild cocoa collected in Peru between 2008 and 2012, held in the ICT collection *(E. Arevalo)*

N°	River	Nº wild cacao collected
1	Aypena	22
2	Marañon - Charupa	22
3	Ungurahui	38
4	Pastaza	24
5	Ungumayo	26
6	Nucuray	25
7	Urituyacu	33
8	Santiago	38
9	Morona	50
10	Chambira	20
11	Tigre	22
12	Napo	22
13	Urubamba	22
14	Ucayali	55
15	Madre de Dios	34
Total		**453**

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What next?

- The diversity in the collections is critical to the world's cocoa production.
- Conservation serves no purpose if the material is not accessible, or its potential evaluated and documented for use.
- Ownership must be resolved to ensure global access to these critical resources.
- The global effort to assemble, document and use this diversity is essential.

C. Motagnon

We have come a long way!

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- We have collections, services and research

Cocoa farmer in Venezuela (A. Eskes).

Cocoa farmer in Côte d'Ivoire (D. Pokou),.

We still have some way to go but we cannot afford to wait and must move quickly and effectively

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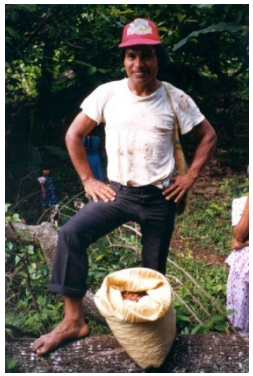
- **Aims to optimize** the conservation and use of cacao genetic resources as the foundation of a sustainable cocoa economy,
- **by coordinating** and strengthening the research efforts of a worldwide network of public and private sector stakeholders,
- with member representatives from cocoa research institutes and organizations that support cocoa research.

www.cacaonet.org



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MERCI
GRACIAS
THANK YOU!