CROPS FOR THE FUTURE

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Member & Chair of

AIRCA
Association of International Research and Development Centers for Agriculture

Social, Economic and Technological Potential of Agricultural Biotechnologies for Crop Diversification – A New Approach in Research

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COO, Crops For the Future

Crops For the Future (CFF)

World's first and only centre dedicated to underutilised crops

Objectives:

1. Introduction to CFF
2. Impact of Climate Change & Need For Alternate Strategies
3. CFF's Selection Criteria of Potential Crops & Links within Research Value Chain
4. Online Tools for the Future
5. ForgottenFoods Network

VISION

World-leader, producing excellent, innovative research on underutilised crops that is demand-led and development focussed

MISSION

Develop solutions to diversify agriculture using underutilised crops to improve food and nutritional security and livelihoods

CFF Roadmap 2030: Delivering the Vision

A World Leading Research Organisation

- Global home
- International Alliance
- Research Value Chain approach

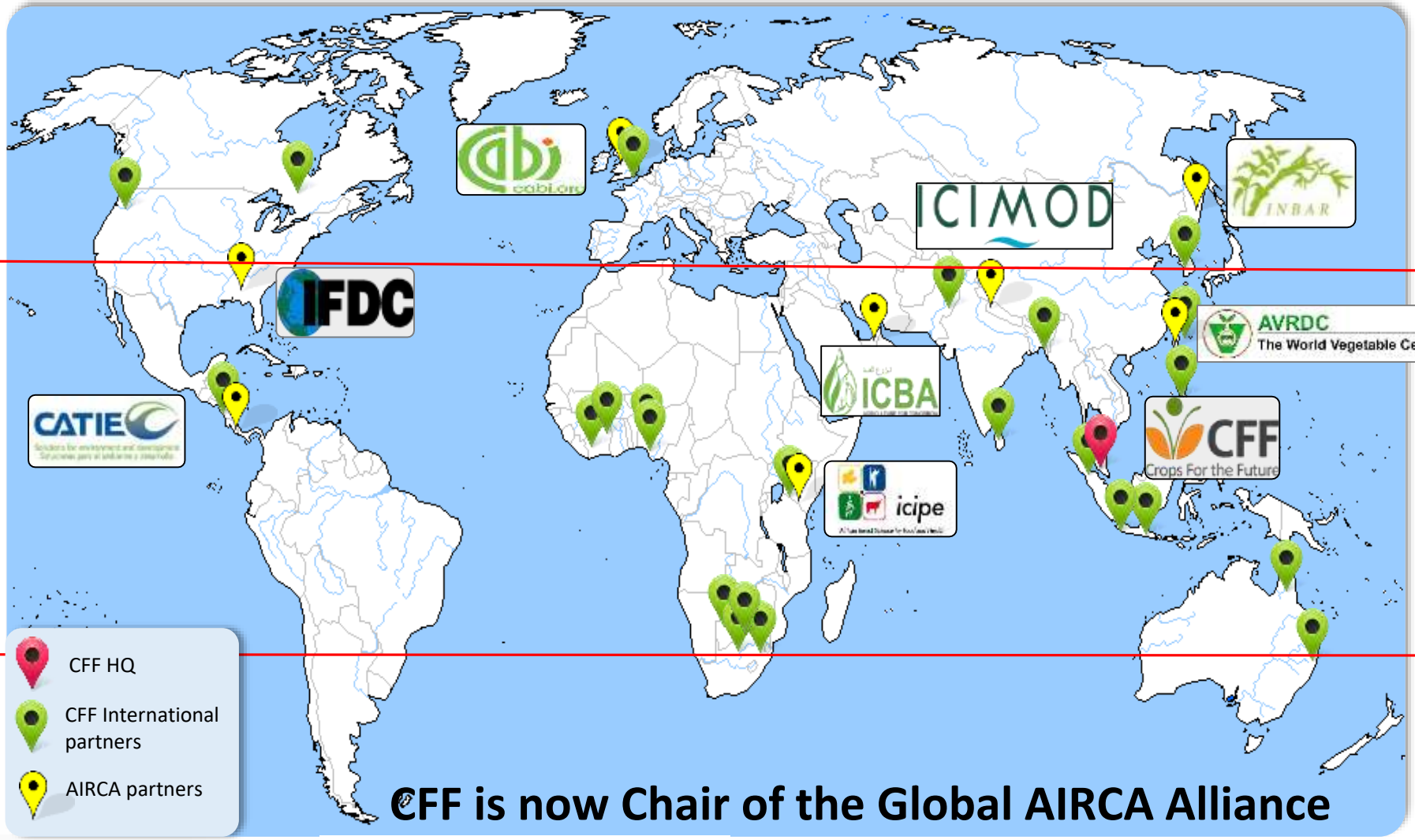
Delivering Global Research

- Tangible outcomes
- Self sustaining
- Research aligns with GAPAD
- (Global Action Plan in Agricultural Diversification)

Transforming Agriculture For Good

- *Transform agriculture for good* by contributing to UN 2030 Agenda for Sustainable Development

Building Global Partnerships

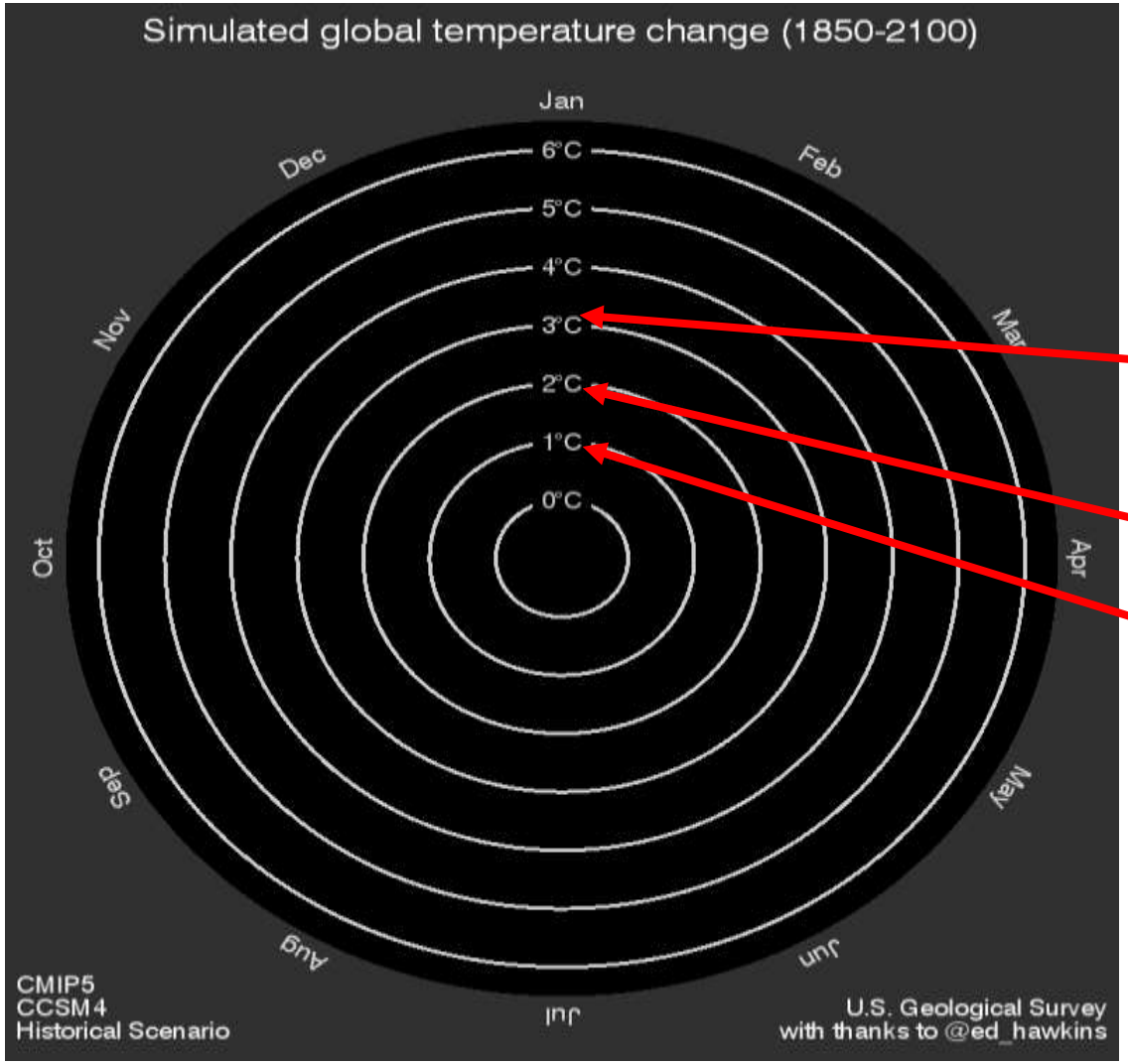


Member & Affiliations

Four Crops Can't Feed the World

- We depend on a few crops to feed over 7 billion people
- Can these major crops, by themselves, feed 9 billion people?
- The same crops are increasingly supporting non-food needs

We Need to Transform Agriculture for Good



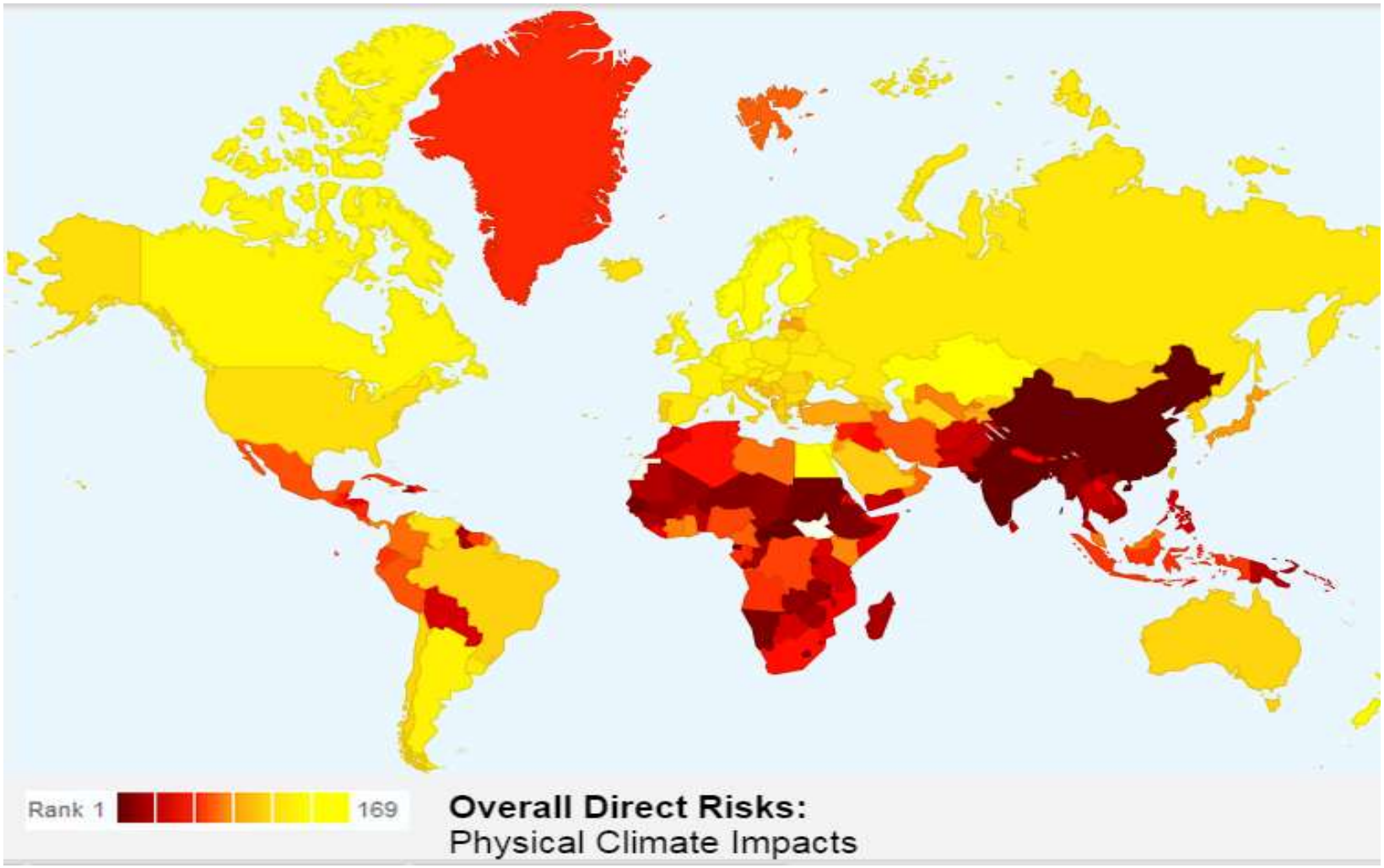
2050
9, 550 Billion

2016
7,215 Billion

1979
4,371 Billion

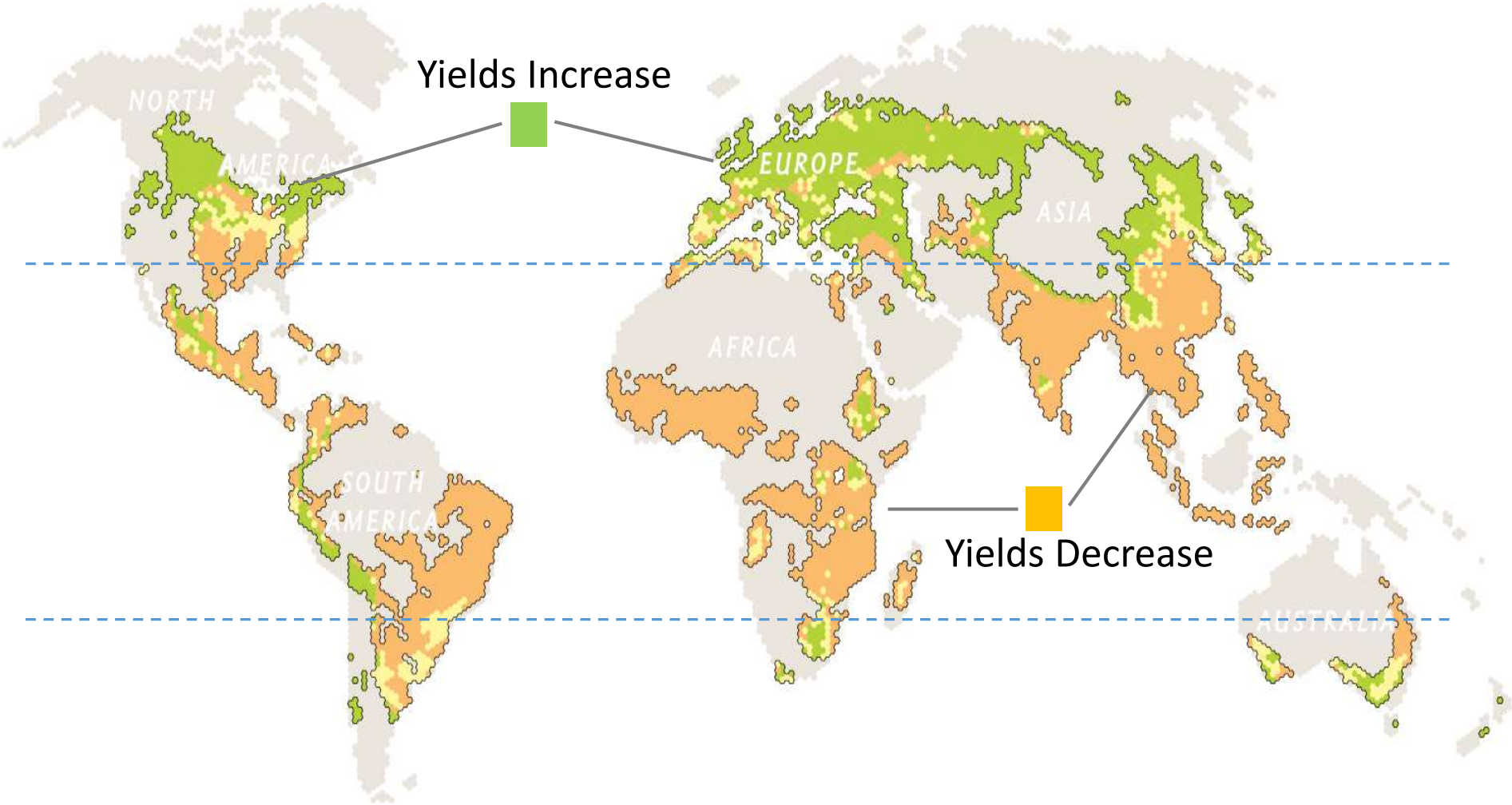
https://prd-wret.s3-us-west-2.amazonaws.com/assets/palladium/production/s3fs-public/styles/full_width/public/thumbnails/image/CCSM4_rcp85_global_temperature_change_spiral.gif?itok=D16sJG9U

Mapping the Impacts of Climate Change



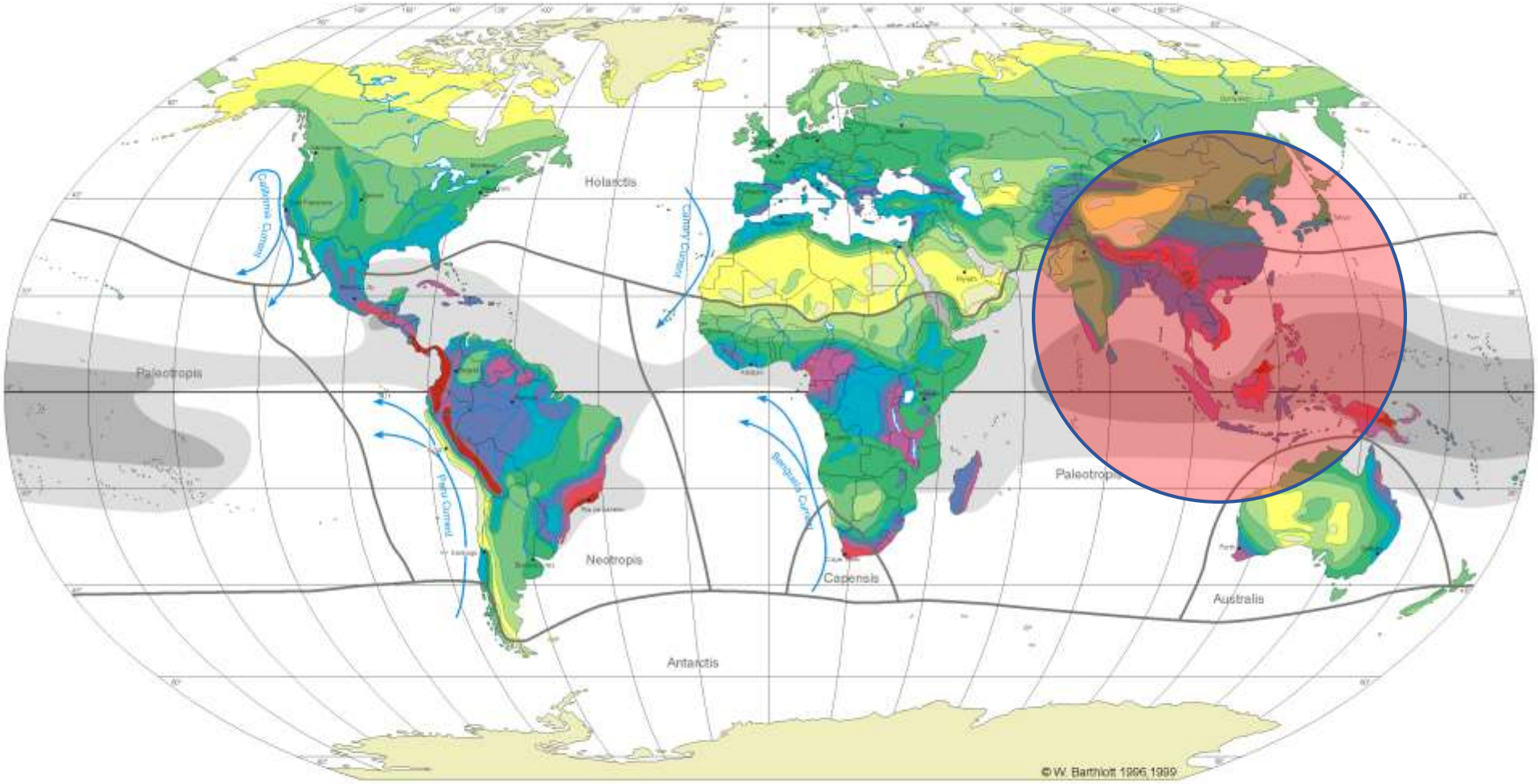
Source: Center for Global Development

Potential average yields of maize, potatoes, rice and wheat in 2050



Source: www.nationalgeographic.com/climate-change

GLOBAL BIODIVERSITY: SPECIES NUMBERS OF VASCULAR PLANTS



Robinson Projection
Standard Parallels 38°N und 38°S

Diversity Zones (DZ): Number of species per 10 000km²

- DZ 1 (<100)
- DZ 2 (100 - 200)
- DZ 3 (200 - 500)
- DZ 4 (500 - 1000)
- DZ 5 (1000 - 1500)
- DZ 6 (1500 - 2000)
- DZ 7 (2000 - 3000)
- DZ 8 (3000 - 4000)
- DZ 9 (4000 - 5000)
- DZ 10 (≥ 5000)

Capensis floristic regions

sea surface temperature

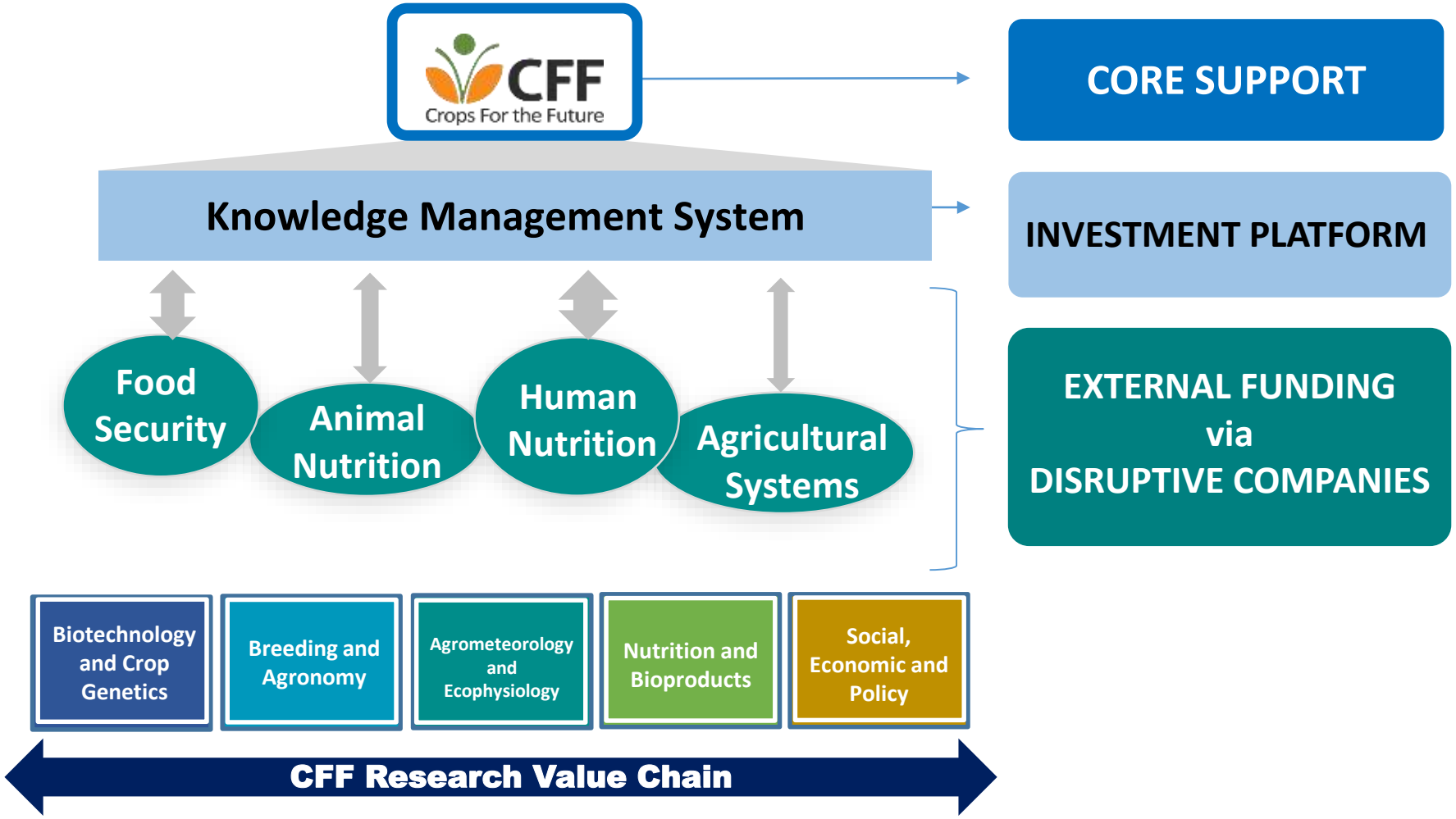
- >29°C
- >27°C

cold currents

W. Barthlott, N. Biedinger, G. Braun, F. Feig, G.Kier, W. Lauer & J. Mutke 1999
modified after
W. Barthlott, W. Lauer & A. Placke1996
Department of Botany and Geography
University of Bonn
German Aerospace Research Establishment, Cologne
Cartography: M. Gref
Department of Geography University of Bonn

CFF: Sustainable Business Model

Supporting Disruptive Research Companies on underutilised crops



PRODUCT, TECHNOLOGY & SYSTEM INNOVATIONS ACROSS THE RESEARCH VALUE CHAIN

RESEARCH VALUE CHAIN

Activities Within Segment To Ensure Linkage – CROP TYPE : MORINGA

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Biotechnology And Crop Genetics

- Germplasm storage
- Genotype storage
- Understanding underlying plant genetics
- Reproductive system study

Breeding and Agronomy

- Screening available material
- Seed viability
- Breeding and seed multiplication
- Crop trait evaluation
- Propagation
- Nursery/ planting material methodology
- Mechanisation
- Standard Operating Procedures and Manuals
- Crop physiology
- Production cost
- Fertiliser input
- Pest and diseases
- Farm Management

Agrometeorology & Ecophysiology

- Geolocation suitability
- Growing techniques
- Location studies
- Climatic profiling
- Post harvest-handling
- Plant & Environment interaction
- Climate & Weather monitoring
- Soil profiling

Nutrition and Bioproducts

- Product Uses : Food
- Product development
- Formulation
- Packaging Studies
- Shelf Life Evaluation
- Nutritional profiling
- Processing methodology
- Scale up process

Social, Economic And Policy

- Cost Benefit Analysis
- Supply-Demand Planning
- Sourcing & Procurement
- Rural farmers engagement
- Contract farming
- Farmers participation studies

Consumers & Customers

- Market Segmentation
  - Government
  - Hospitals
  - Humanitarian(UN)
  - Edu Instituitions
  - SMI's
  - Large Food Producers

- PRODUCT TYPES
- Dried powder
- Concentrated
- Supplements
- Pellets

- Market testing

CROSS FUNCTIONAL SUPPORT

Supply Chain Management

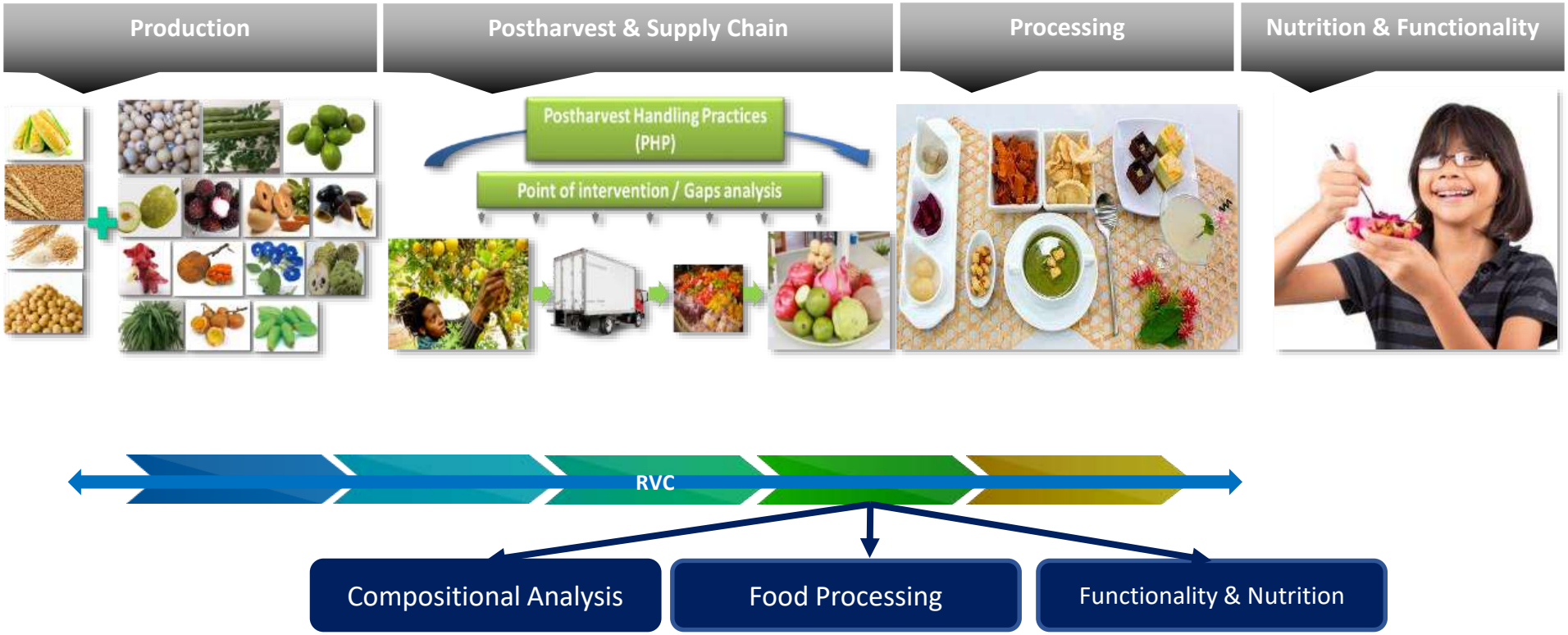
Strategy & Risk Management

Human Capital Management

Operations Management

Crop Modelling & Data Warehousing

- Strengthen food and nutritional security in Asia and Pacific **[SDG2]**
- Foster agricultural production and rural development **[SDG12]**
- Improve capacity to respond to food and agricultural threats and emergencies **[SDG17]**



Underutilised Crops: Examples

Moringa oleifera, Moringa

Vigna subterannea, Bambara groundnut

Improve capacity to respond to food and agricultural threats and emergencies **[SDG17]**

Strengthen food and nutritional security in Asia and Pacific **[SDG2]**

Foster agricultural production and rural development **[SDG12]**

Moringa oleifera

Bambara groundnut

Ambarella

Exemplar: Bambara groundnut (*Vigna subterranea*)

Strengths:

- Drought tolerant, grows in semi-arid and marginal soils
- Highly nutritious
- Nitrogen fixing

Drawbacks

- ⊠ Photoperiod sensitive
- ⊠ Variability within landraces
- ⊠ Lack of varieties, markets, products

Opportunities

- `Climate Smart Nutrition'
- Animal feed
- Income generation

Moringa – Potential Products

Instant noodle

Dried powder

Capsules

Home-made culinary

- Scientific research has proven that leaves are powerhouse of ***nutritional*** value.
- Nutritional ***supplement*** for malnourished children and disease prevention
- **Multi-product capability** – from powder to paste; blends;
- **Multi-sector potential** – consumer, institutional, emergency aid
- The plant's ability to ***grow in a wide range of climates*** and ***survive in low-moisture conditions*** – lower logistics and supply chain issues
- The vitamin content of the leaves is ***retained*** even after they have been dried, allowing the dried-leaf product to be transported and stored safely for months for later use.

Moringa Leaves Production

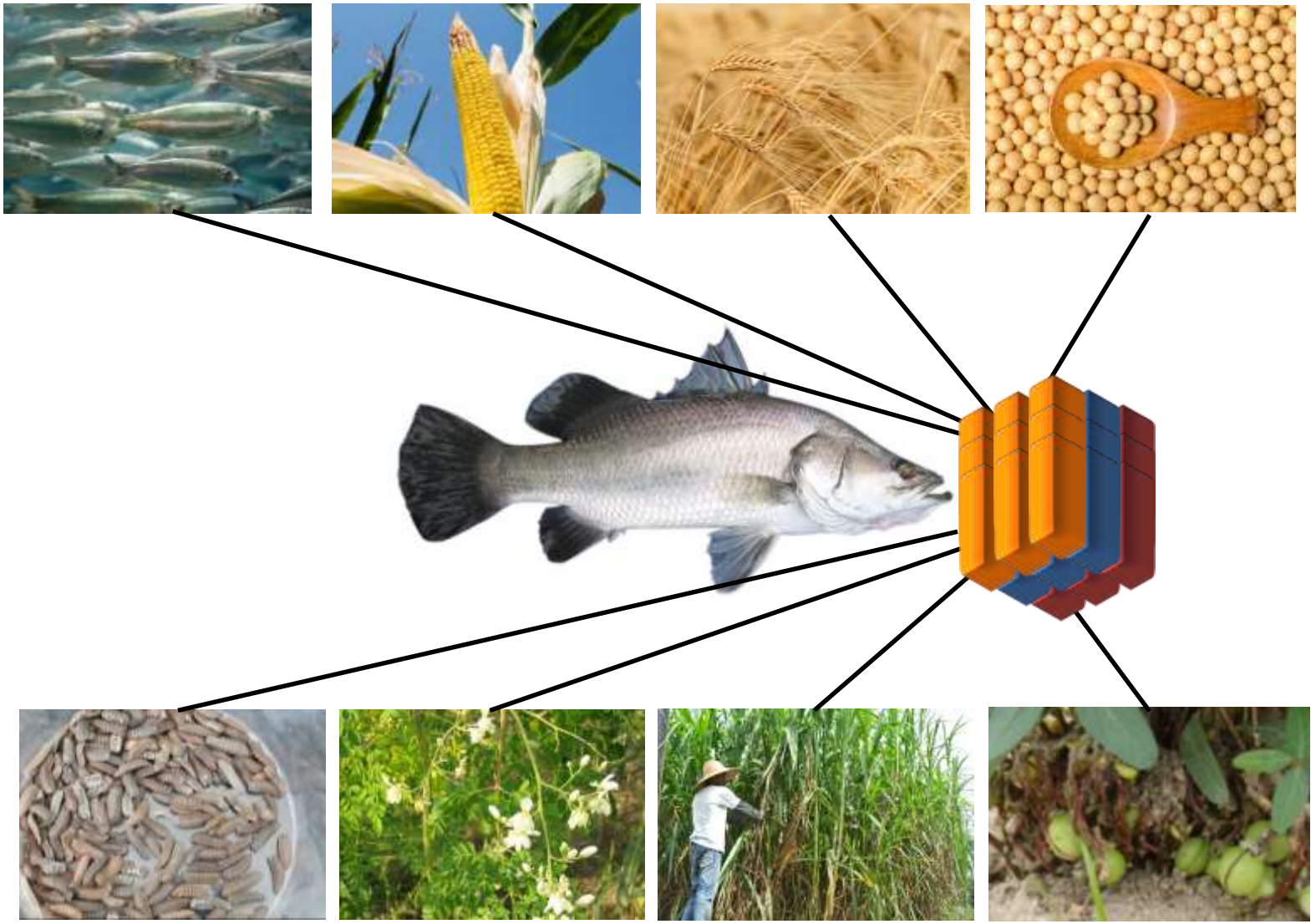
21 days after planting

45-60 days after planting

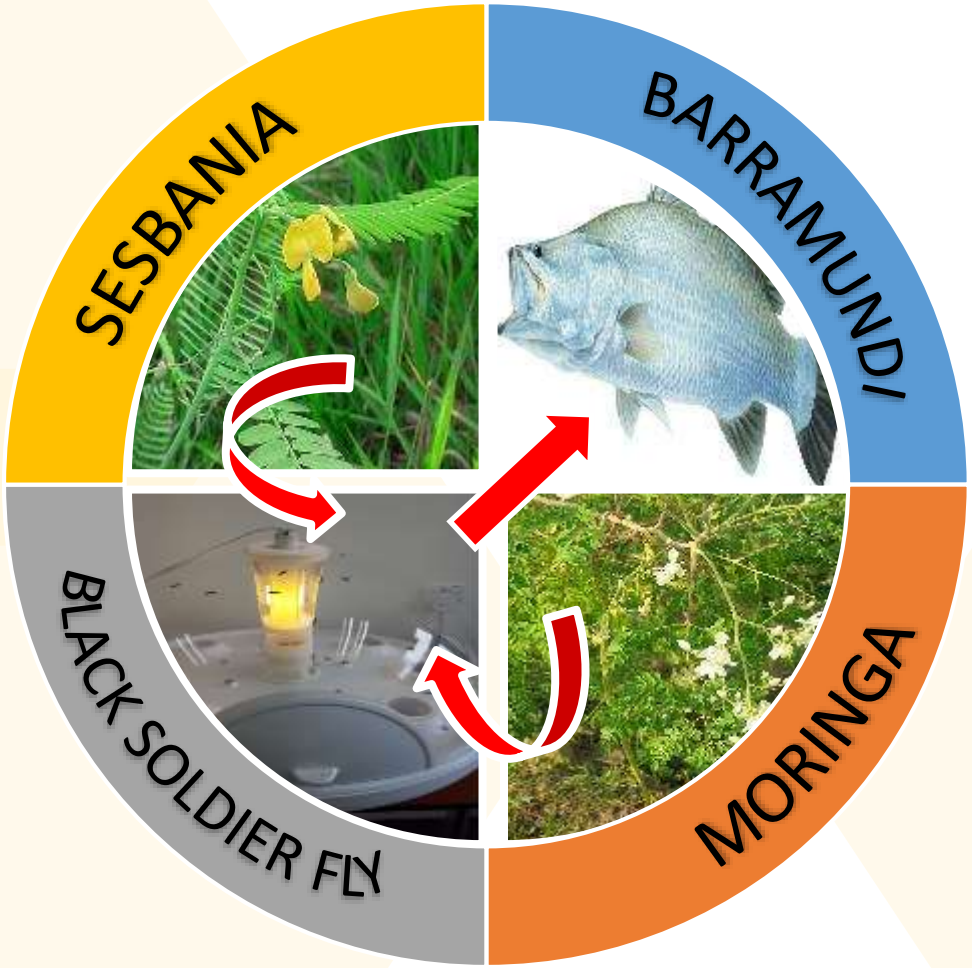
Moringa shoots cut at 20 cm height

Mechanical harvesting of Moringa

Using Insects and Underutilised Crops for Sustainable Aquaculture



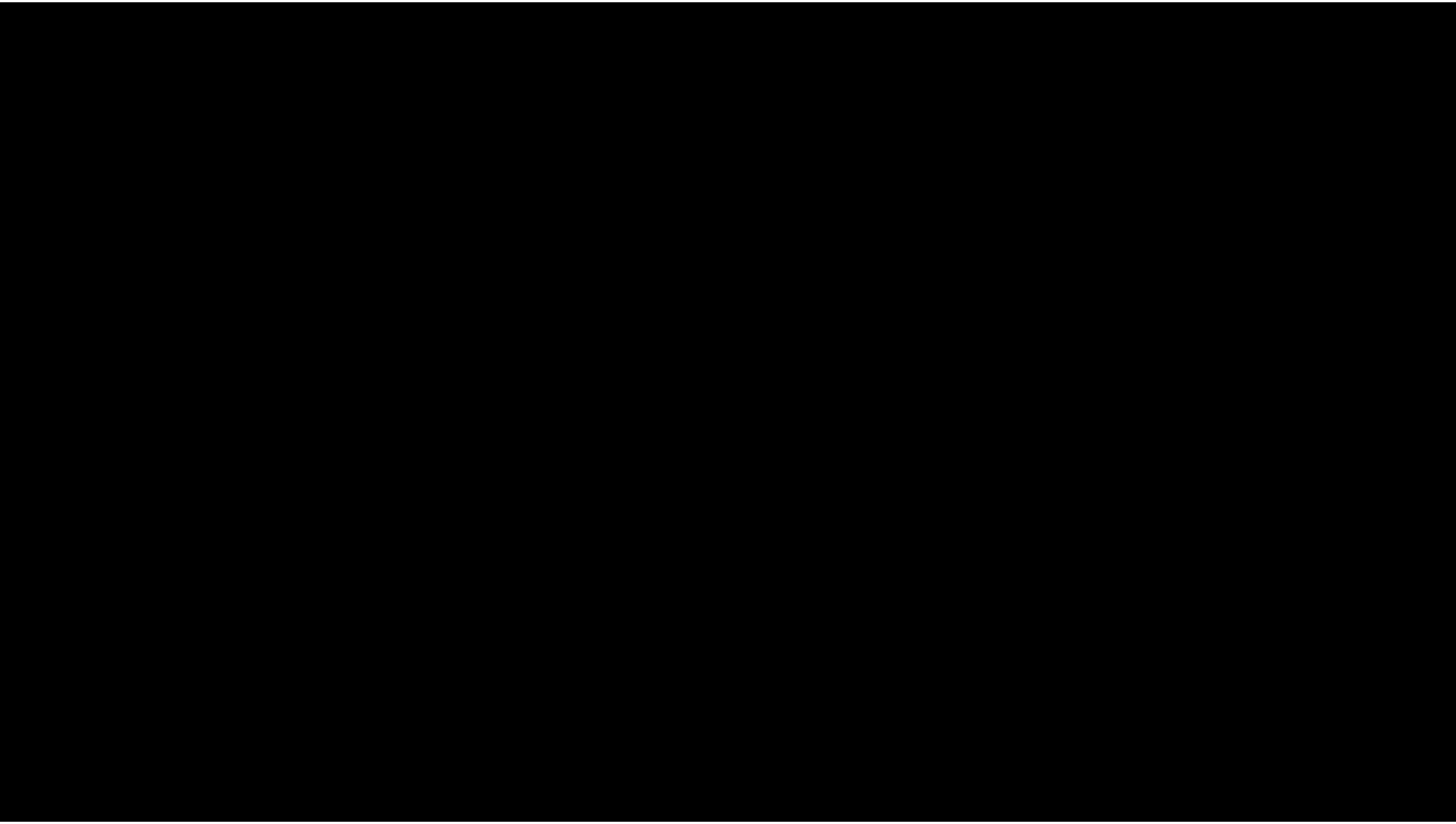
Insects and Underutilised Crops for Fishfeed



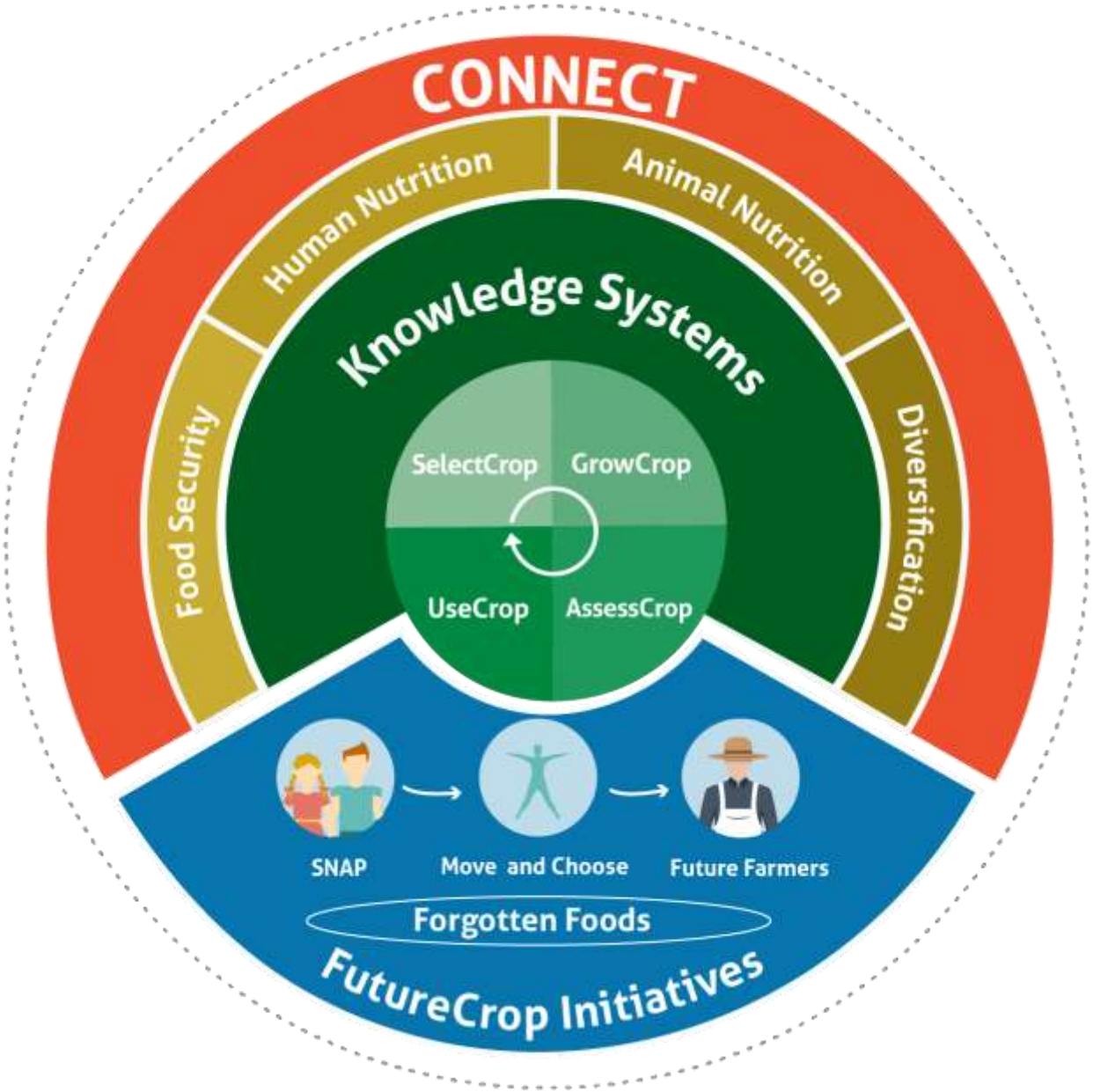
`Disruptive innovation'

- Wealth generation
- Sustainable aquaculture
- Environmental security

CFF Collaborates with Nutritec Technologies



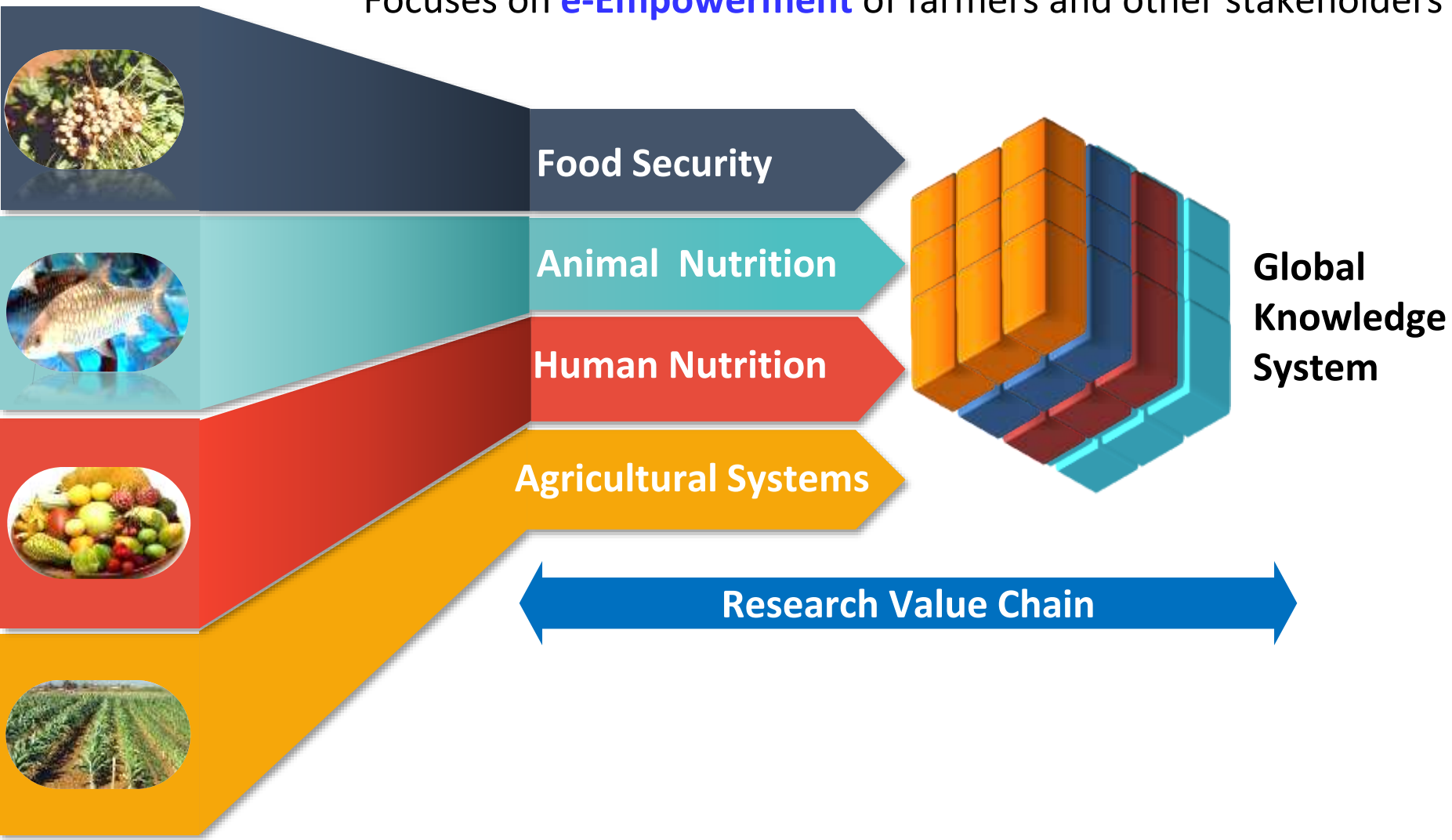
CFF Research



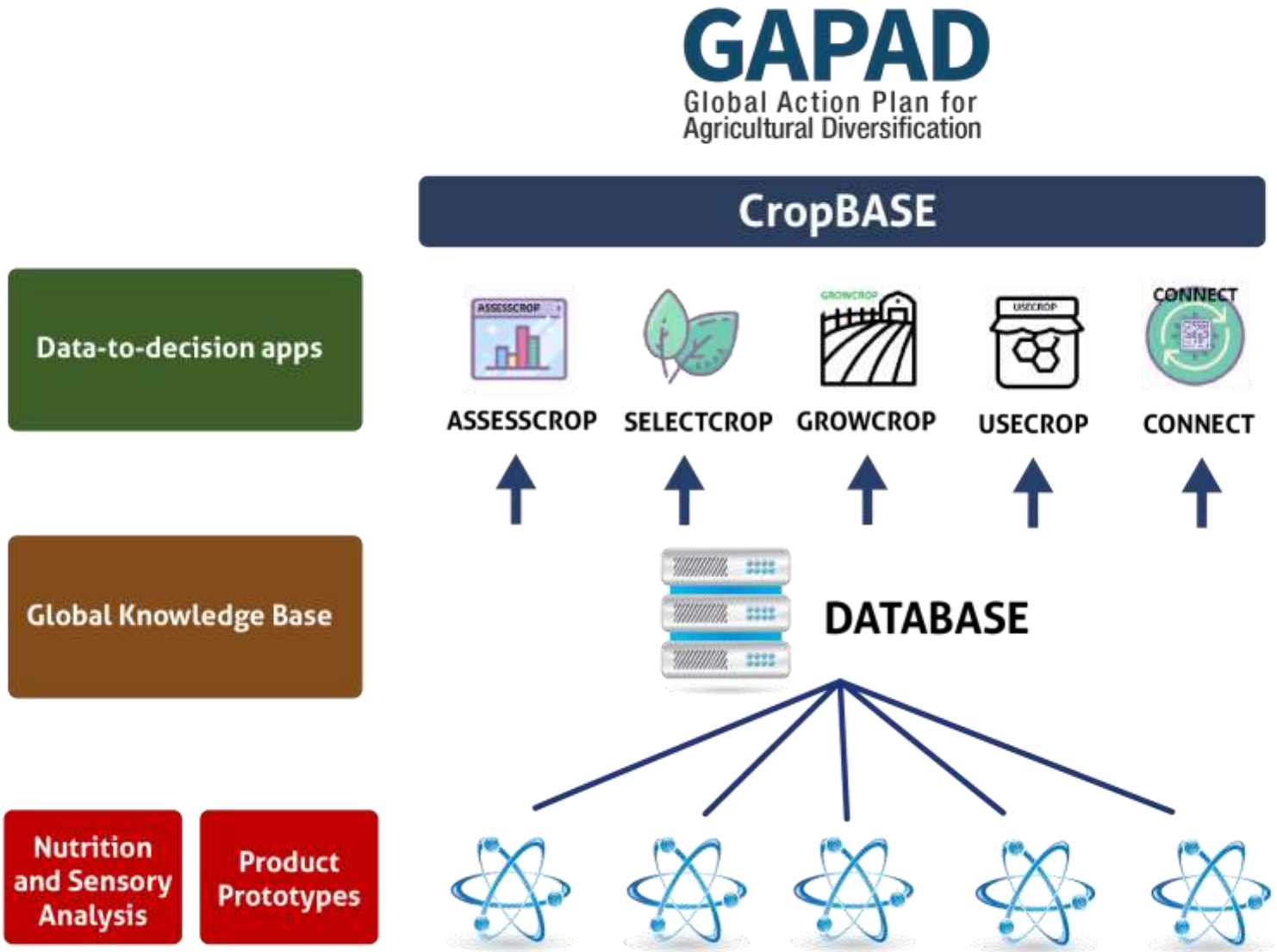
A data-to-decision solution for agriculture

Focuses on underutilised crops as a new source of **innovation**

Focuses on **e-Empowerment** of farmers and other stakeholders

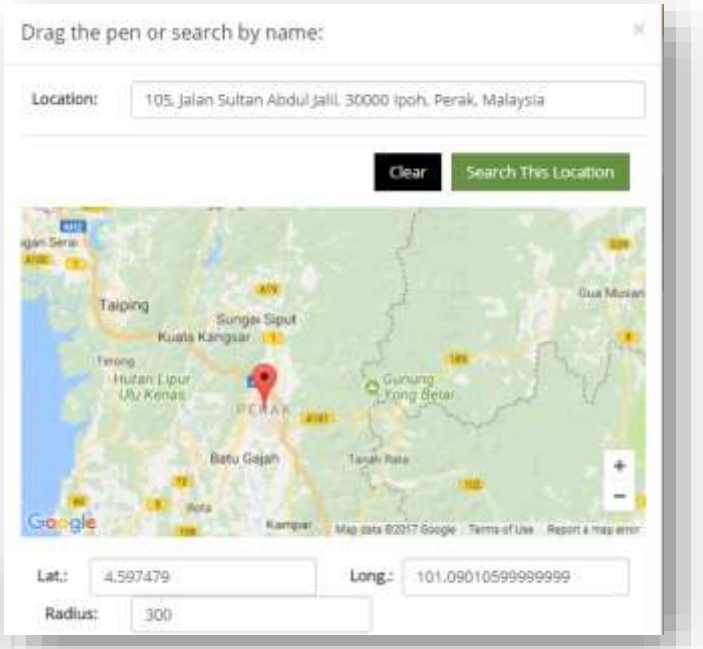


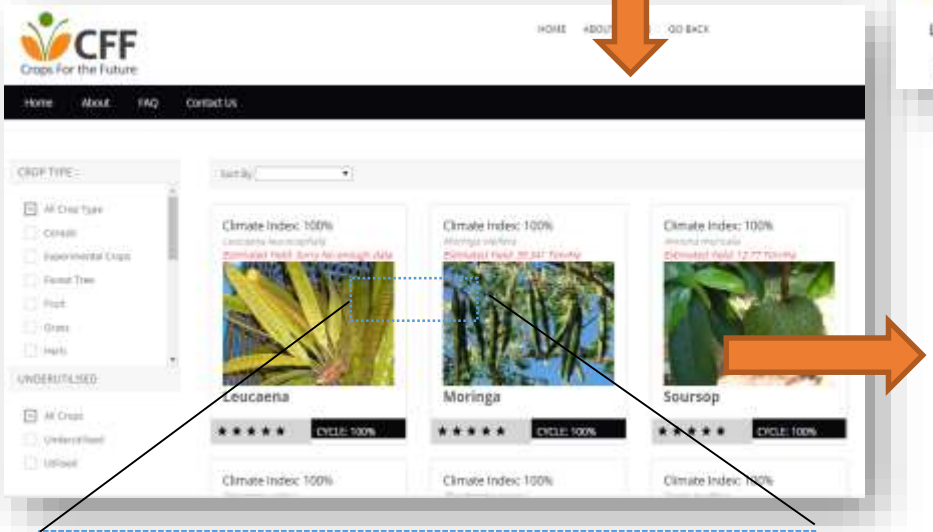
Apps in support of diversification in Agriculture

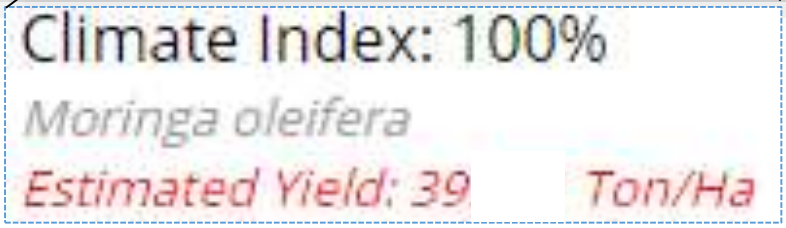


SelectCrop

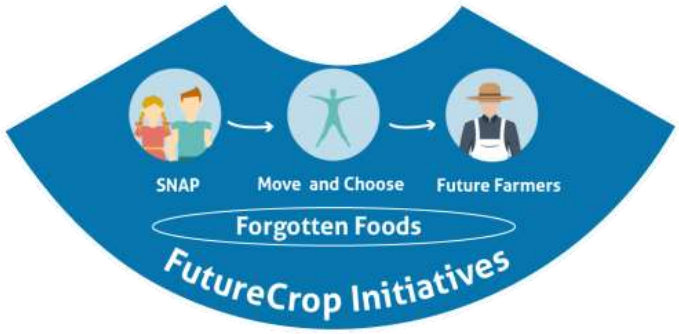
https://www.cropbase.org/







Forgotten Foods



Forgotten Foods Network

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Global project to capture knowledge on foods that used to feature in the diets of past generations

Research at CFF will focus on how those from underutilised crops can;

- Contribute to nutritional security through dietary diversification
- Provide nutritious products in volatile climates of the future
- Support livelihoods for small-scale producers and processors in niche markets - displaced communities, rural populations and urban dwellers

Forgotten Foods Network

THANK YOU

www.cffresearch.org

CFF: Building a Global Institution

Delivering a Global Brand; SDA2030

SDG 17
Partnerships for the Goals

SDG 13
Climate Action

SDG 7
Affordable and Clean Energy

SDG 2
Zero Hunger

SDG 12
Responsible Consumption and Production

SDG 15
Life on Land

- Cope with the impact of climate change on food and agriculture **[SDG13]**
- Enhance equitable, productive and sustainable natural resource management and utilization **[SDG15]**

MTPS72 x 1
Multi-tier walk-in chamber

BDW40 x 8
Walk-in chambers

BDR16 x 3
Reach-in chambers

A1000 x 4
Reach-in chambers

C926 x 2
Storage Cold Room

1. Growth, yield and ecophysiology of underutilised crops under climate change
2. Compositional analysis and products
3. Crop models and climate change predictions