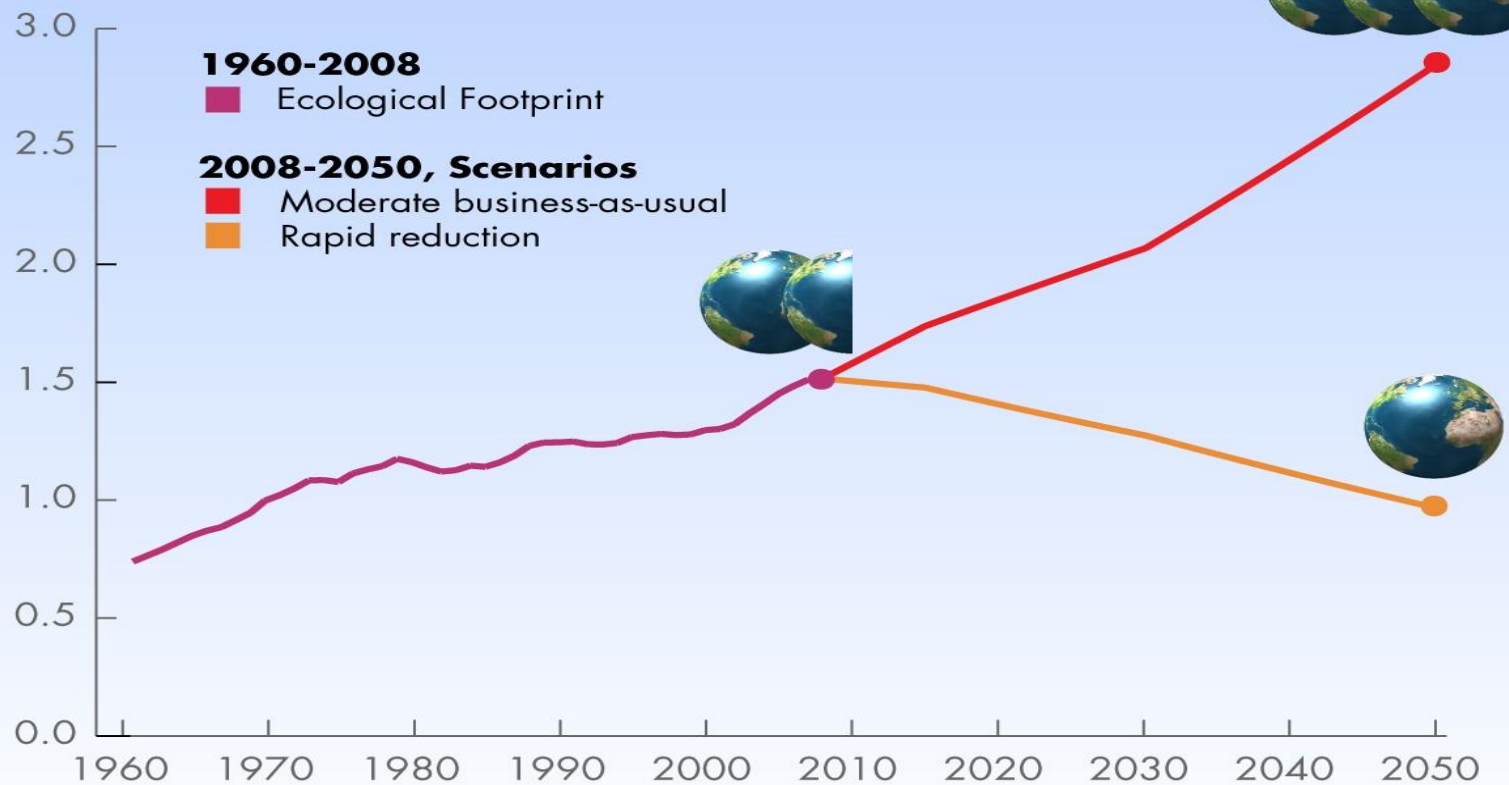




Marleni Ramirez, Ph.D.,
III Climate Change International Forum
October 21 23, 2019 Lima-Perú

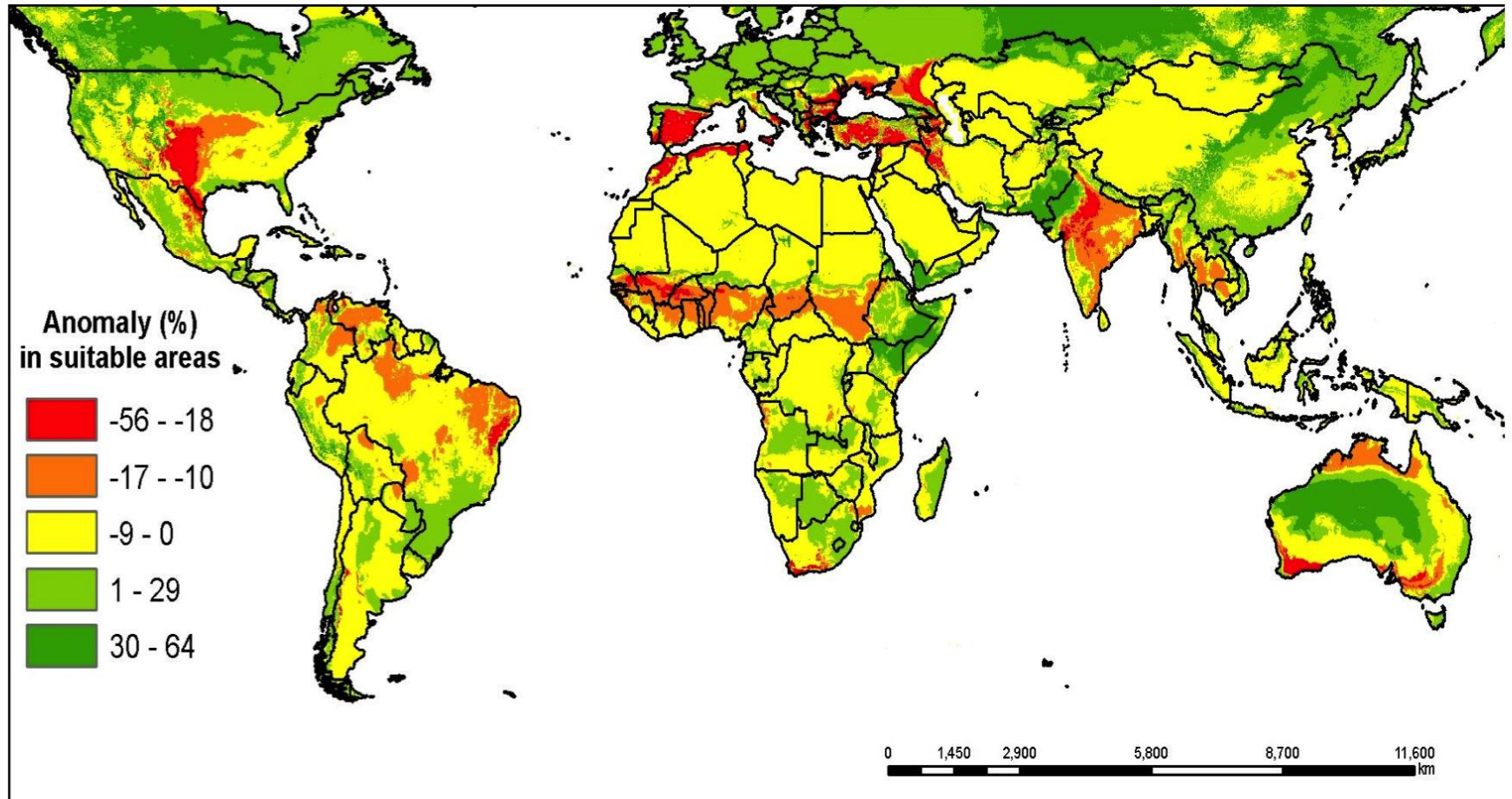
How many Earths



y-axis: number of planet earths, x-axis: years

Impact on agriculture, predicted by 2050

Source: Adapted from Mathur 2014.



Challenge: Climate change



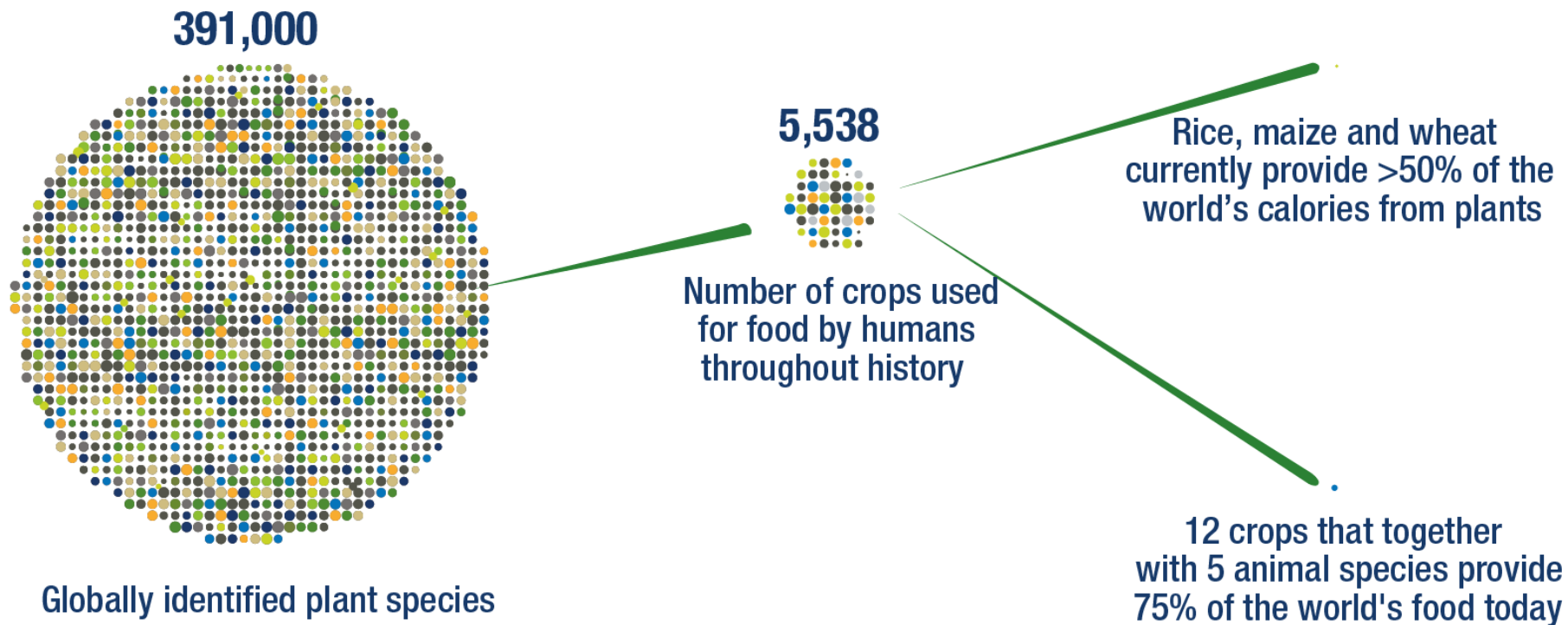
Rice growing in dry, cracked earth, India.
Credit: Bioversity International/N. Capozio

Climate change to reduce agricultural production by 2% every decade while demand will increase by 14% every decade until 2050

Yields of major crops will face average decline of 8% in Africa and South Asia by 2050.



Challenge: Shrinking biodiversity



(Data source: RBG Kew, 2016; FAO, 1997)

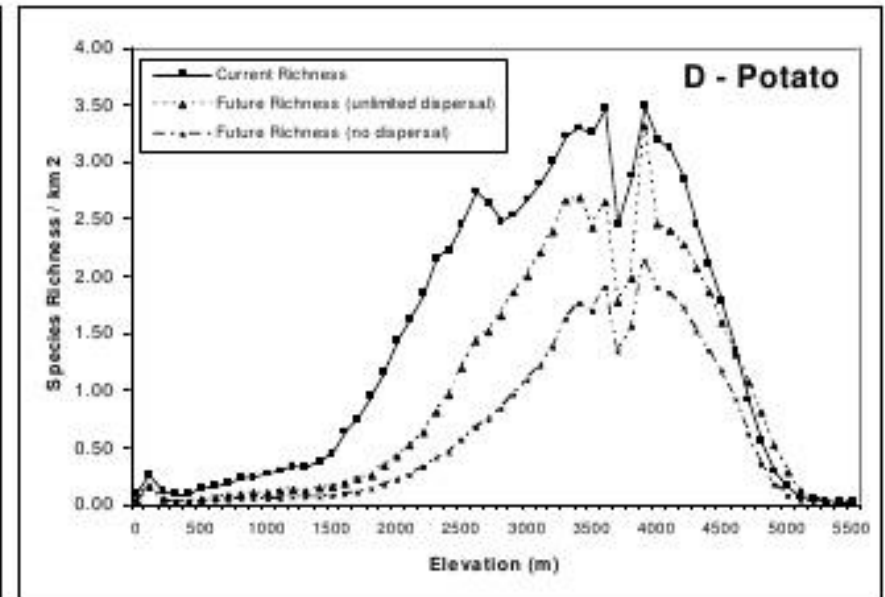
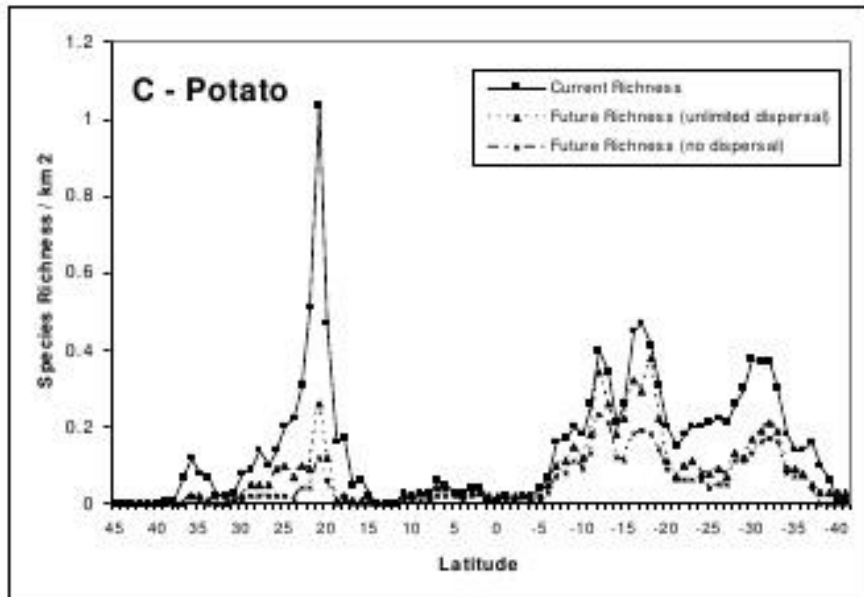
CLIMATE IMPACTS ON CROPS

The northeastern regions of South America will experience a decrease in suitability for cassava production, while the southern regions will experience an increase. The overall area suitable for bean production will decrease.



Source: CIAT, 2013

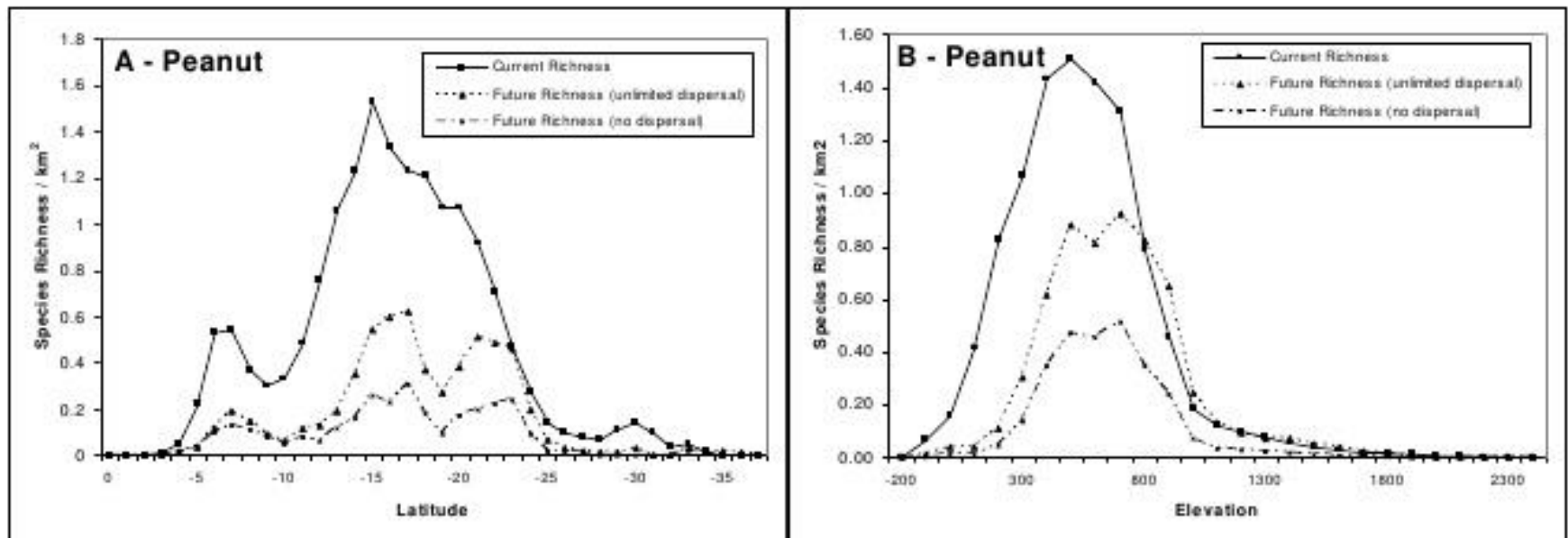
Latitudinal and Elevational Shifts



Potatoes

- Shift upwards

Latitudinal and Elevational Shifts



Peanuts

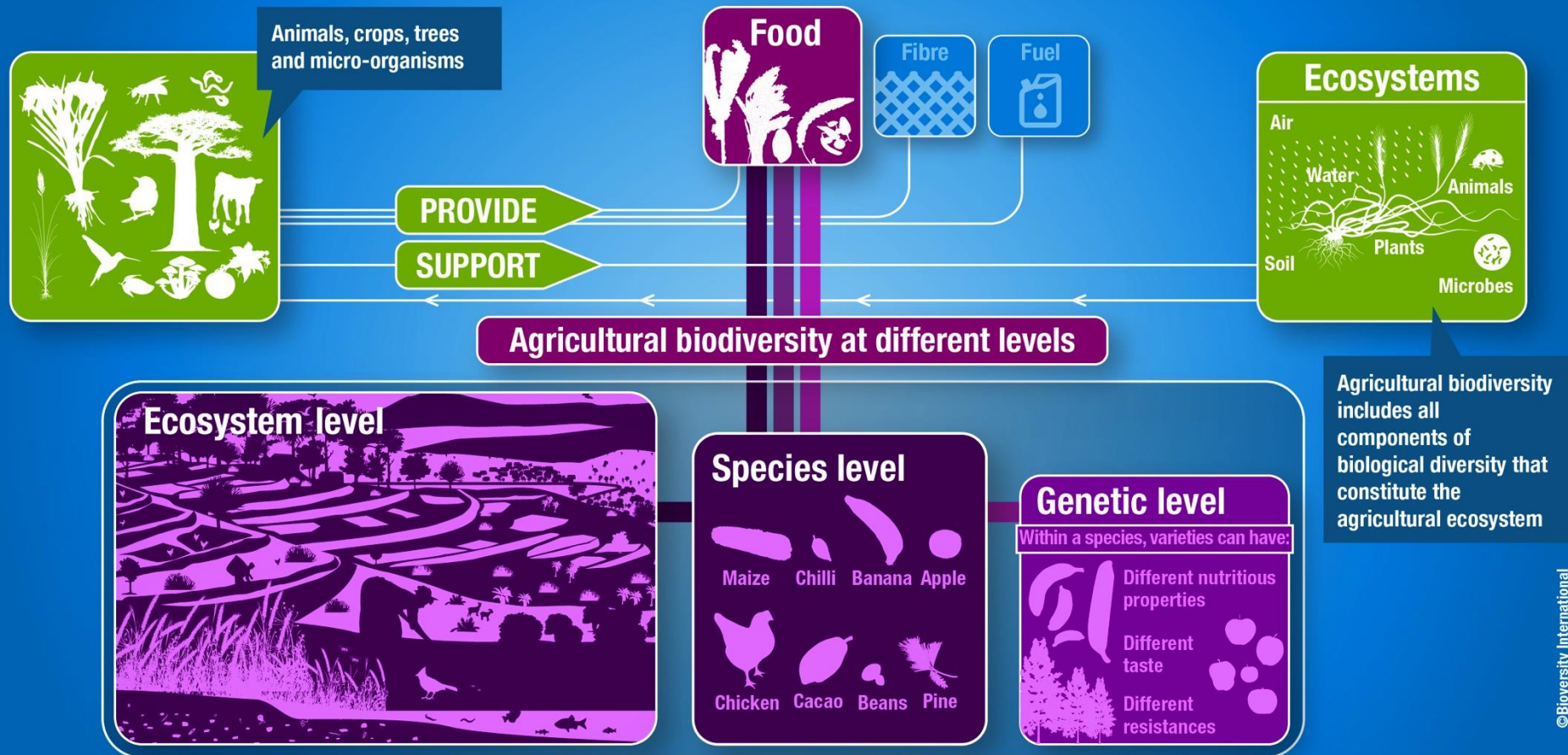
- Shift south and upwards



Agricultural and tree biodiversity is part of the solution

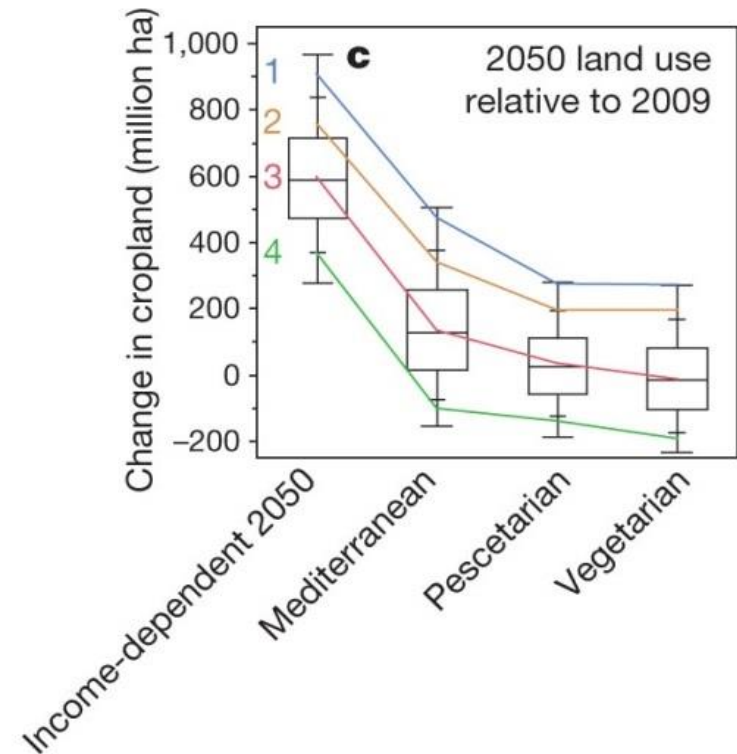
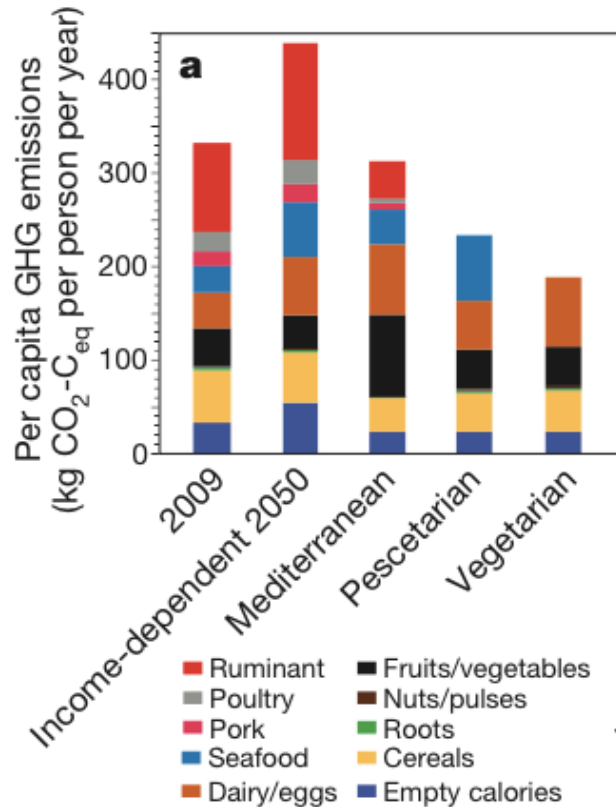


Que es agrobiodiversidad?



La variedad y variabilidad de animales, plantas y micro-organismos que son usados directa o indirectamente para la alimentación y la agricultura

Diversified Diets Reduce GHG Emissions and Land Pressure



Agricultural and tree biodiversity is part of the solution



Is the foundation of agriculture



Fights pests and diseases



Mitigates climate risk

Agricultural and tree biodiversity is part of the solution



Improves nutrition



Boosts ecosystems



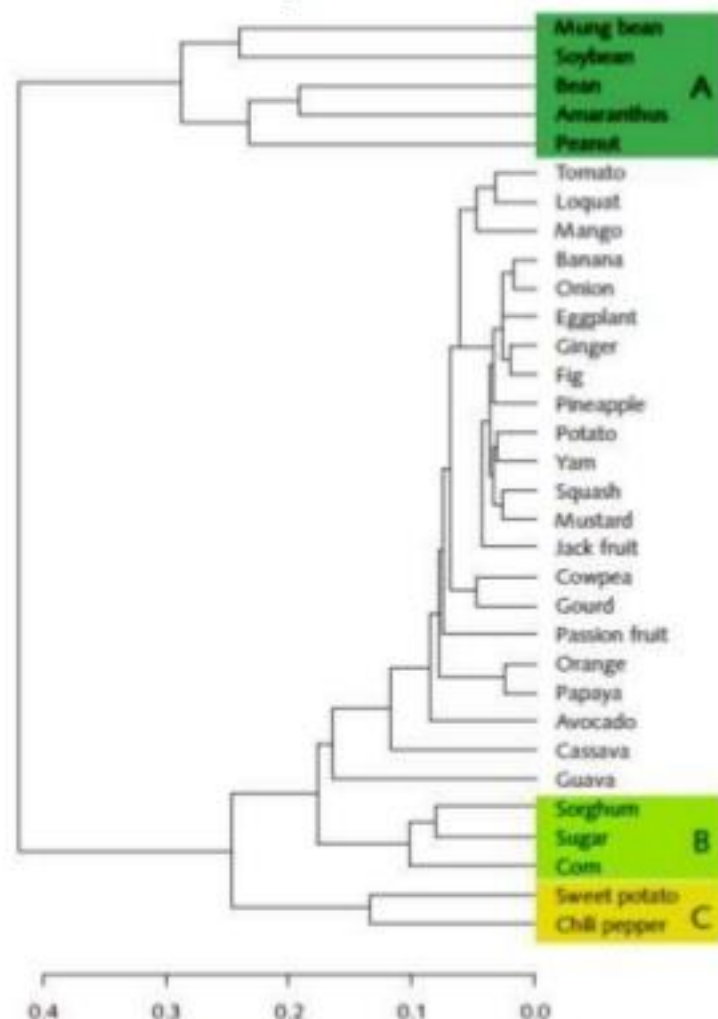
Provides livelihood opportunities

Diversity on farms provides diversity of nutrients

WHAT WE PRODUCE



Photo: Sorghum, Kenya : Credit: Bioversity/Yusuf Wachiira



Declerck et al 2011 FNB

Varietal differences

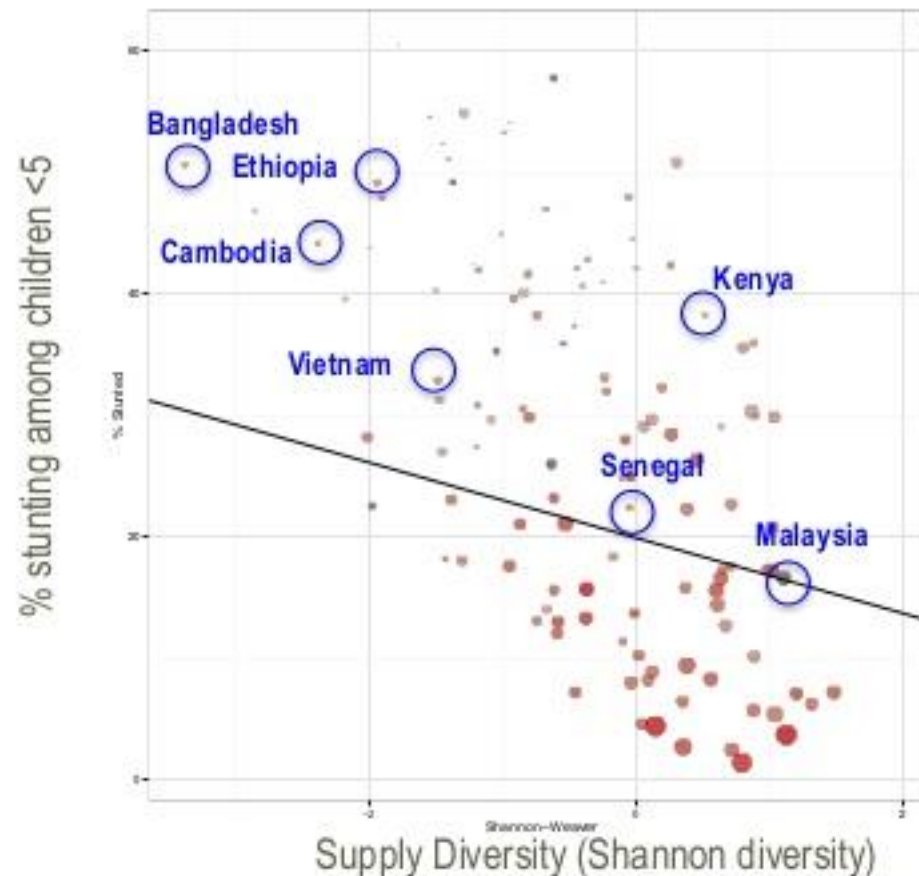
100g	Energy (Kcal)	Calcium (mg)	Iron (mg)
Rice	346	9.0	1.0
Common millet	361	42.0	8.0
Proso millet	341	14.0	0.8
Finger millet	328	344.0	3.9
Little millet	341	17.0	9.3
Kodo millet	309	17.0	0.5

Source: Gopalan C. et al



Stunting decreases with food system diversity

WHAT WE PRODUCE



- Controlling for # socio-economic factors including GNI, trade, infrastructure,...
- size of bullet = GNI per capita
- Low diet diversity in Ethiopia is also well reported on at individual and household level (e.g. Headey 2014, Hirvonen et al. 2014)

Coefficient -3.10***
Adj R² 0.707

Remans et al. GFS 2014;
also adapted by SUN 2014

Challenge: Crop pests & diseases



Worldwide farmers lose on average 13% of annual harvest to pests and diseases.

A farmer can lose 100% of entire crop from a single pest or disease

Common bean leaf rust, Ecuador.
Credit: Bioversity International/C. Fadda



Superfoods in Uganda: common bean diversity resisting pests and diseases



Angular leaf spot disease on bean plant, Uganda
Credit: Bioversity International/P. de Santis



Beyond beans: putting resistant superfood diversity to work against pests and diseases



Intercropping of faba bean and rapeseed in Yunnan, China. Credit: Bioversity International/C.Fadda



In vitro banana collection at the International Transit Centre, Belgium. Credit: Bioversity International/N.Roux



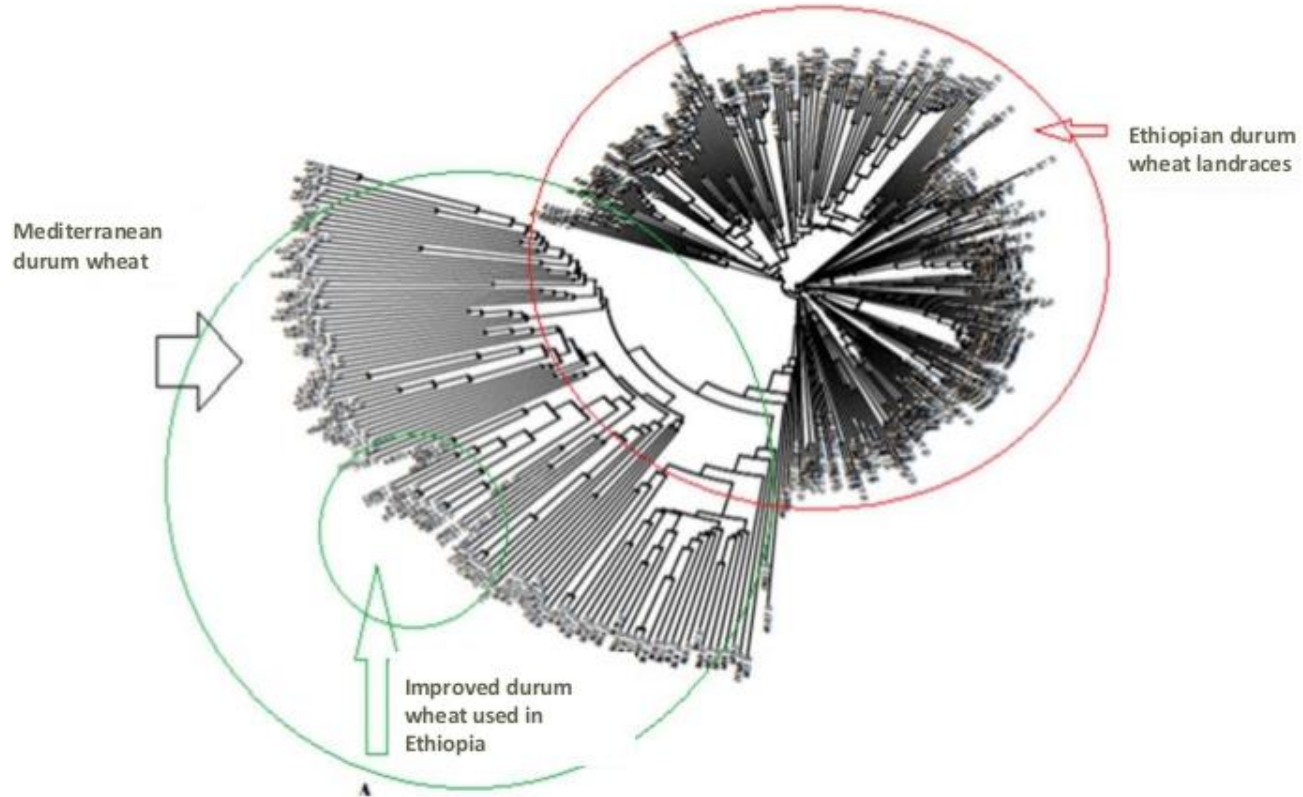
Internal symptoms of Fusarium wilt. Credit: Bioversity International/G.Blomme

Superfoods in Ethiopia: Wheat diversity for climate change



Durum wheat variety in trial plot, Ethiopia.
Credit: Bioversity International/S. Collins

Ethiopian wheat: unique genetic diversity



In marginal areas, tailored solutions are required

Landraces perform better than improved varieties of Durum wheat in Ethiopia

HOW WE PRODUCE

Trait	Superior (improved)	Superior (landrace)	no [†]	Percentage
Days to Maturity [*]	117	109	57	18.4
Biomass Yield (t/ha)	7.2	10.0	97	31.4
Grain Yield (t/ha)	2.2	3.5	68	23.9

- 18.4% of farmers varieties are superior to the best improved variety for maturity

- 31.4% of farmers' varieties are superior than the best improved variety

- A yield advantage of 61% obtained from the best landrace over the best improved variety (Robe) and 23.9% of the farmers' varieties were showing a yield advantage

New business model needed: more consumers, producer and location specific; more co-creation



Seeds for needs



Farmers planting maize and sweet potato, Papua New Guinea. Credit: Bioversity International/E. Dulloo



Tef, a staple grain in Ethiopia, the next crop in Ethiopian trials?
Credit: Bioversity International/C. Zanzanaini



Farmer growing three distinct varieties of common bean, Honduras. Credit: FPMA/S. Alonzo

Superfoods for ...



...nutrition



...resilience



...adaptation

La biodiversidad agrícola y arborea es una parte importante de la solución

- Proporciona: **una dieta variada y nutritiva** al usar muchas especies disponibles y las variedades de esas especies
- Mas opciones de cultivos para proteger **contra eventos climaticos extremos.**
- Permite que los agricultores **limiten el avance de las plagas y enfermedades.**
- Mantiene la **salud del suelo**, los alimentos y el habitat para **los polinizadores** y para los **depredadores naturales** de las plagas.
- Proporciona **variedad para adaptarse** a diferentes circunstancias
- Fuente de **material genetico** para las **generaciones futuras**

A diverse farming system in Burundi. Credit: Bioversity International/P.Lepoint



Zea mays

~ 320 razas en las Américas

~ 69 razas en México

~ 77 razas en Bolivia

~ 66 razas en Perú

~ 47 razas en Argentina

~ 44 razas en Brasil

~ 33 razas en Guatemala

~ 31 razas en Ecuador

~ 29 razas en Chile

~ 23 razas en Colombia

~ 19 razas en Venezuela





Pinchito de mono



Chintito



Malagueta



Charapon rojo



Pucunucho



Rocotito



Charapon amarillo



Charapita amarillo



Upia ucho



Trompito rojo



Trompito amarillo



Ají dulce



Cerecito rojo



Cerecito amarillo



Challuaruro



Challuaruro



Ayuyo

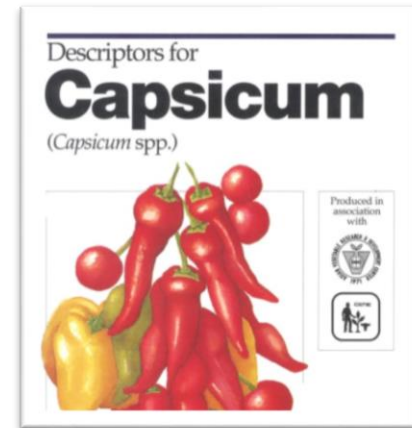
Diversidad de especies y sus variedades permanecen subutilizadas en centros de origen

Promoting use of crop diversity through knowledge

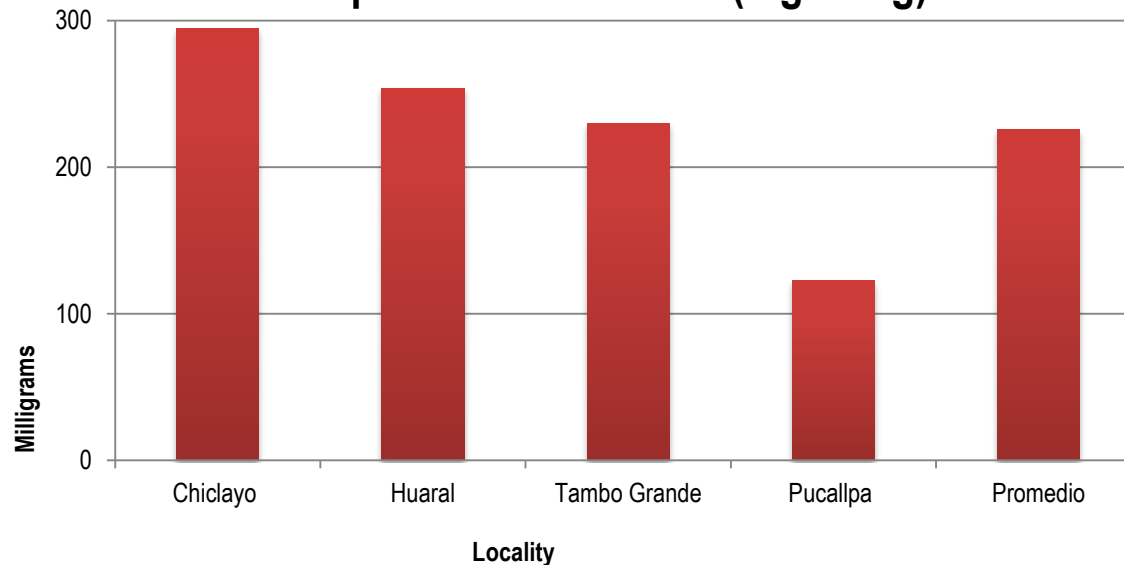
Ají cerezo
Código Nacional: PER017635
Sitio de colecta: Lambayeque



Especie: *Capsicum annum* L.



Capsaicinoids content (mg/100 g)





© Bioversity

**Proyecto Recompensas por servicios de conservación
de la agrobiodiversidad (ReSCA) 2010-2011**



What is the Agrobiodiversity Index?

A consistent long-term monitoring system for agrobiodiversity to be applied across four sustainable food system components:



Nutritious, diverse
diets



Productive and
resilient farms and
landscapes



Farmers' access to
quality, diverse
seeds



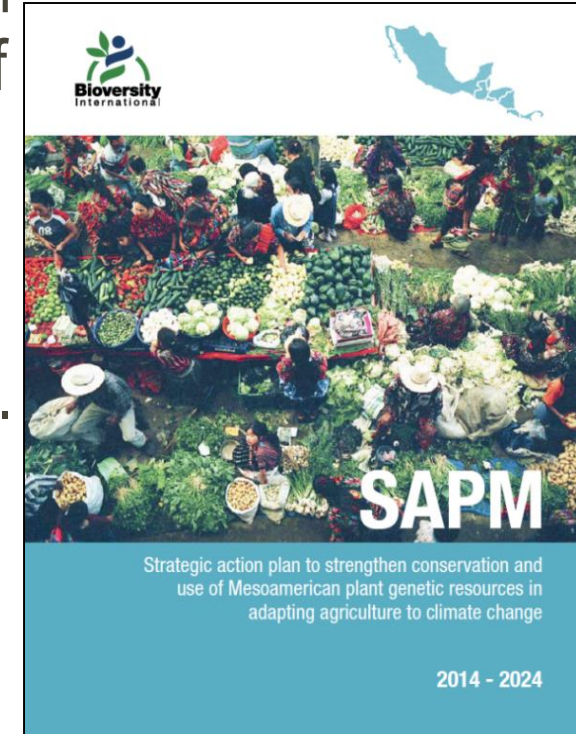
Conservation of
agrobiodiversity for
future options

Since 10,000 BC people have used genetic diversity to improve productivity and diversify diets

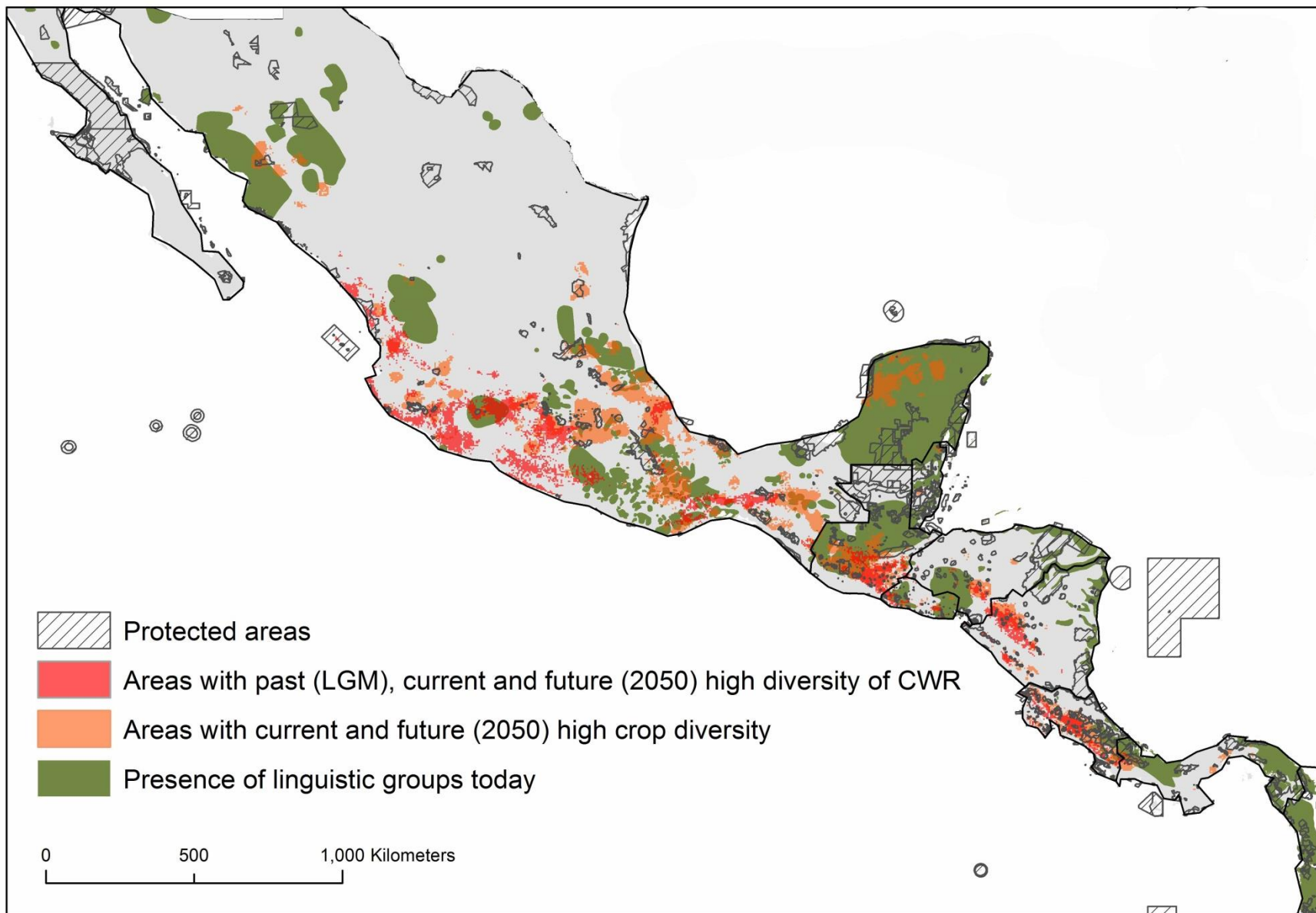


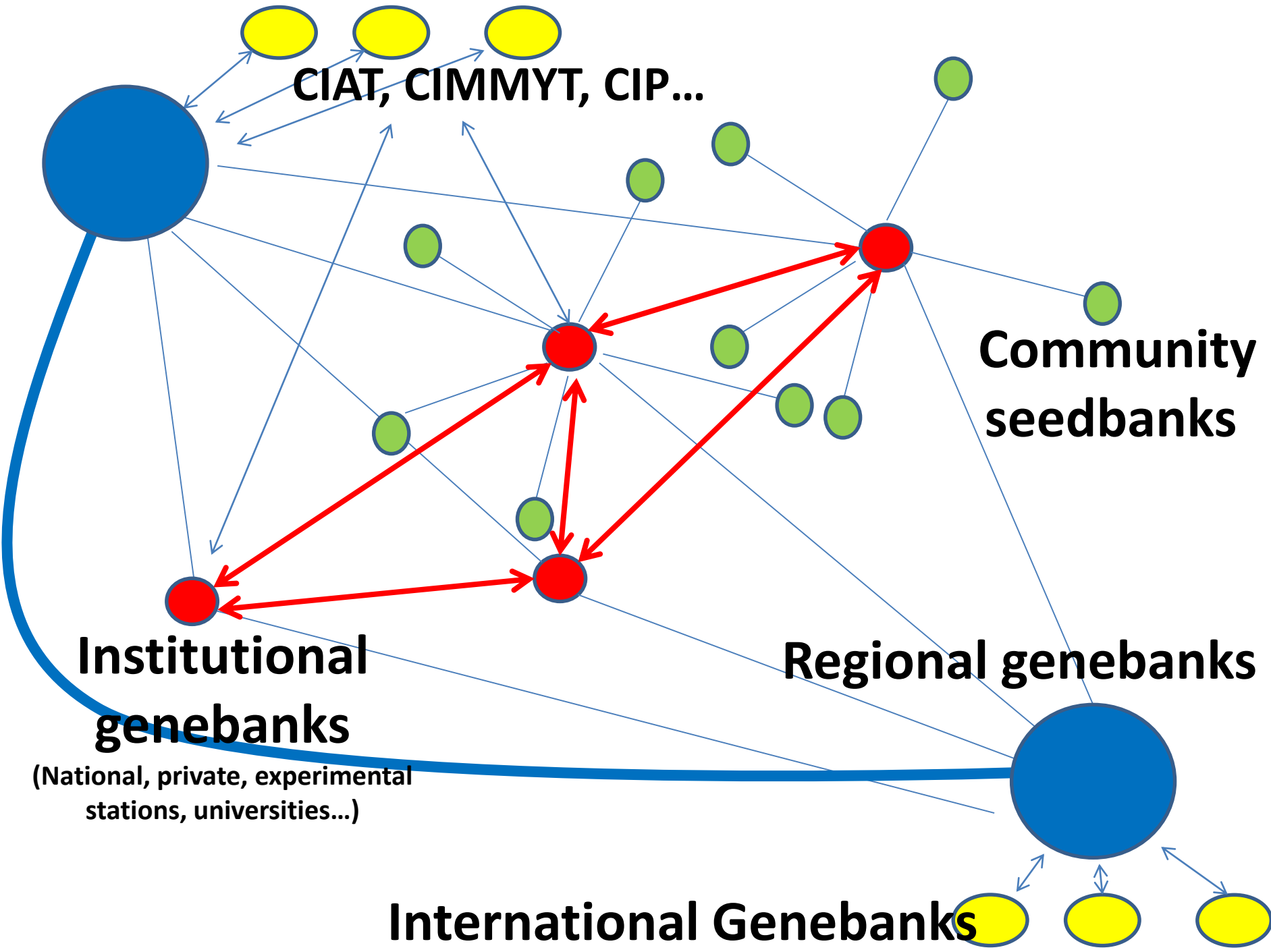
What is the SAPM?

- A roadmap to strengthen the conservation and use of native plant genetic resources of Mesoamerica strategic for the adaptation of agriculture to **climate change**.
- Focused on **10 Mesoamerican crops** important for **local** and **global food security**, with potential to generate income.
- Developed through a **systematic analysis** of relevant information + **broad consultation** with regional stakeholders resulting in the identification of a key set of activities (87) to be implemented in the **next decade**.



Priority Areas for *In Situ* Conservation of Crop and CWR Diversity





What does this mean for research?

- New modalities, new partnerships, new forms of engagement are needed:
- Case by case developing solutions within existing framework fair for all
- Participatory and respectful of the agency of farmers
- More than technical solutions – trust is key
- Increasing relevance and impact
- Increasing scrutiny from civil society organizations, media on research



Find Out More



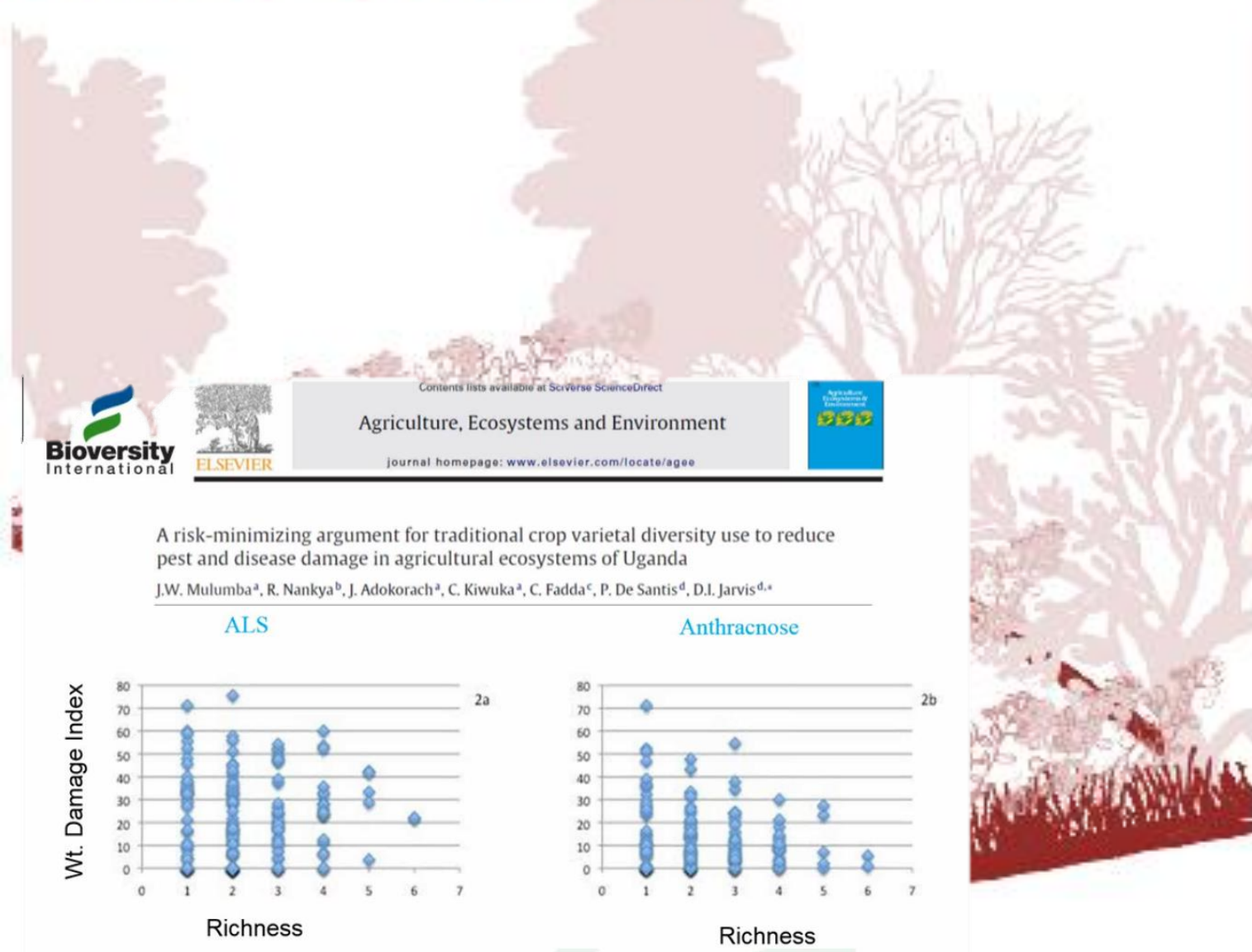
www.biodiversityinternational.org/abd-index

Thank you



How is biodiversity linked to healthy agro-ecosystems?

Genetic / Species level



How is biodiversity linked to healthy agro-ecosystems?



2 ZERO HUNGER



12 RESPONSIBLE CONSUMPTION AND PRODUCTION



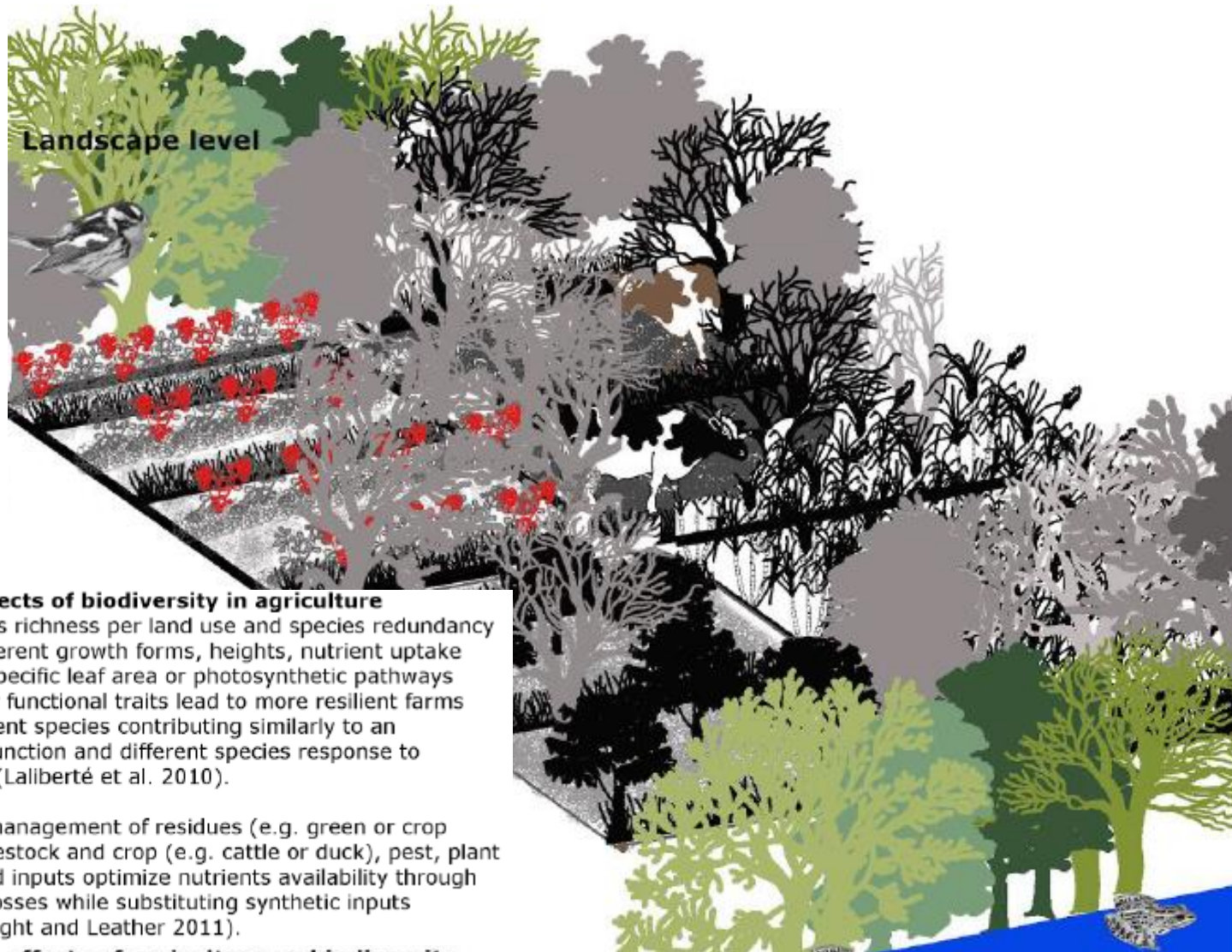
13 CLIMATE ACTION



15 LIFE ON LAND



How is biodiversity linked to healthy agro-ecosystems?



2 ZERO HUNGER



12 RESPONSIBLE CONSUMPTION AND PRODUCTION



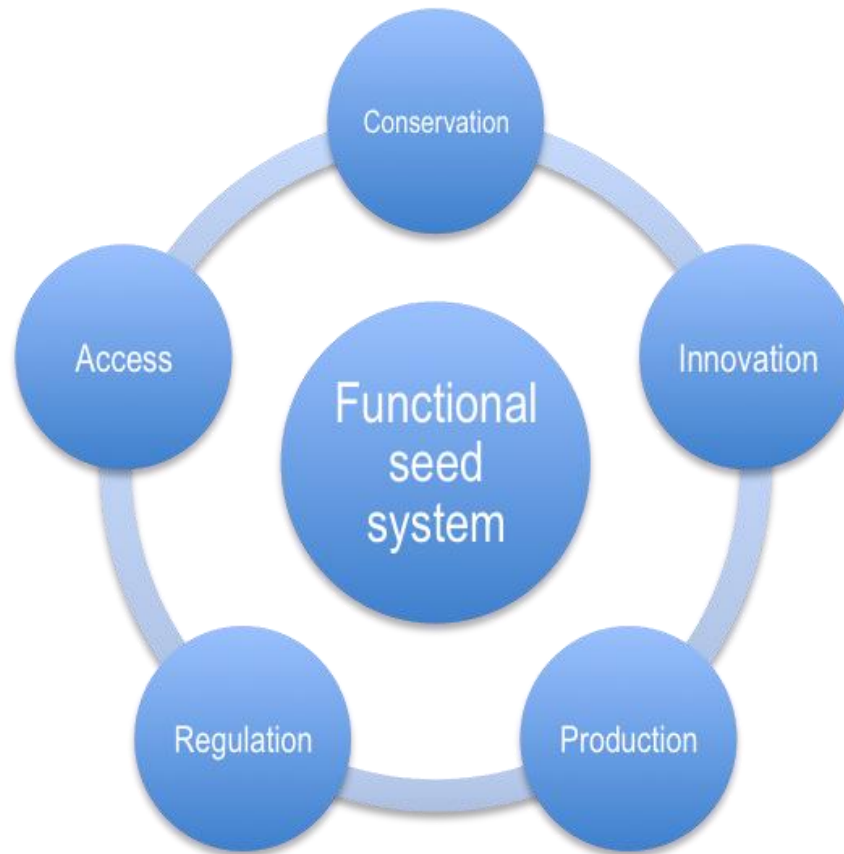
13 CLIMATE ACTION



15 LIFE ON LAND



How seed systems contribute to diversity



2 ZERO HUNGER



12 RESPONSIBLE CONSUMPTION AND PRODUCTION



13 CLIMATE ACTION



Safeguard through use and investment – neglected no more



Farmers involved in participatory plant breeding of rice in Nepal.
Credit: Bioversity International/B. Sthapit

SDG 2: Genetic diversity contributes to improved nutrition



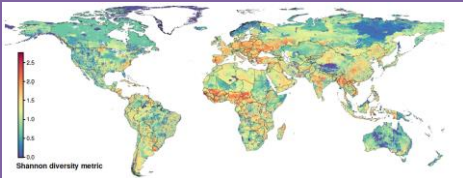
Bioversity International/A. Camacho



Bioversity International/J. Raneri

Methodology – Data in...

Big data
from existing
indices, databases &
monitoring



Crowd-sourced data



Other innovative
data sources?



ABD Index & Tracker Tool

Farming
systems

Food systems

Seed
systems

Conservation
systems

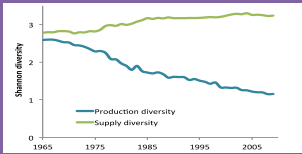
- Genetic diversity for major crops
- Species diversity
- Functional diversity e.g. soil fertility, nutrition, climate change adaptation

Methodology – Data out.

ABD in sustainable investment reports



Local, national and global patterns and score cards



Google and smart phone application



ABD in national and global policy and SDG reports

ABD Index & Tracker Tool

Farming systems

Food systems

Seed systems

Conservation systems

- Genetic diversity for major crops
- Species diversity
- Functional diversity e.g. soil fertility, nutrition, climate change adaptation
- Social diversity

Genetic diversity contributes to many SDGs



Summary Impacts

- 16-22% (depending on migration scenario) of these species predicted to go extinct
- Most species losing over 50% of their range size
- Wild peanuts were the most affected group, with 24 to 31 of 51 species projected to go extinct
- For wild potato, 7 to 13 of 108 species were predicted to go extinct

Los Bancos Comunitarios de Semillas

- Iniciativas para guardar semillas
- Poca atención en la literatura científica sobre BCS, la adaptación al cambio climático y la biodiversidad
- Acaba de publicarse una revisión de la literatura gris y las contribuciones de mas de treinta autores de mas de 20 paises al tema. Vernooy et al.,
- BCS pueden aumentar resiliencia de agricultores, especialmente de los mas afectados por CC.
- Como? Al asegurar mejor acceso a y disponibilidad de sps y variedades de cultivos localmente adaptados y
- Mejorar CT y capacidades de manejo de semillas: selección, tratamientos, almacen, multiplicación y distribución Vernooy et al., in prep

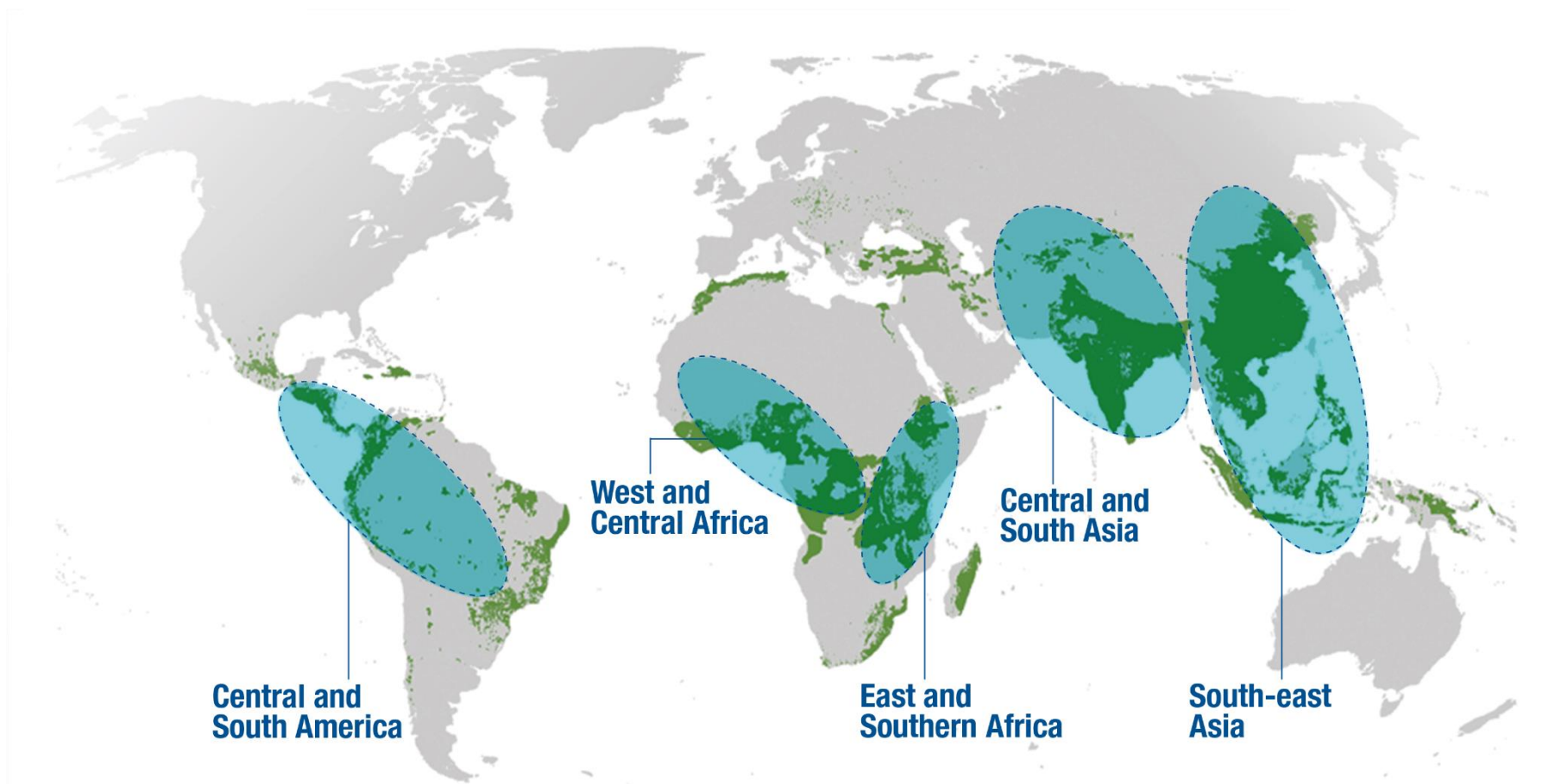
Where we work

5 regions

35 focus countries

19 offices

290 staff



● Hotspots of agricultural biodiversity and poverty

● Bioversity International geographical focus

Bioversity International strategic objectives

CONSUME

a more diversified diet

PRODUCE

in resilient, productive and diversified farms and landscapes

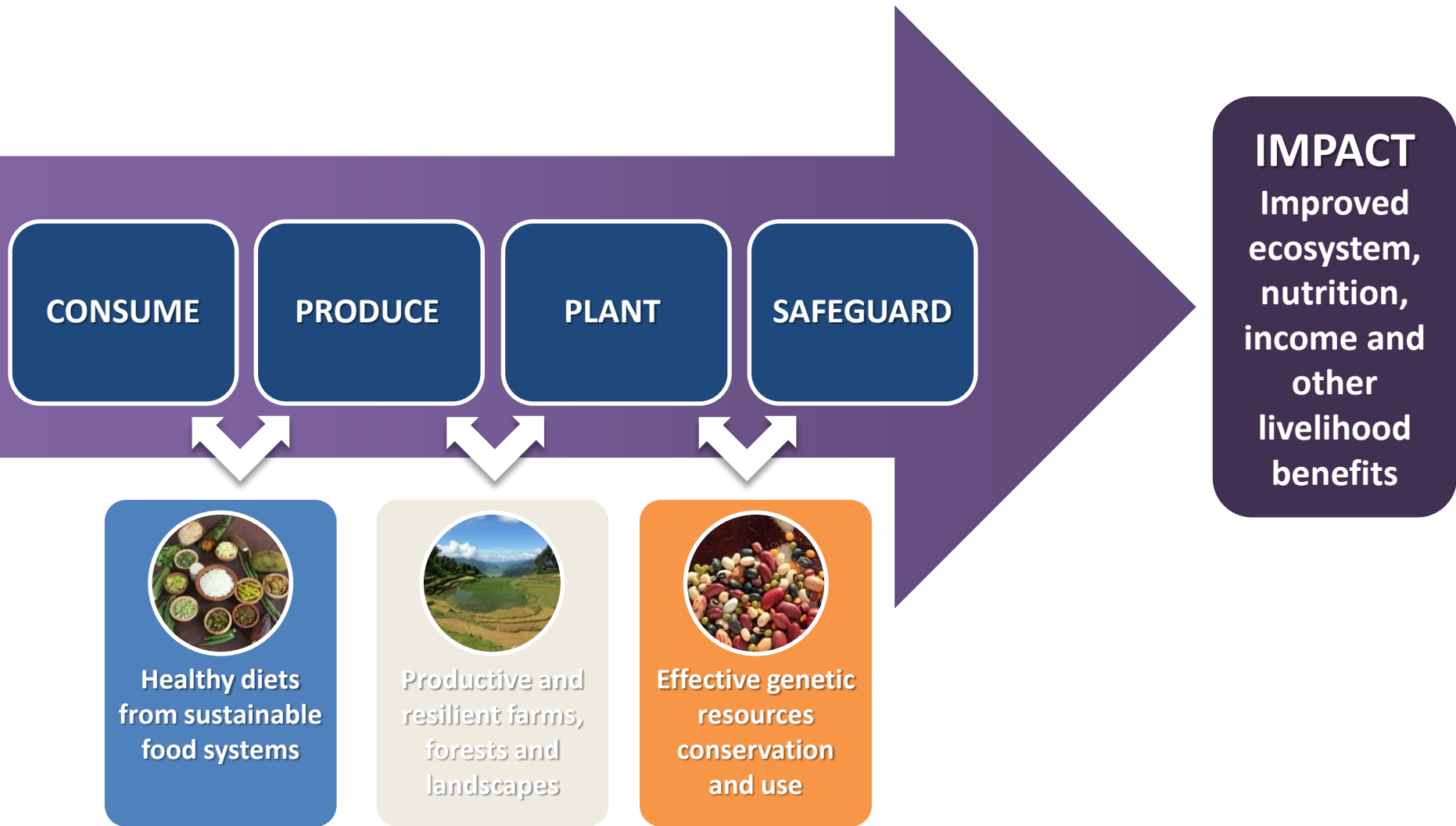
PLANT

a diversity of quality seeds and other planting materials

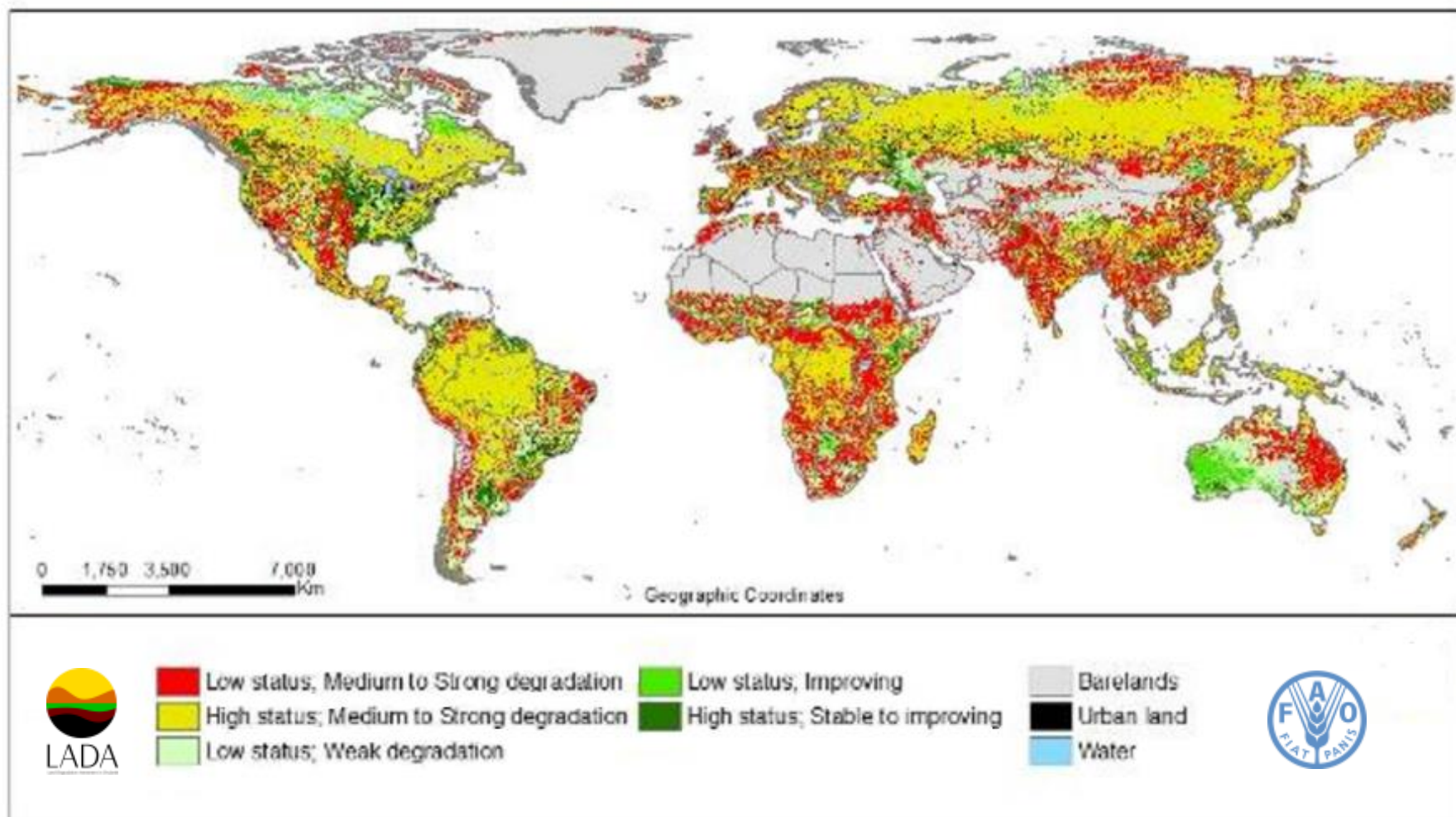
SAFEGUARD

priority agricultural biodiversity for current and future needs

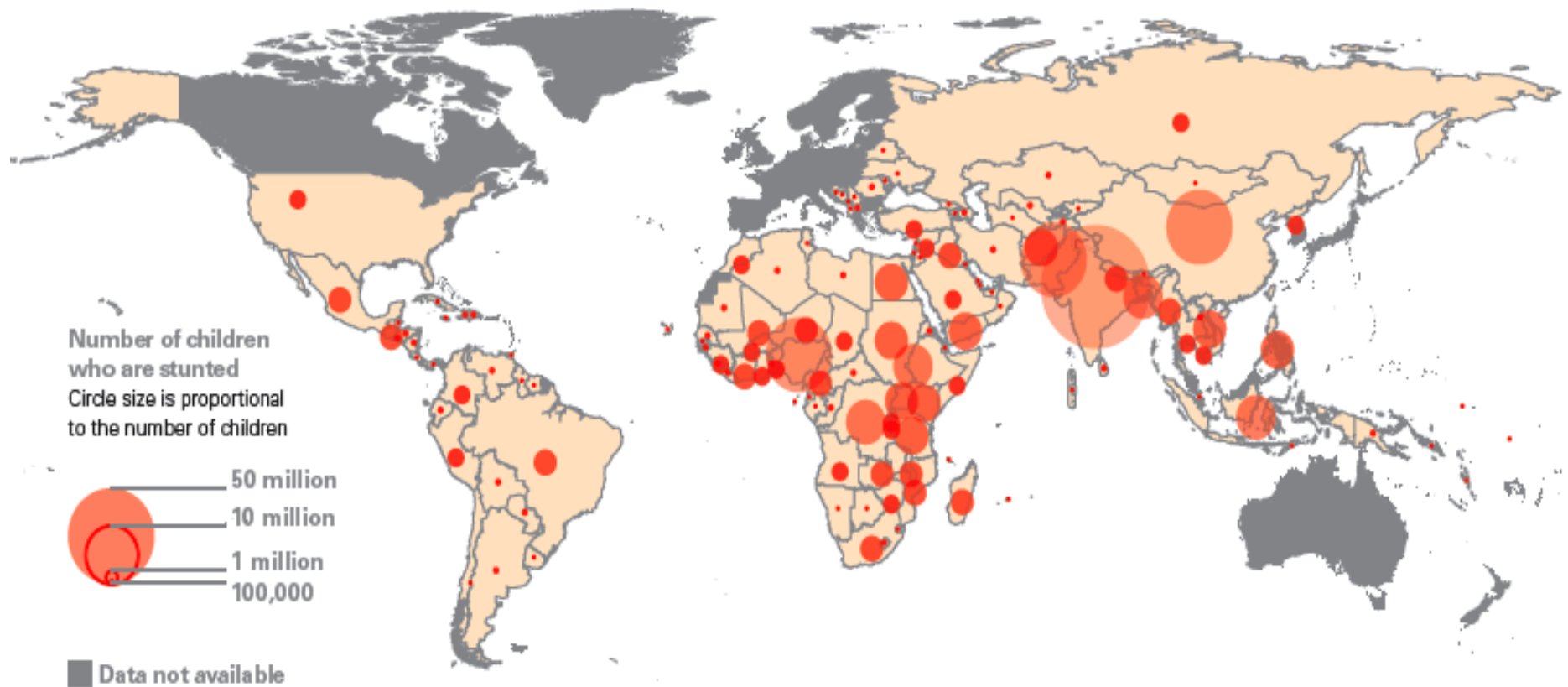
Bioversity International's approach



New challenge: Degraded lands



New challenge: Childhood stunting



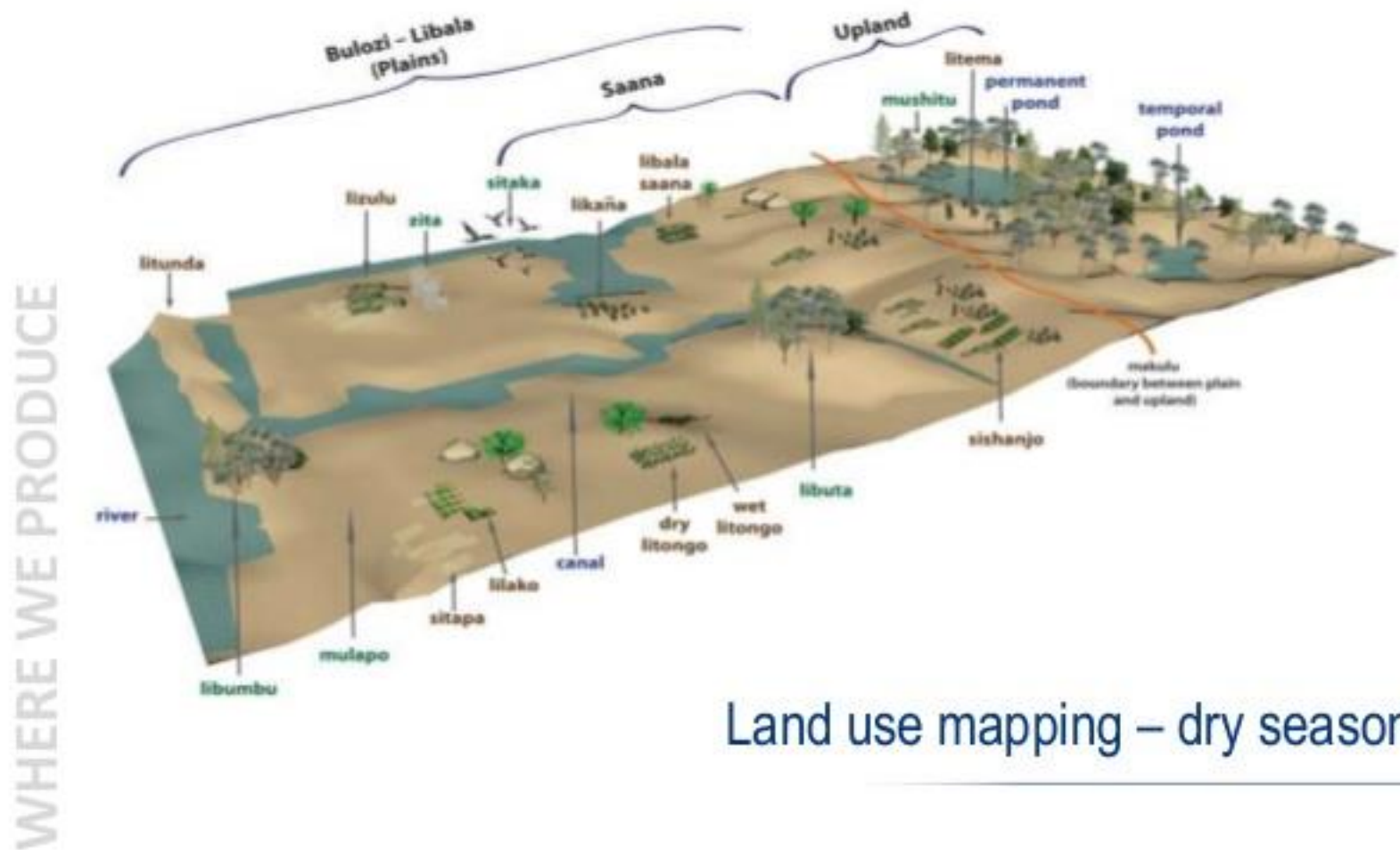
Wild relatives of crops

- Include both progenitor species and closely related species of cultivated crops
- Faba beans – 0 wild relatives
- Potato – 172 wild relative species
- Increasingly useful in breeding, especially for biotic resistance

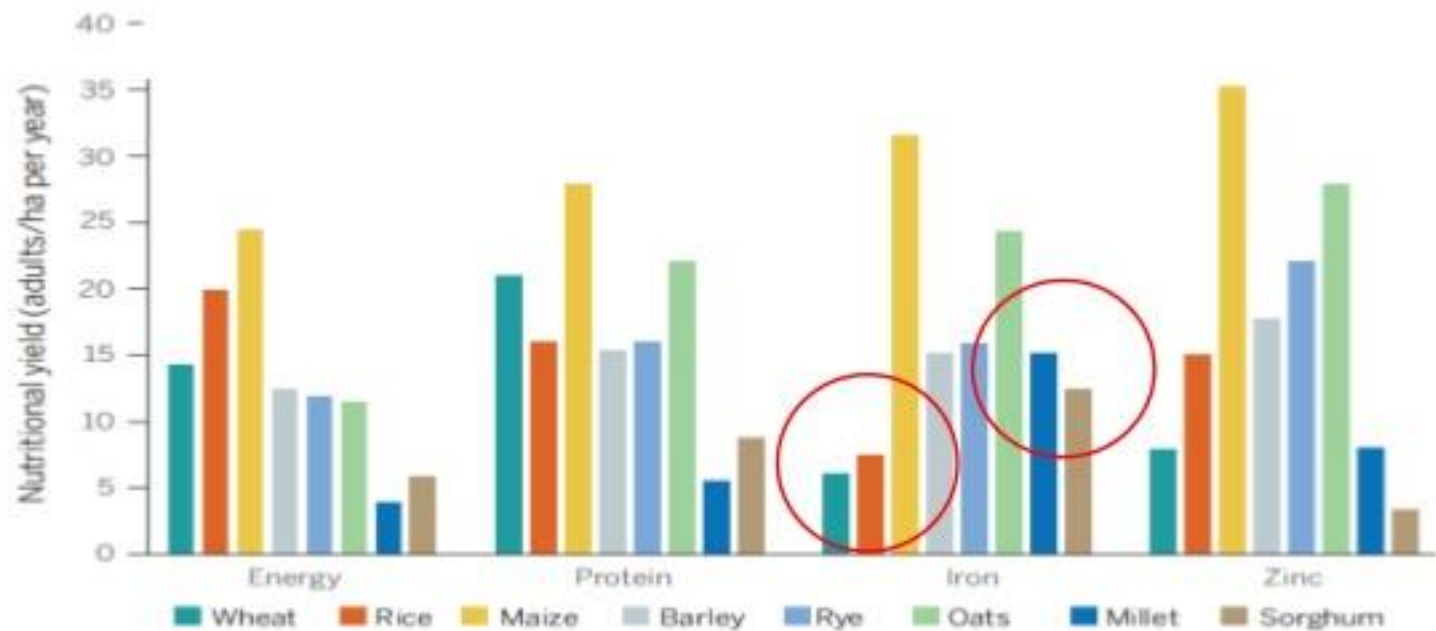


In marginal areas, integrated approaches are required

Barotse floodplain, Zambia



Counting more than calories – nutritional yield



Single Superfood approach

ZEITUNG ONLINE

Politik Gesellschaft Wirtschaft Kultur Wissen Digital Studien Karriere Entdecken Sport Spiele mehr

Superfood

Ich ess nur noch super!

Açaí, Chia, Goji, Quinoa – Klingt schwer zu verdauen, was alles essen soll. Dabei macht dieses teure Superfood auch schön, gesund und fit. Oder?

goodfood

Recipes | How to | Lifestyle & events | More

Top 10 superstar superfoods

By Roxanne Fisher



Kale cocktail. Credit: Foodthinkers/Flickr



Blueberry and Quinoa Recipe. Credit: Jennifer, Sweetonveg/Flickr



food

Give Your Heart to Quinoa

Innovación comercial de ajíes nativos en Perú



More than millets – putting nutritious superfood diversity on plates around the world



Orange-fleshed Fe'i bananas from the Pacific.
Credit: Bioversity International/L. Engberger



Quinoa varieties growing in Bolivia.
Credit: Bioversity International/S. Padulosi



Flowers of Cleome gynandra, a traditional leafy vegetable in Africa. Credit: Bioversity International

Superfoods in India: Rice diversity for climate change

