



Opportunities for AgriScience Collaboration Within and For Africa

July 27, 2020 Webinar

Hosted by ESAFE-UM6P (Morocco), OCP, Agricultural Scientists for Africa and
The Regional Universities Forum for Capacity Building in Agriculture (RUFORM) for Africa

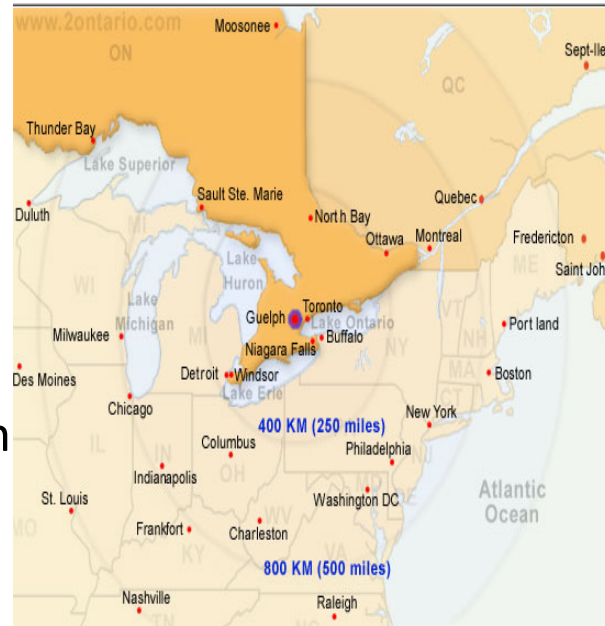
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University of Guelph, Canada

This presentation will be made
available online
as there are many useful links

(details at the end)

University of Guelph Propaganda

- 1hr drive from Toronto, Canada
- Canada's oldest and largest agricultural university
- ranked #12 in agricultural research globally and #1 in Canada for inventions per faculty



Outline



1. African crops and hence expertise are diverse



2. Collaborators



3. Grant funding to enable collaborations

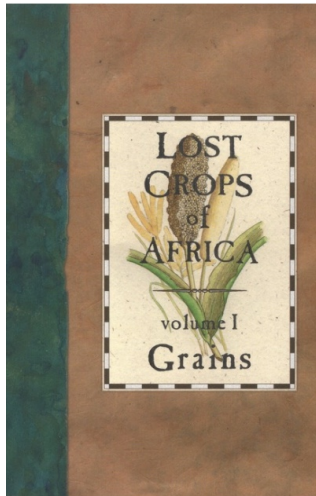


4. Scholarships and fellowships



5. Need and Opportunity for collaboration

Background to African Crops



Good Starter Readings:

“Lost Crops of Africa” (3 volumes) (free download)
U.S. National Academy of Sciences

I. Grains:

<https://www.nap.edu/catalog/2305/lost-crops-of-africa-volume-i-grains>

II. Vegetables:

<https://www.nap.edu/catalog/11763/lost-crops-of-africa-volume-ii-vegetables>

III. Fruits:

<https://www.nap.edu/catalog/11879/lost-crops-of-africa-volume-iii-fruits>

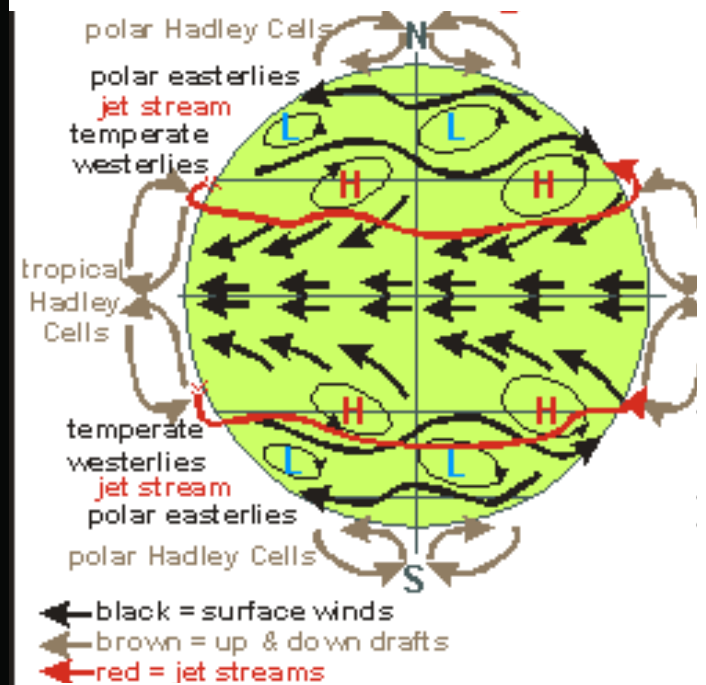
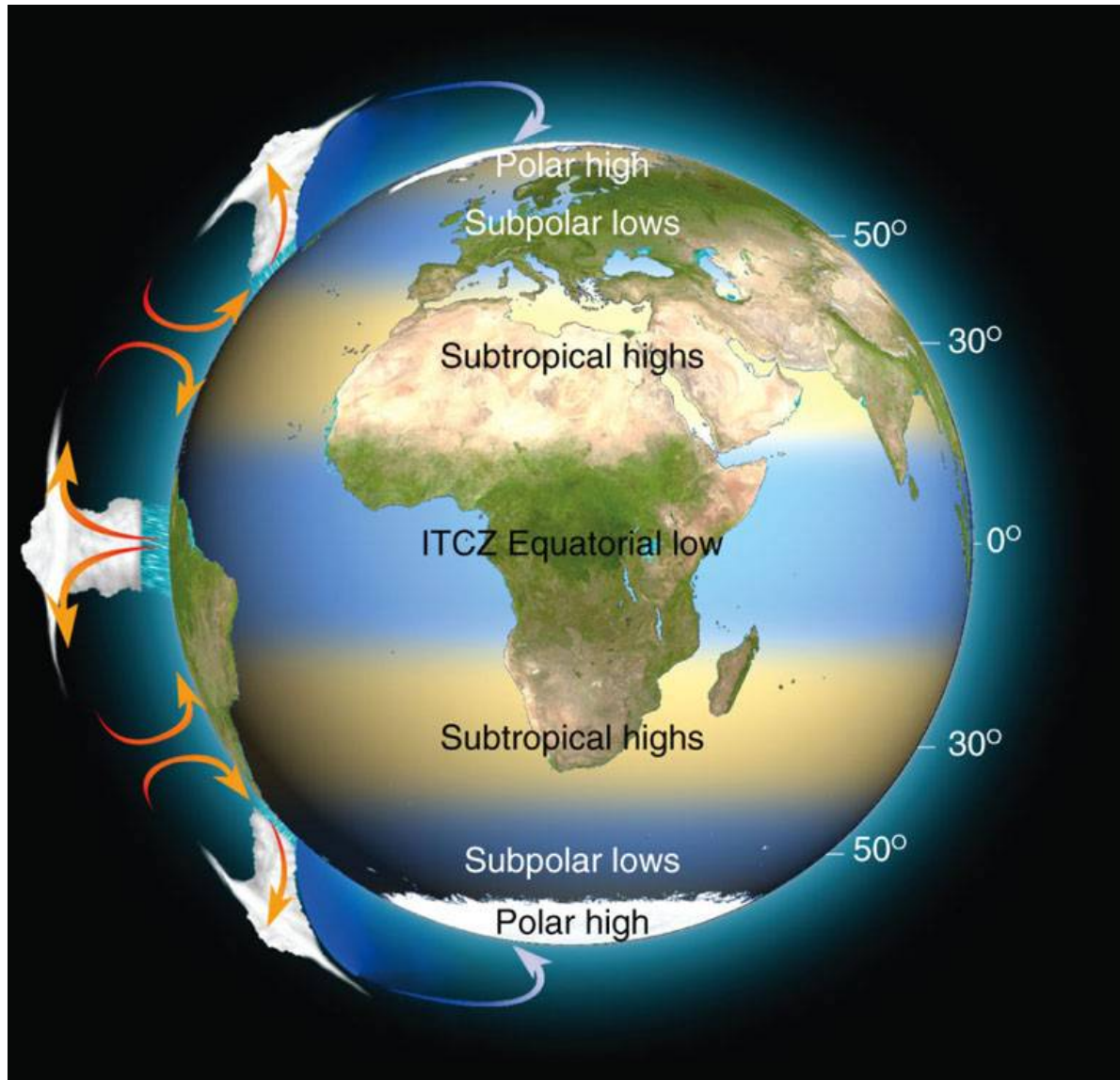


African crop research is diverse

- African crop science research is as diverse as its crops.... hundreds of crops and tens of thousands of landraces.
- There are 2000 languages in Africa, 1/3 of all living human languages, subdivided into 6 major linguistic families
- Each language reflects a unique culture with unique foods, crop species and landraces
- This cultural crop diversity intersects with biophysical diversity.....soils, climate.....

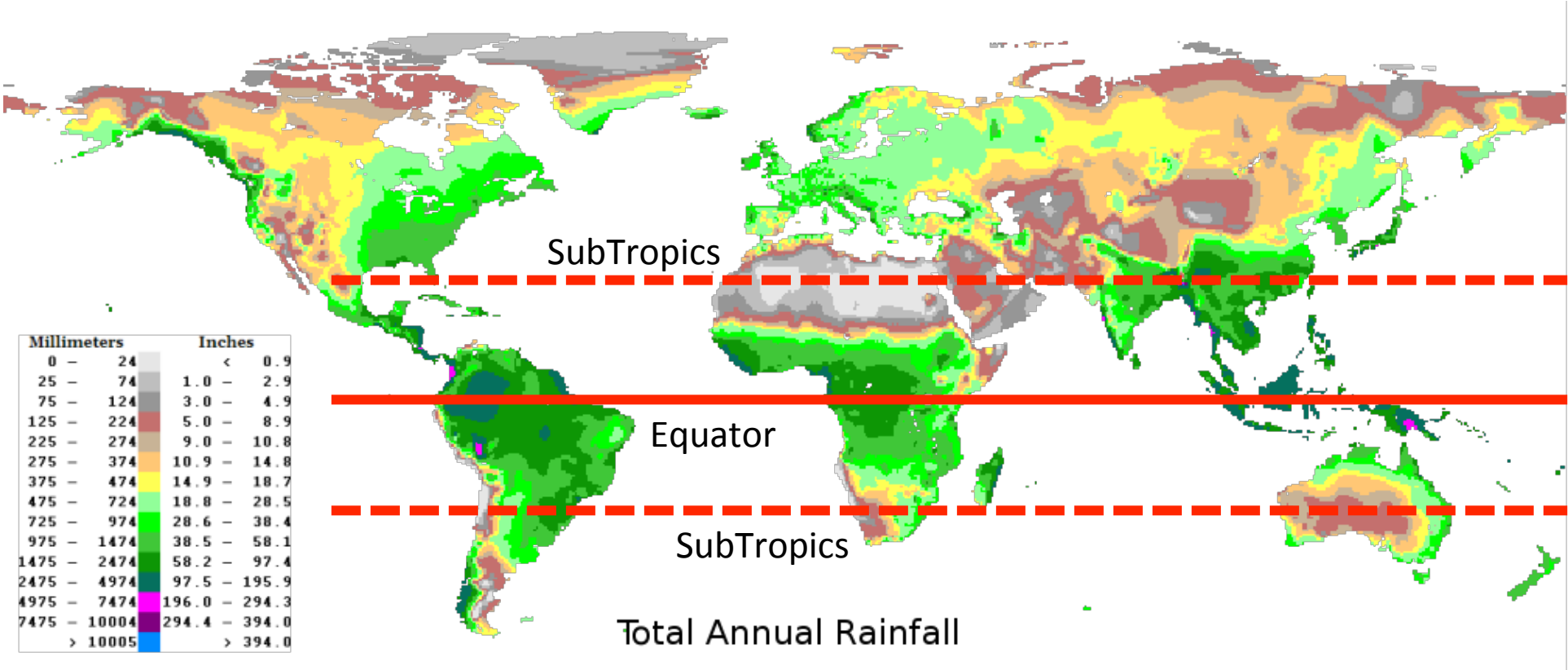
Africa is the only continent directly centered on the Equator:

Consequence: Middle of Africa is too wet, and the top and bottom of Africa are too dry



Hot, moist air rises at the equator, leaving dry air for the subtropics causing deserts

Equatorial zones, ocean currents and topology all influence global rainfall patterns (e.g. monsoons in Asia prevent Indian Subtropics from being totally dry)



Africa can be divided into aridity (moisture) zones that determine which crops can grow

These are the Rainfall zones of Africa (FAO):

1. **Hyper-arid (desert)** = <100 mm
(only shrubs, sometimes no rain for years)

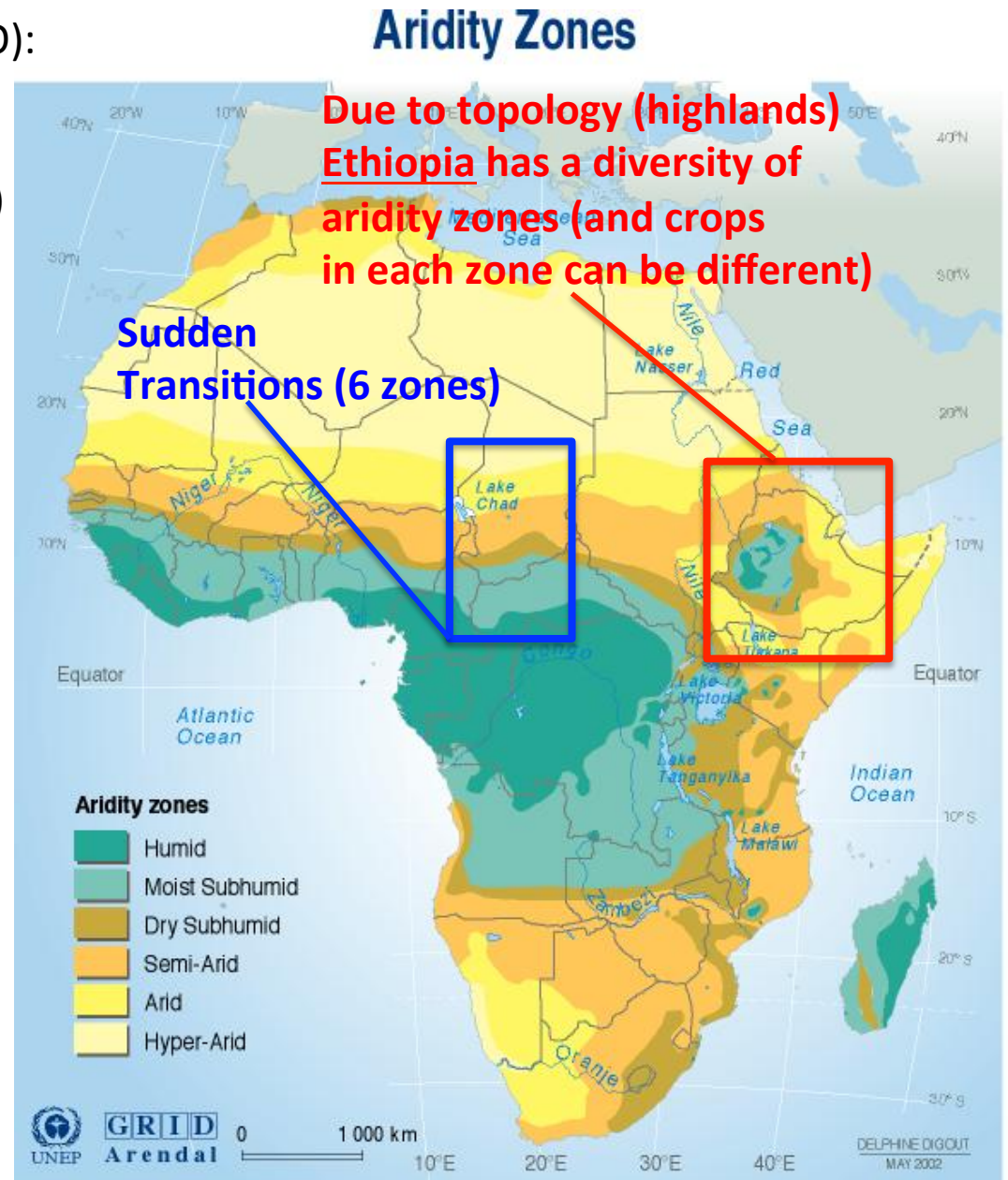
2. **Arid (semi-desert)** = little or no rain,
100-300 mm (1-59 growing days);
Sparse vegetation, annual or
perennial grasses, small
trees, pastoralism

3. **Semi-Arid (savanna)** = low rainfall
300-700 mm (variable, bi-modal rainfall)
60-119 growing days
--supports rain-fed agriculture
and sedentary livestock

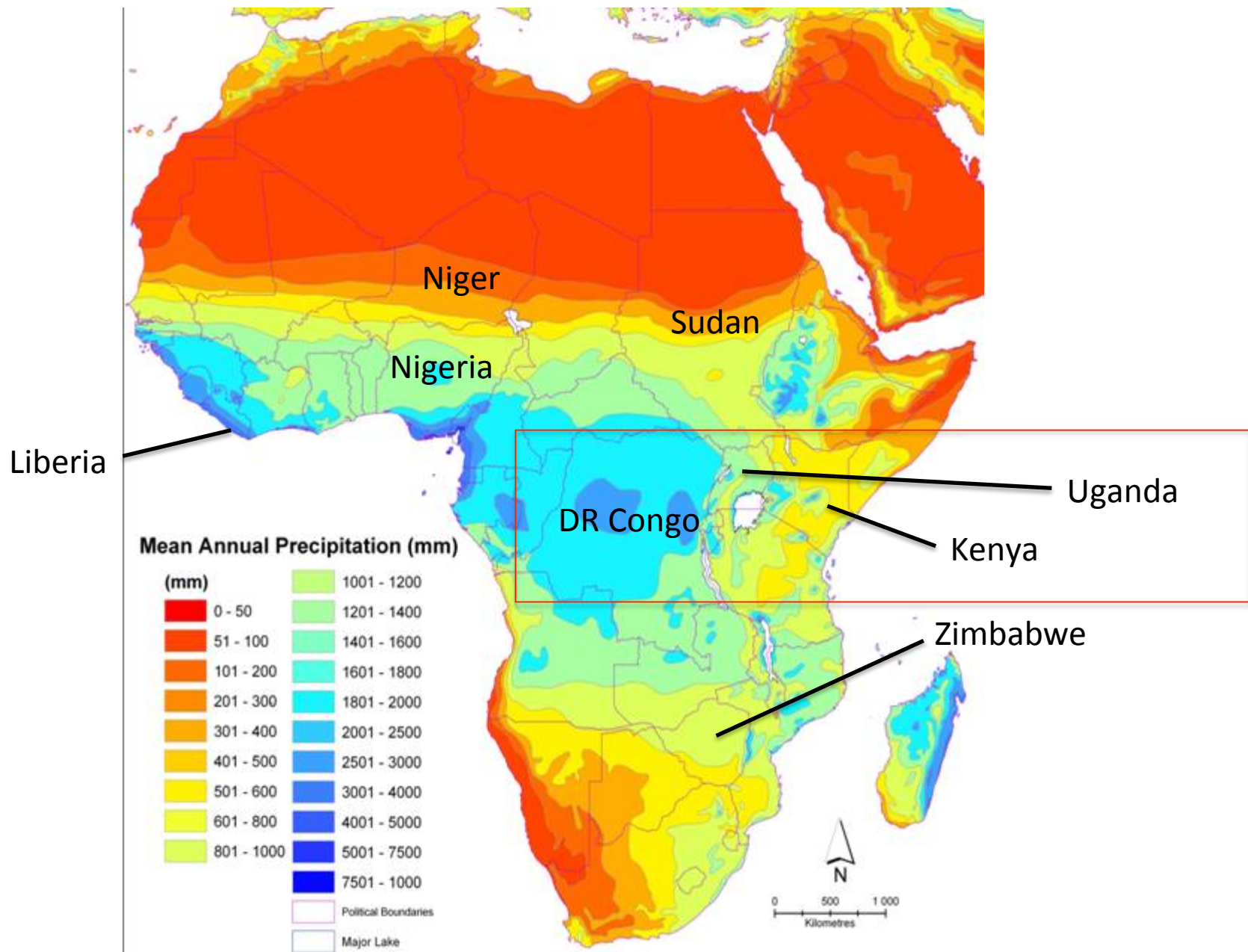
4. **Dry subhumid**
600-1200 mm (bi-modal rainfall pattern)
120-179 growing days

5. **Moist Subhumid (near-Tropical)**

6. **Humid (Tropical)**
>2000 mm (continuous rain: fungus, insects)



Source: World Meteorological Organization (WMO), United Nations Environment Programme (UNEP), *Climate Change 2001: Impacts, Adaptation, and Vulnerability*, Contribution of Working Group II to the Third Assessment Report of the Intergovernmental Panel on Climate Change (IPCC).



Source: FAOSTAT : <http://faostat.fao.org/site/609/default.aspx#ancor> FAO Water: http://www.fao.org/nr/water/infores_databases.html

	Consumption kCal/person/ day	maize	rice	wheat	millet	sorghum	cassava	plantain	yam	sweet potato
	Canada	116	98	649	~0	~0	~0	~0	~0	2
	Honduras	686	119	288	~0	34	6	77	~0	~0
	India	47	702	513	83	48	15	~0	~0	2
Very wet	DR Congo	201	72	77	3	1	861	26	4	9
	Liberia	~0	734	227	~0	~0	457	26	15	13
	Uganda	204	45	79	121	47	285	348	~0	189
Mixed	Nigeria	218	211	153	320	343	252	49	218	30
Dry	Kenya	695	73	195	21	18	30	34	~0	52
	Zimbabwe	922	20	247	25	56	44	~0	~0	~0
Driest	Sudan	21	17	351	153	612	1	~0	~0	~0
	Niger	26	136	36	930	256	24	~0	0	8

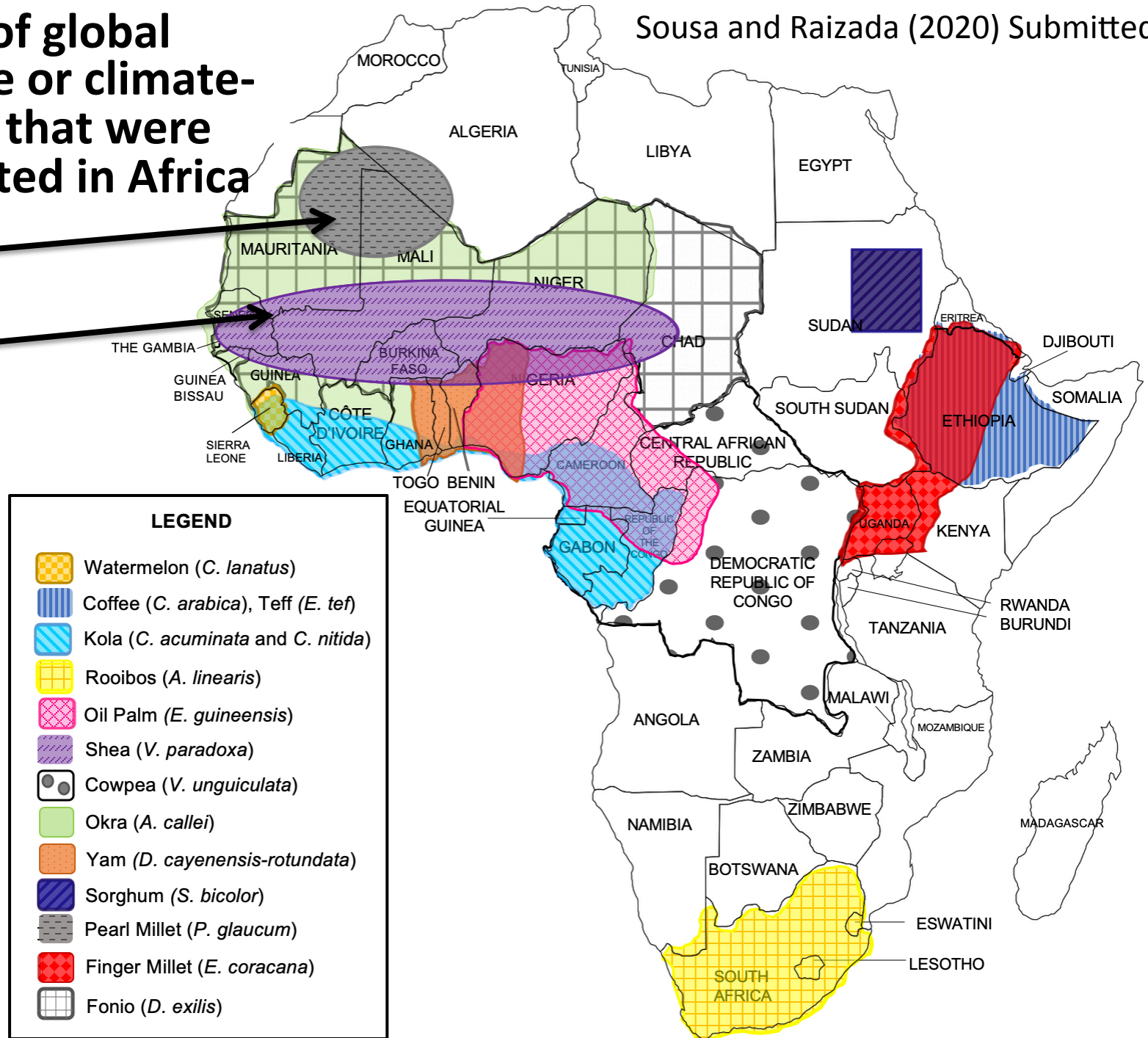
Crops of global importance or climate-friendly that were domesticated in Africa

Sousa and Raizada (2020) Submitted

Pearl millet

Fonio

West Africa is a major center of crop domestication



Indigenous African Crops: Pearl millet

Pearl millet (*Pennisetum*)

- World's 6th most important cereal crop
- domesticated near [Southern Morocco](#) 4000 years ago
- most tolerant of the major cereals to heat and drought
- commonly eaten as a porridge

distribution



Millet fried porridge



Indigenous African Crops: Fonio

Climate smart crop: Fonio (*Digitaria*)

- Grown in the Sahelian region of West Africa
 - world's fastest maturing cereal (>6 weeks), primarily eaten for carbohydrates
 - Highly nutritious, rich in rare amino acids cysteine and methionine, nearing a complete meal
 - matures early in growing season when people are most hungry
- So excellent crop to prevent hunger
- Grows well on poor, sandy soils
 - very delicious
 - drought tolerant



Source: Lost Crops of Africa (NRC)

Indigenous African Crops: Beverages



Coffee
(Ethiopia)



Kola nut (Coca cola)
(West-Central Africa)



Rooibos tea
(South Africa)

Indigenous African Crops: Watermelon



Watermelon and Egusi Melon (West Africa)

Indigenous African Crops (*Abelmoschus callei*) (West Africa)



FIGURE 4 | Okra

(A) Sliced okra pods in preparation for cooking. Source: S. Handa.

(B) Okra plant at the podding stage. Source: M. Shelton.

Indigenous African Crops: Yam (Niger River Basin)



Indigenous African Crops: Cereals

Sorghum (Sudan), Teff (Ethiopia), Finger Millet (E.Africa)



Indigenous African Crops: Oil palm (West Central Africa)



FIGURE 10 | Oil Palm (*Elaeis guineensis*)
(A) Fruits of an oil palm tree. Source: T. Crazzolaro. **(B)** Oil palm fruit harvested from West Kalimantan, Indonesia. Source: N. Sujana/CIFOR. **(C)** Aerial view of an oil palm plantation in West Kalimantan, Indonesia. Source: N. Sujana/CIFOR.

Indigenous African Crops: Shea (Eastern-Central African Savanna)



FIGURE 11 | Shea (*Vitellaria paradoxa*)
(A) Processed shea butter. Source: Daveynin. **(B)** Shea tree nuts. Source: USAID West Africa Trade Hub. **(C)** Sheanuts and some unripe shea fruits collected in Sirigu, Upper West Region, Ghana. Source: F. Khron. **(D)** Women processing shea tree nuts into shea nut butter in Burkina Faso. Source: TREEAID. **(E)** *Vitellaria* sp. tree in Burkina Faso. Source: M. Schmidt.

Indigenous African Crops: Cowpea (West Africa)

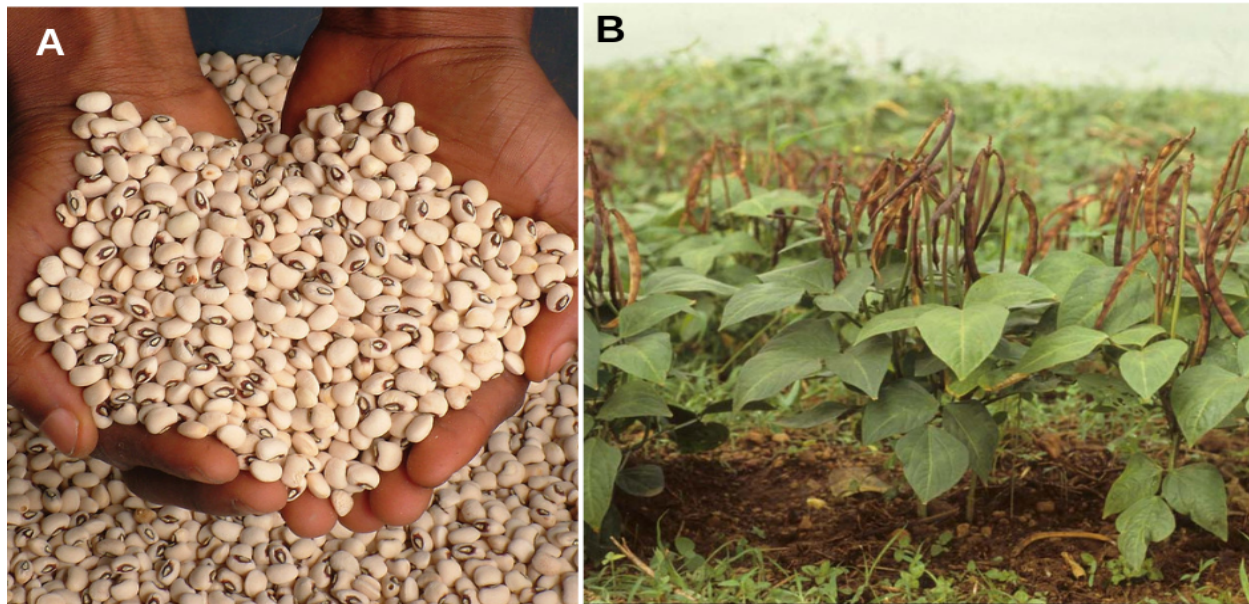


FIGURE 2 | Cowpea (*Vigna unguiculata*)

(A) De-podded and dried cowpeas. Source: Global Crop Diversity Trust.

(B) Cowpea plants at the podding stage. Source: International Institute for Tropical Agriculture.

Indigenous African Crops: Hundreds to Thousands of Local Crops (Leafy greens)



FIGURE 3 | African 'Leafy Greens'

(A) Amaranth (*Amaranthus cruentus*). Source: Scamperdale.

(B) Spider plant (*Cleome gynandra*). Source: F. Starr & K. Starr.

(C) Celosia (*Celosia sp.*) Source: B. Pettinger.

Therefore, there are many regions and
diverse crop expertise, so
collaborations are needed

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Seedbanks as partners for African crop genetic diversity (for omics/microbiome/breeding)

- CGIAR global seed portal: <https://www.genesys-pgr.org/>
- ICARDA (www.ICARDA.org) - 130,000 seed accessions - Seedbank in Marchouch, Morocco – barley, lentil, faba bean, chickpea, regional wheat.
Collaborator in Morocco: Dr. Ahmed Amri –Head of Germplasm Resources (a.amri@cgiar.org)
- International Institute for Tropical Agriculture - Ibadan, Nigeria –<https://www.iita.org/>
- 28,000 African accessions of cowpea, cassava, plantain and banana, yam, soybean, bambara groundnut, and maize (<https://www.iita.org/research/genetic-resources/>)
- <http://genebank.iita.org/>.
- **Collaborator: Dr. Michael Abberton, Head of Germplasm Resources: m.abberton@cgiar.org**
- ICRISAT in India (African sorghum, pearl millet, finger millet): <https://www.icrisat.org/gene-bank/>
- **Collaborator: Dr. Vanja Azevedo , Head of Germplasm Resources: v.azevedo@cgiar.org**
- International Maize Improvement Consortium for Africa (CIMMYT) <https://imic-africa.cimmyt.org/>
- (CIMMYT headquarters in Mexico for corn/wheat but field stations throughout Africa)
- **Collaborator: Dr. Kevin Pixley, Head of Germplasm Resources: k.pixley@cgiar.org**
- **Recent gene editing review from Kevin Pixley:**
<https://www.annualreviews.org/doi/10.1146/annurev-phyto-080417-045954>
- Eastern Africa Plant Genetic Resource Network:
<https://www.asareca.org/page/eastern-africa-plant-genetic-resources-network>
- There are also domestic seedbanks: e.g. Ethiopian Biodiversity Institute: <http://www.ebi.gov.et/>

Consultative Group on International Agricultural Research (CGIAR) as Partners



Assists developing countries, including in genomics, breeding, seed genetic resources.

World's largest partnership in agricultural research -- annual budget ~\$860 million USD/year

They have collaborative funding – e.g. donor countries pledged \$650 million USD to CGIAR recently to help farmers with climate change

CGIAR experts are
in Africa
(5 centers)

+
Research
programs + field
stations for
several other
centers
(CIP, CIMMYT,
CIAT, ICRISAT)

Overview of
CGIAR research in
SSA:

<http://www.ifpri.org/publication/role-cgiar-agricultural-research-development-africa-south-sahara>



International Crops Research Institute for the Semi-Arid Tropics (ICRISAT)



International Rice Research Institute (IRRI)



Center for International Forestry Research (CIFOR)



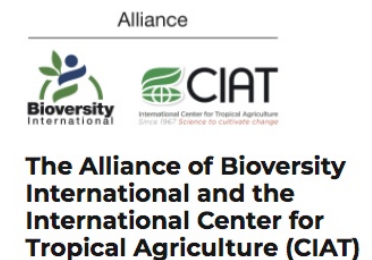
International Food Policy Research Institute (IFPRI)



International Maize and Wheat Improvement Center (CIMMYT)



International Water Management Institute (IWMI)



Collaborative Group of International Agricultural Research (CGIAR) as Partners

International Center for Agricultural Research in the Dry Areas (ICARDA) near Rabat – Senior Scientists - <https://www.icarda.org/about-us/our-experts>

-Omics and other research publications (also experts in ag- economics, agronomy, social sciences, breeding, etc)

-Recent genomics publication from ICARDA in Morocco:

<https://www.frontiersin.org/articles/10.3389/fevo.2020.00032/full>

Africa Rice (Cote d'Ivoire) Staff: <https://www.africarice.org/senior-staff>

IITA (Nigeria) Staff: <https://www.iita.org/about-iita/staff/>

CGIAR (CIAT) - Pan-Africa Bean Research Alliance - <https://ciat.cgiar.org/global-partnerships/pabra/>

CGIAR Platform for Big Data in Agriculture –collaborators in bioinformatics/ computational biology -- <https://bigdata.cgiar.org/>

CIMMYT in Africa (maize/wheat): <https://www.cimmyt.org/location/africa/>

Agricultural Universities in Africa as Partners

Examples...But Many Many Others

- **Ethiopia:** Hawassa University, Jima University, Bahir Dar University, Mekelle University, and others
- **Egypt:** Mansoura University, Others
- **Ghana:** Kwame Nkrumah University of Science and Technology (KNUST)
- **Kenya:** Jomo Kenyatta Univ of Science and Technology, University of Nairobi, Kenyatta University
- **Nigeria:** Ahmadu Bello University (2nd largest university in Africa); University of Agriculture Abeokuta, Obafemi Awolowo University
- **South Africa:** Stellenbosch University, University of KwaZulu Natal, University of Pretoria, Others
- **Tanzania:** Sokoine University of Agriculture
- **Uganda** - Makerere University

Ministries of Agriculture as Partners

Often very grounded research but can lack funding

- **Ethiopia:** Ethiopian Institute for Agricultural Research (TOUR)
- <http://www.eiar.gov.et/>
- Research Centers: <http://www.eiar.gov.et/index.php/en/research/research-centers>

- **Ghana:** Crops Research Institute: <https://www.cropsresearch.org/> (TOUR)
- Ghana - Council for Scientific and Industrial Research (CSIR) – soil institute, food, forestry, et : <https://www.cropsresearch.org/>

- **Kenya:** <http://www.kilimo.go.ke/>

- **Tanzania:** <https://www.kilimo.go.tz/index.php/en>

- **Nigeria:** <https://fmard.gov.ng/>

- **Senegal:** Senegalese Agricultural Research Institute

- **South Africa:** <http://www.daff.gov.za/>

- **Many Others:** Algeria, Morocco, Egypt, Botswana, Senegal, Cote d'Ivoire, Angola, etc.....

Genomics + Bioinformatics Collaborators in Africa

H3Africa Consortium: Human Heredity and Health in Africa (www.H3Africa.org)
<https://www.ft.com/content/eed0555c-5e2b-11ea-b0ab-339c2307bcd4>

African Collaborative Centre for Microbiome and Genomics Research, Nigeria:
<https://h3accme.com/>

- African Genomics Centre (South Africa) Collaboration between South African Medical Research Council + Beijing Genomics Institute (announced in 2019)....**coming soon**

- South African National Bioinformatics Institute (University of the Western Cape)
<https://www.uwc.ac.za/Faculties/NS/SANBI/Pages/Research-Interests-and-Current-Projects.aspx>

- BECA (Kenya) : Genomics, bioinformatics, mycotoxin analysis, molecular breeding, microbiology, research computing (**Tour**) <https://hub.africabiosciences.org/activities/services>

- African Centre of Excellence in Bioinformatics (Mali):
<http://www.aceb-mali.org/2019/12/16/african-center-of-excellence-in-bioinformatics-ace-b/>

- Genomics Research Institute, Pretoria, South Africa: <https://www.up.ac.za/the-genomics-research-institute>

- American University in Cairo, Bioinformatics and Integrative Genomics:
<https://sse.aucegypt.edu/departments/biology/facilities/BIG-lab>

- The African Microbiome Institute (AMI), University of Stellenbosch, South Africa:
<http://www.sun.ac.za/english/faculty/healthsciences/african-microbiome-institute>

- Kwazulu-Natal Research Innovation and Sequencing Platform (KRISP) and Network for Genomic Surveillance in South Africa (NGS-SA) <https://www.krisp.org.za/>

African Genomics & Bioinformatics

Articles of Interest

From *Nature*: “The next chapter for African genomics: Nigeria is poised to become a hub for genetics research, but a few stubborn challenges block the way.”

<https://www.nature.com/articles/d41586-020-00454-1>

Article of interest: “Bioinformatics in Africa” (2015)

<https://www.sciencedirect.com/science/article/pii/S2212066115000204>

African Orphan Crops Consortium as a Partner in Breeding and Omics

- Creating genomic resources for 101 African crops
- University of California (Davis) and World Agroforestry Center (Kenya)

Tour:

<http://africanorphancrops.org/meet-the-crops/>

Good potential collaborators:

<http://africanorphancrops.org/partners-and-network/>

Finding Research Collaborators

- Tap into the African diaspora – Scientists of African origin who are now researchers elsewhere
- Partner with African scientists in Africa and then together seek global funding as part of a network (which many global partners would like to see and at the correct scale)
- Use journal databases to find researchers who have published papers pertaining to your country (e.g. search “Ghana” and “groundnut”)

Plant scientists who are friends of Africa (long list but a few inspiring examples)

Many CGIAR scientists around the world (www.cgiar.org)

IRD, CIRAD - Montpellier and Toulouse – various omics and microbiome researchers who work in North Africa especially Tunisia and Senegal e.g. Prof. Lionel Moulin and colleagues at CIRAD – African soil microbiome

<https://www6.inrae.fr/agrosym/Equipes/UMR-Laboratoire-des-Symbioses-Tropicales-et-Mediterraneennes-Equipe-MASCE-Montpellier>

Dr. Allen Van Deynze (University of California, Davis) – African crop genomics

<https://www.ucdavis.edu/person/articles/846>

Dr. Yves Vigouroux, IRD, Montpellier, France - African crop domestication/diversity genomics

<https://sites.google.com/site/plantbiodiversityadaptation/members/permanents/yves-vigouroux>

Dr. Diane Saunders, John Innes Centre – Pathologist:

<https://www.jic.ac.uk/people/diane-saunders/>

Prof. Gebisa Ejeta – Purdue University, Winner World Food Prize: Sorghum

<https://ag.purdue.edu/agry/directory/Pages/gejeta.aspx>

Prof. Jonathan Lynch – Penn State University – root biology:

<https://plantscience.psu.edu/directory/jpl4>

Prof. Ken Giller – Wageningen University - ecophysiological, nitrogen fixation, N2Africa:

<https://www.wur.nl/en/Persons/Ken-prof.dr.-KE-Ken-Giller.htm>

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African Funding for Grants (+Scholarships and Fellowships) that Foster Collaboration

**The Alliance for Accelerating Excellence in Science in Africa (AESA)
(African Academy of Science)**

<https://www.aasciences.africa/aesa>

Funding: <https://www.aasciences.africa/funding>

African Union Grants (EU partnership):

<https://africa-eu-partnership.org/en/projects/african-union-research-grants-ii>

**Africa – Regional Universities Forum for Capacity Building in Africa (RUFORM) –
Scholarships:** <https://ruforum.wordpress.com/>

Afrique One Alliance: <http://afriqueoneaspire.org/opportunities/>

Funds4Africa.org - <http://www.funds4africa.org/en/category/calls-for-proposals/>

OTHER?

Other links:

AfterSchoolAfrica.com: <https://www.afterschoolafrica.com/>

Advance Africa: https://www.advance-africa.com/Research_Grants.html

External Funding Opportunities:

National Science Councils and Agencies

- Different science agencies sometimes have ad-hoc programs that permit partner funds with scientists in other countries.
- Google: “Science council international” + country

Global Database:

SciDevNet: <https://www.scidev.net/>

Examples:

- Canada – Portal:

<https://www.canada.ca/en/services/science/researchfunding/internationalopportunitiescollaboration.html>

- Canada – Current: New Frontiers in Research Fund:

<https://www.sshrc-crsh.gc.ca/funding-financement/nfrf-fnfr/index-eng.aspx>

- European Research Council:

<https://erc.europa.eu/>

- European Commission: <https://ec.europa.eu/jrc/en>

https://ec.europa.eu/info/research-and-innovation_en

https://ec.europa.eu/info/research-and-innovation/funding/funding-opportunities_en

- Japan: Japan Society for the Promotion of Science: <https://www.jsps.go.jp/english/>

<https://www.jsps-sto.com/fundingopportunities-4-2/>

External Funding Opportunities:

National Science Councils and Agencies - Continued:

- Brazil – CAPES: <https://capes.gov.br/> and <http://www.cnpq.br/>
- Denmark: Independent Research Fund Denmark:
<https://dff.dk/en/about-us/international-cooperation-1>
- European Cooperation in Science and Technology (COST):
<https://www.cost.eu/who-we-are/about-cost>

- France – INSERM:
<https://www.inserm.fr/en/professional-area/appels-projets-et-financements/financements-pour-collaboration-internationale-et-europeenne/funding-programs-for-all-countries>
- Campus France: <https://www.campusfrance.org/en>
- French National Research Agency: <https://anr.fr/en/>

- Germany – DFG Science Cooperation with Developing Countries:
https://www.dfg.de/en/research_funding/programmes/international_cooperation/developing_countries/index.html
- Germany – DAAD - German Academic Exchange Service:
<https://www2.daad.de/deutschland/studienangebote/international-programmes/en/>
- Germany - Kooperation International: <https://www.kooperation-international.de/en/>
- Germany - Humboldt Foundation: <http://www.humboldt-foundation.de/web/home.html>

External Funding Opportunities:

National Science Councils and Agencies - Continued:

- Human Frontiers Science Program - <https://www.hfsp.org/>
- IIE - <https://www.iie.org/>
- Switzerland - <https://www.hes-so.ch/>
- United Kingdom – UK Research and Innovation (UKRI) – International Funding Opportunities:
<https://www.ukri.org/research/international/international-funding-opportunities/>
- United States- USAID -
<https://www.grants.gov/learn-grants/grant-making-agencies/agency-for-international-development.html>
- United States - NSF Office of International Science and Engineering:
https://www.nsf.gov/funding/pgm_list.jsp?org=OISE
- United States – US Department of Agriculture: <https://nifa.usda.gov/page/search-grant>
- USA Grants Portal: <https://www.grants.gov/>
- UN World Academy of Sciences (TWAS):
<https://twas.org/opportunities/research-grants>

External Funding Opportunities:

International Development Proposals - Tips

1. May need a partner from the donor country.
2. Establish relationships before call for proposals (e.g. 1 student).
3. Have a social scientist as a team member.
4. Gender balanced and gender-focused.
5. Emphasize impact evaluation metrics (M&E), and financial transparency mechanisms.
6. Include academic exchanges and training (must show safety).
7. Theory of change is critical.....good science may not be enough but connecting to how it changes livelihoods.
8. Demonstrating scaling up strategy may be required.
9. Have a social media presence so donors can see you and your impact (as important as good science) – YouTube, Twitter, etc.
10. Often huge written proposals, with low chance of success.
11. If possible, have a full-time professional grants writer on staff.
12. Need to be patient – could be >1 year before a decision/start of funding. Typically \$1-\$5 million USD for the entire team.

External Funding Opportunities:

International Development – Government Funding

• Governments may have multiple agencies that deliver international development funding (e.g. development, research, science grants, agricultural trade, private sector entrepreneurs, scholarships, fellowships)

For example – Canada (federal, additional provincial agencies):

• **Development:** Global Affairs Canada (formerly CIDA, merged with former Dept of Foreign Affairs)

https://www.international.gc.ca/world-monde/funding-financement/funding_development_projects-financement_projets_developpement.aspx?lang=eng

• **Research for development:** International Development Research Centre (IDRC, Canada) <https://www.idrc.ca/en/funding>

• **Basic Science:** Natural Sciences and Engineering Research Council (NSERC): <https://www.nserc-crsng.gc.ca/> (CIHR for health; SSHRC for social sciences)

• **Entrepreneurial science:** MITACS:

<https://www.mitacs.ca/en/programs/accelerate/mitacs-accelerate-international>

• **Trade/Business International Portal:**

<https://www.international.gc.ca/world-monde/funding-financement/index.aspx?lang=eng>

• Federal government ministries and agencies have separate programs: Agriculture and Agri-food Canada (AAFC), Environment, etc.

External Funding Opportunities:

International Development – Government Agencies

- Australia: Dept. of Foreign Affairs and Trade: <https://www.dfat.gov.au/aid/australias-development-program>
- Austrian Development Agency: <https://www.entwicklung.at/en/>
- Belgium – Belgium Development Agency (Enabel): <https://www.enabel.be/>
- Canada – previous slide
- China - China International Development Cooperation Agency: <http://en.cidca.gov.cn/> (launched 2019)
- Denmark: DANIDA: <https://um.dk/en/danida-en/>
- Finland – FINNIDA – Finnish International Development Agency - <https://finnida.fi/>
- France – IRD: <https://en.ird.fr/> (research for development) and CIRAD <https://www.cirad.fr/> (agronomic research)
- Germany – Federal Ministry for Economic Cooperation and Development (decentralized): <https://www.bmz.de/en/>
- Germany – Marshall Plan with Africa: https://www.bmz.de/en/countries_regions/marshall_plan_with_africa/index.html
- Italy: Italian Agency for Development Cooperation - <https://www.aics.gov.it/language/en/>
- Ireland: Irish Aid - <https://www.irishaid.ie/>
- Israel: - MASHAV - <https://mfa.gov.il/mfa/mashav/pages/default.aspx>
- Japan – JICA – Japan International Cooperation Agency - <https://www.jica.go.jp/english/> \

External Funding Opportunities:

International Development – Government Agencies

(Continued)

- Netherlands – Netherlands Development Cooperation - <https://www.government.nl/topics/development-cooperation>
- New Zealand – NZ Aid Program: <https://www.mfat.govt.nz/en/aid-and-development/>
- Norway – Norwegian Agency for International Cooperation: <https://norad.no/en/front/>
- South Korea – Korea International Cooperation Agency (KOICA) http://www.koica.go.kr/sites/koica_en/index.do
- Spain – Spanish Agency for International Development Cooperation (AECID): <http://www.exteriores.gob.es/Portal/en/PoliticaExteriorCooperacion/CooperacionAlDesarrollo/Paginas/AECID.aspx>
- Switzerland – Swiss Agency for Development and Cooperation: <https://www.eda.admin.ch/sdc>
- Swiss-African – SARECO - <https://www.sareco.org/funds/>
- Sweden – Swedish International Development Agency: <https://www.sida.se/English/>
- U.K. (in 2020, DFID merged with Foreign and Commonwealth Office): Official Development Assistance:
<https://www.gov.uk/government/collections/official-development-assistance-oda--2>
<https://www.ukaidirect.org/> (civil societies)
- US-AID (USA): <https://www.usaid.gov/work-usaid/get-grant-or-contract/opportunities-funding>
- **Foreign Embassies/Consulates – they often have smaller pockets of money, small applications, local decision-making**

External Funding Opportunities:

International Development/Agriculture/Science/ Climate Change – Philanthropies

- Top 100 Philanthropies Globally with Links (each >\$500 million USD):
<https://www.arcolab.org/en/worlds-100-largest-philanthropic-foundations-list/>
- Devex Portal: <https://www.devex.com/funding-overview>
- Guidestar Portal (food, agriculture USA):
<https://www.guidestar.org/NonprofitDirectory.aspx?cat=5&subcat=24&p=1>
- Funds 4 NGOs: <https://www2.fundsforngos.org/>
- Inside Philanthropy List: <https://www.insidephilanthropy.com/grants-for-global-development>
- Terra Viva Grants Portal: <https://terravivagrants.org/grant-makers/>
- Peak Proposal Africa List: <https://www.peakproposals.com/africa-funding-sources>
- Wikipedia Charitable Foundations List: https://en.wikipedia.org/wiki/List_of_charitable_foundations
- Gates Foundation (usually they approach you):
<https://www.gatesfoundation.org/How-We-Work/General-Information/Grant-Opportunities>
- Rockefeller (USA): <https://www.rockefellerfoundation.org/>
- McKnight Foundation (USA): <https://www.mcknight.org/>
- Ford Foundation: <https://www.fordfound.org/>
- Jack Ma Foundation African Entrepreneur: <https://www.jackmafoundation.org.cn/>
- Sasakawa Africa Association: <https://www.saa-safe.org/>
- Nippon Foundation for African Agriculture: https://www.nippon-foundation.or.jp/en/what/projects/africa_seeds
- Grameen Foundation: <https://grameenfoundation.org/>

External Funding or Collaboration Opportunities: Pan-National

United Nations International Fund for Agricultural Development (IFAD):

<https://www.ifad.org/en/grants>

CGIAR – Collaborative Group of International Agricultural Research

--They have their own funding

--Interesting to see which organizations fund the CGIAR and hence are interested

In global agriculture (and might fund your project)

<https://www.cgiar.org/dashboards/grants/funder-view/>

UN Food and Agricultural Organization (FAO)

<http://www.fao.org/home/en/>

External Funding Opportunities:

International funding for private sector initiatives

- **Governments:** More and more public international development funding is for entrepreneurs who will create local jobs and not continuously rely on donor funding
 - there are separate from traditional funds
 - large pockets of funds available
 - could include funds for a university-public partner
 - significant funds available that boost trade (e.g. Germany Trade for Development Fund)
- **Philanthropies:** Philanthropies such as the Gates Foundation and others are heavily investing in private enterprises that have a social, environmental, health, or food security mission
- **Financial institutions** - World Bank and regional financial institutions
- **Private equity** - venture capital, angel investors, etc.

External Funding Opportunities:

International Development Proposals - Tips

1. May need a partner from the donor country.
2. Establish relationships before call for proposals (e.g. 1 student).
3. Have a social scientist as a team member.
4. Gender balanced and gender-focused.
5. Emphasize impact evaluation metrics (M&E), and financial transparency mechanisms.
6. Include academic exchanges and training (must show safety).
7. Theory of change is critical.....good science may not be enough but connecting to how it changes livelihoods.
8. Demonstrating scaling up strategy may be required.
9. Have a social media presence so donors can see you and your impact (as important as good science) – YouTube, Twitter, etc.
10. Often huge written proposals, with low chance of success.
11. If possible, have a full-time professional grants writer on staff.
12. Need to be patient – could be >1 year before a decision/start of funding. Typically \$1-\$5 million USD for the entire team.

Outline



1. African crops and hence expertise are diverse



2. Collaborators



3. Grant funding to enable collaborations



4. Scholarships and fellowships



5. Need and Opportunity for collaboration

African Funding for Grants (+Scholarships and Fellowships) that Foster Collaboration (duplicated slide)

**The Alliance for Accelerating Excellence in Science in Africa (AESA)
(African Academy of Science)**

<https://www.aasciences.africa/aesa>

Funding: <https://www.aasciences.africa/funding>

African Union Grants (EU partnership):

<https://africa-eu-partnership.org/en/projects/african-union-research-grants-ii>

**Africa – Regional Universities Forum for Capacity Building in Africa (RUFORM) –
Scholarships:** <https://ruforum.wordpress.com/>

Afrique One Alliance: <http://afriqueoneaspire.org/opportunities/>

Funds4Africa.org - <http://www.funds4africa.org/en/category/calls-for-proposals/>

OTHER?

Other links:

AfterSchoolAfrica.com: <https://www.afterschoolafrica.com/>

Advance Africa: https://www.advance-africa.com/Research_Grants.html

Funding for PhD and Postdoctoral Fellowships to Enable Global Collaboration: **Opportunities**

Germany: Humboldt Foundation (postdoctoral fellowships):

<http://www.humboldt-foundation.de/web/home.html>

- International Foundation for Science: <http://www.ifs.se/>
- Organization for Women in Science for the Developing World (OWSD): <https://owsd.net/owsd-fellowships>
- Rotary International: <https://www.rotary.org/en/our-programs/scholarships> (also check local city chapters)
- Biodiversity International Scholarships/Fellowships: <https://www.biodiversityinternational.org/about-us/opportunities/fellowships/>
- Marie Curie Fellowships Program: <https://ec.europa.eu/research/mariecurieactions/>
- IPCC climate change PhD scholarships: <https://www.ipcc.ch/about/scholarship/>
- UNESCO/Korea Fellowships: <https://www.un.org/ldcportal/unescorepublic-of-korea-co-sponsored-fellowships-programme/>
- Japan/UNESCO:Keizo Obuchi Fellows Program: <https://en.unesco.org/fellowships/keizo-obuchi/>

Apart from scholarships/fellowships, professors typically have no barriers in terms of supporting international researchers from their domestic grant funding, however international tuition may be double, which creates a disincentive. International postdoctoral fellows cost the same as domestic.

Funding for PhD and Postdoctoral Fellowships to Enable Global Collaboration: **Opportunities**

- Domestic science agencies in Western countries may have separate funding initiatives for this
- Google: “science research funding” + “country” (or subnational state/province name e.g. California)
- Database: Scholars 4 Development: <https://www.scholars4dev.com/>
<https://www.scholars4dev.com/category/field-of-study/natural-science-scholarships/>
-More medical related: <https://www.fic.nih.gov/Funding/NonNIH/Pages/default.aspx>

Select Examples (but many others):

- USA: United States Department of Agriculture (USDA)
<https://www.fas.usda.gov/programs>
- Canada Portal - <https://www.educanada.ca/scholarships-bourses/> (including Vanier Graduate Scholarship and Banting Postdoctoral Fellowship –both highly competitive)
- Canada - Ontario Graduate Scholarships (OGS) (subnational)
<https://osap.gov.on.ca/OSAPPortal/en/A-ZListofAid/PRDR019245.html>
- Switzerland:
<http://www.snf.ch/en/funding/science-communication/scientific-exchanges/Pages/default.aspx>
<http://www.snf.ch/en/funding/directaccess/young-researchers/Pages/default.aspx>
- New Zealand: <https://www.mfat.govt.nz/en/aid-and-development/new-zealand-government-scholarships/>
- China: China Scholarship Council <https://www.chinesescholarshipcouncil.com/>
- International Foundation for Science: <http://www.ifs.se/>
- Organization for Women in Science for the Developing World (OWSD): <https://owsd.net/owsd-fellowships>
- Rotary International: <https://www.rotary.org/en/our-programs/scholarships> (also check local city chapters)

Note about scholarships/fellowships

Apart from scholarships/fellowships, professors typically have no barriers in terms of supporting international researchers from their domestic grant funding, however international tuition may be double, which creates a disincentive. International postdoctoral fellows cost the same as domestic.

Funding for Foreign PhD and Postdoctoral Fellowships that Enable Collaborations: **Tips #1**

1. Foreign students may or may not be eligible for scholarships/fellowships given to domestic students.
2. International tuition can vary dramatically between universities within a country.
3. There may be dedicated separate funding programs for international students.
4. There may be funding at both the national level and sub-national level (e.g. provincial/state scientific funding agencies).
5. Need a support letter from potential new advisor, so start relationships early and be patient (1-2 years).
6. Some institutions have one deadline per year for PhDs; others have no deadline (can start any semester). Postdoctoral fellows can start anytime.....

Funding for Foreign PhD and Postdoctoral Fellowships that Enable Collaborations: **Tips #2**

7. MOST IMPORTANT--**Send hard copies by mail** to potential supervisors, in addition to email (include cover letter with career objective, resume/CV, academic transcript copies, TOEFL/IELTS scores, 2-3 referee names)
- Customize cover letter for each potential lab (why interested in their lab).
 - Critical: Want to see evidence of good writing/language ability. Show IELTS/TOEFL scores.
 - Ideal but not necessary: Suggest potential scholarship/fellowships
 - Very impressed by publications in international journals and high grades.
 - I recommend sending envelopes to 50-100 potential advisors in multiple countries.
 - Better than directly applying to departments: find an interested advisor who has money first.
 - Do not be discouraged by lack of response to emails (recipients may never open your email since we are overwhelmed by daily emails).

How can a PhD student or Postdoctoral Fellow Meet a Professor in Another Country?

Suggestion: Attend an international conference and meet professors (look at abstracts and arrange to meet with them at the meeting).

Funding

For conferences/travel, many science societies (e.g. American Society of Plant Biology, Plants Canada, American Society of Microbiology) have travel funds dedicated to foreign students from low income countries which is a good way to meet potential advisors.

Outline



1. African crops and hence expertise are diverse



2. Collaborators



3. Grant funding to enable collaborations



4. Scholarships and fellowships



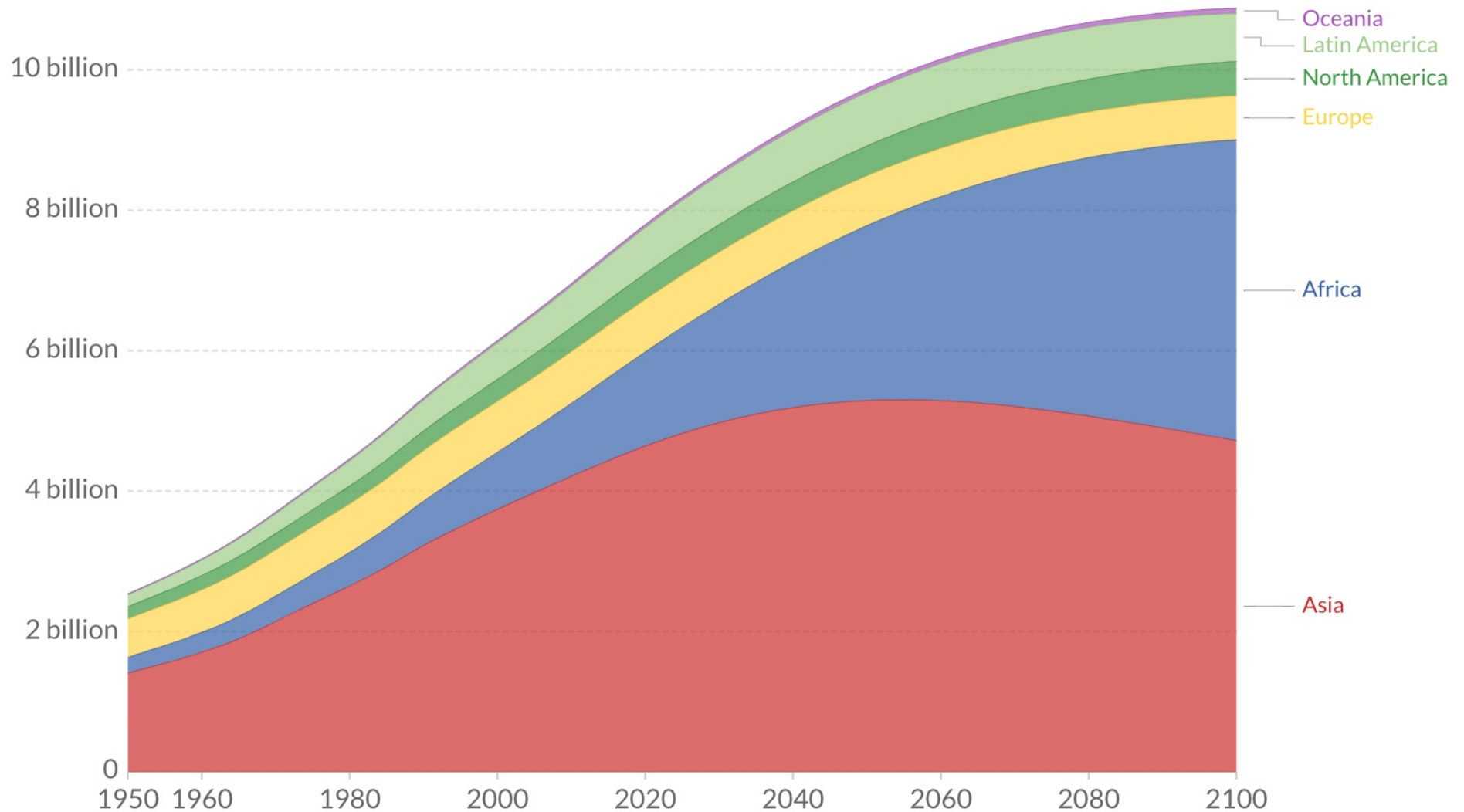
5. Need and Opportunity for collaboration

Big Opportunity for African Agriculture: Need for Collaboration

World population by region projected to 2100, 1950 to 2100

Projected population to 2100 is based on the UN's medium population scenario.

Our World
in Data

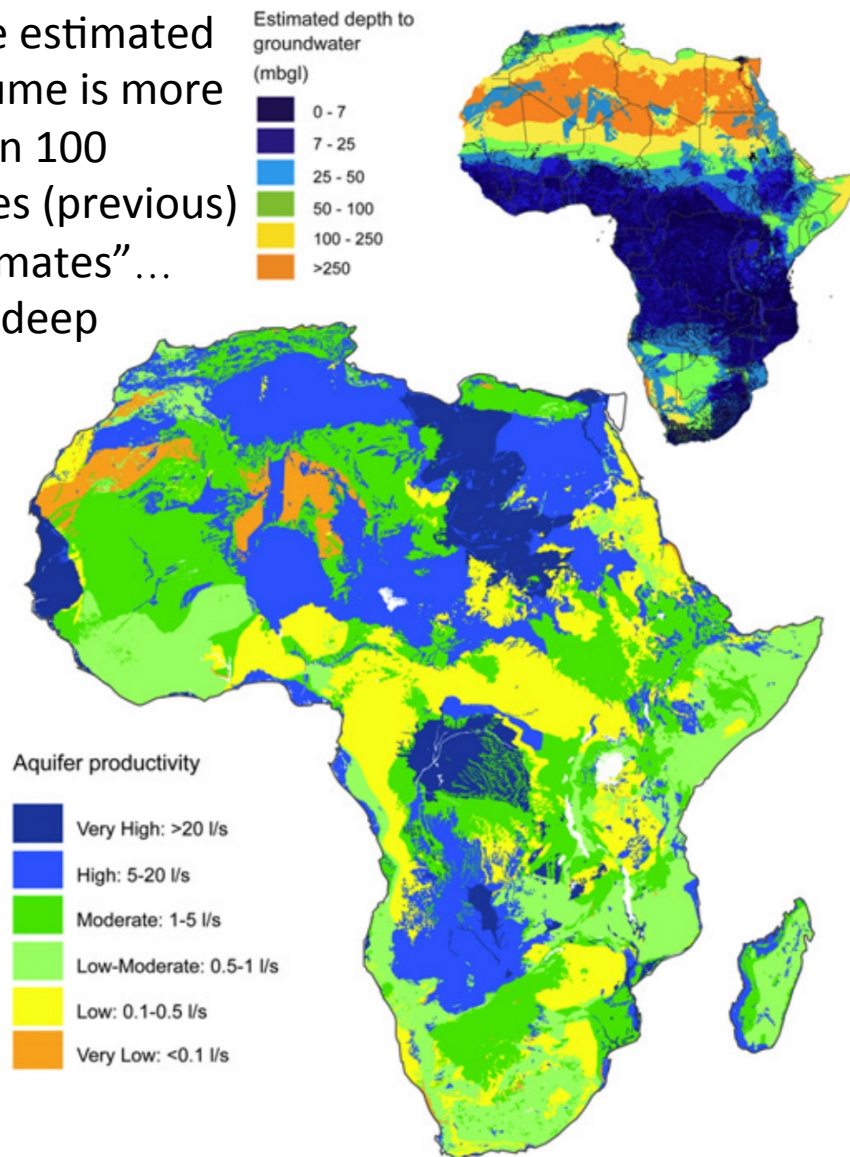


Source: HYDE (2016) & UN, WPP (2019)

CC BY

Opportunities for African agricultural collaboration? Climate change +H2O

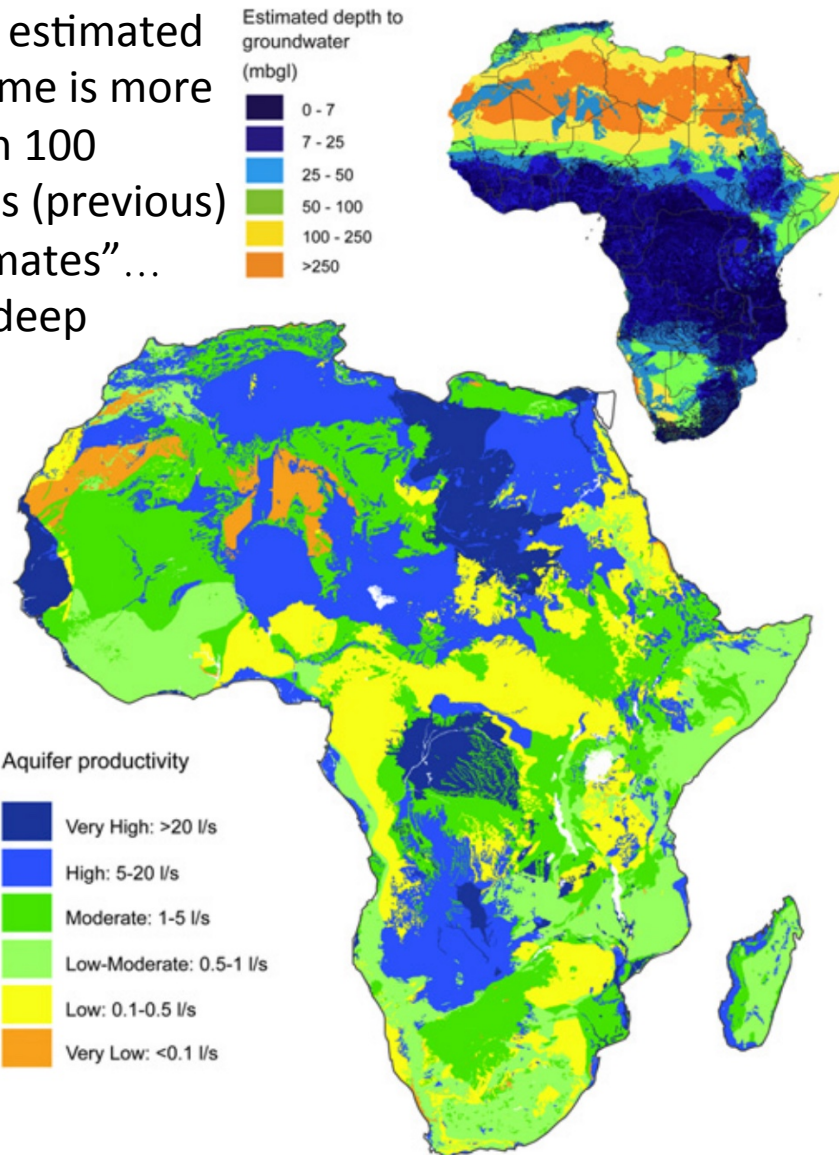
“the estimated volume is more than 100 times (previous) estimates” ... but deep



African ag collaboration opportunities?

Climate change +H2O

“the estimated volume is more than 100 times (previous) estimates” ... but deep



Is this possible?



MacDonald et al. (2012) Environ Sci Lett 7: 024009

Combine solar + ag expertise at UM6P?

Other big opportunities? Climate change +H2O

Perhaps the 21st century should be about water pipelines not oil pipelines

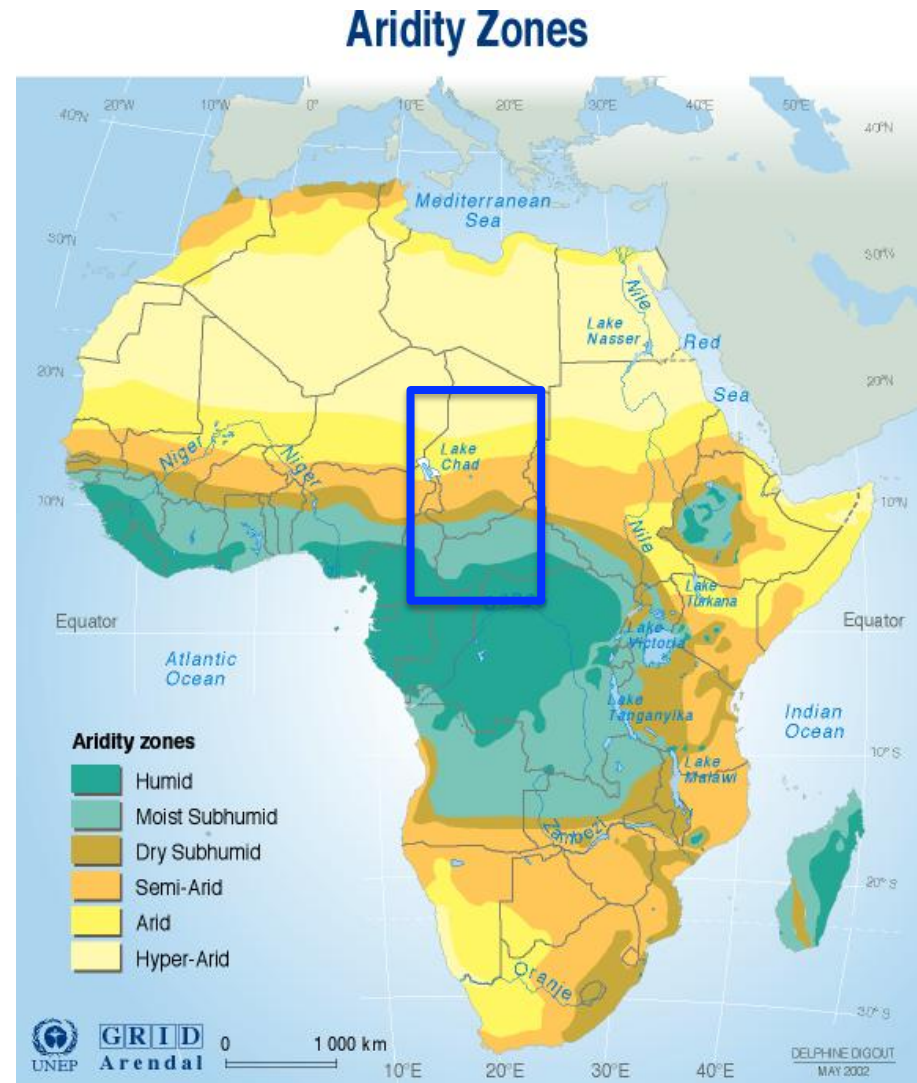
Driven by solar energy

To take water from tropical to subtropical zones.... analogous to California

....combine agronomists

+ engineers

+ solar expertise?



Big African Collaborative Private-Public Opportunities in Agriculture

- Access to agricultural extension
- Low fertility soils
- Access to irrigation, climate change and dry season adaptation
- Crop pests including nematodes
- Crop diseases
- Improved accessibility to inputs, high quality seeds, appropriate mechanization
- Breeding/solutions to aflatoxin
- Post-harvest improvement
- Improving under-utilized and indigenous crops
- Creating markets for high value African crops
- Improving animal veterinary services and vaccines
- Value addition and linkages to domestic/global markets

If Africa can engineer & build cities like this.....



Abidjan
Cote d'Ivoire



Gaborone
Botswana



Maputo
Mozambique



Addis Ababa
Ethiopia

...then Africa can also transform its research
and agriculture

Final Thought

African scientists living in Africa need to be seen as true partners at the cutting edge of science, not only as conduits to resources (e.g. germplasm, diversity).

This is finally happening.

Be confident!

Summary



1. African crops and hence expertise are diverse



2. Collaborators



3. Grant funding to enable collaborations



4. Scholarships and fellowships



5. Need and Opportunity for collaboration

THANK YOU!



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This slideshow is available from UM6P and the
Raizada Lab Website:

www.RaizadaLab.Weebly.com