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Climatic Hazards in Africa and Insights for Farmers' Food Security

The 3rd Basel Sustainability Forum: Climate,

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04.06.2018

Key Messages

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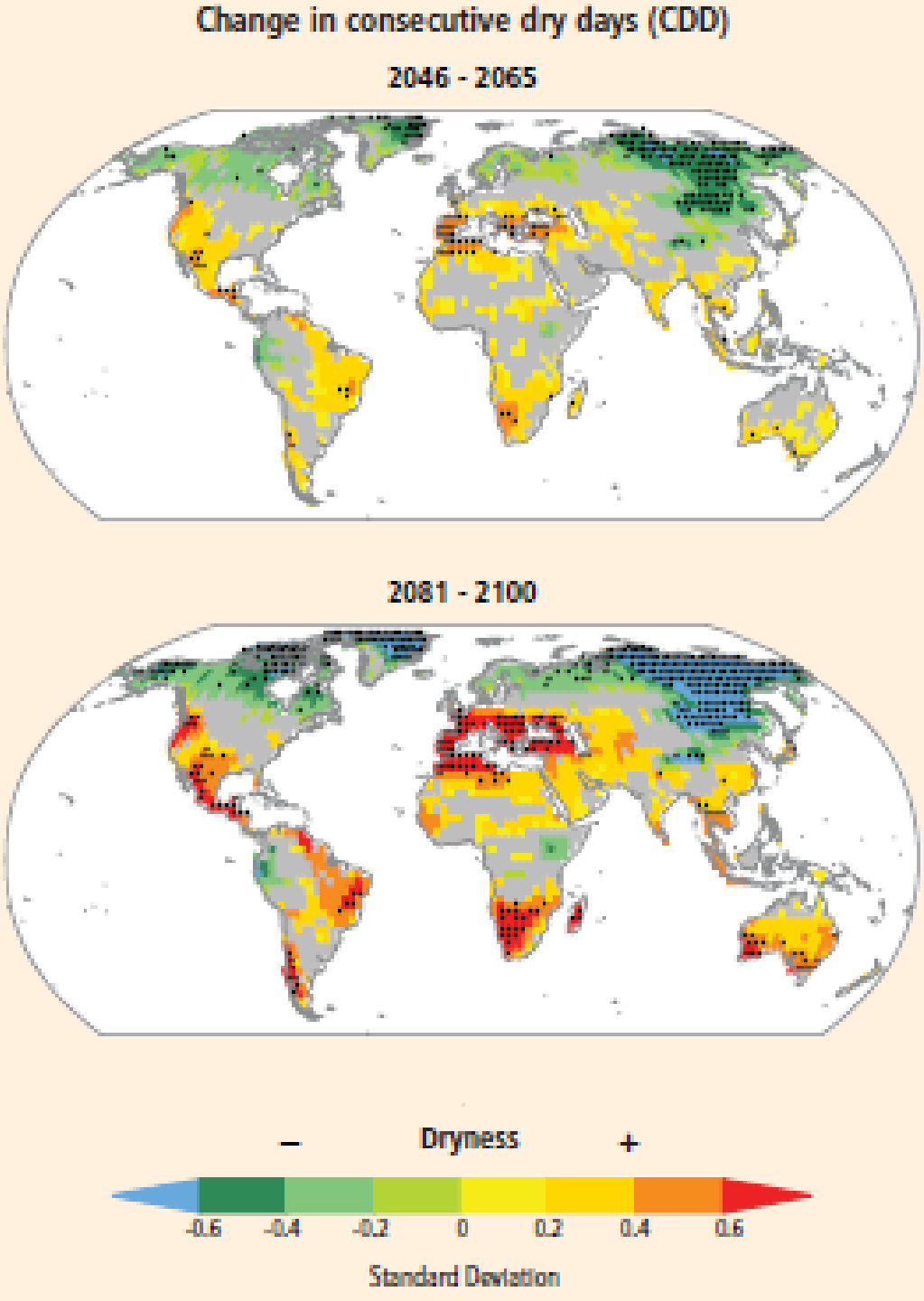
1. Droughts and floods are recurrent climatic features hence emphasis need to be on **building resilience**
2. **Addressing the socio-economic and political drivers** can increase farmers' capacity to buffer climate impacts on food security
3. Various **local-level adaptation actions** are effective in stabilizing food production and **need to be assessed for up-scaling**
4. **Climate services can be effective** early warning sources **if tailored to the needs of the farmers**
5. Many national governments **need to align their policies and strategies towards the resilience** of agriculture and agricultural landscapes

Outline

- Characteristics of climatic hazards in Africa
- Food insecurity in Africa
- Climate and the other many drivers of food insecurity
- Sustainable land management for building resilience
- Policy environment
- Key messages



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Predictions until the end of the 21st century

Changes in consecutive dry days:

- Increase in the south
- Decrease in the East
- Possible increase in the West, but not statistically significant

IPCC 2012: 15

Characteristic High Rainfall Variability

Onset, duration and cessation of seasonal rains at Makindu (1961-2003), Kenya

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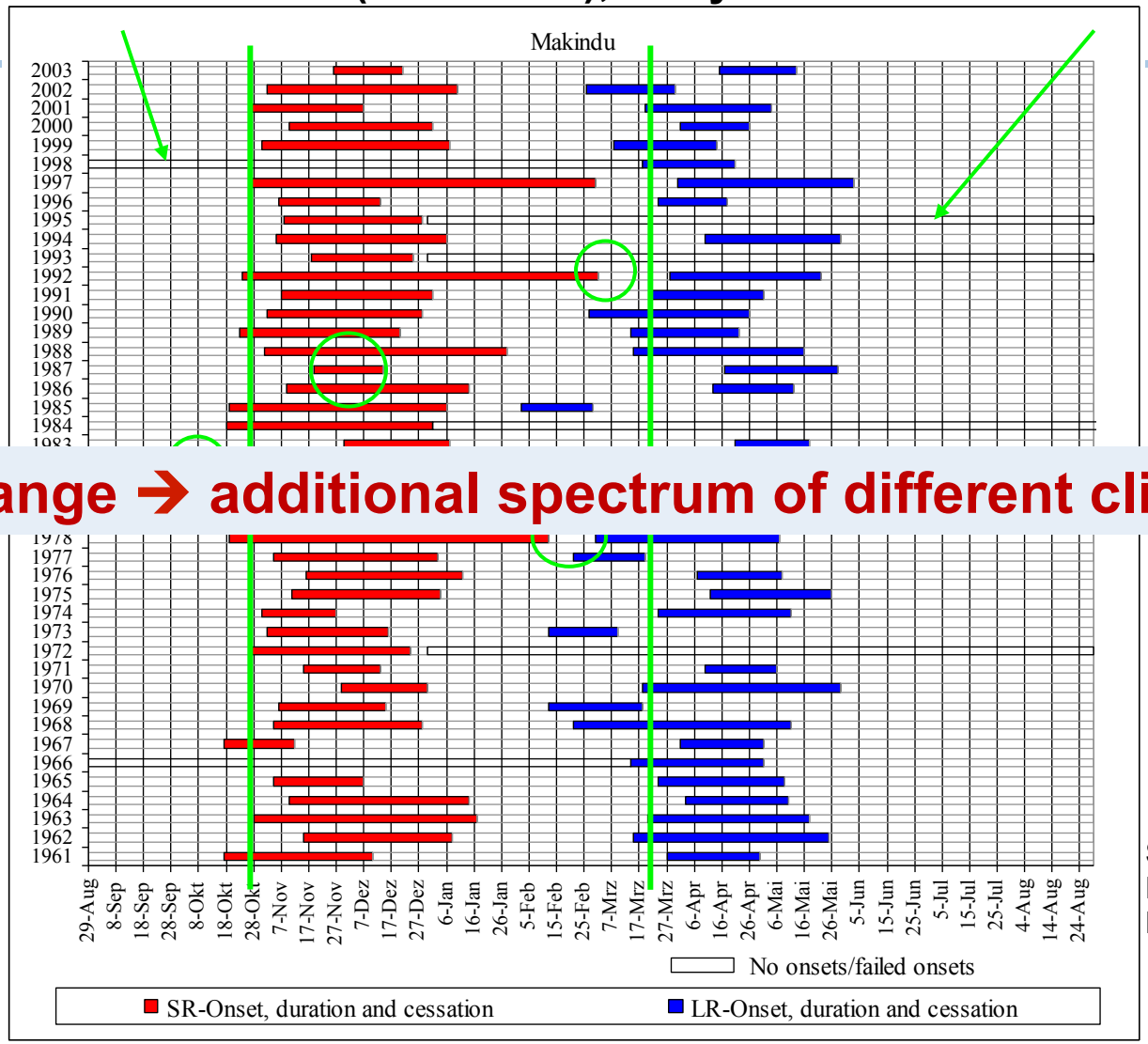


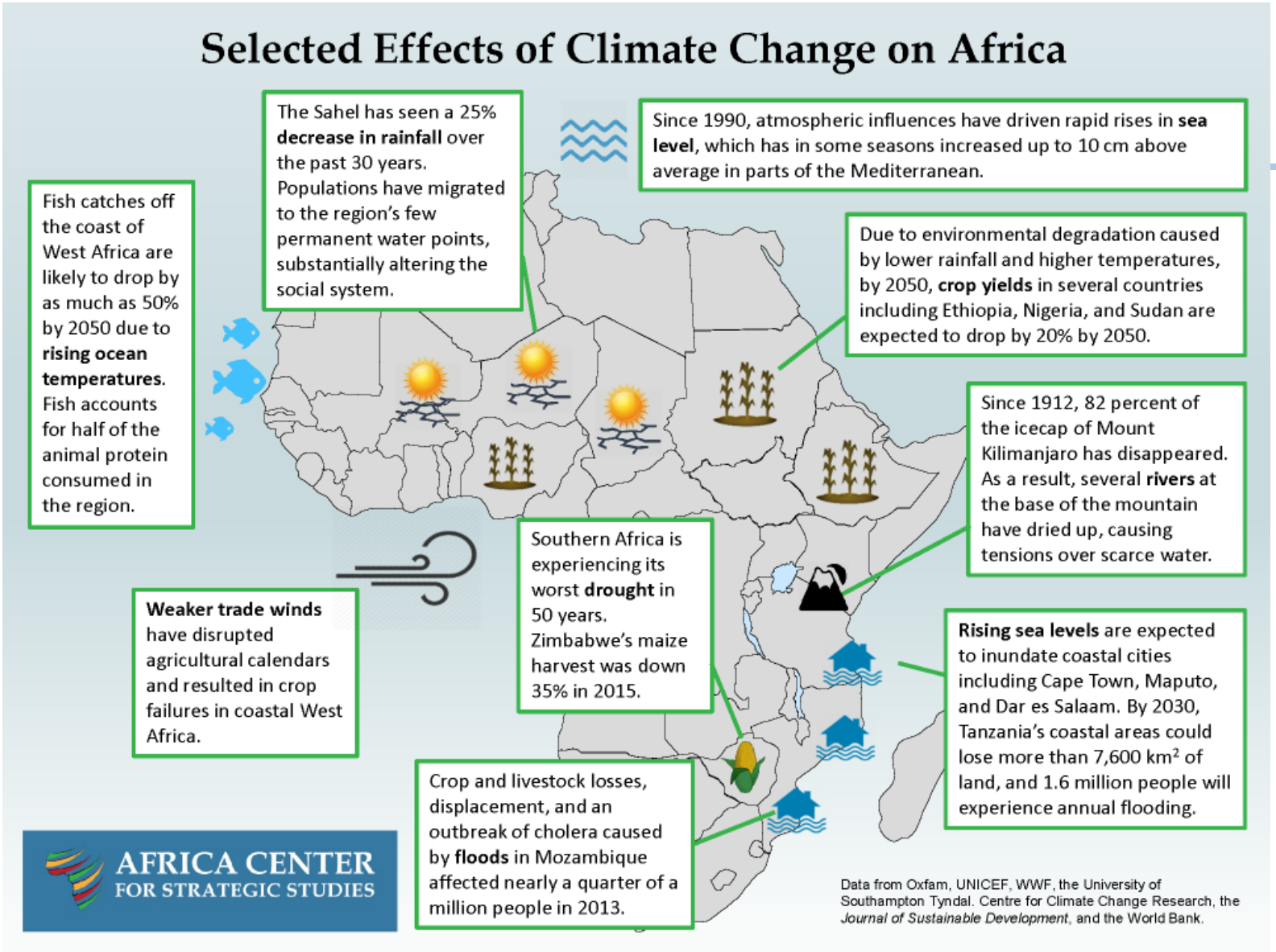
Short Rains

Long Rains

Climate change → additional spectrum of different climatic risks

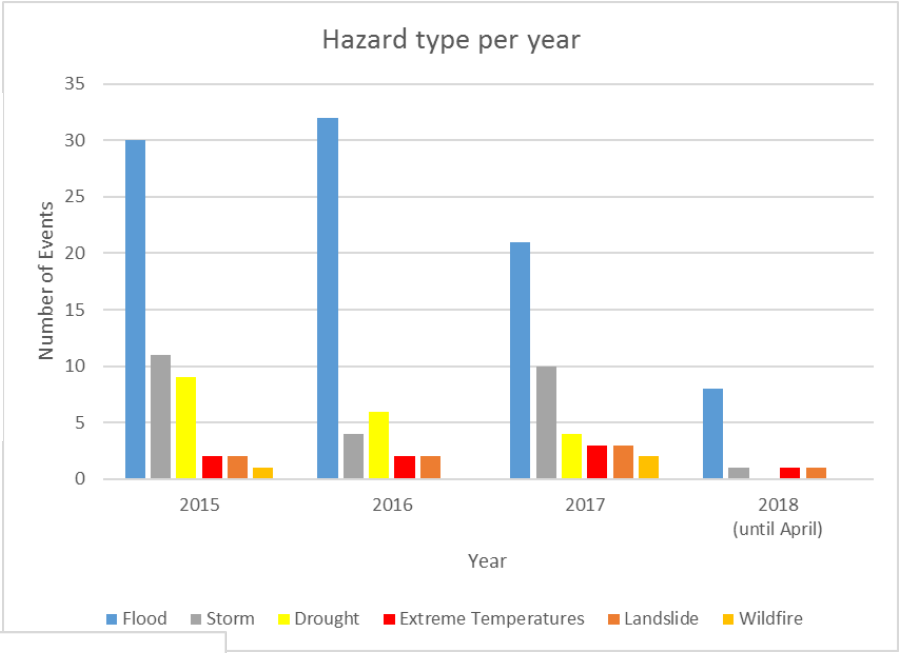
Source: Rainfall data Makindu 1961-2003, Ifejika Speranza 2006

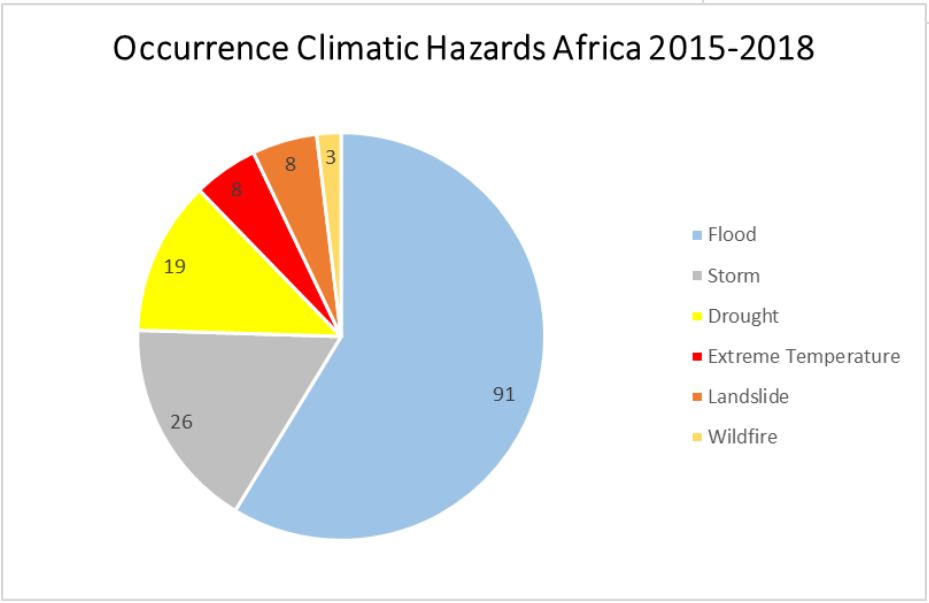
Selected Effects of Climate Change on Africa

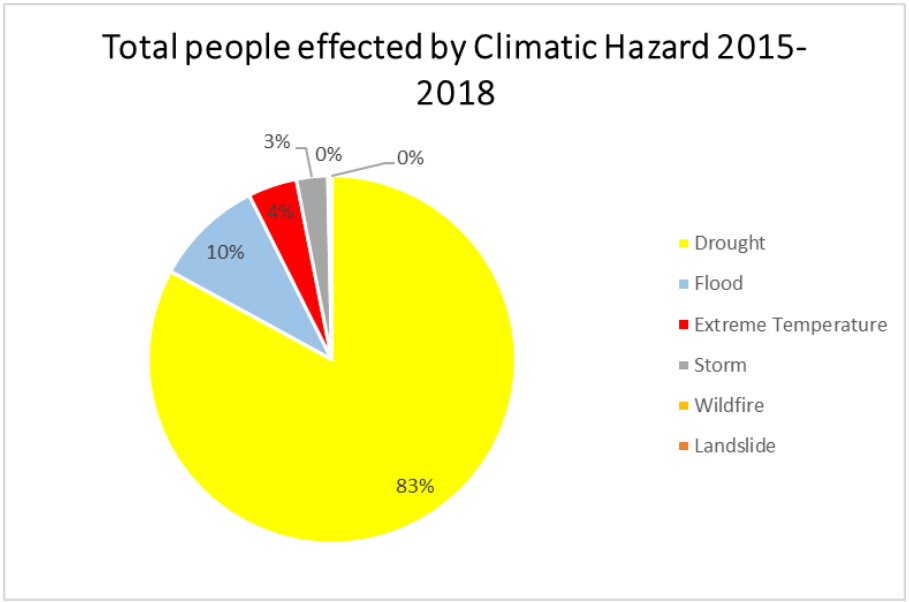


https://africacenter.org/spotlight/selected-effects-climate-change-africa/

Reported Climatic Hazards in Africa 2015-2018

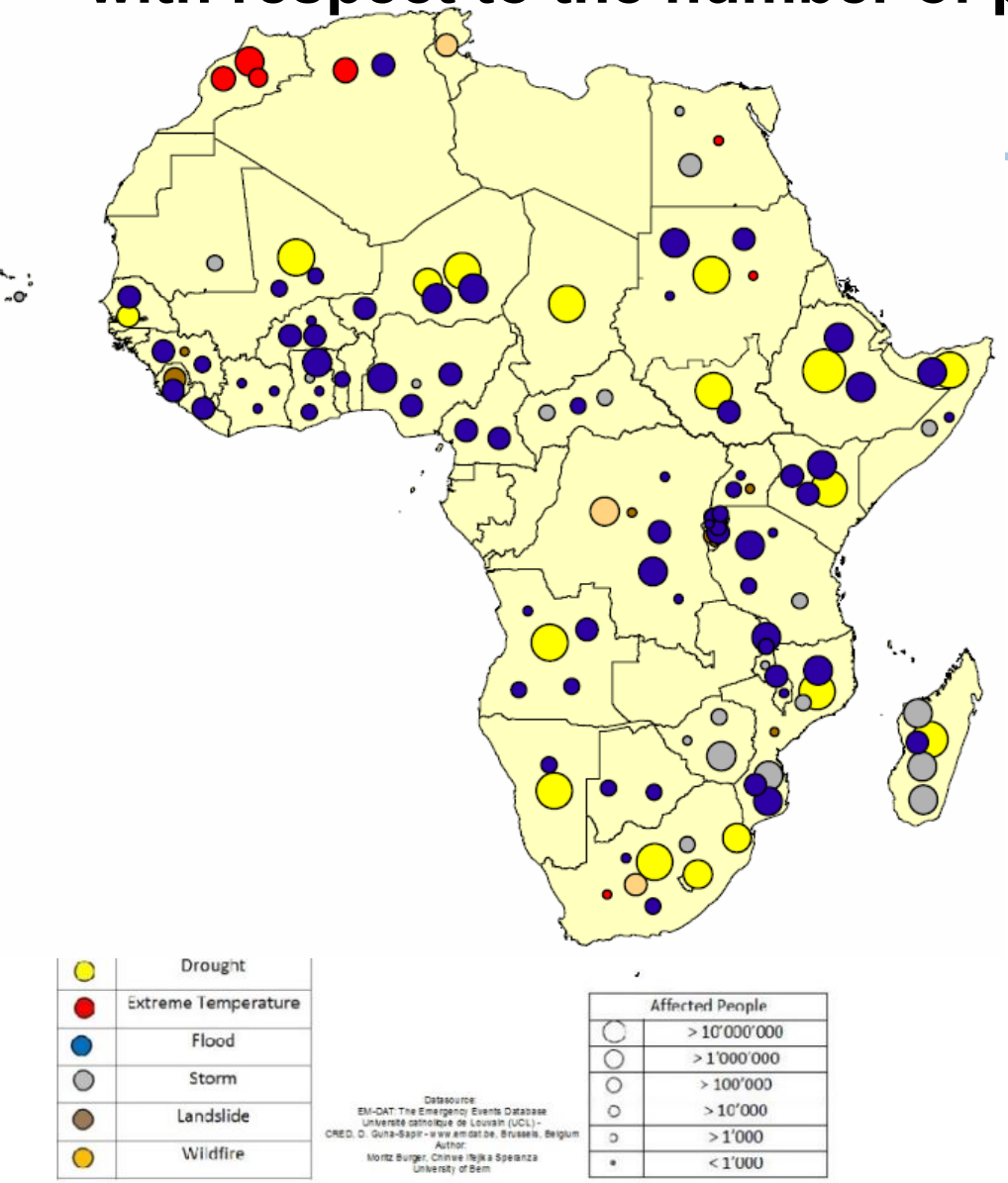






Data: EM-DAT: The Emergency Events Database - Université catholique de Louvain (UCL) - CRED, D. Guha-Sapir - www.emdat.be, Brussels, Belgium

Climatic Hazards in Africa 2015 - 2018 with respect to the number of people affected



- Floods and Droughts affect the most people in Africa

Regional patterns:

- Storms in the South-East
- Extreme Temperature in the North
- Droughts in Sahel-Region & in the South
- Landslides in the West (Sierra Leone, Guinea) & Central East (Rwanda & Burundi)
- Floods in almost all regions

Data: EM-DAT: The Emergency Events Database - Université catholique de Louvain (UCL) - CRED, D. Guha-Sapir - www.emdat.be, Brussels, Belgium

Recurrent Climatic Hazards in Africa 2015 – 2017 - number of people affected

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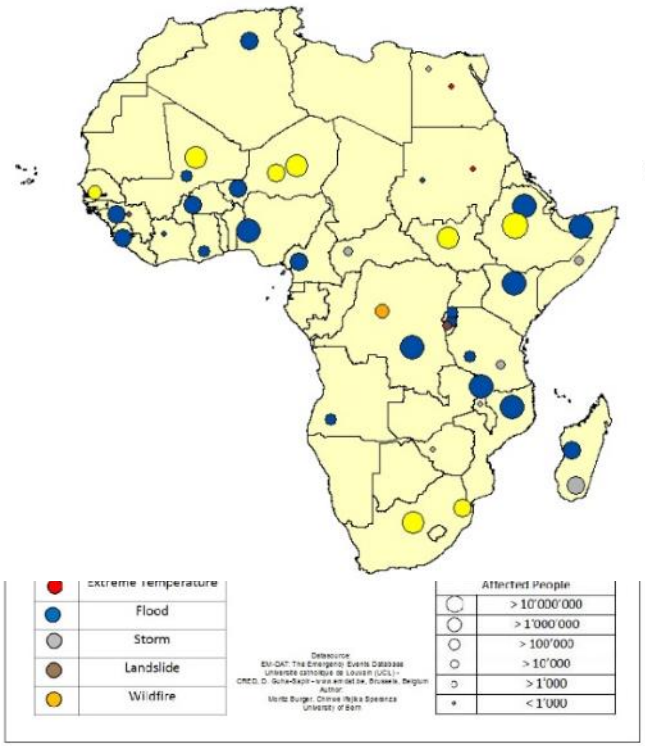
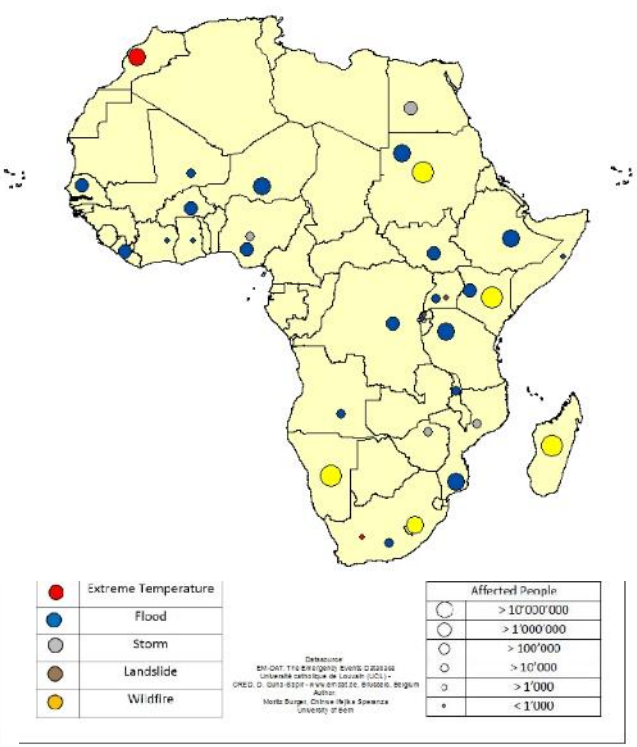
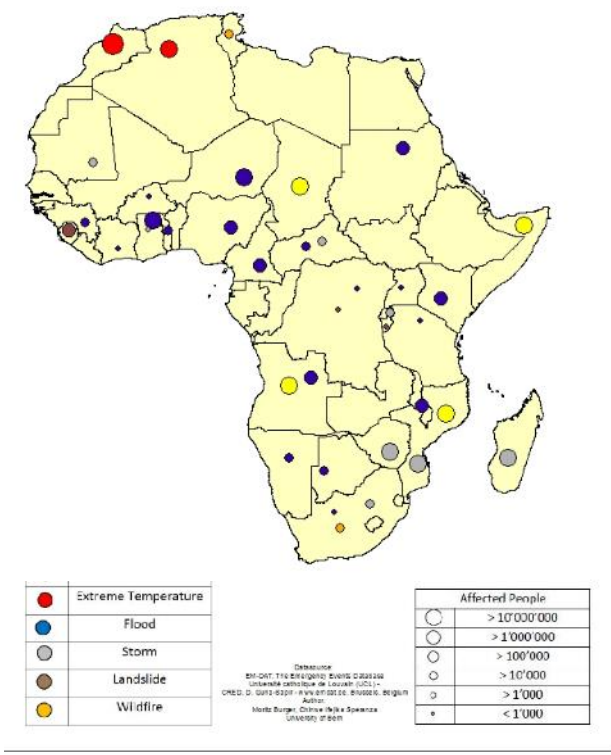
2015



2016

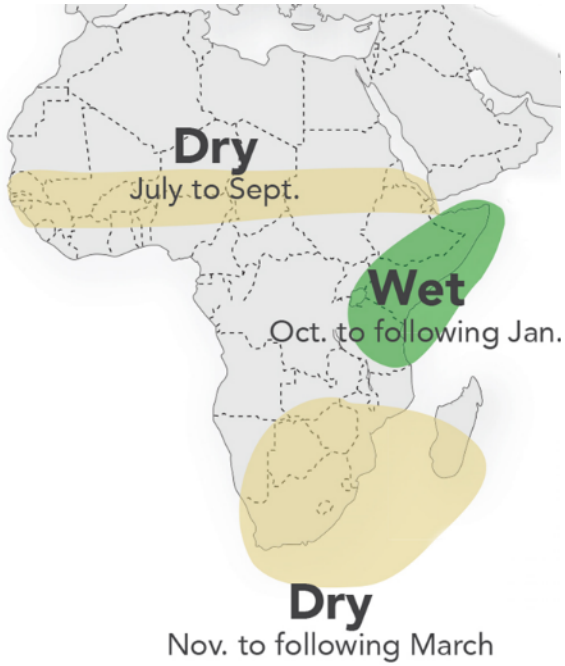


2017

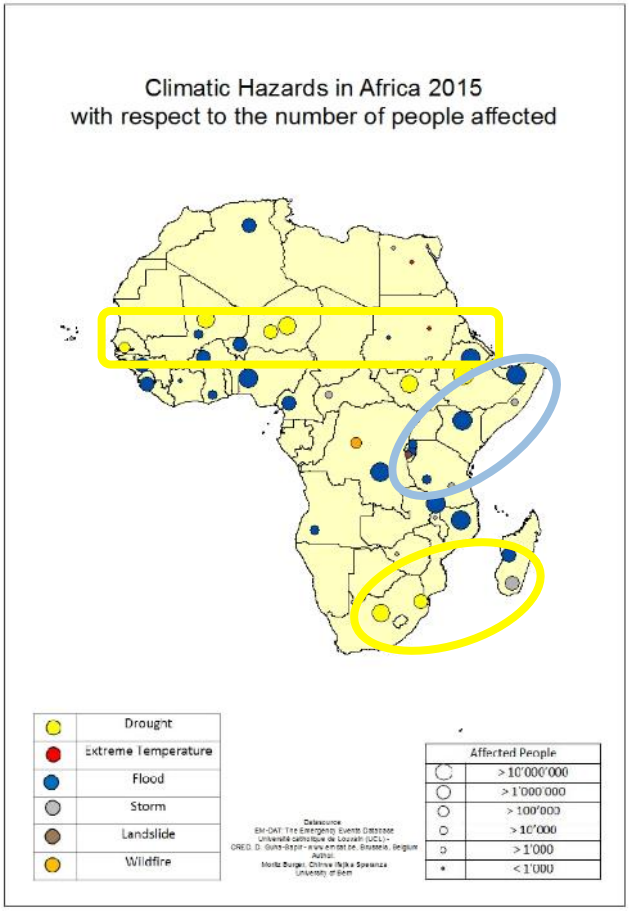


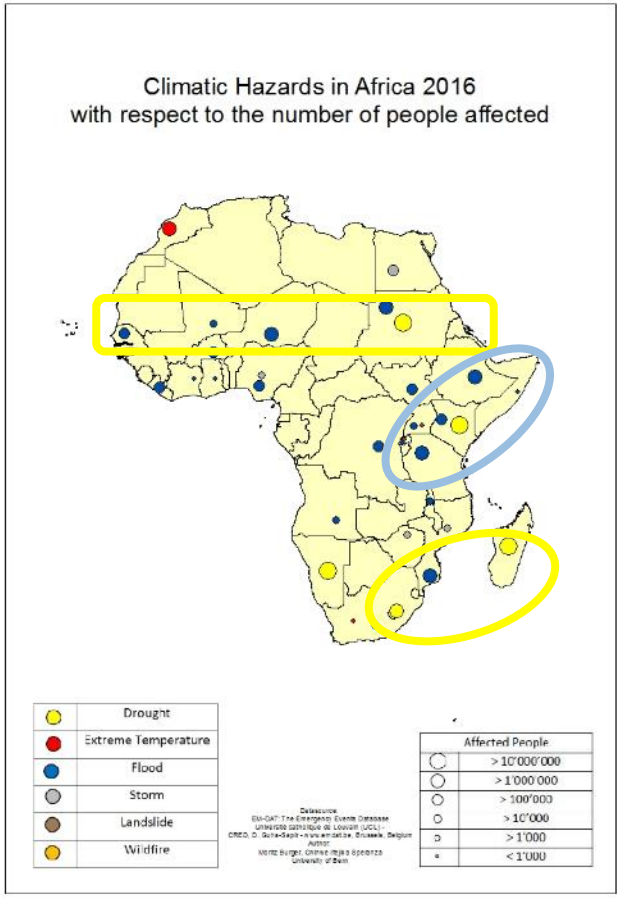
Data: EM-DAT: The Emergency Events Database - Université catholique de Louvain (UCL) - CRED, D. Guha-Sapir - www.emdat.be, Brussels, Belgium

El Niño 2015 and Climatic Hazards



https://iri.columbia.edu





Data: EM-DAT: The Emergency Events Database - Université catholique de Louvain (UCL) - CRED, D. Guha-Sapir - www.emdat.be, Brussels, Belgium

El Niño 2015/16 in Horn of Africa

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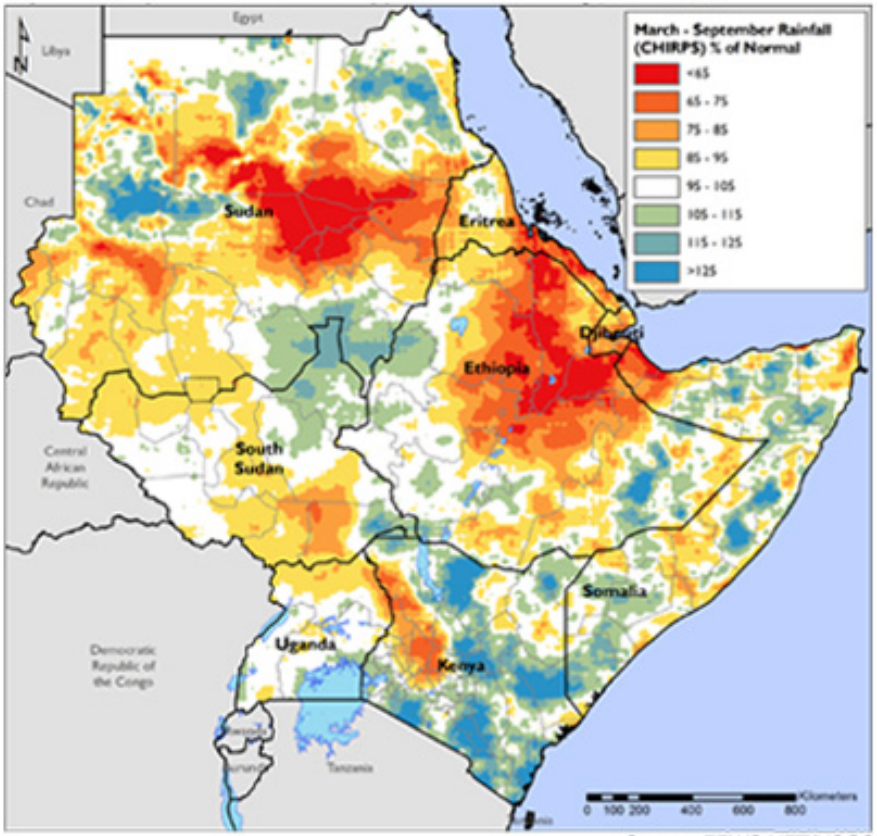
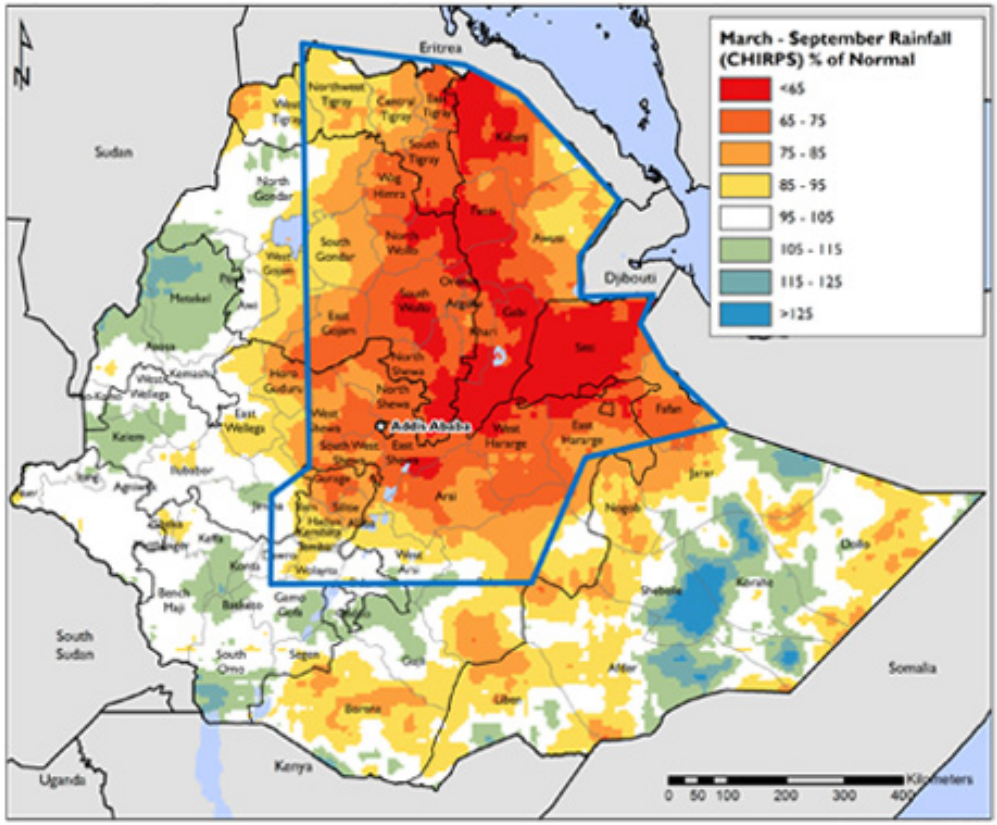
March - September 2015 rainfall anomaly (% of the 1981-2014 average) for East Africa



Source: FEWS NET/USGS

March - September 2015 rainfall anomaly (% of the 1981-2014 average) for Ethiopia

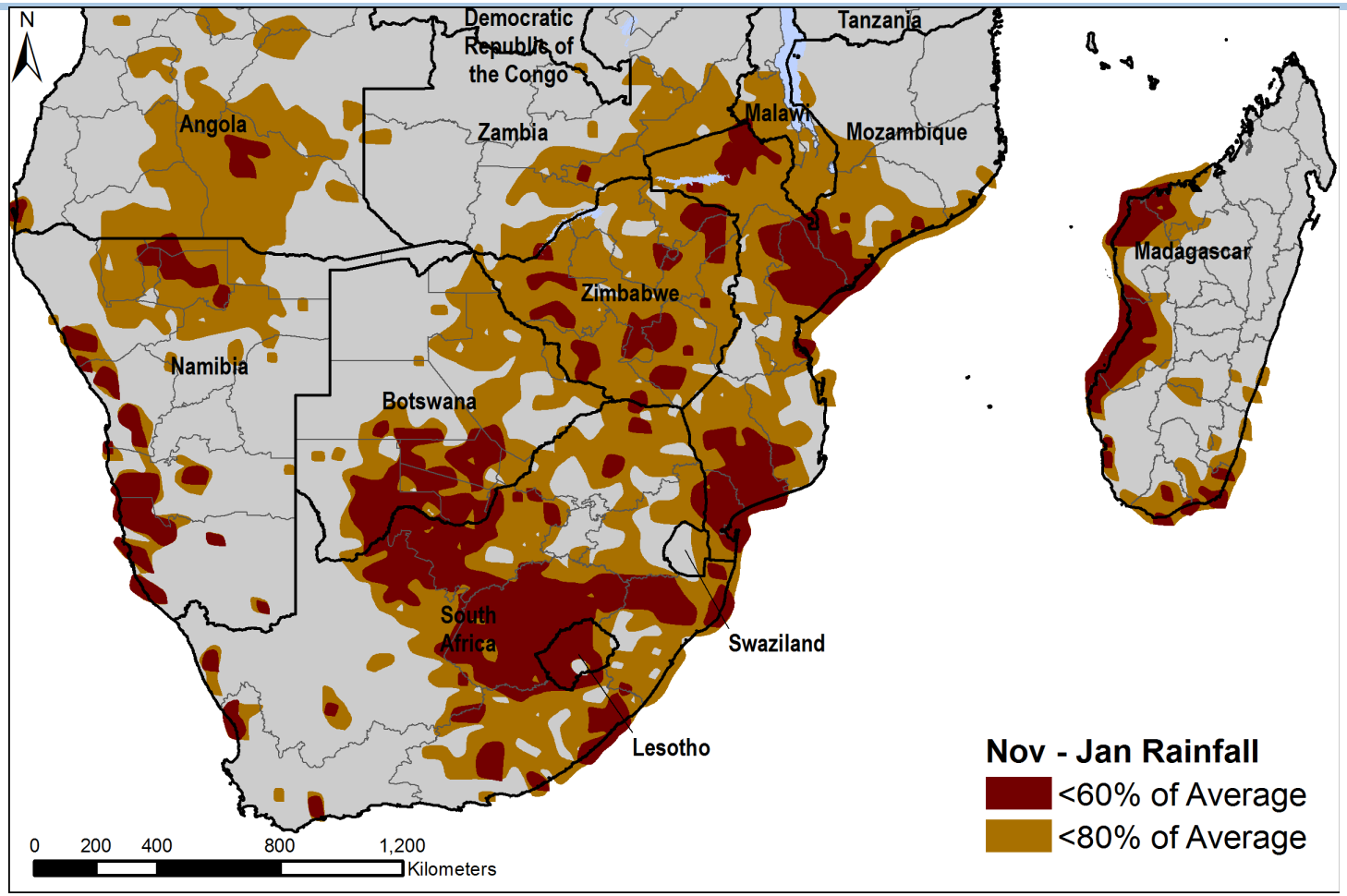


Source: FEWS NET/USGS

El Niño's impacts such as droughts and floods are a primary driver of acute food insecurity

Fews-NET 2016

Areas affected by Drought in Southern Africa, November 1, 2015 - January 31, 2016



Fews-NET 2016

Source: *FEWS NET/NOAA ARC2*

Impacts on Food Production

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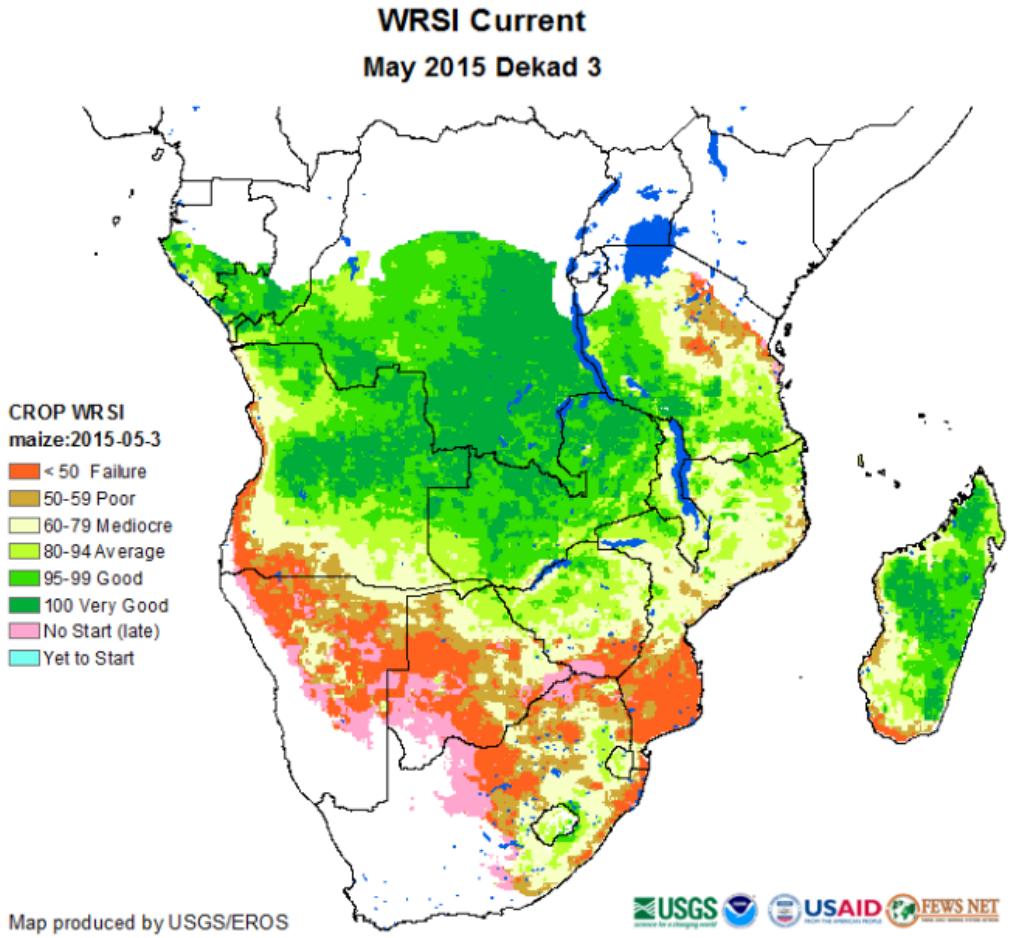
Water Requirement Satisfaction Index (WRSI) 2015 for maize production - poor



2015 maize production levels compared to the five-year average

Botswana	▼
Lesotho	▼
Malawi	▼
Mozambique	▶
Namibia	▼
South Africa	▼
Swaziland	▲
Zambia	▼
Zimbabwe	▼
Regional	▼

Source: *FEWS NET calculations with data from SADC and government ministries*

Food Insecurity in Africa
Global Report on Food Crises 2017

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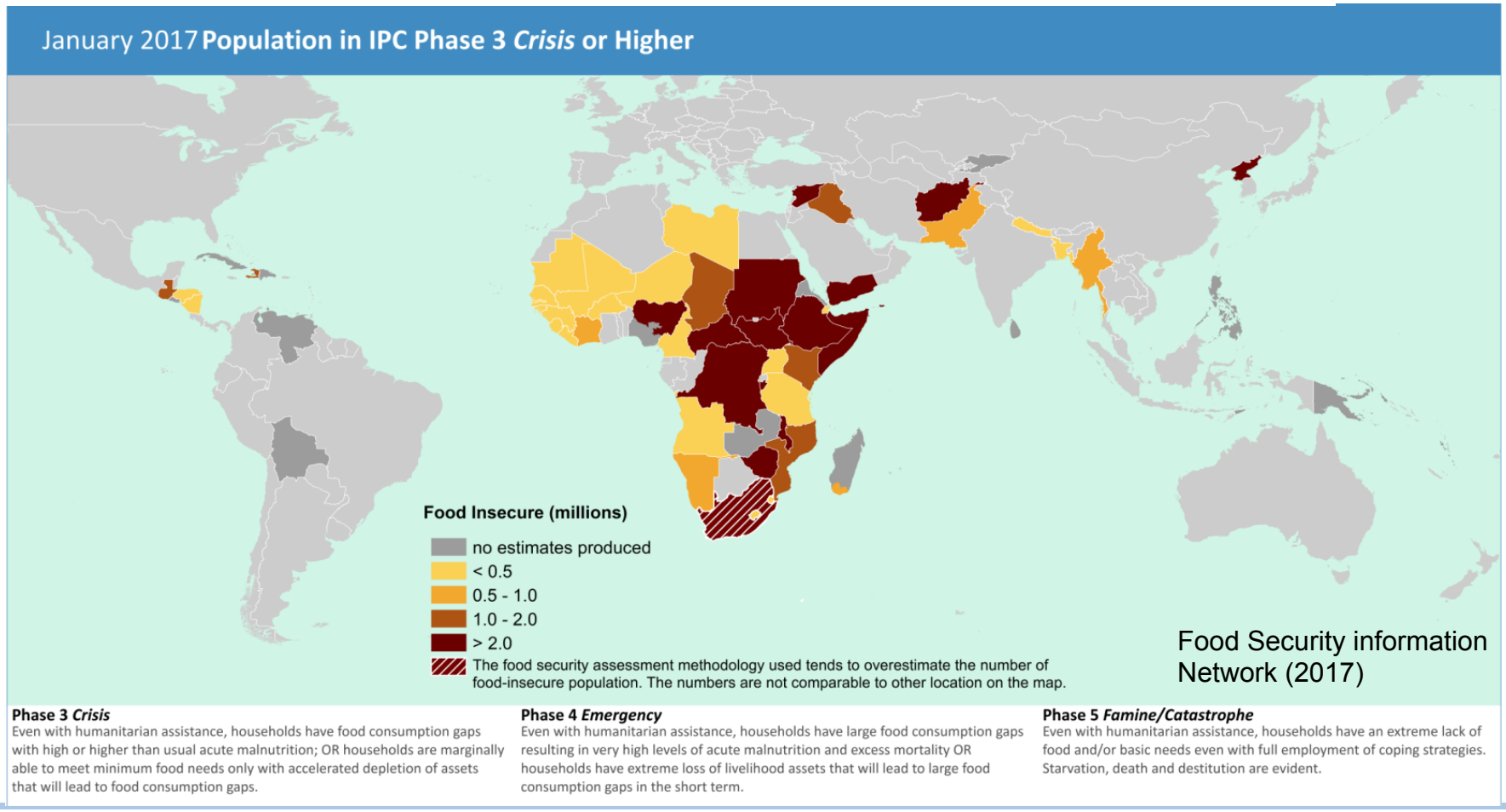
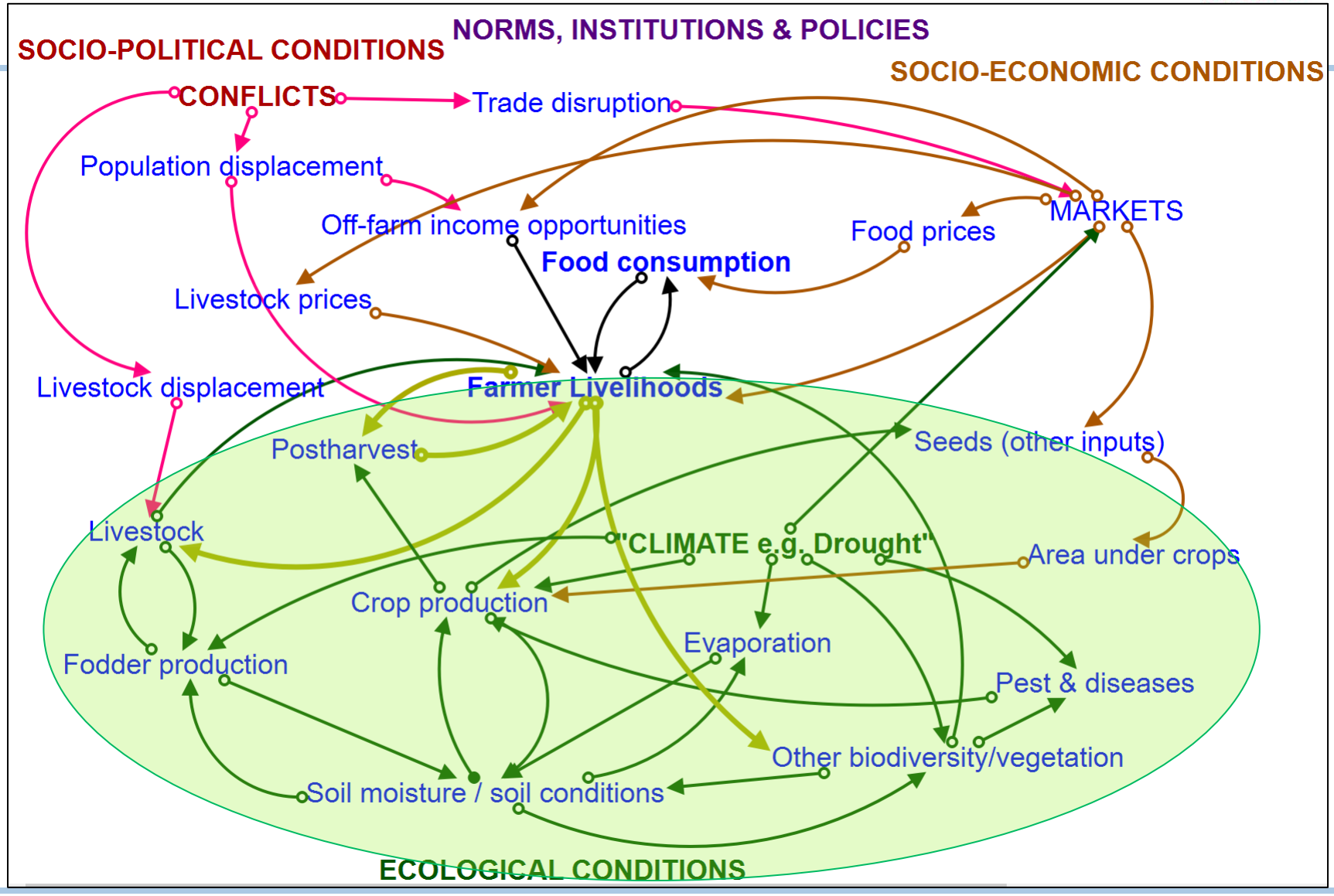
Integrated Food Security Phase Classification (IPC):
at least 20% households have food consumption gaps,
irreversible coping strategies, high malnutrition, excess mortality



However, climatic hazards only one among many drivers of food insecurity…



Sustainable Land Management as a resilience building measure

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- Various local-level adaptation actions are effective in stabilising food production and need to be assessed for up-scaling and out-scaling
- SLM is climate-smart – can **sustainably increase productivity**, **resilience (adaptation), reduce/remove greenhouse gases (mitigation)**, and **enhance achievement of food security**
- **Some examples…**

Case 1: The Biovision Push-Pull East Africa Programme – Agroecological farming

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- Difference visible: the maize on the left has been grown with the Push-Pull method and on the right without it (Biovision n.d.).

Desmodium intercrop btw maize or millet & its smell repels the stemborer moths - **Push**
Napier grass as a border crop draws the moths away from the field – **Pull; destroys Striga weeds**

Case 2: Conservation agriculture

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- Conservation agriculture (CA) - the simultaneous application of **minimum soil disturbance**, **crop residue retention**, and **crop diversification** - address declining soil fertility & the adverse effects of climate change

Debate:
CA needs to be adapted to context

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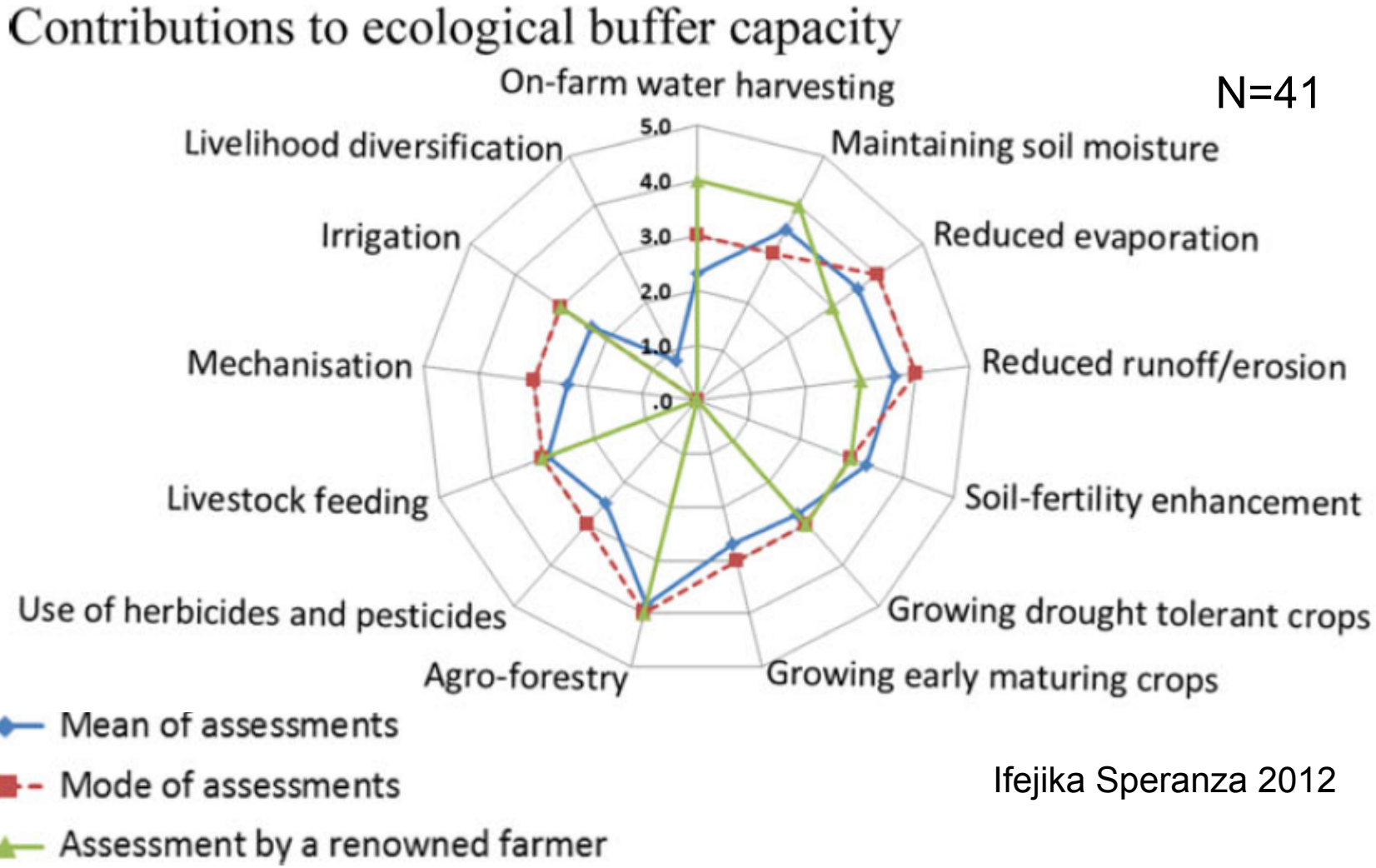
- **CA can increase yields but not always suitable** (Thierfelder et al., 2018; Ifejika Speranza et al., 2018)
- Both CA & 'CA with trees' (CAWT) **consistently reduced leaf area, plant height, and maize yields** (Ndoli et al., 2018)
- **Maize emergence rates** in CAWT & CTWT - 46.9% & 70.1%, compared with 74.7% & 79.8% in sole maize under CA & Conventional Tillage (CT) (Ndoli et al., 2018)
- **Grain yield** in CAWT and CTWT - 0.37 t dry matter (DM) ha(-1) & 1.18t DM ha(-1) compared with 1.65t DM ha(-1) & 1.95 t DM ha(-1) in CA & CT (Ndoli et al., 2018)

Farmer Adapted Conservation Agriculture Practices



Case 3: Agroforestry and Land Rehabilitation Schemes

https://www.rainforest-alliance.org/sites/default/files/styles/1800w/public/2016-09/uganda-tree-cover.jpg?itok=_IO_x05i

E.g. Ecotrust's "Trees for Global Benefits" in Uganda

https://newtree.org/ueber-uns/ https://newtree.org/projekte/wiederbewaldung/

E.g. Land rehabilitation by newTree in Burkina Faso

Table 1: Summary of literature review findings (strength of evidence) regarding the impact of agroforestry (Malawi) and conservation agriculture (Zambia) on maize yields and farmer profits, and the rate of adoption of each.

	Yields	Profits	Adoption
Malawi (Agroforestry)	Positive (55-345 percent increase). Strong evidence.	Positive. Moderate evidence.	Slow. Need for further research.
Zambia (Conservation Agriculture)	Positive (42-200 percent increase). Moderate evidence. Mainly in dry areas.	Positive (44-140 percent increase in gross margins). Weak evidence.	Slow. Considerable constraints. Need for further research.

Table 2: Summary of literature review findings (strength of evidence) regarding carbon sequestration potential of agroforestry (Malawi) and conservation agriculture (Zambia).

	Malawi (Agroforestry)	Zambia (Conservation Agroforestry)	
Carbon mitigation	2-5 tonnes/ha/yr. Weak evidence.	0.2-0.7 tonnes/ha/yr. Weak evidence.	Carbon financing possibilities seems remote – less so for agroforestry in Malawi.

Kaczan et al 2013: 46

Case 4: Local Adaptations of the Great Green Wall (GGW) for the Sahara & the Sahel initiative

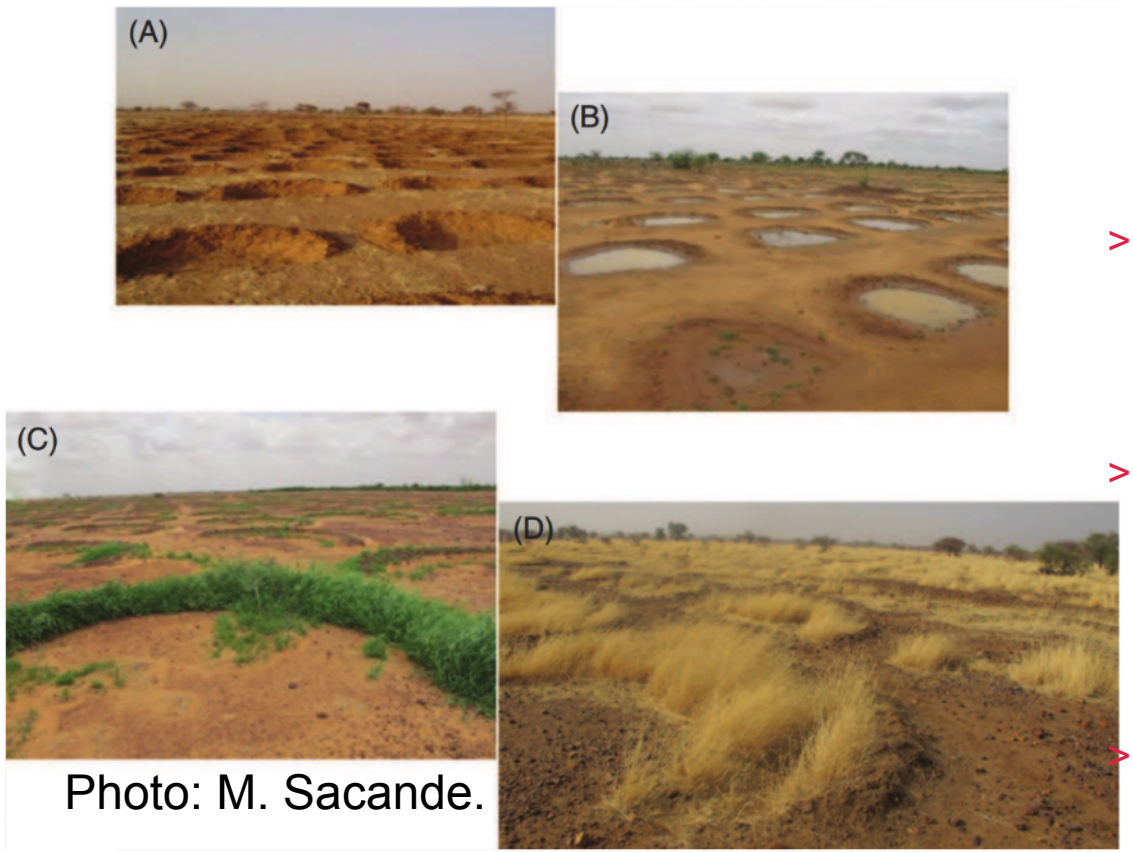


Photo: M. Sacande.

(Sacande and Berrahmouni 2016: 484)

- Figure 3. **Hand-dug "half-moon"** planting holes prepared and planted in 2013 by GGW communities of Dori, Burkina Faso:
- **(A)** before the rainy season (top left), which **(B)** successfully trap rainwater (top right).
- This technique enables **(C)** newly planted woody and herbaceous seedlings to achieve rapid growth in wet season (bottom left).
- **(D)** seedlings established and herbaceous cover of initial bare land in the dry season in 2015 (bottom right).

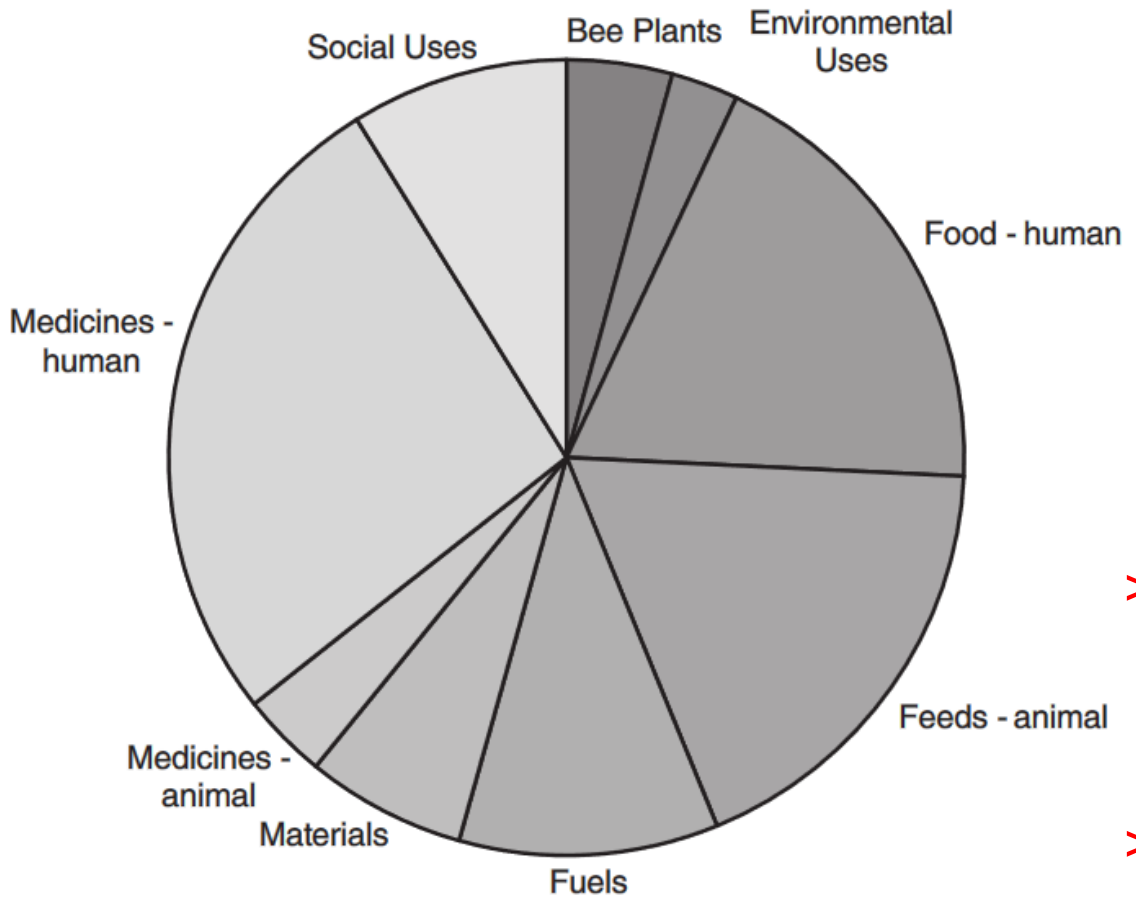


Figure 2. All categories and proportions of native species selected and preferred by local communities, including higher proportions for medicinal-human species (24%), animal feeds (19%), food species (18%), and fuelwood (11%). These choices also illustrated people's needs and priorities in this part of the Sahel, where natural plant resources are very limited.

Selection of tree species with local communities

- Local adaptations of the Great Green Wall (GGW) for the Sahara & the Sahel initiative
- Choice of trees for restoration - four cross-border regions - Mali, Burkina Faso, & Niger

(Sacande and Berrahmouni 2016: 482)

Case 5: Sustainable Land Managment Technologies

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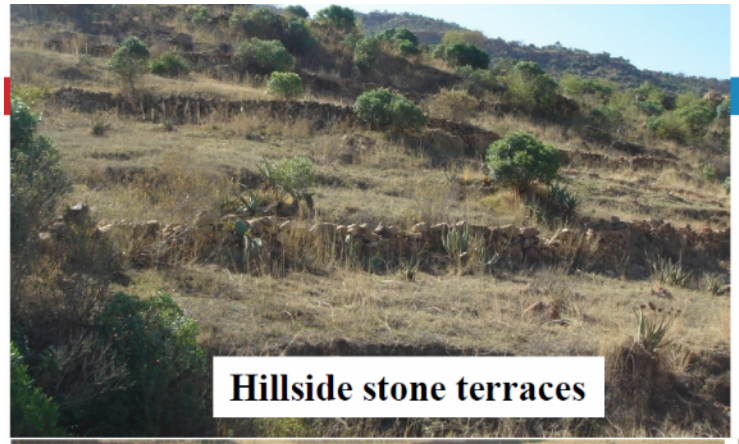
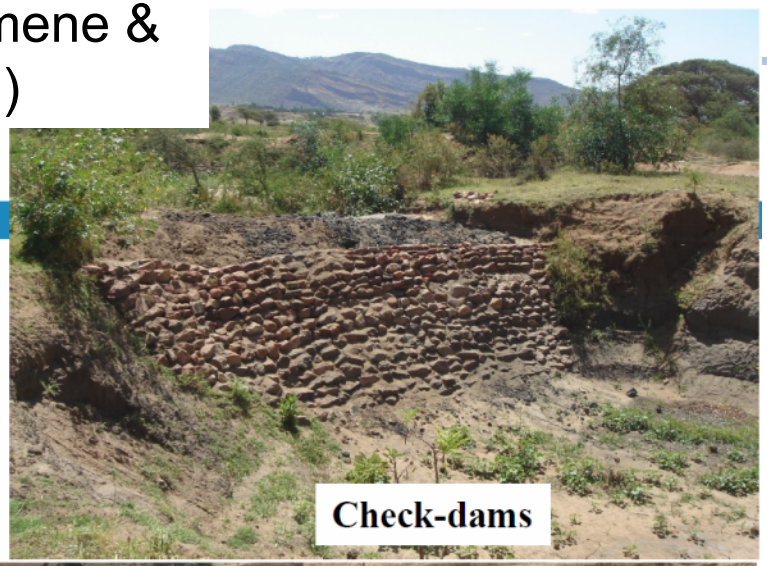
Research by Woldearegay, Tamene & Mekonnen in Ethiopia (2017:11)





Groundwater Recharge through SLM

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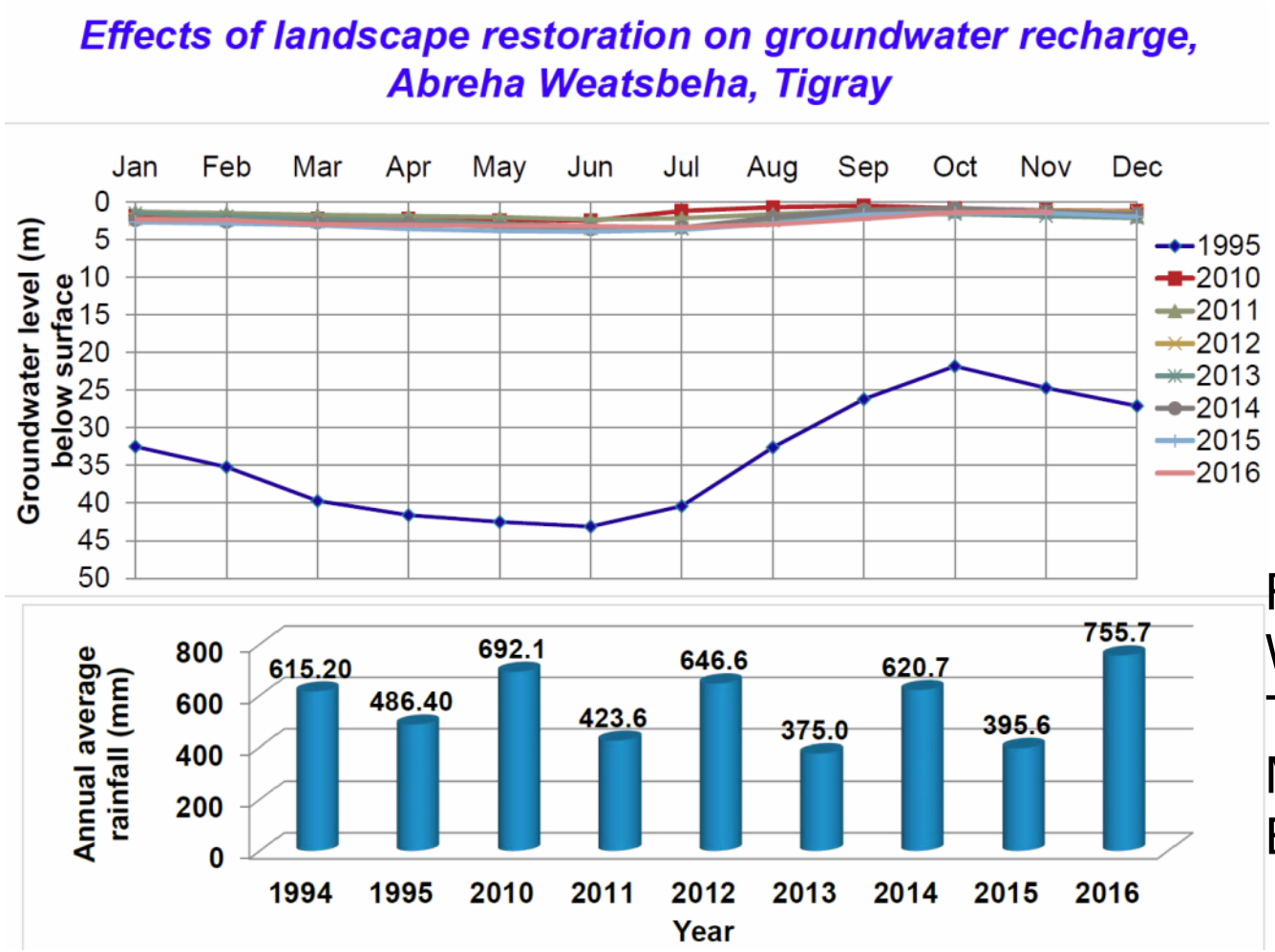

Research by Woldearegay, Tamene & Mekonnen in Ethiopia (2017:20)

Case 6: Farmer Managed Natural Regeneration in Niger

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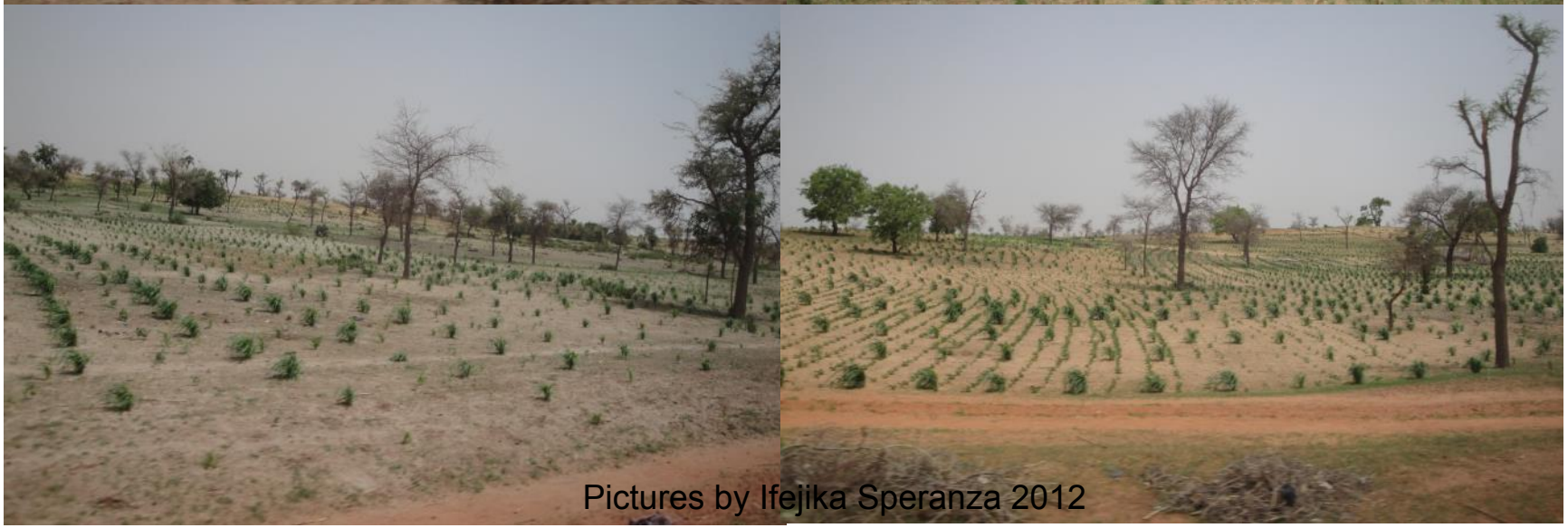
- Mid-1980s, development partners supported Niger's farmers in their long established practices of woodland management
- **Innovation**: a whole-landscape management approach created to encourage expansion of the practice into cropping areas, & protecting trees germinating naturally (Haglund et al. 2011; CCAFS 2013).

Pictures by Ifejika Speranza 2012

2008: ca. 200 million trees on 5 million hectares, attributable to farming practices rather than to decadal climatic trends (Hagelund et al. 2011)

Pictures by Ifejika Speranza 2012



Pictures by Ifejika Speranza 2012

Farmer Managed Natural Regeneration in Niger

- Contributes to food security - improved fodder, reduce loss of fertile topsoil & raises incomes
- Aggregated value of farmer-managed natural regeneration ca. US$56 ha-1 year-1, a net annual value: US$280 million
- Greenhouse gas mitigation benefits not yet measured
- Benefits for about 2.5 million people

(Haglund et al. 2011; CCAFS 2013)

Success factors & insights: Farmer Managed Natural Regeneration in Niger

- Simplicity of the practices
- Adaptation to climatic variability - diversification of local livelihoods – **seasonal migration to Nigeria**
- Government of Niger decision to **transfer tenure** rights over trees from government to landholders
- **Top-down approach by government failed in Nigeria**
- Need for combining bottom-up & top-down approaches in tree planting schemes

Case 7: Climate Services for Agriculture and Development, yes, but…

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- Scientific information on exposure often **inadequate** to achieve development goals (Hansen et al. 2011; Carr & Owusu-Daaku 2016)
- Need for a **better understanding of users & their needs** (Shah et al., 2012; Carr & Owusu-Daaku K. N. 2016; Vincent et al., 2017)
- **Spatial & temporal scale issues**, accessibility, timing, credibility; mismatch in timeframes btw. planning cycles (1–5 years) & climate projections (>20 years) (Vincent et al., 2017)
- Need for **enhancing capacity** to interpret climate information & implement communication strategies across sectors (Vincent et al., 2017)

Conducive Policy Environment thru a Food Systems Approach

- A food system perspective to policy making needed

Rist et al., 2016

  - Many national agriculture policies focus solely on increasing productivity
  - Some neglect the impacts of agriculture on the environment in the drive towards increased agricultural productivity (Ifejika Speranza et al., 2017)

- **Multi-level policies – but improve policy coherence**

The Comprehensive Africa Agriculture Development Programme (CAADP) implementation level

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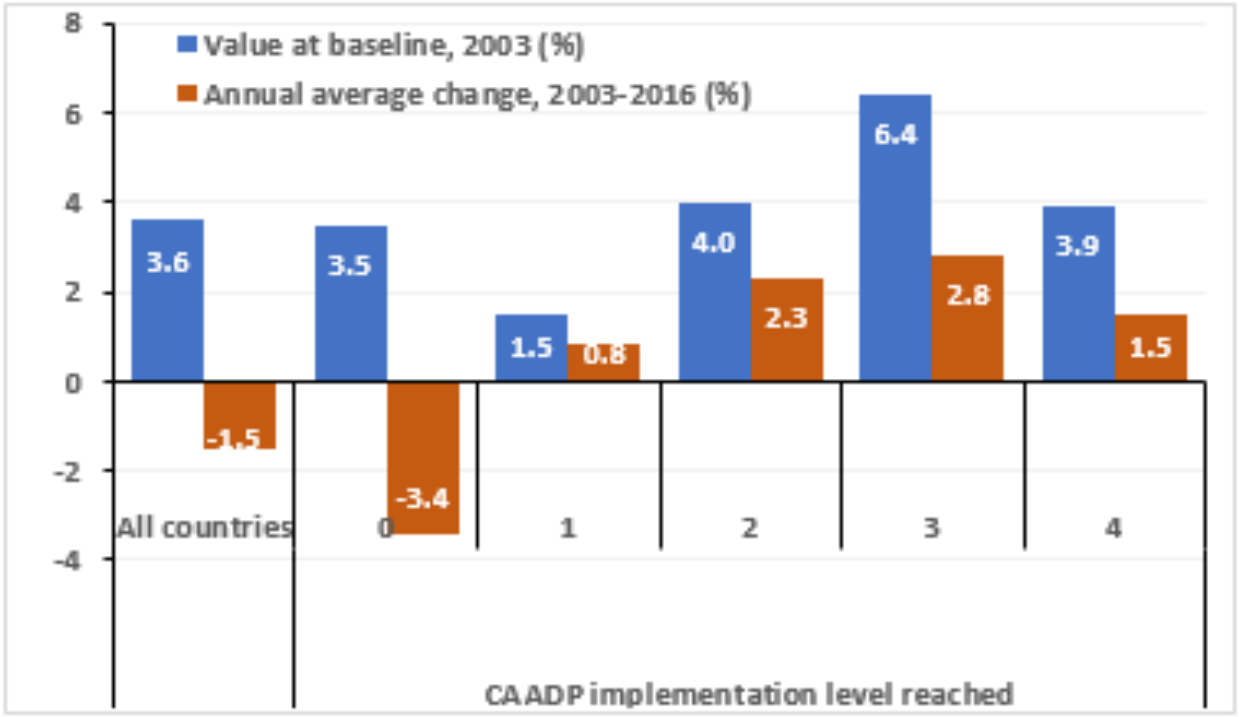
Figure 1: Agricultural expenditure as share of total government expenditure



CAADP impact on agriculture expenditure generally negative (Benin 2016)

0 = countries in no CAADP process or pre-compact;1 = signed a CAADP compact; 2 = Status 1 + have a NAIP; 3 = Status 2 + secured one external funding source; 4 = Status 2 + secured more than one external funding source

Source: ReSAKSS, 2017

The Comprehensive Africa Agriculture Development Programme (CAADP) implementation level

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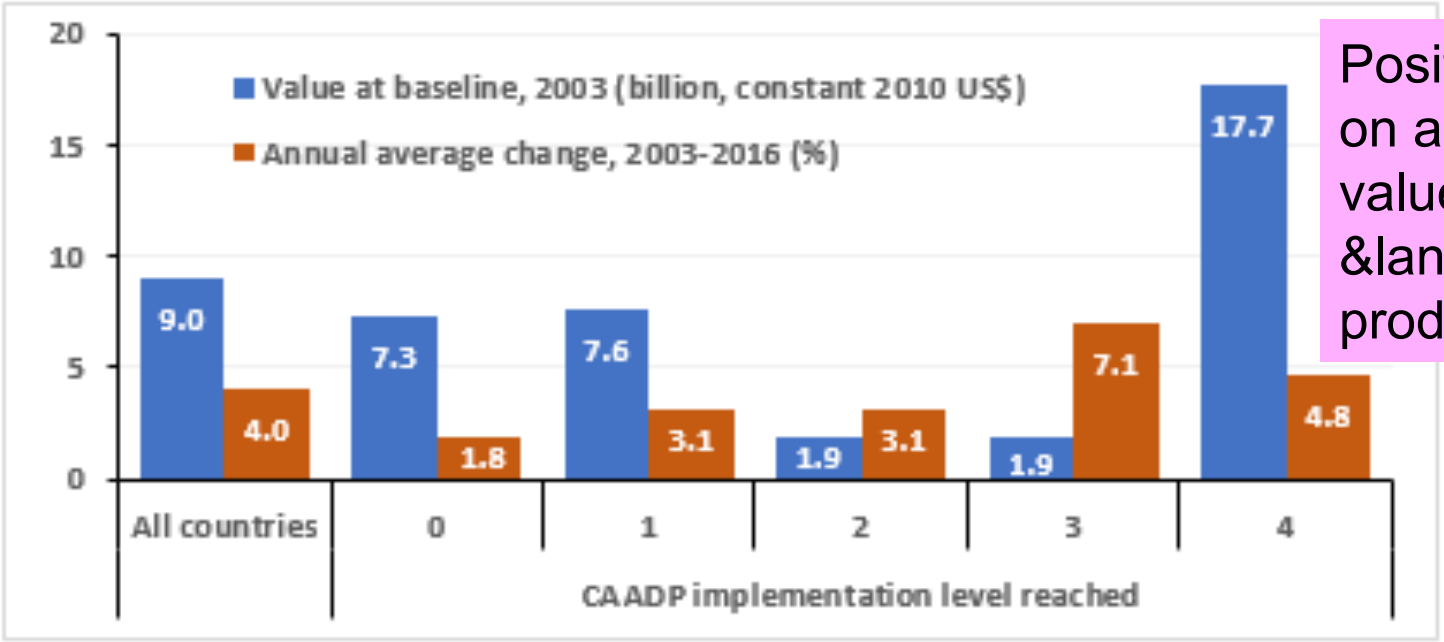
Figure 2: Agriculture value added

Source: ReSAKSS, 2017



Positive impact on agricultural value-added &land & labor productivity

0 = countries in no CAADP process or pre-compact;1 = signed a CAADP compact; 2 = Status 1 + have a NAIP; 3 = Status 2 + secured one external funding source; 4 = Status 2 + secured more than one external funding source

Conclusions - Key Messages Again!

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1. Droughts and floods are recurrent climatic features hence emphasis need to be on **building resilience**
2. **Addressing the socio-economic and political drivers** can increase farmers' capacity to buffer climate impacts on food security
3. Various **local-level adaptation actions** are effective in stabilizing food production and **need to be assessed for up-scaling**
4. **Climate services can be effective** early warning sources **if tailored to the needs of the farmers**
5. Many national governments **need to align their policies and strategies towards the resilience** of agriculture and agricultural landscapes

Thank you for your attention!

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