Derek Tribe Award 2019 Address, Sep 05, 2019, Brisbane, Australia

CGIAR RESEARCH PROGRAM ON Climate Change, Agriculture and Food Security CCAFS

Building climate resilient agriculture and food systems in sub-Saharan Africa:

Challenges and actionable solutions

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Dr Robert Zougmoré
Africa Program Leader CCAFS

Plan

- Global warming in Africa: facts
- Agriculture and food systems challenges in the context of climate change
- Urgent need for climate-resilient agriculture
- Actionable solutions: example cases
  - *WCIS for climate risk management*
  - *Participatory AR4D for CSA options development and scaling up*
  - *Mechanisms for mainstreaming science into policy*
- Key messages

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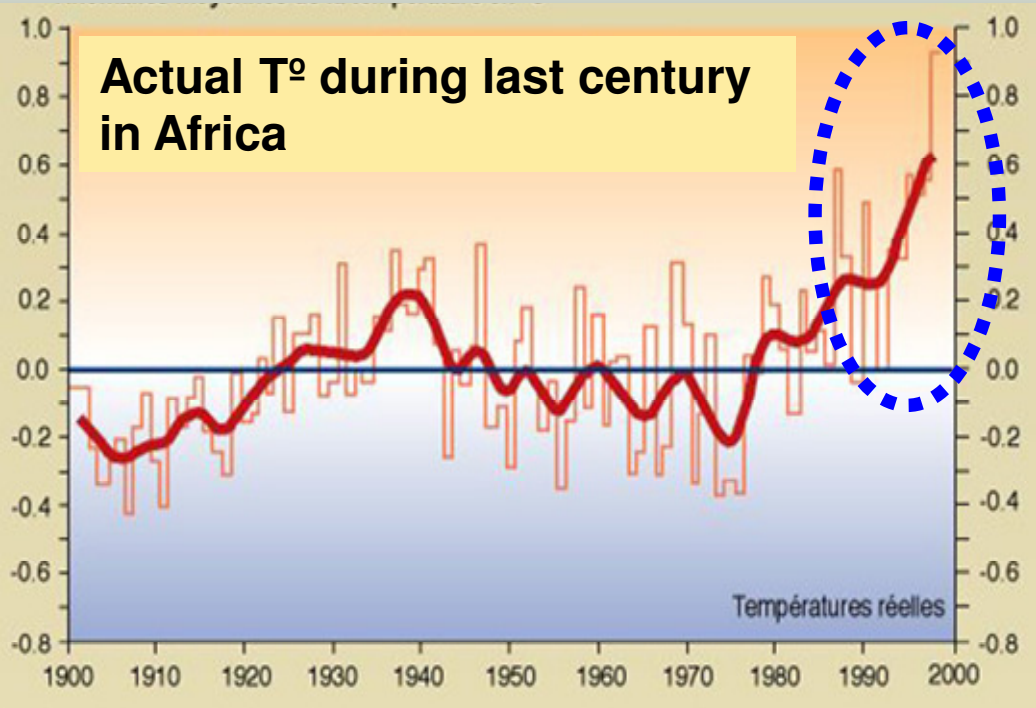
Climate change in Africa: Temperature

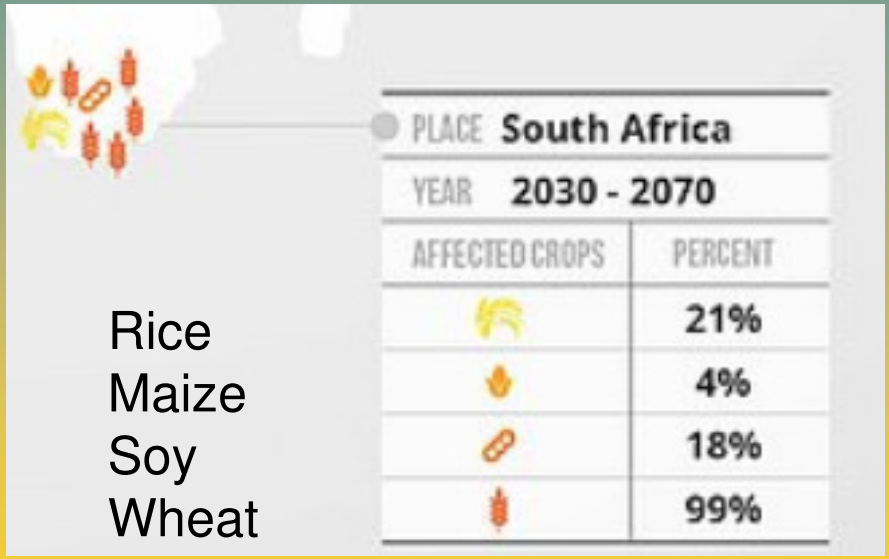


- Africa: projected Tº increases higher than global mean Tº increase
- IPCC Special report on Global Warming: only 12 years to act to prevent warming from exceeding 1.5ºC

Climate change in Africa: Precipitation!

- **Guinea Coast & Central Africa**: length of wet spells will decrease with an increase of heavy rainfall
- **Western Sahel**: strongest drying, with significant increase in length of dry spells
- **Greater Horn of Africa**: length of consecutive dry day spells projected to increase while length of wet day spells projected to decrease
- **Mediterranean region**: Strong increases in dryness and reduced water availability

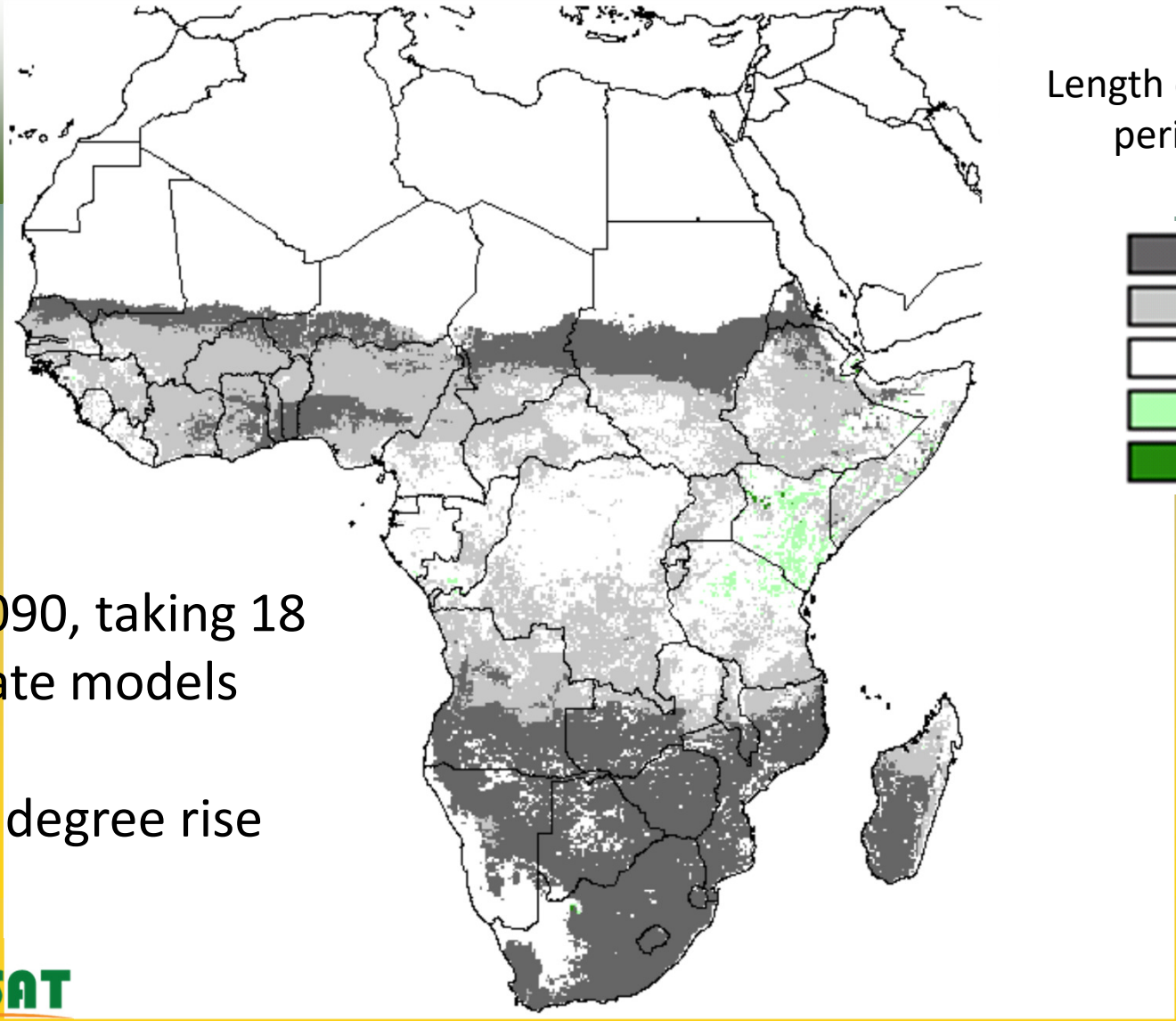
Area of crops with reduced rainfall



Rice
Maize
Soy
Wheat

Rojas et al. 2019. PNAS

High vulnerability of African agriculture to climate change



Length of growing period (%)

- >20% loss
- 5-20% loss
- No change
- 5-20% gain
- >20% gain

To 2090, taking 18 climate models

Four degree rise

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Climate change impact on African agriculture

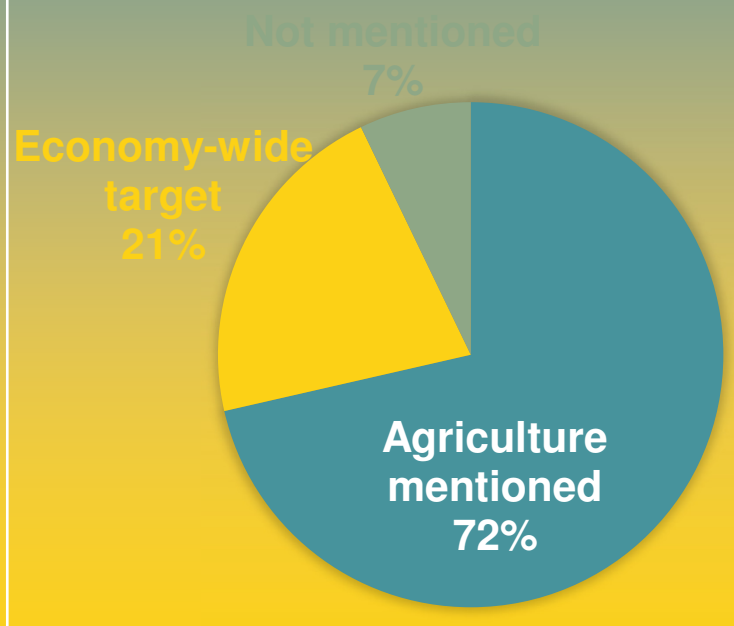
- Agriculture sector absorbs >26% total damage & loss from climatic extremes (>80% when caused by drought)
- CC to cause 71 million food-insecure people (half from sub-Sahara Africa)
- Corollary: loss of employment, income, nutrition, well-being…
- Degradation of lands and natural ecosystems

FAO, 2018

African agriculture in NDCs

- Agriculture sector must reduce methane and N_2O emissions by 1 Gigaton per year by 2030 to stay within the 2℃ limit
- > 85% African countries prioritized agriculture & land use sectors

- 72% explicitly included agriculture in their mitigation targets
- 8 countries quantified agriculture-specific targets, all against BAU: Benin, Chad, Comoros, Côte d'Ivoire, Chad, Gambia, Mali, Nigeria
- For example: Ethiopia, 90 MtCO2e (48.6%) reduction against BAU in 2030, conditional



Actions needed for resilient Agriculture & food systems

- Cross-sectoral/sectoral climate actions by public, private and community stakeholders urgently required for agricultural transformation:
  - Awareness raising
  - Climate-resilient information, knowledge, practices and technologies, scaling-up innovation and mechanisms
  - Resource mobilization
  - Linking local contexts with national and global decisions, policies
  - Monitoring progress and lessons learnt

Example cases to advance climate-resilient agriculture

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Before season	During season	Towards end season
Seasonal forecast ▪ Crop variety? **Onset forecast** ▪ Planting date	**Daily/ten-day forecast** ▪ use of fertiliser ▪ weeding ▪ second cropping?	**Ten-day forecast** ▪ Harvesting day

7 million farmers in Senegal

Ministry of Agriculture

Senegal Meteorological Agency

Climate scientists

Social scientists

Agricultural scientists

Rural radio association

Extensionists

- **Communicate strategically and actively**
- **Invest in two-way capacity enhancement**

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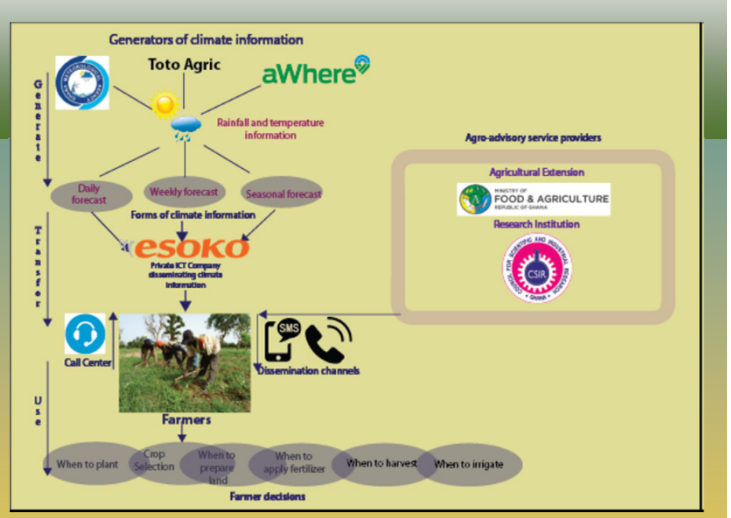
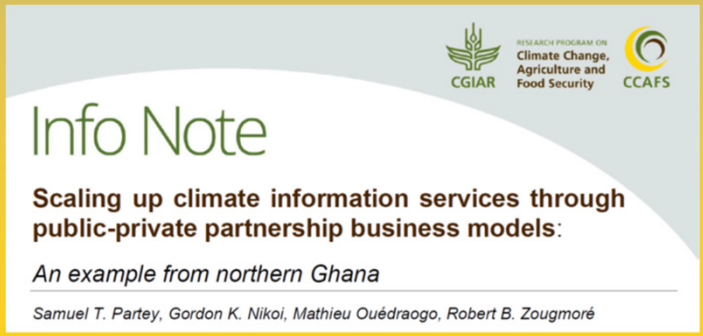
Investment case for climate information services

Development of PPP business model (Esoko, Ghana)

- Esoko enhanced its partnership with private companies (Toto agric. and aWhere, Vodafone Ghana) and public institutions (GMet, CSIR, MoFA) and farmers.
- Defined roles and responsibilities of partners in the PPP

  - *Stage1: Baseline assessment with* 20,000 farmers
  - *Stage 2: Designing a model of CIS platform*
  - *Stage 3: Creating evidence* - CCAFS and Esoko to M&E PPP effectiveness
  - *Stage 4: Scaling* - Using PPP evidence of success to benefit the PFJ Program in Ghana





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PPP for digital solutions
CIS Northern Ghana: (ESOKO-CCAFS)

- 20k subsidized in 2018
- 300k+ farmers paying
- Weather & CIS
- Voice calls
- Commodity prices
- Location agric. inputs and commodities
- Partnership: CSIR, MoFA, Awhere, Ghana met, Toto agriculture, Vodaphone, MTN, Airtel-Tigo, Esoko, CCAFS

The CSV AR4D to scale up CSA

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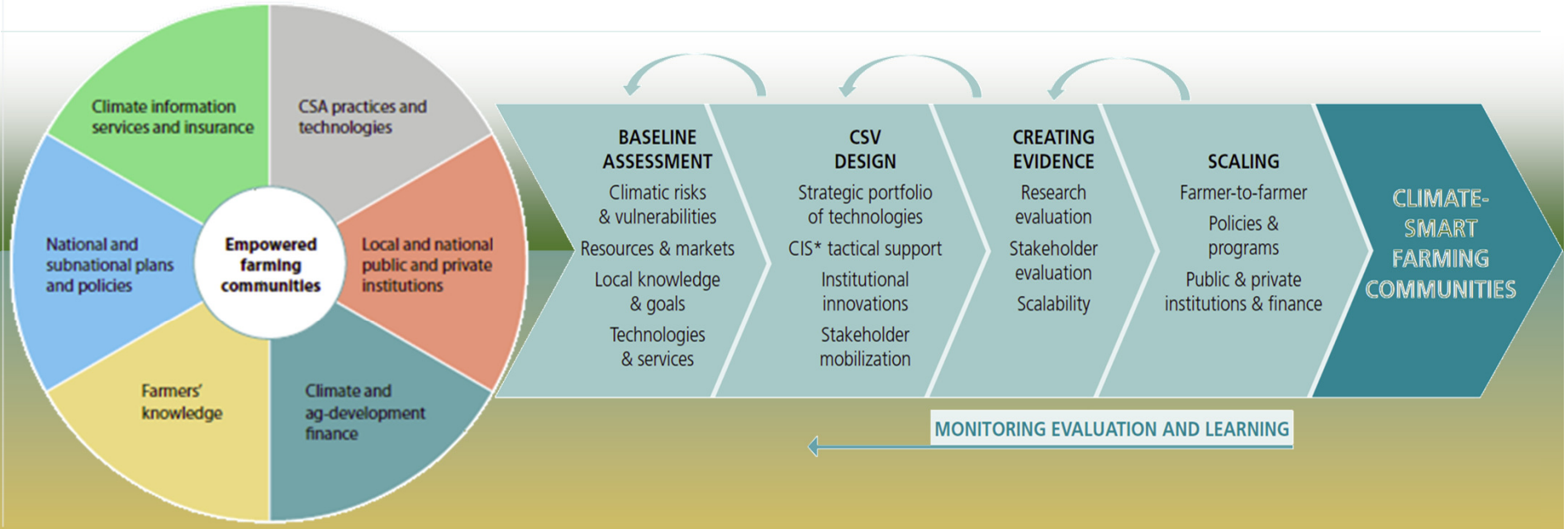
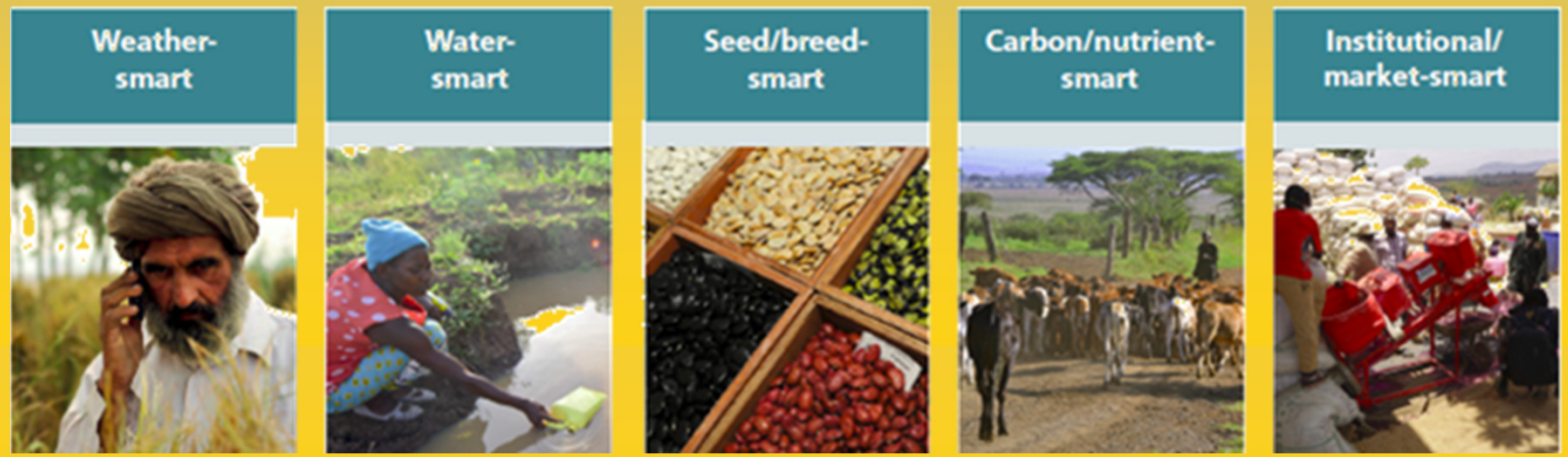


Types of climate-smart options



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Diffusion (awareness) and Adoption of CSA technologies

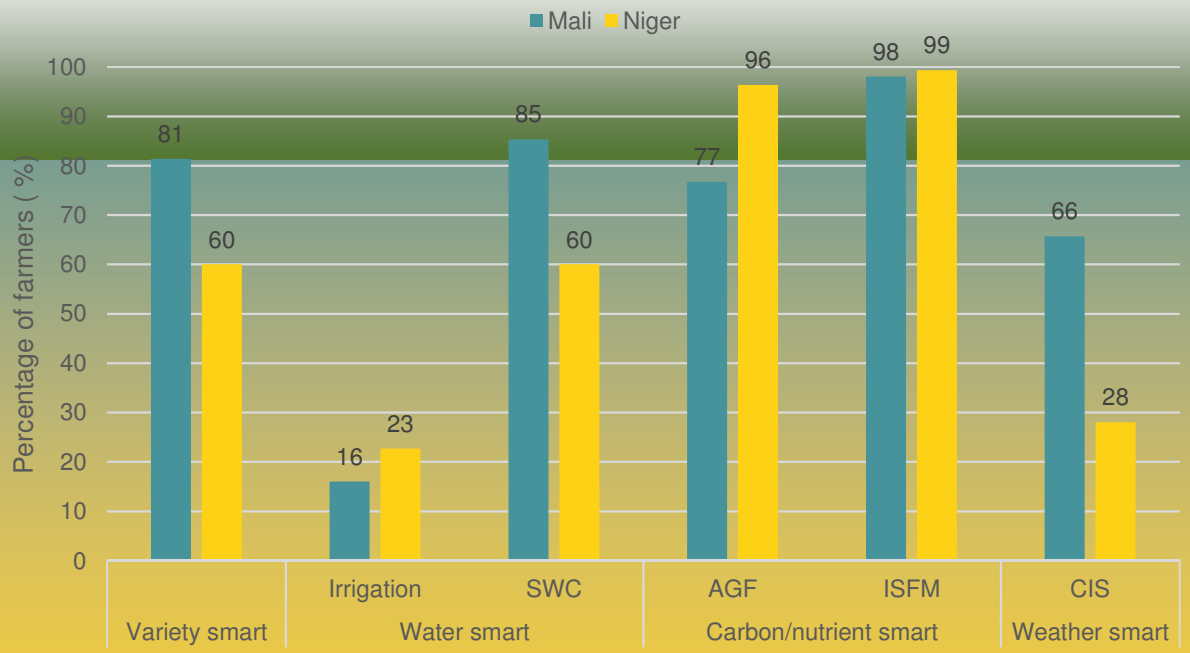
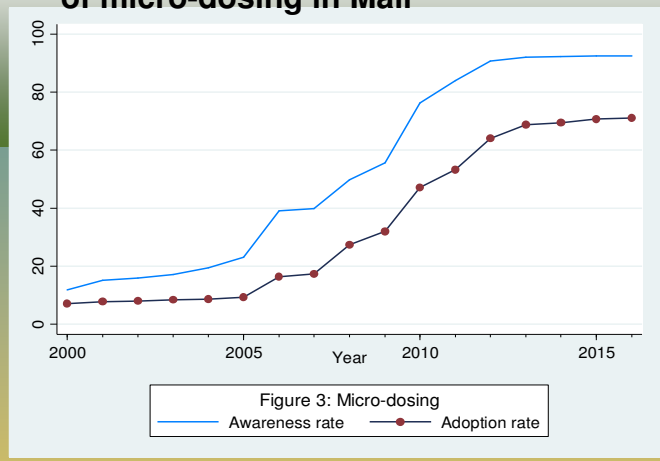
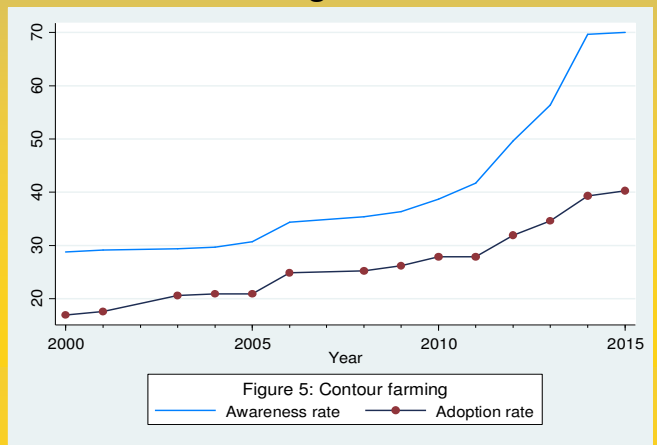


Fig 1. Adoption of CSA technologies in Mali and Niger CSVs

Awareness and adoption of micro-dosing in Mali



Awareness and adoption of contour farming in Mali



High increase of **awareness** (diffusion) and of **adoption** of two CSA options in Mali since 2010

Cost-benefit analyses of CSA technologies in the Climate-Smart Villages

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Economic indicator for CSA technologies and practices per ha in Ghana

Technologies and practices	Benefit/ Cost ratio (BCR)	Net Present Value (NPV) (GH₵)	IRR (%)	Payback period (PBP)
Improved Variety	2.61	9978.38	261%	1
Improved seed	0.66	1571.68	60%	2
Drought-tolerant/short cycle variety	6.72	43523.78	1110%	1
Organic fertilizer (compost & manure)	3.07	11384.94	307%	1
Dry season gardening	5.38	19231.36	538%	1
Intercropping	3.61	16742.28	361%	1
Contour farming	1.18	3746.03	115%	1
Use of climate information	3.36	15887.75	335%	1

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IRR values for all 8 CSA technologies and practices are above the lending rate rate (22%)

Cost-benefit analyses in the Climate-Smart Villages

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Mean comparison test of farm inputs use and productivity for cowpea growers with and without climate information (2014)

	Exposed (N=48)	Not exposed (26)	All farmers (74)	Diff in means
Farm inputs				
• Area (ha)	0.24	0.21	0.23	0.024
• Local seed (kg/ha)	18.27	35.16	24.20	-16.89*
• Improved seed (kg/ha)	7.98	1.22	5.61	6.76**
• Total seed (kg/ha)	26.25	36.38	29.81	-10.13
• Organic manure (kg/ha)	15.40	18.63	16.53	-3.23
• Mineral fertiliser (kg/ha)	32.93	37.55	34.56	-4.62
• Herbicide (l/ha)	0.12	0.00	0.08	0.12
• Insecticide (l/ha)	2.47	3.59	2.87	-1.12
• Labor (man-day/ha)	166.31	177.74	170.33	-11.44
Farm performance indicators				
• Area (ha)	0.24	0.21	0.23	0.024
• Yield (kg/ha)	848	675	788	173
• Gross product (F CFA/ha)	252282	188202	229767	64080*
• Input costs (F CFA/ha)	42303	53537	46250	-11234
• Gross margin (F CFA/ha)	209979	134665	183517	75313*

CI-exposed farmers used less local seed and more improved seed
Gross margin 56% higher compared to non-exposed farmers

Example cases to advance climate-resilient agriculture

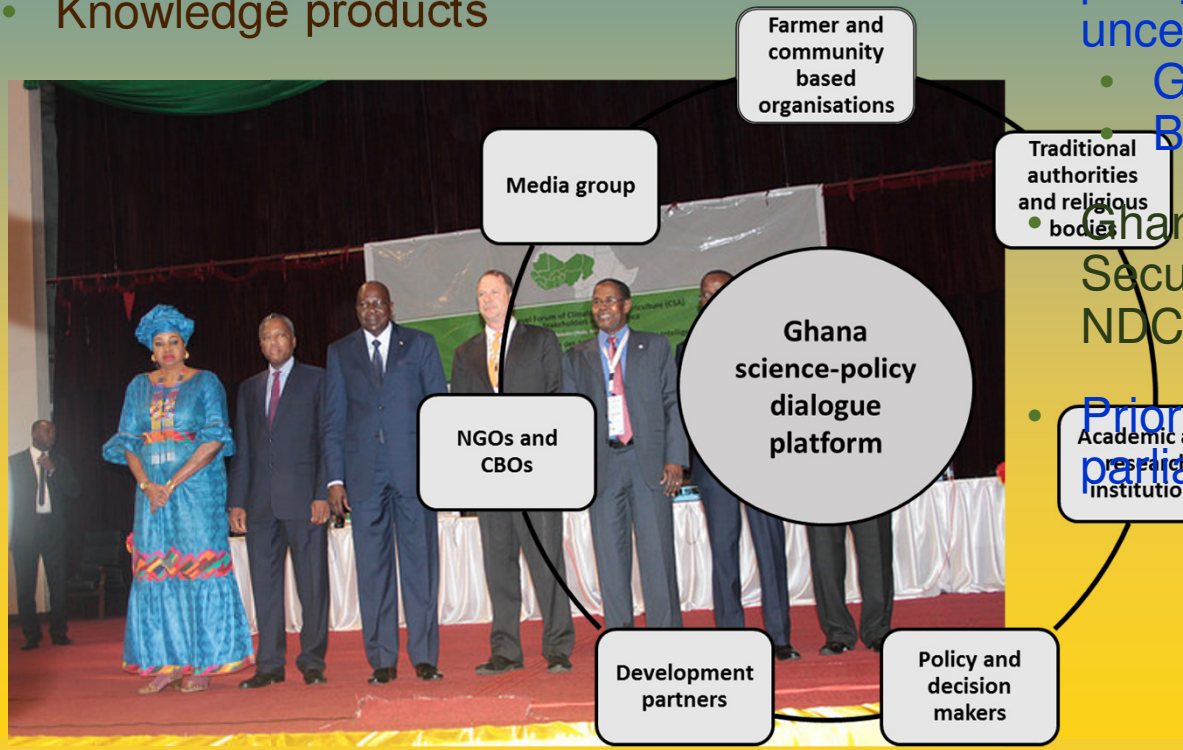
Scientific information from the CSV informed $ 111M WB-funded project

Knowledge & lessons learnt to inform the development of CSA communal investment plans of 60 communes

Science-policy platforms: linking science and policy

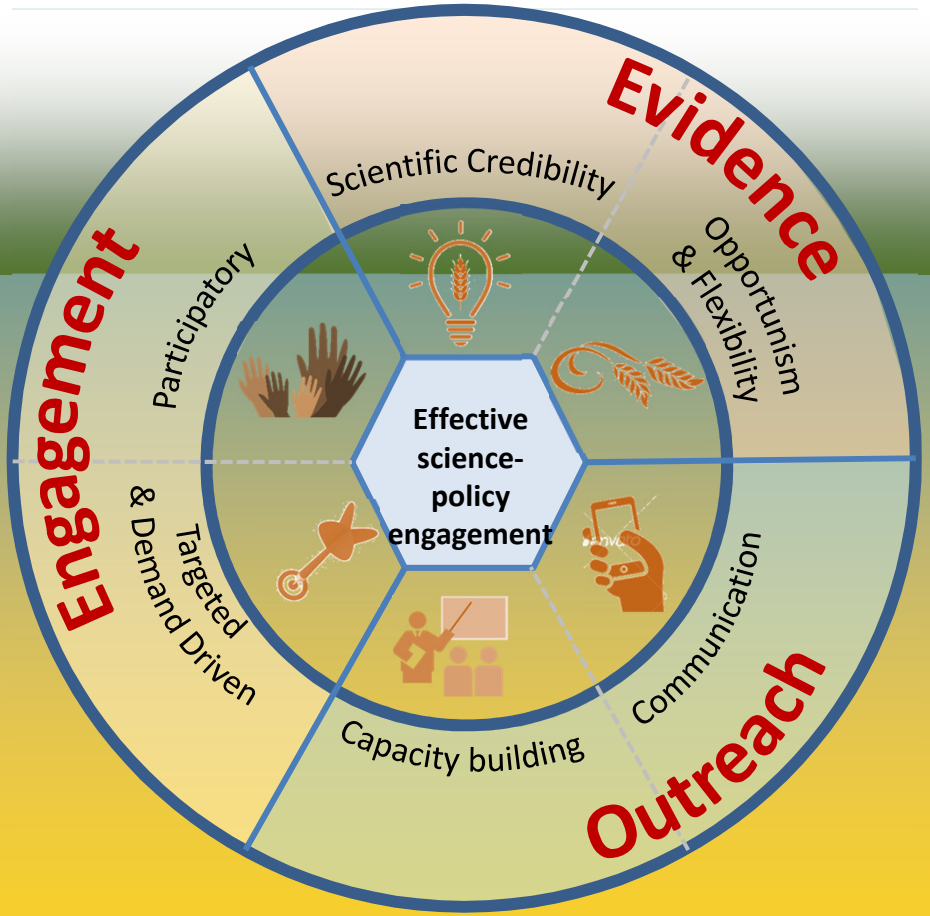
HOW?

- Multi-stakeholders
- Links to ongoing policy initiatives
- Two-way dialogue
- Knowledge products



RESULTS

- Scenario-guided policy planning → policy more robust to future uncertainties:
  - Ghana livestock policy
  - Burkina rural sector plan
- Ghana National CSA and Food Security Action Plan (2016-2020) → NDC
- Prioritized CSA options in Mali → parliament and GCF



Three thirds principle

Allocate resources in three thirds – engagement/needs, evidence, outreach:

Dinesh et al., 2018

Key messages

- Need change on the ground → farmer incomes, resilience, food security
- Need significant policy action to enable such change
- R4D also need to change → more responsive to stakeholder knowledge needs
- Where to focus?
  - Levering finance for the change
  - Climate-informed advisories
  - De-risking: index insurance, productive social safety nets, stress tolerant technologies

Publications

- **66 publications between 2015-2018:**
  - peer reviewed papers
  - book chapters
  - working papers, reports and manuals
  - policy briefs and info notes

Bayala et al. Agric & Food Secur (2017) 6:40
DOI 10.1186/s40066-017-0117-5
Agriculture & Food Security
EDITORIAL
Open Access

Editorial for the Thematic Series in *Agriculture & Food Security*: Climate-Smart Agriculture Technologies in West Africa: learning from the ground AR4D experiences

Jules Bayala[1*], Robert Zougmoré[2], Sidzabda Djibril Dayamba[1] and Alain Olivier[3]

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Article

Farmers' Willingness to Pay for Climate Information Services: Evidence from Cowpea and Sesame Producers in Northern Burkina Faso

Mathieu Ouédraogo [1,2,*], Silamana Barry [2], Robert B. Zougmoré [1], Samuel Tetteh Partey [1], Leopold Somé [2] and Gregoire Baki [3]

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Review

Developing climate-smart agriculture to face climate variability in West Africa: Challenges and lessons learnt

Samuel T. Partey [a, *], Robert B. Zougmoré [a], Mathieu Ouédraogo [a], Bruce M. Campbell [b]
[a] CCAFS, International Crops Research Institute for the Semi-Arid Tropics (ICRISAT), BP 320, Bamako, Mali
[b] CCAFS, Centro Internacional de Agricultura Tropical (CIAT), KM17, Recta Cali-Palmira, Apartado Aéreo 6713, Cali, Colombia

Taylor & Francis
Climate and Development
ISSN: 1756-5529 (Print) 1756-5537 (Online) Journal homepage: http://www.tandfonline.com/loi/tcld20

Power and influence mapping in Ghana's agricultural adaptation policy regime

Chase A. Sova, Thomas F. Thornton, Robert Zougmore, Ariella Helfgott & Abrar S. Chaudhury

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Tribe visited research sites in Adelaide, Canberra, Deniliquin, Gilruth Plains, Griffith, Melbourne, Perth, Sydney and Trangie observing new flora and fauna, including unusual people. As he later observed, ***''this exhilarating experience opened my eyes to so much that I had never previously known''*** and in his trip report, he recorded that ***"every person I met in Australia was most kin and hospitable".*** This was a grand adventure for a young man of Tribe's staid background, ad was to have far-reaching effects.

(Derek Tribe : international agricultural scientist : founder of the Crawford Fund / Lindsay Falvey, 2012)

Sincere Thanks to the Crawford Fund!

Robert Zougmore (R.Zougmore@cigar.org)