Making Climate Services Work for Smallholder Agriculture: Innovations and Lessons from Across the Developing World

CGIAR

RESEARCH PROGRAM ON
Climate Change, Agriculture and Food Security

CCAFS

Jim Hansen, CCAFS Flagship 4 Leader, IRI

APEC Climate Symposium, Can Tho, Vietnam, 18-20 August 2017

Led by CIAT
International Center for Tropical Agriculture
Since 1967 / Science to cultivate change

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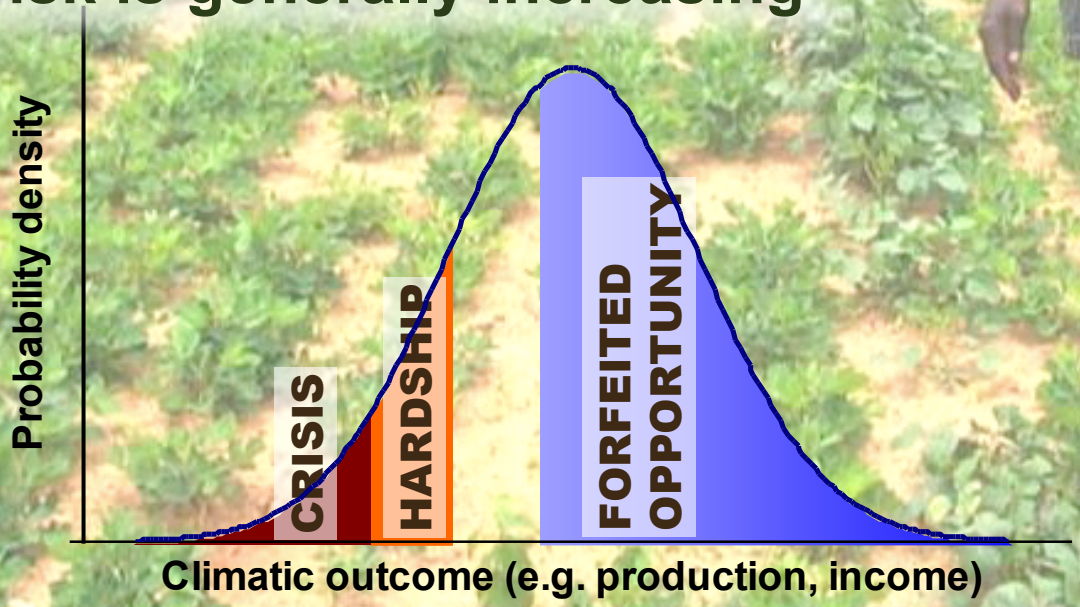
How can climate services help farmers to be resilient, food secure and prosperous?

The cost of climate risk

- **Climate risk contributes to chronic poverty, vulnerability, food insecurity**
  - **Downside risk: shocks**
  - **Opportunity cost: uncertainty**
  - **Affects farmers, markets, the food system, the "relief trap"**
- **Climate risk is generally increasing**



Options for adapting smallholder agriculture to climate require information

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- Matching crops, technology, advisories to local climate
- Index-based insurance
- Participatory methods for using seasonal forecasts
- Production or hydrological forecasts for planning, food security management
- Detecting and understanding change

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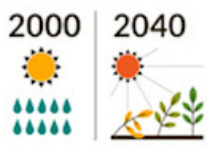
Climate services that work for farmers, at scale and sustainably, require more than just information

From weather to climate services

- All time scales are relevant to agriculture
- Information needed depend on decisions
- With increasing lead time:
  - Decisions more context- and farmer-specific
  - Information more uncertain, complex
  - Decision-makers need more help to understand and use the information

	Type of information	Vehicles for delivering information	Farmer decisions affected
WEATHER **Days to weeks**	 • Observed rainfall and temperature • Daily forecasts up to one week ahead of time • Alerts on pests and diseases • Early warning of extreme weather events	 • Mobile phones • Radio • Television	 • Timing of planting and harvest • Timing of fertilizer, pesticide, and irrigation application • Protecting lives and property from extreme events
CLIMATE VARIABILITY **Months to Years**	 • Probabilities for seasonal rainfall and temperature conditions • Seasonal climate variables targeted to particular agricultural risks (dry spells, rainy season start date, etc) • Historical variability of climate variables	 • Workshops with experts • Conversations with agricultural extension agents (farm educators)	 • Selecting crops and varieties • Livestock stocking rates and feeding strategies • Intensity of input use (fertilizer, pesticides) • Labor or marketing contracts • Intensifying and diversifying crops • Diversifying sources of income
CLIMATE CHANGE **Decades or longer**	 • Projections of future rainfall and temperature • Historical trends in rainfall and temperature • Historical changes in extreme events	 • Workshops with researchers, agricultural extension agents, and meteorological services.	 • Major capital investments (buying or expanding landholding, irrigation systems, farm equipment etc) • Changing farming system or livelihood strategy • Deciding whether or not to farm

From weather to climate services

- Climate services more than adding climate products to weather services:
  - Generation
  - Translation
  - Communication
  - Application

…of climate knowledge and information for climate-informed decision making and climate-smart policy and planning

	Type of information	Vehicles for delivering information	Farmer decisions affected
WEATHER Days to weeks	 • Observed rainfall and temperature • Daily forecasts up to one week ahead of time • Alerts on pests and diseases • Early warning of extreme weather events	 • Mobile phones • Radio • Television	 • Timing of planting and harvest • Timing of fertilizer, pesticide, and irrigation application • Protecting lives and property from extreme events
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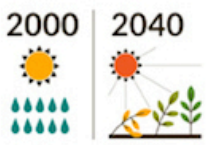
CLIMATE CHANGE Decades or longer	 • Projections of future rainfall and temperature • Historical trends in rainfall and temperature • Historical changes in extreme events	 • Workshops with researchers, agricultural extension agents, and meteorological services.	 • Major capital investments (buying or expanding landholding, irrigation systems, farm equipment etc) • Changing farming system or livelihood strategy • Deciding whether or not to farm

(http://www.climate-services.org/about-us/what-are-climate-services/)

What will it take for climate services to benefit farmers – at scale? 5 challenges:

1. Gaps in capacity to access, understand, act on information
2. Gaps in observations
3. Gaps in capacity to provide actionable information
4. Gaps in information relevance
5. Institutional, governance arrangements to sustain co-development of services

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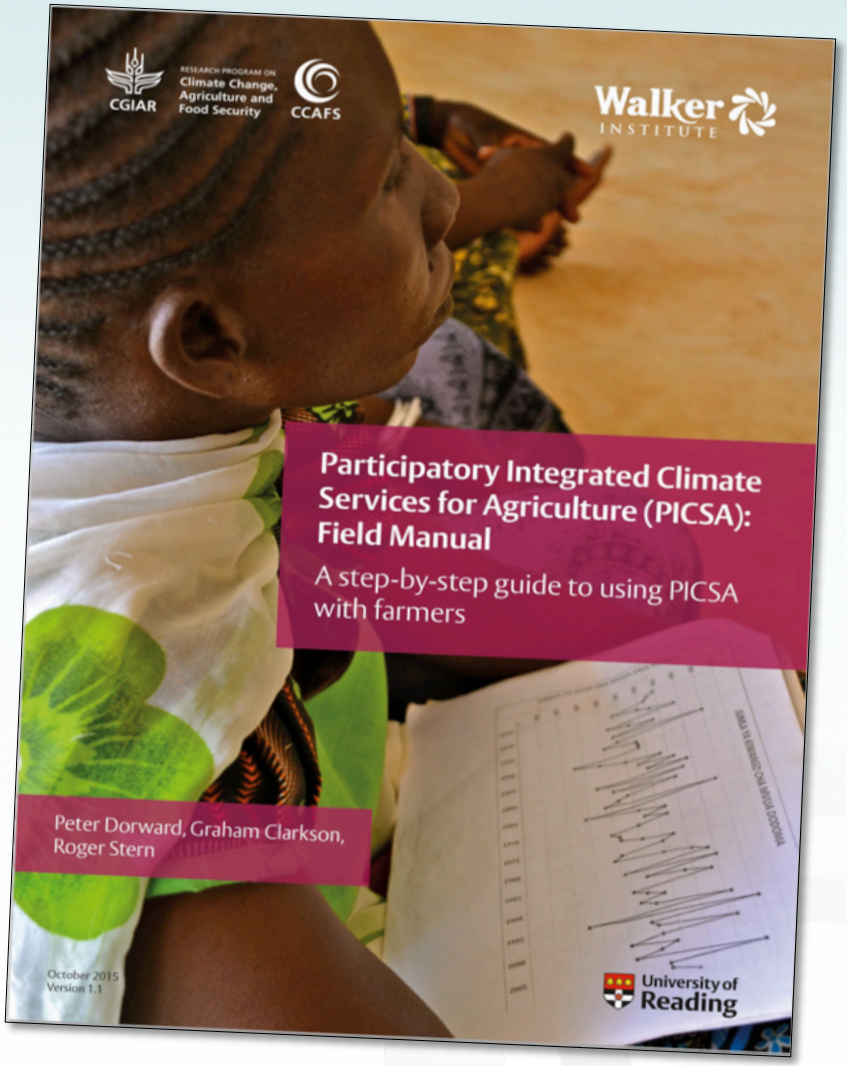
Challenge #1: Farmers' capacity to access, understand and act on climate information

Building capacity to communicate, understand, act on information: PICSA

- One of several good structured participatory communication approaches
- Can be mainstreamed into agricultural extension, other intermediaries, through training
- Extensive use of local historic data and forecasts, graphs
- Complements radio, ICT, other communication channels



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Building capacity to communicate, understand, act on information: PICSA

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Long Before the Season

Historical Climate Data

Crop + Livestock Options

Participatory Planning

Just Before the Season

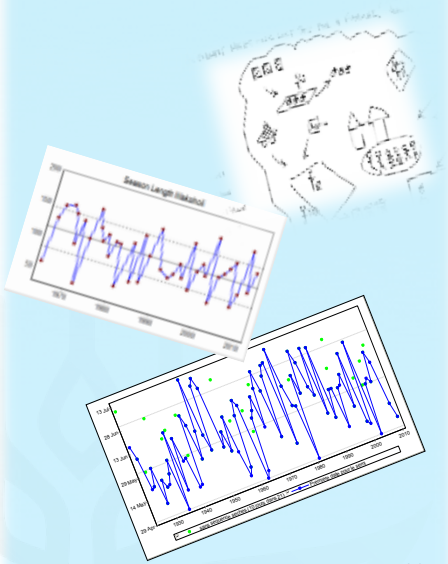
Seasonal Forecast & Revise Plans

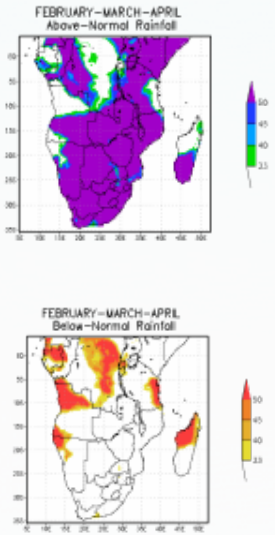
During the Season

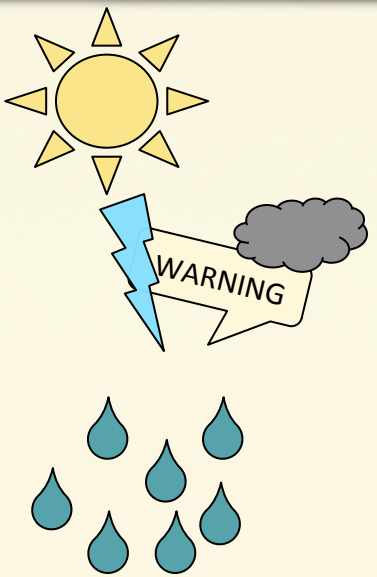
Short-term Forecasts & Warnings

Shortly After the Season

Review weather, production, forecasts & process







Seasonal Forecasts from http://rava.qsens.net/themes/climate_template/seasonal-forecasts/

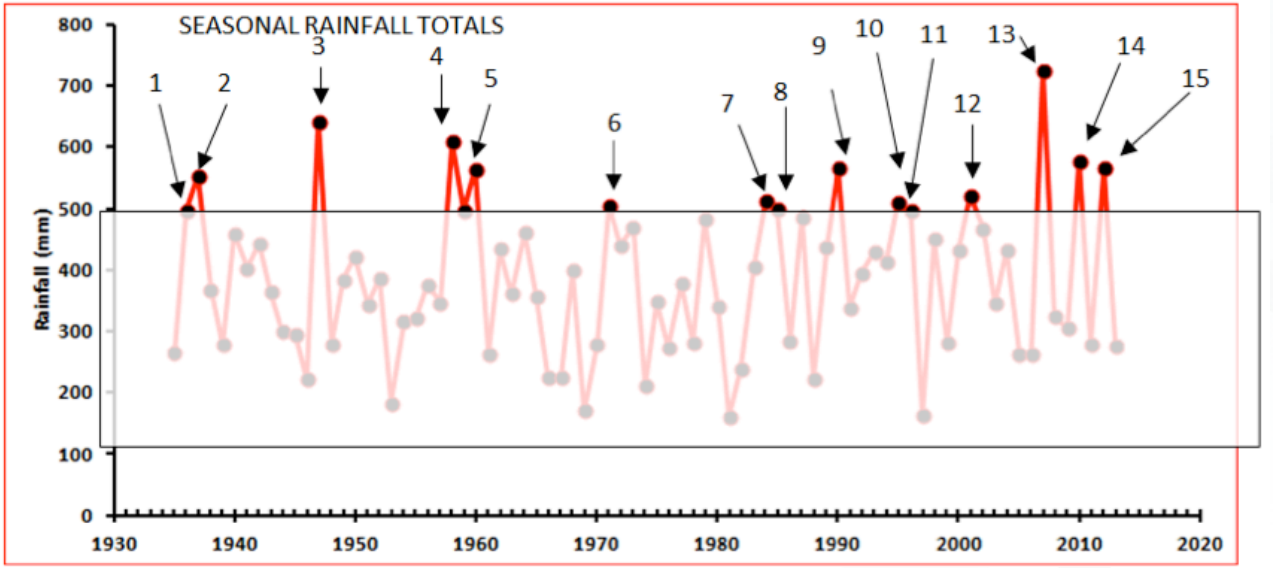
Peter Dorward

Walker INSTITUTE

University of Reading

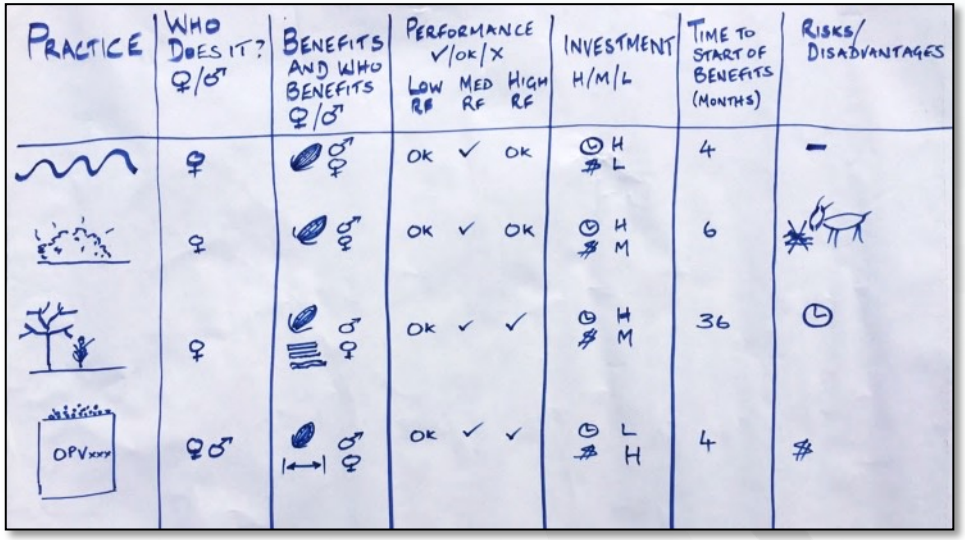
Building capacity to communicate, understand, act on information: PICSA

- Understand historical climate
  - Trends and variability
  - Derived seasonal quantities
  - Crop requirements and risks



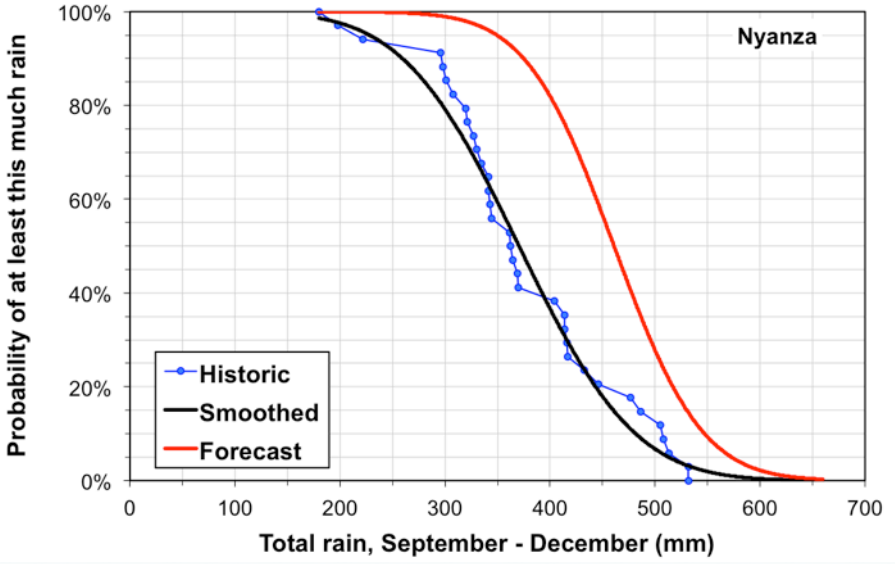
Building capacity to communicate, understand, act on information: PICSA

- Understand historical climate
- Participatory planning
  - Current livelihood system
  - Options to improve system



Building capacity to communicate, understand, act on information: PICSA

- Understand historical climate
- Participatory planning
- Downscaled seasonal forecasts
  - Training on new probability formats
  - Adjust seasonal planning
- ***Depends on information that NMHS often don't routinely provide.***

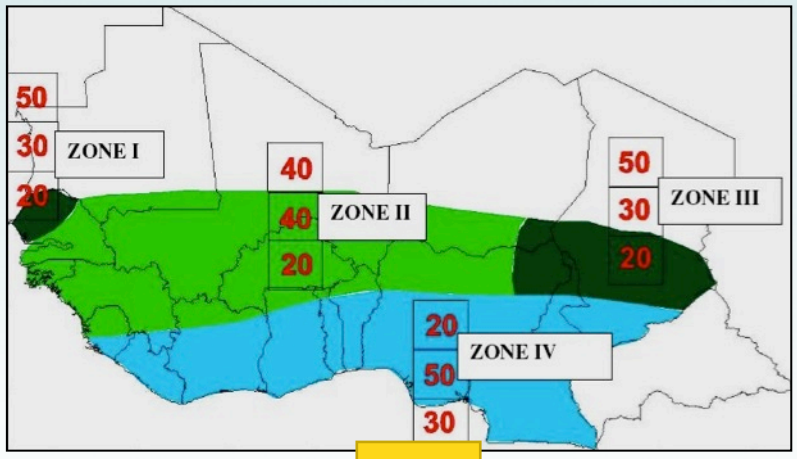


Challenge #2: Gaps in historic data

Challenge #3: NMHS capacity to routinely provide tailored local information

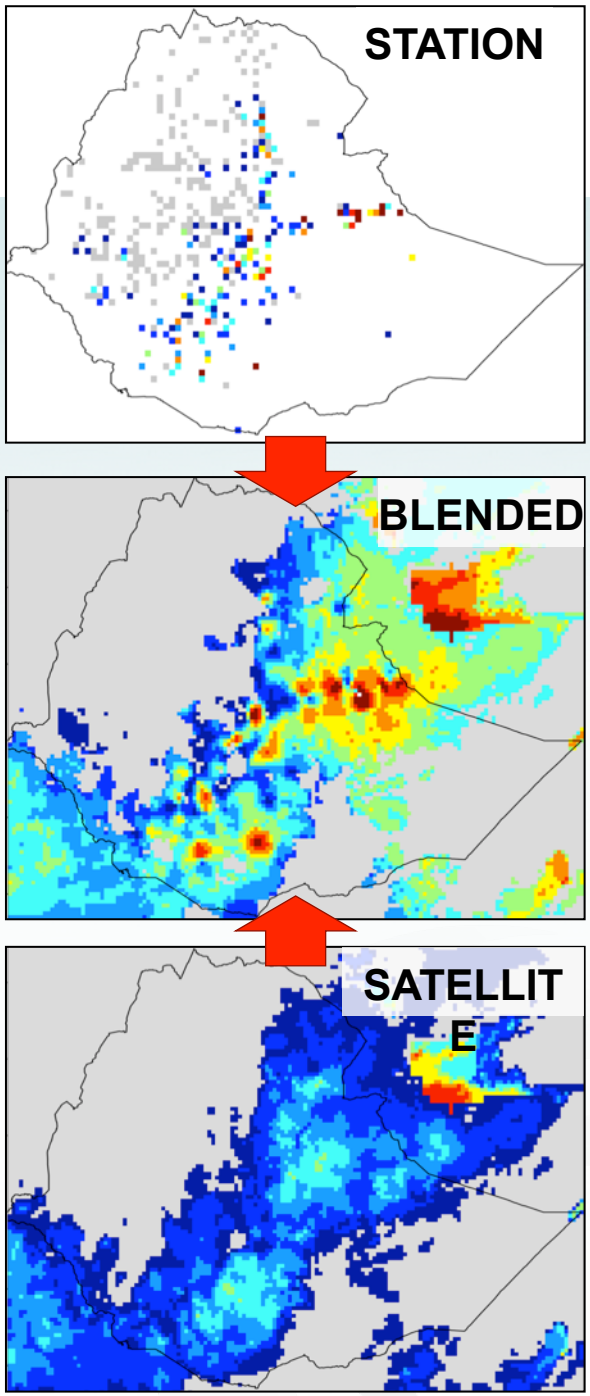
Supporting NMHS to provide actionable local climate information: ENACTS

- Farmers' relevance challenges:
  - Local spatial scale
  - Season characteristics: timing, spells, water balance, extremes
  - Consistency between seasonal forecast and historical variability
  - Transparent communication of variability, accuracy
- NMHS capacity challenges:
  - Parent ministry mandate
  - Human & financial resources
  - Cost of responding to user requests
  - Major gaps in historic observations



Supporting NMHS to provide actionable local climate information: ENACTS

- Enhancing National Climate Services
- Merge station + satellite (or reanalysis) data, ~5 km grid, >30-50 year complete record
- Production and dissemination of an expanding suite of information products through online “Maprooms”
- NMHS capacity development mode
- Expanding ENACTS and connecting with PICSA communication processes



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ENACTS
ENHANCING NATIONAL CLIMATE SERVICES

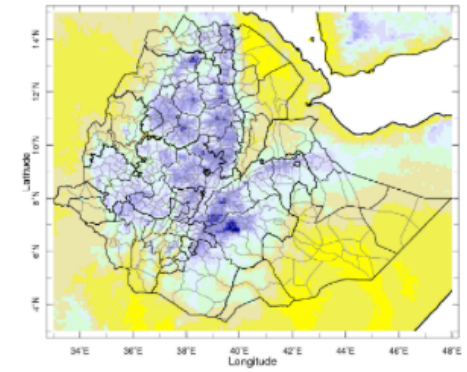
Maproom: Climate | Climate Analysis: Monthly Climate Analysis | Region: Ethiopia | Variable: tmin | Spatially Average Over: gridpoint 0.1

Yearly Seasonal Anomalies: Jan 1983 to Mar 2014

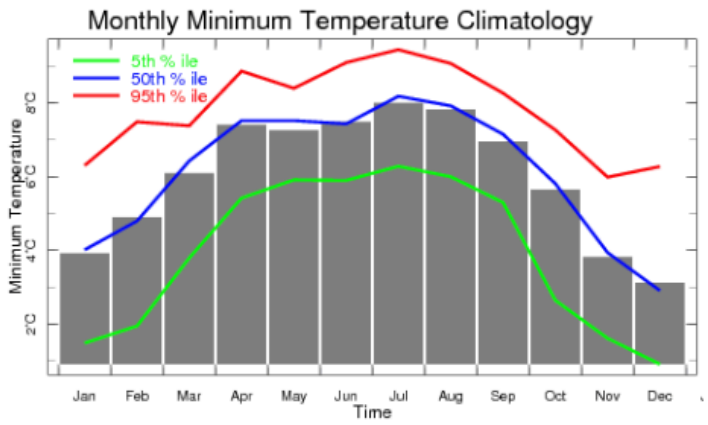
Description | Dataset Documentation | Instructions | Contact Us

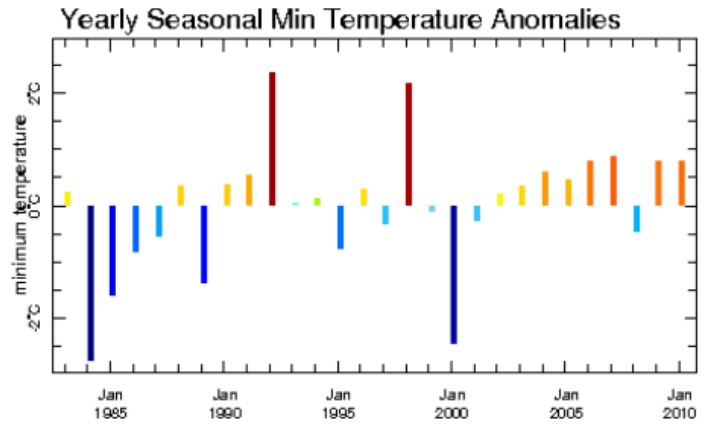
Monthly Climate Analysis

Rainfall time series (1983-2014) and temperature time series (1981-2014) reconstructed from station observations, remote sensing and other proxies. This interface allows users to view rainfall, maximum and minimum temperature climatologies.



Observations for **[39E-39.1E, 7N-7.1N]**





Maproom
Climat

Surveillance du Climat: Surveillance du Climat

Région: Madagascar

Langue: français

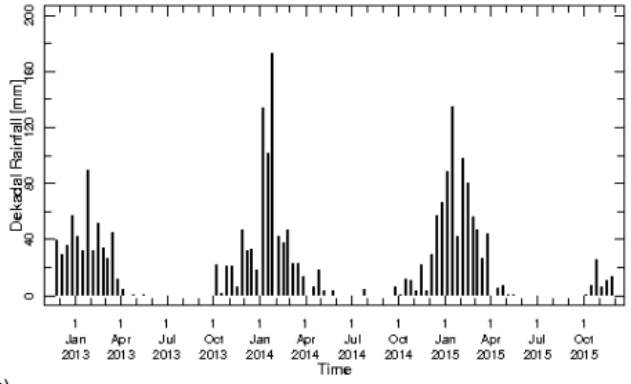
Moyenne spatiale sur: District — IHOSY, FIANARANTSOA

Analyse: Anomalies de Précipitations

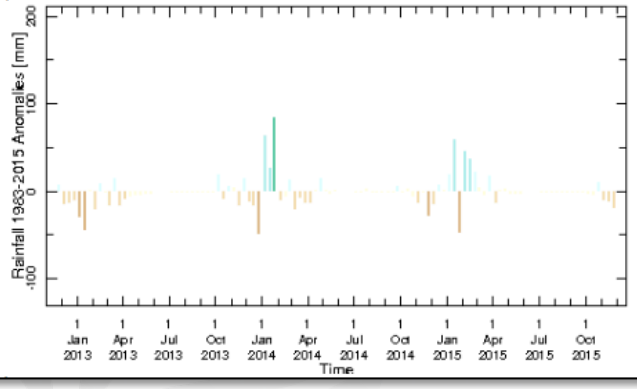
Description | Documentation des Données | Instructions | Contact

Données Combinées Stations-Satellite pour **IHOSY, FIANARANTSOA**

a)



b)



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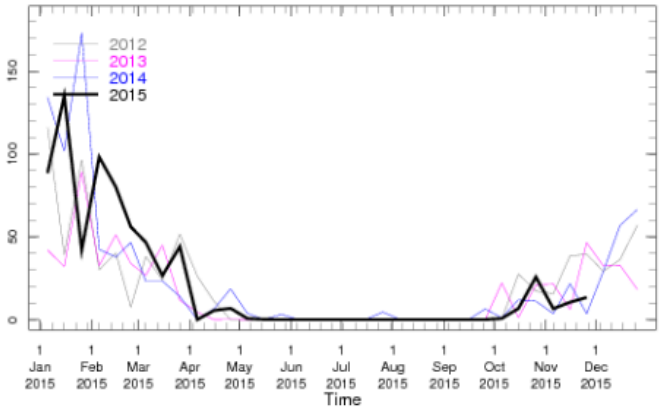
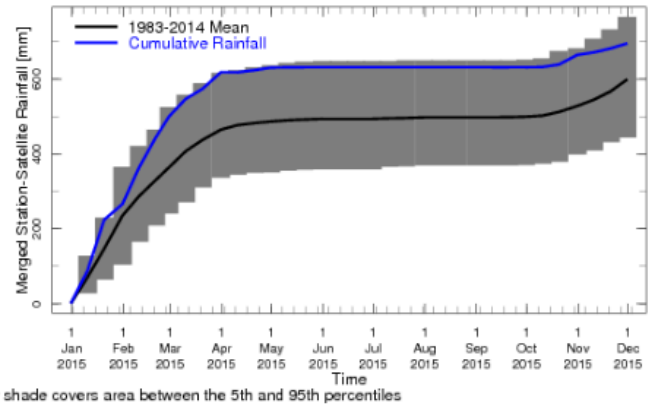


d)



Grey shade covers area between the 5th and 95th percentiles

a) Précipitations décadaires (i.e., ~période de 10 jours) sur la région sélectionnée pour les 3 dernières années.

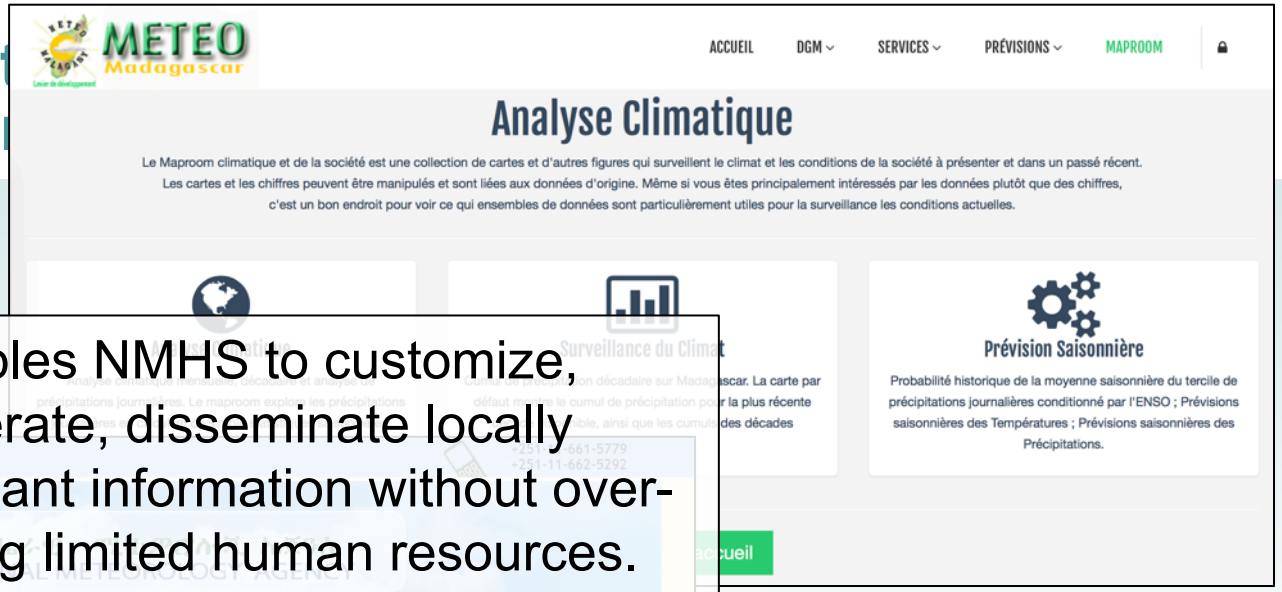
b) Différences de précipitations décadaires (par rapport à la moyenne de 1983-2012) sur la région sélectionnée pour les 3 dernières années.

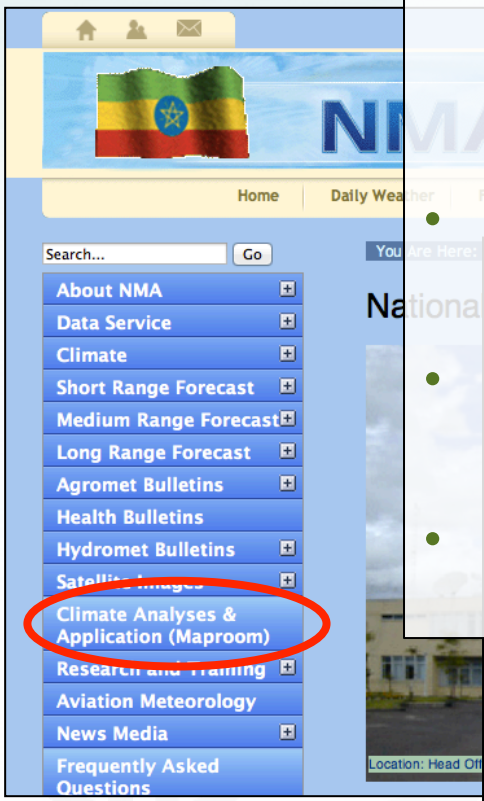
c) Précipitations décadaires filtrées pour l'année en cours (ligne noire épaisse) comparées aux années antérieures (bleue - année précédente ; magenta - 2 années précédentes ; gris - 3 années précédentes).

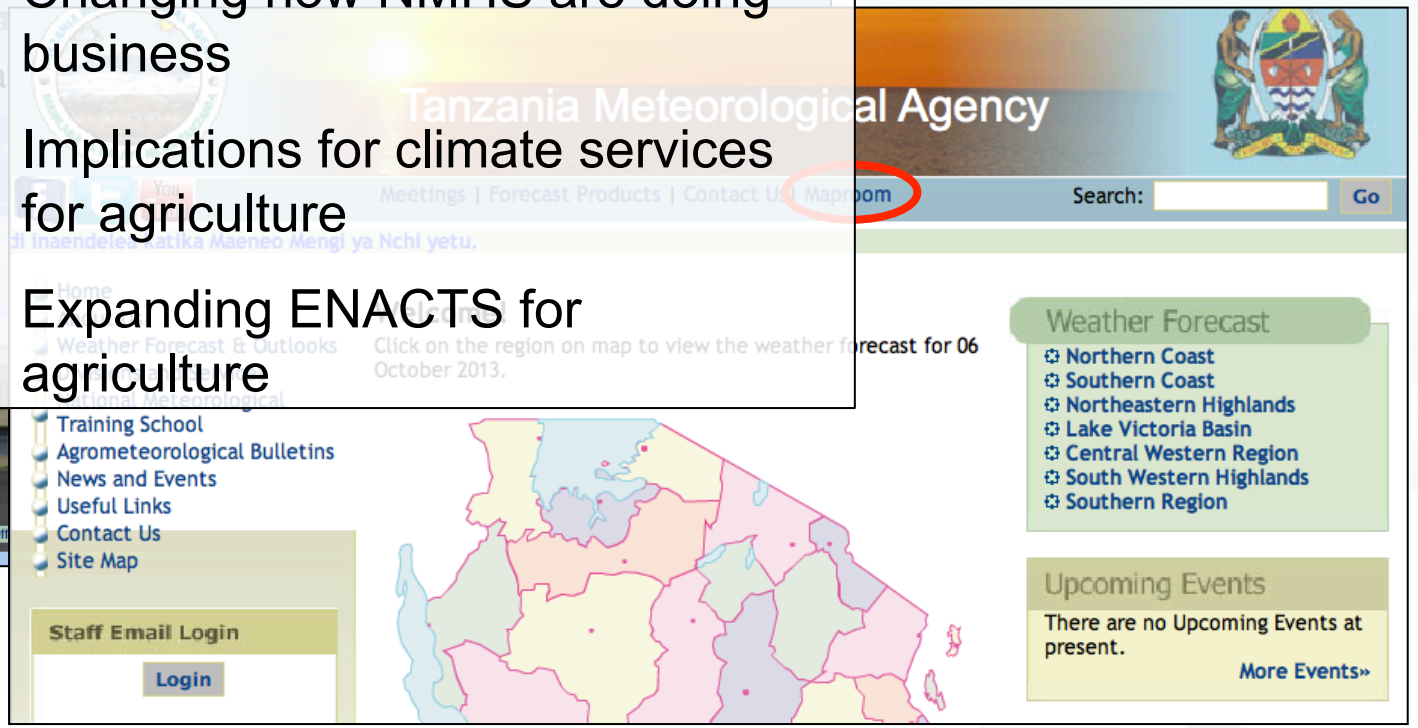
d) Précipitations décadaires cumulées (courbe bleue) et la moyenne cumulée à long terme (1983-2012) (courbe noire) depuis le jour calendaire de l'année choisie par l'utilisateur, dans la région sélectionnée. L'enveloppe grise indique les valeurs de précipitations cumulées comprises entre les 5ème et 95ème percentiles.

Supporting NMS f
local climate infor

- Enables NMHS to customize, generate, disseminate locally relevant information without over-taxing limited human resources.
- Changing how NMHS are doing business
- Implications for climate services for agriculture
- Expanding ENACTS for agriculture

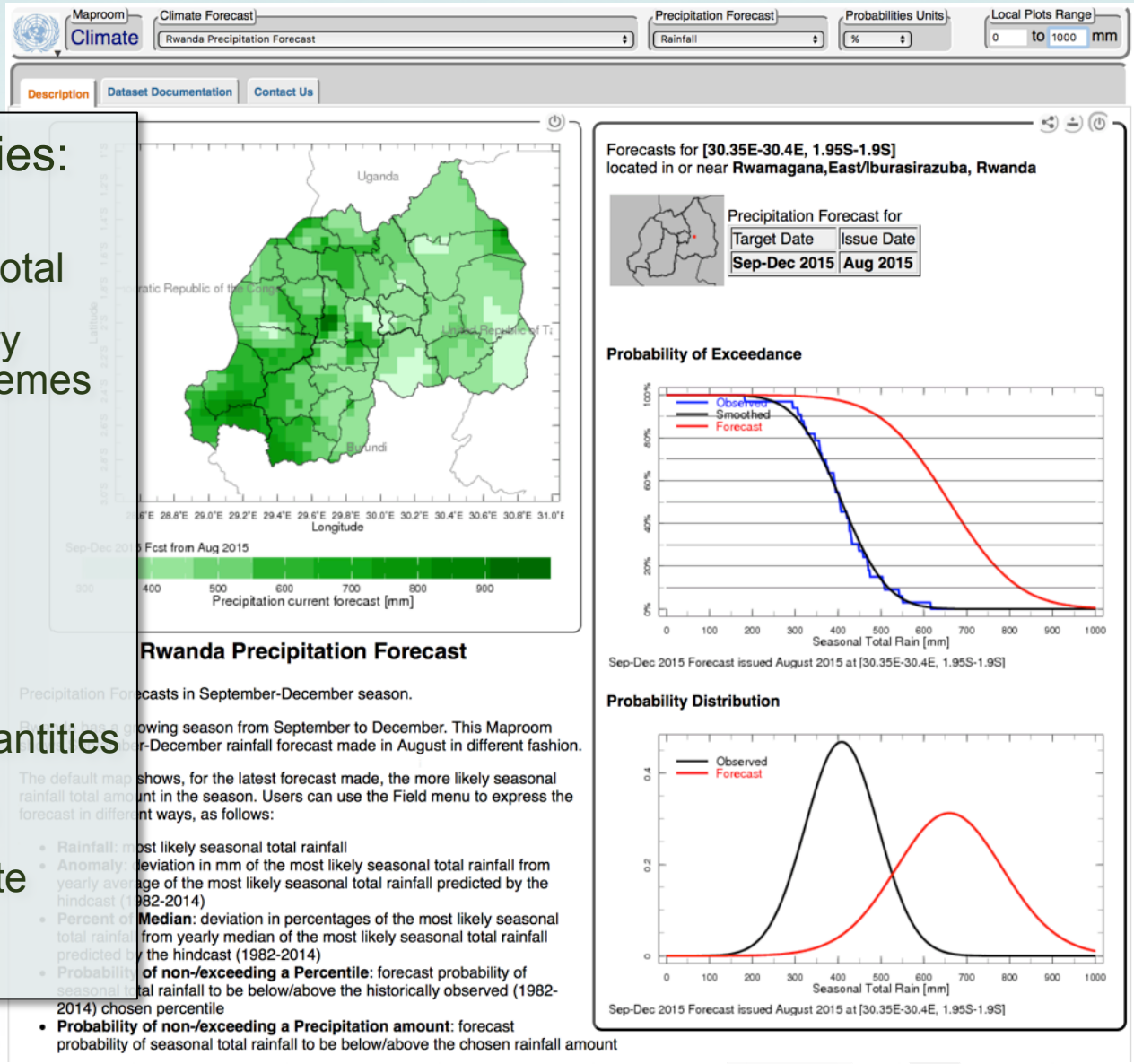






Supporting NMS to provide actionable local climate information

- Derived agromet quantities:
  - Season onset, cessation, duration, dynamic rainfall total
  - Frequency of damaging dry spells; wet, heat, cold extremes
  - Growing degree-days
  - Water balance, WRSI
- Seasonal forecasts:
  - Statistically downscaled
  - Same suite of agromet quantities
  - Full probability distribution
  - In context of historic climate



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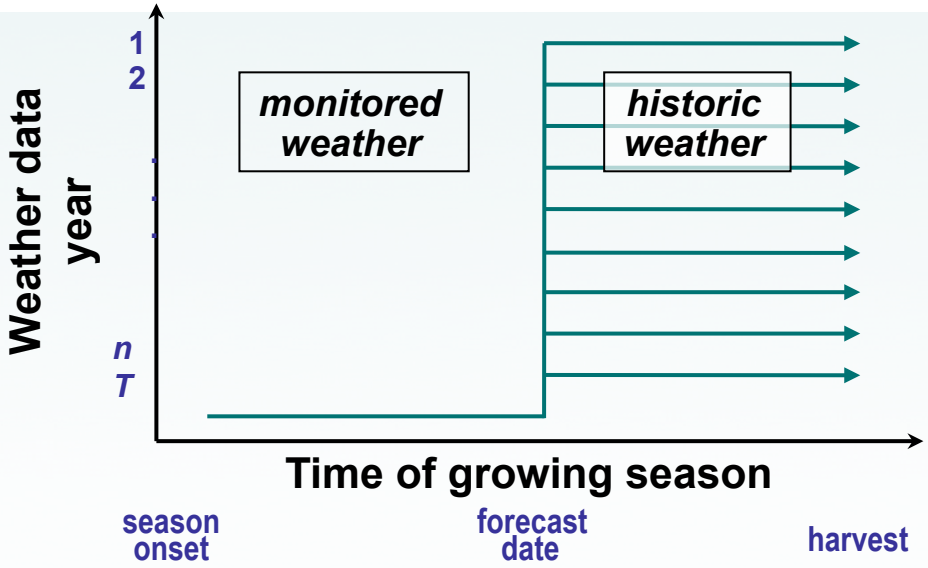
Challenge #4: Translating raw climate information into agriculturally relevant terms

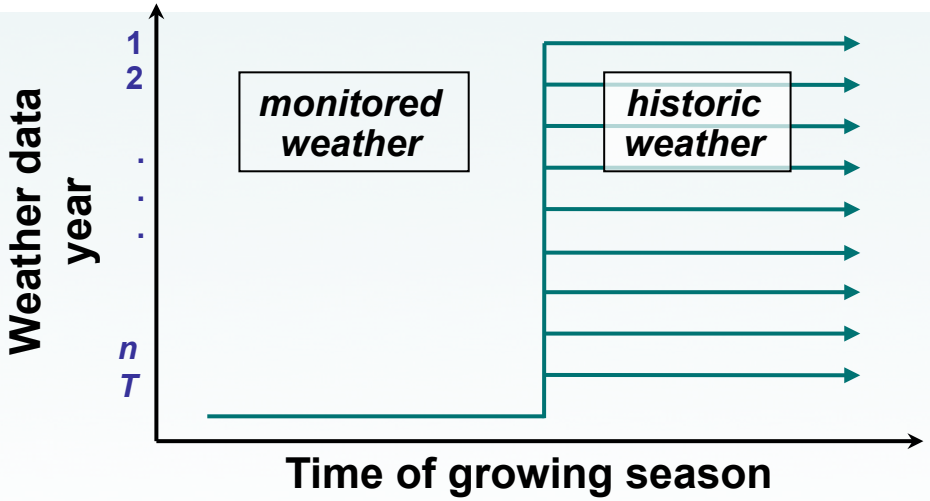
Translating climate information into agriculturally relevant terms

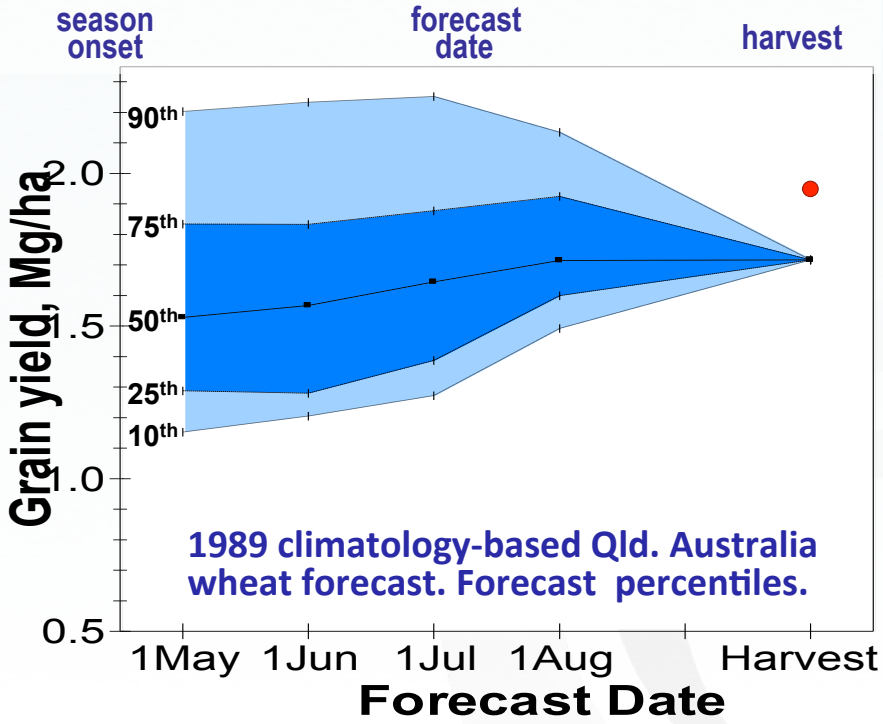
- Consider yields simulated with monitored weather through current date, then sampled historic weather.



Translating climate information into agriculturally relevant terms

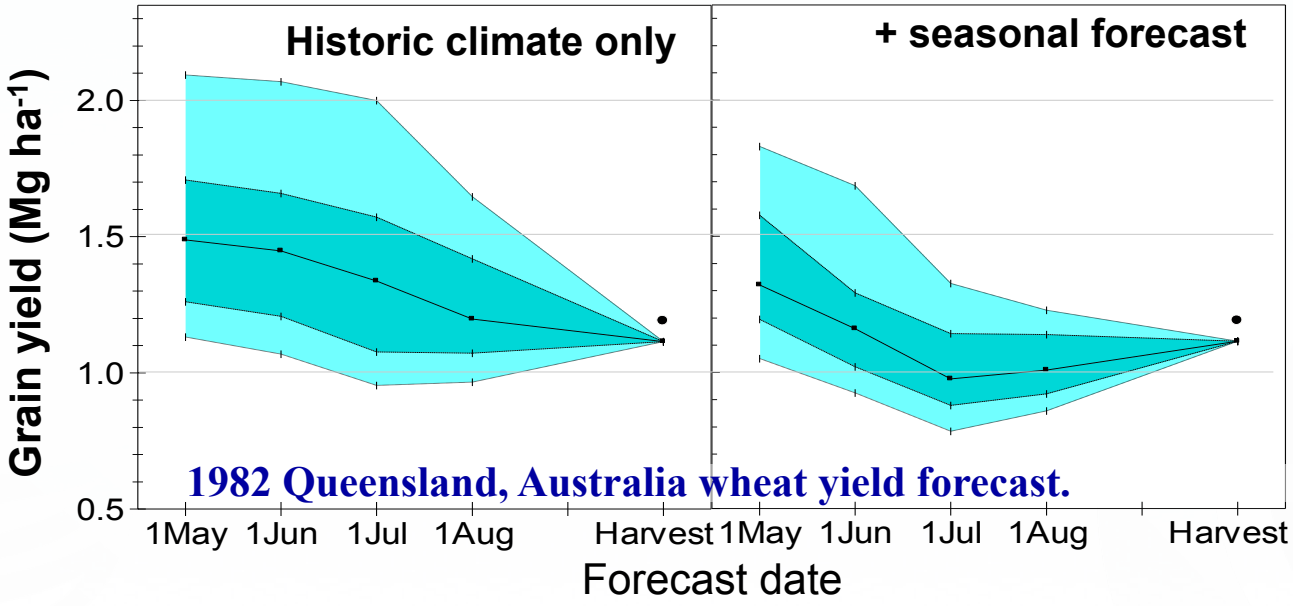
- Consider yields simulated with monitored weather through current date, then sampled historic weather.
- Uncertainty decreases as the season progresses.





Translating climate information into agriculturally relevant terms

- Consider yields simulated with monitored weather through current date, then sampled historic weather.
- Uncertainty decreases as the season progresses.
- Skillful seasonal forecasts reduce uncertainty early in the season.



Translating climate information into agriculturally relevant terms: CRAFT

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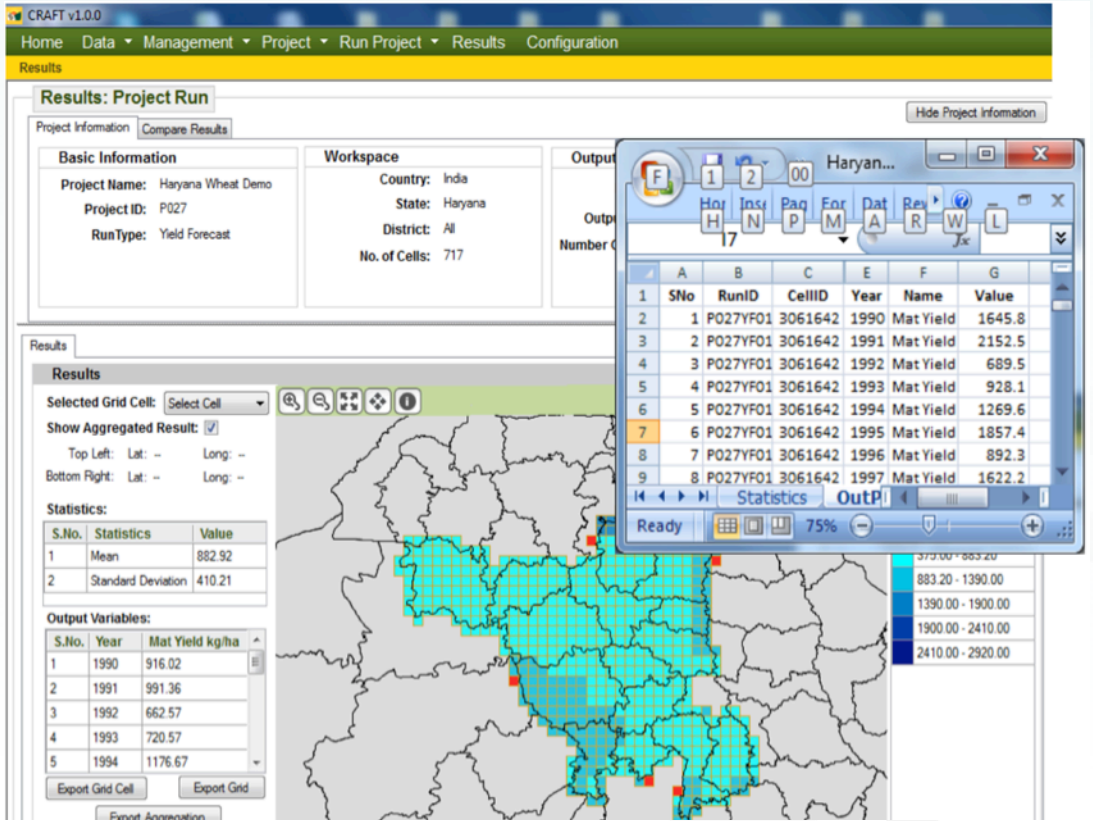
CCAFS Regional Agricultural Forecasting Toolbox (CRAFT):

- Platform to supports within-season forecasting of crop production; secondarily, risk analysis and climate change impacts
- Functions:
  - Manage spatial data, crop simulation (currently DSSAT, APSIM, SARRA-H)
  - Integrate seasonal forecasts
  - Spatial aggregation
  - Probabilistic analysis
  - Calibration
  - Visualization
  - Analyses: risk, forecast, hindcasts, climate change



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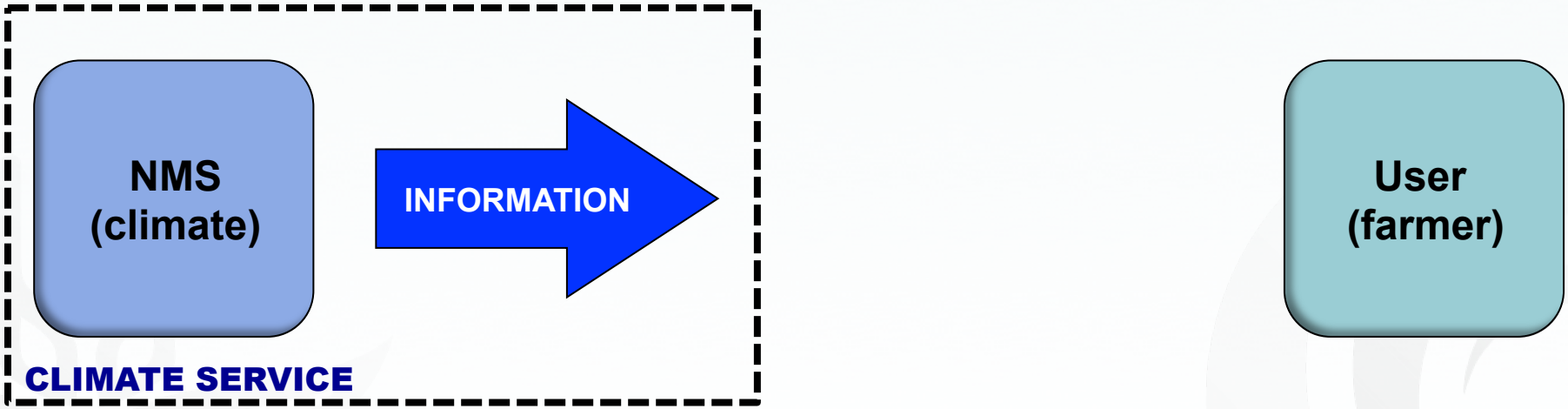
Challenge #5: Institutional and governance arrangements to sustain co-production

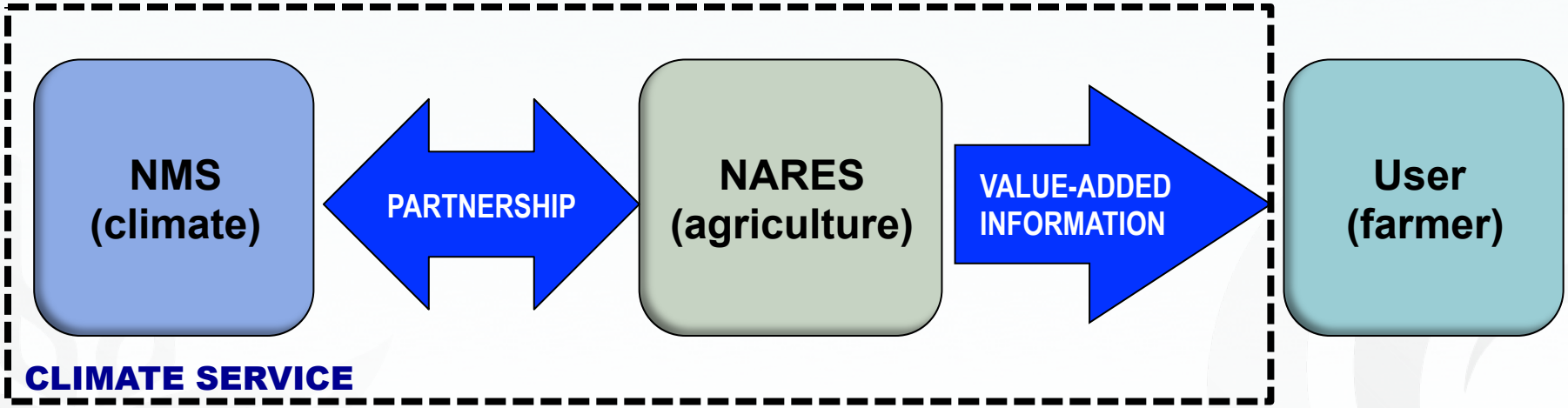
Preliminary thoughts about Climate Service Governance and Institutional Arrangements

- Limitations of supply-driven climate services



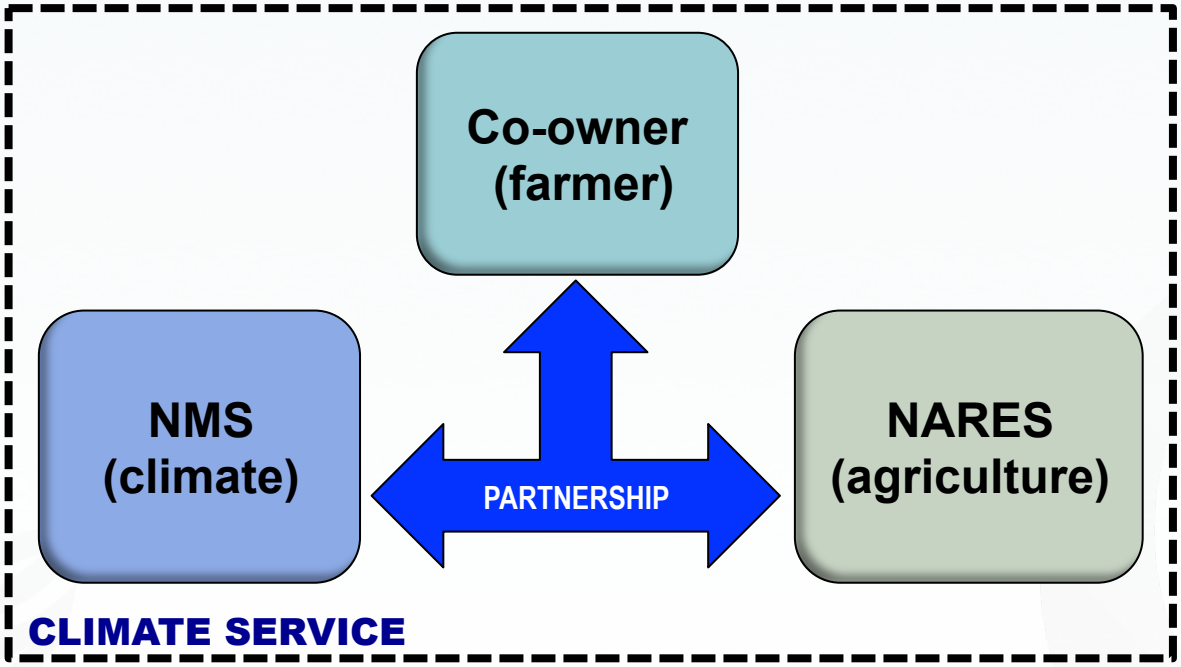
Preliminary thoughts about Climate Service Governance and Institutional Arrangements

- Limitations of supply-driven climate services
- Expand the boundary to agricultural research and development



Preliminary thoughts about Climate Service Governance and Institutional Arrangements

- Limitations of supply-driven climate services
- Expand the boundary to agricultural research and development
- Expand the boundaries to give farmers an effective voice



Preliminary thoughts about Climate Service Governance and Institutional Arrangements

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- Climate services most useful when supported by partnerships that span generation, translation, communication, application
- Partnership often replicated at national and local level
- Regular communication, coordination and user feedback processes are needed sustained co-production of services
- Governance processes ensure that monitoring, evaluation and user feedback are incorporated into improved services
- Rules formalize partner roles, processes, information flow, accountability
- GFCS “National Climate Services Framework” process
- A crucial topic for research

Attempting to develop sustainable, scalable climate services for agriculture in Rwanda

- Led by agricultural research-for-development
- Seeks to strengthen supply- and demand-side capacity in a balanced manner
- Aims to make scalable what is otherwise an intensive, context-specific process
- Aims to develop sustainable capacity and processes

Sustainable, scalable climate services for agriculture in Rwanda

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Outcome 4
National Climate Services Governance

Outcome 1	Outcome 2	Outcome 3
Climate Services for Farmers	Climate Services for Government Planning	Climate Information Provision

Sustainable, scalable climate services for agriculture in Rwanda

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Outcome 4
National Climate Services Governance

Outcome 1	Outcome 2	Outcome 3
Climate Services for Farmers	Climate Services for Government Planning	Climate Information Provision

- Mainstream climate services into *Twigiri muhenzi* extension system through PICSA training
- Scaling supported by structured curriculum and training of trainers
- Context relevance fostered by participatory nature of PICSA
- ICT, media, national agricultural information service complement face-to-face channels

Sustainable, scalable climate services for agriculture in Rwanda

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Outcome 4
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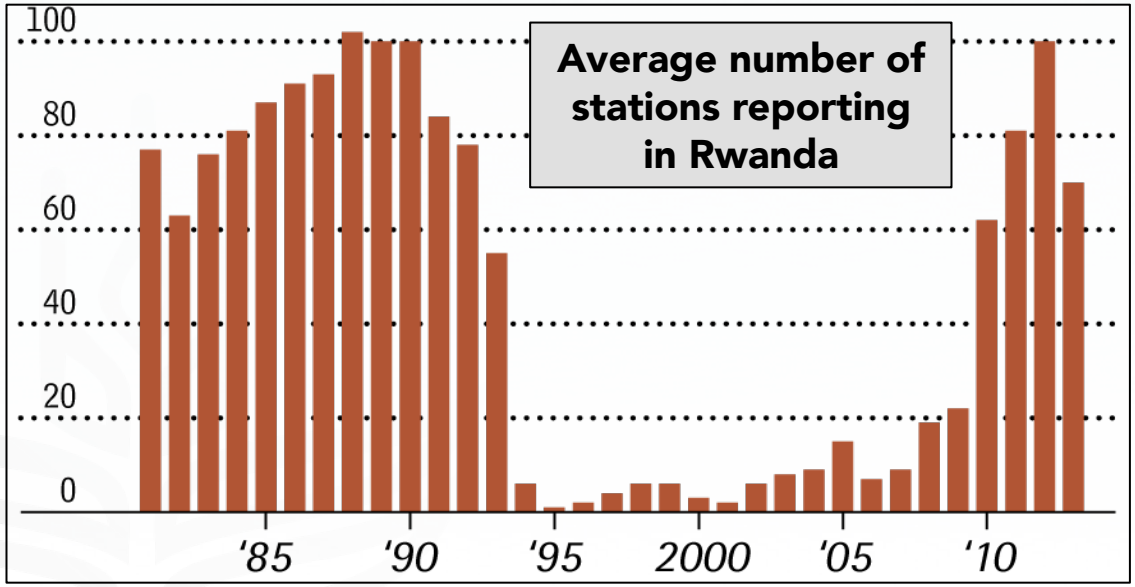

- Significant investment in Meteo-Rwanda data, tools, capacity
- ENACTS merging makes local climate information possible, despite major data gap
- New derived products include drought early warning system based on soil water balance
- Maproom platform for climate information for government and (via PICSA) farmers

Sustainable, scalable climate services for agriculture in Rwanda

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Outcome 4
National Climate Services Governance

Outcome 1	Outcome 2	Outcome 3
Climate Services for Farmers	Climate Services for Government Planning	Climate Information Provision

- Step 1: National Baseline Capacity Assessment
- Step 2: Strategic Plan National Consultation process
- Step 3: Develop National Action Plan
- Step 4: Endorsement workshop to validate Action Plan
- Step 5: Launch National Framework for Climate Services, implementation, M&E

- Sufficiently high-level buy-in crucial but challenging
- Switched strategy: from project-led processes targeting agriculture, to multi-sector National Framework for Climate Services, with GFCS
- Winning conditional support from Ministry of Natural Resources

In Conclusion…

- Effective climate services must be a part of our collective effort to help farmers to be resilient, food secure and prosperous in the face of a variable and changing climate.
- Making climate services work for smallholder agriculture, at scale, requires a lot more than just providing climate information. It requires solutions to 5 challenges:
  - Gaps in capacity to access, understand, act on information
  - Gaps in observations
  - Gaps in capacity to provide actionable information
  - Gaps in information relevance
  - Institutional, governance arrangements
- Promising solutions to these challenges are under development, but more work is needed.

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

Thank you

Jim Hansen jhansen@iri.columbia.edu