



# Climate-smart agriculture & Senegal

Country case of policy and field interplay

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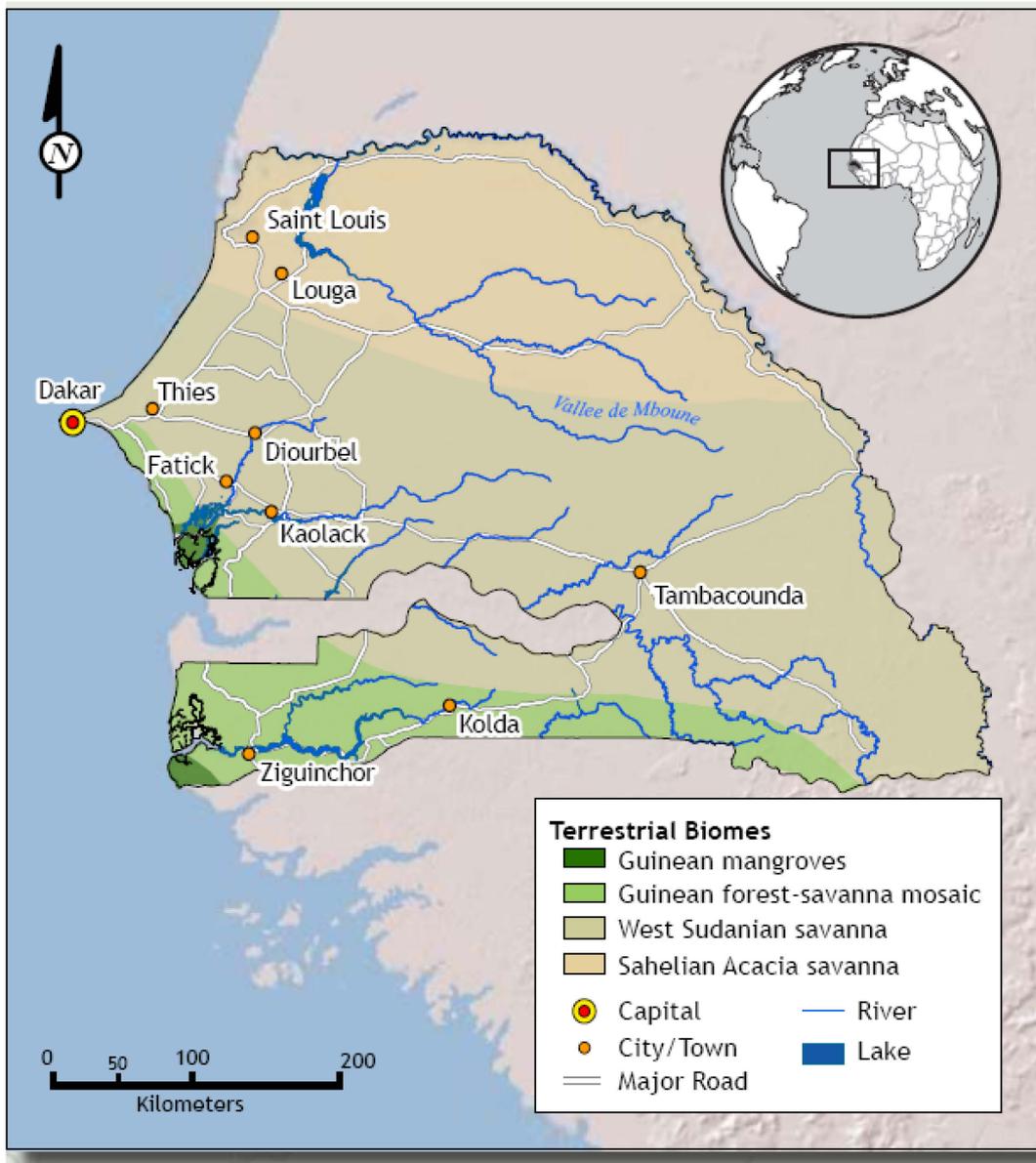
CSA Webinar series

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# Outline

- Introduction to case study: Senegal
- Recent climate trends and projections of future climate & climate impacts in Senegal
- Policy dimensions of CSA
- Key priorities for CSA in Senegal
- Conclusions



## Country case: Senegal

Drawing from an ongoing study on Senegal, which is looking at the dimensions of vulnerability that exist within the country to future CC or near-term variability in climatic conditions.

This study is part of the overall *FoodAfrica* research program funded by the Finnish Ministry of Foreign Affairs

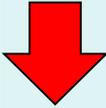


# Basic facts

- While Senegal has enjoyed strong economic performance and steady growth over recent years, the population's living standards are still very low.
  - Ranked 154<sup>th</sup> of 187 countries in the HDI (UNDP 2013).
  - Gross national income (GNI) is \$ 1040 per capita (2012)
  - Life expectancy ranges 61-59 years (for females/males), 2010-15
  - Adult literacy rate at 49.7% (2008-2012)
  - Poverty is most prevalent in rural areas, where roughly 58% of the population resides. The other 42% is found in urban areas, of which the majority live in rapidly growing urban suburbs.
  - Key challenges: Low agricultural production, limited capacity of the economy to create sustainable jobs, and inadequate resource allocation to social services – all contribute towards poverty.



# Recent climate trends in Senegal (World Bank 2012)

<b>Mean annual rainfall</b>	10 to 15mm per decade		Between 1960-2006 in the southern regions (during the wet season of Jun-Sep)
<b>Mean annual temperature</b>	0.9 °C (or an average rate of 0.20°C per decade)		Since 1960
<b>'Hot' nights per year</b>	27 days (an additional 7.3% of nights)		Between 1960-2003

Two distinct seasons characterize Senegal's climate: a dry season from roughly October to May and a rainy season from June to September.



# Projections of future climate in Senegal (McSweeney et al. 2010)

## Mean annual temperature

Expected to increase 1.1-3.1°C by 2060 and 1.7-4.9°C by 2090



Projected rates of warming faster in the interior than in those areas closer to the coast.

## Mean annual rainfall

Projections in annual rainfall are inconsistent



Different models in the ensemble project a wide range of changes in the mean annual rainfall averaged over the country, from -41 to +48% by the 2090s—but **more models show decreases**. While it is difficult to draw robust conclusions of changes in precipitation, **it is likely that a greater proportion of precipitation will occur in heavy rainfall events**.

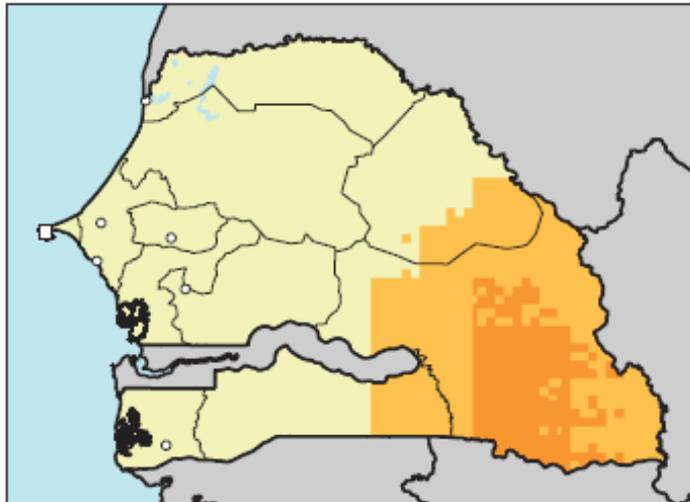
## Extreme

'Cold' nights are projected to decrease

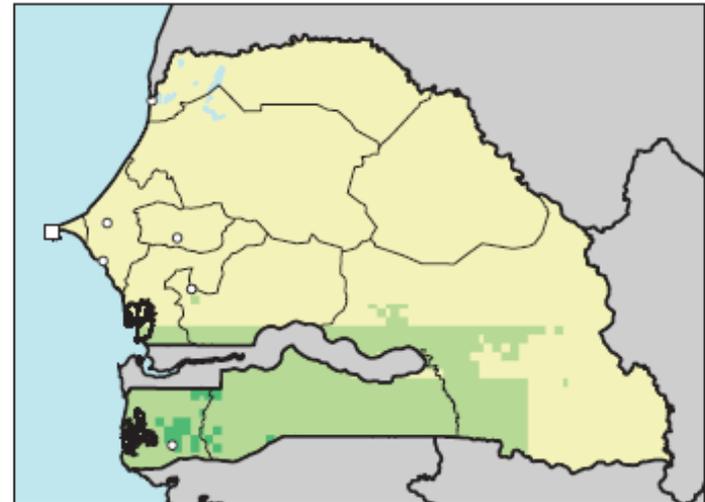


All projections indicate substantial increases in the frequency of days and nights that are considered 'hot' in current climate, with such increases occurring more rapidly in the south and east of the country. All projections indicate decreases in the frequency of days and nights considered 'cold' in current climate.

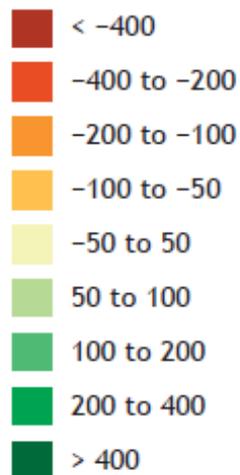
# Changes in mean annual precipitation, under climate change scenarios (A1B SRES variant), in millimeters



ECHAM 5 GCM

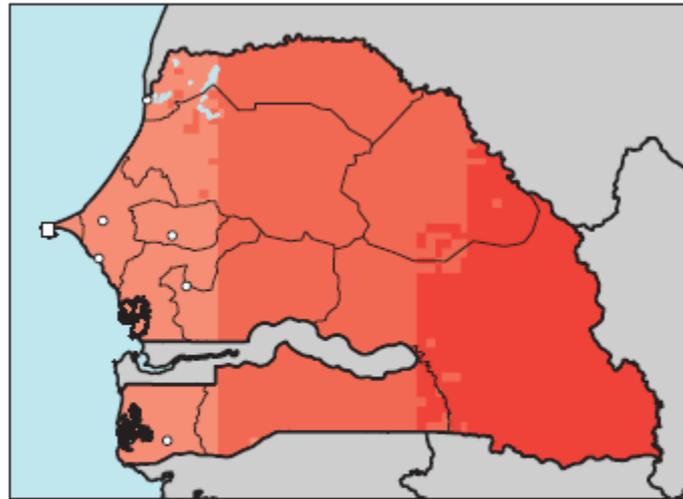


MIROC 3.2 medium-resolution GCM

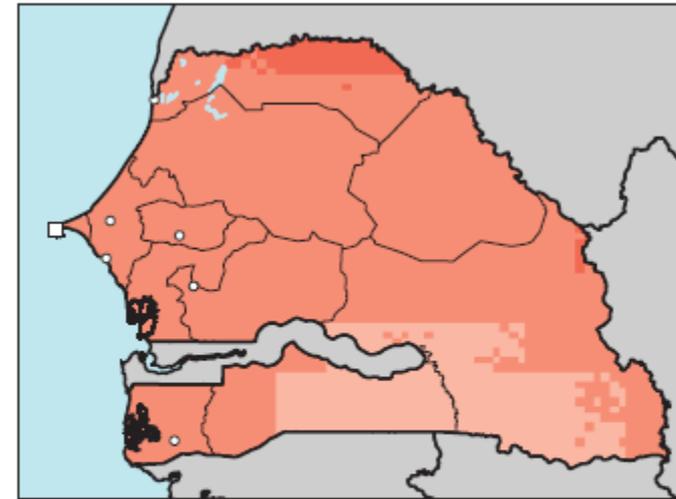


The Max Planck (ECHAM) model projects a drier future – compared to the MIROC (Univ of Tokyo) projections which shows a wetter outcome in the south of the country

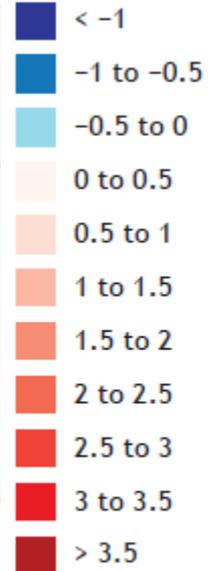
# Changes in daily max temperature (for hottest month), under climate change scenarios (A1B SRES variant), in degrees C



ECHAM 5 GCM

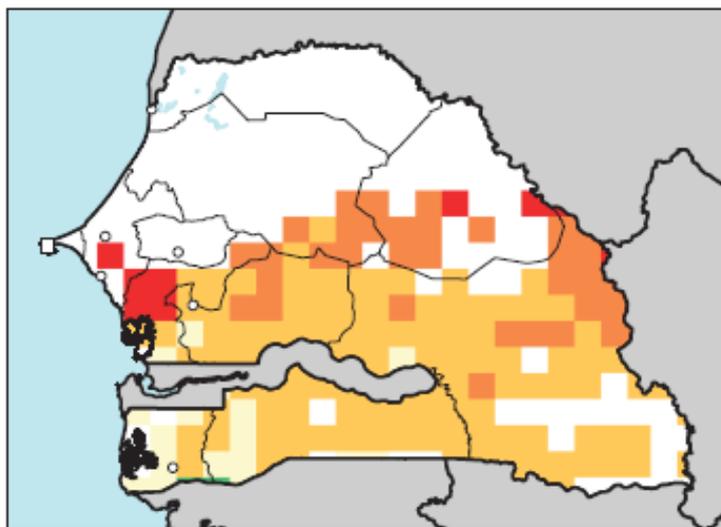


MIROC 3.2 medium-resolution GCM

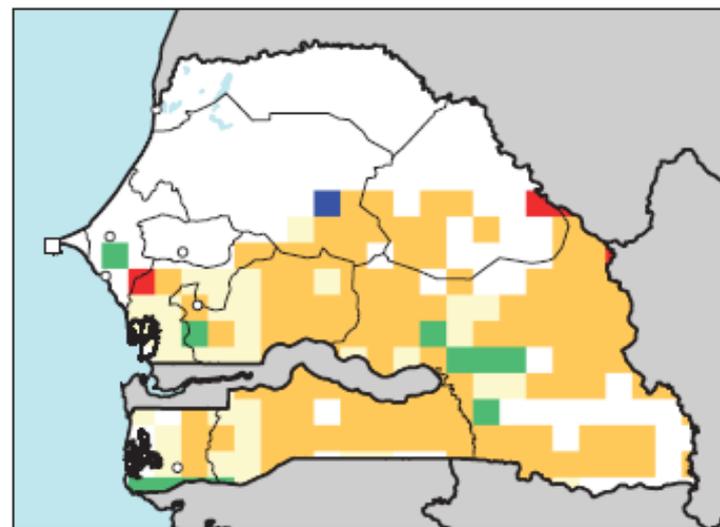


The Max Planck (ECHAM) model projects a warmer future, overall – compared to the MIROC (Univ of Tokyo) model results

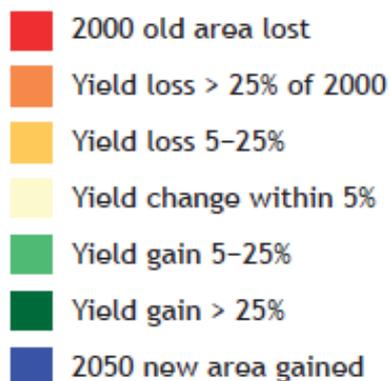
## Changes in yield on rainfed groundnuts, under climate change scenarios (A1B SRES variant)



ECHAM 5 GCM

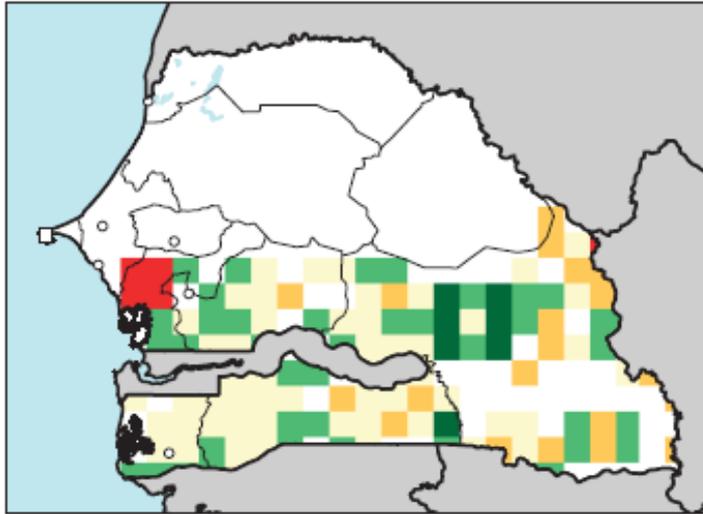


MIROC 3.2 medium-resolution GCM

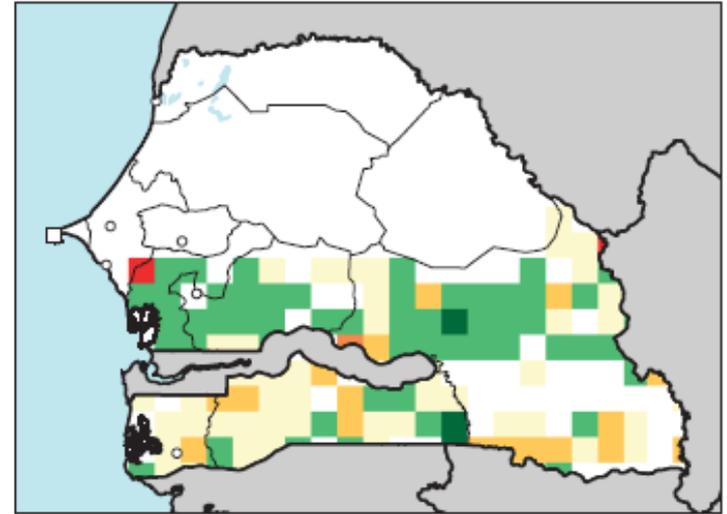


Overall larger yield losses under the Max Planck (ECHAM) model compared to the MIROC (Univ of Tokyo) projections which shows a small gains in parts of the country

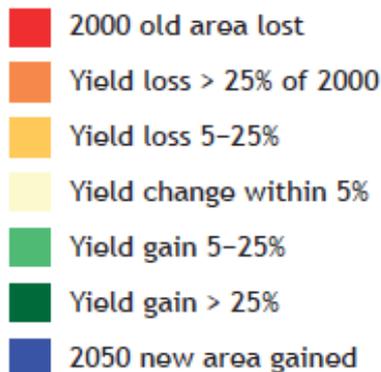
# Changes in yield on rainfed rice, under climate change scenarios (A1B SRES variant)



ECHAM 5 GCM



MIROC 3.2 medium-resolution GCM



Overall larger yield gains for rainfed rice under the MIROC (Univ of Tokyo) model compared to the Max Planck (ECHAM) model projections



## Livestock: a key (often missing) sector

Typically, the impact of climate change on livestock is missing from many studies

- They are a critical part of the agricultural landscape – especially for the northern region of Senegal (the Ferlo), where pastoralism is historically pre-dominant
- Whereas we have a lot of modelling tools to look at the impacts of climate & ag practices on crops – we don't have as many for livestock
- The few modelling tools that are out there focus more on the productivity impacts of feed intake
  - None really deal with heat or water stress effects
- Need to a/c for variety of livestock systems

# Livestock systems in Senegal

Here we have separated the number of cattle and small ruminants into the livestock systems categories developed by FAO (Sere-Steinfeld/Robinson et al)

	Share of animal numbers	
	Cattle	small ruminants
Extensive_Arid	26.4%	27.0%
Mixed_Arid	71.2%	70.9%
urban	1.8%	1.7%
Other	0.6%	0.4%

Most animals in mixed-arid systems

Poultry (and pigs, if any) are in urban or 'other'



# Spatial movements of livestock

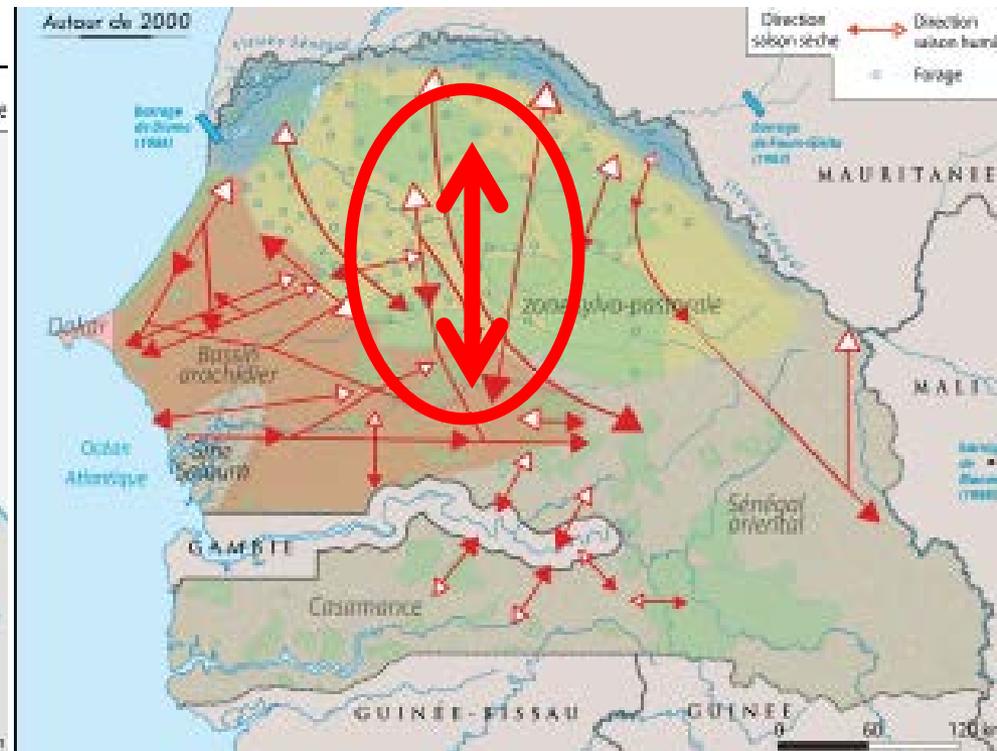
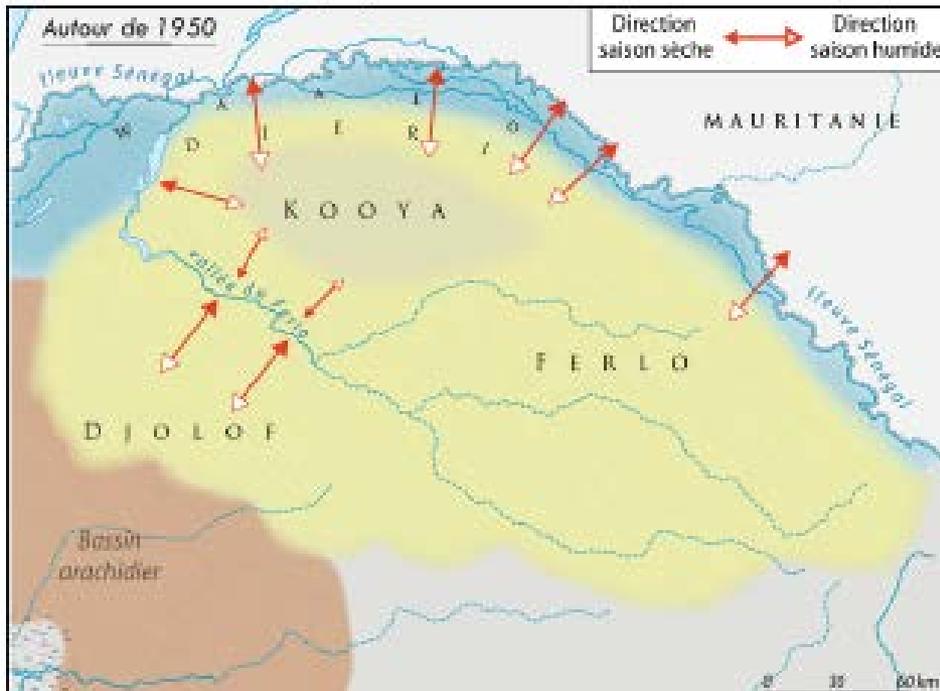
- Pastoralism embodies a distinct set of livelihood patterns that revolve around seasonal movements of herds (transhumance)
- Transhumance is a movement of animal herds between dry and more humid regions, during times of the year when feed is scarce
  - Often timed to coincide with end of cropping seasons (but conflicts can occur if timing chgs)
- The ‘corridors’ of transhumance have changed over time – narrowing the range of movement and reflecting changes in populations, geo-political shifts & environmental pressures

# Transhumance in the 1950's and in 2000's

1950's

2000's

Evolution des transhumances depuis 1950 à aujourd'hui  
D'APRÈS A.T. DIOP DANS DIA D. (2009)



Cesaro et al.



# Adaptation mechanisms for livestock

- Climate change adaptation for livestock in these regions of Senegal could entail
  - Better coordinating patterns of movement through better information on feed availability
  - Possibly ‘fixing’ certain herds in place and intensifying with cultivated pastures
  - Increasing diversification to include non-livestock activities & sources of income to support livelihoods
  - Moving feed over space through markets
  - Possibly seeing an exit of some pastoralists
- Still an active area of discussion and research. CIRAD, CGIAR, WB and others in dialogue on this as part of overall drylands resilience study

# Key policy dimensions



# Climate integrated into overall Ag strategy

- Within Africa, there has been an active program for investments and planning to strengthen the performance of the agricultural sector
- The CAADP (Comprehensive African Ag Development Program) agenda has been taken up (with leadership of AU through NEPAD mechanism) to engage countries in a process of planning for ag sector-focused investments
- Involves a dialogue through which agreements between ministries of Finance, Agriculture & other key agencies are signed – committing to goals of expenditure & growth

# Signing of inter-ministerial CAADP compacts

... a results-oriented approach to policy coordination



SOURCE: Signature of CAADP compact in Rwanda, COMESA NEWSLETTER No 94



## Moving from NAPAs to NPAs...

- At the same time, many countries are moving from national plans that were aimed specifically at climate adaptation, towards more over-arching national plans for agricultural investment and growth
- So that the National adaptation plans for agriculture (NAPA) becomes a National Plan for Agriculture (NPA) that can take on board the longer-term goals that are embodied in the objectives of CAADP
- This is where climate-smart planning fits in



# NAPAs and NPAs – close but different

National Adaptation Plans for Agriculture	National Plans for Agriculture
Supposed to respond to near-term priorities & to address current stresses	Supposed to be more long-term in outlook and forward-looking
To identify the needs for adaptation	To support adaptation through a larger policy framework for agriculture
Based on current climate conditions	Based on anticipated future climate outcomes
Meant to support and enable specific projects on adaptation	Supposed to be linked to national policies that are more generic & far-reaching
Established through a 'one-time' process	Supposed to be part of an ongoing, iterative process that carries forward (a 'living' plan which evolves)
Based on information & observations at field- & community-level	Goes beyond local knowledge & information to incorporate inputs from commissioned studies & research-based outputs (modeling scenarios, etc)



# Planning for (climate) smart agriculture

- Based on this policy context, there's a clear need to support agriculture and its performance through 'smart' investments
- The policy processes are moving towards broader agricultural sector planning, embedding the necessary measures and means for successful adaptation
- Needs a forward-looking perspective & linkages b/w climate, crop & animal scientists as well as with socio-economic assessments that have an economywide perspective
- An ongoing, 'living' process that is flexible enough to accommodate new information into the next iteration



# Priorities for climate-smart agriculture in Senegal



# Making agriculture deliver in a climate-smart way to improve livelihoods

- Given low levels of productivity, there is a clear need for agriculture to intensify – but with a view to climate consequences & resilience
- Any strategy needs to encompass the livestock sector, as well, given its unique characteristics and importance in parts of the country
- There are opportunities for high-value agriculture & horticulture that should also be supported & exploited – the Niayes region has vibrant horticulture, but is facing pressures of salinity & groundwater depletion
  - More attention to drainage & resource mgmt
  - Other regions with available water might also support horticulture (e.g. River Valley of Senegal)
- Fish (capture & aquaculture) should also be covered



# Provisioning of food, feed, fibre & fuel

- Agriculture can also provide sources of sustainable energy if done right. The biofuel policies of Senegal have not delivered so far
  - should stay away from low-yielding schemes based on jatropha for biodiesel
  - Should consider other sources of bioenergy
- Exploiting the co-products from agriculture is a ‘smart’ way to build resilience
  - A key part of building a vibrant bioeconomy where there are multiple streams of products
  - Traditional oilseeds like groundnuts offer sources of feed, oil – but need to address issues of aflatoxin



## Where CSA can make a difference

- Improving the management of key resources that will make agricultural more productive, sustainable and climate-resilient in future
  - Soils, water, grasslands & natural cover
  - Strengthening key ecosystems and their functions (supporting, regulating, provisioning)
- Helping the coordination of investments and planning between key sectors that support agricultural and rural livelihoods
- Making better use of information and bringing it to farmers (to coordinate planting, movement of animals, marketing information, etc)



# Conclusions

Senegal has been a rich case country in which to study climate impacts & adaptation

- Faces some clear environmental pressures on agriculture that need to be addressed
- Is undergoing a political planning process that will help to build a forward-looking, comprehensive plan to build resilience in ag
- More needs to be done on the livestock sector, given its complex nature & importance
- Boils down to how to sustainably intensify agriculture in a way that improves livelihoods and builds resilience in agriculture and the wider economy



**Thank you!**