Work Package 3:
Climate change impacts on agriculture, livestock and food security in Senegal

Siwa Msangi (IFPRI), Jarkko Niemi (LUKE), Kari Hyytiäinen (Univ. Helsinki), Amy Faye, Assane Beye, Astou Diao Camara, Rassoul Sy, Yakhya Thior, Djiby Dia, Cheickh Sadibou Fall (ISRA)

Overview of work package

- Focused on examining the climate change impacts on the agricultural economy of Senegal, and options for adaptation

- Covers several key aspects:
    - Impacts on crop productivity and farm incomes in key regions such as the peanut basin (among others)
    - Goes beyond crops to also consider the impacts on livestock – especially in the extensive systems of the drylands (Ferlo) – often overlooked in many climate change studies
    - Consider the market-level implications of climate change as well.

- Critical partnership with ISRA to connect with local structures and to better focus the work to address national priorities

- IFPRI, LUKE & ISRA contributed key analytical components

What we have learned from this?

- In the course of this project, we have covered the major sectors of the Senegalese agricultural economy in key regions...
    - 1) For the crop sector – we have analyzed the key impacts on
        - Irrigated horticultural production in the Niayes region
        - Rainfed staple and cash crop production in the Peanut Basin
    - 2) For the livestock sector – we have looked at:
        - Adaptation options for pastoralists in the Ferlo – through transhumance
    - 3) Market-level analysis of agriculture supply, demand & trade
        - Multi-regional, multi-market analysis of Senegalese crop sectors and the impact on prices and wellbeing across the country

....and have learned important lessons from each of these components

Main messages from each component of the analysis – and who they're targeted towards

Key lessons from the Niayes region

Adapted from PADEN

Key lessons from the Niayes region

- The groundwater management model applied to irrigated horticultural crops' producers shows that when the climate becomes drier, the availability of irrigation water decreases

- When water availability decreases in the face of climate change, it is optimal for the farmers to decrease the land allocated to the cultivation of irrigated horticultural crops

  - The area allocated to crops with higher water requirements and low returns decreases the most

    - by up to 33% for carrot, 21% potato, 19% eggplant, 17% onion, 10% african eggplant, 8 % sweet pepper, 4% cabbage and pepper and 3% tomato

Key lessons from the Niayes region

- Small gains from managing the water resource
  - This suggests that the groundwater management strategies should not be limited to the consumption side. They should also integrate recharge management.

  - In addition to promoting water-saving irrigation techniques, it is important to reinforce recharge for instance through rainwater harvesting

Key lessons from the Niayes region

- Who can use this information:
  - Managers of the water utilities that govern non-ag water use
  - Farmer & farmer organizations in the region
  - National-level water resource management bodies

How to get change in the Niayes region

- How do we best effect change in behavior?
  - Monitoring costs are high – need a farmers organization to help coordinate user behavior in the ag sector
  - The private company and parastatal governing non-ag usage need to be part of the solution
  - Need more interaction between hydrologists, ag sector managers & analysts – some key information is not shared or collected very well, that is needed for monitoring and evaluation
- Need to fill gaps to do better monitoring & analysis:
  - Missing information on some hydrological aspects (including pumping volumes from users – ag & non-ag)
  - If we only account for direct economic benefits of water use, we probably **under** value the gains to better water management

Key results from the Peanut Basin

Key results from the Peanut Basin

- Our farm production model simulations show negative yield impacts for peanut, maize, millet, sorghum and rainfed rice, as well as decreases in area

- This rainfed region is highly exposed to effects of climatic variability (applies for much of the country)

- Leaves these options for producers:
  - Better management of soil moisture and rainwater harvest techniques to optimize what's available
  - Change crops – either towards more resilient ones, or towards more profitable ones (to justify the costs of equipping for irrigation where this might be possible).

What this requires for change

- Requires investments, were irrigation might be feasible to exploit (mostly small-scale schemes)
- Experience shows that to make an investment successful we need <u>both</u> knowhow and equipments

- <u>Who</u> needs to act on this:
  - Farmer advisory services who disseminate this information
  - National-level ministries charged with making investment decisions on irrigation, roads and other infrastructure

Key lessons from the Ferlo region

Key lessons from the Ferlo region

- Different regions are not in isolation – adverse weather in one region can affect livestock in another region

- Transhumance and adjustments in stocking rate in the more humid region are a beneficial resilience strategy
  - Transhumance is primarily driven by weather although policy parameters can also have a significant impact
  - CC can increase the importance of transhumance

- The optimal stocking rate varies by year
  - In dry years feed availability becomes a constraint and market prices tend to have a smaller effect on the sale of animals, although adverse weather itself can also amplify prices

How to enhance resilience of pastoralists

- Developing efficient feed markets as it increases resilience
  - The price of fodder should be kept at minimum because common pasture is costless to an individual herder
- Subsidised fodder transport especially when the rate of transhumance is low or a lot of feed is purchased
- A public relief aid provided at harsh times especially when the rate of culling the cattle is high or a lot of feed is purchased
- Public planting of fodder trees when the rate of transhumance is low and particularly when simultaneously using a lot of purchased feed

Key lessons from market-level analysis

Key lessons from market-level analysis

- Reducing the transportation costs through better road investments is key to provide farmers with better access to markets.
  - It can facilitate other investments which create positive returns to farmers - especially in eastern parts of Senegal that are far from large urban & international markets
- <u>Who</u> needs to act on this:
  - National-level ministries charged with making investment decisions on roads and other marketing infrastructure
  - Key value chain actors responsible for logistics (e.g. dairy needs to maintain the cold chain)

Key lessons from capacity strengthening

- We conducted a pilot training in 2015 to expose interested researchers, scientists & students to important analytical techniques – using mathemetical programming-based models

- Used simple models of farm production, natural resource management and macro-markets that can be modified & extended (intensive 5 day course with theory & practice)

- Revealed a large demand for these types of tools for looking at a wide range of topics – will use this to shape phase II activities

Further work for Phase II

In the next phase, we will carry out

- Training on the types of analytical models we have applied, building upon the pilot training given in Oct 2015.

- Further dissemination of policy results to key stakeholders - using the new IFPRI country strategy support program's in-country network as an additional channel of outreach – in addition to that of ISRA and other stakeholders

- Further outreach to local agencies (CSE, IPAR, CRES) that do relevant work and who can be future partners
  - Some have expressed interest in using components of our analytical framework
  - Compare our work to other parallel efforts (AgMIP) to learn more lessons

THANK YOU FOR YOUR ATTENTION!