Presentation prepared for the seminar:

Cambio Climático y Seguridad Alimentaria en América Central: Casos de Estudio de Adaptación

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“Climate Smart Agriculture” and Food Security in Latin America

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First, Acknowledgements

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- Additional work on Latin America and the Caribbean was done with Leonardo Corral, Inter-American Development Bank

Climate Change and Agriculture
From IPCC AR5, WG1 and WG2

- Warming:
  - Warmer in Central and South America since 1970's (except off the Chilean coast)
  - Projections suggest continued increase in temperatures
- Rainfall:
  - Increasing trends in southeastern South America
  - Decreasing trends in Central America
  - Low confidence in projections

Climate Change and Agriculture
From IPCC AR5, WG1 and WG2

- Extreme Weather Events
  - Increase in extreme weather events such as temperature extremes (Central America, tropical South America), inundations (southeast South America), hurricanes (Central America and the Caribbean)
  - Extreme weather events projected to increase (low-medium confidence)

Climate Change and Agriculture
From IPCC AR5, WG1 and WG2

- Expected Impacts on Agriculture in LAC
  - Highland regions, with melting glaciers, face changes in water flow and availability
  - Higher evapotranspiration reducing effective water in rain-fed agriculture, and reducing efficiency of irrigation systems
  - Higher temperatures will reduce mean yields in some regions

Climate Change and Agriculture
From IPCC AR5, WG1 and WG2

- Expected Impacts on Agriculture in LAC
  - Average yields may increase in southeastern South America, but are projected to decrease in Central America, north-eastern Brazil and parts of the Andes
  - More extreme weather events will reduce yields, not just in the season affected but in the longer term
    - Farmers facing higher weather risks tend to reduce overall production and to reduce expenditures per hectare
    - They also tend to make fewer investments in land

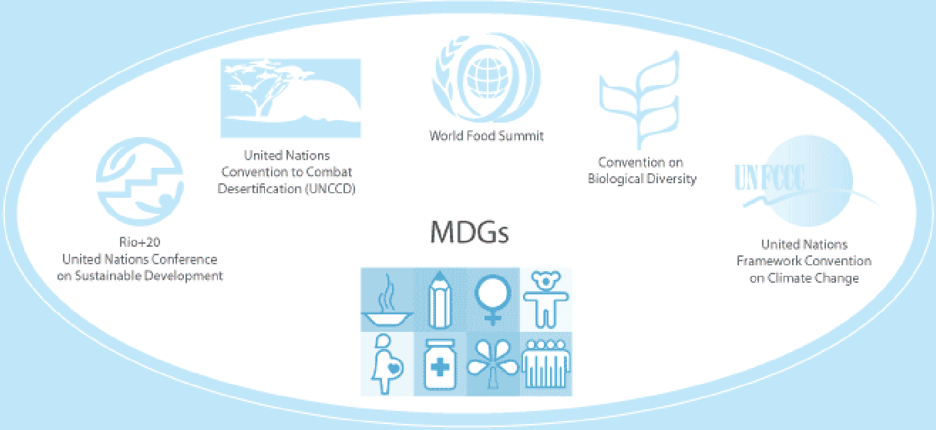
Climate Smart Agriculture: What is it?

SUSTAINABLY INCREASES
FARM PRODUCTIVITY AND INCOME

STRENGTHENS RESILIENCE
TO CLIMATE CHANGE AND VARIABILITY

REDUCES AGRICULTURE'S
CONTRIBUTION TO CLIMATE CHANGE
– greenhouse gas emissions
+ carbon storage on farmlands

ENHANCES THE ACHIEVEMENT OF NATIONAL FOOD SECURITY
AND DEVELOPMENT GOALS



Climate Smart Agriculture: Examples

- Most Sustainable Land Management techniques
  - "Conservation Agriculture" (minimum soil disturbance, permanent soil cover, crop rotations)
  - Many Soil and Water Conservation Structures
  - Agro-forestry
- Energy efficient irrigation systems (e.g. gravity-based)
- Intensification/reduced extensification
- Efficient fertilizer application

Food Security

- The four pillars:
  - Availability: Supply of food available, directly related to food production
  - Accessibility: Ability of people to purchase food, directly related to income and indirectly related to food production
  - Utilization: Ability to safely store and maintain nutrition of foods, avoid spoilage
  - Stability: Stable food prices and availability in market; directly related to variability in food production and volatility in food markets

CSA and Food Security

- CSA technologies and practices directly affect
  - Food Availability by increasing average yields
  - Food Stability by reducing yield variability, particularly by reducing the size of yield losses under poor weather conditions

- CSA technologies indirectly affect
  - Food Accessibility, to the extent that greater and more stable yields lead to lower food prices

CSA in Latin America

- "Conservation Agriculture":
  - Very widely adopted in Brazil, Argentina and Paraguay, but mostly on large commercial farms
  - Barriers for smallholders
    - Higher costs of weeding outweigh reduced costs of land preparation
    - Limited access to no-till planting equipment
    - In many cases, long time period before yield benefits realized (5-15 years)
    - Permanent soil cover appears to be a main driver, but can be expensive; e.g. promotion of crop residues as soil cover conflicts with livestock feed needs

CSA in Latin America

- Soil and Water Conservation Structures:
  - Widely practiced particularly in hill/mountain regions, but evidence of abandonment/leaving to deteriorate is still a problem in many countries
  - Barriers for smallholders
    - Lack of secure tenure leads to lower incentives to invest in these structures
    - Often need to adapt to site-specific conditions, requiring a lot of detailed knowledge, makes investment risky
    - In some cases, very high labor/materials costs that smallholders cannot cover
    - Often provides positive spillovers to neighboring and downstream farms; subject to collective action failures

CSA in Latin America

- Agroforestry
  - Important across LAC, though empirical evidence is concentrated in Brazil, Mexico and Central American countries
  - Barriers for smallholders
    - Availability of seedlings suitable to local conditions; access to extension to learn about varieties
    - In many cases, long time period before yield benefits realize
    - Lack of markets for agroforestry products
    - Tenure insecurity

Still large scope to expand CSA in LAC…

- Limited information reaching farmers
- Limited availability of inputs (e.g. seeds/seedlings)
- Limited access to credit to finance up-front investment costs, especially where benefits are delayed

Still large scope to expand CSA in LAC…

- Previous slide: typical costs and barriers that can hinder adoption of both improved conventional and CSA technologies and practices
- Additional barriers that are relatively more important in understanding CSA adoption:
  – Access to insurance/safety nets
  – Farmers' property rights and tenure security
  – Many CSA practices generate positive spillovers to neighboring farms and others downstream

Access to Insurance/Safety Nets

- Expected effects of increased access to insurance/safety nets is a bit complex
  - Almost all empirical evidence shows that farmers have lower agricultural incomes and yields as uninsured risks increase, so
  - Increased access to insurance/safety nets will expand production, and increase incentives to adopt CSA practices in many cases, except
  - In very risky environments, where CSA practices mainly reduce yield losses but have limited impacts on yields, increased access to insurance/safety nets ***may reduce*** CSA practices (even though other inputs increase)

Property Rights and Tenure Security

- Where you do not feel secure in ability to benefit in the future from investments made now, less likely to adopt
  - The greater the delay in benefits, the stronger is the disincentive
- In many areas, there are community norms on use of cultivated land post-harvest that can limit incentives to invest:
  - All fields open to grazing animals post-harvest
  - Norms on burning fields

Positive Externalities

- When individual investments generate benefits both to the farmer as well as to others, tendency to under-provide
- Many CSA practices generate positive environmental benefits
- Many examples of “payments for environmental services” to upstream farmers to improve water management to downstream users who are not typically farmers

Positive Externalities, Cont.

- But, many CSA practices actually generate positive spillovers locally to other farmers
  - Requires collective action and coordination
- Similarly, underlying hydrological and agro-ecological characteristics can lead to situations where coordinated and complimentary actions across many farmers in a watershed are necessary in order to increase resilience/ability to cope with extreme weather events

Implications for Project M&E and Impact Assessments

- Positive spillovers have implications both for the level of the intervention (community versus household) and for identifying "controls"
- Delayed benefits imply either longer times between baseline and endline, or that suitable "intermediate" outcomes can be identified
- One of the key benefits is to reduce downside losses when an extreme weather event hits; flexiblity to implement "in-between" surveys may be needed instead of reliance on recall

Thank you!