



Cross-Cutting Research Activity 6: Economic and Impact Analysis

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Objectives

CCRA-6 has four main objectives:

- Objective 1: Identify the costs and benefits of CAPS in cropping systems/practices and related animal and forestry sub-systems.
- Objective 2: Identify optimal CAPS and the sequencing of CAPS elements for each cropping system being researched.
- Objective 3: Identify broader economic and social impacts of wide-scale CAPS adoption.
- Objective 4: Identify any policy changes required to enhance CAPS adoption in each crop system.

Current Focus: We are presently concentrating on Objectives 1 and 2.

We are developing an economic model that will serve as a template for economic impact analyses of SANREM CRSP Phase IV regional projects as well as future SANREM CRSP regional programs.

The Andes Regional project (LTRA-7) has been selected as the initial focus for the economic impact analysis template. We are evaluating the impact of conservation agriculture by conducting a farm-level assessment of SANREM CRSP project activities in two sub-watersheds of the Chimbo watershed in Ecuador. A model is being developed to assess the economic impact of LTRA-7 in Ecuador through an evaluation of the effects of selected CAPS on farm income and soil loss.

Demonstration Plot:

Researchers work with project farmers to establish and maintain experimental farm plots which serve to evaluate selected conservation agriculture production systems (CAPS) elements.



Phase IV Goals

CCRA-6 will collaborate with and assist the LTRAs in developing a common baseline and methodology for addressing the economic questions related to CAPS development and implementation, including the short-term, long-term, individual and society-wide costs and benefits of CAPS.

This 5 year project will conclude with an *ex-post* analysis of the economic impact of SANREM CRSP projects throughout the world.

It is expected that the resulting comparative analysis across LTRAs will provide significant insights into general strategies to promote wide-scale adoption of CAPS.



Methods

In order to develop a model template applicable (given project-specific adjustments) to the array of Phase IV LTRAs, we are conducting an *ex-ante* economic impact analysis of LTRA-7, "Pathways to CAPS in the Andes."

We are developing a farm-level linear programming model to analyze the costs and benefits of the experimental CAPS elements, including impacts on farm income (consumption + savings) and soil erosion, in the Alumbre and Illangama sub-watersheds of central Ecuador.

The analysis entails the following steps:

1) Definition of Model Activities

Determine the production-related activities on a typical farm in the study area, as well as activities necessitated by the CAPS elements that are the focus of LTRA-7 [for example, cover cropping, varying types of tillage].

2) Definition of Model Constraints

- Production constraints
Determine the applicable constraints on land, labor, capital, and other farm resources.
- Soil loss constraints
Define appropriate soil loss constraints based on current erosion levels as well as on optimal soil conditions under conservation agriculture systems.

3) Determine Model Coefficients and Right Hand Side Values

Analyze available and collected data in order to populate the linear programming model.

- Secondary data available: 2007 Baseline Survey conducted by INIAP in the study area
- Primary data to be collected from:
Expert interviews (project economists, agronomists, soil scientists)
Farmer interviews (heads of households implementing experimental CAPS elements)

4) Run the Model and Conduct Sensitivity Analysis



Project scientist Luis Escudero on a farm in the Alumbre sub-watershed

Accomplishments to Date

In collaboration with project scientists, and based on the conservation agriculture experiments currently being implemented in Ecuador, we have defined the key activities and production/soil loss constraints which comprise the linear programming model.

Using data from the 2007 baseline survey of farm households in the study area and budgets and other information provided by scientists, we have begun to determine the coefficients and right hand side values of the model. These data will be verified and completed using information obtained through farmer interviews in June 2011.

An aggregated tableau of the model is presented below:

Aggregated Tableau							
	Production Activities	Selling Activities	Borrowing Activities	Labor Activities	Cash Transfer Activities	Revenue Activities	RHS
Objective Function						1	Max
Land Constraint	1						≤ 34999.409 m ²
Labor Constraints	L			±1			≤ 737.18 hrs
Rotational Constraints	±1						= 0
Cash Constraints	A	-B	(-)1, 1, 1	±W	±1	1	≤ C
Credit Constraints			1				≤ D
Soil Loss Constraint	S						≤ E
End of Year Cash Constraint		-B	1, 1		(-)1	1	= 0

L = Monthly labor requirements for each production activity
 A = Cash production coefficients
 B = Cash selling coefficients
 W = Market labor wage
 C = Cash constraint
 D = Credit constraint
 S = Soil loss for each production activity
 E = Soil erosion constraint

Impediments Encountered

Data for many of the CA practices are not available over several seasons. Therefore certain coefficients are rough estimates.



Cooperating farmer in Illangama sub-watershed describing conservation agriculture practices being tested on his farm during a field day with other farmers

Anticipated Products and Their Impacts

1. Analysis of most profitable conservation agriculture program for Chimbo watershed that meets environmental objectives of the CA program in Ecuador
2. A model that will be adapted and applied in other countries for analyzing profitability and environmental benefits of CAPS in other watersheds. Expected impacts are higher adoption of CAPS and improved farm incomes and soils.
3. In future years on the project, adoption analyses and analyses of aggregate benefits will be conducted and a summary impact report prepared for the whole project.