# A Conservation Agriculture Production System Program for the Central Plateau of Haiti


**W.E. Thomason, and T.L. Thompson**

**Virginia Tech, Dept. of Crop & Soil Environ. Sciences, 330 Smyth Hall, Blacksburg, VA 24061**


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## Introduction

The low input/low output agricultural production systems of the Haitian Central Plateau are insufficient to meet the subsistence needs of the local population let alone contribute to the food security for Haiti as a whole. High erosion rates have degraded soils to the extent that slight changes in the production system can lead to rapid loss of productivity (Lutz et al., 1998). Despite these problems the soils of the Central Plateau are considered "less degraded and more productive than most other hilly regions of Haiti" (Jickling and White, 1995:185). In addition to degraded soils, smallholders in the Central Plateau reported that lack of water is their greatest production constraint. Sustainably addressing the production needs in the Central Plateau will require an applied research program to increase both system inputs and outputs. The benefits of Conservation Agriculture Production Systems (CAPS) are clear (Haggblade and Tembo, 2003; Derpsch, 2008; Rockstrom et al., 2009; FAO, 2009): increased production and incomes, improved soil fertility/quality, decreased soil erosion, improved water use efficiency, etc. The actual uptake of conservation agricultural practices and systems, however, cannot be attributed to the technology itself; nor is there a single factor which determines adoption (Knowler and Bradshaw, 2006; Wall, 2007). Research has shown that smallholders have been highly resistant to adopting CAPS or CA practices (Ekboir et al., 2002; Wall, 2007; CIMMYT, 2008; Giller et al., 2009). Two factors have been associated with all successful cases of CAPS establishment: adaptation to local conditions and use of supporting networks (Ekboir, 2003; Baudron et al., 2007; Wall, 2007; Spielman et al., 2009).

## Objectives

1. Increase agricultural production in the Central Plateau through development of CAPS.
   - New CAPS will be developed that address farmer production and livelihood priorities beginning with 'best bet' options particularly focused on improving water productivity, soil quality/fertility, soil organic matter (SOM), and developing higher productivity rotations.
2. Increase the capacity of smallholders to adapt and improve CAPS.
   - An interactive process of farmer learning will be the core component of a program for establishing CAPS and developing adaptations to improve production as conditions in the region evolve.

## Materials and Methods

- Cultivars of black bean (Phaseolus vulgaris) and maize (Zea mays) currently grown in Haiti were compared with high-yielding, adapted lines in replicated studies in the Central Plateau of Haiti over several years.
- Cover crop evaluations were conducted to determine the best-fit choice for current, common intercropped systems in the Central Plateau.
- CAPS studies were conducted at three locations in the Central Plateau over two years. Experimental design was a split plot arrangement of treatments with either no-till or conventional tillage as the main plot and cover crop as the subplot; with four replications. Subplots were 3.5 by 3.5 m.
- Cover crops treatments were no cover crop (fallow) sorghum sudangrass (*Sorghum bicolor*), sesbania (*Sesbania exaltata*), and sunn hemp (*Crotalaria juncea).*
- Cover crops were planted in December 2012, during the dry season. Seeding rates were 50 kg ha$^{-1}$ for sesbania and sunn hemp, and 75 kg ha$^{-1}$ for sorghum sudangrass. Seed was broadcast uniformly over the plot area and lightly incorporated in the tilled plots.

## Materials and Methods (cont)

- Cover crops were irrigated as needed to sustain adequate growth from December through March, at which time supplemental irrigation was stopped and cover crops allowed to senesce.
- Weed density counts were collected from a representative 1m$^2$ from all plots in February 2013.
- Prior to maize planting, cover crop residue was either tilled into the soil to a depth of approximately 30 cm or cut and left on the soil surface, depending on tillage treatment.
- In May, 2013 maize ('ti bourik') was planted by hand in the entire experimental area in approximately 80 cm rows, with 30 cm between planting locations within rows. Two seeds were planted at each location.
- Plots were weeded twice during the season, first when maize was at the V5 stage, and again when maize was at approximately V10.
- At maturity, the center 2 by 2 m area of each plot was harvested. Whole ears were weighed, then shelled and grain weight and moisture measured.

**Preparation of the Experimental Area**

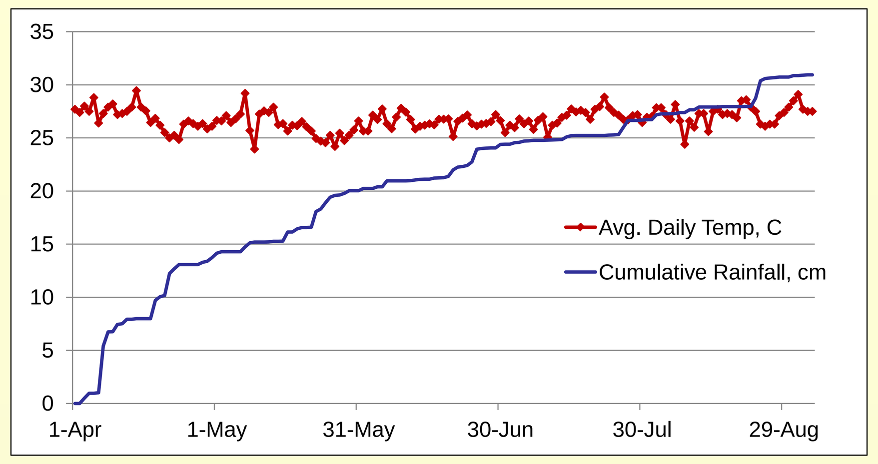
Conventional-Till

No-Till

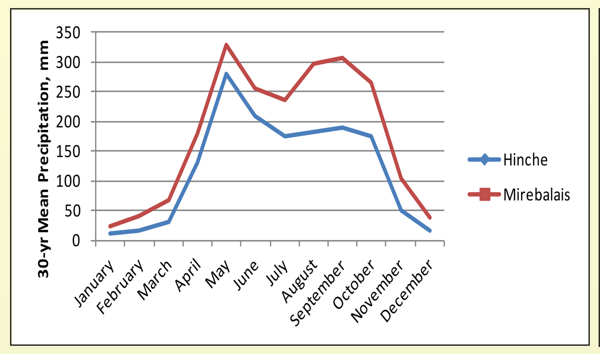
**Dry Season Cover Crop Growth**

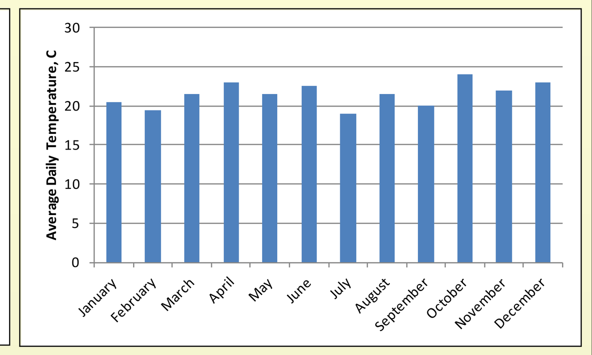
**Early Season Maize Growth**

### 2013 Temperature and Rainfall




### Historical Monthly Average Temperature and Rainfall



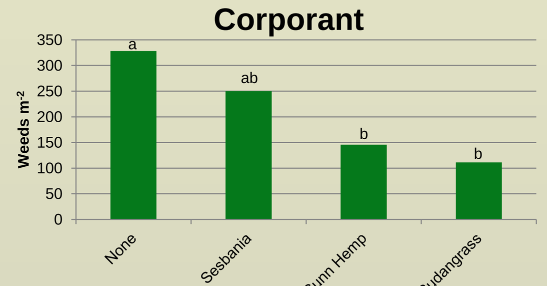




**Weed Suppression under Sunn Hemp**

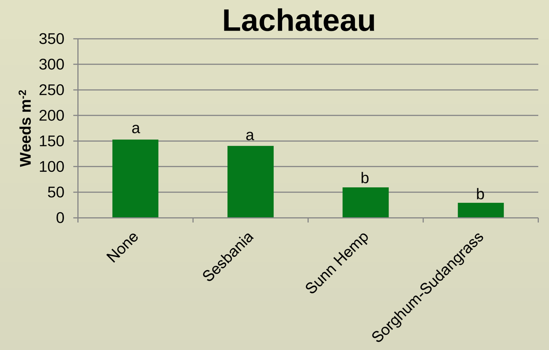
**Sunn Hemp Growth, January, 2013**

**Weed Density During Late Cover Crop Growth**

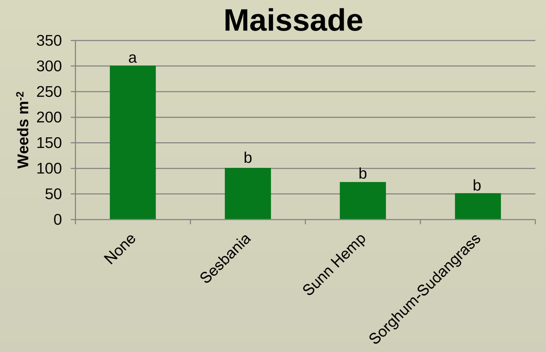
Corporant




Lachateau




Maissade

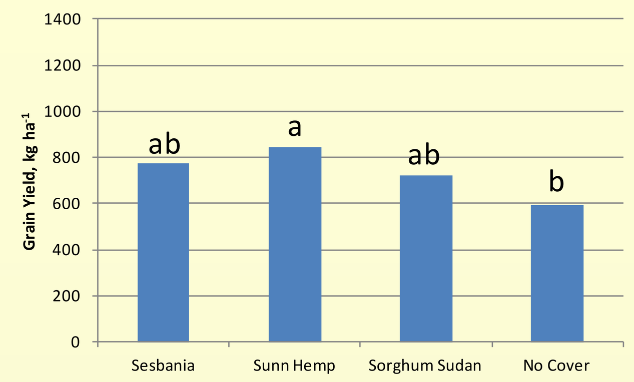



**Effect of Tillage and Cover Crop Treatment on Grain Yield**

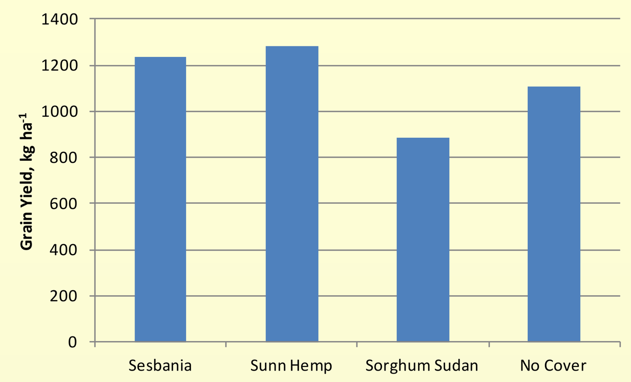
| Source | df | Corporant Pr>F | Lachateau Pr>F |
|---|---|---|---|
| Tillage | 1 | 0.1561 | 0.5034 |
| Cover | 3 | 0.0273 | 0.1828 |
| Tillage*Cover | 3 | 0.3636 | 0.1945 |

**Previous Cover Crop Effect on Maize Grain Yield, 2013**

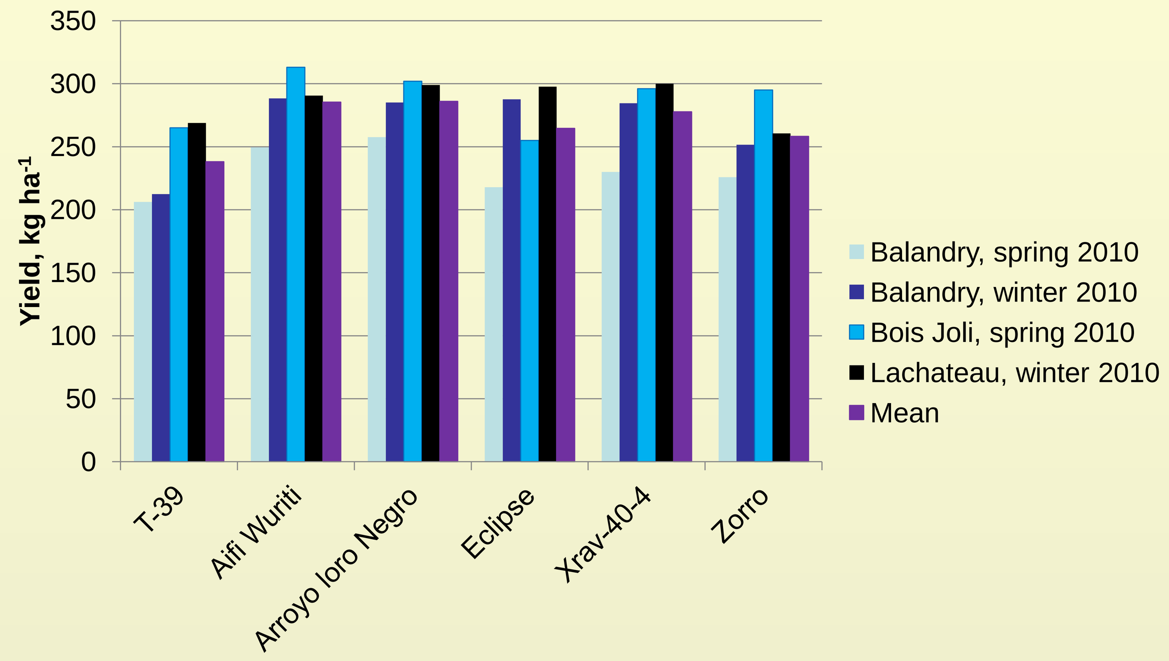
Corporant




Lachateau



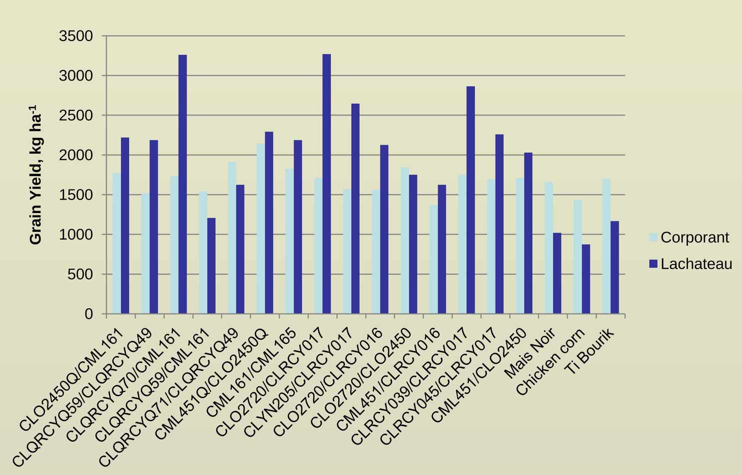

**Common Bean Cultivar Evaluations, 2010-2011**



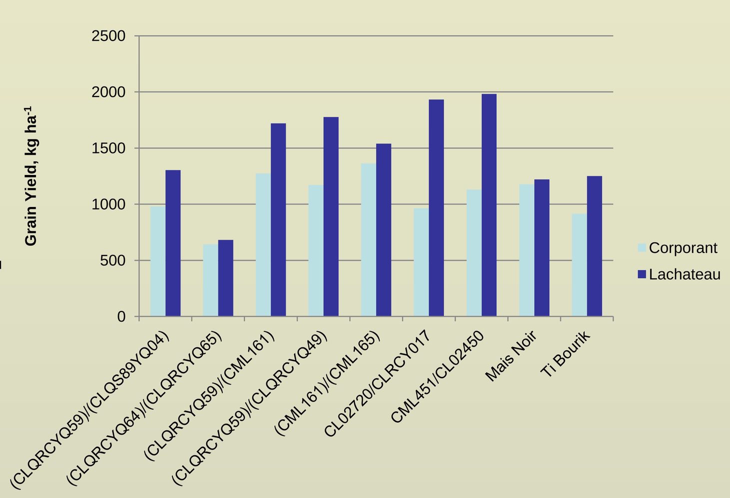

- Average yield over bean cultivars and locations was 268 kg ha$^{-1}$ with max of 286 and minimum of 238 kg ha$^{-1}$. These low yields represent significant environmental limitations, likely related to soil fertility and moisture availablity.

**Maize Cultivar Evaluations, CIMMYT CHTTY**

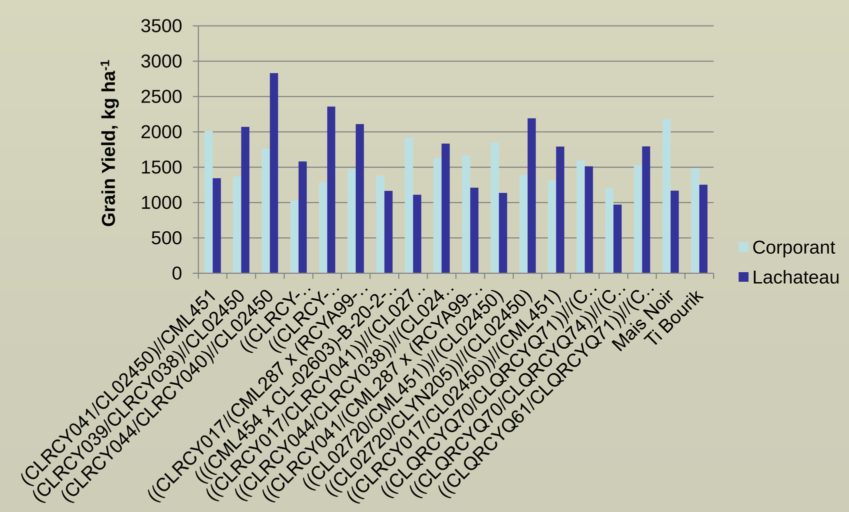
2011




2012




**Maize Cultivar Evaluations, CIMMYT TTWCYL , 2012**




- Average yield of the CHTTY studies in 2011 was 1852 kg ha$^{-1}$ and 1297 kg ha$^{-1}$ in 2012. Yield of the TTCCYL tests harvested in 2012 averaged 1697 kg ha$^{-1}$
- These studies were conducted using partial CA methods including reduced tillage and residue retained in the field. No additional inputs were supplied.
- Environmental maximum yield potential for common bean is reported to be YY and for maize to be LL Mg ha$^{-1}$, indicating the potential for significant yield advances over the performance measured in these trials.