



Building Resilience in Cropping Systems of the Central Plateau of Haiti

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SANREM CRSP

- SANREM CRSP targets the development of conservation agriculture production systems (CAPS). The research aims to increase smallholders' agricultural productivity and food security through improved cropping systems that contribute to and take advantage of improved soil quality and fertility.
- Seven projects developing CAPS in 13 countries across Africa, Asia, and Latin America



Resilience

The ability of a social or ecological system to absorb disturbances while retaining the same basic structure and ways of functioning, the capacity for self-organization, and the capacity to adapt to stress and change (IPCC WG2, 2007).



Haiti

- Poorest country in the W. Hemisphere:
GDP \$1,300/person/yr
- 54% of the population below the poverty line
- 60% of the population involved in agriculture
- Climate: Tropical, rainy season April-Nov.



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Conservation Agriculture Production Systems (CAPS)

- Pillars of Conservation Agriculture:
 - Year-round soil cover with crop residue, cover crops, crop canopy
 - Reduced tillage
 - Crop rotation or intercropping



Soil cover





Cover Crops



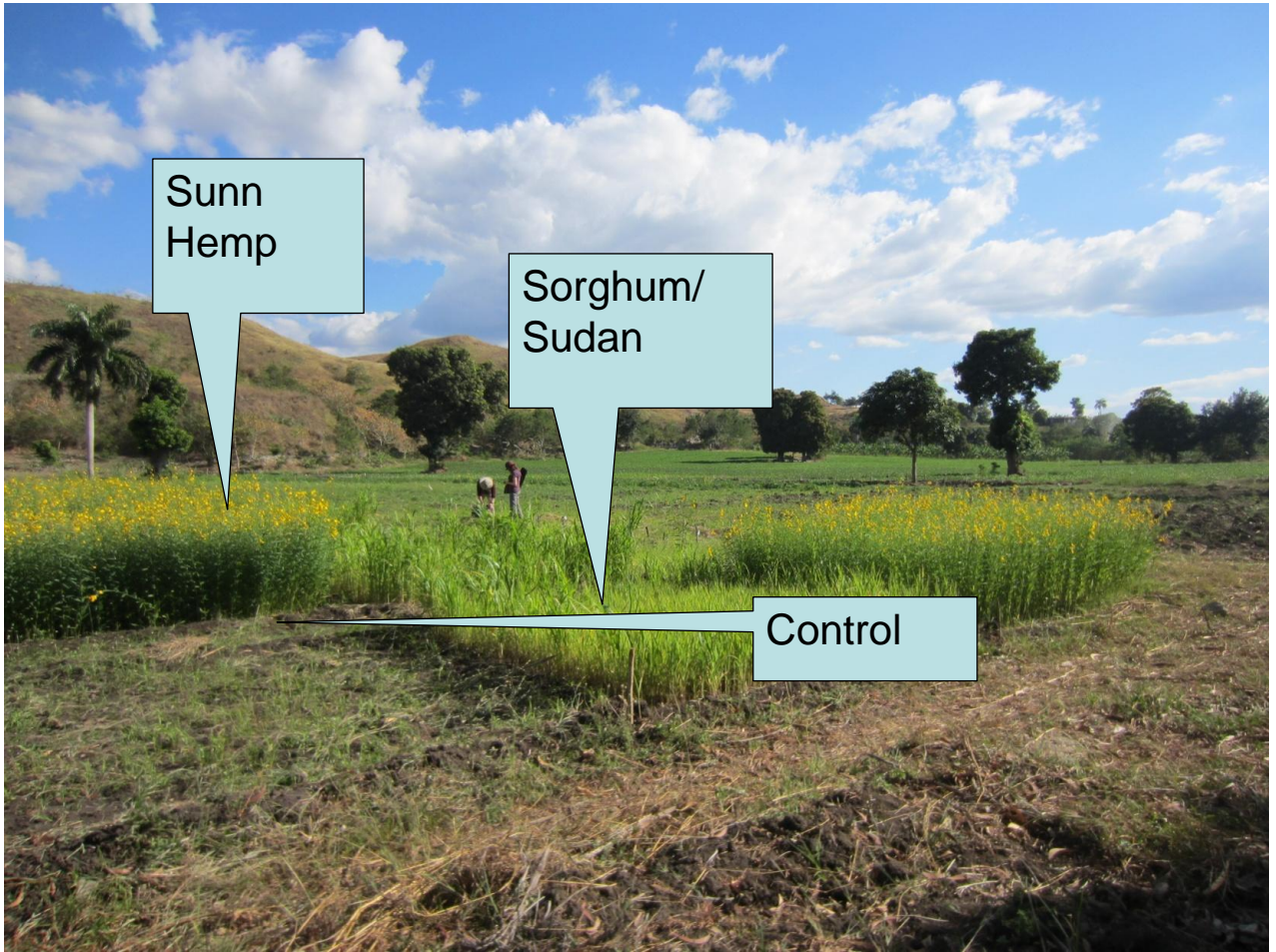
Sunn Hemp



Sesbania



Sorghum-Sudan





Objectives

1. Assess the adaptability of existing agricultural production and livelihood systems for transformation into CAPS
2. Increase agricultural production through development of CAPS
3. Increase the capacity of smallholders to adapt and improve CAPS
4. Strengthen human and institutional research and extension capacity for CAPS



Partners

- Zanmi Agrikol—affiliate of Zanmi Lasante (Partners in Health)
- Caritas/Catholic Diocese of Hinche
- State University of Haiti, Faculty of Agriculture and Veterinary Medicine
- Ministry of Agriculture and Fisheries



How can CAPS build resilience?

- Improved soil quality
 - Less soil erosion
 - Increased N from cover crops
 - Increased SOM
- Decreased labor requirement
 - Less tillage
 - Lower weed populations
- Increased crop yields and farm income



Methods

- Baseline Socioeconomic Survey
 - Objective was to assess current and potential adoption of soil-conserving practices
 - Surveyed 603 households in the lower Plateau
 - Gathered information on more than 3200 individuals, 1400 agricultural plots farmed by households, 1200 fuelwood and water collection sites, and over 3300 crop plantings

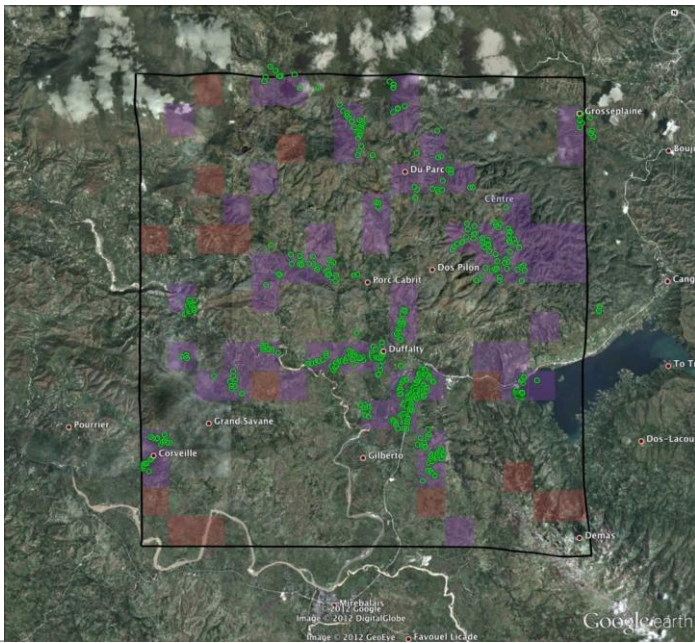


Household Survey





Household Survey





Methods—Agronomy

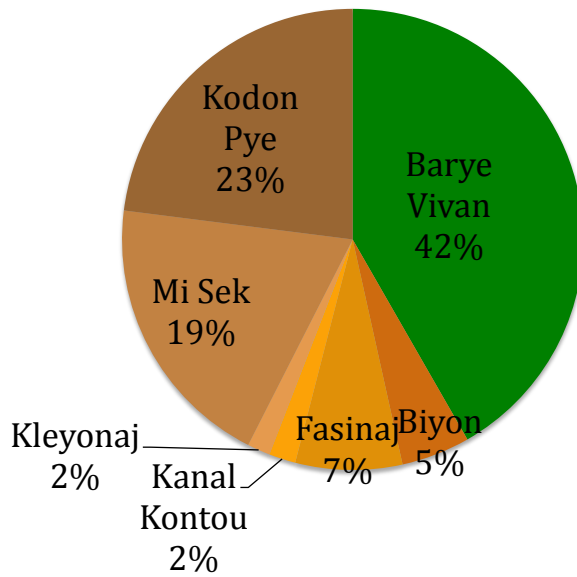
- Maize and bean variety evaluations
 - Identifying new varieties adapted for CAPS
- Replicated CAPS experiments
 - Three locations, three years
- On-farm CAPS trials
 - Initiated in 2013



RESULTS



Soil Conservation Practices



	All Observations		Use of Soil Conservation Practices		
	Average	St. Dev.	Yes	No	p value
Household Size	5.5	2.3	5.5	5.5	0.938
Number of Children (<12)	1.7	1.6	1.7	1.7	0.959
HoH Age	44.3	18.3	45.0	43.8	0.522
Area Under Cultivation (Karo)	0.98	0.76	1.11	0.88	0.003
Percent of Land Labeled "Flat"	50.9	44.7	33.0	65.0	0.000
Percent of Land Labeled "Poor"	9.7	28.9	5.0	13.4	0.003
Percent of Land With Irrigation	7.0	21.8	5.1	8.5	0.106
Diversity Index (0-1, 0 is monocrop)	0.56	0.21	0.60	0.53	0.002
Percent of Land With Title	17.7	35.9	19.2	16.5	0.453
Number of Fruit Trees Planted (5 years)	4.7	22.3	7.7	2.4	0.038
Average HHM Days Sick Per Month	0.8	1.8	0.7	0.9	0.210
Kilometers to the Nearest Market	2.74	2.15	3.18	2.38	0.000
2011 Income from Charcoal (USD)	61.28	205.13	64.81	58.47	0.759
2011 Non-Ag. Income (USD)	396.16	501.68	351.14	431.89	0.102
Value of Livestock (USD)	579.14	621.48	573.65	583.50	0.876
Value of 2011 Crop Production (USD)	353.67	489.18	385.44	328.44	0.259
Number of Observations	386	386	171	215	



Cobb-Douglas Production Function

Variable	Coefficient	Standard Error	t
Ave. Plot Distance	.10414**	.04991	2.09
% of Land Under Irrigation	.13820***	.04544	3.04
% of Land Labeled "Flat"	.04373*	.02453	1.78
% of Soil Labeled "Poor"	.02656	.03855	.69
Total Household Ag Land	.34449 ***	.07304	4.72
Distance to Market	-.01539	.04478	-.34
Male Ag Labor Days	.01660	.02014	.82
Female Ag Labor Days	-.01274	.01348	-.95
Children	-.01227	.02038	-.60
HoH Age	.01661	.02779	.60
HoH Years of Education	.02721	.01672	1.63
% of Land with Title	.04150	.02696	1.54
Days Communal Labor Used	-.00273	.01433	-.19
Days Hired Labor Used	.04976***	.01487	3.35
→ Crop Diversity	.27417***	.07776	3.53
→ % of Land Under Hedgerows	.06244**	.02710	2.30
→ % of Land Under Mi Sek	.02166	.03034	.71
→ % of Land Under Kodon Pye	.12772***	.03881	3.29



Baseline Survey Results

- Average plot = 0.6 ha and 28 minutes away on foot
- Average household farms 1.98 plots totaling 1.25 ha
- Plots are highly intercropped – most common crops are corn, sorghum, pigeon pea, manioc, banana, squash, peanut, and okra
- About 40% of plots prepared for planting with an ox-driven plow, 1% used a tractor, and remainder used hand tools
- About 40% of households had a least one soil conservation practice on one or more of their plots.

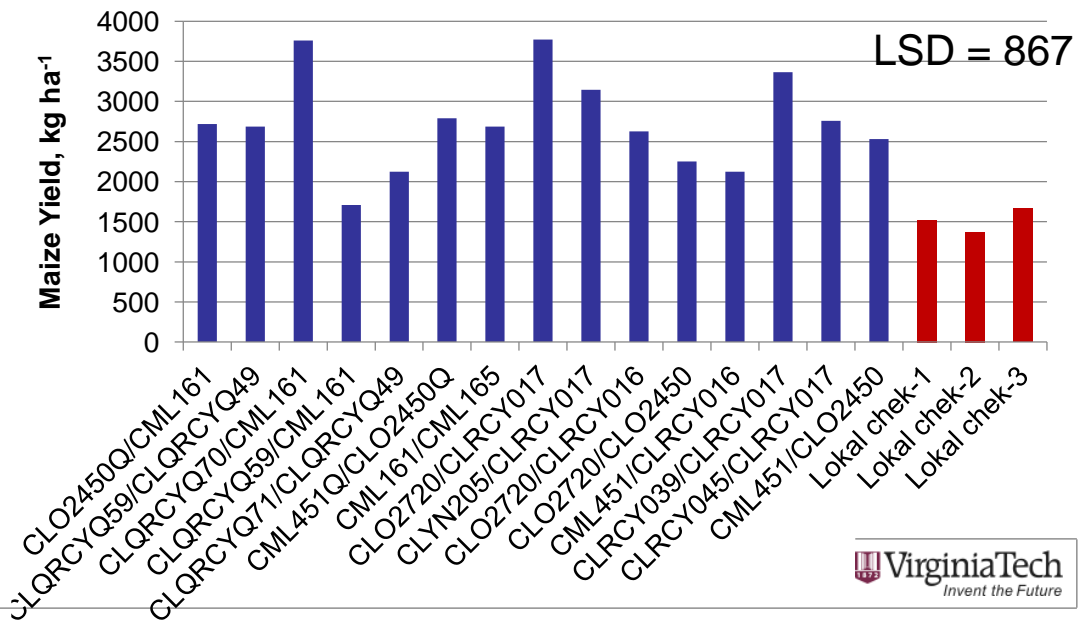


Baseline Survey Results

- Plot specific characteristics play a dominant and significant role in both the adoption and intensity of use of conservation practices
- Households are more likely to establish “live” barriers on plots they perceive as having poorer soil, and they are more likely to establish “dead” conservation practices (e.g. rock walls or barriers) on plots they perceive as having better soil
- Land tenure status does not appear to be a significant incentive or deterrent to the adoption and use of common soil conservation practices

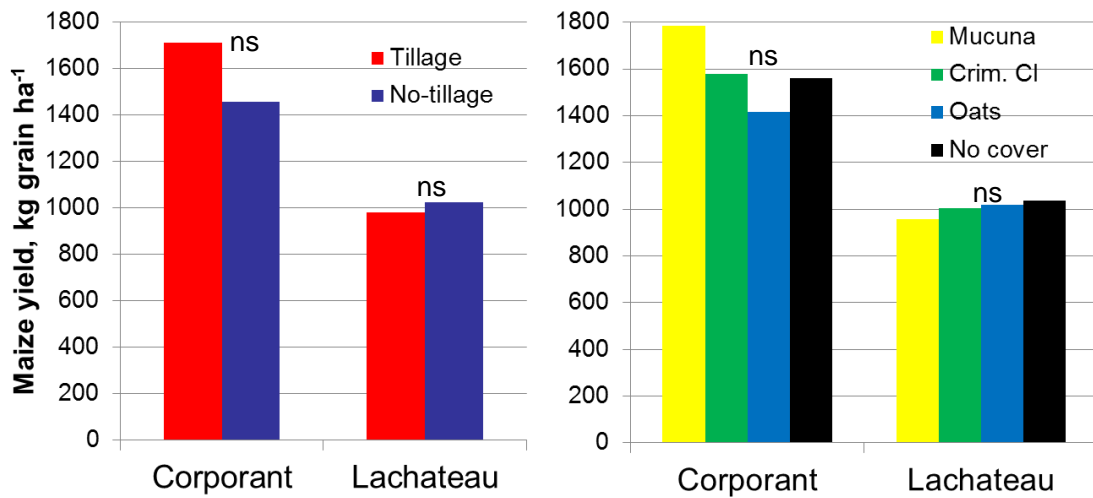


Boucan Carre, Maize 2011





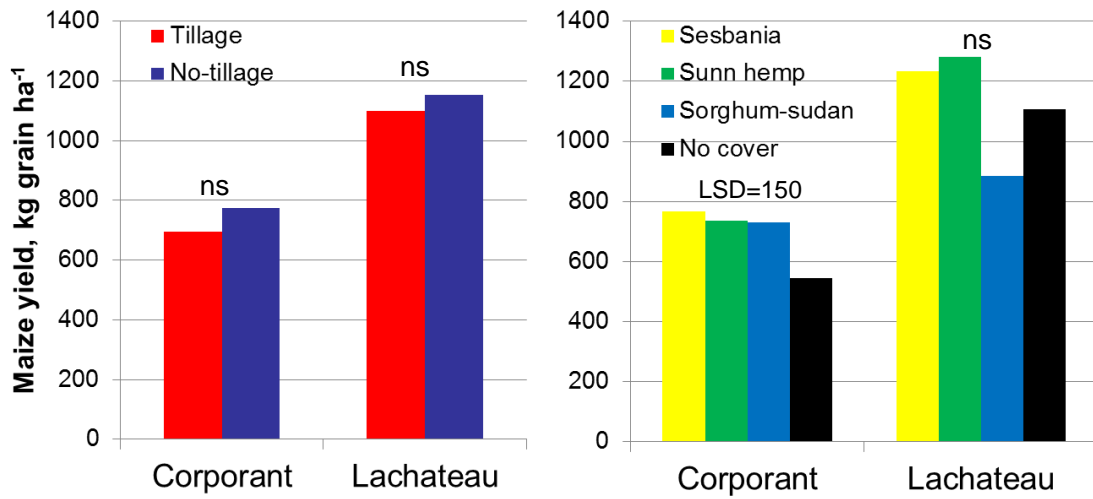
CAPS Maize yield, 2012





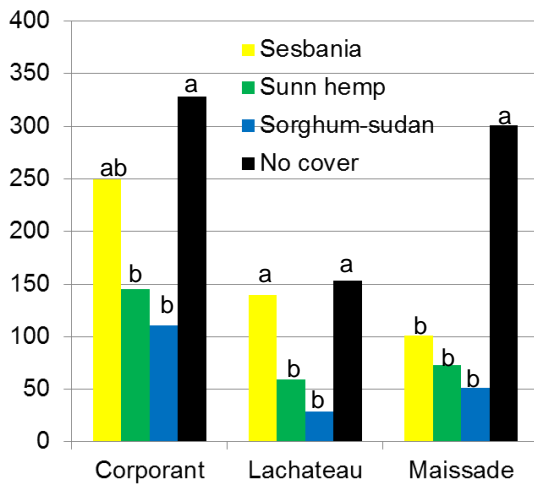
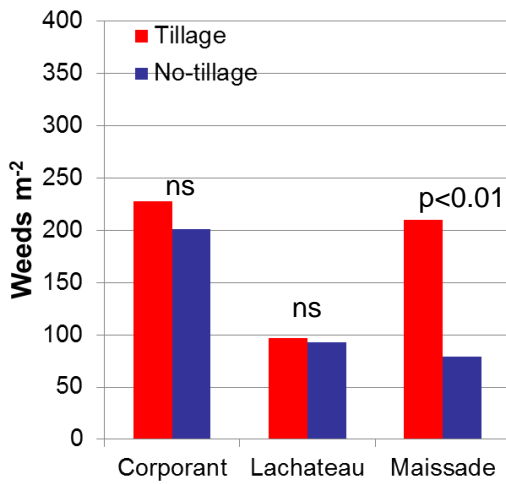


CAPS Maize yield, 2013





Weed populations under cover crops





Barriers to CAPS Adoption

- Fear of the unknown
- Including a non-food crop in the rotation
 - Cost of cover crop seeds
 - Impact on the family's resilience to food shortage
- Weed control during transition
- Timing around the rainy season, except for farmers with irrigation



Building Resilience with Capacity-building



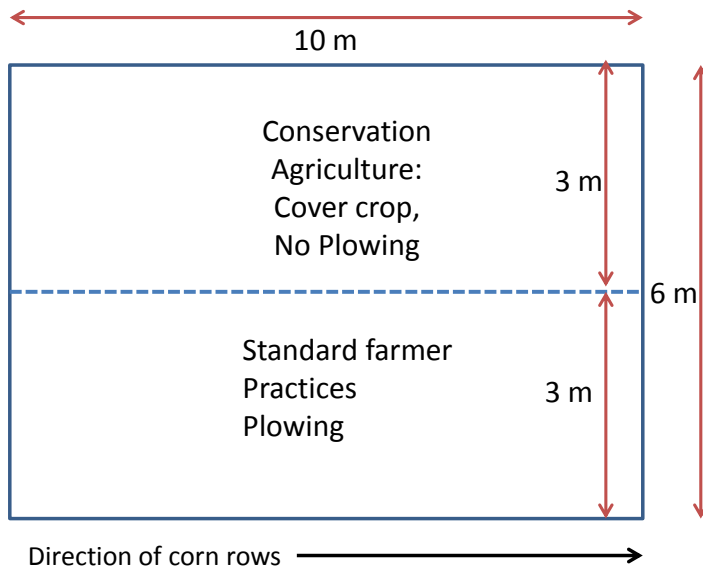
Demonstrating cover crops at farmer-oriented field days



Demonstrating installation of on-farm CAPS plots



On-farm CAPS trials, 2013-14





Conclusions

- Haitian smallholders are susceptible to shocks due to weather events, political and economic upheaval, and climate change
- Our survey shows that existing soil conservation practices are positively correlated to crop yields
- After two years of CAPS experiments:
 - Crop yields have not decreased under reduced tillage
 - Crop yields have increased or not decreased with cover crops
 - Weed populations are lower with CAPS
- So far, our results suggest that CAPS will improve outcomes that will increase resilience