

# Sustainable Agriculture and Natural Resource Management Collaborative Research Support Program

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# Trip Report: Mozambique

7-29 March 2012

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- **Purpose of Trip**: to establish baseline socio-economic information on small-holder farm households in two districts in Mozambique where CIMMYT-USAID/Total LandCare (TLC) (in the Angonia District), and IFAD projects (in the Barue District) have been promoting conservation agriculture (CA) since 2005
- Sites Visited: Beira (Sofala), Chimoio and Hondo Districts (Manica), Angonia and Tsangano Districts (Tete)

## **Description of Activities**

Preparations were made and baseline socio-economic surveys executed in two targeted districts in Mozambique. In total 559 farm households were interviewed by the end of March. Key accomplishments during this visited included: selection and training of enumerators in Angonia/Tsangano and Barue Districts; field testing and final revisons of the survey instrument and associated tools; development of a survey list frame and sampling strategy; execution of data collection in Angonia/Tsangano, preparation of the team for fieldwork in Barue. We also served as liaison between CIMMYT, Total Land Care and UT and visited local agricultural projects, input suppliers and grain traders to continue efforts to identify potential private sector partners for up-scaling of conservation agriculture in Mozambique.





#### 1. Angonia/Tsangano Area Household Survey

TLC efforts have been ongoing for several years in Mozambique. They have recorded CA extension efforts where "adoption" of CA has occurred in more than 75 communities. (Noting that the term "adoption" is used very generally here, meaning that individuals may have abandoned CA over the period.) The districts covered include Angonia (with four sites; Calomue, Domue, Mpandula, and Ulongue), Macanga, and Tsangano (with four sites; Banga, Nsaladzi, Ntengombalame, and Sede). Table 1 summarizes the distribution of "adopters" and "abandoners" according to information provided by Mr. Munguambe, the Mozambique TLC field manager. This information served as the primary data used to develop the list frame for the Angonia survey.

DISTRICT	SITE	STATUS	Total households
ANGONIA	CALOMUE	ABANDON	20
ANGONIA	CALOMUE	ADOPT	42
ANGONIA	DOMUE	ADOPT	16
ANGONIA	MPANDULA	ADOPT	23
ANGONIA	ULONGUE	ABANDON	9
ANGONIA	ULONGUE	ADOPT	23
MACANGA	MACANGA	ABANDON	57
MACANGA	MACANGA	ADOPT	32
TSANGANO	BANGA	ADOPT	20
TSANGANO	NSALADZI	ABANDON	33
TSANGANO	NSALADZI	ADOPT	82
TSANGANO	NTENGOMBALAME	ABANDON	3
TSANGANO	NTENGOMBALAME	ADOPT	39
TSANGANO	SEDE	ADOPT	43
Total			
ADOPT			320
ABANDON			122

Table 1. Distribution of adopters and abandoners provided by TLC-Mozambique,Angonia/Macanga/Tsangano, Mozambique

In the Angonia/Tsangano districts, the CIMMYT-USAID project is generally managed at the "field" level by TLC. In particular, TLC technicians are mainly responsible for sensitizing communities about CA technologies. Farmers who volunteer to participate in CA establish demonstration plots in their communities, where they receive an input loan from TLC (seed, fertilizer, and technological advice), which must be repaid at harvest. A 10% premium is included in the loan rate, which covers overhead costs for TLC operations (e.g. salary, per diem, and fuel). The main fertilizer inputs obtained from TLC are urea (46%) and 12-24-12, and maize seed variety PAN 67, a hybrid variety produced in Mozambique by PANNAR. Fertilizer costs

CA volunteer farmers about 20 mt kg<sup>-1</sup> (1 US\$ = 28 mt), while PAN 67 costs the same. Bean seeds can also be purchased on credit through TLC for intercropping, costing about 30 mt kg<sup>-1</sup>.

# Figure 1. Distribution of "exposed" and "unexposed" surveyed communities, Angonia, Mozambique

Angonia Survey sites (green = "exposed", yellow = "unexposed", red = base camp)



Mozambique

These districts were chosen to be the primary survey area for logistical reasons and because most of the households exposed to CA were located in these areas. Seven communities with USAID/CIYMMY/TLC demonstration plots were selected, and referred to from here as the "exposed" communities (Table 2). For logistical reasons, these communities were selected because of their proximity to Ulongue (all within 30 km of the survey base camp, figure 1) and their proximity to each other. In addition, according to the expert opinion of the TLC field technicians, additional communities were identified, based on the criteria that there had been no previous efforts by TLC or other agencies to promote CA. Seven communities were randomly selected from this list, which were considered community "peers" of the communities where CA had been promoted.

Total community populations were used to determine the sampling intensity for the survey. Due to budgetary and time constraints, a margin of error of 8% (with a 95% confidence interval) was

used to determine sample size. Of the 3,215 farm households in the target communities, 68% had been "exposed" to CA, with 3% of the 2,147 exposed households managing demonstration plots (97). The remaining households (32%, or 1,068) had not been introduced to CA by TLC, government Extension efforts, or other NGOs. In sum, all of the CA-practicing households that appeared on the list frame provided TLC were interviewed, while the sampling intensities of the exposed, but non-adopting households and unexposed households were (respectively) 6% and 12%. In total, 11% of all the households representing the area were surveyed. Sampling weights based on the stratum and were determined based on this information and will be used on the statistical analysis to estimate the total acres covered by CA, and the adoption potential of acres that could be recruited into CA for the study area.

		Demo	community house	eholds		
<u>District</u>	<u>Site</u>	Adopters	Exposed/non- adopters	<u>Total</u>	Unexposed peer community households	Surveys
ANGONIA	CALOMUE Cluster	35	44	79	14	93
ANGONIA	ULONGUE Cluster	7	9	16	20	36
TSANGANO	NSALADZI Cluster	45	36	81	64	145
TSANGANO	NTENGOMBAL AME Cluster	10	48	58	33	91
Total		97	137	234	131	365

#### Table 2. Angonia/Tsangano household survey counts

Non-adopting households in the exposed communities and households in the unexposed communities were surveyed using a systematic sampling procedure (Lohr, 1999). A random number generator was used to determine a starting point (e.g., a household) at the beginning of the community, after which enumerators were trained to survey every *k*-th household. Community leaders volunteered their services for identifying where communities began and ended, and for identifying which compounds were classified as individual households. When a household head could not be identified, enumerators were instructed to flip a coin to move to the house the previous of next household in the sequence. Systematic selection of CA-practicing households was unnecessary because the entire population of CA adopters was interviewed.

#### Local input markets - Angonia

The TLC prices appear to be competitive with input supplier prices in Ulongue. Informal interviews were conducted with three input suppliers. Two suppliers worked for the input supply company PANNAR®, who has extensive operations throughout the region. The third input supplier interviewed was an entrepreneur who based his operation out of the Ulongue city center market.

The most popular variety of maize seed purchased was Matuba; second was the PAN 67 variety. PANNAR vendors sold Matuba (produced by the Bonimar Company) and beans for 50 mt kg<sup>-1</sup>, and maize PAN 67 for 95 mt kg<sup>-1</sup>. In the central market, PAN 67 and Matuba were sold for 50 mt kg<sup>-1</sup>. Anecdotal evidence suggested that local farmers felt Matuba produced higher quality maize and was easier to germinate. October-December were the busiest months for input vendors, who estimated their clientele were mainly located in a 30 km radius around Ulongue.

It is remarkable that farmers and input suppliers in Angonia purchase fertilizer, herbicides (rarely used) and other chemical inputs from Malawi (Blantyre or Ilongue). Some fertilizer (12-24-12 and urea, were produced in Mozambique. Others were made by the Malawi company "PROFERT". An NPK mix of 23:21:0+4S was sold by a central market vendor for 22 mt kg<sup>-1</sup>; and urea 46% for 20 mt kg<sup>-1</sup>. One vendor reported selling about 2,000 50 kg bags of 46% urea and 5,000 50 kg sacs of 12-24-12 per year. Another vendor in the central market reported selling around 2,000 50 kg bags of 12-24-12 and 1,500 50 kg bags of 46% urea per year. During the peak months (November-December), the central market vendor reported selling 100-200 sacs day<sup>-1</sup> of NPK, and about 30 25kg sacs day<sup>-1</sup> of maize seed.

While herbicide use appeared to be rare, backpack sprayers and herbicide were available in the Ulongue input markets. Sprayers ranged between 1,700 to 2,700 mt. While there were pesticides available for purchase, there were no herbicides found in the market.

A significant amount of surplus vegetable produce, maize, and beans produced in Angonia are likely sold in Malawi, as well. In fact, the closer communities were to the Malawi border, the more likely they were to report income and costs in terms of Malawi Kwacha (about a 5 to 1 exchange rate for mt). Generally, households engaged in extra-community grain or vegetable markets would sell their products to aggregators who would then transport the materials to Ulongue or Malawi. In Maguai, there was a local mill (operated by a male and run by a diesel generator) with about 15 regular clients (all female). For 12 mt, the miller would grind 18 L buckets of maize into flour. Milled maize was reportedly for household consumption. During the milling season, about 42 to 58 L buckets of maize would be processed per day.

#### 2. Barue – Honde Site Area Household Survey

In Barue, efforts by IFAD to promote CA have been ongoing for at least the same period of time. The structure of this program differs slightly from the TLC model because it is generally managed by Extension agents working for the Mozambique Ministry of Agriculture. CIMMYT coordinates their efforts in terms of developing community demonstration plots with Extension agents. The two main sites in the Barue districts where CA is being intensively promoted are Inhazowia (which includes at least 10 communities) and Honde (which includes around 15 communities). Nhamizinga, a community in the Inhazowia site, has several USAID-CIMMYT CA demonstration plots. Another project managed by SOFEX (in Cruz) promotes CA as well. Two other communities in the Inhazowia site are also home to numerous CA adopters; the Mussianharo and Mussambizi communities. CA has not been introduced in the 11 communities remaining. The information available for the Honde list frame was different from that used to design the Angonia/Tsangano list frame, but overall the same design was possible. Table 3 summarizes the information used to build the community list frame for the Barue survey.

DISTRI	SITE	STATUS	<b>Total households</b>
СТ			
BARUE	INHAZOWIA	CA Households	706
		Non-CA	1653
		households	
		Total	2359
		Number of	10
		communities	
BARUE	HONDE	CA Households	107
		Non-CA	1363
		households	
		Total	1470
		Number of	15
		communities	

 Table 3. Distribution of CA and non-CA households provided Mozambique Extension

 Agents, Barue, Mozambique

For logistical reasons and budgetary constraints, a margin of error of 10% (with a 90% confidence interval) was used to determine sample size. The Honde site was selected as the target area because this is the site where the USAID-CIYMMT plots are currently managed, according to Mozambique extension sources. In addition to the three "exposed" CA communities, 5 "unexposed" communities were randomly selected as "peer" communities, with communities with larger numbers of household having higher probabilities of being selected (again, for logistical and budget constraint reasons).

Table 4. Barue – Honde h	household	survey	counts
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	Total HH		Surveys n	eeded:	
Exposed community:	CA	Non-CA	CA	Non-CA	Total surveys:
Nhamizinga	58	220	39	19	58
Mussianharo	17	180	11	16	27
Mussambizi	32	250	21	22	43
Total			71	57	128
Unexposed community:					
Tsongorera		25		3	3
Mussinze		45		5	5
Nhamatema		315		31	31
Chuala		215		21	21
Mudzora		62		6	6
Total				66	66

Household survey counts are summarized in Table 4. A total of 194, or 10% of the total number of households, were surveyed. In the exposed communities, about 5% of the 2,041 households representing Honde had adopted CA. About 63% were "unexposed" households. Instead of sampling all of the households that had adopted CA (107), 2/3 (67%, or 71) were randomly selected. The systematic sampling procedure used in the Agonia/Tsangano area survey was used in Honde. The Barue – Honde (Honde) survey was led by Chipunza.

#### Suggestions, Recommendations, and/or Follow-up Items

In total, 559 households were interviewed between 3/19 - 3/31. Of those surveys, 294 are at UT. The remainder will be returned to the UT when Ivan Cuvaca begins his M.S. training at UT in June, 2012. Recently, UT has received information that Timoteo Eduardo Simone (from Mozambique) will be attending UT for an M.S. in Agricultural Economics and Resource Management. He will be working with Ivan Cuvaco (also of Mozambique) analyzing the survey data.

Of notable interest are the communities of Maguai and Gimo, both located in the Angonia District. These are relatively large communities with relatively many households managing CA demonstration plots. Communities that have not been "exposed" to CA but are close (about 2-5 km) to Maguai and Gimo are (respectively) Magumbo and Phenda. A recommendation would be for TLC to begin concentrating their extension activities in Magumbo and Phenda. This would provide an opportunity to assess the relative impact of CA on yields, input use, labor allocation, changes in gender labor demands, and overall household well-being in a "before-after" quasi-experimental setting. While this survey was designed to include a counterfactual (e.g., the "unexposed" communities), extending demonstration plots to these communities would provide a much clearer understanding of the impacts of CA on livelihood and well-being.

Program	am Date Audience Number of Training Participants Provider		Training Provider	Training Objective		
type			Men	Women	TTOVIACI	
Workshop	3/12/12	Enumerator Candidates	12	3	UT, CIMMYT and IIAM	<ul> <li>Familiarize candidates with survey instrument.</li> <li>Finalize survey for field testing.</li> </ul>
Workshop	3/13/12	Enumerator Candidates	12	3	UT, CIMMYT and IIAM	<ul> <li>Role plays conducted for and between trainees to enhance survey efficiency and hone local language vocabulary.</li> </ul>
Field Day	3/14/12	Enumerators	6	2	UT, CIMMYT and IIAM	• Field testing of Survey instrument

#### **Training Activities Conducted**

#### References

Lohr, S.L. 1999. Sampling: Design and Analysis. Pacific Grove: Duxbury Press.

## List of Contacts Made:

Name	Title/Organization	Contact Info (address, phone, email)	
Nyasha Chipunza	Research Associate, CIMMYT, Harare, Zimbabwe	n.chipunza@cgiar.org	
Ivan Cuvaca	Technician, CIMMYT, Chimoio,	Tel: 258 826 990 766	
	Mozambique	<u>ivancuvaca@gmail.com</u>	
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Eduardo	de Manica, Mozambique	<u>eddardojouquinte notinan.com</u>	
Gianluca Luongo	Agro-forestry manager, Clean Star	http://www.cleanstarmozambique.com/who-	
Glainuea Luoligo	Mozambique, Beira	we-are/management-team/gianluca-luongo/	
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Ofaint Taylor	Comercializacao Agricola (ECA), Chimoio		

## List of Enumerators and Trainees:

Name	Email	Phone	Status	Role
Mr. Chiwiro Filipe	jchefilipe@gmail.com	820298860	Graduate (BSc)	Enumerator
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Mr. José Luisa Joao Chaora	josechaora@yahoo.com.br	825826800	Student	Enumerator
Mr. Rui Armando	ruisozearmando@yahoo.com.br	825117220	Student	Enumerator
Mr. Isidro Munjovo	isidromunjovo@yahoo.com.br	823911607	Graduate (BSc)	Candidate
Mr. Inoque João Chaora	inoquejooc5@gmail.com & inoquijooc5@gmail.com	823909388	Graduate (BSc)	Enumerator
Ms. Sara Juliana		829119777	Student	Enumerator
Mr. Fidel Naite	fidel-naite@yahoo.com.br	825510442	Student	Candidate
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Mr. Sírio Martins Francisco Tebuca	stebuca@hotmail.com	823901825	Graduate (BSc)	Enumerator
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Mr. Jarzinho Alfandega	jarzinhoa@gmail.com	829539246	Graduate (BSc)	Candidate
Ms. Veronica Mpagua	vmpagua@gmail.com	824288264	Student	Candidate
Ms. Balbina Sarande	balbysarandee@yahoo.com	824206475	Student	Enumerator
Mr. Ricardo Lázaro Samuel	gundumwa@yahoo.com.br	823395796	Student	Enumerator

Date	Activity
Wednesday, March 07, 2012	Wilcox: Depart Nashville, TN (BNA) for Johannesburg, SA (JNB)
Thursday, March 08, 2012	Wilcox: Arrive in Johannesburg, SA, sleep in Johannesburg, SA
Friday, March 09, 2012	<ul> <li>Johannesburg, SA to Beira, MZ</li> <li>Initial meeting with in-country experts from Clean Star</li> <li>Exchange of information and update on Clean Star's cassava to ethanol project and UT's SANREM-CRSP project; including acquisition of high quality planting material, fostering farm to market efficiency gains, input access in the Beira corridor (including Barue), agronomics and logistics in Angonia/Tsangano District</li> </ul>
Saturday, March 10, 2012	<ul> <li>Beira, MZ</li> <li>Tour of Clean Star ethanol plant facilities, introduction to current and planned intercropping/fertilizer/cover crop field trials, preliminary examination of site for potential for small-scale aquaculture</li> </ul>
Sunday, March 11, 2012	<ul> <li>Beira, MZ to Chimoio, MZ</li> <li>Visit with representative from ECA (Grant Taylor), a private agro-dealer that is working with smallholder farmers in Barue and interested in expanding the adoption of conservation agriculture by addressing current market-based constraints</li> <li>Meet with Ivan Cuvaca (CIMMYT-Mozambique) and Nyasha Chipunza (CIMMYT-Zimbabwe) to discuss upcoming enumerator training/hiring and survey field testing. Provide updates on survey development, scheduling and sampling strategies. Finalize logistics for training.</li> </ul>
Monday, March 12, 2012	<ul> <li>Chimoio, MZ</li> <li>Wilcox, Cuvaca and Chipunza meet and begin training fifteen enumerator candidates. Survey instrument finalized for field testing.</li> </ul>
Tuesday, March 13, 2012	<ul> <li>Chimoio, MZ</li> <li>Enumerator training continues. Role plays conducted between trainees. At the end of two days of training, ten enumerators are selected to join the teams. Teams are split between Angonia/Tsangano and Barue based on language skills and availability. Two of the four Barue team members selected to join the Angonia/Tsangano team as additional members.</li> </ul>
Wednesday, March 14, 2012	<ul> <li>Chimoio, MZ to Honde, MZ to Chimoio, MZ</li> <li>Eight of the ten enumerators join Wilcox, Cuvaca and Chipunza to field test the survey. Working with two Extension personnel from Honde, members of two farmer groups were surveyed using draft instrument.</li> <li>Survey instrument and accompanying worksheets finalized and delivered to printer.</li> <li>Lambert: Depart Knoxville, TN (TYS) for Johannesburg, SA (JNB)</li> </ul>

# Appendix: Chronological Description of Activities

	Chimoio, MZ to Tete, MZ
	• Travel to Tete with Angonia/Tsangano team and two members of
Thursday, March 15, 2012	Barue team.
	• Lambert: : Arrive in Johannesburg, SA, sleep in Johannesburg,
	SA
Friday, March 16, 10 am	Tete, MZ to Ulongue, MZ
	• Travel from Tete to Ulongue (Angonia District). Wilcox Joined
	by Dayton Lambert
Saturday, March 17	Ulongue, MZ
	• Meet Total Land Care (TLC) technicians.
	Develop Angonia/Tsangano survey list frame and survey
	logistics with TLC technicians, Lambert, Chipunza, and Cuvaca.
Sunday, March 18	Ulongue, MZ
	• Survey teams visit all of the participant communities to inform
	community leaders of program goals, objectives and proposed
	schedule.
Monday, March 19	Ulongue, MZ
	• Surveys conducted in Chiphole, Mpata, Micolongo, Mitengo,
	Ntachi, and Chizeze.
	• Survey team meeting held after dinner to process the day, make
T. 1 M. 1 20	adjustments and prepare for Tuesday.
Tuesday, March 20	Ulongue, MZ
	• Surveys conducted in Musso and Njila wa Goma.
	• Barue survey list frame and survey logistics developed with
	Lambert, Chipunza and Cuvaca.
	• Survey learn meeting neid after dinner to process the day, make
Wadnasday Marah 21	Illongue MZ
wednesday, Watch 21	• Surveys conducted in Gime
	<ul> <li>Survey team meeting held after dinner to process the day make</li> </ul>
	adjustments and prepare for Thursday
Thursday March 22	Wilcox - Travel to Tete with Barue team
Thursday, March 22	Angonia - Nzewe community survey
	Barue: Travel to Catandica to meet team members originating
	from Chimoio
Friday, March 23	• Wilcox: Travel back to the US (Tete, MZ to Johannesburg, SA to
	Nashville, TN)
	• Angonia: Nzewe community survey, continued.
	• Barue: Survey community visit; inform community leaders of
	impending arrival and intentions regarding survey activities.
Saturday, March 24	Angonia: Maguai community survey.
	Barue: Nhamizinga community survey.
Sunday, March 25	Angonia: Break.
	Barue: Mussianharo community survey.
Monday, March 26	Angonia: Maguai community survey, continued. Lambert
	interviews first PANNAR agri-dealer in Ulongue
	Barue: Mussambizi community survey.

Tuesday, March 27	Angonia: Maguai community survey, continued.
	• Barue: Tsongorera community survey.
Wednesday, March 28	• Angonia: Lambert meets with TLC regional director, Mr. Zwede Jere (based in Malawi).
	• Lambert interviews second PANNAR agri-dealer in Ulongue, and an agri-dealer in the Ulongue market.
	• Lambert departs for Knoxville, TN. Cuvaca leads Angonia team to survey Magumba.
	• Barue: Mussinze community survey.
Thursday, March 29	Angonia: Magumba community survey, continued.
	• Barue: Nhamatema community survey.
Friday, March 30	Angonia: Phenda community survey.
_	• Barue: Chuala community survey.
Saturday, March 31	Barue: Mudzora community survey.