(AUGUST 2010 - JANUARY 2011)

Project Name:	MTF/MOZ/098/STDF 230 – Establishment of Pest Free Areas regarding CLYD in Mozambique.		
Executing Agency:	FAO-MOZ	Project supervisor:	IPPC
PROJECT DESCRIPTION:	To build phytosanitary capacity in Mozambique to implement ISPMs #4, #6, # 8 and #9 in their application to management of Lethal Yellowing Disease on palms, to increase market access for coconuts from Mozambique and to increase food security and income generation by contributing to a viable coconut industry		
Project Start Date:	01 July 2009	Project End Date:	31 July 2011

Budget overview:

	STDF contribution	In-kind contribution (US $)	Total (US $)	% of Total project cost
Projected Total Project Budget (US $)	346528	39000	385528	100%
Total expenditure to date (US $)	177119	0	177119	51.12%
Expenditure for reporting period (US $)	96023	0	96023	27.71%
Unspent funds (US $)	169409		169409	48.89%

GENERAL REPORTING

Broad Progress Achieved to date:
Project initiated September 27, 2009. Inception mission conducted from 27 Sept – 3 Oct. A follow-up mission was done from Nov 16-27, 2009. Meetings and discussions held with key implementation partners (Eduardo Mondlane University, Ministry of Agriculture – planning, Plant protection department, Millennium Challenge Corporation and FAO). Possible synergies with the MCC programme were discussed. Issue of flexibility with the project was discussed in relation to the possibility that Lethal Yellowing disease is detected south of the Zambezi river. An implementation plan was developed and approved. Methodology and plans for surveillance were identified and approved. Training of pest surveillance team in pest surveillance and related ISPMs has been completed. Awareness materials have been produced and released. Launch of the program happened in June 2010. Collaborators for analytical and identification tasks were identified and necessary arrangements completed. A company to perform the aerial survey was hired and aerial survey was carried out from 9 to 14th of August 2010. Aerial survey report was completed by September 2010. The baseline ground survey in Inhambane Province started and was completed. In 113 sites, 339 samples (from coconut trees and soils) were collected sent to Biotecnology Lab (UEM) and Soils Lab (FAEF- UEM). Results from Biotechnology Lab indicated the presence of ALC in 19 sites (36 coconut trees) using universal primers (P1 and P7) in several districts. From the samples sent to CIRAD lab only 1 tree in Vilankulo district tested positive. It was concluded that ALC is present in Inhambane Province. The baseline ground survey in Maputo city was completed. Plans are in place to continue baseline ground survey in Sofala, Gaza and Maputo provinces. Vector studies initiated in Zambezi Province. Collecting of insects potential vectors started in May 2010 and continued until November. The international expert on vector identification Dr. Michael Wilson visited Mozambique for collecting of specimens, identification of the specimens collected and training on insect identification. A potential vector found in Tanzania (tested positive to ALC with PCR techniques), *Diostrombus mkurangai* Wilson 1987 (Derbidae), was collected from coconut leaves in several locations visited in Zambezia Province. *S. mkurangai* specimens collected were sent to the Biotechnology laboratory. A report on results of vector studies was completed. Plans to continue sampling are being prepared.

A. BROAD WORK ACHIEVED THIS PERIOD:

- Aerial survey was completed by company hired – 9th to 14th August 2010.
- Aerial survey report was completed and delivered by company hired – 20th September 2010.
- Baseline ground survey in Inhambane Province was completed – 13th September to 4th October 2010 (Annex 1).
- Plant and soil samples collected during Inhambane survey were sent to Biotechnology Center and Soil Analysis Laboratory – 6th October 2010.
- Report on coconut trees samples collected in Inhambane was delivered by Biotechnology Center of UEM (BC-UEM) – 20th December 2010. .
- Soil and nutrition studies – soil analysis of samples collected in Zambezi completed; soil analysis of samples from Inhambane in process (Annex 2).
- Vector studies – collecting of insects potential vectors continued in Zambezi province in established sampling sites, using sticky traps (Annex 3).
- Preparation of ground survey plan for Sofala Province and Maputo City was completed (Annex 1).
- Baseline ground survey in Maputo City was completed.
- International consultant on vector identification visited Mozambique from 23 – 26 November 2010; Field visits around Quelimane during Dr. Wilson's consultancy from 23 to 26 November 2010, resulted in the collection (directly on coconut leaves with hand-held insect aspirators) of two important species not yet found in the traps belonging to the family Derbidae (Annex 3).
- The course on vector identification took place in Maputo, at the Eduardo Mondlane University (Faculty of Agronomy and Forestry Engineering and Pedagogic Complex), from 29th November to 3rd December 2010. The course was given by Dr. Michael Wilson of the Museum of Wales (UK), an expert in the identification of vectors of coconut lethal yellowing disease, and attended by 18 technicians from the provinces of Zambezi, Inhambane, Maputo and Maputo City and from different institutions (Plant Health Department-MINAG, Faculty of Agronomy - UEM, Millennium Challenge Account (MCA), IIAM and ACIDI/VOCA) (Annex 1). A set of manuals and brochures was provided to each participant to help in identifying the main families of potential vectors (Annex 3).

B. BROAD WORK REMAINING FOR NEXT PERIOD AND BEYOND:

- Implementation of the survey plan for Sofala, Gaza and Maputo Provinces, samples collection, identification and verification of CLYD.
- Completion of laboratory analysis on plant and soil samples.
- Completion of potential vectors field collection and species identification of potential vectors and molecular testing for CLYD
- Analysis of results and identification of production areas for application of phytosanitary measures to establish and or maintain pest freedom.
- Identification of phytosanitary measures to be applied for establishment and or

maintenance of pest free areas.

- Preparation of technical report/data on disease occurrence, host plants affected, vectors found/tested for infectivity.
- Evaluation and Reporting: discussion of results with SA.
- Project conclusion and evaluation.

- Other Comments: The activity to procure and set up screen house for vector infectivity tests in a specified province has been withdrawn as advised by the consultant on insect identification in agreement with the PMC of the project, because of technical and procurement reasons.

Deliverable / Targets Table *(Log-frame)*

Item ID	Item Description	Target Finish Date (As in project document)	Actual or Forecast Finish Date	Status: (% Complete)	Comments
1.	1.1 Appointment of the Project Management Committee 1.2 Appointment of a pest surveillance management team 1.3 Recruitment of Consultants 1.4 Identifying stakeholders (private and public)			100 % complete	All consultants on board
2.	Training of pest surveillance team in pest surveillance and related ISPMs			100% complete	
3.	3.1 PMC meeting to develop a realistic work plan as well as to discuss the			100% complete	

	project and define roles. 3.2 Meeting with Provincial Directorates and stakeholders to discuss logistical and technical requirements for each province.				
4.	4.1 Preparation of a survey protocol and survey strategy for CLYD. 4.2 Preparation of a survey plan for vectors of CLYD and protocol for infectivity testing of potential vectors. 4.3 Preparation of procedure for testing soil nutrient content. 4.4 Discussion of protocol with South Africa NPPO to facilitate agreement on and acceptance of protocols. 4.5 Identification and training of personnel from the various provinces to assist in conducting surveys in their provinces.			100% complete, except for 4.4 that is not planned for this period.	This activity has been complemented by the elaboration of a manual, a poster and a leaflet to be used during surveys for awareness purposes
5.	5.1 Identify collaborators for sample analyses and independent verification of samples (within or outside the			100% complete	

	region). 5.2 Prepare a MoU regarding on sample preparation, timing of delivery and identification services for samples.				
6.	Procurement of Equipment to support surveillance of targets			60% complete	Procurement of imported equipment is very delayed and no imported equipment has been purchased during this period
7.	7.1 Systematic Implementation of the survey plan, samples collection, identification and verification of CLYD.		**Baseline and systematic ground survey:** Plan for survey ready; survey in Sofala, Gaza and Maputo province delayed. Planned for February to March 2011.	Aerial survey 100% complete Baseline survey 50% completed Baseline survey in Inhambane Province 100% complete. Baseline survey in Maputo city 100% complete.	
	7.2 Systematic implementation of survey plan for vectors.	Vector identification studies	Initiated in May 4 sites and 36 traps established; weekly sampling is being carried on.	80% complete International consultant visit complete	

				Species identification complete	
		Vector identification training	Conducted in November 2010	100% complete	
8.	Procure and set up screen house for vector infectivity tests in a specified province.		Not determined	Not completed	Delayed due to the delay in identification of potential vector. It is proposed to exclude this activity from project as there will be no time left to carry on this study that could present technical and procurement obstacles.
9.	Preparation of Technical report/data on disease occurrence, host plants affected, vectors found/tested for infectivity.		Data are still not available to complete this activity		Delayed due to delays in aerial and ground survey
10.	Analysis of results and identification of production areas for application of phytosanitary measures to establish and or maintain pest freedom.				Not planned for this period.
11.	Identification of phytosanitary measures to be applied for establishment and or maintenance of pest free areas.				Not planned for this period.
12.	Meetings of PMC and stakeholders				Not planned for this period.

13.	Evaluation and Reporting: discussion of results with SA.				Not planned for this period.
14.	Project conclusion				Not planned for this period.
15.	Project external evaluation				Not planned for this period.

Target. *The following information is not required if a target has been met and the information has been provided in a previous project report. If a target has not been achieved or is likely to be delayed, provide:*

The following project targets are delayed due to procurement problems in Target ID 6: Procurement of equipment to support surveillance of targets.

Target ID 7.1 Systematic implementation of the survey plan, samples collection, identification and verification of CLYD.
Target ID 7.2 Systematic implementation of survey plan for vectors.
Target ID 8 Procure and set up screen house for vector infectivity tests in a specified province.
Target ID 9 Preparation of technical report/data on disease occurrence, host plants affected, vectors found/tested for infectivity.

Item ID	**Target Delay Notes.** *A) likely impact on the project:* *B) Reason for delay:* *C) Corrective action planned to be taken, if any*
7.1	A) Likely to impact on project. B) Aerial survey delayed due to procurement problems and ground survey delayed due to delay in aerial survey. C) The ground survey will be done in a more intensive way to compensate for the delay. The extension of the project is helping to correct the delay
7.2	A) Likely to impact on project. B) Problems to identify and hire a specialist in taxonomy. C) Consultant hired and a new date established for the training activity. The extension of the project is helping to correct the delay
8	A) Likely to impact only on a focused activity of the project. B) Impossibility to get the inputs needed and timing to produce the possible outputs. C) Withdraw this activity based on the reassessment of the needs and feasibility.
9	A) Likely to impact on project.

	B) Delays in the performance of aerial and terrestrial surveys. C) The ground survey will be done in a more intensive way to compensate for the delay The extension of the project is he;ping to correct the delay

Mid (End)-project financial statement (NOT DUE)

ANNEX 1
REPORT ON SURVEILLANCE ACTIVITIES
FROM AUGUST 2010 TO JANUARY 2011

Ana Mondjana, Serafina Mangana and Jadwiga Massinga

1. Project surveillance activities planned for reporting period

During this reporting period the following activities were planned:

- Awareness activities in Inhambane province
- Aerial survey
- Ground survey in Inhambane province
- Ground survey in Maputo City
- Diagnosis of surveyed samples
- Preparation of ground survey for Sofala province

2. Broad progress achieved to date

The project initiated in September 27, 2009. Inception missions and reports were conducted and completed. First report included a survey plan that was developed by the project team. This plan included the survey strategy, sampling methodology and implementation plan.

Training of pest surveillance team in pest surveillance and related ISPMs has been completed and awareness materials have been produced and released. A company was hired to perform the aerial survey and aerial survey was carried out from 9 to 14th of August 2010. The baseline ground survey in Inhambane Province started in September 13th and was completed in October 4th 2010. Samples collected during this survey were sent to Biotechnology Center (UEM) and Soils Analysis Laboratory (FAEF- UEM). Baseline ground survey in Maputo city was completed in December 2010. Plans are in place to continue baseline ground survey in Sofala, Gaza and Maputo provinces.

3. Project activities completed from August to October 2010

3.1. Awareness activities

To disseminate the project goals, activities and its milestones, a continuous awareness program has been implemented. From August to September the consultants had meetings with the major stakeholders in Inhambane province where information about the surveys was given and the role of each partner. Also, during the meetings awareness material was distributed, including pamphlets, posters, manuals and a video of CLYD in Mozambique produced within the Farmer Income Support Project, funded by Millennium Challenge Corporation.

3.2. Aerial survey

The aerial survey on the targeted areas was conducted from 9 to 14th August 2010 by services provider contracted by FAO, which the report was already submitted to FAO.

3.3. Baseline ground survey

3.3.1. Inhambane Province

The ground survey was conducted in Inhambane province, from 13th September to 4th October 2010 following the methodology established in Report #.1. The maps for the areas to be surveyed and sampling sites were drawn based on the aerial survey results (Figures 1 and 2).

Important to note that the ground survey was not carried out on the initial planned dates due to the delay in the aerial survey, which already was reported in project report # 2 and #3.

The ground survey consisted on the following activities

- Launching of the survey activities with the major coconut players and decision makers at provincial and district level
- Refreshment training of the pest surveillance team at provincial level in surveillance methodology.
- Field sample collection

3.3.2. Maputo City

The ground survey was conducted in Maputo City in December 2010 following the methodology established in Report #.1. The maps for the areas to be surveyed and sampling sites were drawn based on methodology established in the Report # 1 (Figure 3).

3.4. Diagnosis of surveyed samples

Three hundred and nineteen (319) field samples collected in Inhambane were sent to the Biotechnology Center at UEM (CB-UEM) for testing. According to the CB-UEM preliminary report, which was already sent to FAO, due to sample duplication, only 311 samples (out of 319) were tested.

CB-UEM completed sample analysis and report was completed and sent to FAO on December 20th 2010.

The CB-UEM report indicates the presence of ALC in 19 sites (36 coconut trees) using universal primers (P1 and P7) in several districts. From the samples sent to CIRAD lab and analised using specific primers (Ghana813 and AKSR) only 1 tree in Vilankulo district tested positive. It was concluded that ALC is present in Inhambane.

Samples from Maputo city are being processed by CB-UEM and no report was delivered yet.

3.5. Preparation of ground survey for Sofala Provinces

During the same period, the project team also prepared the ground survey for Sofala province (Figure 4).

4. Proposed activities for next period (February to April 2011)

For next reporting period the following activities are planned:

- Ground survey in Sofala, Gaza and Maputo provinces
- Conclusion of the samples diagnosis by the CB-UEM related to Maputo City, Sofala, Gaza and Maputo provinces

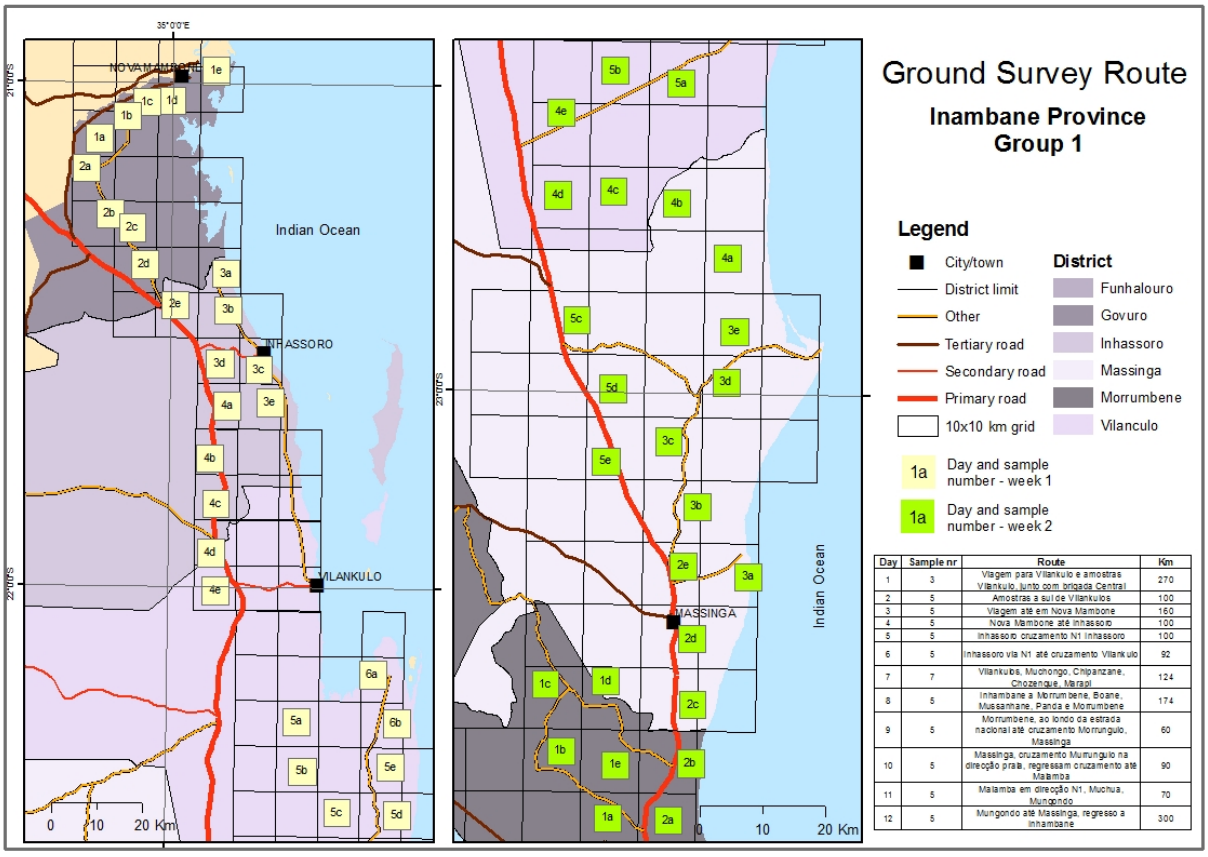
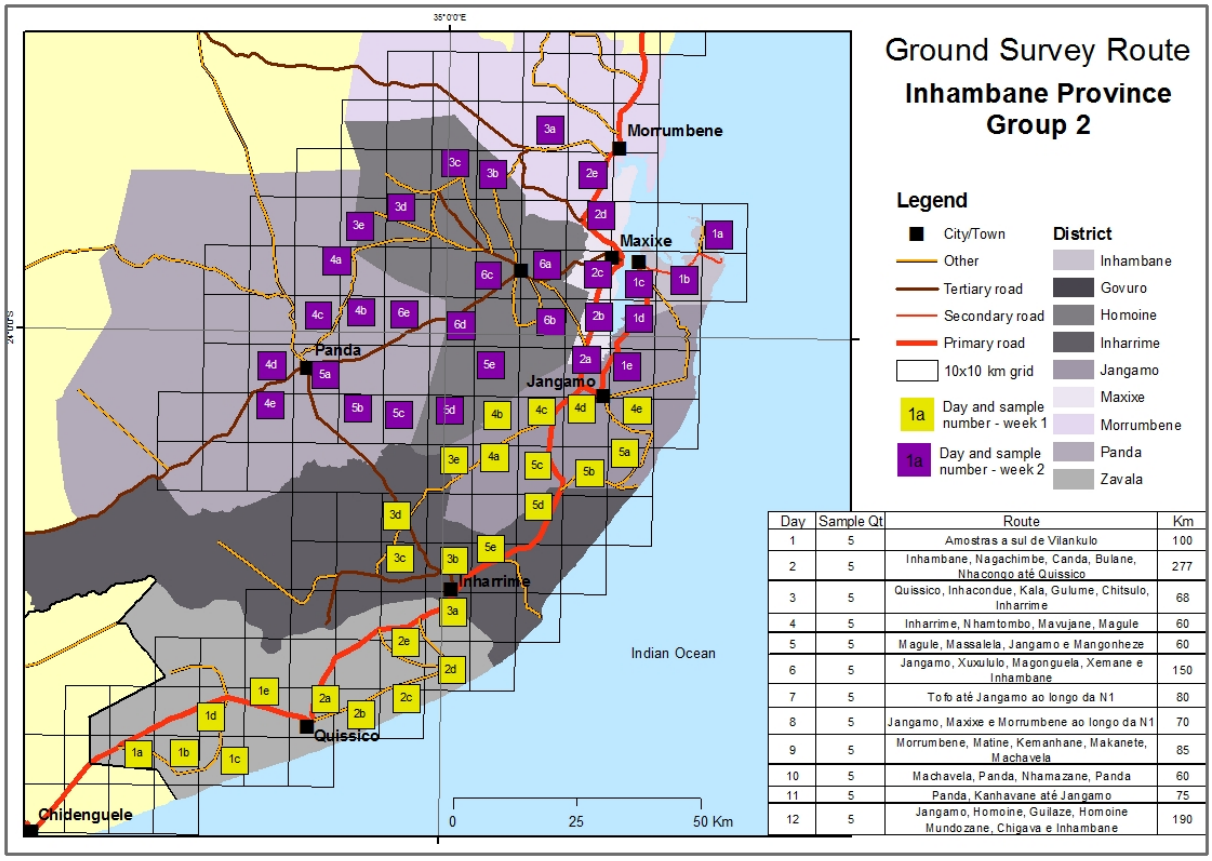


Figure 1. Ground survey route for group 1 in Inhambane province



Day	Sample Qt	Route	Km
1	5	Amostras a sul de Vilankulo	100
2	5	Inhambane, Nagachimbe, Canda, Bulane, Nhacongo até Quissico	277
3	5	Quissico, Inhacondue, Kala, Gulume, Chitsulo, Inharrime	68
4	5	Inharrime, Nhamtombo, Mavujane, Magule	60
5	5	Magule, Massalela, Jangamo e Mangonheze	60
6	5	Jangamo, Xuxululo, Magonguela, Xemane e Inhambane	150
7	5	Tofo até Jangamo ao longo da N1	80
8	5	Jangamo, Maxixe e Morrumbene ao longo da N1	70
9	5	Morrumbene, Matine, Kemanhane, Makanete, Machavela	85
10	5	Machavela, Panda, Nhamazane, Panda	60
11	5	Panda, Kanhavane até Jangamo	75
12	5	Jangamo, Homoine, Guilaze, Homoine Mundozane, Chigava e Inhambane	190

Figure 2. Ground survey route for group 2 in Inhambane province

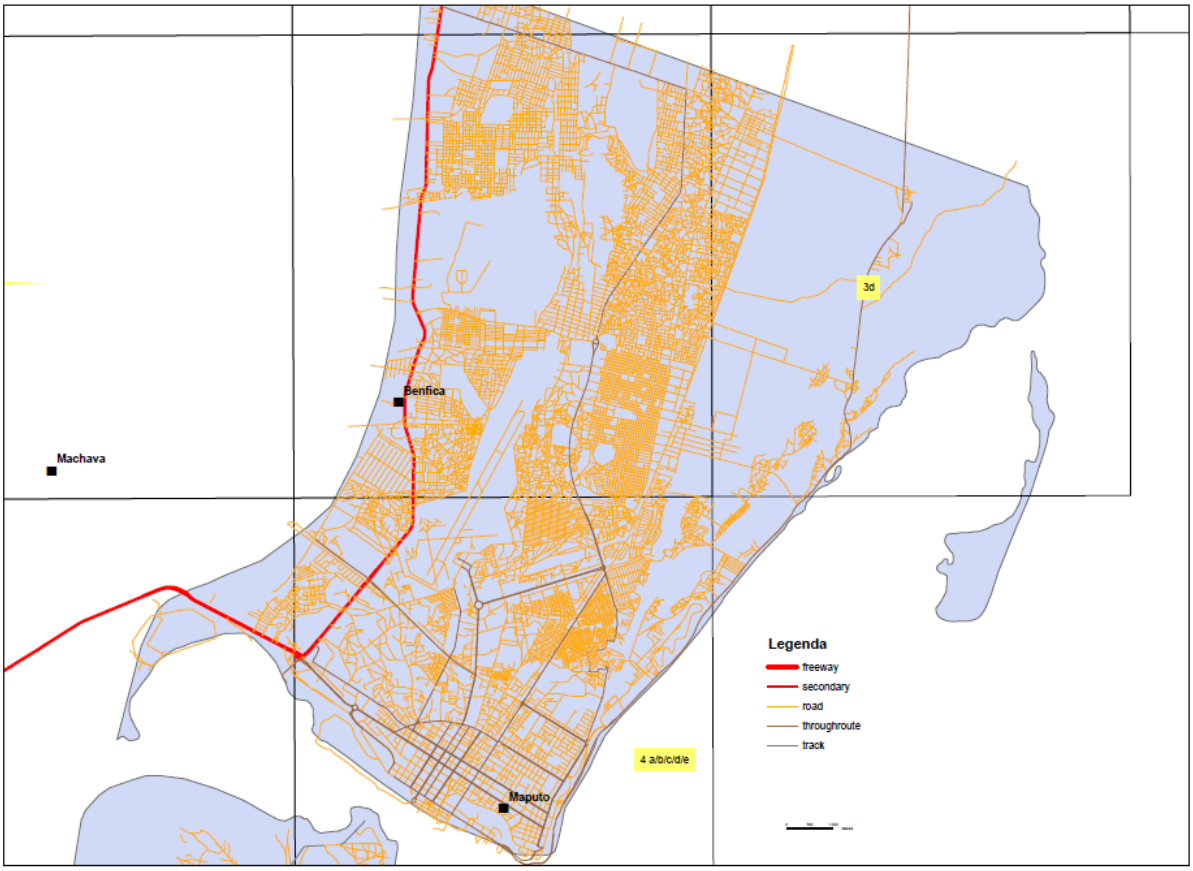
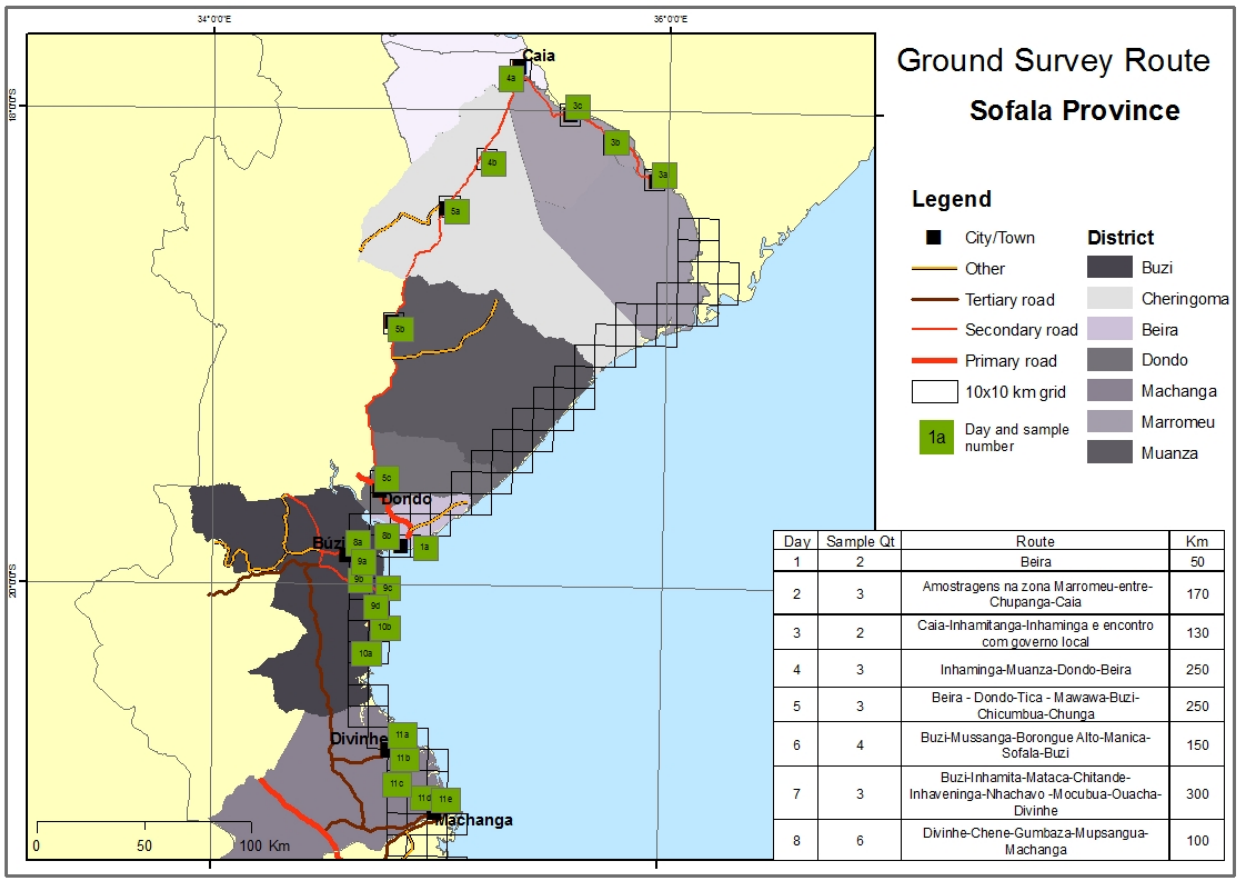


Figure 3. Ground survey route for Maputo City



Day	Sample Qt	Route	Km
1	2	Beira	50
2	3	Amostragens na zona Marromeu-entre-Chupanga-Caia	170
3	2	Caia-Inhamitanga-Inhaminga e encontro com governo local	130
4	3	Inhaminga-Muanza-Dondo-Beira	250
5	3	Beira - Dondo-Tica - Mawawa-Buzi-Chicumbua-Chunga	250
6	4	Buzi-Mussanga-Borongue Alto-Manica-Sofala-Buzi	150
7	3	Buzi-Inhamita-Mataca-Chitande-Inhaveninga-Nhachavo -Mocubua-Ouacha-Divinhe	300
8	6	Divinhe-Chene-Gumbaza-Mupsangua-Machanga	100

Figure 4. Ground survey route for Sofala province

ANNEX 2

REPORT ON SOIL AND NUTRITION STUDIES ACTIVITIES

AUGUST 2010 – JANUARY 2011

Felicidade Massingue

1. Project activities regarding soil and nutrition studies planned for the reporting period

Project planned activities include:

- Assist survey teams on field collection of soil samples in Inhambane province and Maputo city
- Laboratory soil analysis from Zambezia, Inhambane and Maputo city

2. Broad progress achieved to date

From August to December 2010 activities related to soil nutrition studies have been focused to sampling, shipment and laboratory analysis of soil samples. The FAEF's soil Laboratory is processing samples from Zambezia, Inhambane and Maputo city. So far, only sample analysis from Zambezia have been completed.

Contract issues with the Soil Laboratory of Faculty of Agronomy and Forestry Engineering (FAEF) have not yet been completed and an LOA between FAO and FAEF is being prepared.

3. Project activities completed from August 2010 to January 2011

Activities completed during the reporting period are indicated in Table 1.

Table1. Soil nutrition studies planned and implemented from August, 1st 2010 to January 31st , 2011.

No.	Activities	Main actions	Responsible	Status of implementation	Deliverable
2	**LYD soil nutrition studies**	Mission to Inhambane	Felicidade Massingue	Completed as per adjusted dates (from 13 to 17 of September 2010) The objective was to prepare the field teams for collection and processing of the soil samples in the field	
		Soil sampling from Inhambane and Maputo	Inhambane survey teams	Completed (**performed during October and November 2010**) according to the adjustments in the work plan. Soil samples have been delivered to the FAEF soil laboratory.	
		Laboratory analysis	FAEF Laboratory	**Samples from Zambezia:** Completed first week of December). Analysis completed with delay. According to the soil lab, there has been lack of chemicals in the national markets. 110 (100%) soil samples from Zambezia have been analyzed for macronutrients. Analysis of micronutrients will be performed in selected samples if the results on macronutrients suggest so. Micronutrients analysis can only be performed in South Africa. Currently, none of the existing labs in Mozambique are performing such analysis. The laboratory will release data to the client after all the payments procedures have been completed.	Soil analysis data

No.	Activities	Main actions	Responsible	Status of implementation	Deliverable
				Samples from Inhambane and Maputo city Soil samples from Inhambane and Maputo city have been delivered to the laboratory during the months of October and November respectively. Samples collected from individual trees have been composited to form one sample per site. This preprocessing has taken almost two weeks. Small errors on labeling coupled with a complete loss of labels have been the cause of delays. So far 120 out of 206 samples from Inhambane have been analyzed for macronutrients. To prevent labeling mistakes and loss of labels Field teams have to be refreshed on these issues. New procedures on storage of labels will be introduced. Sampling bags have to be changed from the current (20 X 10 cm) to 45 X 20 cm.	Soil analysis data

4. Project activities planned for next period (February to April 2011)

Project planned activities include:

- Assist survey teams on field collection of soil samples in Sofala, Gaza and Maputo Provinces
- Completion of laboratory soil analysis of samples from Inhambane and Maputo City
- Completion of laboratory soil analysis of samples from Sofala, Gaza and Maputo provinces
- Finalization of LOA between FAO and FAEF

ANNEX 3
REPORT ON VECTOR STUDIES ACTIVITIES
FROM AUGUST 2010 TO JANUARY 2011

By
International consultant: Michael Wilson
National Consultant: Luisa Santos
Research assistant: Albasini Caniço

31st January, 2011

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1. INTRODUCTION

The coconut palm is one of most important cash crops along the coastal regions of some provinces of Mozambique. It is one of the main crops produced and exported by Mozambique. In the last few years, many coconut trees were affected by the Coconut Lethal Yellowing Disease, which causes the death of the affected trees. In the provinces where LYD is present, extent areas of plantation of coconut palms are being destroyed. This devastating disease reduces the income of the rural families that use coconut and other parts of the plant as a source of sustenance. Mozambique's coconut industry has also been severely affected by the introduction of Coconut Lethal Yellowing Disease (CLYD), a situation which has caused major trading partners like South Africa to prohibit coconut imports from Mozambique. The disease has affected production North of the Zambezi river and until recently it was not known to occur in the south. In this regard, Mozambique sought and obtained funding from the Standards and Trade Development Facility (STDF) to CLYD free areas in the south of the country.

This project development objective is to build phytosanitary capacity in Mozambique to implement International Standards for Phytosanitary Measure (ISPMs), in particular the ones related to establishing pest free areas (ISPM #4), pest surveillance (ISPM #6) and determination of pest status in an area (ISPM #8), in their application to management of CLYD on palms, to increase market access for coconuts from Mozambique and to increase food security and income generation by contributing to a viable coconut industry (FAO, 2009).

One of the specific objectives of this project is to identify mechanisms including vectors which contribute to the spread of the disease (FAO, 2009). There are no records of studies done in Mozambique regarding ALC vectors so the goals of the vector studies component in the project are:

1) To identify the potential insect vectors and other homopterans insects associated with the coconut lethal yellowing disease in Mozambique;
2) To identify insects which are present on coconut palms in the provinces of Sofala and Inhambane;
3) To establish an experiment of disease transmission in cages.

2. BACKGROUND TO THE SEARCH FOR INSECT VECTORS OF CLYD IN AFRICA

C. 2.1. MAIN CONCLUSIONS OF PREVIOUS STUDIES REGARDING THE SEARCH FOR VECTORS OF ALC IN AFRICA

Several studies have been carried out with the objective of identifying the vector of ALC in Africa, in particular in Ghana and Tanzania (Philippe *et al.,* 2008; Pilet *et al*., 2008, 2009; Mugini *et al*., 2008; Mpumani *et al.*, 2000; Wilson, 1986, 1987a, 1987b, 1988). From those reports and other studies done on CLYD in Africa the most important information relating to the search for vectors in the transmission of CLYD is:

- Coconut lethal yellowing is a syndrome but not one disease. The strains of phytoplasmas causing the disease are not the same in East Africa, West Africa and Latin America/Caribbean.
- Phytoplasmas are transmitted by insects in the Hemiptera Auchenorrhyncha families. Research focuses therefore, on these potential vectors.
- The classical method of detecting transmission ("cage transmission") consists of introducing a very large number of the insects considered as potential vectors and collected from a site where the disease is present into insect- proof cages containing a young coconut tree. Despite years of efforts in various countries and situations, a few positive results were only obtained in Florida in the 1980's.
- The introduction of PCR tools make it possible to look for the phytoplasma directly

on insects as potential vectors, on the coconut trees and on the potential alternative host plants.

- The choice of the PCR primers to identify LY-types Diseases is not a simple issue (the primers can be too generic or too restrictive).
- Despite very intensive work on the local potential vectors, very few positive PCR tests have been obtained. Insects found positive for the LY phytoplasma are different in different regions (7 specimens in Tanzania, 1 or 2 species in Jamaica, 1 candidate in Ghana).
- The research on the name of the vector is not an end in itself but a step in the knowledge of the disease and is necessary to build tools to screen resistant or tolerant genotypes. Experience on other crops shows that the control of the vector itself will probably not be a way to eradicate the disease.
- As vector identification has a long history of failure, research on this topic needs innovative strategies, which must be included in international programs together with other components with better prospects for short-term applications.
- The flora and fauna in the various regions of the world where LY is found is variable- it may indeed be very different. Even in Africa the Hemiptera insect fauna of West and East Africa does not overlap in species. LY diseases have 3 components- the host-vector-pathogen and these interactions are influenced by the environment in different ways.

D. 2.2. HEMIPTERA AUCHENORRHYNCHA (LEAFHOPPER AND PLANTHOPPER) FAUNA OF COCONUT PALMS IN AFRICA

In West Africa and in Tanzania a large number of species (especially from several families of planthoppers) have been collected from the foliage of coconut palms (Wilson, 1987a, 1987b, 1988). With the exception of a typhlocybine leafhopper in Ghana, which does appear to breed on coconut and an introduced planthopper species in east Africa (Wilson, 1986) no species appears to have nymphal stages on coconut. In other words they are all 'tourists' in one way or another. They may develop on other host plants and then feed as adults on coconut, or possibly under dry conditions they may feed from coconut- perhaps as an aestivation on this host.

The fauna associated with coconuts in West Africa and East Africa appears distinctly different from each other- there is very little overlap of species. All are native species in the African fauna, however 2 alien species were recorded in Tanzania (Wilson, 1987a, 1986). The majority of the coconut-associated fauna is from several families of planthoppers (Fulgoroidea). Two of these require further discussion.

Cixiidae

Planthoppers of the family Cixiidae are abundant on palms in West Africa, and especially adults of *Myndus adiopodoumeensis*. This species was considered a candidate vector for some years- mostly because of its relationship (as a cixiid) with *Myndus crudus* in the Caribbean – which has been shown to be the vector of LY in that region. However, there appears no evidence that this species is a vector – despite its abundance. The larval stages of cixiids are found underground, where they feed from roots- perhaps of grasses- possibly other host plants. Interestingly very few specimens of any cixiid were found in Tanzania during the sampling programme.

Derbidae

One of the most notable planthopper families on palms (and including coconut) in Africa is the Derbidae. Many species have been found on palms- and many have been described having been collected on palms. Wilson (1987) described species from the sampling programme carried out in Tanzania.

The biology of Derbidae is enigmatic: The nymphs of Derbidae have rarely been found and are considered to feed from fungal hyphae. But adults are found frequently on the underside of palm fronds where they appear to aggregate and feed. They may be abundant and several species have been tested for phytoplasma.

E. 2.3. RESULTS FROM INSECT VECTOR STUDIES

West Africa: Ghana

Philippe *et al.* (2008, 2009) and Pilet *et al.* (2008, 2009) have reviewed the search for potential vectors of LY in Ghana. The vector of the phytoplasma responsible for the coconut lethal yellowing disease in West Africa is unknown to date in spite of long-term trials and testing. Research on LY in Ghana began from 1990 (90-97; 2002-04) and did not give convincing results. From July 2005, new tests standards were applied: shading, daily collections in the less hot hours and use of various sizes of cages and test plants. More than 70,000 *M. adiopodoumeensis* (Cixiidae) were introduced in cage for 28 months (520 adults/seedling/month). Controls in PCR on the 5 coconut of this *Myndus* cage and on 935 adults were always negative. The transmission tests with *M. adiopodoumeensis*, which apparently is not a vector of the disease, were thus stopped. The LY Phytoplasma was identified by PCR in a coconut having received 4380 *Diostrombus* (4 species of Derbidae) 4 months after the beginning of the test. Emphasis in Ghana has been more recently placed on the study of species found living on ground vegetation around coconuts.

East Africa: Tanzania

Studies have been conducted on the search for potential vectors since 1983 andt his work has been reviewed by Mugini *et al.* (2008). The occurrence and seasonal fluctuations in the populations of the most common Auchenorrhyncha insects in Tanzania has been studied. Observations on the relative abundance and seasonal fluctuations were undertaken only for the common species. Thirty two Auchenorryncha spp. were recorded on coconut palm foliage. PCR was used to detect phytoplasma from insects collected on coconut fronds. Phytoplasma DNA was detected in 7 insects of the species *Diostrombus mkurangai* Wilson (Derbidae) and a *Meenoplus* spp (Meenoplidae). These two insect species were utilized in transmission trials. However, no LD symptoms developed on caged (test) palms under the trial (Mpunami *et al.,* 2000).

3. PLANNED PROJECT ACTIVITIES

Project planned activities included:

- Insects field collection in Zambezia Province
- Field visit by international consultant to Quelimane
- Course on vectors of ALC and fauna associated with coconuts and its identification
- Identification of collected specimens
- Molecular testing of collected specimens for ALC
- Infectivity studies

4. REPORT ON PROJECT ACTIVITIES

4.1. INSECT FIELD COLLECTION IN QUELIMANE WITH YELLOW TRAPS FROM APRIL TO NOVEMBER 2010

Coconut Lethal Yellowing Disease (CLYD) vector studies initiated in April in Zambézia province, with the establishment of collection sites and setup of insect vector traps. Research assistant, Albasini Caniço, arrived in Quelimane in the fist week of April and he was responsible for selecting the sites and setting up the insect traps. Forty five (45) insect traps components, made according to vector trap designed by Eden-Green (2009), were built and assembled in Quelimane during May, 2010.

Site selection was finalized by end of May in collaboration with MCA project staff. Sites were selected according to CLYD incidence gradient in Zambézia province. Four (4) sites were selected: 1) Inhangulue (Nicoadala district) – post-endemic zone, 2) Maquival Rio (Nicoadala district) – endemic zone (disease incidence >75%), 3) Macuse (Namacurra) – intermediate zone (10% < disease incidence <75%) and 4) Diba (Maganja da Costa district) – epidemic zone (disease incidence < 10%). Thirty six (36) insect traps (one trap per coconut tree) were set up in the four sites in the beginning of June as following: Inhangulue - 6 traps; Maquival -18 traps; Macuse - 6 traps; and Diba - 6 traps.

Insects were collected on traps from July to November 2010, and during this period only 63 specimens of insects belonging to Sub-order Auchenorrhyncha (that includes families of potential CLYD vectors) were collected in all 36 traps. Although a great number of insect specimens were found in the traps during this period, few belonged to the Auchenorrhyncha group. This low number is maybe the result of the relatively cold temperatures that occurred during this period. It is expected that number of specimens will increase over time as summer months approach. Insects collected were brought to the FAEF laboratory for further identification by Dr. Michael Wilson.

The trap design included a nylon cord to ease the change of plastic bags from the traps every two weeks. The nylon cord is used to move the trap down and up the coconut tree. However, this technique has been proven very risky as nylon cords are very useful items and prone to theft. In Macuse all the traps were stolen and had to be replaced by new ones. For this reason, the nylon cord has been removed from the trap and local people have been hired to climb the trees to remove the trap and put it back again on the tree. Also, the method of removing of insects was changed. Insects are now removed in the field using a brush with acetone and transferred to a vial containing 95% alcohol, instead of wrapping the plastic bag and brining it to the lab for later insect removal. It was found that the wrapping of the plastic bag damaged the insects and made it very difficult to remove them not allowing for proper identification.

In 30th September 2010, the contract with the project research assistant stationed in Quelimane ended, and traps and insect collection responsibilities were handed over to the Provincial Directorate of Agriculture. By that time some of the traps set up in July had been stolen or damaged and only 26 traps remained operational.

F. 4.2. DR. WILSON FIELD VISIT TO ZAMBEZIA - 23 – 26 NOVEMBER 2010

Field visits around Quelimane during Dr. Wilson's consultancy from 23 to 26 November 2010, resulted in the collection (directly on coconut leaves with hand-held insect aspirators) of two important species not yet found in the traps belonging to the family Derbidae. It was also possible to observe the variety of vegetation types in the coconut growing areas - in some there was very little vegetation, in others grass species were well developed and tall in height. Around villages the variety and different heights of vegetation was very different. The variation in vegetation and species composition is very likely to have an influence on the variety of potential vector species.

During the field visit, insect collection methods were discussed in connection with their efficacy. Hand-held insect aspirators were found to work best for specimens of the Derbidae family, potential vectors. Traps remain an important alternative especially for Cicadellidae species.

G. 4.3. COURSE ON VECTOR IDENTIFICATION

The course took place in Maputo, at the Eduardo Mondlane University (Faculty of Agronomy and Forestry Engineering and Pedagogic Complex), from 29th November to 3rd December 2010. The course was given by Dr. Michael Wilson of the Museum of Wales (UK), an expert in the identification of vectors of coconut lethal yellowing disease, and attended by 18 technicians from the provinces of Zambézia, Inhambane, Maputo and Maputo City and from different institutions (Plant Health Department-MINAG, Faculty of Agronomy - UEM, Millennium Challenge Account (MCA), IIAM and ACIDI/VOCA) (Annex 1). A set of manuals and brochures was provided to each participant to help in identifying the main families of potential vectors (Annex 2).

The course aimed to train Mozambican technicians from several institutions that are conducting monitoring work and research on the CLYD, so they are able to:

- Understand the main characteristics of this group of insects (Order Hemiptera with special emphasis on wildlife and Afrotropical Auchenorrhyncha) in relation to its morphology, biology and ecology.
- Understand the relationship between this group of insects and their hosts in particular with Coconut.
- Identify and separate specimens of Auchenorrhyncha within Hemiptera group from the other species of insects by observing their morphological features and using dichotomous keys.
- Identify specimens of Auchenorrhyncha collected in Zambezia by observing the morphological characteristics and using dichotomous keys.

The course focused on the key characteristics of the group of insects that are considered potential vectors of the Lethal Yellowing disease, different procedures and methods for their collection in the field (nets, traps and vacuums) and their conservation. During the days of the course the technicians learned how to identify insect families which include a potential vector of CLYD that have been identified in previous studies, look for the vectors in the field, collect them and prepare them for identification. The lectures and laboratory lessons were followed by a field day held in a small palm area in Marracuene district, during which were demonstrated and implemented various methods of collecting vectors. Later, the technicians had the opportunity to observe, using the stereomicroscope, the insects captured in the field. Finally, the trainees as a group have drafted a plan, to be held in each province, to continue collecting potential vectors. The detailed program of the event is in Annex 3.

At the end of the course the trainees filled out a form of course evaluation (Annex 4). The trainees considered good (50%) to excellent (50%) the usefulness of the information received in the course and 50% of them considered that the relevance of the course in relation to their present activity was excellent. They considered good the overall organization, the course location and the methods used (including the clarity of the materials). Regarding the way their questions were answered, they considered them as satisfactorily answered. About time management during the course 85.7% of the trainees felt that the time devoted to the presentation of the topics had been sufficient, and 92.8% felt that the time devoted to individual and group work had been also sufficient. Some trainees felt that the language used during the training (English) hindered the perception so that they needed more time for presentation and practice while others thought the time was more than enough (7.2%) (Annex 5).

The topics that the trainees found most useful included: the families of potential vectors, possible vectors in Mozambique, the main features of the vectors and where they can be found in the field, preparation of the genitalia and species identification. Other topics that they would like to be included in the course are: techniques for testing the presence of phytoplasm in the insect vector and vector identification up to the specie.

The trainees made some suggestions and general comments such as:

- It would be necessary to organize regular courses (including refresher ones) related to this matter;
- Participants may receive materials and equipment to continue doing what is learned in the courses.
- Translation to Portuguese in the case of courses that are given in another language would be helpful.

In general, we concluded that:

- Valuable knowledge about the main characteristics of insects with the potential to be vectors of CLYD and their collection methods were transmitted and thoroughly discussed with participants.
- Participants could see the field and collect a flyer similar to that found in Tanzania whose molecular analysis revealed the presence of phytoplasm disease in the insect. In the laboratory it was possible to conclude that these insect belongs to the same genus (*Diostrombus*) found in Tanzania as a CLYD vector.
- The trainees participated actively thanks to the attitude of the trainer to motivate and encourage the participation during the training, and,
- We achieved all the objectives set for this training.

H. 4.3. IDENTIFICATION OF COLLECTED SPECIMENS

The diversity of the species found so far (both in sticky traps as well as hand collected) collected is quite low. The 105 specimens collected belong to 3 superfamilies (Fulgoroidea, Mambracoidea e Cercoidea) and only 7 families (Table 1). Several species were not able to de indentified as they were severely destroyed due to the collecting technique, as referred before.

Only one collected species (40 specimens collected out of the 105), *Diostrombus mkurangai* (Derbidae) is a suspected vector of CLYD, as it tested positive to CLYD in PCR (Mpunami et al. 2000). Only other 9 specimens belong to families that contain species that are phytoplasma vectors (Cicadellidae, Delphacidae) but never a species belonging to these families was confirmed to be CLYD vector.

Table 1 . Species and number of specimens of Auchenorrhyncha found on sticky traps and collected directly on leaves of Coconut trees in Zambezia.

SUPERFAMILY Family *Species*	Total Number of specimens collected	Potential as phytoplasma vector	Potential as CLYD vector
MEMBRACOIDEA			
Membracidae	1	No	
Cicadellidae			
Undet. Cicadellidae	8	Yes	No CLYD vector species confirmed
Undet. Typhlocybinae	3	No	
Batracomorphus sp (Iassini)	22	No	
FULGOROIDEA			
Derbidae			
Diostrombus abdominalis (on leaves, not on traps)	3	Yes	No CLYD vector species confirmed

Diostrombus mkurangai (on leaves, not on traps)	40	Yes	Tested positive with PCR*
Delphacidae			
Indet. Delphacidae	1	Yes	No CLYD vector species confirmed
Tropiduchidae			
Numicia sp.	12	No	
Undet.Tropidichid (not *Numicia*)	1	No	
Tettigometridae			
Hilda sp	5	No	
CERCOPOIDEA			
Aphrophoridae			
Poophilus sp	8	No	
Undet. Aphrophoridae			
Total	105		

*in Tanzania

Other families that include vectors species but were not found in our traps are:

- *Meenoplus* spp (Fulgoroidea: Meenoplidae) – testes positive with PCR in Tanzania and
- *Myndus crudus* (Fulgoidea, Cixxidae) – confirmed vector in Florida (transmission studies).

The most abundant and important potential vector species found so far is *Diostrombus mkurangai* Wilson(Figure 1), described from Tanzania (Wilson 1987a). *D. abdominalis* was found at sites in Zambezia close to Quelimane, but also recorded near Maputo. It was an abundant species in Tanzania, but no positive PCR tests were obtained (Mpunami, 2000). *D. mkurangai* Wilson was found locally common at several sites near Quelimane, on palm fronds of small coconuts. The species was abundant in Tanzania and several specimens were found positive by using PCR (Mpunami, 2000).

Specimens of *D. mkurangai* collected were sent to the Biotecnhology Center for CLYD test with PCR. Results have not been returned by the Center but no positive results were found so far (Nuaila, personal communication). These results maybe because only a few specimens were tested. In Tanzania only 8 specimens out of 1270 tested were positive to CLYD (Mpunami *et al.* 2000).

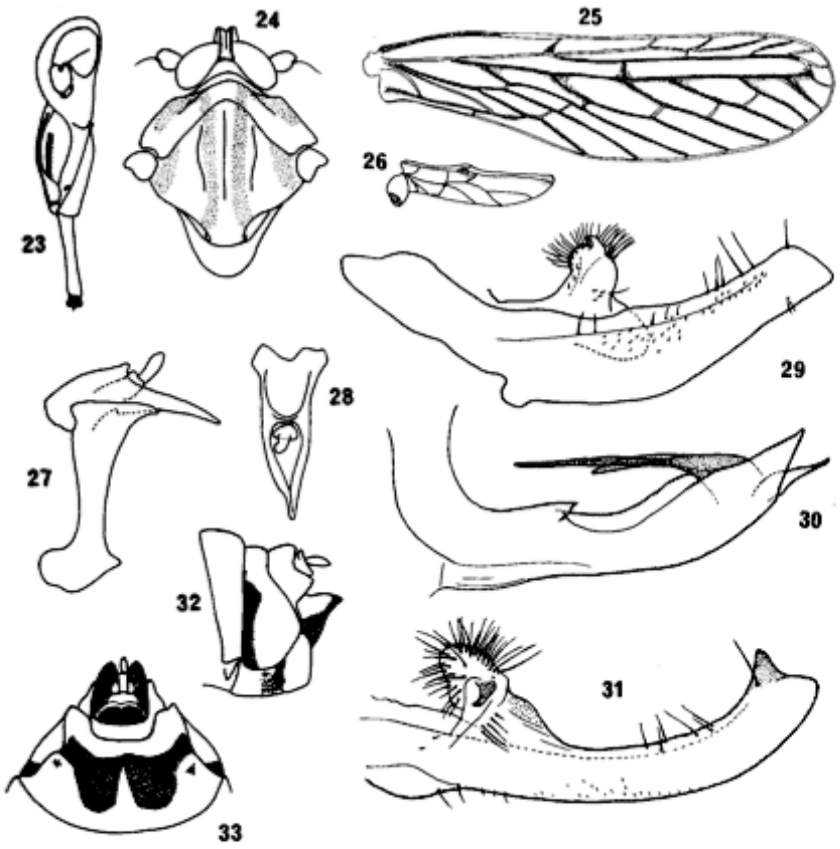

FIG. 23–33. *Diostrombus mkurangai* sp. nov.: (23) head, lateral view; (24) head, vertex, mesonotum, dorsal view; (25) forewing; (26) hindwing; (27) male pygofer, lateral view; (28) anal segment, dorsal view; (29) paramere, lateral view; (30) aedeagus, left lateral view; (31) paramere, dorsal view; (32) female genitalia, lateral view; (33) female genitalia, ventral view.

Figure 1. Drawings of *Diostrombus mkurangai* Wilson 1987 (from original description)

5. MAIN CONCLUSIONS AND RECOMMENDATIONS ON IDENTIFICATION OF CLYD VECTOR

Main conclusions on identification of CLYD are:

- Very few specimens and species have been collected so far.
- Sticky traps as a collecting method are not enough; direct collecting of insects on the trees and vegetation below is needed.
- Only one species collected so far maybe a vector of CLYD in Mozambique – *Diostrombus mkurangai* Wilson 1987 (Derbidae).
- Specimens of *D. mkurangai* collected so far tested negative to CLYD.

Main recommendations are:

- Consolidate efforts to survey potential vectors and investigate methods of increasing the number of insects sampled.
- Select specimens for testing from both coconut and from vegetation below coconuts.
- There should be a detailed vegetation survey across coconut areas to investigate any correlation between the type and diversity of plant species and areas where disease has been most active.
- Resources should not be directed towards transmission trials since they are not likely to be productive and have mostly ended in total failure.
- Resources should not be directed at attempts to use biological control of vectors. In the absence o knowledge of any vectors such use of resources would be entirely wasted. There has been no successful control recorded of any native Auchenorrhyncha species by biological control.

6. PROPOSED ACTIVITIES AND BUDGET FOR NEXT PERIOD (JANUARY - APRIL 2011)

Taking into consideration the conclusions of the work done so far and recommendations we propose to **concentrate efforts, for the next 6 final months of this project, in collecting specimens for PCR testing both in Zambezia and Inhambane** (where CLYD was recently recorded) to find a positive testing and a more definite potential vector. There is not a potential vector identified so far and the is no time available until the end of the project for the transmission studies, so we propose to exclude this activity from project plans.

The collecting of specimens will be done at least twice a week from February to May (during rainy season) and collecting methods will include sticky traps, direct collecting on leaves and vacuum collecting on vegetation below the coconut trees. Specimens will be kept in small vials, labeled and sent to Faculty of Agronomy and Forestry Engineering (FAEF) and Dr. Wilson for further identification. Potential vector specimens will be sent to Biotechnology Center.

The collecting activity in the field will be carried out by DPA trained technicians (Florinda Rufino in Zambezia and Lopes Parruque in Inhambane).

In Zambezia collecting will be concentrated on 3 sites where CLYD infection is clearly spreading and *D. mkurangai* has already been found easily and in high numbers. In Inhambane 3 collecting sites will be selected on the plantations where CLYD infection was recently confirmed.

For the collecting activities materials and financial resources should be made available to the DPA technicians (Table 2).

Table 2. Materials and financial resources needed for insect collection in Inhambane and Zambezia

Item	Unit	Quantity	Cost/unit (in Mt)	Total (in Mt)
1. Materials for collecting insects				
a) Plastic yellow board (30X40cm)	Unit	30	400	12,000
b) Plastic bags*	Unit	600	-	-
c) Sticky glue – needs to be imported	lt	6		
d) Cord (only Inhambane)	rolo	1	200	200
e) Spatula	Unit	6	100	600
f) Knife	Unit	6	50	300
g) Plastic vials	Unit	300	50	1,500
h) Hand held insect aspirator*	Unit	6		
i) Marker*	Unit	12		
j) Labels	Caixa	1	500	500
k) Brush	Unit	12	30	360
l) Forceps*	Unit	12		
m) Magnifier*	Unit	6		
n) Acetone	Lt	1	500	500
o) Alcohol	Lt	1	240	240
p) sweep net	Unit	4	1,000	4,000
Subtotal				19,700
2. Fuel				
DPA Inhambane	Lt	1400	40	56,000
DAP Zambezia	Lt	1300	40	52,000
Subtotal				108,000
3. Per diems				
Lopes Parruque	Days	60	1,500	90,000
Florinda Rufino	Days	36	1,500	54,000
Driver Inhambane	Days	60	1,350	81,000
Driver Zambézia	Days	36	1,350	48,600
Subtotal				273,600
Total				401,300

* already purchased

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ANEXES

I. ANNEX 1 . SPECIES AND NUMBER OF SPECIMENS OF AUCHENORRHYNCHA FOUND ON STICKY TRAPS IN COCONUT TREES IN ZAMBEZIA (DIFFERENT SITES AND DATES) AND ALSO HAND COLLECTED.

Family Species	Inhangulue	Inhassunge	Zalala - Pagone	Marabo	Marabo	Maquival	Maquival	Maquival
	24/11	25/11	26/11	29/9	18/8	7/7	26/8	28/9
Membracidae	1							
Tettigometridae								
Hilda sp	1							
Tropiduchidae								
Numicia	1						1	4
Tropidichid (not Numicia)								
Cicadellidae								
Cicadellidae (dark specimen)	1							
Cicadellid (yellow Typhlocybine)	1							
Batracomorphus sp							1	4
undet Cicadellidae								1
cicadellid: ledrine/hecaline?						1		
yellow cicadellid (Typhlocybinae)							1	
typhlocybine								
cicadellid (brown)								
cicadellid nymph								
cicadellid undet								
cicadellid undet								
undet cicadellid								
Derbidae								
D. abdominalis (on coconut leaves, not on traps)		2						
D. mkurangai (on coconut leaves, not on traps)		10	30					
Delphacidae								
Delphacidae indet.								
Aphrophoridae								
Poophilus sp				1	3		3	
undet Aphrophoridae							1	
Total	5	12	30	1	4	1	9	7

(Continuation)

Family Species	Maganja 30/9	Madai 28/6	Madai 20/7	Madai 17/8	Madai 11/9	Madai 27/9	Totals
Membracidae							1
Tettigometridae							
Hilda sp	2					2	5
Tropiduchidae							
Numicia	2	1	2	2			12
Tropidichid (not Numicia)						1	1
Cicadellidae							
Cicadellidae (dark specimen)							11
Cicadellid (yellow Typhlocybine)							1
Batracomorphus sp		1	2	12		2	22
undet Cicadellidae							1
cicadellid: ledrine/hecaline?							1
yellow cicadellid (Typhlocybinae)							1
typhlocybine				1			1
cicadellid (brown)						1	1
cicadellid nymph						1	1
cicadellid undet						1	1
cicadellid undet				1			1
undet cicadellid					1		1
Derbidae							
D. abdominalis (on coconut leaves, not on traps)							3
D. mkurangai (on coconut leaves, not on traps)							40
Delphacidae							
Delphacidae indet.						1	1
Aphrophoridae							
Poophilus sp						1	8
undet Aphrophoridae							
Total	2	2	4	16	2	10	105

J. ANNEX 2 – LIST OF PARTICIPANTS ON TRAINING ON IDENTIFICATION AND BIOLOGY OF THE POTENTIAL VECTORS OF COCONUT YELLOWING DISEASE

NR.	Name	Institution	Contact (phone and E-mail)
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18	Maria Adélia Mucavele	UEM-Maputo	821471750

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L. ANNEX 4 – TRAINING PROGRAM

Project: *Establishment of Pest Free Areas Regarding Lethal Yellowing Disease of Coconuts in Mozambique*

Training on identification and biology of the potential vectors of Coconut Yellowing Disease
(Training Program)

Day	Work Program	Place	Cronogram (except Wednesday)
29th November	Introduction to Hemiptera. Identification of the main groups of hemiptera. Hemiptera morphology. Specimen observation.	Maputo	08h00 to 10h30- Lesson (Place: Lab 209) 10h30 to 11h00- Coffee break (place: 230) 11h00 to 13h30 - lesson (place: Lab 209) 13h30 to 14h30 – lunch (place: class nr 230) 14h30 to 17h00 - lesson (place: Lab 209) 17h00 to 17h30 - end of the lessons and coffee (place: class nr 230)
30th November	Introduction to Auchenorrhyncha. Keys to the families, genus and species identification	Maputo	
1st December	Collection of insects in a coconut farm.	Marracuene-Maputo	
2nd December	Preparation of genitalia. Continued on identification of specimens collected in Zambezia and Maputo using dichotomous keys.	Maputo	
3rd December	Elaboration of proposals on activities to be undertaken in the provinces of Inhambane and Zambezia to continue the vector collection and studies	Maputo	

M. ANNEX 5 – SURVEY TO ASSESS THE COURSE

MTF/MOZ/098/STF (STDF 230) Establishment of Pest Free Areas regarding Lethal Yellowing Disease of Coconuts in Mozambique

Training on identification and biology of the potential vectors of Coconut Yellowing Disease

(a)

(b) Maputo, de 29th de November to 3rd de December 2010

(c)

(d)

(e) **SURVEY TO EVALUATE THE COURSE BY CURSANTES**

(f) Thank you for your participation in the course above and we invite you to complete this evaluation form, which will help in improving the next courses. Feel free to respond candidly to questions: is your opinion that interests us, whether positive or negative. The answer will remain anonymous.

(g)

(h) For the majority of respondents are asked to use a scale of 1 to 5 as follows:

(i) 1 = Very poor, 2 = Poor, 3 = Reasonable, 4 = Good, 5 = Excellent

(j)

(k) <u>General</u>

1. How do you rate the overall organization of the course?

(l) 1 2 3 4 5

(m)

2. How adequate was the location of the course?

(n) 1 2 3 4 5

(o)

3. How relevant was the course in relation to your present functions?

(p) 1 2 3 4 5

(q)

4. Up to what point did you receive new information during the course?

(r) 1 2 3 4 5

(s)

5. How useful was the information received in the course?

(t) 1 2 3 4 5

(u)

6. How do you rate the methodology used in the course?

(v) 1 2 3 4 5

(w)

(x) Tópicos

(y)

7. Which topics would you like to see included in future courses?

(z)

(aa)

(bb)

(cc)

(dd) Information shared during the course

8. Which information did you find most useful?

(ee)

(ff)

(gg)

(hh) Communication

(ii)

9. Were course topics clearly presented?

(jj) 1 2 3 4 5

(kk)

10. What do you think about the management of the sessions?

(ll) 1 2 3 4 5

(mm)

11. Are you satisfied with the answers given to your questions?

(nn) 1 2 3 4 5

(oo)

(pp) Time management

(qq)

12. Was the time dedicated to the topics presentation enough?

(rr)

☐ (ss) Yes

(tt)

☐

(uu) No, Why

(vv) _____

(ww) _____

13. Was the time dedicated to group and individual work enough?

(xx)

☐ (yy) Yes

(zz)

☐ (aaa) No, Why

(bbb) _____

(ccc) _____

(ddd)

14. Was the time dedicated to the breaks (coffee and lunch) adequate?

(eee)

☐ (fff) Yes

(ggg)

☐ (hhh) No, Why

(iii) _____

(jjj) _____

(kkk)

(lll)

(mmm)

(nnn) Other comments / sugestions:

(ooo)

(ppp)

(qqq)

(rrr)

(sss) Thank you for spent some time to complete this form.

N. ANNEX 6 – TRAINEES COURSE EVALUATION (RESULTS)

Question	Classification (%)				
	1	2	3	4	5
	Very poor	Poor	Reasonable	Good	Excellent
1. How do you rate the overall organization of the course?	0	0	21,4	64,3	14,3
2. How adequate was the location of the course?	0	0	15,4	77	7,6
3. How relevant was the course in relation to your present functions?	0	0	21,4	28,6	50
4. Up to what point did you receive new information during the course?	0	0	0	50	50
5. How useful was the information received in the course?	0	0	21,4	28,6	50
6. How do you rate the methodology used in the course?	0	7,1	7,1	57,1	28,7
7. Which topics would you like to see included in future courses?					
8. Which information did you find most useful?					
9. Were course topics crearly presented?	0	14,3	0	50	35,7
10. What do you think about the management of the sessions?	0	0	38,5	38,5	23
11. Were you satisfied with the answers given to your questions?	0	0	0	50	50
12. Was the time dedicated to the topics presentation enough?	85,7 % Yes, 14,3 % No				
13. Was the time dedicated to group and individual work enough?	92,8 % Yes, 7,2 % No				
14. Was the time dedicated to the breaks (coffee and lunch) adequate?	100% Yes				