LETHAL YELLOWING OF COCONUT PALM IN CÔTE D’IVOIRE

Getting Started with Plant Health Clinics and Going Public

Eric Boa and Jeffery Bentley

6 March 2015
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Abbreviations
ANADER – Agence Nationale d’Appui au Développement Rural
CABI: Centre for Agriculture and Bioscience International
CILY – Lethal yellowing in Côte d’Ivoire
CNRA – National Centre for Agronomic Research, Cote d’Ivoire.
DFATD – Department of Foreign Affairs, Trade and Development Canada.
GP – Going Public
GPC – Global Plant Clinic
IDRC – International Development Research Centre (Canada)
UNA – Université Nangui Abrogoua

Acknowledgements
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We thank the organizers of the Plant Clinic and Coconut Fair for this opportunity to take part in the project.

Organizers of the Plant Clinic and Coconut Fair:
1. Prof. Taky Hortense Atta Diallo (UNA IDRC-DFATD Principal Investigator)
2. Mrs. Koulou Nazaret (ANADER IDRC-DFATD third-party organization)
3. Prof. Jean Konan Konan (IDRC-DFATD CNRA Principal Investigator)
4. Dr. Yaima Arocha Rosete (Sporometrics IDRC-DFADT Principal Investigator and Canada Project Leader).

COVER PHOTO: Farmers attending the Coconut Fair in Badadon receive a mini version of the full fact sheet on lethal yellowing developed during our visit.
Summary

The authors visited Côte d’Ivoire from 2 to 6 March. We held a short training for 16 members of staff from the Université Nangui Abrogoua, Abidjan and ANADER. The training was one of the dissemination activities of the IDRC-DFATD project *Improving livelihoods of resource-poor coconut smallholder farmers threatened by an emerging lethal yellowing disease of coconut in the coastal region of Côte d’Ivoire.*

We held a plant clinic and Going Public at a coconut fair organized by the project in Badadon, a village in the Grand Lahou area to the west of Abidjan, and attended by over 200 people. We led staff in a workshop to analyse the results of the events and to learn about entering data in Excel, making pivot tables, and editing photo-sheets and factsheets.

The first results from the plant clinic and Going Public are presented. For example, the plant clinic was visited by 16 farmers, mostly male, who asked about 28 problems affecting coconut palms and eight other crops, including cassava. The farmers came from 10 villages. None of them used chemical inputs, compost or manure and most crops were rain-fed. Farmers were given recommendations and a copy of a fact sheet on coconut lethal yellowing (CILY).

Another 26 farmers were interviewed during the Going Public event, held in parallel with the plant clinic. Going Public gathered information about current knowledge of CILY and management of the disease. For example, 17 farmers had not heard about CILY before, of whom 13 had the disease on their trees.

The experiences in Badadon and discussions with workshop participants later will help plan future plant clinics and Going Public events.
Introduction

Eric Boa and Jeffery Bentley worked with staff and students from the Université Nangui Abrogoua and ANADER from 2 – 6 March 2015 as part of Improving livelihoods of resource-poor coconut smallholder farmers threatened by an emerging lethal yellowing disease of coconut in the coastal region of Côte d’Ivoire, an IDRC-DFATD-funded project on lethal yellowing of coconut palm (CILY). The phytoplasma (a type of bacterium) disease has recently been confirmed from Côte d’Ivoire though it has been present in Ghana since 1932. Lethal yellowing of palms is a global disease associated with closely related phytoplasmas with major impacts in the Caribbean, Central America and East Africa.

The CILY project has an extension component to consider the best ways to share scientific advances with farmers and to identify practical solutions for managing the disease. During our visit we tried out two extension methods that respond to farmer demands while gathering information that will shape the practical solutions. Both events were held as part of coconut fair, the first of several that the project will sponsor.

The first method is the plant clinic, based on an approach developed by the Global Plant Clinic (GPC) of CABI, with extension and research partners in countries around the world from 2002 onwards. Plantwise, the successor programme to the GPC, supports plant clinics in over 30 countries, including Sierra Leone, Ghana and Burkina Faso.

The second extension method we introduced is known as Going Public (GP). Unlike plant clinics, which accept ‘any problem on any crop’, GP focuses on one problem at a time, in this case CILY, which is a new disease for everyone in Côte d’Ivoire: farmers, extension workers and researchers. Plant clinics and GP are excellent ways to bring all three groups together to make real progress in tackling a deadly disease, one whose impact is bound to increase as more trees die and farmers face bigger challenges in coping with the many effects on their livelihoods and families.

The coconut palms in the area of Grand Lahou, on the coast, are all dead, dying or about to show symptoms. The advance of CILY will be relentless now that the disease is well established. Smallholder farmers in the area are all about to lose their main crop, the one they depend on for their livelihood.
Activities

The time available for training was short and so we condensed the key elements of plant clinics and GP into a mini workshop on day 2. The previous day we adapted training material used in other countries for the workshop. The participants (Annex 1) were given presentations and hand-outs on running a plant clinic and edited a one page fact sheet on CILY.

In the afternoon of day 2 (Tuesday) we drove to the Grand Lahou region, about two hours from Abidjan. A coconut fair sponsored by the project was held in Badadon (Figure 1) on Wednesday, 4 March. There we held a plant clinic and ran a Going Public session, described below.

On Wednesday we reviewed the extension events. The participants identified improvements to the methods, reflected generally on their experiences and began to think about what will happen next.

We produced several pieces of extension material. A one-page fact sheet on CILY was written based on technical literature and edited with contributions from participants. A shorter version of the one page fact sheet (mini fact sheet) was produced as well as several photo-sheets (Annex 2).

We entered all data from the plant clinic and Going Public and analysed the results (Annex 3).

Figure 1  Grand Lahou, showing plantation area for coconut palms (shaded green) and Badadon (red star), the site of the Coconut Fair, where the plant clinic and Going Public were held. Nearby villages are shown in green.
Plant clinic at Badadon

When we arrived at Badadon we saw several large banners advertising the plant clinic and the coconut fair. Badadon is one of several villages affected by CILY and all were invited to attend. The plant clinic was held under a canvas awning, furnished with tables and chairs. Before the plant clinic, there were welcoming speeches, a dancer accompanied by drums, a “libation” by a local chief (who sprinkled water on the ground while praying in the local language). All of this created a certain air of expectation, as the large audience watched from the shade of another awning, provided for the coconut fair.

The clinic was housed under a white tent (left). People who attended the coconut fair gathered under the striped canopy and listened to the speeches. On the far right, makers of coconut products and handicrafts showed their wares. The fair lasted for about two and a half hours and ended at noon.

The plant doctors continued working for more than two hours. During this time they received 28 queries about plant health problems from 20 people, mostly men (14). Details of the problems were recorded in the plant clinic register, and recommendations written down on a prescription form (Annex 3).

Five people presented two or more problems. Coconut problems were most common (14 out of 28 queries) yet farmers also brought problems from other crops: eggplant, avocado, cocoa, yam, stored maize, cassava, pepper and tomato. This was an encouraging sign of a broad demand which helps to justify more plant clinics after the current project ends.

Farmers are always advised to bring samples to the clinic since this helps the plant doctor discuss the problem. But it is difficult to bring in coconut palm samples unless these are fallen nuts, or symptoms seen on young palms. One photo-sheet with a range of symptoms on palm, including those of CILY, was shown to farmers. This has been updated to include more photos of CILY and another added with general views of diseased and dying palms. You can make your own photo-sheets in Word and a short demonstration was given on how to do this to the participants after the workshop.
Summary of feedback from participants on plant clinics

The comments are given in French, as written by the participants.

DIFFICULTES RENCONTREES
- Difficultés de communication due à la musique
- Confusion entre la clinique et la foire.
- Aspect festif de la clinique
- Absence de matériels d'observation diagnostique, ex. loupe.
- Difficulté au niveau des recommandations

ASPECTS POSITIFS
- Diversité de problèmes phytosanitaires
- Intérêt des populations
- Accessibilité des populations aux docteurs

Summary of queries presented to plant clinic: USE OF INPUTS

<table>
<thead>
<tr>
<th>Practice</th>
<th>YES</th>
<th>NO</th>
<th>NI</th>
</tr>
</thead>
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<tr>
<td>Apply chemical inputs (fertilizers)</td>
<td>0</td>
<td>19</td>
<td>9</td>
</tr>
<tr>
<td>Apply compost</td>
<td>0</td>
<td>17</td>
<td>11</td>
</tr>
<tr>
<td>Apply manure</td>
<td>0</td>
<td>17</td>
<td>11</td>
</tr>
<tr>
<td>Use pesticides</td>
<td>0</td>
<td>21</td>
<td>0</td>
</tr>
</tbody>
</table>

NI – no information (not recorded in register)

Summary of queries presented to plant clinic: causes of problems

<table>
<thead>
<tr>
<th>Crop</th>
<th>Abiotic problem</th>
<th>Biotic problem</th>
<th>Not diagnosed</th>
<th>Total queries</th>
<th>Notes</th>
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<tbody>
<tr>
<td>Aubergine</td>
<td>0</td>
<td>2</td>
<td>0</td>
<td>2</td>
<td>Exact causes unclear</td>
</tr>
<tr>
<td>Avocatier</td>
<td>0</td>
<td>2</td>
<td>0</td>
<td>2</td>
<td>Parasitic plant</td>
</tr>
<tr>
<td>Cacaoyer</td>
<td>0</td>
<td>1</td>
<td>1</td>
<td>2</td>
<td>Exact biotic cause unclear</td>
</tr>
<tr>
<td>Cocotier</td>
<td>0</td>
<td>12</td>
<td>1</td>
<td>13</td>
<td>All were CILY</td>
</tr>
<tr>
<td>Igname (yam)</td>
<td>1</td>
<td>0</td>
<td>0</td>
<td>1</td>
<td>General growing problem</td>
</tr>
<tr>
<td>Maïs stocké (stored maize)</td>
<td>0</td>
<td>1</td>
<td>0</td>
<td>1</td>
<td>Storage beetles</td>
</tr>
<tr>
<td>Manioc</td>
<td>0</td>
<td>0</td>
<td>4</td>
<td>4</td>
<td>Root rots, unknown cause</td>
</tr>
<tr>
<td>Piment (pepper)</td>
<td>0</td>
<td>1</td>
<td>1</td>
<td>2</td>
<td>Beetle and unknown</td>
</tr>
<tr>
<td>Tomate</td>
<td>0</td>
<td>1</td>
<td>0</td>
<td>1</td>
<td>Virose (sic)</td>
</tr>
<tr>
<td>TOTAL</td>
<td>1</td>
<td>20</td>
<td>7</td>
<td>28</td>
<td></td>
</tr>
</tbody>
</table>
Going Public at Badadon

After the plant clinic opened, and the villagers had heard from the people selling goods made from coconut (candies, soaps, spoons etc.) the Going Public group organized themselves into pairs and began approaching the farmers one at a time. One person would show the farmer the photo-sheet and the other would administer the questionnaire (Annex 3). The researchers were conscientious about meeting people and quietly getting on with the exercise. They kept going at it until they used all of their questionnaires, near the end of the event.

Twenty six people were interviewed, 18 men and eight women. Men have over 50 trees in their farms; however, women face unique problems since they have fewer coconut trees or have lost of all them.

Most if the interviewees came from Badadon (21) with the other five from three nearby villages.

All the people interviewed grew coconuts to sell. Nine farmers also used some of their produce for themselves and their families. They told us that coconuts are their main source of income.

Twenty one of the 26 have problems with CILY, and two have already seen all their coconuts die, so the problem is clearly serious. Seventeen people had not heard about CILY before the fair, of whom 13 confirmed they had the disease.

Ten people mentioned trying to control the disease by replacing the sick plant. One person tried a resistant variety, PB121. So far, none of the farmers have tried chemical control.

In summary, all of the farmers have problems with the disease and are concerned about it, and need more information. Hence, Going Public may be the most powerful and feasible tool to gather more of the needed information directly from the farmers. This information will help to address disease control and gender issues in Grand-Lahou. Most farmers have mobile phones and can be contacted later to learn how they have used the information gained from Going Public.
Feedback from workshop participants

- Première fois de participer à un Rendre Publique pour tous.
- Les agriculteurs sont prêts à adopter de nouvelles méthodes. Ils déjà ont essayé de méthodes comme l’élimination de la plante malade, et remplacer avec une plante saine, et il n’a fonctionné pas.
- Les méthodes de lutte qui existent sont inefficaces.
- Il n’a pas de méthodes de lutte.

Difficultés

- Difficultés de la langue (communication), dans la langue locale.
- Distraction due à la musique.
- Méconnaissance de la maladie.
- Absence de produits pour le traitement de la maladie.
- Problèmes de maladies sur les autres plants (manioc, aubergine etc.)
What we found out and next steps

CILY is definitely endangering the livelihood of smallholder farmers who rely on coconut in Côte d’Ivoire. The plant clinic, Going Public, and the various written materials are all ways of conveying information to farmers.

This devastating disease has no easy management options, all the more reason to share information quickly with farmers and work with them on finding solutions.

A next step is to ask farmers a bit more about the control options they have used and to get more information on why they have had little luck replacing diseased plants with healthy ones.

This workshop compressed over a week’s material into a day. It may have seemed rushed to the participants, but they did learn a lot. There is still more information to offer them e.g. on running a clinic and on making written material.

The coconut fair, an innovation of the CILY project was wildly successful at attracting and holding an audience. For better outcomes in the future, Going Public should emphasize building spaces where an extensionist can share ideas with the whole audience at once, while colleagues distribute more information. In addition, smaller teams can be sent to the field to run plant clinics.

The project has certainly chosen a worthy research topic and the local people appreciate these efforts to find a solution to a disease which is simply wiping out their main cash crop.

All of the data from the clinic registers and the Going Public forms has been entered into Excel spreadsheets and will be shared with the project via Prof. Hortense Atta Diallo and Dr. Arocha Rosete.

Recommendations from course participants

*Visite guidé des plantations avec les docteurs.* Since the trip to the fair gets project staff all the way to the field, they should follow up with field visits, to see the coconut palms with local people, and to discuss the problem there.

*Equiper les cliniques de matériels techniques.* For example magnifying glasses, reference literature, more photosheets showing symptoms of pests and diseases on common crops.

*Déposer d’espace plus grand pour la réception des clients (agriculteurs).* That is, have more room at the plant clinic for receiving clients.
## Annex 1

### Participants in workshop and field day at Badadon

<table>
<thead>
<tr>
<th>Name</th>
<th>Contact</th>
<th>Work and education</th>
</tr>
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<tbody>
<tr>
<td>ANGOUA Kouakou Hermann</td>
<td>07027925 <a href="mailto:Angona2412@yahoo.fr">Angona2412@yahoo.fr</a></td>
<td>UNA Masters</td>
</tr>
<tr>
<td>BÉLÉ Luc</td>
<td>77558721 <a href="mailto:belebox@yahoo.fr">belebox@yahoo.fr</a></td>
<td>UNA Masters</td>
</tr>
<tr>
<td>BEUGRÉ N’Djihia Isabelle</td>
<td>04952227 <a href="mailto:isabelle.bri@gmail.com">isabelle.bri@gmail.com</a></td>
<td>UNA PhD</td>
</tr>
<tr>
<td>DARAMCOUM Wentoin Alimata Marie-Pierre</td>
<td>09373942 <a href="mailto:mapimapi@yahoo.fr">mapimapi@yahoo.fr</a></td>
<td>UFHB/CNRA PhD</td>
</tr>
<tr>
<td>KODJO Adaba Tano Thierry</td>
<td>57272720 <a href="mailto:Thierry.kodjo@yahoo.com">Thierry.kodjo@yahoo.com</a></td>
<td>UNA Masters</td>
</tr>
<tr>
<td>KOUAKOU Yadom Yao François Regis</td>
<td>06708355 <a href="mailto:yadomregis@yahoo.fr">yadomregis@yahoo.fr</a></td>
<td>UNA PhD</td>
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<tr>
<td>KOUAMÉ Assiri Eloh (Patrice)</td>
<td>07551496 <a href="mailto:kouamass@yahoo.fr">kouamass@yahoo.fr</a></td>
<td>UNA PhD</td>
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<tr>
<td>KRA Kouadio Dagobert</td>
<td>07046369 <a href="mailto:luckaskra@yahoo.fr">luckaskra@yahoo.fr</a></td>
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<tr>
<td>KRA Kouamé Daniel</td>
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<td>KRA Lydie Epse Adou Koffi</td>
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<td>KWADJO Koffi Eric</td>
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<tr>
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<td>Anader</td>
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<td>OUATTARA Bognan Winnie Miyasi</td>
<td>07294108 <a href="mailto:myassijoyce@yahoo.fr">myassijoyce@yahoo.fr</a></td>
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<tr>
<td>SÉKA Koutoua</td>
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<td>TOUALY Marie Noel</td>
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<tr>
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<tr>
<td>YAO Kouassi Francis</td>
<td>47731689 <a href="mailto:francisyok6@gmail.com">francisyok6@gmail.com</a></td>
<td>UNA Masters</td>
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</table>
Extension material: fact sheets and photosheets

2 Lethal Yellowing of Coconut Palms in Côte d’Ivoire
Before the workshop, the instructors wrote a fact sheet on CILY. On Tuesday, the participants read it and made the following comments:

- **Le mode de transmission n’est pas bien connu.**
- **Gestion de la maladie, application chimique est seulement un gaspillage d’argent.** Comme est qu’un peu chercher le vecteur et faire une gestion du vecteur. Si le vecteur est un insecte, c’est possible de faire gestion avec du insecticide ?
- **Il y a diverse erreurs grammaticales**
- **Se peut changer la photo, pour voir le état générale de la maladie.**
- **Utilisation des noms locaux pour la maladie.**
- **C’est manque des variétés avec de résistance**
- **Erreurs grammaticales, le document est pour une région ou la maladie n’est pas présente. Il faut adapter le document pour la zone**
- **Ou le mode de transmission de cette maladie n’est pas bien connu. (Dernier paragraphe).**
- **Le Grand Ouest Africain, et Mawa, sont facilement attaquées.**
- **La noix immature chute, et les feuilles âgées tombent et les jeunes feuilles jaunissent.**
- **Meurent et tombent. Dernier paragraphe.**

The mini fact sheet is a shorter version of the one page fact sheet. A booklet of coconut pest and disease fact sheets was compiled from factsheets written by colleagues in the Solomon Islands. Check the Plantwise knowledge bank for other extension material on coconut pests and diseases, although a preliminary search revealed few fact sheets. Other useful information is available from IFAS at the University of Florida, though their priority is more ornamental palms.
**Annex 3**

**Forms for plant clinic and Going Public**

**Plant clinics**

Each clinic register sheet has space for three queries. A recommendation for the farmer is written separately on the prescription form. The queries were generally well recorded but few plant doctors wrote their names at the top of the form. Several queries contained no information about inputs or source of water, two important aspects of plant health that are helpful in making diagnoses. The names for the different administrative regions were missing for all queries, perhaps on the assumption that the village name was sufficient. Always check forms for missing information.

<table>
<thead>
<tr>
<th>CODE</th>
<th>DATE</th>
<th>Crop (e.g. type)</th>
<th>Crop area or # plants</th>
<th>Source of water</th>
<th>Chemical fertilizer used</th>
<th>Manure</th>
<th>Compost</th>
<th>Phosphorus applied</th>
<th>Diagnosis</th>
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</tr>
</tbody>
</table>

The duplication of the prescription form, with ‘clinic copy’, is a short term measure to allow recording of recommendations given to farmers. In future, use carbon paper or other method such as taking a photograph of the prescription.
Going Public

The site form (Form 1) records the details for the Going Public location. The information allows you to monitor each event and see, for example, how long they lasted, whether there were particular problems in holding the event and to link Going Public to the use of plant clinics. The farmer interview form (Form 2) finds out more about what people know about CILY, or indeed any other topic that is presented using Going Public. It records useful information about current practices and the size and importance of coconut to people.

The farmer details allow you to contact people after the Going Public people and find out if they are doing things differently as a result of receiving a fact sheet, for example, or other advice.

The information from both forms is entered into a spreadsheet. A template was created for both forms. Participants in the workshop where shown how to use pivot tables to make simple summaries. More practice is needed in using pivot tables. Regular use will enable UNA staff to become familiar with this analytical tool and suggest changes to improve the forms. But be careful that the forms are not made too complicated. The general rule is that one page contains more than enough information to assist efforts in providing effective extension support to farmers.
Annex 4

Managing data from plant clinics and Going Public events

The data are collected using short forms. The queries about plant health problems are written by hand on the clinic register (Annex 2).

The information from the plant clinic register is entered into a spreadsheet (Figure 2). The column headings show the type of data they contain. The small arrows show that the data has been ‘filtered’ and can be analysed using pivot tables. A short demonstration was given of pivot tables before the plant clinics. You only need one spreadsheet for all clinics. If you do store data in separate spreadsheets – for different districts – make sure that the same column headings are used.

Pivot tables allow you to check on the consistency of data entry. For example, farmer names should be entered in the same order, shown here as family name then person name. Do not leave blank cells. If an item of information is missing type ‘pi’. Codes allow plant doctors and farmers to track queries.

Information from the Going Public interviews was also entered into a spreadsheet. You need to think carefully about what the data items so that you can analyse the results later. The numbers in some of the column titles refer to the interview form. Note that the headings are much shorter to reduce the amount of white space and make it easier to see more results on one page. Site details are entered into a separate worksheet (see tabs).
<table>
<thead>
<tr>
<th>A</th>
<th>B</th>
<th>C</th>
<th>D</th>
<th>E</th>
<th>F</th>
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<tr>
<td>1</td>
<td>Nom</td>
<td>Rechercheur</td>
<td>Date</td>
<td>Motif</td>
<td>Oui</td>
<td>Oui</td>
<td>Oui</td>
<td>Oui</td>
<td>Oui</td>
<td>Oui</td>
<td>Nom</td>
</tr>
</tbody>
</table>
| 2   | Kouloucou Fatoum-Gagné Badadon | 12 mars 2003 | Oui | Oui | Oui | Oui | Oui | Oui | Oui | Oui | Kouloucou Fatoum-Gagné  
| 3   | Kouloucou Fatoum-Gagné Badadon | 12 mars 2003 | Oui | Oui | Oui | Oui | Oui | Oui | Oui | Oui | Kouloucou Fatoum-Gagné  
| 4   | Kouloucou Fatoum-Gagné Badadon | 12 mars 2003 | Oui | Oui | Oui | Oui | Oui | Oui | Oui | Oui | Kouloucou Fatoum-Gagné  
| 5   | Kouloucou Fatoum-Gagné Badadon | 12 mars 2003 | Oui | Oui | Oui | Oui | Oui | Oui | Oui | Oui | Kouloucou Fatoum-Gagné  
| 6   | Toure Issa | Badadon | 12 mars 2003 | Oui | Oui | Oui | Oui | Oui | Oui | Oui | Toure Issa  
| 7   | Toure Issa | Badadon | 12 mars 2003 | Oui | Oui | Oui | Oui | Oui | Oui | Oui | Toure Issa  
| 8   | Toure Issa | Badadon | 12 mars 2003 | Oui | Oui | Oui | Oui | Oui | Oui | Oui | Toure Issa  
| 9   | Coumba Mbaye | Badadon | 12 mars 2003 | Oui | Oui | Oui | Oui | Oui | Oui | Oui | Coumba Mbaye  
| 10  | Coumba Mbaye | Badadon | 12 mars 2003 | Oui | Oui | Oui | Oui | Oui | Oui | Oui | Coumba Mbaye  
| 11  | Coumba Mbaye | Badadon | 12 mars 2003 | Oui | Oui | Oui | Oui | Oui | Oui | Oui | Coumba Mbaye  
| 12  | Coumba Mbaye | Badadon | 12 mars 2003 | Oui | Oui | Oui | Oui | Oui | Oui | Oui | Coumba Mbaye  
| 13  | Coumba Mbaye | Badadon | 12 mars 2003 | Oui | Oui | Oui | Oui | Oui | Oui | Oui | Coumba Mbaye  
| 14  | Coumba Mbaye | Badadon | 12 mars 2003 | Oui | Oui | Oui | Oui | Oui | Oui | Oui | Coumba Mbaye  
| 15  | Coumba Mbaye | Badadon | 12 mars 2003 | Oui | Oui | Oui | Oui | Oui | Oui | Oui | Coumba Mbaye  
| 16  | Coumba Mbaye | Badadon | 12 mars 2003 | Oui | Oui | Oui | Oui | Oui | Oui | Oui | Coumba Mbaye  
| 17  | Kouadio Diarrassouba | Badadon | 12 mars 2003 | Oui | Oui | Oui | Oui | Oui | Oui | Oui | Kouadio Diarrassouba  
| 18  | Kouadio Diarrassouba | Badadon | 12 mars 2003 | Oui | Oui | Oui | Oui | Oui | Oui | Oui | Kouadio Diarrassouba  
| 19  | Kouadio Diarrassouba | Badadon | 12 mars 2003 | Oui | Oui | Oui | Oui | Oui | Oui | Oui | Kouadio Diarrassouba  
| 20  | Kouadio Diarrassouba | Badadon | 12 mars 2003 | Oui | Oui | Oui | Oui | Oui | Oui | Oui | Kouadio Diarrassouba  
| 21  | Kouadio Diarrassouba | Badadon | 12 mars 2003 | Oui | Oui | Oui | Oui | Oui | Oui | Oui | Kouadio Diarrassouba  
| 22  | Kouadio Diarrassouba | Badadon | 12 mars 2003 | Oui | Oui | Oui | Oui | Oui | Oui | Oui | Kouadio Diarrassouba  
| 23  | Kouadio Diarrassouba | Badadon | 12 mars 2003 | Oui | Oui | Oui | Oui | Oui | Oui | Oui | Kouadio Diarrassouba  
| 24  | Kouadio Diarrassouba | Badadon | 12 mars 2003 | Oui | Oui | Oui | Oui | Oui | Oui | Oui | Kouadio Diarrassouba  
| 25  | Kouadio Diarrassouba | Badadon | 12 mars 2003 | Oui | Oui | Oui | Oui | Oui | Oui | Oui | Kouadio Diarrassouba  
| 26  | Kouadio Diarrassouba | Badadon | 12 mars 2003 | Oui | Oui | Oui | Oui | Oui | Oui | Oui | Kouadio Diarrassouba  
| 27  | Kouadio Diarrassouba | Badadon | 12 mars 2003 | Oui | Oui | Oui | Oui | Oui | Oui | Oui | Kouadio Diarrassouba  

**Notes:**
- **Date:** 12 mars 2003
- **Motif:** Oui
- **Oui:** Oui
- **Oui:** Oui
- **Oui:** Oui
- **Oui:** Oui
- **Nom:** Kouloucou Fatoum-Gagné
- **Nom:** Toure Issa
- **Nom:** Coumba Mbaye
- **Nom:** Kouadio Diarrassouba
- **Nom:** Kouadio Diarrassouba
Coconut lethal yellowing may be a strange name, but it is unlike any disease I have seen. It attacks and destroys whole landscapes. A leafy canopy of coconut palms is a signature image of the tropics. Here in Côte d’Ivoire (once called the Ivory Coast), whole groves of coconut have died. The leaves turn yellow and fall off, leaving nothing behind but a decapitated trunk. The stately palms become a ghastly forest of telephone poles.

In the village of Badadon, people explained that they were losing their livelihood. They depend on coconuts, growing them to sell for their oil. But many coconut palms in the community are turning yellow, and will all be dead in a few months. The farmers are able to grow some cassava between the palms, but coconuts thrive on sandy, salty soil where few other plants will live.

A video made in Côte d’Ivoire and available in various local languages is addressing the issue of how to grow cassava on sandy coastal soils: click here for Growing cassava on poor soils.

The coconut lethal yellowing disease arrived in neighboring Ghana in 1932, although for some reason it has recently spread much faster in West Africa. Similar diseases have been killing coconuts in the Caribbean and in East Africa.

The cause of the disease seems to be a phytoplasma, a bacterium-like organism without a cell wall. It acts a bit like a virus, with deadly effect. Phytoplasmas are carried from plant to plant by sucking insects, and they also live in various alternative hosts, such as the weedy plants between the palms.

I have been watching plant pathologists bore into coconut trunks with carpenters’ drills, collecting sawdust to identify the phytoplasma and confirm the diagnosis and learn more about the cause of the diseases.

It’s frustrating because there is no cure for the disease. There is still basic research to be done such as finding the exact insect vector and the alternate plant hosts.

But even at an early stage, the scientists are sharing what they do know with farmers. In the village of Badadon people from the university in Abidjan and other institutions are explaining that lethal yellowing is spread by a phytoplasma, and how the symptoms progress. Meanwhile the scientists are searching for resistant coconut varieties and will soon start working with the communities, to find a solution. They are going to try intercropping and natural fertilizer trials, to see if healthier soil offers a solution.