

# Plant health clinics for Sierra Leone



Rob Harling

June 2008

*HEALTHY PLANTS FOR HEALTHY PEOPLE*

# The Global Plant Clinic

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The GLOBAL PLANT CLINIC (GPC) is managed by CABI in alliance with Rothamsted Research and the Central Science Laboratory. The GPC provides plant health services and supports over 65 plant health clinics in Africa, Asia and Latin America. Our diagnostic service, which covers all plants and types of problems, is used by over 80 countries and helps maintain disease vigilance. We link extension and research, train plant doctors and scientists, and work with all sectors to improve regular and reliable access to technical support and advice. Our aim is to create durable plant health services for those who need them most.



*Healthy Plants for Healthy People*

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## Acknowledgements

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My thanks go particularly to Dr IMO Shamie of MAFFS Freetown, for hosting my visit, arrangements for the training course and field visits after the course. Thanks also to: Henry Kargbo, Bombali District Director of Agriculture, MAFFS Makeni, for facilitating the training course at MAFFS Makeni offices, and James Spencer, MAFFS Freetown, for guiding my field visits.

### **Front cover**

LEFT *Plant Clinic in Makeni*

TOP RIGHT *Farmer Sorie Sesay, Kundaya village, Koinadugu District, has potatoes rotting in the ground*

BOTTOM RIGHT *Haja Ami Nasa Kamara, Chairlady of Mile 91 Farmer Field School, Mile 91, Tonkolili District*

## Summary

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This report describes my visit to Sierra Leone from 1-10 April 2008. Mine was the second visit to this country from a member of the GPC; Eric Boa, head of the GPC, came to Freetown in December 2006 to run a two day workshop on innovation in extension\* as part of an introductory CABI Partnership Facility (PF) project. These projects provide an opportunity to explore topics requested by CABI member countries and to develop longer term collaborations.

In this instance it wasn't long for the next step in collaboration to take place in Sierra Leone. One of the participants in Eric's workshop, Dr IMO Shamie (known as Shamie, Sierra Leoneans tend to use their surname as their first name) was inspired by the plant health clinic which took place as part of the workshop.

The *ad hoc* clinic took place at Waterloo, just outside Freetown, and was intended as a demonstration of one of the innovation technologies developed by the GPC and designed to meet the demand for knowledge from farmers, to reach large numbers quickly, easily and at low cost.

During the year after Eric's workshop, Shamie submitted a project proposal to the Ministry of Agriculture, Fisheries and Food Security (MAFFS) in Sierra Leone to create plant clinics in each of the 13 administrative districts across the country.

he proposal was successful and a grant of Leones 240 million (US\$ 80,000) was awarded for the project by the Ministry in February 2008. To support this initiative by the Sierra Leone government, I made this visit two months later to provide training for the new plant doctors who were to operate the clinics and to gain information how CABI, and its partners and collaborators, might further assist the efforts in rebuilding and developing agriculture after the end of the civil war in 2002.

A three-day training course was held in Makeni, Northern Province: I delivered the GPC's How to be a Plant Doctor, Module 1, which concentrates on diagnosis of ill health in plants and running plant health clinics. There were 17 participants from the MAFFS District offices across the country, those who will run the new plant health clinics. The course ended with a clinic held in the local market in Makeni, putting the training into practice.

From Makeni, after the course, I made visits to farms and MAFFS offices in Kabala in the North East, down to Mile 91 in the centre, and Bo in the south of the country; I report on findings from these visits. Poor soil fertility, unavailability of fertilizers and pesticides, as well as the cash for farmers to buy them, and poor infrastructure (roads, lack of transport and coolstores) are the major constraints to agriculture in this country. Recommendations for ways to build upon the new clinics and for collaborative work with farmers' field schools, which are well established in Sierra Leone, are made in the final section of the report.












**Farmer Sorie Sesay (centre) with his sons, and Santigie Sesay, Crop Protection Superintendent, MAFFS Kabala. Sorie grows 3 acres of potato in Kundaya village, Koinadugu District.**

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\*A report of this workshop is available from the GPC: *Engaging ideas: Everyday methods that attempt to foster innovation*, Report by Dr Eric Boa, Dec 2006.

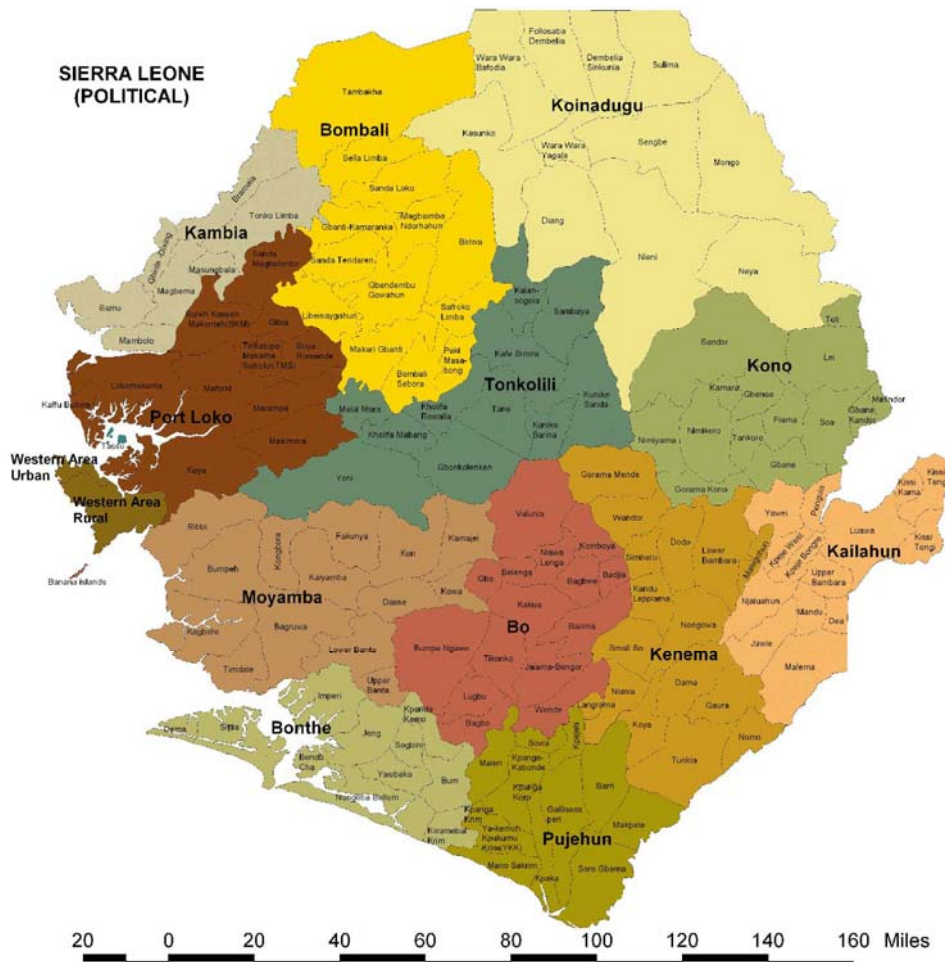
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# Acronyms

- CSL: Central Science Laboratory
- FAO: Food and Agriculture Organisation (of the United Nations)
- FAO TCP: FAO Technical Cooperation Programme
- FFS: Farmers' Field Schools
- GPC: Global Plant Clinic
- IAR: Institute of Agricultural Research
- IITA: International Institute of Tropical Agriculture
- MAFFS: Ministry of Agriculture, Forestry and Food Security
- SLARI: Sierra Leone Agricultural Research Institute (formerly NARCC, National Agricultural Research Coordinating Council)
- UNDP: United Nations Development Programme
- USAID: United States Agency for International Development



Sierra Leone Districts. MAFFS will launch plant health clinics in each of the 13 administrative districts, beginning with Bombali, Kambia, Port Loko, Koinadugu and Tonkolili in the Northern Province



**Blue arrow:** Makeni, site of training course

**Red arrows:** field visits

Map from UNIOSIL (United Nations Integrated Office in Sierra Leone)

## Plant Doctor training course

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The training course was held in Makeni, the provincial capital of the Northern Province. Makeni is an up and coming town, 115 miles north-east along a good road from Freetown; it has a new hospital, a branch of Rokel Commercial Bank (in Pisette, downtown Makeni, the bank apparently accepts VISA, a rarity outside Freetown; Rokel was the only bank that would accept VISA in Freetown) and a nearby dam that will supply hydro-electric power to the town, and eventually to Freetown.

Meanwhile, the whole town runs on small generators which operate only at night to conserve fuel, although it's possible to negotiate with the owners of premises such as guest houses to run them during the day if you pay for extra fuel: 2 gallons of petrol per hour at Le15,700/gal, or US\$11 for 1 hour. Despite this, we decided to hold the course here because it was rural and therefore close to crops for practical sessions, and because it was a reasonably central location for participants from around the country. The largest hotel is MJ's; it's "where the ministers stay when in town", although where the ministers hold their meetings I'm not too sure as I could see no meeting room facilities. We used the rooms of MAFFS Makeni District Office, thanks to Henry Kagabo, the District Office head. Shamie was the local organiser of the training and of my programme in Sierra Leone.

There were 17 participants, of which 16 came from MAFFS District Offices around Sierra Leone, and one was a journalist, Alfred Thoronka Seneh, from Freetown's Radio and Television Broadcasting Service. Seneh's inclusion was a shrewd decision by Shamie; by his attendance, Seneh was able to understand how the plant clinics operate and how they can help farmers, then subsequently present informed features on the clinics initiative on Freetown radio and TV using footage from the course (see later). This will be of great value in the promotion and awareness of the clinics.

The course programme, participants and feedback are at the end of this chapter.



**Plant Doctor Group, Makeni April 2008**



**Describing symptoms**



**Sonny and Mohamed diagnose a problem in aubergine**



**Diagnosis of pest damage in okra**



**Two women office staff join some of the training sessions**



**Diagnosis from photographs**

## **PLANT DOCTOR COURSE, MAKENI**

Saturday am, the last day of the course and the MAFFS offices are locked. We wait for the key to arrive. It does but the extension lead from the generator has gone, its owner reclaimed it yesterday. Someone finds a length of cable without a plug, the ends are bared and stuck into the socket of the small extension cable that I brought with me, and we're in business. The lack of constant, reliable power, even sometimes in Freetown, is a consideration when deciding where to run meetings that require audio visual aids.





**Twin generators, hired from town, that powered our training course in an adjacent room**



**The MAFFS offices in Makeni were taken over by the Revolutionary United Front (RUF) rebels during the war. Everything was stolen, including the aircon units .**

*Discussion points on the final day of the course*

I had brought along a portable soil testing meter although I had not had an opportunity to use it on the course, but I did get a chance later on in the field at Mile 91. I explained how it worked and how it could be used to rapidly test soil fertility and acidity by measuring electroconductivity and pH respectively.

This aroused much interest and Mr Bangura from MAFFS Kenema asked if, in the future, we might supply meters for all regional clinics. The meters cost about US\$250 each. Experience at other clinics shows that farmers do not bring soil along, although there's no reason why they cannot be asked to do so. The meters will probably be most useful when making field visits.

REGISTER		Site of plant clinic	Plant Doctor
DATE	CODE	crop (only one), age+variety	description of problem according to client; crop history (management, what has planted previously)
name			
village		diagnosis	action taken
DATE	CODE	crop (only one), age+variety	description of problem according to client; crop history (management, what has planted previously)
name			
village		diagnosis	action taken
DATE	CODE	crop (only one), age+variety	description of problem according to client; crop history (management, what has planted previously)
name			
village		diagnosis	action taken
DATE	CODE	crop (only one), age+variety	description of problem according to client; crop history (management, what has planted previously)
name			
village		diagnosis	action taken

**The register, for logging all enquiries at the clinic and retained by clinic staff.**

Lahai Dumbuya (MAFFS Magburaka, Tonkolili District) asked for crop-specific training, relevant to their regions, e.g. rice and cassava in the north, rice, oil palm, coffee, cacao and others in the south. Other participants agreed. Shamie replied that the MAFFS grant for the clinics includes some provision for this.

“Healthy plants for healthy people”: Lahai thought this maxim discriminated against disabled people, who also had a right to healthy plants. The group agreed this was not the intention but a misunderstanding in the Kriol language. Never assume others are thinking the same way as you.

James Spencer from MAFFS HQ in Freetown had a problem with “Abiotic/Biotic/Confused (= don’t know)”, the ABC of diagnosis. Having noted the symptoms of a problem, the next step is to place it

in one of these three categories which helps narrow down the options. Spencer said “you can’t tell a farmer that you don’t know, he makes the effort to come to the clinic and expects an answer”. I explained that telling the farmer isn’t the end of the matter. You say that you haven’t enough information at the moment to give an answer but a). Come back next week and I’ll have one (you make some tests such as microscopy, or look up information on the symptoms); b). Bring me more samples next week; c). I’ll make a visit to your farm and see the problem for myself. You should first determine if it’s a problem worth the effort – one affected plant at the edge of a plot isn’t worth it.

Some clarification was sought on filling in the register and prescription forms. On the register, we agreed one box (entry) per problem even if it’s the same crop, but use the same code for the same crop (i.e. two boxes can have the same code). One prescription form per crop but the form can contain recommendations for more than one problem.

### *Plant clinic at Makeni market*

The entire group came along to see what was involved in running a clinic as only those from Makeni, and one or two from Freetown HQ had experience. A clinic had been operating at Makeni, by Alimamy G Kamara from MAFFS Makeni (“AG”, there are many Kamaras in SL) since Eric Boa visited in 2006.

It was Sunday, however, participants had to travel home, and public transport was limited. The clinic was therefore restricted to 2 hours to allow people to get away. The venue was on the balcony of a private home along one of the wide main streets of the market, or “luma”. There was no charge for the use of the space, the owner was honoured, so we shook hands and thanked him.

Prescription	
XX • XX • Global Plant Clinic XX • Unimor Kivotos	
Name	
Village	
Plant	
Code	Date
Identification of problem	
Recommendation	
HEALTHY PLANTS FOR HEALTHY PEOPLE	

**The prescription is what the farmer takes away from the clinic**



**Clinic group sets off, Sunday morning**



**Makeni market**



Lahai Dumbuya announces the clinic



Clinic starts

The market was busy, we arrived unannounced and used a megaphone to announce the purpose of the clinic. In the two hours we had six farmers, not a huge number, but looking around the market, it was mostly women who had come to buy or sell produce or household items, and they were not necessarily farmers. Problems included:

- **Green grasshoppers** (*Zonocerus variegatus*) on cassava and maize. These are near locust-sized insects which can quickly wipe out a crop. The farmer said the adults were already in the crop, in which case the only remedy was to spray malathion. A weed strip established around the crop encourages the grasshoppers to breed amongst the weeds; these can then be cut and burnt to kill the nymphs before the adults emerge. Once the adults emerge only insecticides are effective.
- **Fruit fly** (*Bactrocera invadans*) on mango: the advice was to harvest early and unripe as this is a pest of ripening fruit. **Pineapple**: an unknown problem. **Cotton stainer caterpillar** (*Dysdercus fasciatus*) on okra: soap solution was recommended.

*Programme: How to be a Plant Doctor, Module 1, Makeni 4-6 April 2008*

Exercise		
DAY 1	Welcome and introduction: Dr IMO Shamie, MAFFS Freetown	P1-4 Second diagnosis with plants
C1-1	Personal profile	F1-3 Common symptoms and their causes
C1-2	The crops of Sierra Leone (Latin names of crops)	P1-6 Learning from interviews
P1-1	Introduction to Module 1	P1-8 How to listen to interviews
F1-1	Describing symptoms	C1-8 Group photograph
DAY 2	A global guide to symptoms	DAY 3
P1-2	How to be a detective	P1-7 How to establish and operate a plant health clinic
P1-5	First diagnosis with photos	C1-9 Writing a prescription and completing the register
C1-3	Publicity for clinics and clinic banners from different countries	C1-10 Evaluation of course
-	Field diagnosis	H1 Causes of ill health in plants
P1-3	Causes of plant health problems	H2 Common symptoms and causes
		- Present certificates, Course CD and photograph
		- Clinic at Makeni market

C = class exercise; F = field exercise; P = presentation (PowerPoint); H = handout (information sheet)

## Participants

Name/place of work	Work responsibilities and activities	Key crops and problems that affect them	What do you hope to learn?
Alex B Kamara MAFFS Kabala	Field extension worker, crop protection	Vegetables, rice, tree crops; insects and rodents	Further experience I have not come across since my education and job
Patrick Ndoleh MAFFS Mattra Jong	To teach farmers crop protection	Cocoa black pod disease; rice blast; coffee berry borer; grasshopper control on cassava	To recognise symptoms and diagnose for the farmers
Joseph Francis Karima MAFFS Moyambo	Supervise crop protection in Moyambo District; surveillance for crop pests; introduce IPM training programmes for farmers and extension staff	Rice, maize; stem borers, rice blast, brown spots, rust	To learn new innovation, i.e. mobile plant clinics to help farmers solve P&D problems
Dominic K Kai MAFFS	District crop protection officer, advising farmers	Cereals, tubers, tree crops; rodents, insects, diseases	Identify P&D, diagnosis, control
James D Spencer MAFFS Freetown	Supervising IPM and other disciplines across the country; forecasting impending pest insurgence	Vegetables, rice, cocoa, citrus, mango, coffee; cocoa black pod disease, cocoa capsid bug, citrus scab, rice blast, spiralling whitefly, rice gall midge	Practical experience in pest i/d and control; cultural control; diagnose on the spot
IMO Shamie MAFFS Freetown	Supervise all crop protection activities in SL, policy issues, training and capacity development, supervise extension activities, coordinate phytosanitary activities, correspondence with international organisations on SPS (Special Programme for Food Security)	Cereals (rice, maize, sorghum); roots and tubers (cassava, yam, sweet potato); tree crops (coffee, cocoa, cashew, citrus, kola); vegetables (tomato, chilli, eggplant, jute, onion); other crops (banana, plantain, papaya, pineapple)	Techniques in diagnosis without sophisticated equipment; techniques to respond to farmers' questions on unfamiliar disease symptoms; reporting style and running effective plant clinics; the best solution to solve a farmer's problem
Sonny B Williams MAFFS Pujehun	To teach farmers chemical or cultural control methods	Cassava: mosaic, leaf spots, rotten roots	Identification, control, and how to give farmers advice
Alimamy G Kamara MAFFS Makeni	Supervising crop protection activities in Bombali District, Makeni	Rice, cassava, vegetables, maize; insects, diseases, weeds and vertebrates	To build up my capacity in prevention and control at field level and to transfer this to farmers
Mohamed F Sesay MAFFS Koinadugu	Crop protection officer	Citrus (fungus, leaf blight); mango insects	More knowledge on crop protection services
James M Swaray MAFFS	Supervise crop protection activities in my district, liaise between my office and farming organisations, make recommendations to farmers, write reports	Cocoa black pod; rice blast; coffee scale insects and berry borers; cassava mosaic virus and grasshoppers	To recognise and control P&D problems

Name/place of work	Work responsibilities and activities	Key crops and problems that affect them	What do you hope to learn?
Alfred Thoronka Seneh Sierra Leone Broadcasting Service, Freetown	Reporter and programme producer on agriculture and economic activities	Rice, cassava, oil palm; <i>Cochliobolus miyabeanus</i> (brown spot of rice)	How to sensitize the farmers on diseases affecting their crops and prevention and cure
Lahai PJ Dumbuya MAFFS Magburaka, Tonkolili District	To supervise crop protection activities in the district, update farmers with current P&D problems in their area, to assist farmers to plant on time and free of pests	Rice, cassava, maize, oil palm, citrus, vegetables; birds (oil palm), stem borer, grasshopper, termite, stalk-eye flies, monkeys	New techniques on pest management, safe use and handling of pesticides, soil pest management
Abu-Bakarr Kamara MAFFS Kambia	Crop protection Supervisor; organise farmer training through farmer field school	Rice (gall midge, bugs, grasshopper, grasscutter); cassava (grasshopper, mealybugs, spider mites, grasscutters)	Identification of P&D, their predators and control
Gaskin T Amara MAFFS Bo	Crop protection	Cocoa black pod	More knowledge
Amadou Alami Bangura MAFFS Kenema	Crop protection Supervisor; demonstration of use of agrochemicals to farmers, elimination/reduction of chemical use, crop assessment	Cocoa (black pod, capsids, rodents); coffee (berry borers); cassava (grasshoppers <i>Zonocerus variegatus</i> ); rice (birds, caseworm, rodents, processing losses)	Transform farm communities with acquired knowledge; establish plant health clinic
Santigie S Sesay MAFFS Kabala	Senior Crop Protection Supervisor; supervise crop protection activity, training farmers on crop protection; FFS community facilitator	Vegetables, cereals (general P&D control)	New techniques of pest management; mobile plant clinics
Sahr S Gbamoi MAFFS Port Loko	Crop Protection Supervisor	Oil palm (seedling weevils <i>Dioclandura</i> spp); cassava ( <i>Zonocerus variegatus</i> grasshopper); vegetables (aphids and sap suckers)	More insight into crop protection
Henry Kargbo MAFFS Makeni	District Director of MAFFS Bombali District; coordinating all activities of MAFFS, NGOs, other agencies and institutions in Bombali District	Rice (lack of machinery, fertilizers, herbicides, pesticides); root and tuber crops (lack of marketing, processing, storage facilities)	How the training can be applied to effect positive change in rural communities

## *Some course feedback*

*Thank you for giving me an idea I have never come across in my educational background, to be a plant doctor in my own district. Yes it is true; if you are not healthy you are nowhere.*

**Alex B Kamara**, MAFFS Kabala

*By the middle of Day 1 we started realising what our country needed to help our farming community. This course came at a time when it is needed. We hope this is not the last time to see you. We need you because you were able to deliver to us things we have not known before and things that will give us respect in the community. The clinics are very vital to crop protection we hope the rest of the modules will be taught to us in the near future. We want the training to be up to five days plus more field practicals. Long live the plant clinics, long live CABI, long live Rob. CABI we are delighted.*

**IMO Shamie**, MAFFS Freetown

*This course is very fantastic and very interesting. Running a plant health clinic is a new idea in this country and it should be treated with all seriousness.*

**Lahai PJ Dumbuya**

*I think there is no change to make [to the course] but the only suggestion is that the time is too short for the training programme, I do hope such training is to be continued.*

**AG Kamara**, MAFFS Makeni

*I can be more interested with my job...God Bless you Dr.*

**Sonny B Williams**, MAFFS Pujehun

*I enjoyed the training very much as I found it educating. I also very much appreciate the per diem given to me which was reasonable. I also want to thank CABI for this wonderful assistance that it has given to us for the development of our country.*

**Sahr S Gbamo**i, MAFFS Port Loko

*All the field work done was of utmost importance. Your audibility made the class lively as we understood you well which created room for interaction. The in deep tutorial has given me insight on how to report on plant diseases and their preventative methods.*

**Alfred Seneh Thoronka**, Sierra Leone Broadcasting Service, Freetown

*As a plant doctor I shall do all my best for the success of this programme.*

**Santigie K Sesay**, MAFFS Kabala

*What I have achieved in terms of plant rehabilitation is not only remarkable but hoped to be used in the agro-transformation of rural farmers and community development. I congratulate you and you will continue with more training exercises.*

**AA Bangura**, MAFFS Kenema

*I must confess that I gained a lot from this training. The training was timely for our Sierra Leone situation. More time should be added for the training, 3-5 days.*

**James M Swaray**, MAFFS

*The course was very timely, the presentations very good. The course has learnt me that plants need care like any other living person. In future, I would like the training to lay more emphasis on plant sanitation, especially plant virus infestation.*

**Abu-Bakarr Kamara**, MAFFS Kambia

*The forum for discussion given to everybody the facility to express himself was very cordial. Posters displayed pictures exactly as you find them in the field. Gender equality was lacking, no female participants. In future, more work to be done in the field than in the classroom. The abiotic/biotic/don't know is still not clear to me. The overall training was good and very educational.*

**James D Spencer**, MAFFS Freetown

## Field visits

### *Koinadugu District: Kabala*

On the road to the town of Kabala in the NE of the country, we pass through Lengekoro where the RUF dug deep trenches in the road to prevent government vehicles from entering. This area, Koinadugu, was an RUF stronghold and is one of the poorest areas in Sierra Leone (FAO).



**Abdul MA Sanu, Deputy Director of MAFFS Kabala**

We arrange to meet Mr Abdul MA Sanu, Deputy Director of MAFFS Kabala regional office.

Vegetable production in this area includes: cabbage, cauliflower, aubergine, carrot, sweet pepper, maize, lettuce, cucumber. Caterpillars are the main problem and the lack of pesticides – due to both availability and cost – means that there is much reliance on traditional remedies (see box below). Cuprous oxide is available as a fungicide; the dose used is 50g per 50 litres of water. This would cost US\$1 for 50g, enough for one application to treat only 100m<sup>2</sup>.



**Diamondback moth caterpillars cause major damage to leafy Brassica crops**

### **TRADITIONAL REMEDIES FOR CATERPILLARS**

Kerosene, 1 cup

Soap powder

Tobacco leaves, 1 cup

Hot chilli fruits, 1 cup

Mix ingredients into a paste

Add 2 gallons water

Spray on to crops as a repellent against foliage-eating caterpillars. This mixture apparently works against monophagous pests such as diamondback moth (DBM), i.e. those pests whose food source is plants of one type or group, in the case of DBM, these are Cruciferous species such as cabbage, cauliflower, broccoli etc. Polyphagous species such as army worm are not affected by it. It has yet to be tested against the cotton stainer bug, another major pest of leafy crops, especially okra.

Other remedies as repellents against caterpillars are wood ash, sprinkled on to the leaves (caterpillars find this unpleasant) and papaya seeds, 0.5kg ground up and added to 1 gal water. Light traps are placed in the crop to attract and drown moths at night. Sugar solution is also sprayed on to the leaves of edible crops such as okra and cassava to attract ants which feed on pest larvae.

### *Farmers' field schools in Sierra Leone*

Farmers' field schools (FFS) were frequently mentioned during my visit and were active in two districts I visited, Koinadugu and Tonkolili. Farmers' field schools run by FAO (Operation Feed the Nation) and NGOs are well established in the country. I met briefly with the national co-ordinator of the FFS, Jackariawo (Jack) Jalloh, who works for MAFFS at Brookfields, Freetown. Lack of time and Freetown traffic on my last day back in the capital prevented me finding out more about the activities of the FFS programme across the country.



**Santigie S Sesay (left) and Alex B Kamara are Community Facilitators for the Kabala FFS; they are also MAFFS employees at the Kabala office. Santigie is head of crop protection and Alex is a field extension worker. Both attended the Plant Doctor training in Makeni.**

Current training in the FFS Kabala focuses on vegetable production and keeping small ruminants. Some traditional methods of information delivery are used, i.e. telling stories, dramatisation and dance.



### **Red ants make the mango harvest painful work**

Fruit fly damage is not the only problem on mango (see later). We saw red ants carrying away a cotton stainer larva for food on a mango tree (above). This seems a good thing, as cotton strainers are a big pest of vegetables, but ants don't take enough of them to have an effect, despite the huge populations of the ants. It's the ants that are the bigger problem for Dominic because they nest high in his mango trees and have a vicious bite, making harvesting a painful process. The ants stream continuously up and down the trunks of the trees. Destroying the nests only means the ants rebuild and are back again next year. The best way to avoid being bitten is to divert their attention: a goat skin or piece of rotten meat is placed at the base of the mango tree to attract the ants. You wait for them to come down from the nest, then strip off your clothes, cover yourself in kerosene, and climb the tree, fast. The ants don't like kerosene.



**DOMINIC IS A SENIOR TEACHER AT KABALA HIGH SCHOOL** and has been farming to feed his family and for extra income since 1978. He now owns 80 acres, which is a lot of land, and besides vegetables grows citrus, mango, avocado and guava.



**Dominic S Mansaray (far left) discusses control of diamond back moth with Santigie Sesay, Head of Crop Protection with MAFFS Kabala**

Dominic is knowledgeable about pest and disease control which, he says, is the least of his problems. His biggest headache is his inability to sell his produce; the markets are there in Freetown, in other towns across Sierra Leone and even in neighbouring countries, but there is no co-ordinated distribution system and too few trucks on the roads to take produce away. Thirty years ago there was a marketing co-operative in the area, he said, but not now. Despite his problems, he has been able to pay for education for his 9 children thanks to horticulture, not teaching. Dominic struck me as a dedicated person who loves farming and, given stability and infrastructure development in Sierra Leone, will be one of those individuals making a big impact on the nation's food security.

### **Dominic's mango problems**



**"Mobile"**

Mango affected by a new species of fruit fly, *Bactrocera invadens*. The problem is called "mobile" because pressing the fruit with your thumb as you would a mobile phone key causes rotten flesh to squirt out, (is that what mobiles in Sierra Leone do?). The only control measure available is to harvest the fruit early, before the pest arrives and attacks.



***Bactrocera invadens* on mango**

This species was described in 2005, is of Asian origin and is spreading rapidly through central Africa. It's causing particular damage on mango but also attacks citrus, papaya, guava, tomato, and probably other hosts, it has a wide host range.

**SORIE SESAY GROWS 3 ACRES OF POTATO IN KUNDAYA VILLAGE, JUST OUTSIDE KABALA.** He has problems with low yield, tuber cracks and rots, and caterpillars. Low yields could be due to late planting and/or poor soil fertility. Tuber cracks may be caused by uneven soil moisture during bulking up (cycles of wet/dry conditions). The cracks allow fungi and bacteria to enter and rot the tubers.



**Citrus problem solved in Koinadugu**



Enquiries from Sierra Leone to the GPC in 2006 highlighted a problem affecting many citrus groves in Koinadugu District. I asked to have a look at the problem although the fruits had been harvested in November/December. There were, however, a few fruits still hanging on the trees and I took some samples back to the GPC.

Black scabs develop on the fruits and the fruits rot inside. The fruit drops prematurely, meaning the growers

have to harvest early, before the fruits are ripe and before significant lesions develop, in order to have any crop at all. Isolations from the scabs at the GPC revealed the presence of the fungus *Phaeoramularia angolensis*, the cause of citrus leaf spot, affecting leaves and fruits. Descriptions of the disease in the literature fit the symptoms. The disease is present in neighbouring Guinea to the north, but has never been recorded from Sierra Leone. The internal fruit rot is not a known

symptom of this disease, although severe cracking of the fruits, as in the picture, may encourage secondary rots. One of the fruits brought back to the GPC also had a fruit fly larva within the rotted flesh; the fruit was also showing scab lesions. The local theory of the cause of the lesions, the rot and the premature drop is that this suite of symptoms is all caused by an insect, as the larvae are frequently found inside the fruits. The fruit flies have been identified by Shamie as *Bactrocera invadens*, the same fruit fly that is causing so much damage on mango.

### *Tonkolili District*

Makeni to Magburaka in Tonkolili District is about 15 miles. The main crops here are paddy and rainfed rice, cassava and maize; there are some vegetables and potato. Between Makeni and Magburaka we stop at a crop multiplication site owned by the Institute of Agricultural Research (IAR), where there's a demonstration of cultural control of grasshoppers in cassava. There are no locusts in Sierra Leone but grasshoppers fill the void and are equally destructive.



**Green grasshoppers devastate cassava near Makeni**



*A 10m weed strip at the edge of the field encourages grasshoppers to breed here, where they can be destroyed, instead of within the crop*



*"Candle wick" stems of cassava. Once they have stripped the leaves, the grasshoppers turn their attention to the stems.*

As we walked through the cassava plots at the site, we disturbed the grasshoppers feeding and the plants came alive, the numbers were enormous although mostly around the edge of the field. This was because a 10m strip of uncultivated land had been left at the field perimeter to encourage weeds on which the grasshoppers lay their eggs. The nymphs emerge and the weeds are cut,

allowed to dry and then burnt to destroy the nymphs. Any adults which make it into the crop can be treated with insecticide (malathion and chlorpyrifos, if available) before numbers build up; if adult numbers become too large, insecticides cannot control them.

Spencer (James Spencer, entomologist and my guide from MAFFS Freetown) said he had tried CABI's biocontrol product Green Muscle (a formulation of the insect-pathogenic fungus *Metarhizium anisopliae*) in the NW and Kenema District for control of adults but claims he sprayed it too late to be effective and will try it again next year, but earlier. It takes longer to act than a pesticide because the fungus has first to infect its host.

At MAFFS Magburaka we meet Alphonsou K Turay, the District Director of Agriculture for Tonkolili District and an ex-Reading University Masters graduate in soil science. Pulling up at the same time as us outside the MAFFS office was a lady in a smart 4X4 who told us she owned a marketing company which last year exported 53 tonnes of fruit, mostly pineapple, to the Emirates, Italy and France. Like Dominic Mansaray whom we met the previous day, she bemoaned the lack of transport for distribution, but also the lack of coolstore facilities, causing her to lose 3 tonnes each year. She said that she knew of a proposal submitted to the UNDP for a centralised distribution facility. Nonetheless, she has had more success than Dominic at marketing her produce. Spencer told me later that the lady we met was none other than Fatou Sankoh, the wife of the dead RUF leader.



#### Magbass Sugar Complex, Tonkolili District

*This Chinese-owned and –operated business, growing and processing sugar cane on 1200 acres, is an important local employer. Mr Huang, the farm manager (far left, wearing my hat) took us to see his most important crop health problems. These were stem borer (top left) and smut (right).*

For sugarcane stem borer (*Chilo* spp.) Spencer recommended the systemic insecticide monocrotophos (also known as azodrin). This is not available in Sierra Leone but could be imported under licence from India. Monocrotophos is an organophosphate insecticide, highly toxic to birds (and humans) and although banned in the US since 1988, it is still manufactured (in India and elsewhere) and registered in some EU countries (e.g. France and Spain). There are integrated control programmes available utilising more benign pesticides, and even transgenic sugarcane against this pest.

Sugarcane smut is caused by the fungus *Ustilago scitaminea* and is spread by wind-borne spores and infected seed. There are resistant varieties available which would need to be tested for suitability in Sierra Leone. Mr Huang was genuinely grateful for the information, which he said he will follow up with MAFFS Magburaka.

## TONKOLILI DISTRICT: *Testing soil for fertility and acidity at Mile 91 Farmer Field School*

Mile 91 is a settlement 91 miles from Freetown. The roads from Magburaka to Mile 91 and onwards to Bo and back to Freetown are rough and slow going. Mile 91 has an important FFS run through FAO. I met up with the Chairlady of the FFS, Haja Ami Nasa Kamara, Andrew S Lahai, the MAFFS supervisor, and Mohammed J Touray, Monitoring and Evaluation Supervisor.

The FFS comprises 23 farmers' associations, each association having 25 members, which is about average for an FFS. Mile 91 FFS also trains farmers who come from other districts.

We crop-walked amongst cassava, sweet potato and okra and I was told the major pests are diamondback moth caterpillars, flea beetles, grasshoppers and lady insect, which I didn't recognise.

The damage to okra from flea beetle was especially severe, which is unfortunate as the leaves are eaten as well as the fruits; the okra also looked stunted and weak and I saw this as a good opportunity to use the portable soil test meter I had brought along. No insecticides are used here, farmers relying on traditional remedies as reported above.



**ABOVE: Andrew Lahai (left) from MAFFS Magburaka and Mohammed Touray of Mile 91 FFS help test soil for fertility and acidity**

**RIGHT: The meter shows a reading of 0.05 mS/cm, almost devoid of nutrients**



I use this portable hand-held meter regularly in the UK as part of my diagnostic work with growers. The meter measures both pH and electroconductivity in the soil. Soils which are too acid or alkaline, measured as pH, provide poor conditions for plant growth. Electroconductivity (EC) is the ability of the soil to conduct electric current, and is related to the amount of soluble ions in the soil – itself an indicator of soluble nutrients available to the plant roots and hence fertility. EC is measured in milliSiemens per centimetre (mS/cm). The meter allows a rapid test for potential soil nutrient deficiency, although it cannot detect which nutrient(s) are deficient, this would require lab analysis.



**Okra with severe flea beetle damage and weak, yellow growth. The soil here is acidic and extremely poor in nutrients and organic matter. Good soil fertility and structure will help plants to resist pests and diseases**

Mohammed J Touray, Monitoring and Evaluation Supervisor with Mile 91 FFS, collected some soil around the roots of cassava growing on one of his farms at Mile 91. The “soil” looked more like sand, devoid of organic matter. We put some soil into a plastic cup and added a small amount of bottled water (1 part soil to 2 parts water), stirred to make a slurry, and then inserted the base of the meter. The readings are instant. The soil pH was 4.75, and the EC 0.05mS/cm. I explained this pH was too acidic for good plant growth, the optimum being 6.2-6.9 for field soil; some plants will tolerate acidic conditions, most will show stunting and yellowing to some degree, some can die. An EC of 0.05 means the soil is almost devoid of nutrients; to support reasonable growth the EC should be around 1.0.

Organic matter can be added from composted plant waste. Organic matter provides soil structure for root penetration and adsorption of nutrients. Nutrients come from fertilizers; oil palm waste appeared to be the most commonly available (but not readily available). Urea is available to larger growers who can afford it.

Mohammed was enthusiastic about his role in the FFS; I would have liked to have spent more time discussing crop improvement, and the challenges he faces, with him.

### ***Bo District: Bo town***

Bo is Sierra Leone’s second largest town and our last stop before returning to Freetown. Apart from the usual cassava and rice, we are now in an area with more crop diversity: plantation crops like cacao, coffee, oil palm; and others, pineapple, groundnut, yam, maize, citrus all apparently exist here. But driving through the countryside I didn’t see much land in cultivation, small pockets, yes, and a fair degree of slash and burn, a worry for the government which discourages this damaging way of agriculture. Part of the problem is that 2 million people were displaced from the countryside during the war, about a third of the population, migrating to urban areas from which many have yet to return. Although conditions in the shanty towns around Freetown are bad, returning to your village and starting again from scratch may seem more formidable.



**Slash and burn shifting agriculture persists despite discouragement from the government**



**Henry Tucker and Ishmail Tarawalie from MAFFS Bo District Agriculture office**



**Filling polythene pots for raising tree cuttings at  
MAFFS Bo**



**Citrus cuttings destined for farmers in Bo District**

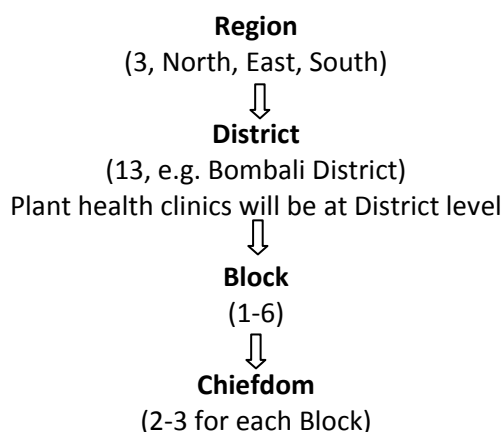
## Sierra Leone's new plant health clinics

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After Eric Boa's visit to Sierra Leone in 2006 and the pilot clinic at Waterloo, near Freetown, a clinic was operated at Makeni by AG Kamara ("AG"), Crop Protection Supervisor Bombali District, MAFFS, Makeni. Dr IMO Shamie, entomologist and senior crop protection officer at MAFFS Freetown, put a proposal to MAFFS in November 2007 to open plant health clinics in each of Sierra Leone's 13 Districts. The proposal was accepted in February 2008, funded by Le 240M, or US\$80,000 for the first year.

At the time of this report, clinics have been opened in Bombali, Kambia, Port Loko, Koinadugu and Tonkolili districts. Kono and Kenema will be launched during June, followed by Bo, Pujehun, Bonthe and Moyamba in July and August (see map page7). The consensus at the training course in Makeni was that NGOs are not to be involved in the clinics because "NGOs come and go". In Uganda NGOs are well integrated into the clinics – in fact, the clinics couldn't operate without them.

### *Administrative divisions, Sierra Leone*



### *Publicity for clinics*

Shamie had made arrangements to publicise the clinics and activities of the GPC during my visit:

- I gave an address to MAFFS senior administrators and staff at the Freetown HQ to support their endorsement of the clinics with the funding they awarded to Shamie. I described what the clinics do, how they work, using examples from elsewhere in the world, and some background to CABI and the GPC. The address was well attended and included the Permanent Secretary (Augustine Sahr Sheku) and the Assistant Director General (Emmanuel K Alieu). Questions and comments included possible confusion with the term "plant doctor" taken to mean medical doctor in rural communities (a point raised again in Makeni), and how to mobilise farmers to attend the plant clinics.
- I gave a recorded interview about the clinics after the address in Freetown to Cotton Tree News (journalist Mr Aruna Augustine Kamara, tel 033 501757). CTN is an independent radio production studio based at Fourah Bay College, Mount Aureol, Freetown (<http://www.cottontreenews.org/latest/agriculture-ministry-launched-mobile-plant-clinic-2.html>). It respects the media laws and institutions of Sierra Leone and its news and programmes are not subject to outside control. Directed by Fondation Hironnelle, Media for



Peace and Human Dignity, Cotton Tree News is funded by DFID, the European Commission, Irish Aid and the Swiss Agency for Development and Cooperation.

- I gave another recorded interview to Alfred Thoronka Seneh of Sierra Leone Broadcasting Service Radio & Television, Freetown, whilst in Makeni. The interview was broadcast on 9 April at 1000h on Freetown radio stations SLBS, CTN (Cotton Tree News) and UN Radio. The Deputy Minister for Agriculture had tuned in and alerted Shamie! The interview was also broadcast the same day at 2100h on SLBS television. I was staying at the Hotel 5-10 in Freetown which doesn't have this station, but besides, it competed with the UEFA Cup match Man Utd v Roma...

## HEALTHCARE PROVIDERS

### KEEPING PLANTS AND PEOPLE HEALTHY

#### Plant doctor



*Dr IMO Shamie, Senior Entomologist at MAFFS HQ, Brookfields, Freetown, with one of the megaphones bought for use at the regional plant clinics. Shamie won US\$80,000 funding from MAFFS to open 13 plant clinics serving farmers in each of the 13 Districts in Sierra Leone.*

#### Native human doctor (gone to lunch)



*Mr Alhaji Abu from Guinea holds a clinic for humans outside the gates of the MAFFS HQ in Freetown. Native doctors offer traditional cures for many physical and mental ailments. Perhaps some of the cures work, e.g. wormwood for malaria, but some doctors also have tricks to extract money from the gullible, like concealing maggots between their fingers whilst they investigate your toothache. You are shown the maggots, the "cause" of your toothache, and the doctor has the "medicine".*

## Concluding comments

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Sierra Leone's initiative with plant health clinics is another step on the way to rebuilding agriculture in this country. The following are suggestions how the clinics might be further supported and enhanced.

- **Further training and materials to support the new clinics:**
  - The Ministry of Agriculture, Fisheries & Food Security in Sierra Leone has agreed to fund thirteen plant health clinics to serve the needs of farmers in each district in the country. The clinics' advocate is Dr Shamie, who has "raised the profile of crop protection in the Ministry" according to the MAFFS Assistant DG. To support this initiative by Sierra Leone, the training given in Makeni during this visit was the first of three modules in How to be a Plant Doctor and ended with a request from participants for the other two modules. I would also suggest that training in pest and disease surveillance for phytosanitary purposes, as the GPC did this year in Burundi together with CSL and IITA, would of great benefit (*Surveillance and vigilance for plant diseases*, Eric Boa et al., Bujumburu, Burundi, April 2008; Report available from the GPC).
  - Participants at Makeni called for crop-specific training in plant health in their districts, i.e. training related to the crops growing in each district. Shamie can support this to some degree with the funds for the clinics but there may be scope for help from CABI and the GPC. For example, the production of Fact Sheets for common and important problems such as grasshopper and DB moth control, similar to those produced for Kenya and Uganda (available from the GPC). Fact Sheets would be an addition to the excellent colour posters of crop pests and diseases produced by Shamie for the district clinics; the GPC helped by providing copies of A3 colour posters, and A4 versions and folders for use at the clinics.
  - Pesticides safety and legislation: this is something for MAFFS to consider, but again, CABI and its partners could offer help if required.
  - Portable soil testing meters: participants asked if we could provide a meter for each district clinic, i.e. 13 meters. Meters would be most useful for farm visits, although there is no reason why farmers cannot be trained to bring soil along to the clinics. Each meter costs around US\$250.
  - At the time of my visit, Shamie was about to submit a proposal to FAO for capacity building to support the new clinics, specifically to establish local labs in the districts to assist clinic staff in diagnosis. Not everything can be diagnosed in the field and support labs are an essential part of a plant health service. Shamie would like to see labs equipped with basic equipment: e.g. microscopes, Petri dishes, media for culturing. Existing staff would need training. CABI could help with training as subcontractors if the FAO proposal is accepted.
  - My guide, Henry Spencer of MAFFS, said that labs with potential diagnostic capacity exist at Njala in central SL, Moyamba Province (Njala University? IAR?) and the University of Freetown, but MAFFS have no arrangement to use them, nor an awareness of what they might offer. MAFFS might explore these links but scope for

usage would be limited by poor communications (roads, lack of a postal service, no internet access and often no computers in district offices).

- **Potential for plant health clinics to work with FFS:**

- Sierra Leoneans are calling for help to rebuild their country. Help should be targeted and co-ordinated for maximum effect. Farmers' field schools run by FAO (Operation Feed the Nation) and NGOs are well established in the country, and the FAO's Kevin Gallagher has just taken up post in Freetown as FAO Representative. By 2007, some 1465 FFS had been established in the country, 981 through the government (FAO TCP, UNDP and some German government funding) and 484 through NGOs (many funded through USAID. *Source: Evaluation of FAO Co-operation in Sierra Leone 2001-2006, Final Report, Rome April 2007*). FAO is about to step up its FFS programme.
- Agricultural research in Sierra Leone has just undergone a re-organisation with the creation of a new R&D co-ordinating body, SLARI (replacing NARCC), and its two top posts have recently been advertised. The timing is right for the newly-launched clinics to join with the FFS to deliver training and advice across the country to farmers and their advisers.
- Participants at the Makeni training told me that *plant protection has not been a formal part of FFS* to date (and confirmed to me by Jack Jalloh, MAFFS national coordinator for the FFS), rather it is done in passing as and when the need arises. The range and severity of plant health problems, e.g. grasshopper and caterpillar control, suggests an urgent need to rectify this and strengthens the case for the clinics to combine forces with the FFS.

- **Potential for crop yield improvement:**

- My impression on farm visits, and particularly at Mile 91, was that crops are not reaching anything near their potential in terms of yield or pest and disease control, and crop losses must therefore be large. Knowing what the problems are and how to rectify them are half the battle. Obtaining the inputs needed is not easy in this country, still rebuilding after the war. In the current situation in Sierra Leone it is difficult to make significant improvements if fertilisers and insecticides are not readily available and/or too expensive (look at the comment made by Henry Kargbo, MAFFS Makeni District Director, as part of the Plant Doctor Course participants' profile on page 16). An FAO report in 2007 stated that Sierra Leone soils are of widespread low fertility and therefore need fertilizer application. Although farmers have adopted many new practices as a result of FFS, the most common new practice *not* adopted is fertilizer use, and lack of cash and unavailability were cited as the reasons for this (*Evaluation of FAO Cooperation in Sierra Leone 2001-2006, Final Report, Rome April 2007*).
- Traditional methods of crop pest control are commonly used. Have these methods been rigorously examined? Insecticides can be a valuable tool in pest control if used sensibly (and of course if available). The new district plant clinics, working together with FFS, can help answer questions about choice of pest control.
- Postharvest losses are large (estimated up to 40%) and the potential for sale of excess produce limited by the lack of coolstores, distribution transport and poor roads. There is apparently a proposal to UNDP for a centralised distribution facility.



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