Nicaragua
Puesto para Plantas

RESULTS AND LESSONS LEARNED
2005 – 2007

NICARAGUA
Public Plant Health Services for All

Edited by Solveig Danielsen and Margarita Fernández

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Plant Clinics • Plant Healthcare and Diagnostic Network
Global Plant Clinic

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Organisations operating the first thirteen Plant Clinics in Nicaragua

INSFOP *Estelí* • ASOPASN *San Nicolás* • CCAJ *Jalapa* • Cooperativa Santiago *El Jícaro* • UNAG *San Juan del Río Coco* • Cooperativa 20 de Abril *Quilalí* Cooperativa Flor de Café *Murra* • INTA, MAGFOR , ASODEL *Somotillo* • CETA *El Sauce* • INTA *Masaya* • INTA *Ticuantepe* • INTA, EIAG *Rivas* • INTA, ITA *Juigalpa*

Institutions collaborating with or member of the Plant Healthcare and Diagnostic Network

PROMIPAC • FUNICA • UCATSE • DGPSA-MAGFOR • FAREM • ADRA
UNA • UNAN León • INTA • INATEC • EIAG • OIRSA • GPC

Cover

What's the matter with my crop? What can I do to cure it? These are the questions most frequently asked by farmers, men and women alike, who visit the Plant Clinics which offer basic plant healthcare. The Plant Clinics along with the Plant Healthcare and Diagnostic Network are part of Nicaragua's National Plant Protection System.

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Preface

The Plant Clinics and the Plant Healthcare and Diagnostic Network were born in 2005, and have generated great changes in the way local extensionists and specialists work. Today the results are clear: better health care services are being provided to more farmers and better use is being made of existing capacities.

Many actors from local organisations and specialist institutions have accepted the challenge of experimenting, learning and working hard to establish reliable, quality services for farm families. Their main motivation has been to expand the scope of their work and serve more farmers, especially those without access to services and projects.

After almost three years of experience and learning in the field it is time to reflect on what has been done. What are the main achievements and difficulties? What do Plant Clinics mean to local organisations? What crucial points make the system work? What does this change in approach imply for the strategies of public institutions and agricultural policies? Which issues of institutionalisation and sustainability should we begin to tackle? What are the next steps to build a National Plant Protection System?

Nicaragua continues to be a pioneer in the search for new ways of linking extension and research to rural areas through organisational innovations.

We hope that this self-evaluation will inspire others and provide guidelines to keep strengthening public agricultural services for the good of Nicaraguan farmers, both men and women, and for the development of the country.

PUESTOS PARA PLANTAS • PLANT HEALTHCARE AND DIAGNOSTIC NETWORK

Managua, Nicaragua. February 2008

ENGLISH EDITION

Preface

Nicaragua is important in the development of public plant health services. Although plant clinics were operating in several countries before, the experiences and results here have inspired many others to start their own schemes and to improve the way clinics are run.

The kind assistance of Iván Jerez of PASA II and translation efforts of David Trauman and Jeffery Bentley have now made it possible to read about the Nicaragua story in English.

At first sight an evaluation of work done by those who did it – the plant doctors and members of the Plant Healthcare and Diagnostic Network – might be unlikely to reveal critical insights. Yet this report shows that people can celebrate success and be aware of their shortcomings. Perhaps it is not so remarkable to trust people to be honest about what they do, though it takes courage to write it down. I hope you enjoy reading this as much as I did.

A common thread is that everyone wants to do better. Government and institutional policies do not always favour steady progress yet the stories and facts in this report are a permanent record of what has been achieved for many farmers in a short time. I hope these achievements continue to be an inspiration for Nicaragua as well as other countries.

ERIC BOA, GLOBAL PLANT CLINIC

Egham, UK January 2009

Abbreviations

ADRA	Adventist Development and Relief Agency
APLARI	Association of Plantain Farmers
APPRUDAS	Association of Smallholder Farmers United for the Development of Sustainable Agriculture
APRENIC	Association of Ecological Farmers of Nicaragua
APROFOSC	Santa Clara Association of Forest Owners
APS	American Phytopathological Society
ASODEL	Association for Local Development
ASOJPAMS	Association of Young Environmentalist Farmers (Las Sabanas)
ASOPASN	San Nicolás Agricultural Program Association
ASPS II	Agricultural Sector Programme Support, Phase II – Danida (Danish cooperation)
CATIE	Tropical Agriculture Research and Education Centre
CCAJ	Central Multiple Services Cooperative of Active Smallholders (Jalapa)
CETA	Agriculture and Livestock Vocational Education Centre
CIAL	Local agriculture research committee
CIPROV	Plant Protection Research Centre
CNEA	National Commission for Agricultural Education
CNU	National Council of Universities
COOPACRESER	Agricultural Credit and Services Cooperative
CURN	Regional North Nicaragua University Centre, Estelí (now FAREM)
DFID	UK Department for International Development
DGPSA	General Directorate for Agricultural and Livestock Health and Protection
DMT	Technology Markets Development
EIAG	International Agriculture and Livestock School
FAITAN	Nicaraguan Fund to Support Technological Research in Agriculture, Livestock and Forestry
FAREM	Regional Multidisciplinary School, UNAN Managua, Estelí campus, (previously CURN)
FAT	Technical Assistance Fund
FFS	Farmer field school
FODA	Odorico D'Andrea Foundation
FUNICA	Nicaraguan Foundation for Technological Development in Agriculture, Livestock and Forestry
GPC	Global Plant Clinic
ICIDRI	Institute for Training and Research in Integral Rural Development
IFAD	International Fund for Agricultural Development
INATEC	National Technological Institute
INPRHU	Human Promotion Institute
INSFOP	Institute for Continuing Education
INTA	Nicaraguan Agricultural Technology Institute
INTECFOR	Technical Forestry Institute
IPM	Integrated pest management
ITA	Technical Agricultural and Livestock Institute
MAGFOR	Ministry of Agriculture, Livestock and Forestry
MINSA	Ministry of Health
NGO	Non-governmental organisation
OIRSA	International Regional Plant and Animal Health Organisation
PAC	People in Community Action
PROCOA	Farmers and Traders in Agricultural Products
PROMIPAC	Central American Integrated Pest Management Program
RAAN	North Atlantic Autonomous Region
SDC	Swiss Development Cooperation
SOPROCOM	Society of Farmers and Traders
SPSS	Statistical Package for the Social Sciences
UCAN	Autonomous Christian University of Nicaragua
UCATSE	Catholic University of the Dry Tropics
UCOSEMUN	Northern Nicaraguan Federation of Multiple Services Cooperatives
UNA	National Agrarian University
UNAG	National Union of Farmers and Cattle Ranchers
UNAN León	National Autonomous University of Nicaragua León
UNICAM	Campesino University
UPOLI	Polytechnic University of Nicaragua
URACCAN	University of the Autonomous Regions of the Caribbean Coast of Nicaragua

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1 Summary

In early 2005, the Nicaraguan Foundation for Technological Development in Agriculture, Livestock and Forestry (FUNICA) began a pilot service in collaboration with the Global Plant Clinic (GPC), the Central American Integrated Pest Management Program (PROMIPAC), the National Commission for Agricultural Education (CNEA) and local organisations in Las Segovias, northern Nicaragua, to find a new answer to an old problem: how to improve farmers' access to adequate and timely information and advisory services for plant health.

Four Plant Clinics[1] were established as a new type of farmer-friendly public service. A short time later, CNEA and PROMIPAC, along with FUNICA and DGPSA-MAGFOR (General Directorate for Agricultural and Livestock Health and Protection, Ministry of Agriculture, Livestock and Forestry) took the lead to establish the *Diagnostic Network* (now the *Plant Healthcare and Diagnostic Network*), realizing that the Plant Clinics need backstopping from specialists in order to provide correct diagnoses and seek accurate control options.

In just 32 months, the pilot experience has produced many results. At the end of 2007 there are 18 Plant Clinics managed by farmers' organisations, NGOs and INTA (Nicaraguan Agricultural Technology Institute) in five regions of the country, and some 14 new clinics being planned. The extensionists ('plant doctors') have responded to over 2,000 queries in more than 100 crops. New diseases have been discovered; diagnostic laboratories are used more, and there is a database of the queries containing valuable information for making strategic decisions.

There is a high degree of satisfaction among clients, who appreciate the service provided and the advice they receive. The plant doctors have improved their overall performance and now have more confidence when making a diagnosis. They have learned to listen more to farmers and seek appropriate solutions with them. Better diagnoses of problems have also led to a reduction in the irrational use of pesticides.

Several plant doctors have created synergy between the Plant Clinics and the farmer field schools (FFS), the local agriculture research committees (CIAL) and other extension methods such as farmer-to-farmer. Some Plant Clinics have linked up with Plant Pharmacies (*Botiquines Agrícolas*) and Technology Markets Development (DMT), two initiatives by PROMIPAC and FUNICA, respectively, intended to increase access by smallholder farmers to good technologies.

The Plant Clinics have made it possible to create new links between farmers, extension and researchers. The Network institutions have a new mechanism to identify demand for technology, research and training.

What began as a small pilot in Las Segovias (a region of northern Nicaragua) soon became a nationwide initiative. The Plant Clinics came to fill an important gap in services to farmers, and many local organisations and network institutions see them as a good opportunity to reach more farmers with better services. The Plant Clinics turned out to be the 'missing link' between farm families, extensionists and specialists.

[1] *Puestos para Plantas* in Spanish

The Plant Clinics and the Plant Healthcare and Diagnostic Network led to a new approach to plant protection, based on a *public health service for plants*. This shift in approach encouraged new thinking, as a 'system' in which the different actors involved in plant protection (plant health surveillance, quarantine, pesticide and seed regulation, research, education, extension, input markets) organise themselves to complement each other and take better advantage of capacities and resources, which in many cases already exist but are underused.

The 'public service' and 'systems' approach has been a great challenge for all the actors. It requires flexibility, new ways of working, communicating and organising. However, institutions and organisations are often not prepared to take on new tasks and styles of work. The initiative still depends very much on the performance and enthusiasm of individuals, not institutions.

Many people are overworked. There is much dependence on projects to cover salaries, and drastic changes in the priorities of public institutions are common. General problems with communication and coordination, and the lack of ownership by many decision-makers, limit network actors and hamper implementation.

The fact that the system has grown from the bottom-up is both its strength and its weakness. The strength is that the initiative has grown organically, little by little from the grassroots in response to an emerging demand from clients, plant doctors and network actors. The weakness is that persons and institutions are not always in a position that allows them to change the attitudes, habits, style and priorities of their work.

The approval of the National Initiative in June of 2007 is an important step toward the maturing of the system and signifies a greater commitment by key institutions. The next step is to consolidate and institutionalise the Plant Clinics and The Plant Healthcare and Diagnostic Network through support policies, clear agreements and commitments between actors, and by including their activities in institutional work plans. This will create the conditions needed to solve the problems identified, learn from successes and mistakes and inspire others. But more than this, the attitude and will of each individual and the commitment of the organisations is what will ultimately lay the foundation for strengthening the system.

Discussions will begin in 2008 regarding payment for services, the certification and accreditation of plant doctors, impact assessment and creating national policies and strategies for the integration and sustainability of the system. These discussions will be a crosscutting priority for the entire 2008-2009 period.

This report presents the results of a self-evaluation made by a diverse team of actors of the Plant Clinics and Plant Healthcare Network. The self-evaluation covers the period from March 2005 to November 2007, and documents results and experiences, identifies the main achievements, difficulties, keys to success and defines guidelines to consolidate the National Plant Protection System in Nicaragua.

2 Introduction

Farm support services are indispensable for a healthy and productive agriculture to meet the demands of national and international markets. The productivity and safety of products depend in large measure on adequate and sensible plant health management. Therefore, timely access by farmers to information and advice for pest and disease diagnoses and management is a permanent necessity.

Despite several decades of intensive work on plant protection in Nicaragua, with large-scale surveillance, research, education and extension programs, the plant health services available to farmers continue to be limited. All too often, agrochemical dealers are the only advisors available. Many pests and diseases are managed by trial and error, without knowing the cause of the problem. The result is an inadequate use of pesticides, higher production costs and harvest losses.

In early 2005, FUNICA (Nicaraguan Foundation for Technological Development in Agriculture, Livestock and Forestry) began a pilot in collaboration with the GPC (Global Plant Clinic), PROMIPAC (Central American Integrated Pest Management Program), local organisations in Las Segovias, northern Nicaragua[2] and CNEA (National Commission for Agricultural Education)[3], to give a new answer to an old problem: 'how to improve access by farmers to information and adequate and timely advice about plant health?'

The Plant Clinic is a public service which farm families can access directly.

Four Plant Clinics were established as a new type of farmer-friendly public community service. A short time later, CNEA and PROMIPAC, along with FUNICA and DGPSA-MAGFOR (General Directorate for Agricultural and Livestock Health and Protection, Ministry of Agriculture, Livestock and Forestry) took the lead to establish the Diagnostic Network (now the Plant Healthcare and Diagnostic Network), realizing that the Plant Clinics need backstopping from specialists in order to provide correct diagnoses and seek accurate control options.

The original demand for a new type of 'basic service' for animal and plant health came from farmers who were users of FUNICA's Technical Assistance Fund (FAT) in western Nicaragua. They were pleased with their technological innovation projects, but felt that accessible and timely local advisory services were still lacking. The technological innovation and integrated pest management projects, among others, serve to focus on specific issues at a particular time. However, projects reach relatively few people and do not satisfy the permanent demand for information and advice to tackle plant health problems. The Plant Clinics try to fill that void.

[2] INSFOP (Estelí), ASOPASN (San Nicolás), Cooperativa Santiago (El Jícaro) and CCAJ (Jalapa).
[3] The members of CNEA are as follows: UNA, UCATSE, UNAN León, EIAG Rivas, FAREM and INATEC.

Evolution of the initiative

What began as a small pilot in Las Segovias soon became a nationwide initiative. The Plant Clinics came to fill an important gap in services to farmers, and many local organisations and network institutions came to see them as a good opportunity to reach more farmers with better services. The Plant Clinics turned out to be the 'missing link' between farm families, extensionists and specialists. The initiative developed in four stages during 2005 – 2007, with growing coverage (Figure 2.1).

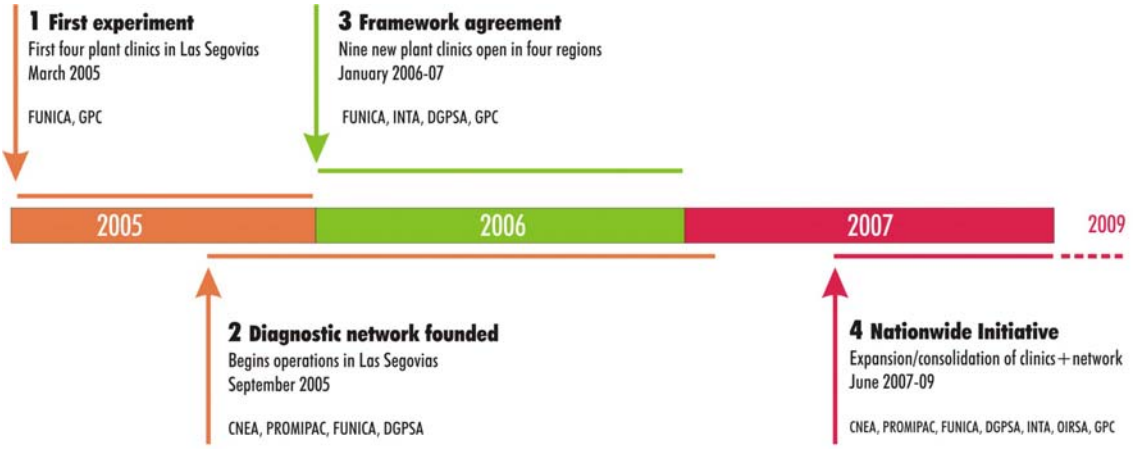


Figure 2.1. Timeline for development of Plant Clinics and the Plant Healthcare and Diagnostic Network, 2005-2007

PHASE 1 – THE FIRST EXPERIMENT

Pilot ➢ "Plant Clinics – strengthening basic services in Las Segovias"
Period ➢ March – November 2005. Partners: FUNICA, Global Plant Clinic

The first four Plant Clinics were established in San Nicolás, Estelí, Jalapa and El Jícaro. There was no formal support network. Collaboration started with PROMIPAC, UCATSE, DGPSA Estelí and FAREM Estelí to support the initiative.

PHASE 2 - BUILDING THE NETWORK

Project ➢ "Diagnostic Network to Support and Strengthen Community Plant Health Clinic Initiatives"
Period ➢ September 2005 – April 2007. *Partners*: CNEA, PROMIPAC, FUNICA, DGPSA

The Diagnostic Network was founded in September 2005 and began operations in Las Segovias to backstop the first four Plant Clinics under the coordination of UCATSE (Catholic University of the Dry Tropics). Later, support was extended to new clinics in Las Segovias established under the Framework Agreement.

PHASE 3: THE FRAMEWORK AGREEMENT

Initiative ➢ "Support to the National Plant Protection System"
Period ➢ March 2006 – December 2007. *Partners*: FUNICA, INTA, DGPSA, GPC

Nine Plant Clinics were established in Quilalí, San Juan del Río Coco, El Sauce, Somotillo, Masaya, Ticuantepe, Murra, Juigalpa and San Juan del Sur. The Diagnostic Network expanded its activities to the Western, Pacific and South-Central regions of Nicaragua in support of the

new clinics. UNAN León (National Autonomous University of Nicaragua León) coordinates the Network in the West. INTA (Nicaraguan Agricultural Technology Institute) coordinates it in the Pacific and South Central regions. The Framework Agreement was reached between partners of ASPS II (Agricultural Sector Program Support II, Danida) to give continuity to the good initial results, ensure the Global Plant Clinic's involvement for another two years, and to improve connections between actors in plant protection. The Framework Agreement started the thinking of the provision of plant health services as a 'system.'

PHASE 4: NATIONAL INITIATIVE

Initiative ➢ "Support to the National Plant Protection System in Nicaragua by Strengthening the Plant Clinics and Consolidating the Plant Healthcare and Diagnostic Network"
Period ➢ June 2007-June 2009. *Partners*: CNEA, PROMIPAC, FUNICA, DGPSA, INTA, OIRSA.

In 2007 new Plant Clinics emerged on their own initiative. The National Initiative plans to support these and other new clinics. It intends to consolidate and strengthen the Network throughout the country, based on existing structures. The Network changed its name to 'Plant Healthcare and Diagnostic Network.' INTA formally joined the Network.

From the start, the initiative developed from the bottom up with a spirit of collaboration and willingness to join forces, share the scarce resources which each actor had and get the most out of them. When the Framework Agreement started in early 2006, seven Plant Clinics were meant to be supported. However, the demand for new clinics was much greater than anticipated, and by late 2007, thirteen clinics had received start-up support, and a large group of new plant doctors were included in the training (Annex 3).

The 'systems' approach to plant protection

The Plant Clinics and the Diagnostic Network gave rise to a new approach to plant protection, a 'public health service for plants.' The Plant Clinic fulfils the same role as a community health centre. It is a simple service for primary healthcare, the first point of contact between the patient and the doctor.

The emergence of Plant Clinics showed that a simple 'community service' approach can generate vital links between expert institutions and rural areas, and give an immediate answer to demands raised by farmers.

This shift in approach encouraged new thinking about a 'system' where the different actors involved in plant protection (vigilance, quarantine, pesticide and seed regulation, research, education, extension, input markets) seek to organize themselves to complement their efforts and take greater advantage of capacities and resources which already exist but which are often underused (Table 2.1).

The 'system' has been developing in an empirical manner through 'learning-by-doing.' However, the following remains to be analysed and defined: What does it mean to work as a system? What does it imply for each member and the way in which they interrelate? How can the performance of the system be measured? With this new thinking Nicaragua has set itself a challenging and novel goal.

Table 2.1 Components of a 'National Plant Protection System' in Nicaragua

Pillars	Actors
SURVEILLANCE, QUARANTINE AND REGULATION	DGPSA-MAGFOR, OIRSA
RESEARCH AND VALIDATION	Universities, INTA, international institutions, NGOs, private companies
EDUCATION	Universities, vocational schools (INATEC)
EXTENSION	Farmer organisations, INTA, NGOs, universities, private companies
LABORATORY SERVICES	DGPSA-MAGFOR, universities, INATEC, Zamorano, Global Plant Clinic
INPUT PROVIDERS	Private companies, INTA, universities, NGOs
FACILITATORS	FUNICA, PROMIPAC and others

Report objective and organisation

The approval of the National Initiative in June 2007 marks an important moment in the expansion and consolidation of the pilot that began in 2005. The end of the Framework Agreement in late 2007 is an ideal opportunity to evaluate and reflect on what was done to develop a new type of local service backstopped by a network of specialist institutions.[4]

This report summarises the results from 2005-2007. It is a critical analysis and reflection on how the Plant Clinics and the Network operate, their achievements and difficulties, and finally some guidelines on how to strengthen Nicaragua's future plant protection system. The report is a kind of self-evaluation since it was written by and with the actors who nurtured the initiative. The first step of the self-evaluation was a planning workshop in September 2007 where participants defined the following objective:

> *To evaluate those results and experiences the Plant Clinics and the Plant Healthcare and Diagnostic Network[5] which contribute to defining strategies to strengthen the National Plant Protection System.*

Chapter 3 describes the methodology employed for the survey, as well as data and information analyses. Chapters 4 and 6 describe the activities and performance of the Plant Clinics. Chapters 7 and 8 analyse how the Network operates, the quality of the services and the value added by the system, and chapters 9 and 10 discuss institutionalisation and sustainability.

[4] Many of the results and experiences of the Plant Clinics and Network have already been published (Annex 5).

[5] In this report the term Network is a shortened version of the new name, "Plant Healthcare and Diagnostic Network".

3 Evaluation methods

All the collaborators from the Plant Clinics and the Network were invited to participate in the self-evaluation and to define a methodology to ensure that the various actors in the initiative had a chance to express their opinion. At a planning workshop in September 2007, attended by fifteen persons, we set the guidelines for a simple, practical methodology for gathering the necessary information. We tested the tools (Table 3.1) and then made some changes to improve the methods.

Table 3.1 Summary of tools used in the self-evaluation

Tool	Type of information gathered
Survey with clients	Directed to clinic clients to understand their opinion of the service. Data analysed with SPSS (a statistical program).
Monitoring form	For plant doctors and their organisations to follow up on the clinic's work.
Semi-structured interview with plant doctors	Open-ended questions on issues of personal motivation and meaning, relations and synergy with other clinics and the Network, assessment of training and materials, achievements and difficulties, recommendations, keys to success and visions for the future.
Semi-structured interview with supervisors of plant doctors	Open-ended questions on original motivation, relations and synergy with other clinics and the Network, achievements and difficulties, recommendations, keys to success and visions for the future.
Semi-structured interview with direct actors and decision-makers of Network institutions	Open-ended questions on original motivation, relations and synergy with other clinics and the Network, achievements and difficulties, recommendations for the national program and visions for the future.
Narratives	Written by plant doctors and direct actors in the Network, on issues arising from cases seen at the clinics, perspectives and personal experiences.
Direct observation	A qualitative view of the social environment observed during the visits.
Data base	Collection and analysis of the data gathered by the clinics. Number of queries, crops, pests, diseases and recommendations made. Data analysed with SPSS.
Workshop to return the results	Presentation of results and findings of the study and feedback from actors from the clinics and Network. Twenty-two representatives from all regions participated.

We formed a team of sixteen evaluators (Annex 2), with representatives from Las Segovias, Western Nicaragua and Managua. Of the 13 Plant Clinics supported by the Framework Agreement, we were able to visit ten *in situ*, and their organisation[6]. We interviewed **70 people**: 18 plant doctors, 21 supervisors of plant doctor, 23 direct actors of the Network, seven senior Network authorities and one external authority (Annex 1). The plant doctors of Quilalí, San Juan del Río Coco, Jalapa and El Jícaro interviewed 25 farmers.

[6] San Nicolás, San Juan del Río Coco, El Jícaro, Jalapa, Quilalí, Murra, Somotillo, Masaya, Juigalpa and Estelí.

4 Plant Clinics in action

A public service. A Plant Clinic is a public service designed to deliver information and advice to farmers about the diagnosis and management of pests and diseases. It is a health service like a health centre for humans. Any person can come to a Plant Clinic. It is an open service, not an exclusive event limited to a few people in one community. The advantage of the service is that it is based largely on existing human resources, structures and experiences.

Expansion of Plant Clinics. The first four Plant Clinics were created in 2005. Today there are eighteen in five regions of Nicaragua and fourteen more are being planned (Tables 4.1 and 4.2). The demand to establish new Plant Clinics emerged both from motivation by Network members (INTA, FUNICA, PROMIPAC, UCATSE, UNAN León) and by local initiative. In all cases there was a recognition of the scarcity of plant health services accessible to farmers. Most of the people interviewed said they liked the idea because it gave them an opportunity to reach more farmers with an important service, and to complement other activities carried out by the organisation, while improving knowledge and gathering new demand. Norwin Flores of INTA Juigalpa explained: "*I learned about this from Lino Castro (INTA Juigalpa), and I liked the idea. One discovers that there is a long ways to go to respond to farmers' problems.*"

Table 4.1 Existing and planned Plant Clinics in Nicaragua

Clinic Location	Organisation	Region
began in 2005		
Estelí	INSFOP – UNICAM	LS
San Nicolás	ASOPASN	LS
El Jícaro	Coop. Santiago	LS
Jalapa	CCAJ	LS
began in 2006		
Quilalí	Coop. 20 de Abril	LS
San Juan del Río Coco	UNAG	LS
Somotillo	INTA, ASODEL, MAGFOR	WN
El Sauce	CETA	WN
Masaya	INTA	SP
Ticuantepe	INTA	SP
began in 2007		
Murra	Coop. Flor de Café	LS
San Juan del Sur	EIAG, INTA	SP
Juigalpa	INTA, ITA	SC
Mozonte	PROCOA	LS
San Rafael del Norte*	FODA	NC
Cusmapa*	INSFOP – UNICAM	LS
Las Sabanas*	ASOJPAMS	LS
León*	UCAN, MAGFOR	WN

Clinic Location	Organisation	Region
scheduled to begin in 2008		
San Rafael del Norte 2	FODA	NC
Santa Lucía 1	UNAG	SC
Santa Lucía 2	COOPACRESER	SC
Jinotega	Coop. Chagüite Grande	NC
Concordia	SOPROCOM	NC
Camoapa	UNA Camoapa	SC
Ometepe	APLARI	SP
Niquinohomo	APPRUDAS	SP
León 2	APRENIC	WN
El Viejo	Coop. El Progreso	WN
Quezalguaque	UNAG	WN
Villanueva	ASODEL	WN
San Lucas	INPRHU	LS
Totogalpa	ADRA	LS

LS – Las Segovias; **WN** – Western Nicaragua; **SP** – South Pacific Coast; **SC** – South-Central Nicaragua; **NC** – North-Central Nicaragua.

* Scheduled to begin soon.

** Information gathered at the course for new plant doctors, June 2007. Needs to be updated and verified.

Modus operandi. The staff that operate the Plant Clinics receive samples of sick plants from farmers, diagnose the problem and give a written recommendation, that is, a 'prescription', sometimes accompanied by a fact sheet with a simple, practical recommendation (Annex 4). They work like 'plant doctors'. If the problem is not solved then and there, they send the sample to a laboratory for further analysis. When the clinic staff receive the results from the laboratory, they discuss them with the client. Most problems are resolved without sending samples to the laboratory. It is a simple tactic, based on links between services that already exist.

Table 4.2 Existing and planned Plant Clinics

Region	Existing	Planned	Total
Las Segovias	10	2	12
West	3	4	7
South Pacific	3	2	5
South Central	1	3	4
North Central	1	3	4
Total	**18**	**14**	**32**

Working hours. Most Plant Clinics are only formally open one day a week (Annex 7). However, if a client comes on a day the clinic is not working, several of them have a system for receiving samples and analysing them later, for instance in Jalapa, San Nicolás, El Jícaro and Quilalí. In Estelí most clients know that they can find the plant doctor, Yamileth Calderón, at the INSFOP office outside of Plant Clinic hours.

Records. The plant doctors write down the information from each visit in a logbook, including the date, name of the client, the plant problem, general information on the crop and the recommendation made. This data is entered into an Excel file (see section 7.5). Once a month every Plant Clinic sends its updated file to the UCATSE Plant Protection Research Centre (CIPROV) or to UNAN León. From there the data is entered to a central database at UCATSE.

Quilalí: An open and flexible space for spontaneous exchanges

The Plant Clinic in Quilalí is ideally located for attention to the public, at the entrance to the *20 April Cooperative*. Many farmers come in to negotiate loans or make purchases, and take advantage of the clinic's services to ask the plant doctors questions about their crops. The clinic draws people's attention, and spontaneous discussions often spring up between clients and curious bystanders. Such conversations are invaluable for understanding more about farmers' knowledge and perceptions.

Above, left: A farmer has come in to discuss a leaf-miner problem in his citrus grove. **Above, right:** Minutes later, four more farmers had stopped to listen, and each gave an opinion of the problem and how to handle it.

A space to exchange, learn and capture demand. The Plant Clinics create a space to provide plant healthcare, normally at the entrance to an organisation or a market. A simple table displaying photographs, literature and plant samples captures the eye and stimulates discussion. This also creates a community space for spontaneous discussions and exchanges, not only between the plant doctor and the client, but also among the farmers themselves. These discussions help the plant doctors learn more about the farmer's practices, perceptions and knowledge, while helping farmers learn from each other.

Masaya: Help from the public

A young man, ELISEO QUINTANILLA, came to the Plant Clinic at the Masaya Market with some grape leaves with symptoms of necrosis. Upon examining the leaves, the plant doctor quickly saw that it was caused by a fungus and linked to excessive rainfall. They discussed the feasibility of different control measures.

A man who was listening to the conversation, EMILIO MOLINA, said it was important to prune grapevines right to keep them healthy. He explained to Eliseo how to do the pruning. Don Emilio has some experience with grapes, though it is not a traditional crop in the Southern Pacific region. He had learned from other grape-growers, and took several courses on fruit-growing at INTA in Campos Azules. *"With good care of grapes, you get a good harvest",* he said.

Conversations with clients reveal valuable information for making decisions and designing extension messages. Farmers know some pests and diseases well, for example coffee berry borer and rust, or fall armyworm in maize and whitefly, but there is misunderstanding about natural enemies, virus diseases, how to manage wilt and the importance of prevention.

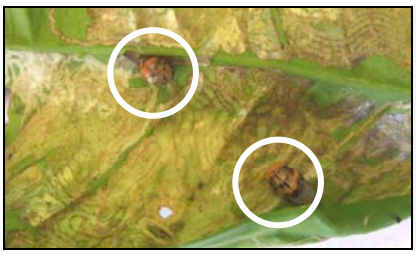
All this information helps identify a diverse demand for information and advice, and guides plant doctors as they design their extension messages.

Publicity to create demand. All the plant doctors say that building up a clientele has been or still is a challenge. It is also difficult to educate people to bring in a sample of the diseased plant. The Plant Clinics that have a good clientele are the ones that have been open the longest and have developed a diversified publicity system (Table 4.3). Even when there is a good publicity system in place, there is no guarantee that clients will show up. As Bayardo of

"One day a man came to the cooperative to ask where they sold chemicals. I asked why he needed chemicals, and he told me it was for citrus leprosis. He had listened to the cooperative's radio program, where we talked about leprosis. Then he took a piece of wood from his back pocket and said his citrus trees had leprosis. I could tell he had misunderstood the message. I showed him pictures of leprosis symptoms, and explained how he could manage it by pruning and applying acaricides (to kill mites). He went away pleased."

Dimas Sarantes
SANTIAGO COOPERATIVE, El Jícaro

San Nicolás explains: *"For a farmer it's hard to miss a day's work in the field just to come to the Clinic."* Juan Carlos Castro of San Juan de Río Coco agrees: *"For a farmer, a minute on the farm is gold."*



There is much misunderstanding about natural enemies, but farmers know well the symptoms and management of the coffee berry borer.

A public service cannot function if it is invisible. It must have at least a sign or some other way of indicating that a service is being offered and what it consists of. This is fundamental. The Plant Clinics that operate in their organisation's headquarters, such as in Jalapa, San Juan de Río Coco, El Jícaro and Quilalí, can advertise permanently with banners, signs or posters. They should take more advantage of this opportunity.

Mobile Plant Clinics that function far from their organisation, such as in Masaya, Juigalpa, Estelí, Somotillo, El Sauce, Murra and San Juan del Sur do not have that possibility.

Some clinics are very active and creative with their method of publicity. Ronald Torres and Julio Galo of INTA Somotillo go to the market themselves and distribute fact sheets to the public.

Table 4.3 Types of publicity used at ten Plant Clinics

Publicity	# clinics
Banner and mural at the clinic on working days	7
Handing out fact sheets	5
Radio	7
Pamphlets	3
Promotion through field visits and other events	7
Mobile clinic (clinic taken to other communities)	3

In El Jícaro they took the Plant Clinic to the town of Siapalí, 10 km from the city. They made publicity on the radio before the event and when they arrived in Siapalí there were 25 clients, samples in hand waiting in line to see the plant doctors. The clinics in Estelí and Juigalpa have made promotional visits, taking a mobile clinic to various places.

Several clinics mention that they do not have sufficient resources to publicise or to have a place that attracts clientele with a banner and a poster with photos. When we asked the clinics "*What are you lacking*?" the reply was always "*More fact sheets, better photos, more materials, etc.*" However, as we have seen in several cases, dedication, motivation and creativity are all essential factors for a clinic to be successful.

Creativity. The plant doctors in Somotillo are very creative and energetic in how they publicise the clinics. The Plant Clinic is open once a week in the local market.

An opinion survey among 25 farmers in Las Segovias showed that more than half had heard of the clinic through the staff of an organisation, and about 22% by means of the

radio. The clients could easily name the organisation the clinic belongs to. This means that the publicity has been effective and that the clinics are seen as a service provided by the organisations.

Almost all the interviewees know well what services are provided. One client said: "*A place for people to learn about the health of their crops".* Another added: *"They describe the problem to you, give you guidance, visit the crop and send samples to the lab.*"

The power of radio. Radio spots have been very effective in attracting new clients. CARLOS PORTILLO (left) of Jalapa, grows valuable ornamental plants. He recently noticed that several plants had died, and he sought help from the Plant Clinic in Jalapa after hearing a promotional spot. Plant doctor Isidro Cáceres, together with the CCAJ president Genaro Paz Quiñones, Flavia Andino and Wilfredo Centeno of UCATSE responded to the query at Mr. Portillo's farm. A laboratory analysis later showed that the problem was due to bacterial wilt caused by *Ralstonia*.

There is a generalised perception that more can and should be done to promote the Plant Clinics, to create demand and position the actors involved, both at the clinics and the Network. If the public does not know of the existence and the benefits of a service, it is as though it does not exist. The publicity must be permanent and renewed frequently. It is also obvious that this requires financing. So far promotion has been done with few resources, and making the most of and complementing what little there is. At the workshop to return the clinic results several suggestions were made on how to bolster existing spaces in order to promote the services of the clinics and by the Network (Table 4.4).

Table 4.4 Some suggestions to bolster the existing spaces and promote the Network and the Plant Clinics (Workshop, October 2007, INTA, Sébaco)

INSTITUTIONAL SPACES	PUBLIC SPACES
• Take advantage of radio spots by institutions e.g. MAGFOR, INTA, the SANTIAGO COOPERATIVE, UNA (Radio Nicaragua) • Include a space for the Network and the clinics on the webpages of those who have one, e.g. MAGFOR, INTA, universities • Make an electronic bulletin and magazine • Use networks of collaborators to disseminate information.	• Use cable TV and/or local TV. • Distribute fact sheets and other information in public places (bus stations, markets, health centres, plazas etc.) • Participate in fairs and other public events • Direct campaigns at specific clients, e.g. organic farmers, or growers of a particular crop

Location. For some clinics finding a good venue has been a struggle and a source of much frustration. In Murra first they tried two places on their own premises in the Flor de Café

Cooperative, but that did not work. No one came, and people even took down the posters the plant doctors had put up in different places in town. Finally they found a more suitable place, at the junction to La Victoria, 10 km from Murra.

In a situation like that, it is easy to get discouraged and give up. Every community has its own dynamic, and the clinic needs to fit into it. If it turns out to be difficult to attract clients in one place it is best to find another one. We know that demand exists, but sometimes it is difficult to connect the supply with the demand.

Ownership of the organisation.
Support from the organisations is crucial for the clinic. There is a close correlation between the level of ownership and support from the organisation and the success of the clinic. Many organisations no longer see it as extra work but as a key part of their programs. It has become institutionalised. The most outstanding examples are Quilalí, El Jícaro, San Juan del Río Coco and Jalapa.

Perseverance pays off. After ten months of searching, the plant doctors in Murra, JOSÉ MARÍA GÓMEZ and BERNABÉ ZELAYA, found a good place to put the Plant Clinic run by the Flor de Café Cooperative. The lab coat and the cap with the green cross lend credibility and prestige, and help define a Plant Clinic.

In the words of Ramón Méndez, manager of the Santiago Cooperative in El Jícaro: "*We don't see the clinics as a luxury but as a necessity. It helps to lower the costs of managing pests and diseases. It helps improve farmers' knowledge. The most important achievement has been the change in behaviour among farmers and the ownership they have taken of the service. It is a tremendous achievement. The fact that the farmer takes a sample and goes to the clinic to find out what he himself can do about it is a great achievement.*" Isidro Cáceres of CCAJ Jalapa puts it directly and simply: "*The Plant Clinic is a reality.*"

"The demand has been answered. There's good motivation. The Plant Clinic is a simple, practical and popular alternative. More people come from other places. Someone came from 34 km away with all sorts of samples. The clinic is having an impact."

Eddy Gutiérrez
CCAJ Jalapa

There are other organisations and institutions that do not have the institutional freedom to achieve the same degree of institutionalisation of their program, especially the government institutions which are more exposed to changes around them. The priorities of the new government mean that the staff must deal with new activities and the work at the clinic becomes a sideline. For greater integration and ownership, the initiative must be institutionalised from the top management level. Although some institutions have faced more constraints than others, the initiative has helped them have more outreach to farmers. This is seen as a great achievement.

Recommendations for new Plant Clinics. With the experience gathered at the clinics it is now clearer what is needed for a successful start (Table 4.5). A positive attitude from the start is

essential. As the plant doctors say: "*You have to like what they are going to do. You should be aware that it can be hard at first. It is necessary to be friendly, enthusiastic and self-motivated. Don't get discouraged–be patient and persevere. Keep insisting and show you believe in what you're doing.*"

The plant doctors in Quilalí suggest that before starting up a new clinic, the staff in charge should have a sort of internship at one of the well-established clinics, for example in Quilalí, El Jícaro, Somotillo, or Estelí. This is already being done. For example, two technical people from ASODEL are having practical experience by supporting the clinic in Somotillo, and will later open their own clinic in Villanueva.

Table 4.5 A good start for Plant Clinics
Recommendations by NORWIN FLORES, INTA Juigalpa

Train before starting
Select the location carefully
Set up a team of 3 people for support and rotation
Always open the clinic on the days that have been established
Have good reference materials
Publicise well, e.g. at large events, radio
Coordinate with laboratories

It is important to get to know the clients and to gain their trust. For the clinic to be trusted, the plant doctors must be reliable. If for one reason or another the clinic cannot open on the usual day, people need to be told beforehand. It takes time and effort to create trust among the clientele, but it is very easy to lose.

During the dry season there is less demand for advice. So that time can be used to carry out information campaigns on how to treat and store seeds, and how to manage crops to prevent health problems later. A kind of "plant health day," with fact sheets, posters and demonstration materials is one suggestion. There is a great potential to be explored here.

Dreams and visions for the future. There are many things that can be improved in order to offer a quality service with greater outreach. "*I want to see a line of farmers, all with their samples in hand*", declared Bayardo López, of San Nicolás. The plant doctors dream of having better equipment and facilities to provide a more complete and integrated service, for example by integrating plant and animal health into an 'Agriculture and Livestock Health Clinic'. The goal is to achieve complete client satisfaction.

"You have to be persistent and patient to operate a clinic. You've got to work if you're going to grow. There is no worse battle than the one not fought."

Bayardo López
ASOPASN San Nicolás

Plant doctors in Jalapa say that they would like to have their own laboratory. "*Sometimes we feel too small to handle such big problems. The clinic needs to be reinforced, for example in nematode extraction. CETA let us use their microscope to analyze soil samples for nematodes, but it would be good to have one right here, to be more flexible*", says José Rubén Sanabria of CCJA Jalapa.

Several plant doctors said they would like to have a microscope or a small laboratory to make a better diagnosis, a good database to be able to detect and prevent outbreaks on time, an experimental area and more equipment, manuals, photographs and demonstration materials. They

would also like to receive training on how to prepare organic and biological inputs to sell themselves. They want to see the clinic as a high profile professional service where the plant doctors work full time earning a salary.

Providing inputs. Many organic and biological products are not accessible to farmers. The plant doctors would like to help open that market.

Juan Carlos Castro of San Juan del Río Coco says: "*It would be good if more organisations got involved so we could support each other and thus offer a stronger service with a wider coverage. We need to overcome the jealousies and distrust between organisations, because at the end of the day we all want the same thing, the development of the municipality.*"

Quilalí: a Plant Clinic on the move

Dr. Luis Roque, veterinarian and plant doctor with 20 APRIL COOPERATIVE

The 20 APRIL COOPERATIVE in Quilalí, Nueva Segovia, inaugurated a plant clinic on 3 April 2006 at the coop's premises: *"A place where you can bring your sick plants."*

Despite the short time we have been operating, we have done a lot. At consultation visits, plant doctors and farmers have worked together to find solutions to various problems of pests and fungal or bacterial diseases in over a hundred crops. The most outstanding cases have been fruit trees and coffee.

The Plant Clinic, Quilalí serving the community

Seeing the potential of this type of public service, the cooperative's management and administrative council decided that the clinic should not be exclusively for plants, but also open for veterinary advice for livestock owners. This is now a reality and the clinic works with both options.

The Plant Clinic at the 20 DE ABRIL COOPERATIVE is one of the most visited in the whole country. But it has not always been easy. We've achieved this thanks to unconditional support from the cooperative's administration and leadership, as well as the effort and tenacity of the plant doctors; we did not get discouraged, especially at the beginning when very few farmers visited the clinic. They were not used to bringing in plants; they saw it as something odd, but no longer.

Nowadays the farmers trust us and the plant doctors are more responsible providing a quality service with complete client satisfaction.

We Quilalí plant doctors urge the other Plant Clinics not to get discouraged and to carry on and to always remember that we as professionals owe it to the farmers and must help them find solutions to their most deeply felt problems. If we achieve that, we will be contributing to their social and economic development, and we as technical people will feel proud of them.

5 The Plant Doctor – a key role

With the Plant Clinics a new actor was introduced to the plant health system, the 'plant doctor.' 'Plant doctor' is not an official degree, because such one does not exist. Rather, it is a title that reflects the type of work that is done: a person who looks after the health of plants. To do the job well, one needs to have practical, theoretical and social skills, like a physician.

"It has been a great experience. At the university it was all very theoretical, and now I can share and exchange ideas with farmers based on reality. The training by Eric and Jeff, (GPC) has helped me a lot. I feel more confidence and satisfaction being able to help farmers who really need it. The community and other organisations recognise that we are leaders in diagnoses and that we give a quality service."

Geovany Rodríguez
SANTIAGO COOPERATIVE, El Jícaro

Most people that work at the clinics are agronomists, or graduates of vocational agricultural-livestock schools and they were all used to giving advice on plant health as part of their regular job.

However, establishing a Plant Clinic as a public clinic and training people as plant doctors has drastically changed their competencies, visibility and self-esteem.

The plant doctors interviewed highlight improved communication with farmers and new knowledge of diagnoses and decision-making as one of their main personal achievements. They feel that they have confidence, enough to tell their clients: "*I don't know what it is, let me find out*", before giving an answer. "*I'm no longer ashamed to say 'I don't know,' because the Network backs me up*", says Bayardo López of ASOPASN in San Nicolás.

The training provided by the Global Plant Clinic and the Network backstopping for laboratory analysis and specialist support have raised the profile, visibility and confidence of the staff. "*When had we ever gone to INTA or MAGFOR for help*?" continues Bayardo. "*The clinic has given us new sources to ask for information and solve problems. For example, now we send animal samples to the DGPSA laboratory too. All of this gives us more confidence and improves the quality of the technical assistance to farmers.*"

The Network actors also recognise that plant doctors are a crucial link to learn and understand what is happening in the countryside. The Plant Clinics have come to have strategic importance for universities, laboratories and research centres, in their efforts to identify the demand for specialised services.

"For me the work at the clinic comes first because it is my daily job. We have learned many things that have helped us a lot, loads, so very much. It's been fundamental."

Juan Carlos Castro, UNAG San Juan de Río Coco

El Jícaro: Proud to be a plant doctor

Dimas Amaru Sarantes Ramírez
Technical Unit Coordinator and plant doctor with the SANTIAGO COOPERATIVE

In 2005 I heard on Radio Líder that a plant clinic would be opening at the SANTIAGO COOPERATIVE, and that plant doctors would be carrying out diagnoses. Now, I knew the word 'diagnosis,' but I had never heard of 'plant doctors.'

At that time I was just finishing up at the university, and I said to myself "*On Friday I'll go the clinic, not to take in a sample, just to see how it works*". But on the day I had planned to go, I couldn't. I had already sent my CV to the cooperative, and the next week they called me for a job interview. By the following Friday I was receiving farmers at the plant clinic.

The plant clinic at El Jícaro has helped many clients

At that time we did things our own way, but with time we got training with the Global Plant Clinic and the National Commission Agricultural Education (CNEA). Today we give a more accurate diagnosis, and we are not sending samples so often to the laboratory.

We have been running the clinic for two years now, and it is bearing the fruit we all hoped for. In November 2007 we graduated as 'plant doctors', it's strange, but that's how it is. This has been one of my main achievements, an important added value to the work I do.

With the Plant Healthcare and Diagnostic Network we work hand in hand and we do laboratory diagnoses faster and more efficiently. Just the simple fact of being a member of the Network fills me with much satisfaction and to know that the work I do is recognised in one way or another.

I've updated my knowledge and that helps solving the multiple problems in my municipality. I feel very satisfied with the work I do with them. My dream is to get a master's degree in rural development and that way be able to help farmers get ahead by forming small rural businesses.

Taking a course on nematology at Zamorano

We have a clear vision of our next steps as plant doctors. Our dream is to have a small laboratory at the cooperative to identify diseases so we do not have to send samples to Estelí. It is very far away and expensive.

There are still things we need to improve. We should do things because we like them and not out of obligation, or because we have a signed contract. The institutions that are active in rural areas, both state government and local NGOs, should find ways to get involved in this initiative. That way together we can answer problems more efficiently.

Training provided by the GPC

Training the plant doctors in courses given by the Global Plant Clinic (Eric Boa and Jeffery Bentley) is an innovation without precedent. The course, "How to Become a Plant Doctor" consists of three modules, each one three days long.

- MODULE 1 - Basic course: field diagnoses, how to run a Plant Clinic
- MODULE 2 - Basic Plant Healthcare: control options, decision-making, quality of service
- MODULE 3 - Extension messages

Module 1 teaches how to make a diagnosis using symptoms, that is, how to distinguish different causes such as abiotic factors (drought, pesticide damage, fire, poor soil fertility, mechanical damage) and biotic factors (fungi, bacteria, viruses, nematodes, insects, phytoplasmas). The key point of the clinic's service is the diagnosis. Good pest and disease management depends on a good identification of the problem, just as with human and animal health.

Students also learn how to communicate with clients to get all the necessary information to make the most correct diagnosis possible. Technical, scientific knowledge of all the diseases is worth nothing if the plant doctor does not know how to communicate with clients and listen to their perceptions and concerns. The plant's symptoms provide part of the evidence of the disease; the other part is revealed during the conversation with the client: How is the disease distributed within the plot? When did it start? What did you plant last year? And other relevant questions.

"Training to be a plant doctor filled me with much satisfaction. I learned many things that I needed to know, like making fact sheets or being patient during the diagnosis. It has helped me a lot."

Alan Castillo
INTA Masaya

Module 2 teaches how to make accurate decisions and recommendations. Nobody is an expert in all diseases in all crops. In this module the trainers urge the group to reflect on and discuss control options and find more information as needed. For each management option, the students must answer questions like: How do you know if it works? How is it used? Where can you get the product? Scrutinizing as a group helps create awareness of the viability of different management techniques.

Module 3 teaches how to design a simple, practical extension message aimed at the clinic's clientele. The design of the message is based on the 'snowman' model, which has three parts: problem description (head), background information, for example how the disease spreads (chest)

and control options and instructions on using them (the buttom part). The model is applicable to any medium (fact sheets, radio, talks or video). The course has concentrated on writing fact sheets (see Annex 4). To guarantee the quality of the material, the fact sheets go through a 'double validation': a peer review with farmers who critique the content, language and terminology, and another with the Network to validate the technical quality of the message. The double-validated fact sheets are another innovation in 'basic plant healthcare'.

"What I learned in the training I use every day. The diagnosis is so important. It was a great joy to take all 3 modules. It's difficult for someone who has not had the training to understand that."

Joel Flores
SANTIAGO COOPERATIVE, El Jícaro

Training the plant doctors was key to creating a new vision of plant healthcare. Many of them recognise that previously they were unaware of the challenges of diagnosis. They gave hurried responses and preferred to give a wrong answer than admit that they didn't know. The training has improved the quality of the technical assistance in general, and has encouraged self-criticism. "*The training has helped us a lot to do more practical and straightforward work, to give better answers, to improve technical assistance. One learns to evaluate oneself*", note Bernabé Zelaya and José María Gómez of the Flor de Café Cooperative in Murra.

"The course helped me a great deal in my personal and professional development. I discovered that we extensionists were giving recipes. I realized that things are not that way. You have to be more careful when you give recommendations, and more patient when talking to people, and understand their problems."

Norwin Flores
INTA Juigalpa

'Graduation' Fifteen of the 28 plant doctors who received their final diploma during the closing event of the Framework Agreement on 13 November 2007 in Estelí

The Global Plant Clinic leaves a considerable human capital installed in the country. They gave eleven training courses to a total of 87 people (Annex 3). Of these, 28 completed all three modules and 'graduated' as plant doctors. Furthermore, in 2007 a team of nine Nicaraguan trainers was formed who will be in charge of training future plant doctors (see list below).

Nicaraguan trainer team

1. Yamileth Calderón
   INSFOP, Estelí
2. Francisco Pavón
   INTA Managua
3. Lester Pupiro
   EIAG Rivas
4. Yanet Gutiérrez
   UNA Managua
5. Jeannette Flores
   DGPSA León
6. Alejandro Parrales
   ADRA Ocotal
7. Lino Castro,
   INTA Juigalpa
8. Xiomara Rivera
   UCATSE Estelí
9. Álvaro Caballero
   UNAN León

Supervisors, GPC

10. Eric Boa
11. Jeffery Bentley

6 Queries received in the Plant Clinics

In 2005 the plant doctors started keeping records of queries received. The design and management of the electronic record has been improved over time, but not all the queries were entered into the database. In general, the clinics in Las Segovias regularly send their record of queries to UCATSE. Sending records from the Plant Clinics located elsewhere in the country is more sporadic. Management of the logbooks and database is described in more detail in Section 7.5.

Number of queries. Table 6.1 shows the number of queries received at each clinic per year between March 2005 and November 2007. It also compares the number of queries recorded in the database (DB) with the number of queries recorded on the monitoring forms (MF). In some cases, the data were gathered by telephone calls. It was not possible to establish direct communication with El Sauce, Ticuantepe and Rivas, so their data are a rough estimate.

The electronic data is not complete for most clinics; on average 66% of the data is recorded electronically. This is due to several reasons, including: the clinic did not transfer all the queries on the log to the Excel sheet, limited access to computers and/or Internet, and general communication difficulties. The numbers recorded on the monitoring forms are more real because they come directly from the logbook of each Plant Clinic.

Table 6.1 Queries per Plant Clinic recorded in the UCATSE database (DB) and monitoring forms (MF). March 2005 - November 2007

Plant Clinic	2005		2006		2007		Total		% of queries entered in database
	DB	MF	DB	MF	DB	MF	DB	MF	
Estelí	130	131	128	128	110	135	368	394	93
San Nicolás	93	142	24	62	84	84	201	288	70
El Jícaro	48	110	51	52	80	85	179	247	72
Jalapa	37	131	41	50	52	63	130	244	53
Quilalí			167	167	97	118	264	285	93
San Juan del RC			28	28	25	25	53	53	100
Somotillo			36	42	0	88	36	130	28
El Sauce			0	20	0	30	0	50	0
Masaya			12	70	13	73	25	143	17
Ticuantepe					0	30	0	30	0
Juigalpa					19	43	19	43	44
Murra					19	19	19	19	100
San Juan del Sur					0	40	0	40	0
Total	**308**	**514**	**487**	**619**	**499**	**833**	**1294**	**1966**	**66**

Shaded cells indicate that the Plant Clinic had not started yet.

In 2006 the clinics that received the most queries were those in Quilalí and Estelí, while in 2007 the most visited clinics were Estelí, Quilalí, Somotillo, El Jícaro and San Nicolás. In total, the Plant Clinics received approximately 2,000 queries during the whole period.

The real number is higher because not all queries are recorded in the logbook, especially ones received in the field. There is a notable increase in the number of queries every year from 514 in 2005 to 619 in 2006 to 833 in 2007. The growing demand reflects the need and importance of this public service. Most clients would have had no alternative source of advice and timely information to manage their plant health problems.

Number of crops. Plant doctors have provided advice on a great diversity of crops (some 108). Several clinics have given advice on animal health. So far there are six groups of animals (cattle, pigs, dogs, goats, poultry and equines). Table 6.2 shows the number of consultations provided by crop/animal.

Table 6.2 Queries by crop or animal recorded in the UCATSE database. March 2005 to Nov. 2007

Crop / Animal	Queries
Coffee	176
Citrus	128
Avocado	125
Orange	116
Tomato	64
Beans	56
Lemon	54
Potato	44
Cattle	39
Maize	37
Rose	20
Mango	21
Papaya	18
Guava, *chaya* (squash)	17
Passion fruit	14
Cabbage, green pepper, onions	13
Dragon fruit (cactus)	10
Plantains, pasture grass, mandarin orange	9
Squash, ornamentals, chilli pepper	8
Grape, granadilla (passiflora), bananas	7
Annatto	6
Manioc, cocoa, dogs, pigs	5
Sour orange, hog plum, mint, soursop, coconut, cedar, ayote (squash)	4
Soybeans, sorghum, watermelon, rue, cucumber, palm tree, noni, nance, peanuts, cinnamon, zucchini	3
Chinese cabbage, radish, pineapple, pear, coconut palm, oregano, plantains, apples, mammon (*Melicocca bijuga*), lettuce, basic grains (maize, beans, sorghum rice), geranium, cauliflower, cypress, goat, broccoli, celery, garlic	2
Carrot, thyme, soil, solfa, frangipani, hibiscus, oak, bougainville, pipián and ayote (squash), poinsettia, carambola, lemon balm (Melissa), matasano (a wild tree fruit, 'white sapote' *Casimiroa edulis*), cashew, taro, jazmine, vegetables, Inga, pomegranate, gerbera (*Gerbera jamesonii*), genciana (*Gentiana lucea*), string beans, strawberry, spinach, crawlers, ferns, beaucarnea, acacia, gourd, pumpkin, horses, begonias, bastón del emperador (*Etlingera eliator*), poultry, rice, philodendron, sesame, Swiss chard, 'diez de la mañana' (flower), two queries not specified	1
TOTAL	**1294**

In some cases the queries appear both under *crop group* (i.e. citrus) and specific crop within that group, i.e. *orange* and *lemon*. Sometimes only the crop group is recorded in the logbook. For a proper analysis of the database, it is important that the clinics record both the group and the specific crop.

Some crops are seen at all the clinics, the most important being citrus, coffee and avocado, with 311[7] (24%), 176 (14%) and 125 (10%) queries respectively. The clinics also responded to queries on many other crops that normally are considered of little economic importance, such as ornamental plants, fruits and medicinal plants which are not important to research institutes. Nevertheless, all these plants are important for food security and the economy of rural families.

Figure 6.1 shows the percentage of queries received at the clinics by crop group[8] or animal. The crops with the most demand are in the groups of citrus, fruits, vegetables, coffee and cacao, with orange, avocado, tomato and coffee as the most relevant crops of each group. The most diverse groups are fruit and vegetables, with 26 and 24 crop species, respectively.

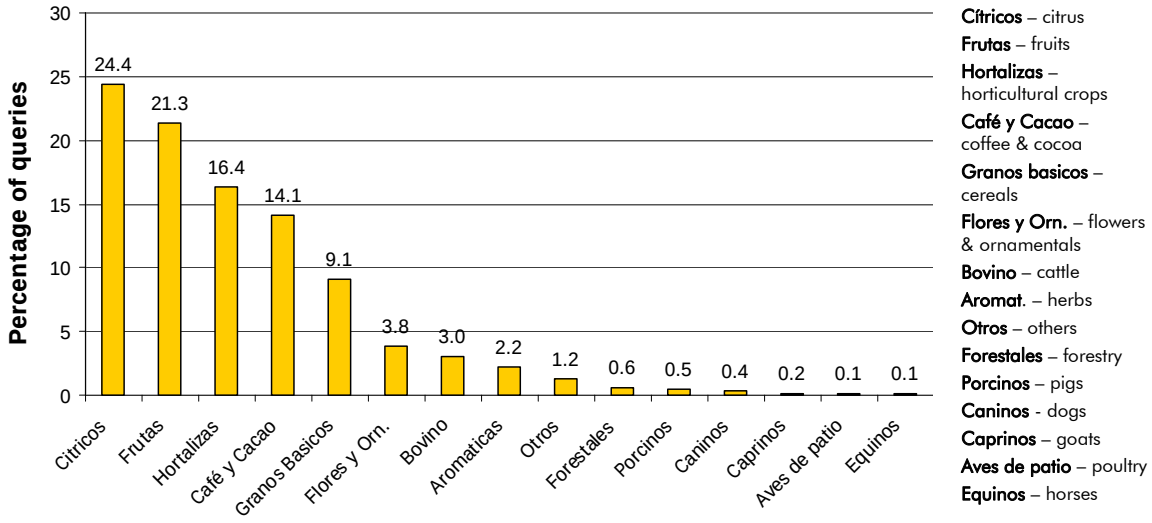


Figure 6.1 Queries (%) by crop and animal group recorded in the UCATSE database: March 2005 – November 2007

Note: Crops with less than ten queries have been lumped into the 'others' category

Citrus and other fruit represent almost half (46%) of all the queries. Why is there so much demand for advice on citrus and fruit? Is it because citrus and fruit have a high incidence of pests and diseases and farmers do not how to manage them? Or are there few sources of information on the management of these crops in general? One likely reason is that almost all rural families and many urban and semi-urban ones have at least one lemon, orange, mango, avocado or other fruit tree in their garden or field. The fruit is valued as a contribution to the family diet, or to generate income by selling it at the local market.

Many of the queries for citrus are from small groves and gardens. However, other examples are from large farmers with thousands of trees representing a great economic value. With the

[7] This number was calculated by adding the queries for citrus, orange, lemon, mandarin and sour orange.

[8] The grouping of crops is based on information available at WWW.INFOAGRO.COM.

expansion of the Plant Clinics to the southern Pacific area of Nicaragua, the demand for advice on fruit will increase because of its commercial importance in that region.

There are surprisingly few queries on basic grains (9%) yet these are the staple foods of all Nicaraguans. Is it because people already know the diseases and how to manage them? Or is it because basic grains are considered of little value? Or are there other sources of advice and information that help to solve the problems?

We do not know the reasons for the distribution of queries by crop. For the clinics and Network the database is an indispensable source of information for identifying the demand and complementary actions for the future. However, it is important to get to the bottom of what motivates people to seek advice for some crops and not others. This would help to design more effective strategies for disseminating information for the people who need it.

One might ask if it is appropriate for all Plant Clinics to attend any problem in any crop? Could services be geared to specific crops of interest? What would be the criteria for determining if a crop is of interest or not?

Julio López, national coordinator of PROMIPAC and representative of Zamorano in Nicaragua, would like to see the specialisation of some of the clinics to achieve more outreach and impact though actions directed at crops with high economic value. "There are crops with a high export potential, such as beans and several vegetable species", he says. "If we could set up clinics specifically for these crops, it would be of great importance for strengthening the value chains."

A simple and effective practice. There are common pests and diseases that are easy to identify and that many people know, such as the coffee berry borer. In San Juan de Río Coco they recommend setting homemade traps made from a container, such as a plastic bottle, with something inside it to attract the borer, such as ground coffee with alcohol.

New demand. The clinics help to identify new demand for advice. For example, they have revealed the need for advice and information on animal and forest health. The number of queries on animal health is significant, 52, with cattle as the most important. This indicates an opportunity to create new links with animal health laboratories, which is already starting. From the start the clinics in San Nicolás, El Jícaro, Jalapa, Juigalpa and Quilalí expressed a desire to offer an integrated service because of the demand in the area, and in fact animal health is part of what they offer, although the training and support of the Network are not yet designed for animal healthcare.

There is also an increase in the number of queries for forest species, such as cedar and cypress, important timber timbers, and acacia, which many families use as firewood. This shows the need to strengthen forest health as part of the services of the Plant Clinics and the Network.

Diagnoses made. As there is a great diversity of crops, we also have a long list of pests, diseases and other problems (Table 6.3). Most of the diagnoses made by the plant doctors are for fungi, leafminers, and nutrient deficiencies. Nutrient deficiency is a very common diagnosis (115 queries). However, it is not that easy to diagnose a nutritional deficiency based on symptoms, and the risk of error is high. It is easy to conclude that a generalised yellowing is due to a lack of nutrients, although there are many possible causes (see the story by Dr. Hodges, p. 39). This indicates that there is a need to deal with issues such as soil health and good fertility management in greater depth.

Table 6.3 Queries according to diagnosis recorded in the UCATSE database March 2005 – November 2007)

Problem found	Queries
General diagnoses	261
Fungi [1]	151
Leafminers	121
Nutritional deficiency	115
Aphids (*áfidos*)	87
Cutworms	60
Nematodes	58
Mealybug	51
Anthracnose	48
Cochineal	39
Bacteria [2]	35
Mites	33
'Scorch' (*chamusco*) [3]	29
White fly, virus	28
Rust	24
Sooty mould, scab, leaf-cutter ants	21
Phytophthora	20
Scale insects	19
Fruit fly	18
Leprosies, aphids (*pulgones*)	15
Citrus tristeza, *tortugilla* (leaf beetles, usually *Diabrotica* spp.)	14

Problem found	Queries
Chinches [4] (i.e. true bugs, the order Hemiptera)	11
Mildew, parasites, Sigatoka	10
Stem borer	9
Picudo (field weevils)	8
Gummosis	7
Ants, mastitis	6
Cenicilla (various fungi with powdery symptoms), infection	5
Thrips	4
Algae, angular spot	3
Coffee berry borer, vesicular stomatitis, hypocalcemia, Panama disease, metritis, placenta retention	2
Abcess, termites, conjunctivitis, *gusano cabeza de perro*, fruit worm, herpes, pneumonia, abnormal birth	1

[1] Refers to various types of fungi. [2] Includes some identified genera of bacteria and the generic name 'bacteriosis.' [3] Includes blights and what plant doctors call 'burned by the sun'. [4] Includes hemipterans and plant suckers.

Total number of queries: 1294

Many queries are categorized as 'general diagnoses', consisting of information about the clinic, effects of crop management, and diagnosis without samples where the causal agent of the disease could not be identified. This shows the importance of bringing a sample to make a correct diagnostic. On many occasions the farmer visits to learn about the clinic and enters into general discussions about a crop, pest, disease or good fertility management as a preventative strategy. Section 7.6 includes a discussion of recommendations given at the clinics and guidelines for quality control of the service.

▶ Jalapa: White grub and blight in potatoes

Santos Isidro Cáceres
Plant doctor AT CCAJ Jalapa Plant Clinic

Mr. Bernardo Falcón, a smallholder farmer in Jalapa, decided to try growing potatoes. Two months after planting his crop, a disease appeared that began to propagate rapidly.

Don Bernardo heard about the Plant Clinic in Jalapa through a radio spot, so he went to the cooperative to explain his situation. He explained that he had no experience with potatoes, described the general problem of the crop, and the level of damage in the field.

Potato is a delicate crop. There are several pests and diseases that can cause heavy losses in a brief time, such as late blight, white grub, bacterial wilt and several viruses.

We asked him to bring some plant and soil samples to the clinic. Once we received the sample we sent it to the laboratory at UCATSE. After a week don Bernardo returned for the diagnosis, but since it still had not arrived, the plant doctors visited his field to make a general diagnosis.

The soil sample showed a high occurrence of white grubs (average of five larvae per plant). Besides the disease was quite advanced, in the whole crop. We determined that the combination of white grubs and blight had limited much of the development of the crop and that a curative control at this time was no longer economically viable, nor safe either.

We recommended that don Bernardo discard the field, eliminate crop residues, apply an insecticide aimed at the roots for the control of white grubs, which were concentrated there. Despite his bad luck, don Bernardo said that next year he would try again. We gave him a series of recommendations so he would be successful:

- Get advice in time
- Plant the potatoes on a different field
- Recommendations about the variety to plant, quality and type of seed, soil preparation, among other agricultural practices.

After having invested almost $1,000 USD it is difficult to have to make a recommendation like this one, but one cannot induce a farmer to make more expenses, when there is no certainty that he will recoup his investment.

Samples sent to the laboratory. The Plant Clinics help create demand for specialised services such as laboratory analyses. So far almost all analyses have been done by DGPSA-MAGFOR in Estelí and León, and by CIPROV-UCATSE. The number of animal health analyses made because of requests through the clinics is also increasing.

The electronic records do not always contain information about the samples sent to laboratories. The data summarized in Table 6.4 are based on interviews with the heads of laboratories and with the plant doctors, a review of the monitoring reports, the records of DGPSA Estelí and the database kept by UCATSE.

The laboratories have received about 248 samples from the Plant Clinics, the vast majority from Las Segovias. According to records at DGPSA in Estelí, most of the samples have been for an analysis of bacteria and fungi.

Table 6.4 Estimated number of samples sent to a diagnostic laboratory. March 2005 – November 2007

Year	Samples sent to a laboratory
2005	37
2006	100
2007	111
Total	**248**

One thing that makes it difficult to document the role of the laboratories is that they do not detail in their records whether a sample comes from a Plant Clinic or from another client. For this reason the data presented in the table does not include animal health analyses. The continuous improvement of database management will also include a better register of the samples sent to a laboratory.

Expert support in making diagnoses. The Global Plant Clinic (GPC) offers diagnostic services free of charge for developing countries (Annex 6). In 2007 the GPC helped to identify several pathogens, among them one not found before in Nicaragua, a tomato virus called 'Tomato Mosaic Havana Virus'[9]. In addition, the GPC identified rust in lemon grass, a virus in chilli peppers and a phytoplasma in a native tree.

Problems with maize and beans

Two clients came to the clinic in Juigalpa to say that they have problems with 'lapa' in maize. They had not brought a sample, so it was not possible to make a precise diagnosis. 'Lapa' or 'lapeado' in maize is caused by a phytoplasma transmitted by a planthopper. It was a serious problem in the 1970s, but was controlled through the promotion of resistant varieties. It is not known if the disease is spreading again.

The same farmers were also concerned about 'melosa' and 'quema negra' in beans. Again, they had brought no sample and the cause could not be determined solely on the basis of their description of the symptoms. The plant doctor told them: "Bring a sample to analyse the problem better."

[9] A peer-reviewed new disease record has been published by the journal *Plant Pathology*. See www.bspp.org.uk/ndr/jan2008/2007-71.asp.

Quilalí: Enterprising, demanding and satisfied clients

Dórlang Ramón Martínez Chavarría
Plant doctor at 20 APRIL COOPERATIVE, Quilalí

At the Plant Clinic in Quilalí we give accurate and convincing answers. When analysing a problem one goes beyond the symptoms: handling and examining the sample to make a detailed diagnosis and above all, listening to the farmer to be able to make a precise diagnosis and give a practical recommendation.

In a year and a half we have received almost three hundred queries in different crops. Many farmers have visited the clinic, and we have given answers to many of them. Luis Miguel Aráuz and Jesús Lobo were the first ones to make effective use of the Plant Clinic.

Any problem, any crop. Celso Rivera is worried about a wilt that is developing in his tomato field

A special case is that of Mr. Ildefonso Rivera. One day he came down from the community of El Cacao with his yellow saddlebag filled with samples of diseased plants, saying "I bring you these plants because I've heard on the radio that you know how to cure them." The saddlebag had a bit of everything: citrus, coffee, cashew and cacao. The plants had everything; complex and simple. With over three diseases per plant, it was a challenge to define what each was and how to cure it.

Delicious guavas. The advice Mr Toribio Herrera received at the plant clinic helped him harvest guavas of excellent quality.

A few days later he returned and said 'the plants are better', and of course he brought more plant samples. He was satisfied. There are many other examples like the cases of don Ilfefonso. Mr Presentación Ponce experimented with resistance to fungal diseases in pineapples by selecting resistant varieties. An experience born with a farmer and taken to the plant clinic for the inspiration of others. Sometimes farmers have the solution to their problems; listening to them is worthwhile.

Our Plant Clinic is dynamic and accessible. There are some persistent farmers, such as Mr Fausto Cornejo, who never stopped coming to the clinic until his coffee plantation fully recovered from thread blight and ojo de gallo (chicken eye or American leaf spot of coffee, caused by the fungus *Mycena citricolor*). "With the recommendations you gave me last time my coffee got better and that's why I came back", he told us.

There are also enterprising farmers, such as Mr Toribio Herrera. When he found out that the plant clinic helped with pest and disease problems, he sought advice on how to plant a guava orchard. From the time he set up the nursery he asked us what to do, and each time he has a problem in his crop he is the first to bring in samples of the diseased plants. With that enthusiasm and his desire to work, today don Toribio is the first producer of big, healthy guavas in Quilalí.

These are only some of the examples of how the plant clinic has helped many farmers to solve plant health problems.

7 How the Plant Healthcare Network works

7.1 Structure, coordination and communication

The 'plant protection system' or 'plant healthcare system' is made up of three groups of actors: 1) farmers; 2) Plant Clinics and the organisations that run them; and 3) the Plant Healthcare and Diagnostic Network that backstops the system[10] (chapter 2). In the past two and a half years the Network has grown and consolidated itself as a network that supports and feeds the Plant Clinics to help them guarantee a quality service. So far the integration of actors in the 'plant protection system' has grown from the bottom up through specific activities carried out by persons/ institutions that are actively involved in the initiative. Figure 7.1 illustrates the various actors in the system, their roles and how they relate to each other.

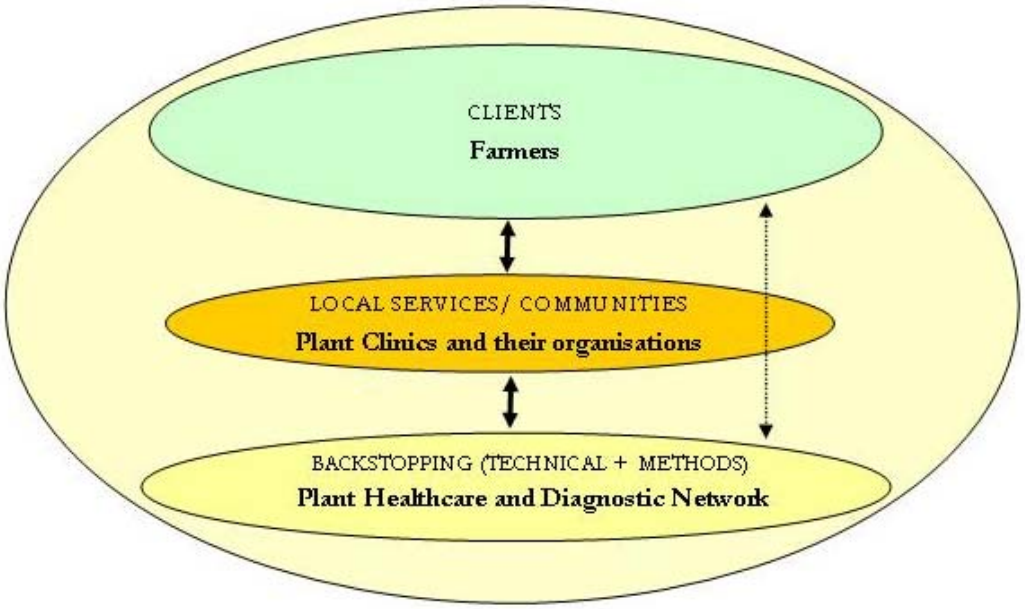


Figure 7.1 Actors of the National Plant Protection System in Nicaragua, roles and relationships (**solid arrow** – direct relationship, frequent and well-defined; **dotted arrow** –occasional, for developing specific actions)

The Plant Clinics are the link between farmers and national and regional specialists. The clinics unite demand with supply, they are a space for meeting and exchange between local and scientific knowledge. The member institutions of the Network carry out specific actions directly with farmer groups (e.g. training, field visits, demonstration or experimental plots). Having the clinics as a new link, the Network can better offer its services and knowledge to many more farmers, based on a demand directly identified in the communities. Nicaragua has many human and institutional resources that work on plant protection (Figure 7.2). The development of a systems approach that provides plant health services to farmers will, it is hoped, allow these resources to be used better.

[10] The current members of the Network are CNEA (universities and INATEC), PROMIPAC, FUNICA, DGPSA-MAGFOR, OIRSA and INTA. The network is open to other interested parties.

Figure 7.2 Location of Plant Clinics and Network partners by department (see below for details).

1 **INTA** has branches in Managua, Estelí, León, Masatepe, Matagalpa and Juigalpa, 34 extension offices, ten technological development centres and six experimental centres (Managua, Posoltega, Masatepe, Sébaco, El Rama and Nueva Guinea.)

2 **DGPSA** has regional offices and plant health diagnostic laboratories in Managua, Estelí, León, Rivas, Matagalpa and Chontales; nine quarantine posts located in El Rama, Río San Juan, Bluefields, Peñas Blancas, Corinto, El Guasaule, El Espino and Cinco Pinos. There are also Regional Plant Health and Epidemiological Surveillance Services (SRF), with branches in Region I (Estelí), Region II (León); Region III (Managua); Region IV (Granada); Region V (Chontales) and Region VI (Matagalpa).

3 **INATEC** has eight Agricultural and Livestock Vocational Education Centres (CETA) in Chinandega, El Sauce, Ticuantepe, Jalapa, Muy Muy, Siuna, El Recreo and Nueva Guinea; two Technical Agricultural and Livestock Institutes (ITA) in Nandaime and Juigalpa; and one Technical Forestry Institute (INTECFOR) in Santa Cruz.

4 **Thirteen Plant Clinics**, located in Estelí (INSFOP/UNICAM), San Nicolás (ASOPASN), Jalapa (CCAJ), El Jícaro (Santiago Cooperative), Quilalí (20 April Cooperative), San Juan de Río Coco (UNAG), Somotillo (INTA, MAGFOR, ASODEL), El Sauce (CETA), Masaya (INTA), Juigalpa (INTA, UNA, ITA), Ticuantepe (INTA), Murra (Flor de Café Cooperative) and San Juan del Sur (INTA, EIAG).

5 **Universities** linked to the agriculture and livestock sectors (UCATSE–Estelí; FAREM–Estelí; EIAG–Rivas; UNAN León; UNA–Managua-Camoapa-Juigalpa (Chontales) and URACCAN-RAAN.

Laboratories that provide plant diagnostic services (DGPSA, UCATSE–Estelí, FAREM–Estelí, EIAG–Rivas, UNAN–León, UNA).

Ten DGPSA-OIRSA quarantine posts located in Managua (CETREX-A.C.S. Airport), Rivas (Peñas Blancas), RAAS (Puerto El Rama), Río San Juan (San Carlos), Chinandega (Corinto, El Guasaule, Somotillo), Nueva Segovia (Las Manos) and Madriz (El Espino, Las Tunas).

The Network provides various services to the Plant Clinics, such as 1) technical assistance through training; 2) laboratory analysis; 3) research; 4) surveillance and quarantine services; 5) meetings, exchanges and promotional events; 6) monitoring visits to Plant Clinics; and 7) facilitation of access to input markets. The Network ensures the logistics and administration for conducting the system's activities. The organisations that operate the clinics contribute the time of the plant doctors, a locale for clinic operation and some promotional activities.

All Network actors interviewed agree that supporting the clinics helps them meet their institutional missions, such as providing services to the agricultural and livestock sector and improving production techniques. As the deputy vice president of UNAN León, Maritza Vargas, points out: "*These are important spaces where the community can deepen discussion of their problems and where technical staff and specialists can exchange information and knowledge. It allows us to learn in greater depth the problems of the area and of farmers. We are increasingly convinced that teachers and students must be in contact with real problems, in close contact with farmers and the field. The clinics allow up-to-date diagnoses of the problems, and a search for solutions.*"

The head of DGPSA in western Nicaragua, Ricardo Padilla, notes that "*The laboratories are not that accessible to farmers, so we saw the clinics as a good opportunity to work on DGPSA's fundamental objective, to make pests disappear, especially those for which there are quarantines.*"

Table 7.1 Current and potential members of the Network by region

Las Segovias	West	South Pacific	South Central
active members	*active members*	*active members*	*active members*
UCATSE	UNAN León	INTA	INTA
FAREM	DGPSA laboratory	EIAG Rivas (partially)	*to be activated*
DGPSA laboratory	INTA (in some places)	*to be activated*	*DGPSA laboratory*
PROMIPAC	FUNICA (in process)	*DGPSA laboratory*	*UNA Juigalpa (in process)*
FUNICA	*to be activated*	*CETA Ticuantepe*	*ITA Juigalpa (in process)*
ADRA	*INTA (in some places)*	*ITA Nandaime*	**Results**
to be activated	*CETA Chinandega*	*UPOLI*	The Network is unorganised, but several actors show interest.
CETA Jalapa	**Results**	*ICIDRI*	
INTA (in process)	A core group has been very united for years with UNAN León as coordinator. More integration is needed.	*APLARI*	
INTECFOR Santa Cruz		*MINSA*	
Results		**Results**	
Consolidated network under UCATSE leadership. INTA needs to be integrated.		An unorganised network with few stable actors.	

The Network operates its activities through regional coordination. Every region is organised according to specific structures and work dynamics. So far the Network functions in four regions of Nicaragua. As highlighted in Table 7.1, each region has reached different levels of operation, with Las Segovias being the most advanced and the Southern Pacific Coast and South Central the most incipient. A national coordination under the leadership of the National Agrarian University (UNA) is being created, with representatives from each region, as part of the National Initiative.

Las Segovias. UCATSE coordinates the Network in this region. Among the services it offers are lab diagnoses, training, basic equipment, technical documentation, promotion of information about the Plant Clinics, technical and methodological advice and financing to guarantee participation at meetings and other events (Table 7.2). Representatives of the Network and clinics meet every two months to follow up on work, exchange information, ideas and experiences, identify problems, seek solutions and plan activities. Sometimes practical sessions or field visits are included, if there is time.

Table 7.2 Actions developed by the Network in Las Segovias

International course on nematodes (Zamorano, GPC)
Visit to Honduras for exchange with experts on long-distance diagnoses
Participation of farmers in the Agro-Ecology Week
Participation in the Organic Agriculture Congress in Guatemala
Establishing the group of trainers
Preparing a handbook for plant doctors
Training in making diagnoses for UCATSE staff
Research in support of Plant Clinics

UCATSE has assumed the role of coordinator with much dedication and commitment and with unquestioned support from the authorities. From the beginning the university saw that the integration of the Network and the Plant Clinics would give new opportunities to expand its radius of action and expertise to the rural communities, farmers and extensionists.

UCATSE, PROMIPAC and FUNICA have incorporated support for the Network into their annual work plans, so it is institutionalised. Members of the Network think the group functions well. They know each other quite well, there is great trust and they have broken down the mental barriers between local organisations, universities and public institutions.

Mutual support. The bimonthly meetings between network members and the clinics are a valuable space to exchange ideas, information, results and experiences, discuss problems, plan actions and keep spirits high.

From the beginning DGPSA Estelí was very willing to participate in the initiative and offer its laboratory services and the support of its staff for specific activities. They have developed workshops on tomato and coffee in El Jícaro, together with UCATSE, and training in good agricultural practices with PROMIPAC. When leprosis was discovered in El Jícaro, DGPSA visited the area and helped devise a plan to contain it and a public campaign. With that they were able to stop the epidemic. "*The Plant Clinics contribute to surveillance of endemic pests of interest to quarantine and detecting new diseases. They provide a timely and reliable service to farmers who have no access to laboratories*", says Martín Urbina of DGPSA Estelí. However, the DGPSA staffs have a very tight schedule, which makes it difficult to attend the bimonthly meetings, monitoring visits and other activities organised by the Network. "*Participation can be improved if we are able to establish an institutional work plan that includes the*

work with the Network, preferably together with INTA. So far this has not been part of our institutional work", explains Luis Felipe Pérez, head of DGPSA Estelí.

It has been difficult to establish close coordination with INTA. There are specific cases of bilateral cooperation, for example with the Plant Clinic in San Nicolás, with a potato problem, but INTA has not participated formally in the Network. In general, public institutions have little flexibility to assume new ways of working, even the ones that could help increase the scope of their interventions. The frequent changes in staff and strategies make it difficult to get involved in new initiatives. The new INTA director for Las Segovias, René Gustavo Jarquín, says that the current restructuring of INTA is an opportune moment to formalize and expand INTA'S participation in the Network. "*Plant Clinics can be created in all municipalities by means of lead farmers*," he says.

Communication is a serious problem for several Plant Clinics due to the lack of telephone, Internet and cell phone coverage. It has been difficult to maintain quick and fluid communication between all members of the Network and the clinics. UCATSE, as regional coordinator, has long suffered the absence of a telephone line, and DGPSA Estelí has no e-mail in its offices. There are clinics that do have a telephone and e-mail but communication and coordination with the Network is still poor.

Logistical problems are not the only reason for slip-ups. The habit of communication must be cultivated. There are Plant Clinics that say they have not made use of the Network. As Bayardo López of San Nicolás explains: "*We were not paying attention. We did not seek out the Network and they did not come looking for us, either. There is poor communication and it must be improved.*" Several clinic staff members said that they feel very much alone and they need more support from the Network. There are also some problems with sending samples to the laboratory and the time it takes to get a reply. This will be discussed in more detail in Section 7.2.

A united group in western Nicaragua. DGPSA/MAGFOR, INTA and UNAN León have had a close relationship through the Regional IPM Group for many years. This facilitates the work of the Plant Healthcare Network in the region.

Some clinics, such as Quilalí, El Jícaro and San Juan del Río Coco stressed that they have good relations and communication with FUNICA, because they already have projects with them. Of the seven organisations that have a clinic in Las Segovias, six now have or once had a project with FUNICA. Aurora Castillo, FUNICA secretary in Estelí, played a crucial role in maintaining good communication with the clinics, for example sending out invitations to meetings and courses, organising the purchase and delivery of materials and sending samples to the DGPSA and receiving results.

For FUNICA, the clinics have a strategic importance: "*The articulation between the Network and the clinics is an organisational innovation between the community and the university. The research sector is connected to the*

technical sector. For FUNICA this is a satisfaction, because we feel that we are fulfilling our mission of promoting technological innovation", says Julio Centeno, FUNICA coordinator in Las Segovias.

Western Nicaragua. The Network here works through the Regional Integrated Pest Management (IPM) Group, by means of already established bimonthly meetings. At the beginning, DGPSA West coordinated the Group and now this has been given to UNAN León. Plant Clinic representatives come to these meetings, give a presentation and give their logbooks to Patricia Castillo of UNAN.

The Network supports the Plant Clinics in different ways. UNAN León has given several training courses on biological control and good agricultural practices. DGPSA receives samples for analysis and sends back the results on time, as there is a close relationship between the clinic in Somotillo and DGPSA. The Network organised an exchange between clinics in western Nicaragua and Las Segovias, and a promotion workshop in El Sauce and Somotillo, where they discussed Plant Clinics worldwide to motivate the western organisations. After this workshop, CETA-INATEC took charge of the clinic in El Sauce. It had been run by INTA, but the staff there decided they did not have enough time and they left it. Other organisations such as ASODEL and Save the Children have shown interest in the clinics and have joined the IPM group.

Over the past year FUNICA West has faced budget constraints and staff changes which have hampered its Network participation. Now it does have the resources to support the clinics and is planning to open one in each of its regions (Chinandega South, Chinandega North, León South and León North). This is already part of its line of action, and terms of reference are to be drawn up with Patricia Castillo for the integration of FUNICA to the Group.

The Network is functioning quite well, but some things still need improvement. Patricia Castillo mentions that the agreements are unclear and that the budget is too low. Javier Berríos of INTA says that all the institutions are overworked and that the clinics are something added on. More linkage is necessary between UNAN, DGPSA and INTA to motivate clinic staff. The clinics and their organisations feel that they need more financial and logistical support: for example, Somotillo lacks a banner, a bulletin board and facilities to move the clinic.

This region also lacks good and timely coordination. They have not been able to link up with the Network in Las Segovias for the lack of communication and transport. They feel that they need more support from the national Network. "*More collective action is needed, where we take advantage of the few resources that each institution has. The functions of the Network need to be defined. It must work horizontally, not top-down*," said Henri Zambrana of FUNICA León.

Adrift in the south. *"We have high expectations for the work with the clinics, but we feel isolated when communication and coordination with the Network is missing."*

South Pacific. So far the Network only has one active member in the southern Pacific region of Nicaragua, and that is INTA. The Regional IPM Group fell apart and with the staff rotation at INTA this past year the formation of the Network was

delayed. Likewise, the three Plant Clinics located in Masaya, Ticuantepe and San Juan del Sur have operated in an irregular fashion due to the relocation of staff at INTA and other institutions.

In December 2007 the IPM Group met to renew its commitment to the Plant Clinics. "*It is important that the national Network coordinator come to the zone and accept the commitment of offering technical support, so the staff feels motivated*", says Francisco Pavón of INTA headquarters. "*Also, the national coordination should meet with decision-makers at the International Agriculture and Livestock School at Rivas (EIAG), to make them see the importance of being a member of the Network.*"

Once or twice people from the Southern Pacific region have participated in Network meetings in Las Segovias in search of support and inspiration, but it is too far away for them. Sebastián Salinas of INTA Carazo stresses that the Plant Clinics provide an excellent opportunity for INTA to fulfil its mandate. "*INTA wants to reach all the farmers, but we have a limited number of staff. This initiative is an alternative for providing technical assistance, especially to the most needy. It coincides with INTA'S new vision of increasing coverage, of reaching more farmers that don't have access to services. A mobile clinic is flexible and timely. The inauguration of the Plant Clinic in San Juan del Sur was very good. One could clearly see the potential of the service.*"

Coordination with EIAG has been problematic. The assigned person has little time or autonomy at work. The integration of INATEC (CETA Ticuantepe, ITA Nandaime) and DGPSA Rivas into the Network is still pending. It is a duty of the national coordination to plan, provide information and ensure that the actions taken are part of the work plans. "*It would be a shame if all these good ideas didn't work out due to lack of communication and coordination*", says Francisco Pavón.

South Central. INTA is the only actor of the initiative left in Juigalpa. The coordination agreed upon at the beginning with ITA-INATEC and the regional branch of the National Agrarian University Juigalpa (UNA) stopped functioning after a while, as with the IPM Group. They used to coordinate activities, like preparing pamphlets, radio spots and other materials and participation at fairs. "*There was going to be more coordination to operate the clinic and start others.*" says Norwin Flores of INTA Juigalpa. "*Now I'm alone here. ITA and UNA pulled out.*"

DGPSA Juigalpa has also been unable to join the Network. "*The support exists, but it was never made real. We have a backlog of tasks and it is difficult to get people to move. More communication and coordination is necessary. We have a commitment to the initiative, but little has been done*," says Juan Ramón Jarquín of DGPSA Juigalpa. "*DGPSA-MAGFOR has a plant health surveillance program, but there has been no interaction with the clinic.*"

A new beginning. Network actors in Juigalpa want to meet again and to improve communication.

Despite initial problems, the representatives of DGPSA, UNA and INTA expressed their complete willingness to return to coordination with INTA on the Plant Clinic in Juigalpa. Everyone recognises that there has been a delay due to changes in staff and new priorities at the state institutions. The person at UNA who

was studying to become a plant doctor found other employment and is no longer available for this initiative. ITA continues firmly committed to the clinic. Humberto Brenes has completed his training to be a plant doctor and will continue to support the clinic every second week. *"We are here to serve society. That is our main motivation"*, says Lorena Suárez, director of ITA Juigalpa.

7.2 Support from diagnostic laboratories

The laboratories play an essential role to ensure a quality diagnosis. They are an important backstop for the clinics. The plant doctors send samples from their clients to a laboratory in the region, which can be DGPSA (Estelí, León, Rivas, Managua), UNAN León, UNA, CIPROV-UCATSE, EIAG or INATEC (Annex 6). Laboratory technicians analyse the samples and send their diagnoses and recommendations back to the clinic which passes them on to the farmer. The laboratories become 'reference centres', where plant doctors can request analyses, information and advice.

The link between farmers and laboratories and specialists through the clinics is an important innovation that has meant a lot to position the Network and create demand for specialised services. The capacity existing in the country is being made better use of and a direct mechanism has been created to identify research topics (chapter 8). The farmers have learned to value the role of the laboratories and universities, and this lends credibility to the clinics.

Communication and logistics. The Plant Clinics in Las Segovias have already established their links with laboratories at CIPROV-UCATSE and DGPSA, although Murra and Quilalí have had difficulties sending in samples due to the geographic distance. The clinic at Jalapa also has access to the local CETA-INATEC laboratory for nematode analysis.

In western Nicaragua, the plant doctors at the clinic in Somotillo travel to León every weekend and use the opportunity to take samples to DGPSA León.

Demand for laboratory services. Martin Urbina of DGPSA-MAGFOR Estelí analyses disease samples sent in from clinics in Las Segovias.

The clinics in Pacific and South Central Nicaragua have not yet been able to establish permanent contact with a nearby reference laboratory. The link between clinics and laboratories has created new challenges not foreseen by the actors in the system.

Although most of the clinics do not have a consistent system for sending samples, plant doctors and members of the Network have found creative ways to do so: with the bus driver, with students, through FUNICA or with people they know who are heading to town. However, sometimes these ways result in lost or spoiled samples which then cannot be diagnosed. Further, some clinics have no way to keep samples cool until they can be sent. As José Rubén of Jalapa admits, *"We once made a farmer bring in a sample three times and they were all lost. That was a hard blow."*

The laboratories are committed to providing an immediate response to whoever requests the service, whether by e-mail, telephone, FUNICA or other persons. However, sometimes contact breaks down due to problems with communications and logistics. Several clinics mentioned a

problem with the delayed response from the laboratory. The results never get back to the clinic, or they may arrive two months later, when it is too late for a farmer to solve the problem. Sometimes these delays have discouraged people. As Milton Guerrero of UNAG San Juan de Río Coco says, *"The client who comes in once, and his problem goes unsolved, will not come back. It would be best if we could send the sample to Quilalí. We've proposed opening a small laboratory there for nematode analysis. That could solve the access problem and cover San Juan, Quilalí, Wiwilí and Jinotega."*

Flavia Andino of UCATSE adds, *"When the laboratories do an analysis, it is the client who comes for the results and not the laboratory staff who send them to where the client is. So it is not only a matter of finding ways to get samples to the laboratory, but also of how to get the result back. It is complicated and we both have to find viable solutions."*

The issue of coordination and communication between clinics and laboratories was discussed at a workshop held in October 2007 at INTA Sébaco. Table 7.3 summarizes the proposals made to improve the efficiency of sending samples and results.

Table 7.3 Proposals to improve contact between Plant Clinics and diagnostic laboratories

Have clear agreements between the clinics and the laboratories
Assign specific persons to send samples and results
Laboratories must call the clinic when the result is ready
Laboratories can send results by e-mail
If the person in charge of the laboratory is not in, leave the result with someone else
Seek liaison persons that can help with delivering (from the organisation, the community, Network members)
Allocate a budget line for covering the cost of sending samples and results

National capacities. The laboratories do not have enough trained staff and materials for making diagnoses. This may contribute to delays in returning results. At DGPSA Estelí there is only one person for the entire region who can make laboratory diagnoses. The laboratories frequently do not have enough reagents to isolate fungi from plant tissue. Nor do they have enough tools to do soil analyses. Much of the equipment and reference materials are old. Although these limitations can be solved, there remains the challenge of convincing the farmer to bring a representative sample in good condition, and if necessary, a soil sample as well.

With the FUNICA-FAITAN project, UCATSE will expand its laboratory to be able to identify nematodes and fungi. They will bring experience with the production of biopesticides from UNA-Managua to Las Segovias. Although there is much demand for soil analysis, there is no financing for a soil laboratory. Flavia Andino of UCATSE says "*The UCATSE strategy is to equip the laboratory little by little with support from different projects.*"

DGPSA Juigalpa offers only animal health analysis. There is a plant health laboratory, but there is neither qualified staff nor equipment. *"Most of the equipment here has been ruined for lack of maintenance"*, says Juan Ramón Jarquín of DGPSA Juigalpa. *"More attention is paid to the laboratories in León, Estelí and Managua. They say that demand here is weak and so they closed the plant health laboratory."*

The director of UNA Juigalpa, José Aníbal Montiel, shows willingness to restart and strengthen collaboration in the region. *"We could support the Plant Clinics with laboratory analysis. I travel to Managua two or three times a week and I can take samples to the UNA laboratory in Managua. We could store the samples in our refrigerator here."* Mr. Montiel explains that the strategic alliances UNA maintains with INTA and FUNICA's Technology Markets Development Program through new cooperatives could also favour the Plant Clinics.

Underused laboratories in Juigalpa

"The animal health laboratory works well. It is accessible and open to receiving samples from the clinic. But the plant health laboratory needs to be strengthened. We have neither the equipment nor the qualified staff."

Juan Ramón Jarquín
DGPSA Juigalpa

As one of the few laboratories in the country, the Technical Agricultural and Livestock Institute (ITA-INATEC) in Juigalpa offers soil analysis. *"What we have here is at everyone's service"*, offers Lorena Suárez, ITA Juigalpa director. *"We have the equipment and trained staff to do soil analyses. But we have to find a way to cover the cost of reagents, because we no longer have any."* ITA also offers to collaborate with the participation of students and with technical training for plant doctors and farmers.

INATEC has a nationwide network of vocational education centres (Section 7.1), but little capacity to do laboratory analyses. Strengthening some of the centres with laboratory equipment would help to respond better to the growing demand for laboratory analyses through the Plant Clinics.

DGPSA-MAGFOR publishes the results of the thousands of laboratory analyses they do in the book *Official List of Pests Reported in Nicaragua*. It is a valuable resource that lists the problems that Plant Clinics and the Network are likely to find in each crop. However, the list is incomplete because of the poor capacity to identify viruses, phytoplasmas and forest diseases, among others, and because the surveillance system tracks imports and exports more than it monitors plant health problems in the nation's agriculture. The list has not been updated since 2004.

INATEC laboratories

"The only INATEC centres that have equipment and laboratory materials are CETA Jalapa and ITA Juigalpa. At ITA Juigalpa there is equipment available to do soil analyses (macro and micro nutrients), and analyses of gastrointestinal parasites in cattle and of milk quality. There is no complete material to identify nematodes and pathogens, but the staff is trained to make the identifications. At CETA Jalapa there is basic equipment for extracting and detecting nematodes.

The new agreement (National Initiative, see chapters 2 and 10) *specifies INATEC's commitment to support the Plant Clinics through dissemination and the use of qualified staff at its centres.*

Through a complementary project this year we hope to give seven centres material and equipment for physical, chemical and biological laboratories, which in the future would form part of the support that INATEC can facilitate to the Network and clinics."

Javier Pérez INATEC Agriculture, Livestock and Forestry Sector

The collaboration from Zamorano, the Global Plant Clinic, the University of Georgia and other international institutions continues to contribute to the development of national capacities in the various areas of diagnoses and plant health management. In early 2008, Dr. Yaima Arocha of the Global Plant Clinic taught an intensive course to a group of Nicaraguan specialists on the diagnoses of viruses and phytoplasmas.

More capacity for the laboratories – more outreach and impact by Plant Clinics

Dr. Charles Hodges
NORTH CAROLINA STATE UNIVERSITY, USA

"After seeing the Plant Clinics in action I became convinced that it is an initiative that is very beneficial to local farmers. The success of the services offered will depend in large measure on the competencies of the plant doctors to make correct diagnoses.

I think there should be some sort of feedback mechanism to estimate the quality of the diagnoses and recommendations. The great dependency on symptoms-based diagnoses constitutes a weakness.

The Plant Clinics are of great benefit to farmers. Also, the information they gather helps specialists better design their support.

Another weakness is the poor overall quality of MAGFOR laboratories. The ones I visited had obsolete equipment and few inputs. There were not many reference books or slides on important diseases and pathogens. Many of the books and other reference materials were old and outdated. Not all laboratories had access to Internet, and those that did had no access to electronic databases.

It is important to have good, permanent record management at each clinic and to share information among clinics, the universities and the Ministry of Agriculture. The logbooks contain extremely valuable information for conducting early warning on new or quarantined diseases, and to identify new topics for research on important diseases.

National laboratories have willing and enthusiastic staff, but need better equipment and working conditions.

According to my experience, there are many physiological problems that can be difficult to diagnose. Many of these are caused by high or low pH, and by high levels of soluble salts, especially in greenhouses and nurseries. This is why at our clinic we always routinely analyse for pH and soluble salts when plant samples come in with soil. The equipment to do this is not expensive. In fact, the Plant Clinics themselves could easily do a pH test using indicator paper.

There is little capacity in Nicaragua to diagnose and manage forest diseases. This area must be strengthened. There are some facilities and qualified staff at UNA, but Dr. Alberto Sediles emphasises the need for strong scientific support to develop the necessary competencies and thus provide a better quality service to protect the country's forest ecosystems.

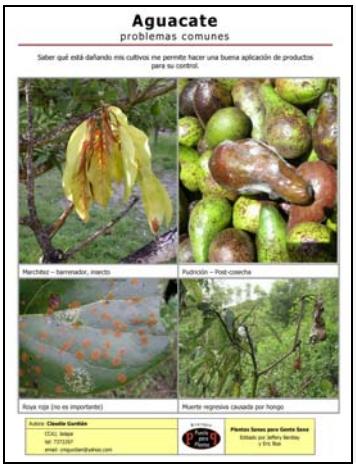
Dr. Charles Hodges, plant disease diagnostician with over forty year's experience, volunteered to visit Nicaragua to observe the Plant Clinics and Plant Healthcare Network, and to offer advice to improve the quality of diagnoses.

7.3 Materials given to the Plant Clinics

The first thirteen Plant Clinics received a basic tool kit containing reference materials,[11] books and photo-sheets, fact sheets to give to clients, tools to analyse samples (e.g. magnifying glass and razor), insect display boxes, materials to handle samples (thermos, bags), a banner, a bulletin board, office materials, and a green coat and cap for the plant doctor.

The value of this basic kit is about US$1,000. However, it is possible to start with less and add on little by little. Many extensionists have access to some type of reference material via their organisations, and a handmade sign of stiff paper works well at the beginning.

The materials delivered have been very useful to the plant doctors. They are happy with what they have received. A well-equipped Plant Clinic makes plant doctors feel good and gives them the confidence to do the job. So far few have used the insect display box, mainly because of the time it takes to set up and maintain. In Quilalí and Juigalpa they include the insects brought in from field visits, and sometimes farmers also bring insects to the clinics. In order to solve the problem of lack of time, Dimas Sarantes of El Jícaro suggests that students become involved in collecting and mounting insects. Wilfredo Centeno of UCATSE offers his support for identifying insects and mounting and maintaining the box correctly.



SUPPORT MATERIALS

Left: High-quality photographs depicting typical symptoms are important to a correct diagnosis.

Right: The insect display box is a good support tool for diagnoses and teaching, but it requires time and attention to mount and maintain it.

One of the most important tools for diagnosis is bibliographic material with high quality photographs. The plant doctors demand more. "*The Network should send information material, for example on papaya and coconut, which are not typical crops in this area*", says Dórlang Martínez of Quilalí. The Masaya clinic also requests more materials. "*The material they have given us is very useful, but the fact sheets have little to do with the crops grown here. We need more on fruit and vegetables*", declares Alán Castillo of INTA Carazo.

The course "How to Become a Plant Doctor" includes practice in photography, and making photo-sheets and fact sheets. Everyone recognises that they must keep improving their skills to develop high-quality photographic materials, and thus create a set of fact sheets of the important pests and diseases in each region.

[11] Reference materials prepared by PROMIPAC-Zamorano, EIAG, INTA, UCATSE, MAGFOR, CNEA, OIRSA, UNA, CATIE, GPC and APS, among others.

7.4 Training

The continuing training of the plant doctors is a constant task and an important commitment of the Plant Healthcare Network. The plant doctors need to stay up to date and to keep training. Because of lack of funds only the first clinics in Las Segovias received training from the Network during this first phase.

UCATSE, UNAN-León, UNA, DGPSA-MAGFOR, INTA and PROMIPAC are all active Network members and have taught courses on various subjects (Table 7.4). The purpose of the training is to strengthen the theoretical and practical knowledge of the plant doctors, so they are well prepared to face pests and disease problems with the farmers.

Table 7.4 Examples of topics from courses given by the Network

Insect pest management in vegetables and cucurbits (applied entomology)
Alternatives for integrated crop management
Recognition and isolation of diseases in the field and the laboratory
Use and handling of a camera. How to take and download photographs

"All the courses we attended at UCATSE, UNA, UNAN León and the course on nematodes by the GPC at Zamorano have been very good, although they should be longer, so there is a chance to cover the subject matter in greater detail," suggest the plant doctors in El Jícaro. *"We need many more training courses."*

The Network in Las Segovias has conducted two *in situ* training courses for farmers in response to concrete demand expressed at the Plant Clinics: a) nematodes in coffee and b) pest and disease management in tomatoes and coffee.

When the problem of potato seed quality appeared in San Nicolás, INTA gave much support with training for farmers and technical staff. *"Now the farmers are aware of the problem and understand the importance of seed quality. Many already know about late and early blight and how to control them,"* explains Bayardo López of ASOPASN, San Nicolás.

Work at the clinics has revealed there is significant demand for continuing training for the plant doctors. The universities, INTA and MAGFOR do everything possible to respond.

7.5 Database of queries received by the Plant Clinics

The record of queries managed by each clinic and the electronic database managed by UCATSE are innovations with a great potential. Never before has Nicaragua had a system capable of gathering information in a direct, systematic and continuous manner on the plant health problems present in the fields of hundreds of smallholders. The database contains information of much value for making strategic decisions and designing actions in response to an identified demand (Table 7.5).

The proper management of electronic records is of vital importance in order to capitalise as much as possible on the information received at the clinics. A plant doctor can be very good and provide a good service at the clinic, but if records are not kept properly, no one else will know about the plant health problems that exist in the area.

UCATSE has taken the institutional responsibility for managing the electronic record of queries received at the Plant Clinics, updating it each month, perfecting the design of the database and controlling the quality of the data. Human resources have been assigned specifically to this task, which is demanding and requires much time and constant attention, which are hard to come by sometimes.

Table 7.5 The UCATSE database of queries is valuable for many purposes

A reference to understand the incidence of pests and diseases in each region
Complements MAGFOR's plant health surveillance
Helps identify demand for research and technology
Helps identify training needs of plant doctors
A crucial element for monitoring the performance of the clinics and the quality of their services
Reference information for students, researchers, extensionists and other stakeholders
The main foundation for documenting queries and analysing them by zone, crop, pest and season

In western Nicaragua, UNAN León is in charge of collecting the logs in the bimonthly meetings and delivering them to UCATSE at the central database. Most of the clinics are filling out their logbooks correctly, with a description of the problem, the diagnosis (when one can be made), and a recommendation. In some cases the information is incomplete, or they arrive too hastily at a conclusion about the cause of the problem. Several clinics respond to queries during field visits, and these should also be recorded in the log.

There is still a weakness transferring the data from the logbook to the simple Excel format. It has taken much effort to develop the habit and discipline to fill it out correctly and continuously. Updating and cross-checking the common record becomes a tedious and cumbersome task. The Plant Clinics need someone to help them learn the technique well and incorporate it to their work routine, since not everyone handles Excel with equal ability. UCATSE has made a guide for plant doctors on how to enter the data into the computer.

Filling the treasure chest. UCATSE has accepted the challenge of creating and maintaining a user-friendly database and making it available for the benefit of everyone in Nicaragua.

UCATSE has been working on the idea of creating an interactive Web page with a simple database where plant doctors can enter their log data directly and where plant doctors and Network members can study and analyse the data in the system.

Plant doctors express a constant demand for access to updated information: "*We would like to have access to the data from all the clinics, so that if a problem comes in that is unusual in our zone but is common in another, we can see in the database the recommendations that others make*", says Dórlang Martínez, of Quilalí.

The Somotillo Plant Clinic has few resources but it has a well organised and updated logbook on paper and in Excel.

7.6 Monitoring and quality control of services

Monitoring of the Plant Clinics is one of the most important functions of the Network to support the constant improvement of the service, and to make the Network's competencies available.

There is no simple definition of a quality service (Table 7.6). The appraisal must be holistic and take into account the technical and social competencies of the staff, the pertinence of the recommendations, the profitability and scope of the service.

Table 7.6 A quality service must satisfy several criteria

Quality criterion	Comments
1. Technical quality	Correct diagnosis Effective recommendations
2. Timeliness	The answer is given on time
3. Inputs are available and accessible	The product or input recommended must exist and be accessible in terms of cost, time and volume
4. Safe recommendations	Recommendations must not be harmful to human health or the environment
5. Response to specific demands	Depending on the type of farmer, for example: **i)** organic vs. conventional; **ii)** smallholder vs. large farmer; **iii)** importance of the crop to the client; **iv)** degree of specialisation; **v)** purchasing capacity; **vi)** personal preferences
6. Attitude	The plant doctor must be respectful, curious and interested in learning from farmers to find the best possible solution

So far no monitoring and quality control system has been devised, but it is evident that it is necessary to use different methods to assess the quality of the service and the performance of the system from different perspectives: the client, the organisation and the Network. Monitoring must be a shared responsibility between local organisations and the Network and an integral part of the work plans. During the development of the initiative different mechanisms have been used to measure the performance and impact of the Plant Clinics and the Network.

Bimonthly meetings. Periodic meetings between the Plant Clinics and the Network have been the most frequent mechanism to maintain contact, discuss progress and difficulties and coordinate actions. Face to face meetings are indispensable for exchanging ideas and experiences, problem-solving and keeping up the interest and team spirit. However, not all clinics have enjoyed the privilege of belonging to a support group with well-defined functioning.

From the beginning the bimonthly meetings functioned well in Las Segovias, despite a few problems with communication and attendance because of distances and workloads. In western Nicaragua the clinics plugged into the bimonthly meetings already established by the Regional IPM Group under the leadership of UNAN León, DGPSA-MAGFOR and INTA.

"We need more support". The plant doctors in South Pacific and South Central Nicaragua feel frustrated and forgotten and receive little support from the Network. There are no regular meetings, and little monitoring.

Eduardo Espinoza, INTA Carazo

In the South Pacific and South Central regions it has not been possible to set up a support group because the Network has fallen apart in those areas. This has been a source of much frustration for the plant doctors in those regions. Sometimes they have come on their own initiative from Masaya, Ticuantepe and Juigalpa to participate in meetings in Las Segovias, seeking support. This is not a viable long-term solution because of transport costs and time required to travel.

Monitoring visits to Plant Clinics. The plant doctors have pointed out that the monitoring visits by the Network are extremely important and that more are needed. They need this backup to keep improving their technical knowledge and to not feel so alone. The visits are also important to recognize the organisations, so that they see that they are part of a much wider initiative. It is easy to feel alone and isolated in distant communities such as Murra and Quilalí.

Quality control. The monitoring visits allow observation of how the service is functioning, how records are kept, how clients are received and what is being done to promote the clinic.

Yamileth Calderón, INSFOP Estelí

The plant doctors in El Jícaro explain that the visits allow them to adjust the methodology and strategy. They have received three visits in 2007 from the Global Plant Clinic, the Network and specialists from INTA. "This has given us confidence and security, and has improved the quality of the technical services, due to the methodological contributions they give us when doing the diagnoses."

So far monitoring visits have been few, sporadic, and lacking in a systematic method. In Las Segovias the Network has visited the local organisations in San Nicolás, Estelí, Jalapa and El Jícaro, to review administrative issues, the use of

materials delivered, and to gain a general impression of how the clinic functions. But a technical monitoring and an evaluation of general performance are still lacking. In western Nicaragua the Network has tried to visit the clinics in Somotillo and El Sauce every three months, but several clinics have not yet been visited by the Network (Juigalpa, San Juan del Sur and Murra).

In the South Pacific area the change in priorities and strategies of the public institutions and the relocation of staff to other institutional activities affect the image and quality of the clinics' services.

Much of the technical and methodological monitoring was done by external advisers (over twenty visits), based on a simple form and direct observation, to review how each clinic worked as a whole, from the quality of the diagnosis and recommendations, record keeping, communication with clients, promotion work and interaction with the Network.

We took advantage of the tour of the Plant Clinics to test and validate the monitoring form with the organisations and start establishing a systematic way of doing monitoring with the clinics and organisations. Two to three-page long reports were returned to the plant doctors and their supervisors and we asked for their opinion on the reports' pertinence and usefulness.

The plant doctors in El Jícaro and Quilalí stated that the reports were very useful to them for continued improvement, to learn and maintain a close relation with the Network. A critical external eye is seen as something positive. This was the first time that the reports were delivered directly to the supervisors as a way of institutionalising the monitoring, improving communication between the organisations and the Network and to give the organisations elements to do their own monitoring.

> *"The Network needs to do more monitoring of the clinics, for example on sample taking and diagnoses (DGPSA), technological advice (INTA) and technical and methodological support for record keeping (other Network members). We suggest that each clinic receive a monitoring visit every two months."*
>
> **Participants at Workshop, INTA Sébaco, Oct 2007**

The results of the training by the GPC are clearly visible in the way the plant doctors make diagnoses and give recommendations. They talk patiently and confidently with clients, and they apply the fundamental principles of symptoms-based diagnoses: the identification of the most probable cause of a problem by eliminating the possible causes. Dimas Sarantes says that "*talking to farmers, they themselves give you the answers*". However, diagnosis is difficult and complex; more practice is needed, more support from laboratories and specialists and more training so the plant doctors keep improving their skills.

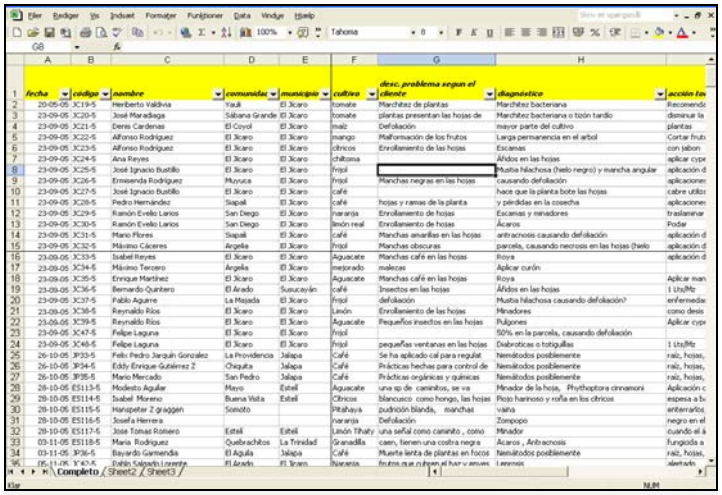
Monitoring visits to organisations. Local organisations that operate a Plant Clinic also need a system to judge whether the service is providing the benefits which the clientele want. The supervisors of the plant doctors at the cooperatives for the most part do not have the technical know-how to be able to evaluate the technical quality of the service. For that they need support from the Network. But they can monitor on the performance of the plant doctors' work discipline, if they fulfil their obligations to send records and reports to the Network, and of course, if the clients are satisfied with the service.

So far this part of the monitoring has been weak. Most clinics submit periodic reports to their supervisors, manager or board of directors, and at El Jícaro, San Juan del Río Coco, Quilalí, Jalapa

and Somotillo the managers, coordinators and members of the board visit the clinics frequently to see how things are going. But in other cases, like Masaya, Ticuantepe, Murra and San Nicolás, there is little monitoring of clinic activities.

Review and analysis of the database. The query database, incomplete though it still is, contains valuable information for quality control of the service, for diagnoses and recommendations, and to identify training needs and information on specific issues. This unique resource has been underused for several reasons. The work done by UCATSE to feed the database and clean the information has been time-consuming, and it is not clear who at the Network was going to take charge of reviewing and analysing the data, or how the necessary conditions would be guaranteed so that someone could accept that responsibility permanently. It has not been possible to incorporate this task into the Network's daily activities. They are crucial issues that need to be solved to institutionalise the system. They must become a part of how the Network is set up and of the definition of roles and responsibilities.

During the bimonthly meeting in Quilalí in October, 2007 we explored how to make better use of the information in the database. Wilfredo Centeno of UCATSE brought up some examples of common pests and diseases from the database and listed the different control options recommended at the clinics (Table 7.7).



A treasure chest of underused information. The database managed by UCATSE contains a wealth of information based on hundreds of queries. It is a valuable tool to monitor the quality of diagnoses and recommendations.

An interesting and enriching discussion followed regarding the efficacy and relevance of the different technologies and cultural practices. How well do they work and under what circumstances? Are the inputs accessible? Are there other more efficient and safer technologies? It was like a 'doctor's conference' at a hospital where the doctors meet to discuss specific cases and assess the most appropriate measures and treatments. There is not one single correct answer; rather it depends on the circumstances of each case.

Some recommendations were identified as less appropriate than others, and in the case of bacterial wilt, crop rotation should also be included as a pertinent measure.

This type of exchange based on specific examples is extremely useful, both for plant doctors and specialists in the Network. This should be a permanent part of the bimonthly meetings, as a means of continuous quality control and to strengthen competencies of the actors. No one has all the correct answers. The combination of everyone's knowledge and experience increases the probability of identifying more robust and correct solutions, together with farmers who visit the Plant Clinics.

Table 7.7 Examples of recommendations made at the Plant Clinics

Pest / disease	Control options taken from the UCATSE database
Mites	Weed control, *caldo sulfocálcico* (a boiled solution of sulphur and lime), soapy water
Aphids	Detergent, detergent + tobacco, cipermetrine (insecticide), systemic insecticides, leaves of *madero negro* (*Gliricida sepium*, a tree) + manure, detergent + chilli peppers, neem, weed control
Nematodes	*Phaecelomyces* (fungus, biocontrol)
Virus	Eliminate the diseased and host plants, transplant healthy plants, control the vector (in greenhouses), milk
Bacteria	Eliminate diseased plants, disinfect machetes, weed control, *caldo sulfocálcico*, plant resistant varieties, gliricidia + dung
Scale insects	Sanitary pruning, lime diluted in water, detergent, neem, cipermetrine, *caldo sulfocálcico*
Fungi (Cercospora, mildew)	Bordeaux mixture, Manzate (a fungicide)

Monitoring in the field. Another way of verifying if the recommendations have really been helpful is through direct observation in the field. However, this type of monitoring is costly, takes much time and resources, and would only reach few clients. Participants in a project are well identified by first and last name, which makes monitoring in the field much easier. But as the Plant Clinics are an open and public service it is more complicated to 'trace' the clientele. So far little has been done.

In a case of citrus leprosis in El Jícaro monitoring was done in the field, because it is a quarantined disease and MAGFOR followed it closely to ensure the epidemic was eliminated. In San Nicolás there was also close monitoring of a case of bacterial wilt in potatoes, a devastating disease that causes tremendous economic losses if allowed to spread.

In Quilalí, El Jícaro, Jalapa, San Nicolás, Somotillo and San Juan de Río Coco the plant doctors have made farm visits in relation to other organisational activities, especially already scheduled technical assistance visits. They try to combine attention at the clinic with field visits when there are cases the plant doctors consider important.

'Medical conference'. Group discussion on recommendations made at clinics must become a permanent part of the service's system of quality. These exchanges raise awareness, spread new knowledge and help correct mistakes.

"*Almost all of them follow the recommendations, maybe not exactly like we told them, but they try to*", says Juan Carlos, of San Juan de Río Coco. "*The advice gives good results; one sees it in the field, for example in the treatment of rust and American leaf spot with copper sulphate and biofertilisers. The farmers are grateful for the help they get. All of the attention on citrus leprosis has made the farmers in general aware of the problem. They know the risk and the symptoms and that they can seek help at the clinic if they have any questions.*"

"We received a query about an avocado tree in a garden that showed symptoms of dieback. We sent a sample to Martin Urbina at DGPSA and he found Phytophthora. *It was definitely dieback. We recommended pruning and applying Bordeaux mixture and carbendazine. That stopped the disease. The same client, Reinaldo Ríos Cárdenas, came back another day with some mango leaves with little holes and little whitish growth spots. He told us they were from an old tree that gives lots of healthy fruit.'* Since I had that problem with the avocado now I pay more attention to my trees, and when I saw these spots on the leaves, I thought I'd better go ask the plant doctors just in case, and to be prepared*', don Reinaldo told us. For us as plant doctors it's encouraging to see how the farmers little by little are starting to appreciate the clinic as a service that can help to prevent diseases, not only cure them."*

Geovany Rodríguez, SANTIAGO COOPERATIVE, El Jícaro

In Quilalí the plant doctors have made field visits to observe the effects of the recommendations and they see that some problems have indeed been solved, for example the coffee berry borer, leafminer in citrus, and some cattle diseases. In other cases the effect has been partial, because some farmers do not apply the treatment correctly. For example, when they see the disease stop, they do not finish the treatment, and the plants get sick again. There are also farmers that resist crop rotation, either from force of habit or because they are working with a high value crop and don't want to earn less by changing for a season or two.

As Félix Medina explains, "*Another obstacle to adequate disease management is that many farmers come to the clinic too late, to ask for advice when the disease is already very advanced and maybe they've applied lots of chemicals. In those cases preventive measures are no longer of use. It is difficult to educate people so they take timely precautions and thus minimise the use of pesticides.*"

Opinion surveys and feedback from clients. An important criterion for measuring the quality of the service is customer satisfaction. So far feedback from farmers has been limited, although some plant doctors try to encourage people to come back and report how it went with the recommendation. But it takes time to create such a habit. "*Well, at least no one comes back to complain!*" jokes Dimas Sarantes of El Jícaro.

Table 7.8 Repeat visits by 25 farmers to four Plant Clinics (see text)

No. of client visits to clinic	Amount	Percentage
1	11	44
2	3	12
3	7	28
5	1	4
No answer	3	12
Total	**25**	**100**

The plant doctors recognise the need to gather information on the perceptions and opinions of clients in order to demonstrate the impact of the service and to learn more about what works well and what needs to be improved. The courses given on 'technical-popular writing' (module 3 of 'How to become a plant doctor') have inspired several of them to write articles and stories on concrete experiences at the clinic as a way of documenting results for an outside audience (see stories in shaded boxes, this report). This is something new and an important achievement for these extensionists who are used only to writing technical reports for internal use. It reflects a great change in attitude and style of working.

Opinion survey. A short and simple questionnaire is a good tool to learn about the degree of satisfaction among farmers.

As part of this study we held a first opinion survey of clinic clients to learn about their perceptions of the service, to what degree the recommendations had helped them or not, and whether they would be willing to pay for the service in the future.

There was not much time for the survey, but information was gathered from 25 clients (9 in San Juan del Río Coco, 8 in El Jícaro, 7 in Quilalí and 1 in Jalapa). Of these, almost half had come to the clinic more than once, a good indicator of satisfaction (Table 7.8).

Sixteen farmers said they took diseased plants to the clinic, but of these only six received the result of the analysis. This indicates there are deficiencies in coordination between the clinics, the laboratories and the farmers for taking and analyzing samples, and returning the results to the farmers.

Most farmers claim to have put the recommendation they received into practice and think they got good results: "*The plants showed change*", "*the pest diminished*" and "*the disease disappeared*" are some of the clients' comments.

They think that the recommendation given was "very good" (52%), "good" (28%) and they would return to the clinic if they had another problem with their crop (92%).

The interviewees appreciated the courteous attention, the services offered, ease of access and the availability of reference materials. The main limitations are related to the short hours at the clinic, the small number of plant doctors, the lack of materials and products which are recommended, as well as laboratory access (Table 7.9).

Table 7.9 Positive aspects and constraints at the Plant Clinics, according to clients interviewed

Positive	Constraints
• Very good, quality attention from the plant doctors; it is the best • The laboratory analysis lets you know what the disease is that's affecting crops • Very good, effective diagnoses and accurate recommendations • The plant doctors come to see the crops and diseases • It is good because it is close by • It improves the crop yields • Farmers get guidance on planting crops • Access to reference information • The service is free of charge • We save money because the service is nearby	• The clinic is only open until noon. That is not enough time • The clinic is only open one day a week • There are too few plant doctors • The products recommended are not available • More equipment and reference material is needed • More dissemination is needed • The office is out in the open, in the weather • There is no laboratory nearby, lab analysis is lacking • If a sample is taken to the laboratory the result should be given immediately. Late results. • Some doctors could provide better care

Although the monitoring provided thus far has been a bit of 'trial and error,' without defined tools and timetables, there are many examples of the quality and relevance of the services offered by the Plant Clinics and the Network. It is also clear that the coordination and communication between the different actors in the system needs much improving.

With the results of this study and the validation of the monitoring instruments, there is enough material for the clinics and the Network to establish a monitoring and evaluation system of their own. A simple, flexible, user-friendly system that allows for evaluating everyone's performance, while improving and adjusting it as they go along and documenting the results.

I would like organic pest control

Edwin García, Juan Carlos Castro and **Adalberto Guerrero**
Plant doctors at UNAG San Juan del Río Coco

In the municipality of San Juan de Río Coco there is mixed farming of coffee, citrus and bananas. These crops are the main source of income for smallholder families, but they do not know all the pests and diseases that attack crops and cause economic damage.

Mr Adolfo Alvarado recognises the value of the service provided by the Plant Clinic

One day Adolfo Alvarado Herrera from the community of Babilonia showed up at the clinic with some small branch of mandarin orange in his hand, saying *"Doctors, I've got this problem with my plants, and I've seen some little animals that are damaging the sprouts, and I need an organic product that will help me to control them."*

It was clearly urgent for the farmer to control the pest, as his mandarin orange grove is one of his family's main sources of income. We lost no time offering Adolfo a seat and asked him to tell us how he came to notice the problem.

After talking for a long time, observing the symptoms and the pest on the sample, checking our bibliographic material and using the tools provided by the courses, we arrived at the conclusion that this was an attack of aphids, and recommended he prune all the affected branches, burn them and remove them from the area, beside applying *sulfocálcio* to prevent the outbreak of other diseases, and soapy water to eliminate existing insects.

Five days after the visit, one of the plant doctors went to the farm to see the effect of the recommendations. Don Adolfo happily said: *"It was the easiest, cheapest and most effective recommendation I could have applied to my plants, because I completely controlled the pest."*

Don Adolfo has taken this experience to heart, telling others about it and passing on the recommendation to others who have the same problems, which suggests that the service provided at the clinic is useful and is having the results we expected.

This was a very special case for us as plant doctors. We are promoting organic production and feel great satisfaction recommending techniques that are affordable for farmers and in harmony with the environment.

We do not discard the use of synthetic products for controlling some pests and diseases, but organic products offer a number of advantages that allow saving money while avoiding environmental pollution or harming people.

8 How the Network adds value

The existence of a network is justified by the added value generated by joint activities. Added value emerges from innovation, creativity and the improvement of the services offered by the members. The clinics and their organisations offer a specific service, and the added value is the fruit of the complementarity and synergy created between the services offered by the clinic, the organisation and the Network. But an added value may also be something unexpected.

The Plant Clinics offer more than a plant health service. They complement other initiatives and so have the potential to form part of an integrated rural development strategy.

David Espinoza, a farmer in San Juan del Río Coco, produces biofertiliser at home, using manure, milk and brown sugar.

Contribution to disease surveillance. At the clinics, especially the ones with many clients, the queries help the plant doctor and the network to have a view of the behaviour of pests and diseases at the local level, and even more importantly, to identify occasional threats of outbreaks or the presence of quarantined diseases.

In 2005, the clinic at El Jícaro found there was citrus leprosis, a quarantined virus disease, and immediately alerted MAGFOR. The clinic at San Nicolás identified several cases of potato seed infested with *Pseudomonas*. They alerted INTA which supported them with training and they were able to control the problem. In San Nicolás they also observed that a new variety of potato, Karl White, recently introduced into the region, has caused problems, possibly due to a new and aggressive type of leafminer now affecting several potato varieties. The clinic is seeking ways to control the problem.

Inputs. Often plant doctors recommend the use of non-synthetic products such as biofertilisers, biopesticides and biological controls to manage pests and diseases. But these inputs are not always easy to come by.

Several clinics want to produce and sell organic and biological inputs themselves. Others are offering inputs through synergy with the local Plant Pharmacies (*Botiquines Agrícolas*[12]), an initiative promoted by PROMIPAC. The Plant Pharmacies function as suppliers of inputs for families at the local level. There are also organisations and institutions that train farmers to make homemade biofertilisers and biopesticides.

[12] A *botiquín* is a medicine chest, medicine cabinet, or a small collection of medicines. We have translated it as 'pharmacy'here.

The Plant Clinics and the Plant Pharmacies – two complementary initiatives

By **Julio López Montes**
National Coordinator, PROMIPAC

We all recognise the tremendous effort that is being made by development institutions – NGOs, MAGFOR, DGPSA, OIRSA, FUNICA, PROMIPAC, and the universities among others to improve the diagnostic systems and management of plant health problems in crops of economic importance to Nicaragua. It is well known that the country is deficient in knowledge and management of current technology.

The Plant Pharmacies (*Botiquín Agrícola*) help to solve the problems of access to adequate inputs for farmer families

The Plant Clinics, the Plant Healthcare and Diagnostic Network and the Plant Pharmacies are initiatives that respond to the felt needs of farmers and that in the hands of government and private institutions could solve a good part of crop's health problems. These initiatives are designed to empower a large number of farmers to make the correct pest managements.

The Plant Clinics have advanced on the issue of diagnoses and prevention of diseases through accurate recommendations and they have generated trust between farmers and technical staff. However, a correct and timely diagnosis of the pest is not enough, if what is proposed to manage it does not exist in the community, or the amounts and formulations are not adequate.

This led us to develop a strategy to join the Plant Clinic to a complementary service to make pest management more efficient and to ensure input production on time and in appropriate quantities.

A Plant Pharmacy is a community stand that offers effective alternative technologies for managing the pests of the main crops in the community. The pharmacy is set up to function as a small community agribusiness, where one or more farmers, cooperatives or institutions that have received training buy inputs, prepare the products and then sell them to farmers in the community that need them. They make organic fertiliser, organic fungicides, and distribute inputs that are difficult to find at conventional agrochemical shops. They also carry the pesticides which are the least hazardous and most effective for pest control.

PROMIPAC has established seventeen Plant Pharmacies through partner institutions. This has made it easy for us to measure their impact: 1) a reduction in the use of highly polluting chemicals; 2) an increase in the availability and dissemination of technology that is often hard to find (i.e. microbiological products); 3) the development of more appropriate technical assistance programmes; and 4) above all, the pharmacies are accepted by MAGFOR. The persons in charge of the pharmacies are trained and certified to run them.

A Plant Clinic could be even more effective if it worked with a Plant Pharmacy with a local supply of products, inputs and appropriate technologies on time and in adequate amounts. This would bring prices down and formalise links with providers of agricultural products.

If we want to evolve towards a healthier agriculture, where we reduce environmental pollution, stop harming our land, reduce the poisoning of water and human beings, it is important to start using new knowledge and technologies in rural contexts. Through the Plant Clinics and Pharmacies smallholder farm families can take firm steps towards a promising future and a safer one for their children, without contaminants.

FUNICA's Technology Markets Development (DMT) is another initiative to promote the sale of technologies for small producers through small local enterprises. DMT has a great potential to complement the Plant Clinics by providing agricultural inputs such as seeds, plantlets, biopesticides and animal feed, among others. So far only the Santiago Cooperative in El Jícaro has joined the initiative by providing artificial insemination, a veterinary pharmacy and the sale of cattle feed.

Display homemade technology. At the clinic in Jalapa the idea emerged that Plant Clinics could be improved by displaying technology, learning material and different types of samples. The samples they have include a natural strain of *Beauvaria* parasitizing a larva, a homemade silo for seed storage, and a bottle of *sulfocálcico*. This draws people's attention and stimulates discussion between people who visit the clinic.

Plant doctor Isidro Cáceres and Genaro Paz Quinónes, president of CCAJ Jalapa, display a homemade maize seed silo designed for small farmers. In Jalapa they try to make the most of the synergy between the clinic, the field school (FFS), the Local Agriculture Research Committee (CIAL) and mass extension by radio.

Animal health services. In addition to plant health, at least six of the ten clinics interviewed also offer animal health services. Several of the plant doctors are veterinarians, so they already have the training to offer this service. Some clinics even want to change their name to reflect that reality, i.e. from 'Plant Clinic' to 'Agriculture and Livestock Services Clinic' or 'Agriculture and Livestock Health Clinic'.

Synergies with farmer experiments and research. The plant doctors at the clinic in Jalapa have established a novel link between the clinic, FFS and CIAL. When they identify a problem of relevance to the clinic, they take the problem to the field school; they show how to do the diagnosis and they experiment with different control methods. The results of the experiments at the FFS are then sent back to the clinic and to the radio for broader dissemination.

For example, at the FFS they experiment with *sulfocálcico*. They have also brought samples from the clinic and extracted nematodes in the experimental plot. They even do workshops on how to make inputs for the control of pests and diseases. The clinic becomes an integrated iterative service between: **Plant Clinic ↔Farmer Field School↔Radio.**

The clinic at El Jícaro also integrates its activities with the FFS by training lead farmers. They take problems identified at the clinic and do experiments or research in the field. Pedro Antonio Vásquez, a farmer from El Jícaro, says: *"They did a test at my farm and found nematodes. Now we are doing experiments with different products with a project of FUNICA-FAITAN. It was the clinic that identified the problem."*

New inter-institutional links. The problem with nematodes in coffee identified by the clinics in Jalapa and El Jícaro led to the formation of a strategic alliance between UCATSE, UNA, PROMIPAC, CATIE, UCOSEMUN, APROFOSC and the financing of research projects through FUNICA-FAITAN. These new inter-institutional links were not foreseen when the Network was formed, but they were created in response to a specific demand identified by the Plant Clinics.

Another result of the new links is the interest shown by the institutions to train their staff. Recently several institutions of the Network got together, coordinated by UNA and INTA, to prepare a proposal for an international course in virology taught by the GPC (Section 7.2).

Integrating students. The fact that the clinics have technical information in the form of fact sheets, books, insect display boxes etc. means that they are a kind of library. At the clinic in San Juan del Río Coco secondary school students consult with plant doctors and use the material for their research and theses. One student is doing practical work for academic credit with the plant doctors. They have received queries from students in all four years of secondary school. At El Jícaro the clinic also receives students doing practical work for academic credit. In Estelí there are students from the Regional Multidisciplinary School UNAN Managua (FAREM) working at the clinic. Through CIPROV, UCATSE has included student interns, as is the case with Wilfredo Centeno. He began as a student working with the database and today is an active facilitator within the Network.

Better quality in technical assistance and synergy with other methods. As emphasised earlier, several clinics are linking their work to the FFS. In San Juan del Río Coco they are integrating the farmer-to-farmer extension method to the clinic. Many of the plant doctors make technical assistance visits to farmers as part of their regular work.

Everyone emphasizes that the work at the clinic and the training given by the Network and the GPC (chapter 5 and section 7.4), instilled the plant doctors with more knowledge on how to do a correct diagnosis and make adequate recommendations. Besides, just the experience of receiving so many queries has improved their extension strategies, the quality of technical assistance, communication with farmers and their own self-confidence.

"We saw the problem of wilt in tomatoes. The farmers were spending and spending on chemicals with no result. There are problems with education and communication. The Plant Clinic helps to overcome this. There is now more awareness among farmers and the advice given by the cooperative now has a greater impact. The importance of this community service is overwhelming".

Ramón Méndez

Manager of the SANTIAGO COOPERATIVE, El Jícaro

Less chemicals. A better diagnosis of plant health problems and better access to appropriate inputs have as an immediate consequence reduced the irrational use of synthetic pesticides. Clients at the clinics are learning that not every symptom requires treatment, that with preventive measures one can avoid or diminish the development of diseases, and that it is not good to use pesticides blindly without knowing the cause of the problem, and that there are less toxic alternatives.

The Network researches plant health problems in coffee

Lilliam de Jesús Lezama Gaitán
Director of Research and Postgraduate Studies UCATSE, Network Coordinator for Las Segovias

The Plant Healthcare and Diagnostic Network carries out activities in search of solutions to plant health problems, such as nematodes. Queries came in from many worried farmers, but we realised there were not enough control options to eliminate the infestations in the field.

The Network decided to formulate a research project to provide a timely and appropriate answer to the problem. The research also encompassed the management of rust and anthracnose.

Another project covers issues of fertility and shade. The work teams include Network members, extensionists, farmers and specialists.

For Las Segovias it is a very important achievement to have multidisciplinary teams set up to study common problems. This contributes to the development of the region.

Collective actions. Groups of researchers, farmers, extensionists and specialists work together to seek solutions to problems.

We at UCATSE see the Plant Clinics as strategic for identifying research topics and placing our competencies at the service of society.

Left: Technical staff and specialists at a course on plant health and farm diagnoses at the Los Angeles farm in the community of La Bujona. **Right:** The Plant Healthcare and Diagnostic Network and the Plant Clinics are a new platform where researchers interact directly with farm families.

Research projects carried out by members of the Plant Healthcare and Diagnostic Network:

1) *Quality of coffee cultivars under different types of shade cover and soil characteristics in five municipalities in Las Segovias*. Participants: UCATSE, UNA, PAC (NGO), ATLANTIC (coffee exporter). Coordinated by Jorge Luis Martínez, UCATSE.

2) *Technological innovations for the ecological management of rust, anthracnose and nematodes in coffee in five municipalities in Las Segovias*. Participants: UNA, UCATSE, PROMIPAC, UCOSEMUN (farmer cooperative), CATIE (research center), APROFOSC (farmer association). Coordinated by Élida Rosa Méndez, UNA

9 Achievements, difficulties and keys to success

The Plant Clinics have filled a void in the supply of agricultural and livestock services. They are a timely response to a diverse and permanent demand, and backstopping from the Network lends them credibility. *"The clinic will always exist because there is a demand for it. In this municipality there is no other entity that offers this service"*, says Isidro Cáceres, plant doctor at the CCAJ in Jalapa.

The achievements are many, but what really stands out is the change in attitude and the ownership taken by farmers, local organisations and members of the Network. *"The change in habits among producers, the ownership they have taken of the service is a far-reaching achievement,"* says Ramón Méndez, manager of the Santiago Cooperative in El Jícaro. *"The fact that a farmer takes a sample and goes to the clinic to find out what he himself can do about it is a great achievement"*. The head of DGPSA in western Nicaragua, Ricardo Padilla, puts it this way: *"The participation of DGPSA in the Network has helped to increase our presence, prestige and knowledge in the region."* Tables 9.1 and 9.2 are a summary of the main achievements of the Plant Clinics and the Plant Healthcare and Diagnostic and Plant Healthcare Network, respectively.

Table 9.1 Main achievements of the Plant Clinics, March 2005 – November 2007

Achievement	Discussion / Example
Clients and services	
Technical assistance to many farmers	The Plant Clinics have received about 2,000 queries on over 100 crops. A large part of the clients do not have access to other sources of advice and information.
Less use of pesticides	The clinics have reported several cases in which the advice given helped the client find more accurate solutions and reduce the irrational use of pesticides.
Better yields	Some clients report that their yields and the quality of their harvest have improved, thanks to advice given at the clinic.
Client satisfaction	Clients surveyed say that the plant doctors are friendly, courteous and give useful information to improve crop management. They appreciate the free service, especially if the plant doctor comes to the farm to make a diagnosis.
Access to information	The clients value the reference materials available for consultation at the clinics.
Plant doctors and their organisations	
Better performance by extensionists	The plant doctors feel that through the training and work experience at the clinic they have gained more knowledge and self-confidence in their work.
Improved relations with farmers	Most plant doctors highlight better relations with farmers as an important achievement. This is the result of a better understanding of the farmers' real problems, and better communication skills on the part of doctors.
New links with expert institutions	Through the Network, the clinics allow plant doctors to gain direct access to expert support and information.
Monitoring and quality control	Some clinics are beginning to combine monitoring of recommendations with other activities that require field visits as part of the quality control of the service.
Advertisement	The use of different advertising methods has helped position the clinics: e.g. radio, pamphlets, banners, signs and taking the clinic as a 'mobile clinic' to other communities ('portable clinics').
Acceptance and ownership	Several clinics report that the service has been accepted by the community and that local organisations have taken ownership of these as part of the services they offer.

Ownership. *"With or without a project, we will continue with the Plant Clinics. It is deeply satisfying to provide technical assistance to the many who don't have access to services."*

Milton Guerrero, technical coordinator. **Evelio Báes**, president; **Wilfredo Avilés**, vice president. UNAG, San Juan de Río Coco.

Confidence and quality. *"The guys keep coming up with ideas to update themselves and give better services. The training has helped a lot to create a good quality service. The farmers know there is a complete service here that can solve their problems. They've taken ownership of the clinics."*

Román Valdés, president; **Noé Rodríguez,** deputy manager. 20 APRIL COOPERATIVE, Quilalí.

Table 9.2 Summary of the main achievements of the Plant Healthcare and Diagnostic Network March 2005 – November 2007

Achievement	Discussion / Example
Greater use of existing laboratories	The laboratories of DGPSA and UCATSE have received some 250 samples from the clinics.
Outreach and prestige	Network institutions have increased their outreach and prestige as they find ways to satisfy the demand for expert support that has emerged through the clinics.
Quality of services	The Network serves as technical backstopping for the clinics and oversees the quality control through training, monitoring visits and exchanges.
Database of queries	The query database managed by UCATSE is an innovation and a powerful tool to document the results, monitor the quality of the diagnoses and recommendations, and identify training needs.
Identification of research demands	The clinics constitute a new mechanism for capturing research demand. A strategic alliance has been formed between UCATSE, UNA, PROMIPAC, CATIE, UCOSEMUN and APROFOSC to seek viable solutions to the problem of nematodes in coffee.
New channels for technology dissemination	The universities and INTA see the Plant Clinics as strategic points for the dissemination of information, IPM technologies and good agricultural practices.
Integration of new institutions	Through regional networks and the clinics, new institutions have shown interest in joining the initiative. For instance, in western Nicaragua the Somotillo Clinic began as an INTA responsibility and is now a collaborative effort between ASODEL, MAGFOR and INTA.
Ownership	Some Network members have integrated the activities into their work plans. This helps to ensure that the actors involved are given the necessary time to comply with the commitments entered into.
Integration of the system	Network institutions have been able to organise their regular activities to include the demand from clinics with little additional cost. There is now more synergy between research, extension, education, surveillance and regulation and the provision of inputs.

Table 9.3 summarizes the difficulties and gaps facing the Network and the Plant Clinics. Many of these difficulties are interrelated. For example, the lack of ownership and support by some clinic organisations and Network institutions hampers coordination and limits the amount of time plant doctors or Network actors can spend.

Table 9.3 Summary of difficulties and gaps at Plant Clinics and the Network

Difficulty / gap	Discussion / Example
Plant Clinics and their clients	
Create and maintain demand	Several clinics mentioned difficulties creating demand and getting farmers to understand they must bring in their samples on time.
Materials	Some clinics need basic materials (banner, fact sheets relevant to the region, table, chairs). Others require materials to make a better analysis (e.g. a microscope, equipment for nematode extraction). All need more reference materials.
Monitoring	More monitoring in the field is needed to be able to assess the relevance of the recommendations.
Working hours	Several clients complained that the working hours were too short (only half a day per week).
Access to inputs	Often the recommendations made by plant doctors involve the use of products that cannot be acquired or do not exist. Clients point out the service should include access to the products that are recommended.
Plant Healthcare and Diagnostic Network and their interaction with the Plant Clinics	
The regional networks	The South Pacific and South Central networks have had difficulty getting established for lack of communication and coordination, staff rotation, lack of time and budget, and new institutional priorities. To improve the functioning of the networks in Las Segovias and western Nicaragua it is necessary to define roles and agreements, create a clear common vision and plan better.
Communication	Many clinics are located in remote areas where there are no phones or Internet, which impedes fluid communication. It is also necessary to improve the habit and discipline of communicating.
Coordination	Many actors report deficiencies in coordination that limit the effectiveness of their work.
Database	It is difficult to keep the database updated. Most logs arrive quite late and sometimes lack sufficient quality.
Workload	The time constraint is an important problem. For many the work with the clinics or the Network is something additional and there is not enough staff.
Contact with laboratories	There are problems sending samples and getting results. Obstacles include transportation, sample quality, and communication between clinics and laboratories.
Monitoring and quality control	The Network needs to follow up the clinics more closely, assess problems progress, and in general work more closely with them.
Access to funds	Several clinics and Network actors report lack of funds for materials, transport, communications etc. This constrains the efficiency of the initiative.
National capacities	National capacities to analyse viruses, phytoplasma, forest diseases and soil are very limited. There is no place to analyse phytoplasma in the country.
Ownership and institutionalisation	The organisations and agencies involved need to assume more ownership and institutionalisation. Without it the participation of plant doctors and Network actors is seriously limited. The work should form part of the annual work plans, with clear roles as well as more willingness and commitment.

Despite these problems, many people stressed that the initiative is still young and that much has been achieved in a short time. More time is needed for it to mature into a quality plant protection system with good coordination and support.

Keys to success. People make change happen. Achievements are mainly the result of people's will, commitment and perseverance. However, there are other factors in the surroundings that determine if an individual or collective effort bears the desired fruit.

Support from the GPC has been crucial for creating new competencies, motivating and encouraging a change of vision of the services to farmers and the roles of extensionists and specialists.

"To get the farmers to come in with their samples has been difficult. It is necessary to continue insisting and advertising, otherwise they'll stop coming. Also, the farmers often bring in their sample when the pest or disease is very bad, not at the beginning."

Plant doctors in Quilalí

The Plant Clinics and the original Diagnostic Network were born in Las Segovias with the participation and backstopping of FUNICA, PROMIPAC and UCATSE, coupled with the great willingness and commitment shown by the first pioneer clinics. The link between the Plant Clinics, the projects of FUNICA's Technical Assistance Fund and the PROMIPAC supported Farmer Field Schools have allowed close coordination and communication, while creating a relation of deep trust between the plant doctors and members of the Network. The other regions have not had the same opportunity to develop strongly integrated and coordinated actions.

The list below summarizes the main keys to success as defined by the actors themselves, based on their accumulated experience.

Keys to Success | *The Network*

- Enthusiasm for the work
- Key persons to guide and motivate the process
- Clear strategy and vision, reached by consensus
- Signed agreements and firm commitments
- Continuous support from decision-makers at the institutions
- Clear administration procedures
- Inclusion of the activities into the institutional work plans
- Good communication and coordination
- Documentation of achievements and results
- Ongoing updating of capacities (training)

Keys to Success | *Plant Clinics*

- Willingness, friendliness, creativity
- Patience, perseverance, confidence
- Good clinic location and a consistent service
- Permanent and diversified advertisement
- Good reference material
- Prior training
- Ownership, support and commitment from the host organisation
- Support from other local organisations
- Constant support from the Network
- Good communication and coordination with the Network
- Clear agreements between institutions
- Exchanges with other clinics

10 How to build a national system

In only 32 months, the pilot experience with Plant Clinics and the Plant Healthcare and Diagnostic Network has led to many encouraging and surprising results. Hundreds of smallholder farmers have received accurate technical assistance for the diagnosis of plant health problems in basic grains, vegetables, fruit and coffee, among others. New diseases and insect pests have been discovered. More use is being made of the laboratories at the universities and MAGFOR. A research alliance on nematodes in coffee has been forged. And new channels of communication for the dissemination of technologies have been opened. The Plant Clinics have created links between farmers, extensionists and specialists that did not exist before.

The fact that the 'plant healthcare system' or 'national plant protection system' has grown little by little from the bottom up is at once its strength and its weakness. The strength is that the initiative has developed organically, in response to the demand emerging from the clients, plant doctors and network actors. The weakness is that persons and institutions are not always in a position that allows them to easily change the habits, styles and priorities of their work.

The next step in consolidation the Plant Clinics and the Network is their institutionalisation through supportive policies, clear agreements and arrangements between actors, and the inclusion of activities into institutional work plans. This will create the necessary conditions to seek solutions to the problems identified, learn from successes and mistakes, and inspire others.

"The operation of the Network needs to be made more formal. How often will it meet? How long will the coordination period last? How will it meet and exchange information and document results?"

Maritza Vargas
Vice President, UNAN León

In June 2007, CNEA, DGPSA-MAGFOR, INTA, FUNICA, PROMIPAC, OIRSA and the GPC approved a proposal for a National Initiative titled: "Support to the National Plant Protection System in Nicaragua through Strengthening of the Plant Clinics and Consolidation of the Plant Healthcare and Diagnostic Network".

This National Initiative has three main objectives:

1. Respond to farmers' demand with a basic, good quality service in diagnosis and plant health management through the *Plant Clinics*.
2. Expand the *Plant Healthcare and Diagnostic Network* nationwide.
3. Strengthen the integration and institutionality of the *National Plant Protection System*.

The National Initiative includes several activities to reach these objectives:

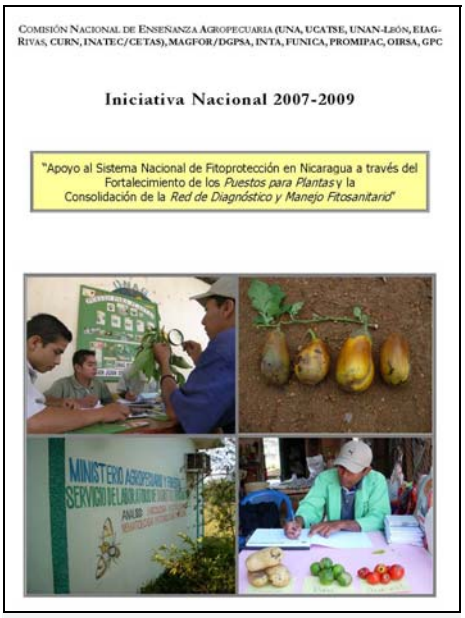
- Define and formalize a way to establish new clinics in the country, based on emerging demand.
- Prepare procedures to make the Network operational in the regions and nationwide. This means defining a clear strategy, roles, responsibilities and swift mechanisms for obtaining resources; ensuring an efficient flow of information; defining the frequency of meetings, monitoring visits and

exchanges; organising training and other events; establishing norms for data management and documentation of results.

- Strengthen the capacities of plant doctors and the Network; create robust structures and tighten links between INTA, DGPSA-MAGFOR (e.g. the plant health surveillance program, diagnostic laboratories), INATEC, OIRSA and other sector institutions.

- Include the Initiative's lines of work in the annual work plans of the partner institutions. This is fundamental to the institutionality of the Network. Several members have emphasised that they need a larger budget to do quality work.

The point of departure for organising the Network is making good use of capacities and structures that already exist, including physical, economic and human resources. But more than this, the attitude and willingness of each individual, and the commitment by the organisations is what will generate lasting change.



Towards a nationwide system. The National Initiative is an ambitious and innovative effort of great scope to the country.

The steady strengthening of the Network is an important precondition for the clinics to be able to provide a high quality service in the future. In order to achieve this aim, the firm commitment of public institutions such as INTA, DGPSA-MAGFOR and CETA-INATEC is indispensable. Ricardo Padilla, head of DGPSA in western Nicaragua says that "*each public sector institution that works with agriculture and livestock in rural areas must participate in the Initiative and forge strategic alliances among institutions.*"

From the start UCATSE has been an energetic promoter of the institutionalisation of the Network. Father Jaime Valdivia, collegiate rector, explains: "*For UCATSE it is strategic to be part of the Network. This space allows for extremely valuable feedback of knowledge and information between farmers, students, extensionists and teachers. All these activities together strengthen and complement capacities and skills, and improve decision-making. If we want to make a national success out of the initiative and contribute to reducing poverty in our country, it is necessary for all actors to firmly assume our responsibility and commitment.*"

The financial and organisational sustainability of the Plant Clinics depend in great measure on the relevance, timeliness and quality of the service they provide, the impact it has in the farmer's fields and the added values it generates for the country.

A SERIOUS CHALLENGE FOR THE NETWORK | **Responding to the demand for support from the new Plant Clinics**

"To be able to offer something different to farmers for pest management has been a great success for us, the founders of the first Plant Clinic in Nicaragua. We want to open approximately seven more clinics in our area of influence, and involve the lead farmers in the duties of the clinics. This is a challenge, as it means another responsibility to which time must be dedicated. The technical staff responds to projects that pay them. The other is voluntary."

Josefa Ruiz Lorente, Director INSFOP
Edgard Castellón, Coordinator UNICAM
Yamileth Calderón, Plant Doctor, INSFOP

The value of the service is largely reflected in the willingness of clients to pay for it once they see the benefits it brings them. But it takes time to generate a sustainable demand for a new type of service such as a Plant Clinic, where the final output is the correct application of knowledge.

The survey of 25 clients revealed that 80% of farmers are willing to pay between10 to 150 córdobas ($0.10 to $7.50) per visit, and between 20 and 600 córdobas ($1 and $30) per laboratory analysis. This year, discussions will cover payment for services, certification and accreditation of plant doctors, ways to measure impact, and the creation of national policies and strategies to integrate and sustain the National Plant Protection System. These discussions will be a crosscutting priority during the entire 2008-2009 period.

"*It is necessary to ensure the sustainability of the clinics, for example, by charging farmers for the service. Giving them a legal and political framework would strengthen them in financial and organisational terms.*"

María Auxiliadora Briones

FUNICA General Manager

Lorena Jarquín, head of the National Plant Health Diagnosis Centre at MAGFOR says: "*We must continue to strengthen the institutions that are in this initiative, stay united and keep up the will to work in support of a National Plant Protection System in Nicaragua. We must not give up*!"

At a forum held in October 2006, decision-makers of Network institutions (UNAN León, DGPSA-MAGFOR, UNA, CNEA, UCATSE, FUNICA, PROMIPAC and FAREM) for the first time manifested their commitment to support the construction of a National Plant Protection System in Nicaragua.

ANNEXES

Annex 1 People Interviewed

Plant Clinic • Estelí – INSFOP/UNICAM	
Yamileth Calderón	Plant doctor
Josefa Ruiz Lorente	Director
Edgard Castellón	Coordinator UNICAM
Plant Clinic • San Nicolás – ASOPASN	
Bayardo López	Plant doctor
Plant Clinic • San Juan del Río Coco – UNAG	
Juan Carlos Castro	Plant doctor
Evelio Báes	President
Wilfredo Avilés	Vice-president
Milton Guerrero	Project Coordinator
Plant Clinic • El Jícaro –Santiago Cooperative	
Dimas Sarantes	Plant doctor
Geovany Rodríguez	Plant doctor
Joel Flores	Plant doctor
Ramón Méndez	Manager
Reynaldo Ríos Cárdenas	Treasurer
Róger Armando Cáceres	Vice-president
Pedro Antonio Vásquez	Senior Committee Member
Plant Clinic • Jalapa – CCAJ	
Santos Isidro Cáceres	Plant doctor
José Rubén Sanabria	Plant doctor
Eddy Gutiérrez	Manager
Genaro Paz Quiñones	President
Plant Clinic • Quilalí –20 April Cooperative	
Dórlang Martínez	Plant doctor
Félix Medina	Plant doctor
Luis Arturo Roque	Plant doctor
Noé Rodríguez Torres	Deputy manager
Román Valdés Morán	President
Plant Clinic • Murra –Flor de Café Cooperative	
Bernabé Zelaya	Plant doctor
José María Gómez	Plant doctor
Nelson Quesada	Manager
Mario Rivas	President
Santiago Jirón	Vice-president
Julio César Altamirano	Committee member
Domingo Flores	Treasurer
Plant Clinic • Somotillo – INTA	
Ronald Torres	Plant doctor
Julio Galo	Plant doctor
Alberto Paredes	Head INTA Somotillo
Plant Clinic • Masaya – INTA	
Alan Castillo	Plant doctor
Marvin Bello	Head INTA Carazo

Plant Clinic • Juigalpa – INTA	
Norwin Flores	Plant doctor
Humberto Brenes	Plant doctor
Hansel Marín Díaz	Head INTA Juigalpa
The Network – Las Segovias	
René Gustavo Jarquín	Regional Director INTA
Julio López	Coordinator PROMIPAC
Ivania Zeledón	Resp. education PROMIPAC
Julio Centeno	Coordinator FUNICA Segovias
Lilliam Lezama	Research Director UCATSE
Flavia Andino	Teacher UCATSE
Wilfredo Centeno	Research assistant UCATSE
Jaime Valdivia	Collegiate Rector UCATSE
Martín Urbina	Resp. DGPSA Laboratory
Luis Felipe Pérez	Head DGPSA Segovias
Vilma Azucena Acuña R	Animal Health Lab. DGPSA
Erundina Espinales	Animal Health Lab. DGPSA
The Network – Western	
Javier Berríos	INTA North Pacific
Maritza Vargas	Rector, UNAN León
Eva Gutiérrez	Director Agroecol. Dept. UNAN-León
Patricia Castillo	Teacher UNAN León
Cony Narváez	Teacher UNAN León
Wilber Salazar	Teacher UNAN León
Jeannette Flores	Resp. DGPSA Laboratory
Ricardo Padilla	Head DGPSA Occidente
Carlos Mercado	Coordinator FUNICA León
Henry Zambrana	Project official, FUNICA León
The Network – South Pacific	
Sebastián Salinas	INTA Pacífico Sur
The Network – South Central	
Félix Báez García	Zonal Director INTA South Central
Juan Ramón Jarquín A.	DGPSA
José Anibal Montiel	Director UNA Juigalpa
Lorena Suárez Madriz	Director ITA Juigalpa
Luis Manuel Luna Lazo	Technical Director ITA
The Network – Central	
Francisco Pavón	National Coord. IPM INTA
Lorena Jarquín	Resp. DGPSA Laboratory
María Aux. Briones	General Manager FUNICA
External	
Charles Hodges	North Carolina State University, USA

Annex 2 Evaluation Team

Name	Institution
Flavia Andino	UCATSE
Lilliam Lezama	UCATSE
Solveig Danielsen	ASPS-Danida/FUNICA
Margarita Fernández	Consultant
Xiomara Rivera	UCATSE
Wilfredo Centeno	UCATSE
Carmen María Méndez	FAREM
Pedro Pablo Benavides	FUNICA
María Auxiliadora Briones	FUNICA
Julio López	PROMIPAC
Ivania Zeledón	PROMIPAC
Francisco Pavón	INTA
Álvaro Caballero	UNAN León
Patricia Castillo	UNAN León
Dimas Sarantes	Santiago Cooperative
Geovany Rodríguez	Santiago Cooperative

Annex 3 Global Plant Clinic training

A total of 87 people were trained by the GPC. Of these, 28 completed all three modules of the curriculum on 'How to Become a Plant Doctor'. 59 people received one or two modules.

Courses held 2005 – 2007

Module 1 – Field Diagnosis and How to Run a Plant Clinic

2005: Estelí, 12-13 and 19-22 September

2006-1*: L eón, 31 May – 2 June

2006-2: Estelí, 15 – 17 November

2007: Estelí, 13 – 15 June**

Module 2 – Plant Healthcare

2006: Estelí, 20 Novembre (preliminary)

2007-1: Estelí, 26 – 28 March

2007-2: Estelí, 30 October– 1 November**

** The number next to the dash indicates that the module was given more than once that year*

Module 3 – Extension Messages

2006-1: Estelí, 5 – 7 June

2006-2: Estelí, 21 – 22 November

2007-1: Estelí, 18 – 20 June

2007-2: Estelí, 5 – 7 November**

Training the Trainers

1: Estelí, 20 – 22 March 2007

2: Estelí, 12 June 2007

3: Estelí, 29 October 2007

These were specific training sessions for the team of national trainers. The remaining part of the training-of-trainers consisted of teaching the three course modules to new plant doctor candidates under the supervision of the GPC.

*** Implemented by the national trainers under the supervision of the GPC.*


Capacitador

Yanet Gutiérrez Gaitán

UNA, Managua

ha impartido los siguientes cursos sobre

Cómo llegar a ser un Doctor de Plantas

Dr Eric Boa — Jefe, Clínica Global de Plantas

noviembre del 2007

Dr Jeffery Bentley — Antropólogo Agrícola, Clínica Global de Plantas

La Clínica Global de Plantas es una alianza entre CABI, Rothamsted Research y Central Science Laboratory.

Puesto para Plantas • Red de Diagnóstico y Manejo Fitosanitario • Clínica Global de Plantas


Doctor de Plantas

Dimas Amaru Sarantes

Cooperativa Santiago, El Jícaro

Cómo llegar a ser un Doctor de Plantas

Dr. Eric Boa — Jefe, Clínica Global de Plantas

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Puesto para Plantas • Red de Diagnóstico y Manejo Fitosanitario • Clínica Global de Plantas

Annex 4 Fact Sheets and authors

FS	Title	Author (s)
1	Cómo tomar muestras	Eric Boa Solveig Danielsen
2	Cómo reconocer enfermedades causadas por virus	Eric Boa
3	La Plutela, o el gusano del repollo	Jeffery Bentley
4	La mosca blanca	Jeffery Bentley
5	Marchitez en tomate tiene varias causas	Eric Boa
6	La hormiga brava en almácigo	Jeffery Bentley
7	La gallina ciega	Jeffery Bentley
8	El gusano cogollero	Solveig Danielsen Hugo Fiallos (q.e.p.d)
9	La broca del café	Solveig Danielsen Anita Pérez
10	Pájaros y sus daños	Francisco Dávila
11	Tizón tardío en papa	Xiomara Rivera
12	El gorgojo del pino	Bayardo López
13	El cogollero 2	Carmen María Méndez
14	Roya en café	Dimas Sarantes
15	Nemátodos en café	Félix Jarquín
16	Sigatoka	Gustavo Molina
17	Marchitez de la papa	José Rubén Sanabria
18	El Picudo en chiltoma	Yáder Gerardo Olivas
19	La Plutella del repollo 2	Yamileth Calderón
20	El zompopo	Hugo Fiallos (q.e.p.d)
21	Como hacer humo líquido (ácido piroleñoso)	Francisco Dávila
22	Ácido piroleñoso para manejo de nemátodos	Xiomara Rivera
23	El barrenador del aguacate	Yamileth Calderón
24	Control de la muerte regresiva en aguacate	Gustavo Molina
25	Trampeo para controlar el picudo del plátano	Ivania Zeledón
26	La leprosis de los cítricos	Geovany Rodríguez
27	Casa de malla para mosca blanca	Débora Casco
28	Manejo integrado del piojo harinoso o cochinilla	Claudia Gurdián
29	Mal del talluelo en café	Dimas Sarantes
30	Carbendazín para prevenir pudrición del repollo por Sclerotium	Bayardo López

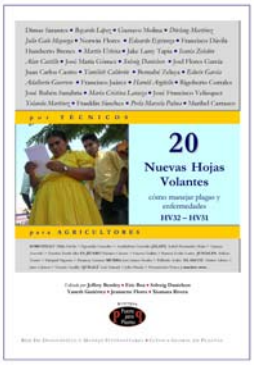
FS	Title	Author (s)
31	Mildiu o cenicilla en pipián	Carmen Méndez
32	Mancha de hierro o chasparría en café	Dimas Sarantes
33	Cómo mejorar los precios del repollo	Bayardo López
34	Caldo bordelés	Francisco Dávila
35	Caldo sulfocálcico	Gustavo Molina
36	La cenicilla en la uva	Yamileth Calderón
37	Curar el frijol para que rinda más	Dórlang Martínez
38	La mustia hilachosa	Julio Galo
39	Cómo saber si su cultivo tiene nemátodos	Ivania Zeledón
40	Antracnosis o muerte descendente en café	Dimas Sarantes
41	Control de babosa	Humberto Brenes Norwin Flores
42	Mosaico dorado en frijol	Eduardo Espinoza Martín Urbina
43	Achaparramiento o lapeado en maíz	Jake Larry Tapia Alan Castillo
44	La virosis en tomate	José María Gómez Joel Flores García
45	Producción de tomate con poco riego	Juan Carlos Castro Bernabé Zelaya
46	El moko en banano o guineos	Edwin García Adalberto Guerrero José Rubén Sanabria
47	Conozca el Tospovirus en tomate	Harold Argüello Solveig Danielsen
48	Poda para curar la pudrición en pitahaya	Franklin Sánchez José Fsco Velásquez
49	Papa sana en almacén	Maribel Carrasco Perla Marcela Palma
50	Urea para la caída de flores y frutos en naranjo	María Cristina Lanuza Yolanda Martínez
51	Bastones para controlar chinches en frijol	Francisco Juárez Rigoberto Corrales

Annex 5 Publications [1]

'31 Fact Sheets' [2]

First collection of extension messages (fact sheets) written by plant doctors and members of the Network. Each fact sheet consists of practical recommendations for farmers. 2006

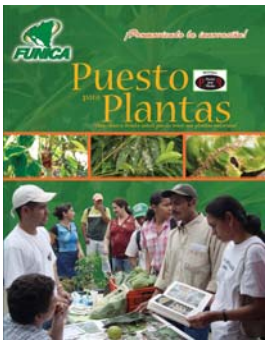
33 pages (Spanish)



'20 New Fact Sheets' [2]

Second collection of extension messages (fact sheets) written by plant doctors and members of the Network. 2008.

22 pages (Spanish)



'Puesto para Plantas – *a clinic where you can bring your sick plants'* [3]

S. Danielsen, E. Boa, J. Bentley

Reflects the experiences and outputs of the first year of clinics and training. 2006.

46 pages (Spanish and English)

'Healthy plants, healthy people' [3]

B. López y co-authors

A series of short accounts ('testimonies') by plant doctors and Network members on how to help farmers solve their plant health problems. 2006.

9 pages (Spanish)

'A Healthy Revolution'

E. Boa, J. Bentley

A photo essay describing the operation of the Plant Clinics, the role of the Network and the challenges related to the provision of a quality service. 2006.

10 pages (Spanish and English)

'Simple and it Works'

Report 1, E. Boa, J. Bentley

Summary of first visit under the Framework Agreement by the Global Plant Clinic. 2006.

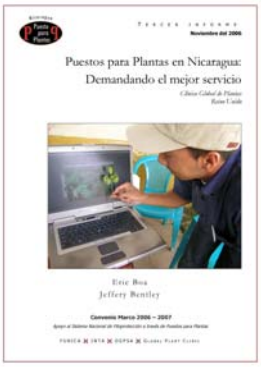
40 pages (Spanish and English)

'More Plant Doctors – better advice'

Report 2, E. Boa, J. Bentley

Summary of second visit under the Framework Agreement by the Global Plant Clinic. 2006.

27 pages (Spanish and English)



'Plant Clinics in Nicaragua: Demanding a better service'

Report 3, E. Boa, J. Bentley

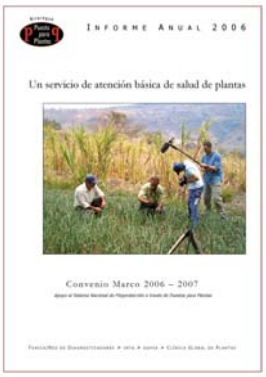
Summary of third visit under the Framework Agreement by the Global Plant Clinic. 2006.

45 pages (Spanish and English)

'Plant Clinics – Nicaragua shows the way' [4]

DVD describing the clinics and the Network, produced by CountryWise Communication. 2006.

(Spanish and English version)

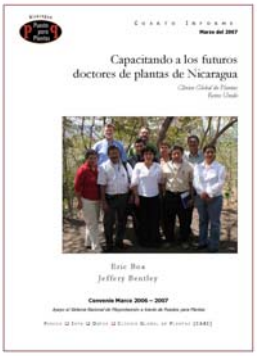


'A Plant Healthcare service'

Annual Report 2006, authors from clinics and the Network

Summary of the main results and lessons learnt in the first year of the Framework Agreement. 2006.

29 pages (Spanish)



'Training future Plant Doctors for Nicaragua.'

Report 4, E. Boa, J. Bentley

Summary of fourth visit under the Framework Agreement by the Global Plant Clinic. 2007.

30 pages (Spanish and English)

'Learning to direct: preparing for the future.'

Report 5, E. Boa, S. Danielsen, J. Bentley

Summary of fifth visit under the Framework Agreement by the Global Plant Clinic.2007.

26 pages (Spanish and English)

'Plant Clinics of Nicaragua: Ready for the future'

Report 6, E. Boa, J. Bentley, S. Danielsen

Summary of sixth and final visit under the Framework Agreement by the Global Plant Clinic. 2007.

17 pages (Spanish and English)

Training Manual 'How to become a Plant Doctor'

E. Boa, J. Bentley

Instruction manual for trainers with complete training material produced with the national training team. 2007.

40 pages + CD (Spanish)

[1] The majority of publications are available on the FUNICA website www.funica.org.ni

[2] Printing costs covered by additional funds from INTA.

[3] Printing costs covered by additional funds from FAT Segovias.

[4] The DVD was co-financed by GPC from the grant provided by DFID and from the framework agreement. FAT Segovias paid for copying and distribution of the DVD within Nicaragua and to other interested parties.

Annex 6 Laboratory analyses offered through the Network

The National Commission for Agricultural Education (CNEA) is an umbrella organization that brings together all agricultural universities and technical centres attached to the National Technological Institute (INATEC) in Nicaragua. One of the CNEA'S objectives is to strengthen capacities as regards diagnoses and pest management in the various agricultural systems.

The General Directorate for Agricultural and Livestock Protection and Health (DGPSA) of the Ministry of Agriculture, Livestock and Forestry (MAGFOR) in Managua is the reference laboratory for Nicaragua. It is run by experts and coordinated by Ms. Lorena Jarquín. DGPSA has branch laboratories in Estelí, León and Rivas. The cost for analyses of bacteria, fungi, nematodes, weeds and invertebrate pests is approximately US$3.00. The DGPSA-MAGFOR animal health laboratories (in Estelí, Juigalpa and Managua) offer the following analyses at the prices indicated in brackets: BHC (US$5.00); equine infectious anaemia (US$15.00), brucellosis (US$1.00); anthrax (US$3.00) and blackleg (US$3.00).

The Catholic University of the Dry Tropics (UCATSE) is a regional university specializing mainly in entomology. Ms. Xiomara Rivera and Mr. Wilfredo Centeno are in charge of its Plant Protection Research Centre (CIPROV), at which laboratory analyses are carried out to identify insects, nematodes and fungi at a cost of US$3.00 per analysis. The laboratory at the National Agrarian University (UNA) is the only one in Nicaragua capable of identifying viruses.

The National Autonomous University of Nicaragua León (UNAN-León) has a strong tradition in entomology, and is now starting work on plant pathology. There is no charge for the analyses of samples. UNAN-León offers expertise and collaboration to a wide range of institutions and organizations, and produces and sells biological products that help to control insect pests.

The National Technological Institute (INATEC) has several branches nationwide that offer a technical education. Two of these – the Agriculture and Livestock Vocational Education Centre (CETA) in Jalapa and the Technical Agricultural and Livestock Institute (ITA) in Juigalpa, have basic equipment for partial pest analysis. At ITA there is also equipment for soil analysis (macro and micronutrients), analysis of gastrointestinal parasites in cattle and milk quality analysis.

Zamorano in Honduras, a highly renounced agricultural university, has one of the best facilities in the Central American region as regards the identification of insects, viruses, phytoplasms and other organisms. The Central American Integrated Pest Management Program (PROMIPAC) of Zamorano is setting up distance diagnostic centres in Nicaragua. The most advanced of these is run by the Adventist Development and Relief Service (ADRA) in Ocotal, Nicaragua. PROMIPAC has provided support to the clinics for field diagnoses and the identification of insects, in addition to making available literature, manuals and other sources of information.

Finally, the Global Plant Clinic (GPC) offers free services for expert identification of pests in developing countries via the UK Department for International Development (DFID). The GPC uses state-of-the-art technology to identify any pest in any crop. Information on how to send material can be found at www.globalplantclinic.org. In addition, the GPC has the capacity to conduct research on the extant literature and to provide photographs.

Annex 7 Operating hours and contacts for Plant Clinics

Plant Clinic	Day and place	Contact person
ESTELÍ	*Fridays from 8am to 12m* El Mercadito Verde, Central Place	*Yamileth Calderón*, UNICAM Phone 713 2140 or 862 6556, insfopes@ibw.com.ni or Yamcal1@yahoo.es
SAN NICOLÁS	*Wednesdays from 8am to 12m* (samples are received everyday) The Natural Medicine Pharmacy of the Parroquia	*Francisco Javier Dávila,* ASOPASN Phone 713 7785 or 821 1240 frandavila200@yahoo.com or Yadira2022@yahoo.com.mx
QUILALÍ	*Mondays from 8am to 12m* The 20 April Cooperative building	*Luis Arturo Roque*, Coop. 20 de Abril Phone 735 5128 or 735 5184, Coop20ab@ibw.com.ni
JALAPA	*Everyday from 8am to 4pm* The CCAJ Cooperative building	*Santos Isidro Cáceres*, CCAJ Phone 737 2267 or 404 7045, jccaj92@yahoo.es
EL JÍCARO	*Fridays from 8am to 12m* The Santiago Cooperative building	*Dimas Sarantes Ramírez*, Cooperativa Santiago Phone 735 2217 or 735 2212, coosant@turbonett.com.ni
SAN JUAN DEL RÍO COCO	*Thursdays form 9am to 12m* The UNAG building	*Milton Guerrero Guillén*, UNAG Phone 649 7889, unagpcac@yahoo.com
MURRA	*Wednesdays from 8am to 12m* "La Casa del Productor", La Victoria, Murra	*Bernabé Zelaya,* Coop. Flor de Café Phone 735 2243 or 642 5177, bernabezelaya@yahoo.com or flordecafe2005@yahoo.es
CUSMAPA	*Fridays from 8am to 12m* The Llanito community. Remains to define venue	*Gustavo Molina*, INSFOP Phone 713 2140, gusmolriv@yahoo.com.mx
MOZONTE	*Information pending*	*Oscar Oswaldo López*, PROCOA Phone 414 1033, alexeve7@yahoo.com (through Alejandro Parrales)
LAS SABANAS	*Remains to define day and venue* The El Cipián community, from 8am to 1pm	*Janeth Hernández,* ASOJPAMS Phone 606 4140, asojpams@yahoo.com
SOMOTILLO	*Mondays from 8am to 12m* From the main entrance of the market, 50 yards to the south	*Ronald Torres Prado*, INTA Somotillo Phone 821 8460 or 346 2202, ratp2710@yahoo.com
EL SAUCE	*Thursdays from 8 to 12m* The Central Market, bus terminal	*Rigoberto Corrales*, CETA El Sauce Phone 644 6398
LEÓN	*Fridays from 8am to 12m* The market of Subtiava	*Francisco Juárez*, UCAN Phone 311 0353 or 675 3036, juarez@hotmail.com
MASAYA	*Wednesdays from 8am to 11am* The Ernesto Fernández market, from the bus station, 2 blocks to the south	*Alan Castillo*, INTA Carazo Phone 616 3793, 532 3059 o 522 5867, eduardoef@hotmail.com or marvinyeser@yahoo.es
SAN JUAN DEL SUR	*Every other Wednesday from 8am to 2pm* "Las Parcelas", San Juan del Sur	*Lester Pupiro*, EIAG Rivas y *Mario Rocha*, INTA Phone 268 4460 or 563 3627, lester_itf@yahoo.es or mrocham60@yahoo.es
TICUANTEPE	*Fridays form 7am to 11am* INTA offices, Ticuantepe	*Eduardo Espinoza,* INTA Carazo Phone 255 4226, 850 8318 o 532 3059, eduardoef@hotmail.com
JUIGALPA	*Wednesdays from 8am to 12m* Municipal market next to UCA	*Norwin Flores*, INTA Juigalpa Phone 512 0754 or 693 6344, Norwin.nef@hotmail.com
SAN RAFAEL DEL NORTE	*Remains to define day and time* FODA offices, San Rafael del Norte	*Heriberto Úbeda,* FODA Phone 784 2226, foda@ibw.com.ni

Annex 8 Plant Healthcare and Diagnostic Network

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Plant Clinics

A Plant Clinic (*Puesto para Plantas)* is a health clinic for plants, at which farmers can seek advice and bring in samples of diseased plants for diagnosis and advice on how to deal with the problem.

This is a community service designed to provide a timely response to the problems of pests and diseases afflicting crops. The clinics are run by agronomists from local organizations trained as 'plant doctors'. Usually they are open for visits once a week, during morning hours.

Plant Healthcare and Diagnostic Network

The Network brings together Nicaraguan institutions and organizations that specialize in providing plant health diagnoses as well as education, research and outreach services. The Network offers technical and other support to clinics with the aim of offering a timely and quality service to farmers. The Network also promotes research and validation of the technologies requested by farmers through the clinics.

Current Network members are the National Commission for Agricultural Education (**CNEA**); Nicaraguan Foundation for Technological Development in Agriculture, Livestock and Forestry (**FUNICA**); Central American Integrated Pest Management Program (**PROMIPAC**); General Directorate for Agricultural and Livestock Health and Protection (**DGPSA**) of the Ministry of Agriculture, Livestock and Forestry (**MAGFOR**); Nicaraguan Agricultural Technology Institute (**INTA**) and the International Regional Plant and Animal Health Organisation (**OIRSA**).

Global Plant Clinic

The **Global Plant Clinic** (GPC) is managed by **CABI** in alliance with **Rothamsted Research** and the **Central Science Laboratory**. The GPC coordinates and provides plant health services in Africa, Asia and Latin America. These include an expert diagnostic centre for all plants and types of problems. We are a leading publisher of new disease records. The GPC trains plant doctors and scientists, establishes and supervises plant health clinics and builds plant health systems.

We link extension and research and farmers 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.

Genaro Paz Quiñones, President of CCAJ Cooperative, Jalapa