OUTPUT III. NARS' CAPACITY TO DESIGN AND EXECUTE IPM RESEARCH AND IMPLEMENTATION STRENGTHEN

Sub-output 1. Catalyze Improved Organizational Capacity in Pilot Communities in East Africa.
(K. Ampofo)

Activity 1. Approaches for improved dissemination: action research in Arumeru district

Introduction

Disseminating agricultural technologies is more likely to be effective if based on farmers' ways of learning about new ideas and how they pass on innovations to other farmers. This action research project seeks to put theory into practice by working in close collaboration with farmers on some of their problems. It also monitors the dissemination of several technologies that are developed or adapted together. Its output is ideas and approaches for enhancing dissemination, necessary for achieving impact.

Materials and Methods

During this third phase, some trials continued in three villages in three agro-ecological zones of Arumeru District, Northern Tanzania. Our main focus was on how to phase out and to empower the farmers to continue on their own. Each village decided on the research area and the research plan was discussed together. The resulting small trials focused on evaluation of bush and climbing beans, maize, wheat and safflower varietal evaluation, production practices and pest management. The trials were farmer planned, implemented and managed. During meetings with the participating farmers, we discussed the outcome of this year's trials but also evaluated the past two years of collaboration. The researchers encouraged the farmers to continue with their research, although CIAT was leaving the area, as the project was coming to an end. We assured them, that they should continue to come to the research station for help when needed.

Results and Discussion

Two villages received varieties of climbing beans. They were planted on the grounds of the local primary school and on farmers' fields. The crop failed in one village as a result of heavy bean stem maggot infestation, in spite of the seed dressing (Murtano = lindane +thiram) used by farmers. The farmers group selected preferred varieties and the harvested seed distributed to farmers, school children and teachers for further multiplication and testing.

In collaboration with the wheat section of SARI we planted 3 wheat varieties in Kisimiri on three plots. In one plot, the plants died before flowering because of suspected manganese deficiency. The other two plots performed well and the wheat was harvested. In the same village, a few farmers continued to plant safflower (seed from last year's harvest) and had good yields. Farmers also planted 10 highland maize varieties in search for a replacement of their traditional variety that does not yield well, matures late and has many disease problems (e.g. smut). The farmers

identified preferred varieties, but the harvest data could not yet be collected. 10 farmers in two villages planted 7 drought tolerant maize varieties supplied by the maize section. Due to lack of funds, the research partners could not evaluate the trials, but the farmers identified a few preferred varieties. A collaborator from the animal husbandry section conducted seminars and taught the farmers on how to care for their animals, how to recognize diseases and how to treat them, how to build improved sheds and how to plant fodder shrubs, grasses and legumes. We gave the farmers seeds of fodder plants and they established demonstration plots.

Activity 2. Support farmers' experimentation and application of technical skills

Introduction

Farmers in Olmotonyi experience pest problems in beans, vegetables and maize. They do not want to use too much chemical pesticide and are looking for an alternative.

Materials and Methods

One farmer offered a field with diamond back moth infested cabbage field as trial site. As a group they decided that they want to test "Ormabinu" (a local medicinal plant), and fermented cow urine. The two treatments were sprayed and the farmer recorded insect abundance and damage. After two days he noticed that the treatments might not work because of the heavy rains during those days. We then decided together, to use stronger treatments (for him to be sure not to lose his crop): neem seed powder and a chemical pesticide (Selecron). He sprayed again and monitored the trials. After one week he repeated the neem treatment and after two weeks both treatments.

Results and Discussion

The farmer noticed that Selecron kills fast, but that neem needs almost 5 days to show first effects, but then it protects well. The farmer learned the need of frequent spraying with the neem extract for good results. Damage was similar in both treatments. In spite of the time lad for neem to take effect", he prefers neem to Selecron, saying that neem is a medicine but Selecron is a poison".

Activity 3. Scaling up participatory IPM development and promotion with small holder farmers through strategic alliances with specialist NGOs

Introduction

Many technologies have been developed for the management of pest problems in smallholder production systems but a lot have remained out of reach to them. Community participatory approaches to increase awareness of the availability and adoption of IPM technology were initiated with farming communities and the research and extension services in several countries in eastern and southern Africa with funding support from the DFID Crop Protection Programme.

The approaches enabled farmers to combine traditional knowledge and recent discoveries from research to make the best decision for themselves with regard to their prevailing production circumstances.

Materials and Methods

A proposal was submitted to the DFID Crop Protection Program for grant support to scale up "Participatory IPM Development And Promotion In Eastern And Southern Africa". The proposal was accepted and funded for operations in Kenya, Tanzania and Malawi. The Bean Networks made a decision to link all IPM subprojects to it and allocated funds for extension of the project to Madagascar, Mozambique and Sudan. A stakeholders' meeting (including all collaborators) was held in February to ensure a common understanding and enable collaborators to share their work plans with all. The project was initiated in April 2001. Collaborative links for dissemination have been developed with GTZ-IPM and Farm-Africa in Tanzania and with Concern Universal in Malawi.

Participating extension officers and farmer extensionists were trained in IPM methods, including pest identification, as well as the fundamentals of participatory research. Local knowledge and the available scientific knowledge were integrated and discussed for their suitability in the management of the selected priority problems. Common strategies were the use of community participatory approaches, inclusion of traditional pest management strategies for evaluation and training of extension staff and farmers on IPM concepts and approaches. The farmers groups in collaboration with their partners (research and extension staff) established learning plots at several sites within each target area to verify and learn the new management practices. At all sites there was a strong collaboration between researchers, farmers and extension, including NGOs involved in agricultural development. There were regular meetings by the farmers, extension and research staff to monitor and discuss their activities and observations from the LPs (learning plots). The project in N. Tanzania is now fully led by the extension service and their farmer communities with technical backstopping from us (CIAT and the Tanzania National Program). We help in methodology development for community research and extension activities and also undertake on-station and laboratory research to answer basic questions that could not be done in the farmers' fields.

Results

At each site farmers contributed their traditional knowledge for managing the various pests they encounter in bean production. The traditional IPM practices from the different sites were different and appeared to be related to local traditions or cultures. Among the Merus and the Chaggas of northern Tanzania, the traditional IPM practices were related to animal products (cow urine and cowshed slurry) whereas among Wasambaas (also of north-eastern Tanzania), the Nyakusi of southern Tanzania and the Sukwa, Phoka and Tumbuka of northern Malawi, the IPM practices were related to botanical products and other concoctions such as ashes of the offending pest (N. Malawi). There were differences also in farmers' knowledge about the pests they encountered: in Malawi, many farmers could describe their pests and their management strategies well but in northern Tanzania many farmers did not know their hidden pest. This difference is probably due to the level of contact with extension service.

Investigations Into The Efficacy Of Traditional IPM Methods: After confirming that their traditional technologies were effective as compared to the new scientific discoveries, such as neem **(Figure 3.1)**, the farmers were very eager to apply their traditional knowledge through the participatory IPM process to various other crops and livestock. In Lushoto District the process has been integrated with farmer training in Integrated Nutrient Management and there is demand in other sites also for integration. This process of community experimentation has been applied to the improvement of farmer understanding of the various production and pest problems they encounter.

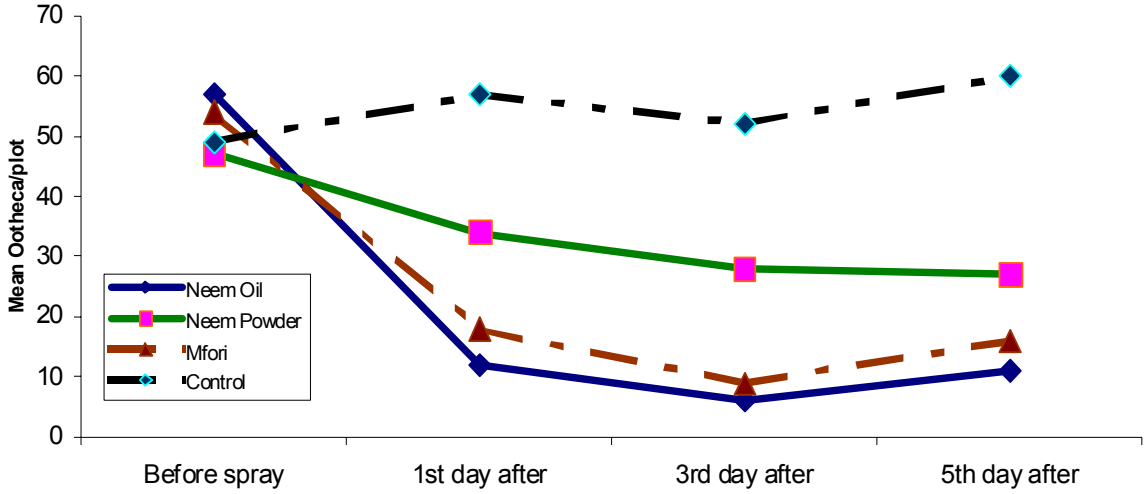

Figure 3.1. Effect of cowshed slurry and neem on *Ootheca* infestations (farmer experimentation).

Activity 4. Effectiveness of selected traditional pest management practices against bean foliage beetles (*Ootheca* spp)

Introduction

Traditional IPM strategies appear to be related to local traditions and vary from one group to another. The Wa-Sambaa use plant based concoctions (e.g. Mhasha, a *Vernonia sp.*) while the Wa-Arusha, Wa-Meru and Wa-Chagga practices are uses preferentially animal derived concoctions (e.g. fermented cow urine). These practices need to be assessed for effectiveness before they can be disseminated to other areas. We compared some of these traditional IPM practices to verify their efficacy

Materials and Methods

We evaluated the performance of some of the traditional IPM recommendations from these groups in an on-station controlled trial. The treatments were Cow urine fermented for (1) 1, (2) 5 and (3) 9 days. These were diluted at the rate of 1:3. Treatment 4 was 0.5% Neem seed oil (at 2.5 ml:1 litre of water), *Vernonia* spp. leaf extract (1:1, vol/vol). All treatments were applied at the

same day as foliar sprays. BFB were counted and damage scored before and after the treatment and then daily. When the insect counts went up and no difference between treatments could be seen, we applied a second time again all treatments.

Results and Discussion

All the treatments repelled *Ootheca* from the plots and reduced damage **(Figure 4.1)**. However, for most of them the protection only lasted about three days after which there was no effect and the pest returned. Another application of the treatments seven days after the initial application repelled the pest again. Neem seed oil and *Vernonia* leaf extract maintained infestations below the control, but the cow urine applications wore off after about five days from the initial application and needed repeated application. This confirms the efficacy of traditional IPM methods and boosts farmer confidence in their use. Farmer awareness of this has empowered them to revisit and try more traditional IPM options.

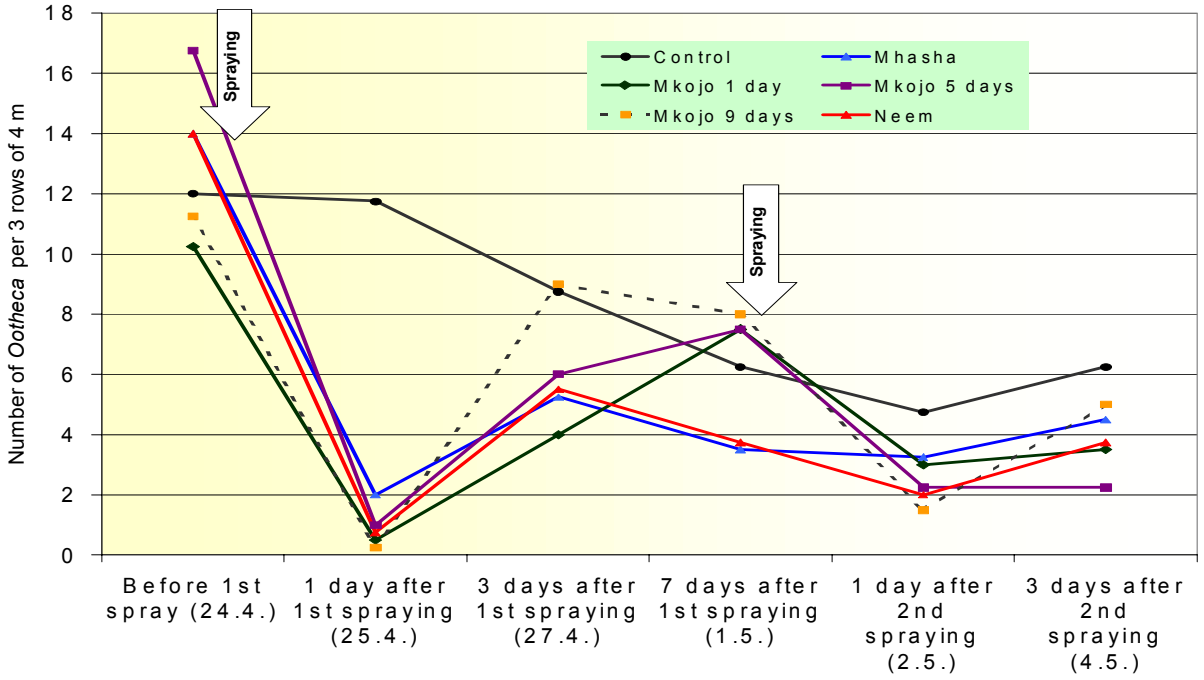

Figure 4.1. The effect of various traditional IPM recommendations on *Ootheca* infestation and damage (Figures in parenthesis e.g. 24.4, 25.4 etc. correspond to activity dates).

Activity 5. Effect of crops rotation on *Ootheca* emergence pattern

Introduction

Crop rotation emerged as an option for the management of *Ootheca* and farmers wanted to evaluate it at their learning site. They realized that part of the increasing *Ootheca* population rise

was due to the continued cropping of beans on the same plot of land and were eager to learn more about this interaction. Farmers are now aware of that *Ootheca* develops in the soil.

Materials and Methods

Learning plots were established to compare different crops: maize, cowpea, soybean, sorghum and fallow on *Ootheca* emergence from teneral diapause. Small replicated plot were planted with these crops and *Ootheca* emergence trap cages were placed over then. The traps cages were monitored at regular intervals to collect and count *Ootheca* present in them. The data was summarized and discussed with all stakeholders.

Results

Beans and cowpeas were the only crops that hatched out any significant numbers of *Ootheca* from the soils. The other crops hatched out very few adults. *Ootheca* emergence started soon after bean crop emergence and peaked at crop growth stage V3, thereafter there was a decline in the emergence pattern but emergence persisted until growth stage R5. Emergence from cowpea plots followed a similar pattern but the emerging population was low. The fact that the only beans and cowpea hatched significant numbers of *Ootheca* out of diapause suggest the presence of an emergence stimulus probably associated with root exudates. Experiments are underway to study these exudates further.

Activity 6. Monitoring and evaluation of IPM dissemination process

Introduction

Participatory research requires regular monitoring and evaluation of progress by all stakeholders to ensure that the process in on course. The objective of the project was to identify appropriate pest management strategies and dissemination pathways in smallholder production systems through participatory approaches and use lessons learned to scale up IPM technologies to the large community.

Materials and Methods

Farmers and their partners held a field day to share what they had been doing with others within the community. Farmers and other stakeholders were invited to the Sanya Juu community-learning site where they viewed different IPM practiced. The participating farmers explained the activities; other farmers shared their experiences and the whole group discussed the process and the technologies. We took advantage of the large gathering to administer a questionnaire to evaluate the dissemination process.

Results

Farmers that participated were very appreciative of the process. What they liked best was the new knowledge they had acquired and the fact that the activity was focused on issues that concerned them directly. They also liked the fact that research was working with them and that

new findings were shared directly. The farmers were very confident in sharing their knowledge and experiences with others especially as those experiences were direct. Participants in the field day were predominantly male (65.9%). A summary of stakeholders' responses (disaggregated according to gender) to issues in the questionnaire is presented in Table 6.1. Most farmers felt working in groups enhanced community cohesion, which enabled them to "educate one another", and made it easier to for them to communicate with "experts" (outsiders e.g. researchers, who are supposed to be more knowledgeable). Many group participants were however appalled by lateness and absenteeism by other; this they saw as a drag. The preferred pathway for dissemination of IPM technology was: field visits by extension officers, group demonstrations, seminars, and radio programs. The ranked the use of drama, newspapers and television quite low. One farmer group had initiated a program "Ukilima Wakisasa" with funding support from the local administration on Radio Sauti ya Njili, a local Christian station that gave them the clearest reception. Our survey suggested that the station was not the most tuned in by farmers. They are now considering a switch to a more popular station across the district. The extension service is planning to use the data to sensitize the district administration for more support and also to review the current extension pathways to focus on increased community participation.

Table 6.1. Farmer evaluation of participatory IPM development and promotion activities in Hai district, northern Tanzania.

Question/Category	Male (N=191)	Female (N=89)
	% Responding	
Desire to learn through group activities	2.6	77.5
Participation in Bean IPM and other group activities	33.0	61.0
Gets help from extension whenever needed	24.6	27.0
Frequently visited by village extension officer	17.3	9.0
Awareness of IPM promotion activities in district	41.4	50.6
Knowledge of traditional IPM methods	29.9	51.8
Recommendation for IPM dissemination channels:		
Participation in group learning activities	42.9	40.4
Visits to community learning plots	46.1	36.0
Radio programs	40.3	40.3
Visits from extension officer	33.5	27.0
Seminars	45.0	49.4
Drama	4.2	4.5
Newspapers	9.9	3.4
Radio station frequently tuned into:		
Radio Free Africa	1.0	4.5
Radio One	52.9	43.8
Radio Sauti Ya Njili	13.6	25.8
Radio Tanzania	22.5	16.9
Expectations of members of farmer groups:		
Acquisition of knowledge	12.6	25.8
Other support	1.6	9.0
How expectation was met:		
Increased yield	3.1	3.4
More knowledge	54.5	49.4

Publications

Ogecha J., J.K.O. Ampofo and J. Owuor, (Under review) Development of an integrated pest management strategy for bean stem maggot control in southwestern Kenya, Insect Science and Its Application.

Ampofo, J.K.O., U. Hollenweger, S.M. Massomo, and E. Ulicky. 2001. Participatory IPM development and extension: the case of bean foliage beetles in Hai, northern Tanzania. *A case study presented during the Workshop on Advancing Participatory Technology Development, September 17-21, 2001, IIRR, Silang Cavite, Philippines.*

Ampofo, J.K.O., S.M.S. Massomo and U. Hollenweger, 2001. Using participatory approaches for IPM development and extension: Two case studies from northern Tanzania. *Presented at the PABRA Millennium Synthesis:A workshop on Bean Research and Development in Africa over the last Decade. Arusha, May 28-June 1, 2001.*

Seminar

Ampofo, J.K.O. IPM Research and Development in the CIAT Africa Program. A seminar at the Department of Applied Entomology, Swiss Federal Research Institute (ETH) Zurich, June 2001.

Collaborators

K. Ampofo, D. Mohamed; staff of SARI (Dr. Ndondi, Mrs. Ngulu, and Dr. Mduruma, Dr. Massawe, Mr. Muhidini); Development office of the Anglican church (Mr. H. Horsch), Mr. Solomon Silongoi, Hendry Mziray, Mrs. Amanda Koola, (Hai District Extension Service), Ursula Hollenweger, Daima Mkalimoto.

Staff at the Arusha base

Dr Pyindji Mukishi, ECABREN Coordinator
Ms. Ursula Hollenweger, SDC Research Associate (Left in October 2001)

Support Staff

Mrs. Betty Travas, Finance and Administrative Assistant
Ms. Eva Ngalo, Secretary
Mr Hendry Mziray, Research Assistant (Joined in October 2000)
Mr Miraji Ndolwa, Driver/Mechanic
Mrs Julita Shirima, Office Cleaner/ Messenger
Mr Abdalla Gamba Security Guard
Mr Meseiki Laizer, Security Guard

Sub-output 2. IPM-Cassava Training
(A.C. Bellotti)

Training Offered

Manejo integrado de plagas en yuca (IPM in Cassava).
Polos de desarrollo Cauca – 30 farmers, department of Cauca. MADR . Jun. 29, Tambo, Cauca.
CIAT-CLAYUCA. Sena-Buga -15 students. Jul. 13.
CIAT-CLAYUCA - 12 technicians and farmers, department of Cauca. Ago. 31.
CLAYUCA - 60 farmers of Magdalena Medio. Sept. 3-5. Cúcuta, Santander.
CLAYUCA - 50 technicians and farmers. Sept. 18-19. Florencia, Caquetá.
CORPOICA- 80 participants, CORPOICA. Oct. 16-18. Villavicencio, Meta.
Agroempresas Rurales - 12 farmers, department of Cauca. Oct. 30. CIAT..

Acaros plaga de la yuca y su Control. CIAT-CLAYUCA. Sena-Buga – 15 students. Ago. 17.

Curso de ácaros plaga y su control. María Virginia Bertorelli. INIA-FUNDACITE-3 weeks. Sept. 17-Oct. 5, CIAT.

Manejo de baculovirus en el control de lepidópteros, *E. ello*. Students of Entomology. Universidad del Valle. Oct. 26. CIAT.

Entrenamiento en identificación de moscas blancas. Señor Octavio Zegarra de Perú, Centro Internacional de la Papa-CIP. March, CIAT.

Manejo integrado de plagas de yuca. Farmers and technicians in Santander de Quilichao, department of Cauca - UMATAS. April.

Comportamiento de mosca blanca en campo. FIDAR, farmers and technicians, department of Cauca. May.

Training Received

Hongos y nemátodos entomopatógenos en el control de plagas en Colombia. SOCOLEN. Universidad Nacional de Colombia. Oct. 12. Bogotá.

Especialización en hongos y nemátodos entomopatógenos. Universidad del Valle. Oct. Cali.

Segundo período del Master en Biotecnología. Universidad Autónoma de Madrid, España. (April-July).

Entrenamiento en técnicas moleculares aplicadas al estudio de biotipos de mosca blanca y parasitoides, y fundamentos para estudios filogenéticos. Centro de Investigación y Desarrollo Agroalimentario. CIDA, Murcia, España. June.

Seminario Nemátodos Entomoparásitos, una alternativa en MIP. Univ. Nacional de Bogotá. Ago.

Thesis in Progress

Alean, I. Evaluación de la eficacia de diferentes hongos entomopatógenos (Hyphomycetes) en el control de la mosca blanca de la yuca *Aleurotrachelus socialis* Bondar. Tesis de Pregrado. Pontificia Universidad Javeriana, Bogotá.

Ramírez, C. Aportes al estudio de la biología, comportamiento y distribución del barrenador del tallo de la yuca; *Chilomima clarkei* A. (Lepidoptera: Pyralidae) en el departamento del Tolima. Tesis de Pregrado, Ingeniero Agrónomo. Universidad del Tolima.

Rendón, M. Control biológico de chinche subterráneo de la yuca *Cyrtomenus bergi* Froeschner (Hemiptera: Cydnidae) con hongos entomopatógenos Hyphomycetes. Tesis de Pregrado. Universidad de Santa Rosa de Cabal – UNISARC, Santa Rosa de Cabal, Risaralda.

Carabalí, A. Evaluación del potencial de resistencia/tolerancia de diferentes genotipos de yuca *Manihot esculenta* Crantz al biotipo "B" de mosca blanca *Bemisia tabaci* (Homoptera: Aleyrodidae). Tesis de Maestría. Universidad del Valle, Cali.

Sub-output 3. Group training of farmers, technicians, extension workers and students. (E. Alvarez)

Seminars

Advances in the project management of Powdery Mildew in rose. Asocolflores. CIAT Palmira, February.

Asociación de Micología de Colombia. Phytophthora in palms. Diagnostic, isolation, disease management. Bogotá, February.

Field Day in participatory research, incorporation of ash and organic matter (dead leaves and sticks from forest soil), variety selection. 115 participants included technicians from SENA, CDA, JER School, Secretaría de Desarrollo del Vaupés, ONGs. Seima Central (Mitú). October 18, 2000.

Research advances in the most important cassava diseases. Carlos Yepes from Congelagro. CIAT Palmira, July 5.

Seminar on Cassava diseases and pests integrated management. Cassava varieties. 19 participants: farmers, technicians from Umatas (North of Cauca), students and professor from Universidad Nacional de Colombia (Palmira). CIAT Palmira, July 13.

Field day. Root rots integrated management. 12 participants: Farmers and technicians. Farm La Elena Municipality of Montenegro, Quindío. August 8.

Training Offered

Training to four oil palm technicians in a Bud Rot control strategy. Villanueva (Casanare) and Paratebueno (Cundinamarca) January, March, April.

Training to 10 indigenous communities in participatory research, variety selection and incorporation of ash and organic matter (dead leaves and sticks from forest soil) in soil. 77 participants included technicians from SENA, CDA, JER School, Secretaría de Desarrollo Agropecuario, ONGs. Mitú. April 20th.

Cassava diseases integrated management, presented in: Curso intensivo sobre el manejo agronómico y poscosecha del cultivo de la yuca con fines industriales. Corpoica, Villavicencio, 36 participants April 24 - 26.

Molecular techniques. Universidad Nacional de Colombia (Palmira). Professors and students. 10 Professors and students participated. April 4 - 6.

Training to Mariana Valencia, Microbiologist from Levapan S. A. RAPDs and AFLP. 6 months. February to August.

Training to César Ospina, Thesis student from Corpoica, Palmira on PCR. March – November.

Cassava diseases integrated management. 31 participants: Farmers and technicians. El Tambo (Cauca), June 29.

Case study: Participatory research to control cassava root rots, presented in the course: Methods and techniques of farmer participation in research. 24 participants: CIAT research assistants, professionals from Agriculture Ministry from Cuba and Costa Rica and INIA (Chile). CIAT Palmira, June 29.

Cassava diseases integrated management. Sena from Buga (Valle). 18 participants: Students and technicians. CIAT Palmira. August 17.

Ramón Arbona (Dominician Republic). Research and management of Commom Bacterial Blight and Superelongation Disease in cassava. August 23.

Training Received

Course: Methods and techniques of farmer participation in research. CIAT Palmira, June 29.
Course: Statistical analyses for molecular markers. CIAT Palmira, August 8-10.
Course: The nature of disease resistance, mechanisms of pathogenesis and signal transduction in plants. Dr. David Collinge, Associated Professor. Royal Veterinary and Agricultural University (Denmark). CIAT, October 16 – 20.

Thesis in Progress

Loke, J.B. Identifying and isolating major genes conferring resistance to causal agents of the root rots *Phytophthora drechsleri*, *P. nicotianae*, and *P. cryptogea* in a segregating population of cassava (*Manihot esculenta* Crantz). Universidad Nacional de Colombia, Palmira.

Llano, G.A. Evaluación de la homología de sondas heterólogas en el genoma de yuca y su asociación con la resistencia a *Phytophthora* spp. Tesis para Maestría en Ciencias Agrarias con énfasis en Fitomejoramiento Universidad Nacional de Colombia, Sede Palmira.

Trujillo, O.F. Producción sostenible de yuca en un sistema agroforestal indígena de Mitú (Vaupés), con participación comunitaria. Beginning: September 1.

Celis, A. Determinación del agente causal de la enfermedad Marchitamiento Letal en palma de aceite. Beginning: September 1.

Mejía, J. F. Caracterización molecular y patogénica de aislamientos de S*phaceloma manihoticola* provenientes de la región centro-sur de Brasil.