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Report of the External Advisory Committee

GLO/91/013 ECOLOGICALLY SUSTAINABLE CASSAVA
PLANT PROTECTION IN SOUTH AMERICA AND AFRICA (ESCaPP)

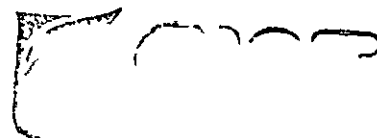
Cotonou Benin
1-4 June 1996
with Site Visits to
Nigeria (28 May - 1 June)
and Benin (29 May - 1 June)

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Acknowledgment

The EAC wishes to thank the members of the ESCaPP national teams in Nigeria and Benin for welcoming site visits to their nations for sharing their expectations experiences results and wisdom with ESCaPP members and for organizing transport accommodation and meals in such an efficient manner We also thank the ESCaPP regional staff at IITA Cotonou for hosting the formal meetings of the EAC and all members of ESCaPP for the frank and open discussions that contributed so much to a successful review

List of Acronyms

ACMV African Cassava Mosaic Virus
 AWLAE African Women Leaders in Agriculture and Environment
 CARDER Centre d Action Regionale pour le Developpement Rural Atlantique Benin
 CD ROM Compact Disc Read Only Memory
 CGM Cassava Green Mite
 CIAT Centro Internacional de Agricultura Tropical, Columbia
 CNPMF Centro Nacional de Pesquisa de Mandioca e Fruticultura Crus das Almas Brazil
 COPAL Comite Pesquisa Agricola Local
 DNA Dexoxyribonucleic Acid
 EAC External Advisory Committee
 EMBRAPA Empresa Brasileira de Pesquisa Agropecuria Brazil
 ESCaPP Ecologically Sustainable Cassava Plant Protection
 FPR Farmer Participatory Research
 FUTO Federal University of Technology Owerri Nigeria
 IITA International Institute of Tropical Agriculture
 INRAB Institut National de Recherche Agronomique au Benin
 NRCRI National Root Crops Research Institute Umudike Nigeria
 PCR Polymerase Chain Reaction
 PROFISMA Protecao Fitossanitaria Sustentavel de Mandioca
 UNDP OPS United Nations Development Programme Office for Project Services

I INTRODUCTION

This is the second report by the EAC on ESCaPP the African component of GLO/91/013. The first report dated 28 February 1995 is on file with UNDP OPS as are two reports documenting the EAC's evaluation of PROFISMA the South American component of this global project. In all three of the above reports the EAC explained how it interacted as constructively as possible with the project participants and exhaustively identified many areas in which improvements could be made that would facilitate achievement of the project's objectives. They also went into quite extensive scientific detail. Some of the same approach is embodied in this report. However as the project nears its termination point the EAC felt that it was important to emphasize its accomplishments in this report.

There is now ample evidence of achievement that is already beginning to pay back on the four year investment by UNDP. However in a scientifically based project involving the manipulation of organisms as well as substantial societal change a four year horizon will be passed far before the work will have reached its logical end. Maximal benefits will not yet have accrued. Thus while the project will have been cost-effective if terminated after four years there will be much more benefit to gain if it is granted a second phase. This report with eight recommendations is written in part with a second phase in mind.

II ORIGINAL OBJECTIVES

Reference to the 1991 Project Document will disclose six specific objectives of ESCaPP that are paraphrased as follows: 1) to foster an inter-disciplinary approach to cassava plant protection; 2) to identify major on farm constraints to increased cassava

production 3) to estimate losses due to the identified constraints 4) to train national program researchers extension workers and farmers in the principles and practices of ecologically sustainable cassava crop protection 5) to develop test and implement pest control technologies and estimate their actual and potential impact and 6) to evaluate the effectiveness and impact of the training program and farmer adoption of the above intervention technologies

III SUMMARY OF ACHIEVEMENTS WITH REFERENCE TO OBJECTIVES IN THE PROJECT DOCUMENT

The EAC is composed of doubting scientists In its extensive tours of four national ESCaPP programs Ghana and Cameroon in 1994 Nigeria and Benin in 1996 (see Section VI) it adopted a show me attitude It poked into laboratories examined equipment trudged through fields reached at the end of dubious roads talked at length person to person with ESCaPP scientists technicians extension personnel AND farmers (after dispensing as quickly as possible with courtesy calls to senior administrators) poured over budgets and milestones arrayed on spreadsheet after spreadsheet, and listened to many formal presentations by ESCaPP personnel who in turn were relentlessly grilled by members of the EAC We are therefore confident that the following achievements cited by ESCaPP in Annual Reports and other documents are if anything understated

A ESCaPP and PROFISMA Achievements in Collaboration

- Location identification and culturing of predators of the cassava green mite (CGM) in South America, and shipment (through quarantine in the Netherlands) to Africa for biological control of the CGM

- Mapping of climatic homologues between regions in Africa and South America to identify locations in South America in which to search for biological control agents that will be ecologically adapted to specific African conditions
- Biological and genetic characterization of natural enemies of cassava pests
- Scientific exchange visits
- Training of African and South American technicians in mite taxonomy
- Sharing and compilation of information resources production of CD ROM including databases bibliographies and grey literature
- Global project coordination and exchange

B ESCaPP Achievements Independent of PROFISMA

- Classical biological control of the CGM in the rain and transition forests of West Africa, causing pest populations to decline by two-thirds and yields to increase by one third where the exotic natural enemies are established
- Delivered sustainable cassava plant protection training to 194 trainers 1800 extension agents and more than 2400 farmers groups through existing national extension services using national expertise
- Provided specialized training to 24 national program scientists and post graduate training to 12 women
- Completed a regional diagnosis of major insect disease vertebrate and weed pest problems of cassava and compiled a huge digitized database of quantified survey results that now provides a baseline for future comparisons
- Discovered a new disease of cassava in Ghana and Nigeria

- Established multi disciplinary national teams operating for the first time in an inter disciplinary manner a model that has subsequently been adapted for other R&D activities in the participating countries
- Set future research and implementation priorities for specific ecozones in the region based on the ecoregional diagnostic survey results
- Initiated a collaborative and competitive small grants program utilizing existing institutional capacities to broaden the scope and impact of the project in the region
- Created a cassava information resource package on CD ROM that includes personnel institution and project directories bibliographies field guides and handbooks general references and a series of raw databases relevant to cassava plant protection decision making
- Developed a curriculum for sustainable cassava plant protection based on the particular needs of farmers extension agents and research scientists

A comparable list of independent achievements can be cited for PROFISMA

None of these is a trivial achievement. All are of the scope and significance expected in a global multidisciplinary project. Global collaboration and activity is supported on each side of the Atlantic by two strong but separate regional programs that have accomplished much in their own right. The achievements clearly meet the first four objectives originally proposed for ESCaPP (see Section II). While there is vigorous activity the last two objectives as expected have been only partially satisfied. There is much development testing implementation and evaluation still to be done but the results to date are impressive and appear to justify continuation of the project and its expansion to other cassava growing areas in Africa.

Recommendation 1 Because of the remarkable success of the first phase of GLO/91/013 and the probability of continuing success in the future, the Project Leaders of both ESCaPP and PROFISMA should be encouraged to apply for support of a second phase of the project

IV IMPACT OF ESCaPP

The achievements of ESCaPP have already yielded economic social scientific and environmental benefits for West Africa

A Economic Benefit

One example alone demonstrates the extraordinary potential economic payoff of GLO/91/013 The predatory mite *Typhlodromalus aripo* has been introduced and has become established at many sites in all four ESCaPP countries Because of its preference for inhabiting the growing tip of a cassava plant many mites become windborn and the predator is now spreading by itself on the wind Although much more work needs to be done to establish *T aripo* throughout its potential range it is sufficiently well established in some areas for the impact on its prey and on yield of cassava to be evaluated

The EAC saw very recent data obtained by ESCaPP scientists from 12 randomly chosen farms in Oeume Province of Benin indicating that *T aripo* has reduced the population of CGM by two thirds The consequence of this reduction in the pest population has been an increase in the yield of roots per plant from 1.7 to 2.3 kg At the suggestion of the EAC during the final day of the Mission ESCaPP regional Project Leaders together with the four national Team Leaders calculated the potential economic benefit of the establishment of *T aripo* Summation of the total estimated area in cassava

production (using FAO data) in the three (of six) ecozones in Ghana Benin Nigeria and Cameroon that are within *T aripo* s expected range assuming VERY CONSERVATIVELY that *T aripo* will inhabit only half of the crop and also assigning a very conservative market price of \$0.01 (US) per kg for cassava root the total annual value of the increased production of cassava amounts to an astounding \$59 239 500 (US)! Thus when *T aripo* occupies its full expected range the corresponding benefit cost ratio will be approximately 10:1. But this truly sustainable benefit should occur every year.

Conservative as the above estimate is it does not take into account other economic benefits such as increased quality and quantity (and thus value) of planting material better yield of leaves for human consumption and the opportunity to hold production levels constant and use the recovered land for some other crop. Nor does it include the impact of *T aripo* in suitable ecozones outside of the four ESCaPP countries the benefit that will accrue from the introduction and establishment of other species of predatory mites and fungi that are pathogenic to the CGM better productivity arising from the management of other pests (e.g. ACMV root rots and weeds) and the benefits accruing from better cultural practices by well informed farmers receptive to new technology. Thus a second phase of GLO/91/013 should lead to a continuing escalation of sustainable economic benefit.

B Social Benefit

ESCaPP s on farm trials involving the active participation of resource poor farmers in research on their own land appear to have effected a profound social change. Instead of research being a remote concept, the results of which are passed on to farmers by extension agents ESCaPP trained extension agents work with farmers to set up field experiments. Conversations between the EAC teams and farmers in both Nigeria and Benin were most

enlightening. The farmers had readily grasped the concept of an experiment and eagerly awaited the results of the trials they had set up. They obviously highly respected the extension agents with whom they worked and apparently because of their newly found affinity for research were very receptive to new technology. The ESCaPP training programs for extension trainers who then trained extension agents who in turn trained farmer groups (a knowledge based social impact in itself) had clearly done its job.

The model for on farm trials within ESCaPP follows a traditional top-down model of information transfer except that farmers and extension agents working together generate some of the information. Possibly an even better model is the Farmer Participatory Research (FPR) model used by PROFISMA. In this bottom up system a farm community led by an elected four person executive committee identifies its particular problems. The farmers then work with extension agents to design their own experiments under the guidance of an advisory research scientist. Three concepts are embedded in all of the research: control treatments, randomization and replication. The first research topic might not be the one an extension agent might pick but the farmers become involved and empowered and very rapidly are able to see the extension agent's point of view. In an agrarian based society research is suddenly practiced at all levels not just by a group of elite scientists. During its last mission in Columbia, the EAC actually heard farmers involved in FPR complaining that their local politicians knew nothing about research. After a crop failure the politicians wanted to give them chickens instead the farmers wanted help with the research to solve their own problems.

Recommendation 2 Because farmer participatory research (FPR) for cassava growers has been developed and implemented in PROFISMA, and because there is great interest amongst ESCaPP personnel in involving farmers in research, the EAC recommends that a workshop on this subject

for selected ESCaPP socioeconomists, trainers extension personnel and scientists be hosted by EMBRAPA/CNPMF/CIAT. If this workshop cannot take place before the termination of PROFISMA at the end of 1996 project funds should be set aside for a workshop planned for a later date.

C Scientific Benefit

The ESCaPP team of scientists and socioeconomists is almost all African. With ESCaPP funds they are doing world class research in Africa for Africans. An impressive list of high quality publications many in peer reviewed journals is beginning to build up and most of the results have yet to appear in print. The regional ESCaPP staff are well served by a state of the art infrastructure at the IITA Cotonou Station. However many of the national program scientists are doing good science under extraordinary hardships despite ESCaPP purchased equipment and some refurbished laboratories. Electric power fails daily one national station has no phone lines and another has an inoperable Fax machine mail routinely goes astray the BEST of the four national research station libraries has had no significant new acquisitions for over a decade technical staff go on strike travel at best takes a very long time and at worst is dangerous accommodations outside of main population centres are primitive and the threat of disease is constant. In the face of all this ESCaPP and its participants are helping in a small but very significant way to keep African science alive and strong.

Under ESCaPP a highly innovative small grants program has been instituted. Rather than to simply call on external researchers to flesh out undermanned areas of activity ESCaPP administrators decided to set up a competition. They developed rigorous criteria for application and appointed a representative multi disciplinary multinational evaluation committee composed of ESCaPP participants. They received 129 proposals

and awarded 27 small grants for a total of \$742 000 (US) There was no national bias except that each of the four participating countries had to receive one grant each in socioeconomics entomology and plant pathology The program has fostered institutional collaboration expanded the expertise available to ESCaPP broadened the scope of the project and funded capable researchers who were stifled for lack of support It has been a very positive stimulus for African science

Recommendation 3 In view of the success of the ESCaPP Small Grants Program UNDP OPS should consider using the ESCaPP model as a basis for incorporation of a small grants component into other large R and D programs to broaden the expertise utilized as well as the scope and impact of the funded work

The small grants program is not without problems however The EAC did not witness much personal (as opposed to institutional) collaboration in reports from small grant recipients A number of recipients appeared to be repeating research already done and published by others did not seem to be aware of this and had not even accessed technology available elsewhere in GLO/91/013 There was also a tendency to stick strictly to plans that were no longer relevant For example when preliminary results clearly indicated no treatment effect, one small grant researcher was pushing ahead with an experiment anyway whereas a more experienced scientist would already have been investigating an alternative hypothesis

Recommendation 4 To avoid delays and unnecessary replication of work already done, recipients of small grants should be well informed and encouraged to make use of the information and resources available at other institutions within ESCaPP, and elsewhere Access to such information as

well as advice on experimental procedures and data analysis could be facilitated by a mentorship program for new grantees

D Environmental Benefit

Faced with rising production of cassava worldwide and its increasing popularity as a cash crop the original Project Document predicted that without intervention there would be a corresponding rise in the use of chemical pesticides primarily to control arthropod and weed pests of cassava. The extensive diagnostic and socioeconomic surveys conducted by ESCaPP indicate very little use of pesticides at present in West Africa.

It now appears that ESCaPP's emphasis on the development of ecologically sustainable plant protection should make it possible for cassava producers to continue to avoid the use of chemical pesticides even if better yielding varieties are introduced and market demand grows. The probable success of biological control of the CGM is a major reason for this conclusion. Other reasons are the anticipated results of ESCaPP's on going research into the adoption of pest resistant varieties of cassava, control of weeds through the use of cover crops, production of vigorous disease free planting stock and the control of root rot fungi by inoculating soil with fungi that are antagonistic to pathogen species.

V PROGRAM REVIEW

In both Nigeria and Benin the EAC site visit Teams heard detailed oral presentations on the respective National Programs. Reports for Cameroon and Ghana were presented during two days of formal meetings on 2 and 3 June at IITA Cotonou. Also heard were numerous presentations on scientific, technical, socioeconomic and administrative aspects of ESCaPP. Unlike other EAC reports this report refers the reader

for the most part to the 1995 ESCaPP Annual Report for detailed information. While the EAC was very favorably impressed with most of what it heard, we felt compelled to make a few pertinent observations and single out areas in which we feel that there is need for improvement. For the collaborative effort with Winrock International's AWLAE program, the EAC was able for the first time to meet with its Regional Representative for West Africa. We document this meeting somewhat more extensively.

A National Programs

The EAC noted with approval that Cameroon and Ghana had the courage to terminate or replace non-productive individuals. The \$240,000 budget cut by UNDP in September 1995 had significant effects, e.g. the cancellation of a training workshop in one country and doubling up on responsibilities to compensate for personnel cuts. The diagnostic and socioeconomic surveys in southwestern Nigeria (started late when a second Nigerian team had to be formed to cover the entire country) and Ghana (held up due to war) are now completed. Each National Program is working very hard in producing its component of the comprehensive summary reports.

B Socioeconomics

In the diagnostic and socioeconomic surveys, ESCaPP socioeconomicists played a major role. Their findings provide key insights into the perceptions, priorities, and practices of farmers, the ultimate consumers of ESCaPP science and technology. The EAC considers it imperative that socioeconomic findings be integrated into implementation schemes, that management continue to involve socioeconomicists in ESCaPP activities, and that socioeconomic findings be expressed according to established protocol so that they are accessible worldwide.

C Biological Control of the Cassava Green Mite

In spite of the early and obvious success of the *T aripo* release program the CGM is an obscure pest not well recognized as such by farmers. Accordingly the EAC is concerned that the beneficial impact of biological control also will not be recognized. Local recognition is critical to recognition in all sectors including the political community that ultimately will decide whether or not to support science in Africa.

Recommendation 5 To assure that ESCaPP receive proper credit for its beneficial work and to aid ESCaPP in detecting the spread of and local extinctions of *T aripo*, and ultimately other predators and fungal pathogens of CGM ESCaPP training activities should be refocussed immediately on the training of extension agents and farmer groups in recognition of the CGM and *T aripo*, and their offsetting impacts.

The precise reasons why *T aripo* did not survive the hot dry season 250 km inland in Benin (see Section VI, B) and potentially will not survive in similar transition zones in other countries are not known. In the anticipated 5-10 year duration required for widespread establishment of other natural enemies of the CGM it is important that *T aripo* be used optimally over as many ecozones as possible.

Recommendation 6 While the search for ecologically adapted natural enemies of the CGM continues, ESCaPP should engage in research on the characteristics of cassava plants that could enhance the survival of *T aripo* in hot, dry weather (e.g. leaf retention, apical morphology) and should utilize field multiplication plots to provide sources for periodic

reintroduction of *T aripo* when unfavourable weather causes local extinctions

D Plant Pathology

Although Koch's postulates have yet to be employed to confirm pathogenicity the ESCaPP Regional Plant Protectionist is to be commended for his discovery of a new disease tentatively called cassava stem necrosis. While much fine research is under way the EAC has four areas of concern: 1) that DNA fingerprinting utilizing polymerase chain reaction (PCR) technology be used to identify and establish test strains to screen for resistance to cassava bacterial blight with the ultimate objective of developing and releasing resistant varieties; 2) that Koch's postulates be employed before any species of root rot is concluded to be pathogenic; 3) that the ESCaPP Regional Plant Protectionist collaborate with the resident IITA Cotonou plant pathologist on similar root rot research that is now proceeding separately; and 4) that mycological research on stored cassava chips focus on fungi capable of producing mycotoxins and as much as possible utilize well-established methodology so that results will be compatible with those of post harvest studies in other stored food crops.

E Winrock International, African Women Leaders in Agriculture and Environment (AWLAE) Fellowships

The ultimate goal of the Winrock International Institute is to reduce poverty and hunger through sustainable agriculture and development. In review of the AWLAE Fellowship program with the Winrock International West African Representative the EAC was reassured that the selection process was highly competitive, open and fair. We approved of the late decision not to place Fellows in African universities following the

closure by strike of Cape Coast University in Ghana trapping two Fellows in course. With reopening of the university both Fellows are now proceeding toward completion of their degrees as are 10 others studying in France, England, the Netherlands and the USA. The money for the Fellowships is transferred from ESCaPP to be administered by Winrock. The 1995 budget cut forced the cancellation of Fellowships for two candidates who had been selected to study overseas but had not yet begun their studies.

The case for a third candidate whose Fellowship was also canceled was not so clear. Correspondence obtained from the candidate and her academic supervisor by the EAC's Nigeria Site Visit Team appeared to indicate that she had been selected as a Fellow early in 1994 with the provision that she obtain a place in an African University. The correspondence also shows that she was accepted into the Federal University of Technology Owerri, Nigeria, began her academic work in June of 1994, received no money and subsequently had her Fellowship revoked late in 1995. The correspondence was given to ESCaPP management with the suggestion that consultation on the case occur with Winrock and that if the apparent injustice is verified, financial redress be made.

Although ESCaPP is a plant protection project, only three of 12 Fellows are focusing on plant protection studies in their graduate work. However, all specified protocols with respect to selection of study area were strictly followed and it is neither Winrock's nor the candidates' fault that plant protection is under-emphasized in favour of such subjects as rural sociology and agricultural extension. Moreover, all of the chosen subjects for study are relevant in some way to the delivery of effective plant protection.

F Project Administration

ESCaPP is very carefully appropriately and firmly administered. The main problem as noted in several places in this report appears to lie in suboptimal communication between its individuals and components as well as with its trans Atlantic twin

Recommendation 7 Whereas exchange of information between researchers with a common cause is often very beneficial and because communication between and within elements of ESCaPP and PROFISMA occurs on an uncertain, *ad hoc* basis the EAC recommends that a mailing list for all elements of GLO/91/013 be established and that any and all reports and publications originating from any member of the mailing list be distributed with dispatch to each other member

The \$240 000 budget cut in September 1995 forced ESCaPP to proceed at a maintenance level for the balance of the year to conserve money to meet its 1996 budget commitments. Occurring late in the fiscal year without a chance for planning the cut was very counterproductive causing key activities to be canceled or delayed. Some personnel were laid off and other positions were lost by attrition forcing an overload on remaining personnel. However the overall success of the project has not been jeopardized. One reason for its success is the back up expertise available in IITA. For example management of the huge data set (9.3 megabytes) arising from the diagnostic and socioeconomic surveys has been smoothly handled by a young African specialist (first degree in Physics second in Information Science) who works for IITA Cotonou

The EAC's Nigeria Team with the UNDP OPS Project Officer met on 30 May with the Chief Financial Officer of IITA and his deputy to review the financial management of ESCaPP. Imprest accounts are set up in the four member countries, each of which has a separate code for ESCaPP projects. Each national program must account in detail, and with documentation, for all expenditures before additional monies are advanced to an imprest account. Financial statements are issued monthly by IITA. Documentation is kept for five years, so if an audit is planned, it must be done within five years of the start of the project. There was some concern expressed by ESCaPP representatives with regard to an apparent policy of funding programs by deficit payback. However, rapid accounting for expenditures will allow UNDP to provide regular advances, eliminating any need for deficit financing.

Administration of small grants is unusual by conventional standards, in that they are given to individuals to protect them from institutions. An account is opened by the grantee in ESCaPP's name. All expenditures must be validated by receipts. Expenditures and disbursements to the accounts must be endorsed by ESCaPP management in Benin and are subject to standard accounting procedures by the IITA Ibadan Finance Office.

VI SITE VISITS TO NIGERIA AND BENIN

From 28 May to 1 June the EAC split into two Site Visit Teams to review and advise the ESCaPP national projects in Nigeria and Benin. The reports from each team are presented herein in the expectation that the experiences and observations of the teams may be useful to UNDP OPS and to project participants.

A Report of Site Visit to Nigeria J H Borden and M Dahniya with C Dike
UNDP OPS B James Regional Trainer Liaison Officer W Msikita, Regional

Plant Protectionist B Ospina PROFISMA representative T N C Echendu
 ESCaPP Nigeria National Coordinator C C Asiabaka ESCaPP East Nigeria
 Socioeconomist A R Salawu ESCaPP West Nigeria Socioeconomist and D
 Ojo ESCaPP West Nigeria Plant Protectionist

The Nigeria Team left Cotonou in the IITA airplane about one hour late on the morning of 28 June. A further delay occurred at Port Harcourt while six immigration officers toiled for two hours to stamp seven passports. A scheduled 1030 h meeting with the Dean of Agriculture of the Federal University of Technology (FUTO) at Owerri finally occurred in mid afternoon. Thereafter the Team heard brief presentations on resource allocation in cassava growing households and on factors affecting adoption of new cassava technologies by two grantees of ESCaPP's Small Grants Program.

Two pertinent observations arose from these presentations and the discussions ensuing therefrom. Firstly the presentations reaffirmed the Team's opinion that the Small Grants Program administered by the ESCaPP regional office appears to be an excellent way of fostering collaboration between institutions. Moreover it utilizes relatively small sums of money to broaden the scope of ESCaPP and to build a region wide body of cassava researchers. Secondly the Team noted that the economic analysis of household labor allocation embodies components that should make it possible to conduct benefit cost analyses that could demonstrate the impact of ESCaPP research on increased quantity and quality of cassava crops. The Team was therefore disappointed to learn that the Nigerian ESCaPP researchers were unaware of the 1995 CIAT publication entitled Global Cassava Sector Constraints and Estimated Future R & D Benefits. This lack of awareness has occurred despite the EAC's recommendation that PROFISMA circulate the report to their African counterparts and that the methodology of the report should be adapted to assist in evaluating the impact of GLO/91/013 (Recommendation 1 in the EAC's 5 September 1995

report to UNDP OPS) In addition to contributing to the evaluation of applied research in general a demonstrable impact expressed in benefit cost terms could well be used to justify contributions by donors to a second phase of the project

At the end of the afternoon the Team heard the complaint of a young woman graduate student who had been promised support for masters studies at FUT0 by Winrock International and had commenced an approved study program only to have her support revoked when the project budget was cut by UNDP The Team received relevant correspondence and agreed to consider her case on return to Benin

On 29 May the Team spent the day at the National Root Crops Research Institute (NRCRI) at Umudike The group was welcomed by the Acting Director after which there was a conducted tour of some of the Institute s facilities including the office and laboratory provided by the Institute for use by the project Equipment provided by ESCaPP including computers photocopier and Fax machine were seen The group noted the rather poor communication between the station and the outside world and observed that the Fax machine was broken and had not been used for a long time

Also visited were the Institute s tissue culture and soil science laboratories and the library The laboratories provided services to the Project for which no charges were made Such assistance is a hidden benefit which is often not recognized The library lacked recent scientific publications but some journals had started coming in under the World Bank supported National Agricultural Research Project The team also saw the rearing of phytoend predators of the CGM using stake 'trees' in a greenhouse and screened tunnel mass rearing structures This is a good example of the decentralization of the production of natural enemies using technology transferred from IITA Cotonou

On the afternoon of 29 May the Team heard oral presentations from various members of NRCRI an external Small Grants recipient and a successful Winrock fellow. The Nigerian national program appears to be ambitious, active and successful. For example, a national directory of cassava researchers has been compiled, a workshop has been held on indigenous knowledge, and the Nigerian components of the diagnostic surveys are reported to be in an advanced stage of data analysis, with various individuals assigned to write up specific components of the report.

In general, experiments were of sound design, but in a study on the effect of companion plants on cassava pests, the choice of statistical methods was questionable, and in all cases, visual presentations of written information and data (overhead transparencies) were often cluttered and incomprehensible, a fault commonly encountered by the EAC in both Africa and South America.

Recommendation 8 Because poor visual presentation techniques detract from the ability of ESCaPP scientists to report their results in a compelling manner, and cannot result in ESCaPP being viewed in the best possible light, ESCaPP should ensure that all project scientists are sent the visual presentation guidebook available from IITA, and possibly that a training workshop be arranged for each national team. PROFISMA administrators may also wish to make note of this recommendation.

The Team noted that the recipient of a Small Grant was doing sound research on the impact of cover crops on the productivity of cassava, but could have benefited from contact with farmers prior to commencing his experiments. Moreover, he was not aware of a similar research project in PROFISMA. Specialized training had obviously been put to good use by a young scientist who was using a monoclonal antibody technique to identify

three African Gemini viruses of cassava. However, he too could have benefited by contact with his PROFISMA counterparts. As elsewhere, the release, spread and impact of predator mites on the CGM appears to be spectacularly successful in Nigeria.

The Winrock Fellow had recently returned to Nigeria after completing a one year masters degree program at Reading University in England. She had obviously benefited greatly from her degree program in agricultural extension and was well prepared to contribute at a very high level, particularly in sustainable agriculture and gender issues. However, in view of the fact that ESCaPP deals with plant protection, the Team was disappointed to learn that none of her studies or her thesis had anything to do with plant protection *per se*, nor had she received any guidance or advice to orient her education at least partially in that direction.

After travelling to IITA, Ibadan, on the morning of 30 May, the Nigeria Team spent the afternoon considering the contribution of IITA's Training and Materials Section to ESCaPP, observing impact trials for *T. aripo* and studying the role of IITA's Finance Office in administering the ESCaPP budget. The latter function is outlined in the main body of this report.

The Team was fascinated by the process in which seven informative posters on cassava protection are being prepared for distribution to extension agents and growers. A brain storming and artistic workshop produced mock up posters. During a break in the workshop, these were taken to a village for evaluation by farmers, and then revised immediately on the basis of the farmer's comments. The posters are simple, factual, employ clear pictures, and end with advice to contact a local extension agent. The agent can then help interested growers to further their knowledge, often through more challenging written material prepared with ESCaPP input. A workshop on communication

skills is planned for extension agents working with ESCaPP which will fund the workshop but gets the IITA expertise at no charge

In the *T aripo* impact study plants that were selectively sprayed (tip only) to eliminate *T aripo* but not CGM were much poorer in their performance than plants with both the pest and the predator

The team spent the entire day on 31 May visiting training facilities at two state Agricultural Development Programmes and interacting with farmers and extension agents in two farming villages where on farm trials were in progress Both Development Programmes were obviously proud of the interactive manner in which training programs and curricula had been developed for Extension Agents and the hundreds of farmer groups that had subsequently also received training One Programme Manager when asked was not aware of the spread and impact of *T aripo* indicating a need for constant communication with ESCaPP scientists

Both farming villages had similar organizations led by a head farmer and a secretary (both male) the latter served as interpreter during the visit Women apparently took an active role in cassava production and were quite ready to voice their opinions which appeared to be heard by the men In neither group did women take an evident leadership position The Extension Agents were highly respected but one group said that scientists had never visited their plots

Demonstration plots in both villages clearly showed that varieties of cassava that were resistant to ACMV at IITA did not express resistance uniformly in the field This failure had led to a similar experiment in each village where the Extension Agents had apparently suggested that stakes for planting be taken from the mother stem or from

primary or secondary branches to determine if stake quality influenced resistance to ACMV. Many stems for each treatment were planted in unreplicated plots. In discussion with the Team, the farmers demonstrated that they understood why the experiment was being done and quickly grasped the new (for them) concept of and rationale for replication. Moreover, in response to a question they said that they enjoyed doing the experiment and had ideas for other experiments.

These on farm trials followed a conventional top down extension model with obvious and commendable success. The Team wondered however if adoption of farmer participatory research (FPR) methodology could have made this enterprise even more effective.

B Report of Site Visit to Benin D W Roberts and A Raymundo with J S Yannek, ESCaPP Regional Project Leader, S Lapointe, PROFISMA Co Leader, N Maroya, Benin National Coordinator, R B Agbassy Boni, Winrock International West Africa Regional Representative, and M Boya, UNDP Benin Assistant Program Officer.

On 29 May the Benin Team began its tour by visiting two fields at Ikpınle where 11 farmers had begun experiments with ESCaPP in March 1995. This is the area where *T aripo* was first released in Africa in 1993. An experiment on the effect of *T aripo* (similar to one observed by the EAC in Ghana in 1994) is in progress in which a local variety of cassava plants in 400 m² plots are selectively sprayed twice a month with permethrin to kill *T aripo* but not CGM. Control plots also 400 m² are untreated. Both plots are weeded regularly by the farmers who are paid for their services at twice their estimated return for their crop by ESCaPP. The farmers were not given extensive training but had some idea of what was happening.

The Team was given data from this experiment which clearly indicated 20-40% reductions in tuber biomass when *T aripo* was excluded. The experience gained in this experiment, the first of its kind in Africa, will be used to organize a larger study. It is estimated that the effect of *T aripo* may add up to \$60 (US) per ha per year to a farmer's income based on a fresh weight price of \$0.01 (US) per kg and a previous crop value of \$250 (US) per field. A more elaborate four replicate experiment (duplicated at IITA Ibadan) was set up on nearby government land. It comprises three treatments (dimethoate treated to kill all mites, permethrin treated to kill only phytoseid predators, and untreated) and three cultivars, but is complicated by a large cross field gradient in size and vigor of the plants.

After a side trip to visit Songhai, a self-contained village, the Team proceeded to the headquarters of the Direction de l'Agriculture in Porto Novo. An outdoor mesh screen tunnel was being used to mass rear *T aripo* for field release. The Team observed outplanted cassava cultivars and a collection of slide-mounted phytoseid predators and was shown how mycotoxin is extracted from and detected in cassava chips. The investigator appeared to be unaware of methodology for mycotoxin detection or assessment of moisture content developed for other food products and no data are available on the percent of cassava that is converted to chips in Benin. The Chief of Station praised ESCaPP for providing essential support and for the first time enabling collaboration to occur with other institutions.

The day ended with a meeting with the Director General of the Institut National de Recherche Agronomique au Benin (INRAB). Under ESCaPP, INRAB has developed a holistic pest management approach for cassava. At this point, the renewal of ESCaPP is critical for completing the research program and working toward food security in Benin.

On 30 May the Team first visited the Centre d'Action Regionale pour le Developpement Rural (CARDER) Atlantique a national extension unit with a branch in each of Benin's six provinces. Cassava is the country's second most important food crop. ESCaPP has helped to overcome constraints to cassava production by training six extension agents in such subjects as techniques of rapid cutting production and soil fertility setting up demonstration plots diagnosis of extension needs and problems and planning of two courses on management of insect and vertebrate pests of cassava.

At Sekou the Team observed field experiments on the effect of cyanide content in five varieties of cassava and the effect of fertilization with potash (potassium) on the CGM. Another experiment is evaluating the influence of four cassava varieties planted at three different densities on the survival of *T. aripo* which seeks shelter in the apical cluster of expanding leaves. The best variety and spacing will be selected for planting in field multiplication sites for the predator. A final experiment is assessing the effect of weeding frequency on productivity of cassava and the survival of *T. aripo*. These experiments are in progress and conclusions are not yet available. The survival of *T. aripo* is of some concern because a population established in July 1995 at Save in the transition zone was apparently wiped out during the hot dry months and could not be found after December.

Proceeding to the INRAB Niaouli Station the Team was briefed on its activities which include protection of cassava and maize. A Professor from the Agriculture Faculty of the Universite Nationale du Benin explained his university's collaboration with ESCaPP in research training and diagnostic surveys. The research collaboration has led to two theses (one on resource allocation for sustainable cassava production and the other on constraints to sustainable cassava production) and to other projects on weed management and post harvest pest damage. A plea was made to include the university from the outset in a second phase of ESCaPP. The laboratory at Niaouli which was re-roofed and

refurbished two years ago with ESCaPP support is now heavily used. The Station houses a cassava germplasm collection consisting of 376 accessions that pre-date ESCaPP. Parting words from the Director emphasized the important role that ESCaPP Benin has played in bringing together the country's agricultural research, plant services and extension agencies to collaborate in working for a common cause.

Leaving Niaouli, the Team stopped briefly at a research station near Agbotagon where a 1 ha plot of cassava was planted in mid 1995 for multiplication of *T. aripo*. Natural spread of the predator has already made this plot unnecessary. Proceeding to Save, 250 km north of Cotonou, the Team saw fertilizer and cover crop studies that duplicated experiments seen previously in Sekou. The disappearance of an apparently well established population of *T. aripo* from Save in December 1995 suggests that this is at or near the northern limit of its range. A second phase of ESCaPP would be necessary to identify, import and release predators from South America that are better adapted to hot, dry environments. The Team saw experiments on the effect of cultivar and weeding on *T. aripo* and was introduced to a technician who received ESCaPP training in sustainable production of cassava and biological control of CGM.

On the morning of 31 May, the Team had to forgo a visit to a cassava chip processing plant in Glazone Zou because a resolute guard refused to allow visitors without his boss being present. Proceeding to Assante, the Team was shown on farm trials by an ESCaPP trained extension agent who serves 24 farmer groups, each with 12 farmers from whom a head farmer and a secretary are selected. In response to the farmers' interest, the extension agent has helped them to set up an experiment in which planted stakes are oriented in separate plots either vertically, horizontally, slanted, or according to local practice. The farmers will decide after the experiment which is the best method for adoption.

The Team also observed two methods of storing fresh cassava roots. In one, the roots are laid in a hole in the ground and successively covered with ashes, plastic sheeting, soil, and leaves. In the other, the roots are put in a wicker basket, which is then buried in moist sawdust and covered with dried palm leaves.

Before leaving Assante, the Team was given a feast of various cassava recipes, native cactus, and chickens, which the farmers said was laid out in gratitude for the benefits received from ESCaPP.

At Dassa, the Team met with another ESCaPP-trained extension agent whose farmers were comparing the performance of a local cassava variety with that of an IITA-recommended variety that was clearly the better. However, the farmers are supplied only with starting material and must propagate the new variety themselves to obtain large numbers of stakes for widespread planting.

The Team was then taken to Bohicon, where another farmer group is served by a woman extension agent. Under her guidance, farmers are testing improved varieties against a local variety. All farmers already grow some improved cassava, but also retain the local variety, which is sweet and can be boiled and eaten immediately without steeping to remove cyanide.

CARDER Atlantique has a very energetic four-man technical group run by an ESCaPP-trained supervisor near Allada. Marketing of cassava is no problem in this area, so the farmers, having lost the opportunity to practice the bush fallow system, are interested in high production. Nine demonstration plots displaying the effect of stake orientation, weeding schedules, cover crops, and choice and treatment (heat) of planting material are laid out along a road to gain attention of local contact groups, who helped set up the plots and

will be involved in their harvest and evaluation. The contact group structure was instituted by the World Bank in Benin about three years ago and has served ESCaPP well. It does not provide work units but does allow farmers to make informed decisions.