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UC/AID PEST MANAGEMENT AND RELATED
ENVIRONMENTAL PROTECTION PROJECT

TRIP REPORT

Report of Daily Activities of
Project Employee Dale G. Bottrell
during the period September 1 - October 23, 1979
to Review Crop Protection Activities
and AID-Project Proposals in
the African Countries Kenya, Upper Volta,
Niger, Ivory Coast, and Liberia

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(Note that 9 Attachments accompany this report. The first attachment, a memorandum, dated October 27, 1979, to F. W. Whittemore, AID-Washington, D.C., provides a summary of activities in each country.)

Submitted to Project Director Ray F. Smith on December 21, 1979.

ATTACHMENTS

NUMBER

- 1 Memorandum, dated October 27, 1979 to F. W.
Whittemore from Dale G. Bottrell
- 2 Memorandum, dated September 13, 1979, to Ray
Love from Dale G. Bottrell
- 3 Program for WARDA Seminar on Integrated
Management of Rice Diseases and Insect Pests
at Bobo Dioulasso, Upper Volta, September 17-22,
1979.
- 4 List of Participants - WARDA Seminar
- 5 "Concepts of Integrated Management of Crop Pests
with Special Reference to Rice", by Dale G.
Bottrell, paper presented at WARDA Seminar
- 6 "Cultures: Situation generale au 31 Aout 1979",
Niamey (Niger) newspaper, 01 October 1979
- 7 Letter, dated October 18, 1979 to Dale Bottrell
from Harold L. Dickherber
- 8 Memorandum, dated October 22, 1979, to Jack M.
Cornelius from Dale G. Bottrell
- 9 Environmental Assessment of Pesticide Use,
Nimba Rural Technology Project, by Dale G. Bottrell

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DAILY ACTIVITIES OF DALE G. BOTTRELL

SEPTEMBER 1 - OCTOBER 23, 1979

(Attachment 1 provides a Summary of Activities)

01 September

19:30: Departed my residence, Huntingtown, Maryland, personal vehicle.

22:00: Departed Washington, D.C. (Dulles).

02 September

10:00: Arrived London (Heathrow).

03 September

13:10: Departed London (Heathrow).

22:20: Arrived Nairobi, Kenya.

04 September Nairobi

10:30: Met Mr. Wilbur Scarborough, Director, Agricultural Division, USAID, Nairobi. He had not yet received notification from USAID, Washington, D.C. of my mission in Nairobi--no one else at Nairobi had either. He notified REDSO office of my arrival and explained that his office and REDSO should coordinate my mission to review the proposal submitted by the International Centre of Insect Physiology and Ecology (ICIPE), \$500,000(U.S.)+ for research on crop insect pests.

11:15: I met with Mr. George Rublee, a lawyer at REDSO, to discuss my mission in Kenya.

11:50: A. Ray Love, Director, REDSO - Nairobi, joined us. Love had just received the cable (sent from Washington 01 September) concerning my mission to Kenya. He suggested that I review the

ICPIPE proposal, with these questions: (1) Should it be funded? (2) Is it duplicative of ongoing work now being conducted at ICPIPE or elsewhere? (3) Is it compatible with the programs at other international centers, i.e., IRRI, ICRISAT, IITA, CIMMYT, etc.?, and (4) Does the proposed work allow an institutional framework for ICPIPE's becoming a member of the Consultative Group for International Agricultural Research (CGIAR) network?

15:00: Meeting at ICPIPE, Nairobi, to discuss my mission. Present: Dr. Alex Tahori, Deputy Director of ICPIPE, L. Moshia, financial manager, and Mrs. Odhingo, economist and managerial head at ICPIPE; George Rublee, Tom Bebout (Agricultural Officer), and Morgan Gilbert (same) of REDSO; and me. Tahori explained mission of ICPIPE--its current activities, and plans, and reasons for submitting the proposal to USAID. The \$500,000 (U.S.) requested from USAID is perceived by ICPIPE as important interim support for 2 years until ICPIPE becomes admitted to CGIAR network; Tahori et al. at ICPIPE are optimistic that admission into the network will be granted. Tahori arranged for Tom Bebout (REDSO) and I to meet with primary ICPIPE personnel and to travel (with Ed Smith) to the ICPIPE Mbita Point experiment station at Lake Victoria.

05 September Nairobi

I (and Tom Bebout) spent all day at ICPIPE, Nairobi, visiting with the following personnel who described the various research programs at ICPIPE and plans for the USAID proposal and provided us a tour of ICPIPE facilities (Dr. Edward H. Smith, Chairman,

Department of Entomology, Cornell University, joined us at 10:45 and participated in all later discussions. He arrived in Nairobi on 03 Sep.; for the next 6 months he will serve as a Visiting Professor at ICIPE): Dr. G. C. Unnithan, Research Scientist and Mr. A. G. L. Delobel, Research Scientist, working on sorghum shoot fly project; Dr. Syed Khasimuddin, Research Scientist, and Dr. Bert Persson, Research Scientist, working on African armyworm project; Dr. Z. Dabrowski, from Poland, Senior Research Scientist, Basis of Plant Resistance; Dr. F. S. Kezdy, Visiting Scholar (a chemist on short-term leave from University of Chicago); Mr. Isaac Jondiko, Graduate Research Scholar working with Dr. Kezdy; Dr. Elizabeth D. Kokwaro, Research Scientist (working in ultrastructure); and Dr. Jack Clark, Research Scientist, and Mr. R. K. Saini, Scientific Officer--both working in basic aspects of insect behavior.

06 September Nairobi

- 09:00: Tom Bebout, Dr. Edward H. Smith, and I met in my hotel room to discuss objectives of our 10:00 meeting at ICIPE.
- 10:00: ICIPE, Director Thomas R. Odhiambo's office. Present: Odhiambo, Tahori, Ed Smith, T. Bebout, Ray Love, Mrs. Odhingo, L. Masha, and me. For 2 hours, I directed questions to Director Odhiambo concerning the ICIPE \$500,000(U.S.)+ proposal to USAID. He was optimistic about ICIPE's being accepted into the CGIAR network, although he acknowledged that he couldn't be 100 percent certain. He said the money

request from USAID was needed as a source of "interim" funding between now and acceptance into the CGIAR network. He explained ICIPE's collaborative arrangement with IRRI, ICRISAT, IITA, WARDA, and the Kenya Ministry of Agriculture and the University of Nairobi. He said that these relations were good; he planned to work up a collaborative agreement with CIMMYT in the future. ICIPE is now formalizing an agreement with University of Nairobi on crop-loss assessment and already has an agreement with the University of Ibadan (Nigeria) on training plant protection specialists. If funded, Dr. Dabrowski (from Poland) will be the project's (USAID-funded project) Programme Leader; Dr. Saxena (now at IRRI) will be the Research Scientist; a Kenyan--M.S. degree - an agronomist at Mbita Point, the Agronomist; the two post-doctoral fellows will be a Kenyan (entomologist) and a plant physiologist from Sierra Leone, both to be stationed at Mbita Point.

14:10: Resumed tour of ICIPE and visits with personnel. I visited Dr. J. A. Odebiyi, University of Ibadan (Ph.D. University of California, Riverside under Oatman)--at ICIPE working on natural enemies of insect pests of cowpea.

17:30-20:15: T. Bebout, Ray Love, Dr. Anita Mackey (economist, REDSO), Mary Love, Ed Smith, Jan Smith, and I at A. Mackey's house.

07 September

07:15: Departed Nairobi (T. Bebout, Ed Smith, Jan Smith, driver, and I in ICIPE vehicle).

16:25: Arrived Homa Bay, Kenya, on banks of Lake Victoria. We checked in hotel, then drove (about 1 hour) to Mbita Point, also on the banks of Lake Victoria. Currently, the Mbita Point facility consists only of a small house-like structure with offices and small laboratory space. But there is a \$6(U.S.) million facility (including laboratory, lodging facility for personnel, swimming pool, the whole bit) just being started--to be completed in about 2 years. The contracting consultant in charge of supervising the construction provided us a tour of the grounds, pointing out where various structures are to be located. The Netherlands is to be the principal funder of the facility.

The ICIPE personnel now at Mbita Point include Dr. R. S. Ochieng (entomologist, Ph.D. from University of Ibadan), Mr. Okeyo-Owour (entomologist, M.S. degree from University of Nairobi), Mr. Omolo (agronomist--M.S. from Iowa State University--completing Ph.D. degree from University of Nairobi), one more entomologist (I didn't learn his name), and Mr. Ommodo, the Administrative Officer. The Mbita Point personnel provided us with a tour of their experimental plots and explained their concept of integrated pest control. They will be the personnel primarily responsible for carrying out the proposed project for 2 years. They are interested in determining the "optimal" intercropping combinations for the primary food crops (maize, sorghum, cowpea) being grown

by small farmers in the area and the response of insect pests under the various combinations. Also, they are interested in studying the dynamics of insect pests of rice, devising inexpensive monitoring techniques for sorghum shootfly, and various other aspects related to integrated pest control. They exhibited a good understanding of the concepts of IPC, and the work they proposed for IPC in that area appeared to make sense: they believe that the ultimate IPC program should avoid all uses of insecticides and should be based primarily on host plant resistance, selection of appropriate intercropping combinations, and conservation of resident natural enemies. They indicated that one of the most urgent needs in the area was for more extension personnel trained in IPC. The Kenya Ministry of Agriculture (MOA) has a Farm Training Centre (FTC) program they feel is important in exposing farmers to IPC concepts and techniques. ICIPE personnel at Mbita Point and local personnel of the MOA apparently have a good working relation.

21:45: Returned to Homa Bay.

08 September

07:45: Departed (Ed Smith, T. Bebout, I) Homa Bay--met the Mbita Point personnel on a farm near the Mbita Point facility. The Mbita Point personnel explained that the farm was representative of most farms in the Lake Victoria area where the USAID-funded work is proposed. A farmer, his two wives, and their

children lived on the farm (15 hectares) where maize, sorghum, cowpeas, cotton and some vegetables were grown in addition to cattle. We visited the elder wife who showed us a certificate she had obtained via the FTC program noted above. The training program included instruction on insect control (use of insecticides, application methods, etc.). She had treated the farm's cotton 7 times (with carbaryl) this year; she said she would use less material if given proper advice on how to reduce the numbers of applications without resulting insect pest losses. The woman's husband works for the Ministry of Agriculture and assists with the FTC program of which she had participated.

10:30: Departed the farm and returned to Homa Bay for a final wrap-up session with ICIPE-Mbita Point personnel.

11:00: Departed Homa Bay.

19:30: Arrived at lodge in Masai Mara Game Reserve where we spent night.

09 September

07:30: Departed lodge in Masai Mara.

17:00: Arrived in Nairobi.

10 September Nairobi

AM: Ed Smith and I discussed the ICIPE proposal in my hotel room.

12:30: Ed Smith and I met T. Bebout, R. Lov, M. Gilbert, and Cal Martin (REDSO, just arriving Nairobi--he will be in charge of the USAID-funded ICIPE project) for lunch. We discussed our trip to Mbita Point and discussed major items that we wanted

to discuss at 14:00 meeting in Odhiambo's office.

14:00: Director Odhiambo's office, ICIPE. Present: Odhiambo, Tahori, Mrs. Odhingo, L. Mosha - ICIPE; T. Bebout, M. Gilbert, C. Martin - REDSO; Ed Smith, and I. We questioned Odhiambo about arrangements for linkage between the Mbita Point and the Ministry of Agriculture. Odhiambo said both linkages would be favorable for effective relations--he suggested we contact the Minister of Agriculture and ask him about ICIPE/MOK relations. Odhiambo said he agreed with the need for a socio-economic input into the proposed project (an input we recommended) but didn't feel the input of an economist or sociologist should be done at the expense of other work already proposed in the project proposal -- suggested the Ford Foundation as a possible funding source. He said he agreed (with me, Ed Smith) that mass rearing insects at Mbita Point may not be too practical but saw no alternative--rearing was essential for work on host plant resistance, a major activity planned for the Mbita Point facility.

16:00: Meeting in Odhiambo's office concluded; I went to my hotel room to begin writing the report REDSO personnel requested of me - an analysis of the ICIPE proposal.

11 September Nairobi

08:30: Met T. Bebout at REDSO to plan the day's activities.

08:50: Met with M. Gilbert and C. Andersen (both of REDSO, the latter will be in charge of writing Initial Environmental

Examination, IEE, for USAID project), to discuss the preparation of an IEE for the ICIPE proposal. I agreed to provide Andersen a list of potential environmental hazards associated with the work proposed by ICIPE, even though I explained that I thought the potential hazards were few and the potential benefits (reduced pesticide use, more stable agricultural system) greatly outweighed the possible adverse side effects. I suggested that Dr. Edward H. Smith be consulted also for his opinions concerning the IEE.

- 09:50: M. Gilbert's office. He offered guidelines for the written report to REDSO concerning the ICIPE proposal. I agreed to try to have the hand-written manuscript on the typist's desk by 11:00, 12 Sep.
- 11:30: Departed REDSO office; to my hotel room, where I worked on the report until 14:45.
- 15:00: Mr. Wilbur Scarborough's office (he is head of the Agricultural Division, USAID, Nairobi); present: Scarborough, T. Bebout, C. Hash (Project Director for Agricultural Extension, USAID, Nairobi). Scarborough outlined his thoughts on the ICIPE proposal--suggested that I meet with a Kenya Ministry of Agriculture representative before finalizing my report. He called the Ministry's office and arranged for meeting on 13 September.
- 16:15: M. Gilbert's office; I asked several questions concerning my report that I was writing--also, I briefed him on my session with W. Scarborough.
- 17:30: I returned to my hotel room and resumed work on my report.

12 September Nairobi

10:50: I completed the hand-written manuscript of the report.

11:00: I gave the manuscript to REDSO typist.

11:00-13:30: I worked on the material I had promised for C. Andersen to use in preparing the Initial Environmental Evaluation for the ICIPE project. I gave the hand-written material I had prepared to Tom Bebout who agreed to get it typed (I did not see the typed product).

16:00: Cal Martin (REDSO) and I called Dr. Fred Whittimore (USAID, Washington, D.C.) regarding my mission in Nairobi and subsequent locations in Africa.

16:30-17:30: Visited Curtis Andersen, Tom Bebout, and Cal Martin concerning various aspects of the ICIPE project proposal.

17:30: Typist handed me a rough typed-draft of my report to Ray Love concerning the ICIPE proposal. I distributed copies of the unproofed draft to T. Bebout, M. Gilbert, and W. Scarborough.

18:00: I returned to my hotel room and worked on the editing and proofing of my report.

13 September Nairobi

08:00-08:30: Dr. Edward H. Smith and I met in my hotel room to discuss
08:30 meeting in W. Scarborough's office.

08:30: W. Scarborough's office: present - Scarborough, Bottrell, E. H. Smith, T. Bebout, C. Hash, C. Martin, and M. Gilbert, to review significant points to be discussed with Mr. Kaimini at 09:25.

- 09:00: I gave the edited first-draft of my report to REDSO typist for retyping.
- 09:25: In office of Mr. George M. Kaimini, Director of Research, Kenya Ministry of Agriculture. Present - Mr. Kaimini, W. Scarborough, T. Bebout, C. Martin, E. H. Smith, and D. G. Bottrell. Purpose: to discuss the relation of the Kenya Ministry of Agriculture and ICIPE. Mr. Kaimini favorably impressed all of us. He assured us that he would see that the MOA experimental stations (1 regional station and 1 national station located near Mbita Point) and MOA extension personnel cooperated with the ICIPE personnel to conduct the proposed work at Mbita Point. He suggested several mechanisms: one would be through seminars on IPC held jointly by MOA and ICIPE personnel; another would be to include one of the ICIPE staff members at Mbita Point in the MOA regional committee, a committee that examines and directs MOA regional activities. He had not discussed these possibilities with ICIPE's Director Thomas R. Odhiambo, nor had he discussed with him any aspects of the ICIPE proposal, but he said he planned such discussions.
- 10:00: From Mr. Kaimini's office to Hotel Intercontinental for check out.
- 12:00: Ray Love's office for a final discussion of the ICIPE proposal. I gave him a copy of the final report (dated 12 September 1979) entitled Analysis of a Project Proposal by the International Centre of Insect Physiology and Ecology

Entitled "Interim Support for Research Project Proposal Pests Critical for Tropical Rural Development", by Dale G. Bottrell, along with a cover letter dated September 13, 1979. (Refer Attachment 2.) I asked him if I could distribute copies to Dr. Ray F. Smith (UC/AID, Berkeley) and Dr. Fred Whittemore (USAID, Washington, D.C.), and he granted permission. Tom Bebout joined us at 12:30.

I reviewed the outcome of my mission in Kenya to determine the adequacy of the ICIPE proposal, highlighting what I thought were the most significant points of the written report. He indicated that he agreed with my analysis and said he would recommend to Mr. Dennis Conroy (African Bureau, USAID, Washington, D.C.) that only certain well-defined aspects of the project proposal should be funded; he indicated that REDSO planned to follow progress of the ICIPE project closely.

13:00: Departed REDSO office for Nairobi airport in ICIPE vehicle; Dr. Edward H. Smith accompanied me to the airport so we could discuss last-minute aspects of the ICIPE project proposal.

14:45: Departed Nairobi.

19:25: Arrived Abidjan, Ivory Coast.

14 September Abidjan

09:15: REDSO office, Abidjan. Met with Roy Wagner, Program Manager, ENTENTE Fund (REDSO), and his deputy Ronald Rogers; G. Evans, Director of REDSO; J. A. Hradsky (REDSO); W. D'Epagnier,

Project Manager, ENTENTE Fund; and Jack Shea (REDSO). They briefed me on what they envisioned for my return mission to Ivory Coast on 08-15 October.

15:00: Completed my discussion at REDSO and went to my hotel room to review written materials from the REDSO-Abidjan office concerning my return mission 08-15 October.

15 September Abidjan

17:45: Departed hotel in Abidjan for airport.

21:30: Departed Abidjan

22:50: Arrived Ouagadougou, Upper Volta.

16 September Ouagadougou

11:30: To airport in attempt to arrange flight to Bobo Dioulasso--
no flights available before 22 Sep.

15:05: Departed Ouagadougou (on train).

22:30: Arrived Bobo Dioulasso.

17 September-22 September Bobo Dioulasso

From its commencement at 08:30, 17 Sep., until its conclusion at 14:00, 22 Sep., I participated in all aspects of the "WARDA Seminar on Integrated Management of Rice Diseases and Insect Pests". On 17 September, I presented the Seminar's opening invitational paper entitled "Concepts of Integrated Management of Crop Pests with Special Reference to Rice". The Seminar included a series of technical paper sessions, panel discussions, and field trips related to various aspects of rice production and rice pest management. A copy of the Seminar Program is attached (Attachment 3); a list of participants (showing their agencies and addresses) is also

attached (Attachment 4); finally, a copy of my paper presented at the seminar is attached (Attachment 5).

23 September Bobo Dioulasso

Reviewed the project proposal related to my mission in Ouagadougou, beginning 24 Sep.

24 September

09:00: Departed Bobo Dioulasso.

10:25: Arrived Ouagadougou. Met at airport by Dr. Claude Charreau of Dakar, Senegal, Resident Representative in Africa for the International Crops Research Institute for the Semi-Arid Tropics (ICRISAT), and Dr. Kanayo Nwanze, an entomologist with ICRISAT in Ouagadougou. Dr. Charreau briefly discussed the "Proposal for Soil and Water Management Study to Improve and Stabilize Agriculture Production", a project proposal for the Upper Volta that now includes plans for using certain insecticides that USAID in Washington, D.C. is uncomfortable about.

11:25: USAID office, Ouagadougou. Mr. Howard Thomas, Director, Human Resources Division (the person I was to contact) was not available; I left a message for him to call me at my hotel.

17:30: Howard Thomas called: he suggested that I spend 25 Sep. at ICRISAT and that I meet him 26 Sep. at 11:00.

18:00-21:00: Visited with Dr. Kanayo Nwanze about my mission in Ouagadougou.

25 September

08:00-10:30: Visited with Dr. Enyi (Research Coördinator for the West African Rice Development Association, WARDA), held over in Ouagadougou from WARDA, also Dr. H. Zan (International Rice Research Institute, African Representative, Ibadan, Nigeria), concerning follow-up to WARDA Seminar.

11:00-18:00: Visited ICRISAT personnel of ICRISAT experimental facility 15 kilometers from Ouagadougou: Dr. Kanayo F. Nwanze (entomologist), Dr. W. A. Stoop (agronomist), and Dr. C. M. Pattanayak (sorghum breeder). I toured the ICRISAT facility and sorghum/millet/maize field trials and discussed the proposal "Proposal for Soil and Water Management Study to Improve and Stabilize Agriculture Production" (henceforth referred to as the AVV/ROAP/ICRISAT proposal). Dr. Nwanze, (Ph.D. in Entomology from Kansas State University) had reviewed the proposal's section that proposed the use of several insecticides (endrin, DDT, endosulfan). He agreed with my analysis: the rationale for the use of the materials was not clear - the insect pests to be used against were not listed, why the materials were to be used (i.e., economic implications) was not discussed, and there was no mention of economic thresholds. The agronomist Dr. Stoop said he thought it was ridiculous that USAID send a consultant to examine the proposal--was afraid this would only slow initiation of the project. I explained that my job was to give guidelines on how to expedite USAID approval of

the project and I thought I could do just this but I would need technical information on the pests to be controlled, data on alternative pesticides that might be considered, etc. Dr. Nwanze was able to provide a limited amount of useful written information.

26 September Ouagadougou

8:00-11:00: Reviewed AVV/ROAP/ICRISAT proposal.

11:00: I met Mr. Howard Thomas, Director Human Resources Division, USAID Ouagadougou, in his office. I explained that I hadn't been able to acquire much useful information concerning the pests to be controlled in the proposed AVV/ROAP/ICRISAT project, etc. I explained that I must have this information before I could help him. He expressed dissatisfaction with USAID Washington's stand on the project proposal but said he recognized the need for following regulations and would cooperate any way he could.

12:30: Returned to my hotel room; drafted an outline of needs in order to complete mission.

17:00: Dr. W. A. Stoop (agronomist of ICRISAT) met me at hotel. I showed him the Regulation 16 and Dr. George Schaefer's paper on USAID project policies on pesticide use/procurement and explained why the Initial Environmental Evaluation in the AVV/ROAP/ICRISAT project proposal (which he helped prepare) was unacceptable. We discussed ways to acquire the information I needed.

18:00: I met with Mr. Guido Boccara, a WARDA economist/communication specialist stationed in Monrovia, Liberia, who had attended

the WARDA IPC rice seminar in Bobo Dioulasso. He suggested some persons and agencies I might want to contact for information concerning the AVV/ROAP/ICRISAT project proposal.

27 September Ouagadougou

06:45: Departed Ouagadougou with ICRISAT personnel, Dr. W. A. Stoop (Ouagadougou), Dr. C. M. Pattanayak (Ouagadougou), and Dr. R. J. Williams (Rob Williams, plant pathologist, ICRISAT-Hyderabad, India), and Mr. Luis Furste, agronomist with AVV (Ouagadougou). Toured field experimental projects (sorghum, cotton, maize, sesame, cowpeas, peanuts) in the "Kaibo-Sud" area, about 100 kilometers south of Ouagadougou. This is one of the AVV/ROAP/ICRISAT project areas.

13:30: Returned to Ouagadougou.

16:00: To USAID office. Visited briefly with Howard Thomas and briefed him on progress of mission.

 Briefly visited Mr. Arlen MacSwain, Director of the USA SAFGRAD (Semi-Arid Food Grain Assistance and Development Project). He volunteered to assist my mission any way he could.

16:30: To office of Mr. Koal Saidu, an agronomist, of Institut de Recherche Sur Culture Tropicales (IRCT), a French operation that has the primary responsibilities for cotton production in Upper Volta. Mr. Saidu is in charge of testing insecticides on cotton. His organization recommends spraying cotton six times per season, beginning 45 days after planting, with a combination of endosulfan-DDT-methyl parathion. He said

field tests showed that, on the average, this treatment program was the most profitable. But he said few farmers treated their cotton six times. Nearly 100 percent treated once or more per season, however. The most common cotton insect pests are Heliothis, Spodoptera, Diaprosopia, and Pectinophora gossypiella. He said shortage of trained extension workers to advise farmers precluded the possibility of integrated pest control. There has been no effort to develop IPC in cotton in Upper Volta. He said he thought lots of people were injured yearly in Upper Volta by insecticides used in cotton.

21:00-22:30: Visited with Dr. Rob Williams, ICRISAT phytopathologist from Hyderabad.

28 September Ouagadougou

08:00: Departed for ICRISAT, arriving 08:20.

08:20: Met with Dr. J. Ph. van Staveren (ICRISAT agronomist) who will serve as a primary manager of the AVV/ROAP/ICRISAT project. He answered many of my questions about the proposed work and provided additional useful information. He agreed with the need for AVV/ROAP/ICRISAT project participants to collaborate with the FAO/C.I.L.S.S. research project on integrated pest control (focusing on the development of IPC in sorghum, millet and other crops in the Sahel region). He said he welcomed the input of IPC specialists in his project to give guidelines on IPC research needs. He believes that the results from the AVV/ROAP/ICRISAT project are applicable in areas of West Africa with climatic/soil characteristics similar to those of the AVV area;

thus IPC being developed under the project may apply to these areas. I told him I might suggest to the USAID Mission, Ouagadougou that the agency recruit an IPC specialist to work on the project, jointly with Dr. Nwanze and Dr. Y. Rathore (an entomologist with the Semi-Arid Food Grain Assistance and Development, SAFGRAD, project in Ouagadougou).

09:10-10:20: Visited Dr. Y. Rathore who is working on host plant resistance (to insects) in cowpeas. He provided much useful information on the insect problems of cowpeas, also cotton (based on his experience in India). He agreed to collaborate on the AVV/ROAP/ICRISAT project, offering guidelines on the integrated control of insect pests of the crops to be studied, but he said existing commitments to other projects would preclude any major participation on the project.

10:20-11:30: Visited Dr. Vas Aggarwal, a cowpea breeder of the International Institute of Tropical Agriculture (IITA), stationed at Ouagadougou. He provided considerable information on the insect pest problem of cowpea.

11:30-12:30: Drafted a cable for Dr. Fred Whittmore (to be sent from USAID, Ouagadougou), summarizing my analysis (and requesting some information) of the AVV/ROAP/ICRISAT project.

12:30-13:00: I reviewed the cable draft with Drs. W. Stoop and van Staveren; they agreed with my analysis.

13:30 16:00: Worked on summary for Mr. Howard Thomas concerning my mission in Ouagadougou.

16:30: Mr. H. Thomas' office. I suggested that USAID might consider recruiting a technical assistant to work under the supervision

of Kanayo Nwanze (ICRISAT) or Dr. Y. Rathore (SAFGRAD) to check the AVV/ROAP/ICRISAT project fields, to assist in determining the "real" need for pest control, etc. He didn't disagree with the need but indicated that USAID probably couldn't get approval for any more funding; he suggested I bring this need up with Dr. Claude Charreau (ICRISAT Resident Representative for West Africa), Dakar, Senegal, in Niamey, Niger on 01 Oct.

H. Thomas said it was the responsibility of Ms. V. Fort (Environmental Advisor, REDSO/USAID, Abidjan, Ivory Coast) to prepare the Initial Environmental Examination (IEE), that is, if USAID-Washington, D.C. required a new one for project approval. I told him that I would meet with Ms. Fort in Abidjan 08-15 Oct.

17:30: Returned to hotel.

18:30-22:45: Dinner and discussion with Drs. W. Stoop, C. Pattanayak, and R. Williams--all employees of ICRISAT.

29 September Ouagadougou

Worked on travel report and developed recommendations for Howard Thomas' consideration.

30 September Ouagadougou

Continued work of 29 Sep. Also, reviewed material provided by Dr. F. W. Whittemore concerning mission in Niger, 01-08 Oct. Visited (by telephone) with Dr. J. Ph. van Staveren (ICRISAT) in evening and reviewed (once again) the draft of

the cable I planned to send Dr. F. W. Whittemore before departing Ouagadougou 01 Oct. He agreed with the language in the cable draft.

01 October Ouagadougou

07:30: At USAID office. Gave H. Thomas' secretary a draft of the cable for F. W. Whittemore--asked her to have H. Thomas review it and edit before being typed into final.

09:30: I proofed cable for F. W. Whittemore and signed. I explained to Howard Thomas that I believed it was the responsibility of the ROAP/AVV/ICRISAT project managers to follow through with points highlighted in my cable (dated 01 Oct. 1979) to F. W. Whittemore (i.e., the application of pesticides in the project would be only for research and limited field evaluation purposes and by or under the supervision of project personnel; only pesticides registered without restriction by the U.S. Environmental Protection Agency would be identified and used at acceptable rates and frequencies of application; ICRISAT and SAFGRAD entomologists, versed in integrated pest control, would collaborate and offer guidelines on use of pesticides; and efforts would be taken to link the crop protection activities of the project with those of the FAO/C.I.L.S.S. Sahel project in integrated pest control). I told Thomas that I would try to see Dr. Claude Charreau (ICRISAT Representative for West Africa) in Niamey, Niger this week and I would stress to him the need for this follow through. Charreau was a copy receiver of the cable.

I deposited with H. Thomas a copy of an Environmental Assessment of pesticide use on an USAID project in Panama (prepared by George A. Schaefers, Cornell); I gave him a second copy and asked him to distribute it to Ms. V. Fort, the Environmental Advisor with REDSO/WA in Abidjan who Thomas said would be in charge of preparing any Initial Environmental Examination or Environmental Assessment entailing pesticide use in the ROAP/AVV/ICRISAT project.

10:00: Departed USAID for Ouagadougou airport.

10:30-11:10: Visited (at airport) with Dr. W. A. Stoop (ICRISAT) about ROAP/AVV/ICRISAT project.

11:55: Departed Ouagadougou.

12:40: Arrived Niamey, Niger. Met at airport by Mr. Harry Dickherber, USAID Liaison Officer to the Niger Cereals Project.

14:00: To USAID office, Niamey, with Dickherber. He briefed me on the pesticide/crop protection situation in Niger and outlined a tentative program for me in Niger 01-08 Oct. He provided two documents that described USAID projects in agriculture in Niger. I read the documents and began working on a list of questions for Dickherber and also a list of persons and agencies I'd like to visit in Niger.

17:00: Dr. Claude Charreau, ICRISAT Resident Representative for West Africa (Dakar, Senegal) met me at USAID. I reviewed my mission in Upper Volta concerning the ROAP/AVV/ICRISAT Project. I showed him a copy of the cable concerning the project that I sent to F. W. Whittemore (from Ouagadougou)

01 Oct.; Charreau was copy receiver). He said he agreed with my analysis. I expressed that I thought the project afforded good opportunities for work on integrated pest control. I said that I knew no agronomist worth his/her "salt" who would recommend the use of a fertilizer on a crop without first determining its need. I said I thought it was a reasonable request for an agronomist to view pesticide use in the same light, i.e., the pesticide shouldn't be used without first determining its need. Also, I stated that I hoped arrangements were made to recruit the close collaboration of crop protection specialists, versed in the principles of integrated pest control, to work with agronomists on the project. I mentioned that I was impressed with Dr. Kanayo Nwanze (ICRISAT sorghum entomologist in Ouagadougou, native of Nigeria, Ph.D. under Dr. Korber at Kansas State University in host plant resistance) who just joined ICRISAT and hoped arrangements could be effected for his collaboration in the project.

19:15-22:00: Visited with Dr. Kanayo Nwanze who was in Niamey waiting for a flight to Ouagadougou. He indicated that he would like to work on certain aspects of the ROAP/AVV/ICRISAT project.

02 October Niamey, Niger

08:10: USAID office. Harry Dickherber provided breakdown of activities planned for Niger Cereals Project that probably would entail the use of pesticides. However, he explained that the Project currently was being revised and expanded and many details could not be provided at this time. It will

be several months yet before work on the Project Identification Document (PID) even begins. Consequently, he said it would be premature to begin work now on an Initial Environmental Examination (IEE) or an Environmental Assessment (EA) if the latter was required. I explained that I understood it was my job in Niger to begin work on the IEE and EA, if required. He said that he probably should have notified USAID-Washington of the status of the PID before I arrived. In any case, he suggested that I proceed to make an analysis of the crop pest management/pesticide situation in Niger, especially as related to millet, grain sorghum, cowpea, and peanut, the country's major food crops and crops to be included in the revised-expanded Niger Cereals Project (henceforth called NCP). He suggested that I also (1) examine the present pesticide-use situation, agencies, personnel, attitudes, etc., in the Niger Government and (2) develop general guidelines to be followed when the IEE (and EA, if required) was being developed along with the PID.

The Niger Cereals Project was initiated about five years ago in response to the food shortages occurring during the Sahelian drought (Niger is one of the Sahel countries). The Niger Cereals Project aims to widen the availability of good, high yielding varieties of food crops. The primary crops in Niger and current estimated millions of hectares are as follows: millet (2.9), grain sorghum (0.6), cowpea

(0.4), peanut (0.3), rice (10,000 hectares) and wheat (1,000 hectares); small amounts of cotton and maize also are grown. The NCP has demonstrated that the use of clean, high quality seed by itself will give a 5-7% increase in yield of the high yielding varieties (HYVs). Without fertilizer, however, the HYVs do not yield significantly greater than other varieties unless they are fertilized.

The Institut National de Recherchers Agronomies Du Niger (INRAN) is the national agricultural research agency of Niger. The agency has a number of French expatriate collaborators; the French influence definitely is integrated into the agency. INRAN has 8 or 9 USA-trained Nigerian agriculturalists. It presently is working to increase its indigenous capacity for agricultural research.

The Service of Agriculture (SOA) is the national agency with responsibilities for implementing agricultural programs. A Canadian advisory group, Pluritec Consultants, advises SOA on crop protection activities and cooperates in carrying out crop protection programs.

The Niger Cereals Project, via INRAN and SOA, maintains Seed Multiplication Centers (SMCs) which carry out the primary project activities (variety trial evaluation, fertilizer testing, seed increase, distribution of seed and fertilizer, etc.). The SMCs contract (with Niger farmers) some work involving seed increase. The SOA, until about one year ago,

distributed small packages of the seed protectant THIORAL (fungicide thiram, insecticide heptachlor, combination) which the farmers used themselves to treat seeds of cowpeas and other crops. Now, UNCC (name for which the acronym stands, not determined), an agency that is supported by the Government of Niger but not administered by the Government, carries out this activity. Probably 40-60 percent of all sorghum and millet seed planted in Niger is pre-treated with THIORAL. Eventually, UNCC plans to become self-sufficient with sub-outlet stores and services at the village level that meet all consumer needs for goods and services. Presently, the government subsidizes UNCC up to 50-60 percent.

The crop protection service of SOA administers most of the other pest control practices that entail application of pesticides to farmer fields. During pest outbreaks, the SOA may dispatch spray planes to treat crops in a given area; the insecticide fenitrothion most commonly is used, but the SOA maintains a large inventory of other pesticides that also are used. Dr. George Schaefer, as a Cornell University consultant to the UC/AID Pest Management and Related Environmental Protection Project, prepared a report in July 1978 that briefly summarizes the current crop protection activities of the SOA and other Government agencies.

10:20: Harry Dickherber and I met with Mr. Salifou E. Mahamane, Coordinator of the Niger Cereals Project. Mr. Mahamane received a B.S. degree in seed technology from Mississippi

State University. He commented briefly on the NCP.

10:55: Dickherber and I met Dr. Cyril Brown, an agronomist/soil scientist, with the Consortium for International Development.

11:30-13:00: I met with John Mullenax (technical advisor on personal services contract with AID) and Mark Wentling (AID Project Manager). Neither is involved in crop protection per se, but both occasionally are called upon to advise on various aspects of pest control.

15:20: Dr. Kanayo Nwanze, entomologist with ICRISAT in Ouagadougou who I visited there, dropped by USAID office. He was enroute to Ouagadougou and planned to spend the night in Niamey. We agreed to meet in the evening to discuss needed follow-up to the ROAP/AVV/ICRISAT project I had reviewed in Ouagadougou.

16:25: Harry Dickherber and I met with Mr. Neino Souley, Assistant Director of Service of Agriculture. He is in charge of administering crop protection activities for the SOA. He said that the Canadians, previously with major responsibilities for supplying and applying pesticides, reduced their activities in Niger last year, forcing a more active role by the Niger Government. Mr. Souley had been in his present position only one month and, therefore, could not provide many specifics on pesticide use and crop protection activities in Niger. He referred us to those of his group who could provide more specifics.

16:55: Harry Dickherber and I met with René Beique, an entomologist and Canadian with Pluritec Consultants. The Canadian firm

Pluritec Consultants is under contract to advise on and carry out crop protection activities in Niger. (The consulting firm also has entomologists in Upper Volta, performing a similar role.) Beique referred to an article that appeared in the 01 Oct. 1979 Niamey newspaper; he said the article (Attachment 6) presented a good summary of the current pesticide use on crops in Niger. Beique said that Niger had only 5-10 qualified crop protection experts. As a general rule, the Government applied pesticides based on political demand rather than actual need; it is a common practice for the government to dispatch spray planes to treat cropping areas where the pests present no threat. Pluritec Consultants is encouraging the Government of Niger to use "softer" pesticides (large quantities of BHC and lindane now used) and also pesticides with higher LD 50 values (synthetic pyrethroids are being encouraged in place of parathion, for example). Also, Beique et al. of this firm have emphasized the importance of area-wide crop pest surveillance and forecasting; limited work on surveillance and forecasting is underway now. The Government of Niger is receptive to the new directions being taken by Pluritec Consultants, but the Canadian firm will pull out of Niger in 1981; uncertainty of funding beyond that date thus is a major obstacle to future planning to advance the work being initiated by Beique and associates.

The head of Pluritec Consultants (Jean-Marcel Laferriere) joined the session in Beique's office. He said that the

Canadians had brought a lot of pesticide analytical equipment to Niger with the intent of constructing a pesticide analysis laboratory. But none of the equipment is being used.

19:15-22:00: Visited with Dr. Kanayo Nwanze, ICRISAT entomologist from Ouagadougou. I briefed him on my session the evening before with Dr. Claude Charreau. Nwanze would like to collaborate on the ROAP/AVV/ICRISAT project in Upper Volta but does not care to get into the pesticide-testing -- in fact, his job description would prevent that activity. He said he could advise on pesticides to use in the project and on other aspects of crop protection.

03 October Niamey

08:00: I met Harry Dickherber at the U.S. Embassy. From there, we drove to the USAID offices.

08:30-09:50: I visited John Mullenax; at his request, I briefed him on the outcome of my and Dickherber's session with Pluritec Consultants.

09:50-11:15: Visited Harry Dickherber.

11:30-12:30: Harry Dickherber and I met with James K. Bishop, the American Ambassador to Niger. He expressed interest in the long-term plans of USAID to contribute to advancing sound pest control programs. Dickherber gave an overview of the current situation in Niger, i.e., pesticide use, activities in SOA and by Pluritec Consultants, plans for the FAO-C.I.L.S.S. project, status of the USAID-sponsored seed multiplication centers and other activities of the Niger Cereals Project.

I encouraged Bishop and Dickherber to support the pest crop surveillance scheme being advanced by Pluritec Consultants and also training programs to increase the indigenous capacity in integrated pest control and pesticide management in Niger.

13:30-18:10: At USAID office reviewing reports and project proposals pertaining to USAID activities in crop production and protection in Niger.

04 October Niamey

10:30: Harry Dickherber and I departed Niamey for the Lossa Seed Multiplication Center, about 50 kilometers from Niamey. The facility, just completed, consists of offices for personnel, workshops, seed-drying and -storage bins, etc. One of the SMC technicians provided a tour of the structures and also the field experimental and seed-increase plots.

13:30: Returned to Niamey for lunch.

15:20: To USAID office then to another SMC, at Hamdallayae, about 40-50 kilometers from Niamey. Willie Russell (an AID personal services contractor) of the USAID Mission in Niamey provided a tour of the seed multiplication center, introduced me to personnel working there, and explained the current and planned activities.

18:15: Returned to Niamey.

05 October Niamey

10:30: Harry Dickherber and I met with Mr. Sid Bliss (USAID Project Officer), officed at US Embassy. He had recently attended an

organizational meeting of the FAO-C.I.L.S.S. integrated pest management project, held in Ouagadougou, Upper Volta. He said it is uncertain when the project will be initiated in Niger--perhaps as early as 1980. The Government of Niger apparently is not very enthusiastic about the project, especially because of the delay in getting it kicked off. Also, the Government wonders if the project is placing too much emphasis on "blue sky" research; the Government would like to see more emphasis on the practical (operational) aspects of IPM.

11:10: Dickherber and I met with USAID Mission Director Jay Johnson and his Deputy Harvey Gutman. I briefed Johnson and Gutman on the progress of my activities in Niger; I expressed gratitude with the assistance that Dickherber and others of AID had given me; I also provided a breakdown of future activities that USAID might consider to advance IPC and proper pesticide use in Niger--i.e., crop pest surveillance, training, participation in the FAO-C.I.L.S.S. project.

12:30-15:00: At hotel.

15:00-17:15: At USAID office, working on my report to Dickherber.

06 October Niamey

11:00: H. Dickherber and I met with Merle Baker, a USAID Project Officer who will have responsibility for writing the Project Identification Documents (PIDs), soon to be prepared as required of the expanded and revised Niger Cereals Project. I advised Baker and Dickherber on aspects concerning pesticide use that they should consider in preparing the Initial

Environmental Examinations of the PIDs. Baker said that Ms. V. Fort, Environmental Advisor of REDSO/WA-Abidjan, would prepare the IEEs; I explained that I planned to see Ms. Fort in Abidjan next week and discuss IEE requirements for the Niger Cereals Project. I promised to deposit with Dickherber before departing Niger on 08 Oct. a brief written report with guidelines for preparing the IEEs. I suggested that they send preliminary drafts of the IEEs to Dr. F. W. Whittemore in Washington, D.C. and ask him to review them and return as soon as possible.

12:30: Returned to hotel. Worked rest of day on my report to Dickherber.

07 October Niamey

At hotel all day working on my report to Dickherber. He visited me for about an hour. I agreed to have a hand-written report for him before departing on 08 Oct. He said he would have it typed and would send a copy to me.

08 October

04:00: Harry Dickherber picked me up at hotel in Niamey to drive me to airport to catch flight to Abidjan. The flight, scheduled for 05:30, was delayed 12 hours; therefore, I returned to hotel. I gave Dickherber a penciled report (Attachment 7) which he agreed to type and have sent to me and also a penciled draft of a cable to be sent to Dr. F. W. Whittemore (AID-Washington, D.C.) that described my activities in Niger.

15:30: To Niamey airport again.

17:20: Departed Niamey.

19:00: Arrived Abidjan, Ivory Coast.

09 October Abidjan

07:00: Roy Wagner (Director of ENTENTE Fund, REDSO/WA), his wife and I departed (his personal automobile) Abidjan for Bouaké. Enroute to Bouaké, Wagner and I discussed the project I had come to Ivory Coast to review.

The project, North-East Savannah Rural Development Project, is to be located in the North-East Savannah of Ivory Coast, not far from Upper Volta. The Government of Ivory Coast is working to expand and to stabilize agriculture in this area which until recently had been excluded from the mainstream of development. Continuous use of arable land, diversification of crops, support services (extension, credit, transport, storage, marketing), and adaptive research programs aimed at developing new farming systems are being emphasized. The proposed project, of which USAID is to serve as a major donor, is to support research, training, development, and service activities as required to assist the government in achieving its objective. The 4-1/2 year project is being funded by the World Bank and the Conseil de l'Entente for a total of \$17(U.S.) million. The Conseil de l'Entente contributions are by the Fonds de l'Aide et de Cooperation (FAC) of France and USAID; USAID's contribution [\$3.7(U.S.) million] is only for the first three years (1979-81) of the project.

Though the project will emphasize several crops, only rice growing under irrigated conditions is to be treated with pesticides; an estimated 10-12 percent of the irrigated rice in the project area of the North-East Savannah annually will receive treatments of Furadan 3G (3 percent carbofuran granules). The Environmental Protection Agency recently proposed that all formulations of carbofuran containing 2 percent or greater active ingredient be classified as "restricted" for use in rice on the basis of its hazards to aquatic organisms and residual effects on birds. My mission was to prepare an environmental assessment of carbofuran use in the project and to advise on possible alternatives and the use of integrated pest control techniques. (REDSO/WA had recruited a private US consulting firm to prepare the IEE which described the use of the insecticide.)

12:00: Arrived Bouaké, checked in hotel, and ate lunch.

Bouaké, a city about 400-500 kilometers from Abidjan, is the primary center of activities entailing crop production/protection research and extension in Ivory Coast, especially activities administered by expatriates from France. The French exert considerable influence. Several entomologists (one Ivorian and three French) working on rice pests in Bouaké attended the WARDA Seminar on rice in Bobo Dioulasso, Upper Volta that I also attended. Our purpose for being in Bouaké was to visit them and other specialists who could advise me on the rice pest situation in the N-E Savannah area.

15:00: Roy Wagner and I met with Dr. Bakary Ouagojode (an Ivorian who recently obtained a Ph.D. degree in entomology at Utah State University) and Mr. Claude Monnet (a French entomologist), both of the Institute of Tropical Agricultural Research (IRAT). I had visited both of them in Bobo Dioulasso in September. IRAT, a national agency, is in charge of most of the crop production/protection research in rice and other cereal grains. It is located in the Ministry of Scientific Research. The French agency ORSTOM (Office de la Recherche Scientifique et Technique Outre-Mer), which is financed 100 percent by France, also conducts research on rice pests. CIDT (Ivory Coast Company for the Development of Textiles) essentially is the extension service of the Ivory Coast. CIDT advises farmers on the use of crop varieties, fertilizers, pest control practices, etc., as part of its extensional activities. CIDT generally does not recommend the use of pesticides. Proper selection of fertilizers and variety and proper water management are considered more important to effective pest management. CIDT recommends that pesticides are used only on those farms where good cultural practices are followed and where the yield potential is high.

18:30: Departed IRAT offices for hotel.

10 October Bouaké, Ivory Coast

08:15: Roy Wagner and I met with a Mr. Bosselli, in charge of cereal production for CIDT. Mr. Bosselli described the rice production situation in Ivory Coast. He said that the use of carbofuran was justified on irrigated rice with high yielding potential

if good rice farming practices were used, i.e., proper selection of fertilizer, varieties, water management, etc. The very best farmers can achieve 4-6 tons rice grain per hectare if carbofuran and fertilizer are used. On farms with such high yielding potential, CIDT recommends the preventive use of carbofuran. CIDT recommends two applications of carbofuran per year (each application, 420 grams A.I./hectare; first, one week after transplanting rice from the nursery; second, four weeks after transplanting). According to Mr. Bosselli, in most other West African countries three applications of carbofuran per season are recommended. The cost of the two applications per hectare is high, equivalent to about 215 kilograms of rice. But the potential returns also are high, about 800 kilograms, in other words, a 4-fold return, or greater, on the investment. Mr. Bosselli said that the "poor" farmers did not like to spend money on pesticides and generally could not afford the materials. The chemical companies exert very little influence on the rice farmers, but chemical company representatives frequently visit CIDT officials.

A complex of stem borers (three species) and birds are major pests of rice. Presently, carbofuran is the only insecticide that will control the borers and give significant yield increases. Mr. Bosselli said that the Government of Ivory Coast had not adequately emphasized the need for lowland rice variety development. The varieties being used in lowland,

irrigated production are largely IRRI varieties and may not be the best for the country. In the North-East Savannah where the project is to be located, there is little known about the pests that attack rice; most information on rice pests has come from the Bouaké area, and one or two other areas of the country, to a lesser extent.

10:30-12:00: Visited the entomologists Drs. P. Cochereau (Research Leader), A. Pollett, G. Tavakilian, and M. Tran of ORSTOM. Dr. Cochereau has worked considerably on biological control (he coauthored Chapter 15, Biological Control of Pests of Tropical Fruits and Nuts, in the 1976 book Theory and Practice of Biological Control by C. B. Huffaker and P. S. Messenger, Academic Press, New York) and spent some time with Dr. Paul DeBach in California. His group is pursuing work on various aspects of rice insect pest ecology, including studying the interaction of pests and natural enemies, quantifying mortality factors, determining the response (vegetative growth, tillering, yield, etc.) of rice plants to pest attack. They have observed that diazinon provides about the same percent of stem borers control as carbofuran but, for reasons unknown, carbofuran-treated rice yields more than diazinon-treated rice; they speculate that carbofuran may control certain sucking insects and/or nematodes unaffected by diazinon. Pollett has recently obtained some data (very preliminary) which indicates that carbofuran may negatively affect rice plant growth. The ORSTOM work on ecology and other basic aspects is very significant--perhaps the most

significant of its kind underway in rice in West Africa.

12:00-15:00: Lunch with IRAT and CIDT personnel.

15:00: Departed (Roy Wagner, his wife, I) Bouaké for Abengourou.

20:00: Arrived the city of Abengourou, Ivory Coast where we spent the night.

11 October

06:45: Departed Abengourou.

09:30: Arrived the city of Bondoukou in the North-East Savannah of Ivory Coast where the proposed project is to be located. Met with Mr. Bordes, a French agronomist with CIDT in charge of crop development work in the area. He explained the existing CIDT operation and plans and introduced us to his coworkers. Then he provided a field tour, showing us an irrigated rice field typical of those to be included in the proposed project. The project area now has about 300 hectares of lowland irrigated rice; the hectares eventually will be expanded to about 400. According to Mr. Bordes, only about 10-12 percent of the hectares can justify treatment with carbofuran.

13:30: Departed Bondoukou.

20:20: Arrived Abidjan.

12 October Abidjan

09:00: Attended REDSO/WA Staff meeting and, at the request of Director Gordon Evans, I presented an informal paper (1 hour) on the concept and use of integrated pest control. Following the paper, I visited with various REDSO/WA personnel until

13:00 about the progress and problems of implementing IPC programs.

14:30-19:00: I worked on the Environmental Assessment of pesticide use, required of the North-East Savannah Project.

13 October Abidjan

Worked all day on EA, noted above. At 15:00, I visited with Mr. William D'Epagnier, Project Manager of the ENTENTE Fund (REDSO/WA), who has had a major hand in putting together the North-East Savannah Project. He answered several questions I raised pertaining to project implementation.

14 October Abidjan

Worked all day on EA, noted above.

15 October Abidjan

08:30: Arrived REDSO/WA office.

09:00: I visited Ms. V. Fort, Environmental Advisor for REDSO/WA and Mr. Jack Heldermaann of REDSO/WA. I apprised Ms. Fort of my activities in Upper Volta, Niger, and Ivory Coast, explaining that Environmental Assessments would be required for pesticide use in the projects I reviewed in these countries. I agreed to send her certain material pertaining to integrated pest control.

10:45: Visited Director of REDSO/WA Gordon Evans for final briefing of my mission in Ivory Coast. I explained that I was very pleased with the attitude of Roy Wagner; Wagner had showed considerable interest in seeking inexpensive alternatives to carbofuran and also in advancing integrated pest control. Wagner had said that he planned to try to recruit the

cooperation of IRAT and ORSTOM entomologists at Bouaké in guiding pest management activities in the North-East Savannah Project. I told Evans that this cooperation was important and that throughout the Environmental Assessment on the use of pesticides in the project I had made recommendations to encourage the linkage of the IRAT and ORSTOM entomologists with the project. I also told him that these entomologists had expressed interest in the project, but that supplemental funding may be required to ensure their cooperation. Evans said he appreciated my comments and that he too was interested in integrated pest control.

Evans said that a Purdue University agronomist, Roy Bronsen, soon would be spending some time in Abidjan (presumably on a REDSO/WA-Purdue arrangement). He suggested that upon return to the USA I visit two persons at Washington, D.C.: Jim Kelley, in charge of the Sahel project; and Fermino Spencer, with responsibilities for USAID activities in the coastal area of West Africa. Evans indicated that they surely would appreciate learning of my activities in West Africa and hearing my comments on crop protection problems and needs.

11:30: REDSO/WA typists provided me with a draft of the Environmental Assessment of Pesticide Use for the North-East Savannah Rural Development Project that I had written over the weekend.

12:30-18:00: I proofed and edited the rough draft of the EA. I gave it to Roy Wagner who planned to have it typed in final and

then circulated to appropriate REDSO/WA and/or AID-Washington, D.C. personnel, for comments and approval.

18:05: Departed Abidjan for airport.

21:20: Departed Abidjan airport for Monrovia.

22:30: Arrived Monrovia, Liberia, Roberts Field Airport--met there by USAID drivers.

24:00: Arrived hotel in Monrovia.

16 October Monrovia, Liberia

08:00-11:30: Reviewed the cables and other material concerning my assignment in Liberia and visited (by telephone) with Mr. Van B. J. Henderson, the USAID Project Officer to serve as my primary contact in Liberia. Henderson and I agreed to meet in his office at 13:30 and work out my program.

13:30: At USAID. Mr. Van Henderson is to serve as Project Manager of the Project, Nimba Rural Technology Project, that I was to review in Liberia. He suggested that he and I visit Yekepa, the only major town in the project area in Nimba County, about 200 miles from Monrovia, very near the border of Guinea in northeast Liberia. Mr. Jack M. Cornelius, Agricultural Development Officer, USAID-Monrovia, had planned to accompany us to Yekepa but had just come down with malaria; Henderson suggested that I see Mr. Cornelius after our return to Monrovia on 19 Oct.

I reviewed with Mr. Henderson the objective of my mission in Liberia: as I understood it, my job was to secure essential data on pesticides and plans for pesticide use in

the Nimba Rural Technology Project as required to assist the USAID Mission in revising the Initial Environmental Examination and in preparing the required Environmental Assessment on pesticide use, if the latter was required. He said that the Partnership for Productivity (PFP), a private U.S. firm with personnel stationed in Liberia, would be the project's implementing agency; PFP personnel in Yekepa would have to provide the information I needed.

17 October Monrovia, Liberia

09:00: Departed Monrovia in USAID car (driver, Van Henderson, myself).

16:30: Arrived Yekepa, Liberia. Went to office of PFP and met Mr. George P. Butler, General Manager of PFP. An American, Mr. Butler has spent about 22 years in Africa. Formerly with the Ford Foundation, he has been in Liberia for seven years; until recently, he was employed by LAMCO (the Liberian-American Mining Company) in Yekepa. He now manages the PFP operation in Liberia.

Mr. Butler provided background information on the proposed project for Nimba County. The project's rationale is to create a diverse agricultural-based economy in the Yekepa area. Presently, the area's economy is based almost entirely on the LAMCO iron ore mining concession. The iron ore reserves are being depleted rapidly, however, and the LAMCO operation is not expected to continue beyond the year 2000 if it continues that long. Therefore, the Government of

Liberia and LAMCO are promoting increased and diversified agriculture in the area and expanded agricultural services and loan structures. Agriculture is perceived as the only viable economic alternative for the area. Row crops (rice, vegetables) and tree crops (cocoa and coffee) are being increased. The proposed project will focus on developing and demonstrating production techniques for increasing the crop yields; new crops (Irish potatoes, for example) also will be tested to determine their potential in the area. Primary activities will be carried out on a PFP-managed farmer training center; it is a demonstration/training farm where educational/demonstration programs are conducted for area farmers. The programs span a wide range, including instruction on the proper use of pesticides, pesticide-safety devices, and application equipment. Farmers successfully participating in the farmer training center programs are certified by the PFP. PFP also manages a farm-supply store in the area, apparently the only (at least the only significant) source for pesticides in the area. Only farmers that have been certified through the farmer training center can purchase pesticides from the stores. This is the only real mechanism for regulating pesticides in the area; the pesticide regulations and enforcement by the Government of Liberia (Ministry of Agriculture) are very ineffective.

19:00-22:00: Van Henderson and I dined and visited with George Butler about my mission in Yekepa.

18 October Yekepa, Liberia

08:00-12:00: At PFP office: present, George Butler, Buxton Cooper (PFP employee in charge of developing pesticide recommendations), the PFP accountant (I did not learn his name), Van Henderson, and I. We reviewed the current pesticide use situation in the proposed project area, proposed project use of pesticides, and needed training programs.

The Initial Environmental Examination that the USAID Mission-Liberia sent to Washington, D.C. (in August 1979) identified only the following pesticides for use in the proposed project: MCPA and diazinon on swamp rice, cuprous oxide on coffee and cocoa, and lindane on cocoa and coffee. However, the PFP personnel indicated at our meeting in Yekepa that they actually planned to use numerous pesticides (perhaps 25 or more) and to include crops and animals that had not been identified in the IEE sent to Washington, D.C. Use of some of the materials obviously would have been viewed unfavorably by AID-Washington, D.C. Several have been suspended or cancelled by USEPA. Some could be identified only by brand name, not chemical name, and some could be identified only by their foreign manufacturer. PFP personnel said that all of the pesticides proposed for use in the project were available locally, most were endorsed by the Ministry of Agriculture, and some were now being used by area farmers. Information on efficiency of the materials is lacking in

the area, and there is no active research on pesticide evaluation or the development of pest management systems. Buxton Cooper, a native of Liberia, will be primarily responsible for developing pest control recommendations in the project. He obtained a B.S. degree in animal science from Denmark. He impressed me as being very capable, but he has no training in pest management or pesticide use; he acknowledged his weakness in the field of pest management and pesticide use. His only sources for information on pesticides currently are pamphlets, etc., supplied by chemical companies.

12:00-13:30: Lunch with Van Henderson and PFP personnel.

14:00: George Butler, Buxton Cooper, and I met with Dr. Kell B. Jakobsen, a medical doctor and Public Health Officer. Dr. Jakobsen, a citizen of Sweden, is employed by LAMCO and practices out of the LAMCO Medical Department, a modern hospital facility (and the only) in Yekepa. His duties as Public Health Officer include advising on malaria control. He has experience in the field of clinical diagnosis of pesticide poisoning and treatment. He made his views on the use of pesticides in the area very clear. He does not believe that the area farmers, most of whom are illiterate, should be allowed to use pesticides. He feels that the risks are too great. I suggested to George Butler that the Doctor's input into the project would be desirable; his advice on human health aspects of pesticide use, pesticide safety, etc., would be invaluable. Butler

agreed and asked Dr. Jakobsen if he would be willing to collaborate. Dr. Jakobsen said he did not want to play an active role in the project (partially because of his belief that international projects should not sponsor the use of pesticides in underdeveloped rural areas inhabited largely by illiterate people). But he said he would be willing to respond to questions of project personnel concerning toxicity of pesticides, etc.

14:45-16:30: At PFP office, continuing the discussions on pesticide use in the project. Dr. Swanie (an Indian from Hyderabad), an FAO agronomist (FAO and UNDP are to collaborate on the Nimba Rural Technology Project), joined in the discussions.

16:40-18:00: We (Van Henderson, PFP personnel, and I) toured the Farmer Training Center, discussed above, and a rice farm. The Government of Liberia is working toward self-sufficient rice production by 1981. Perhaps 40-50 percent of all project efforts will focus on rice production. There presently are about 1000-1200 acres of lowland, irrigated rice in the area; two crops annually are produced in most of this acreage. To achieve self-sufficiency in the area, PFP personnel estimate that the lowland, irrigated rice must be increased to 2000 acres, all double cropped in high yielding varieties (IRRI varieties are commonly grown in the area). Presently, about 10 percent of the lowland, irrigated rice is treated with insecticides, primarily dieldrin for control of stem borers, caseworms, and leaf

miners. Herbicides (primarily MCPA) are used on about 30 percent of the rice. Properly managed, yields of 1800 and 2000 pounds of rice grain per acre are possible for the first and second crops, respectively, on the double-cropped land.

18:00-19:30: At George Butler's home, visiting Dr. Swanie (FAO), Buxton Cooper, Butler and Van Henderson.

19 October Yekepa

07:30-08:30: Van Henderson and I had breakfast with George Butler.

08:30-10:00: At PFP office for wrap-up session with PFP personnel.

10:00: Van Henderson, USAID driver, and I departed Yekepa for Monrovia.

16:45: Arrived USAID office, Monrovia.

20 October Monrovia

Worked all day on my report concerning pesticide use in the Nimba Rural Technology Project.

21 October Monrovia

09:00-11:45: I visited with Jack Cornelius, Agricultural Development Officer of the USAID Mission in Monrovia. I explained that the "laundry" list of pesticides proposed by PFP personnel for use in the project presented some problems--some of the materials had been suspended or cancelled by USEPA for use in the USA, some were on the USEPA's Rebuttable Presumption Against Registration (RPAR) list, and some were classified by USEPA for restricted use on the basis of hazards to users and/or the environment. I explained that considering the circumstances (i.e., the Liberian Government's inability to

effectively regulate pesticides, the low level of understanding of pesticide use and pest management among project personnel), I thought it would be unadvisable to seek approval (by AID-Washington, D.C.) for use of the 25+ pesticides in the project. I suggested that the PFP personnel in Yekepa meet with personnel of the Liberian Ministry of Agriculture, as soon as possible, and try to identify alternatives for those pesticides that created the greater problems. I told him that prior to departing Liberia I would prepare a set of typed guidelines for use by PFP personnel; if they followed my instructions closely and supplied the information requested in the guidelines, I would proceed to revise the IEE and to prepare an EA, if the latter is required. Also, I told him I would deposit a memorandum with him prior to departing that summarized my activities in Liberia and advised on steps he may want to take to ensure rapid action on the proposal. He said he welcomed my suggestions, agreed with my analysis of the pesticide use situation in the project, and would follow through with my recommendations.

I spent the rest of the day drafting my report.

22 October Monrovia

08:25-12:00: At USAID office. Typists worked on my report. I visited with Cornelius and Henderson about various aspects of the project.

12:00-13:15: Lunch with Van Henderson.

13:15-18:30: At USAID office. At 15:00 hour, Mr. Delvin H. Walker, Director of Plant Quarantine, Ministry of Agriculture (MOA) of Liberia, came by USAID office to present his views on pesticide use in the project and to describe the MOA's policies and programs on pesticide use and regulation.

Mr. Walker is one of only two persons within MOA with responsibilities in crop protection who has received training in pesticide use/pest management outside Liberia. He spent some time at Imperial College in England studying under Matthews; he had additional training at the University of Florida in the Department of Entomology and Nematology (in the early 1970s). Presently, there is a proposal within the MOA to create a crop protection agency that Walker feels would enhance greatly the country's capability for carrying out sound pest management and pesticide management programs. He said that the MOA currently has no good mechanism for regulating pesticides or enforcing pesticide regulations. He said, for example, some stores in Monrovia are selling pesticides from used beer bottles that are not labeled. The pest control recommendations now available via MOA were formulated more than a decade ago by a U.S. consultant who spent some time in Liberia. Mr. Walker said he would be glad to cooperate with PFP personnel in Yekepa on revising the list of pesticides currently proposed by the PFP personnel.

I proofed and edited my report to USAID-Liberia personnel and distributed to Jack Cornelius and Van Henderson (copy attached, Attachment 8). (NOTE: After returning to the USA, I prepared an Environmental Assessment of Pesticide Use in the Liberian Project, which is attached, Attachment 9). (A draft of the EA was reviewed by Dr. F. W. Whittemore, AID-Washington, D.C., and personnel of Partnership for Productivity, Washington, D.C. The EA describes the use of seven pesticides in the project; a series of recommendations are included.)

20:45: Departed (in USAID vehicle) Monrovia for Roberts Field Airport.

23 October

01:20: Departed Roberts Field Airport.

07:40: Arrived John F. Kennedy Airport, New York. To La Guardia Airport in taxi.

10:00: Departed La Guardia Airport.

11:00: Arrived National Airport, Washington, D.C.

11:30: Departed National Airport in personal vehicle.

12:30: Arrived my residence in Huntingtown, Maryland.

October 27, 1979

TO: F. W. Whittimore
 Environmental Coordinator
 Office of Agriculture
 Agency for International Development
 Department of State
 Washington, D.C. 20523

FROM: Dale G. Bottrell
 UC/AID Pest Management and Related
 Environmental Protection Project
 2233 Fulton Street, Suite 310
 Berkeley, California 94704

SUBJECT: Summary of my consultant assignment for AID in Kenya,
 Upper Volta, Niger, Ivory Coast, and Liberia

KENYA

Dates Visited: September 3-15

Principal Contacts: Ray Love, George Rublee, Tom Hebout, Cal Martin,
 Morgan Gilbert/REDSO-EA
 Wilbur Scarborough/Kenya AID Mission
 Thomas R. Odhiambo, Director, and Alex Tahori,
 Deputy Director/ICPE
 G. M. Kimini, Assistant Director/Kenya Ministry
 of Agriculture

Objectives:

- (1) To review a project proposal "Interim Support for Research Project on Crop Pests Critical for Tropical Rural Development" (REF. FI/CONTR/USAID/14/24) submitted by the International Centre of Insect Physiology and Ecology (ICPE), Nairobi.
- (2) To acquire information on the pesticide BACDIP, available through Nairobi vendor, that the Kampala AID Mission had requested

With reference to Objective (1), you are in receipt of my letter and report to A. Ray Love, Director of REDSO-EA, including my analysis and recommendations pertaining to the ICPE project proposal.

As you know, ICPE applied for support from AID to conduct research leading to improved management of primary insect pests of cereal crops (viz. maize, rice, sorghum) and legumes (primarily cowpea),

all basic food crops being grown by subsistence farmers in much of Africa. ICIPE's specific objectives and plan of work were stated rather vaguely in the Project Identification Document. However, the proposed project's principal research personnel at Nairobi (where the more basic work is to be centered) and at Mbita Point (an ICIPE field station on the shores of Lake Victoria where the field work is to be carried out) supplied details of planned project activities.

Essentially, the project proposes to develop systems of integrated pest control for the primary food crops being grown by subsistence farmers in the Mbita Point area. Pest resistant varieties of crops are a primary component envisioned for the integrated systems; therefore, screening for and evaluating promising insect pest-resistant germ plasm are to receive high priority. This work will entail a major effort to develop procedures for the mass rearing of insect pests for which resistant germ plasm is being sought. Determining the "optimal" intercropping combinations of the crops being grown by farmers in the area and studying population dynamics of insect pests in the intercropping systems also are to be emphasized.

Presently, the ICIPE facility at Mbita Point is limited to offices for the research personnel and very crude laboratory provisions. However, a sophisticated facility (including modern laboratories, offices, conference rooms, library, glass houses, and housing arrangements and recreational facilities for research personnel) is now being constructed. I believe the government of Netherlands is the major donor institution behind this operation.

The proposed project represents a new endeavor for ICIPE which is recognized primarily in the field of basic insect physiology and ecology and not in applied pest control, the underlying theme of the proposed work. However, according to ICIPE's Director Odhiambo, ICIPE's long-term plans call for increased emphasis in the applied field, including integrated pest control. He indicated that ICIPE's formal application for membership in the Consultative Group for International Agricultural Research (CGIAR) presently is being considered; the Director is optimistic that membership will be granted but not before 1981. Membership would insure a more stabilized source of funding for ICIPE and would, in principle, increase the Centre's capability for carrying out work in integrated pest control. The proposed project submitted to AID for funding obviously was predicated on the assumption that ICIPE's membership in CGIAR will be granted in 1981; Director Odhiambo in fact indicated this. Therefore, the Director considered the request from AID as interim support of work to be continued under the provisions of CGIAR.

After visiting the primary research personnel to carry out the proposed work, I became convinced that: (1) they understand the concepts of integrated pest control and (2) they are qualified to conduct research leading to the development of practical integrated pest control systems for African farmers. The Mbita Point group

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includes an agronomist and several entomologists, all Africans, trained in both theoretical and applied aspects of integrated pest control. I especially was impressed with the entomologist J. B. Okeyo-Owour (a 30-year old Kenyan with a M.S. degree from the University of Nairobi). He is one of the most promising young leaders in integrated pest control that I have met in the developing countries. The project Programme Leader (a Dr. Dabrowski of Poland) stationed in Nairobi has considerable experience in host plant resistance and other aspects of integrated pest control and seems capable of coordinating research that synchronizes theoretical and field-oriented efforts. An extremely important component of the project team is visiting Professor Dr. Edward H. Smith, Chairman of the Department of Entomology, Cornell University, who is to serve as an advisor; he also is to carry out various aspects of the proposed research. Dr. Smith will reside in Kenya for only 6 months, however, he is agreeable to continuing in an advisory role throughout the duration of the project. I believe the success of the proposed project is closely linked to Dr. Smith's participation; his guidance is especially critical if ICIPE broadens its emphasis in integrated control to include pests other than insects and to bring in other disciplines--economists, sociologists, and others.

In any case, one of my recommendations to Ray Love was that, if AID chose to fund the proposed project, provisions should be made to ensure the continuation of Dr. Smith as advisor to the project during the proposed 2-year period. Other recommendations, either appearing in the report to Mr. Love or offered to him verbally at our final session in Nairobi on September 15, were as follows:

(1) If AID chose to support the project, it should provide support earmarked for specific research activities rather than general support merely granted for purposes of institutional building. I identified several specific high priority research activities, appearing on pages 14-15 of my report to Mr. Love.

(2) Then, REDSO-BA personnel should request immediately that the project's principal research personnel (both of Mbita Point and Nairobi) prepare a detailed plan of work describing the project activities on a 2-year time table.

(3) In organizing the project, arrangements should be effected to ensure ICIPE's close collaboration with various international centers (e.g., International Rice Research Institute, International Institute of Tropical Agriculture, International Crops Research Institute for the Semi-Arid Tropics, International Centre for Development of Maize and Wheat, West African Rice Development Association) and other international organizations (e.g., AID, FAO, Centre of Overseas Pest Research, Commonwealth Institute of Biological Control) engaged in similar work on integrated pest control.

(4) Provisions for collaboration with the various international centers and organizations should include a quarterly report of project activities, prepared by the Programme Leader, for distribution to personnel of the international institutions and other agencies engaged in related work on integrated pest control.

(5) Further, provisions should be included to ensure ICIPE's

close collaboration with personnel of the Kenya Ministry of Agriculture, particularly those in the Mbita Point area in charge of developing educational programs for farmers.

(6) To ensure that pest control technologies emerging from the ICIPE project are effectively synchronized into the existing socio-economic framework of the African rural community, REDSO-EA should ensure the input of one or more socio-economic specialists, recruited at inception of the project; this individual or these individuals should perform an active role throughout the project.

(7) Until the feasibility of large-scale rearing of insect pests at Mbita Point has been demonstrated, AID should support only specific aspects of the proposed work on insect rearing; priorities should be given to the support of research on the life histories, survivorship, and behavior of insects on various food substrates.

(8) To ensure proper evaluation of the project results, REDSO-EA should appoint an outside review team, unattached to the ICIPE project, to evaluate the project at the end of 18 months. I suggested the review team should consist of the following individuals: one integrated pest control specialist, one agronomist familiar with cropping practices in Eastern Africa, one sociologist or economist with expertise in the socio-economic aspects of rural development, and a representative (or designee) of FAO's Plant Protection Service, Plant Production and Protection Division, Rome, Italy.

Follow-up: upon return to the USA earlier this week I was in receipt of a letter from Dr. Edward H. Smith in Nairobi, dated October 1. Perhaps you have more recent information. In any case, the AID contract with ICIPE apparently was signed in Nairobi on September 29. According to Dr. Smith, the essential features of my report to Ray Love were incorporated into the contract. Dr. Smith indicated that he had been designated as advisor to AID on the project; also that the mass rearing project was being reorganized with the developmental work at ICIPE/Nairobi rather than at Mbita Point.

I believe the most important follow-up is to ensure that the project is evaluated by an outside review team at the end of 18 months. ICIPE presently is not a proven leader in integrated pest control or applied agricultural research, but the AID-funded project provides the Centre an opportunity to prove itself in these fields. Though \$500,000 (the AID contribution to the 2-year project) may appear to some to be a rather modest sum, the fact remains that this amount represents a fairly substantial portion of the total extraneous budget presently earmarked for research on integrated pest control systems in the developing world. Therefore, it is only logical that the project should be critically evaluated.

With reference to Objective (2) concerning the Kampala AID Mission's request for BACOM, Cal Martin (REDSO-EA) indicated (based on his telephone conversation with you on September 12) that the cable sent to you from Nairobi included all information that you had requested for the pesticide.

UPPER VOLTA

Dates Visited: September 15-October 1

Principal Contacts: (1) At WARDA Seminar in Bobo Dioulasso:
Dr. A. Enyi/Research Coordinator, WARDA
Mr. Mitsuo Yoshimeki/Global Coordinator for
Integrated Pest Control, FAO, Rome
Dr. K. Zan/African Representative for the
International Rice Research Institute
(2) On assignment in Ouagadougou:
Howard Thomas/AID
Dr. Claude Charreau/Resident Representative
for West Africa, ICRISAT (Dakar)
Drs. W. Stoop, J. Ph. van Staveren, K. Nwanze,
and C. Pattanayak/ICRISAT (Ouagadougou)
Dr. Y. Rathore/SAFGRAD (Ouagadougou)
Louis Furste/AVV (Ouagadougou)

Objectives: (1) to participate in "WARDA seminar on the
Integrated Management of Rice Diseases and Insect
Pests" at Bobo Dioulasso, September 17-22

(2) To review the use of pesticides and integrated
pest control techniques in proposed ROAP (698-
0416)/AVV/ICRISAT Soil and Water Management Study
Project (in Ouagadougou, September 24-October 1)

With reference to Objective (1), I attended the WARDA (West African Rice Development Association) Seminar in place of Dr. Ray F. Smith (Director of the UC/AID Pest Management and Related Environmental Protection Project) who had been invited to participate in the seminar and present the paper, "Concepts of Integrated Management of Crop Pests with Special Reference to Rice." Over 40 participants representing the principal rice-producing countries of west Africa participated in the seminar. The rice pest/pest management situation was reviewed in each of the countries.

At present, there has been little effort to develop systems of integrated pest control in rice in these countries. There is some work on individual components of integrated pest control (e.g., biological control, resistant varieties of rice plants, selective use of pesticides), but it is highly fragmented; there is no organized effort underway.

On the last day of the seminar, the participants formulated a series of recommendations which may be of particular interest to you and Ray Smith. One recommendation was that WARDA take the initiative to form a regionally coordinated program on integrated pest control in rice in West Africa. The rice research and extension personnel in attendance expressed considerable enthusiasm about the formation of a regional program leading to the development and implementation of integrated rice pest control in the region. One aspect receiving greatest discussion was the need for training, at all levels--research personnel, village extension workers, crop protection officials,

and others.

WARDA's Research Coordinator Dr. A. Enyi agreed to carry the recommendations to WARDA's Executive Secretariat. (Perhaps you know that CGIAR finances the greater part of WARDA's research and research administrative cost. AID is a major contributor.) He is very supportive of the recommendations, and I believe he will push to get them effected. He inquired about AID's interest in coordinating some of the training efforts--the Seminar participants had discussed the possibility of a regional short course in integrated pest control, similar to the one held in the Philippines last year. In any case, I suggested he send a copy of the recommendations (which had not been typed when I last visited him, in Monrovia on October 22) to Ray Smith.

Follow-up: I suggest that AID endorse WARDA's efforts to form a regionally coordinated effort in integrated pest control in rice. I also suggest that AID, FAO, WARDA, and IRRI consider the desirability of sponsoring a short training course on the principles of rice IPC in the west African region. Finally, I suggest that the UC/AID Pest Management Project provide WARDA (for distribution to its member countries) publications on pesticide/pest management that have emanated from the Project (the publication by Barr et al. on losses caused by rice pests and the Proceedings of last year's Philippines short course would be especially useful).

With reference to Objective (2), I visited principal personnel of International Crops Research Institute for the Semi-Arid Tropics and AVV (the Upper Volta Rivers' Basin Authority) in charge of the proposed ROAP/AVV/ICRISAT Soil and Water Management Study Project and visited some of the proposed study sites. Briefly, the proposed project seeks to develop cropping systems for areas of the Volta Rivers' Basin where the black fly vector of the onchocerciasis (river blindness) organism presumably has been "eradicated" or greatly reduced; the government of Upper Volta and various international agencies are promoting resettlement of these areas. The project will stress the use of pest-resistant crop varieties and biological methods of pest control, insofar as possible. Project managers believe, however, that pesticide use on pure stands (i.e., not intercropped) of cotton, cowpea, and sesame will require some treating with pesticides (insecticides and seed treatments). Pesticides will not be applied to other crops (sorghum, maize, peanut, vegetables) included in the project or to cotton, cowpea, and sesame when intercropped with the other crops.

The project managers originally proposed to use DDT and other pesticides that are commonly used in Upper Volta but that have been cancelled, suspended, or classified for restricted use by the EPA. I apprised these persons of AID regulations specified in Part 215, Environmental Procedures of Regulation 16, concerning use of pesticides in AID projects. They agreed to using only pesticides registered by EPA without restriction, and at acceptable rates and frequencies of application, providing that effective materials can

be identified and procured. Specific pesticides cannot be identified at present, however, because there simply is little information available in Upper Volta on the kinds of pests affecting cotton and efficacy of pesticides for their control; further the local availability of pesticides registered by EPA without restriction could not be determined. I agreed to seek and send to project managers any relevant information available in the USA or through FAO.

You had requested that I point out to the project managers that the FAO-C.I.L.S.S. project on integrated pest management may entail work related to and of considerable value to the ROAP/AVV/ICRISAT project. The project managers concurred with my recommendation that steps should be taken to link related crop protection activities of the two projects, but they were not familiar with the FAO-C.I.L.S.S. project.

The ROAP/AVV/ICRISAT project was developed without the input of crop protection specialists. But two entomologists--one with ICRISAT, Dr. Kanop Nwanze, Ph.D. degree (specializing in host plant resistance) from Kansas State University, and one with SAFGRAD (Semi Arid Food Grains Assistance and Development), Dr. Y. Rathore, Ph.D. degree (also specializing in host plant resistance) from Iowa State University--are now in Ouagadougou and agree to collaborating with the project, offering guidelines for insect pest management.

After reviewing the project and visiting the principal project participants I visited (in Niamey on October 1) Dr. Claude Charreau who is ICRISAT's Resident Representative for West Africa (stationed in Dakar). He agreed with all of the points in the cable sent to you from the AID Mission, Ouagadougou on October 1 (he received a copy). I presently am gathering information on pesticides which, as noted above, I agreed to seek and send to ROAP/AVV/ICRISAT project personnel. I shall provide you copies of letters of transmittal. I assume once that project personnel have identified the pesticides to be used in the project they and the Environmental Advisor V. Fort with REDSO-WA, Abidjan will prepare a revised Initial Environmental Examination and Environmental Assessment, if the latter is required. In any case, I visited Miss Fort in Abidjan on October 15 and apprised her of my assignment to review pesticide use in the ROAP/AVV/ICRISAT project.

Prior to departing Upper Volta, I apprised Howard Thomas (Director, Human Resources Division, AID-Mission Ouagadougou) fully of my findings. As you know, a cable was sent to you from AID Ouagadougou. The cable summarizes my findings and is self explanatory. Nevertheless, I am not convinced that he will readily follow-up on the points I made in the cable, especially the one regarding the need for coordinating the ROAP/AVV/ICRISAT project with the FAO-C.I.L.S.S. project. (He was very cooperative and receptive to my suggestions but is not an agriculturalist and had minimal involvement in forming the project.)

I should mention that several of the crop protection officials that I visited in Upper Volta and Niger expressed some ill feelings

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about the way the FAO-C.I.L.S.S. integrated pest management project is progressing. I mentioned this (in a note from Monrovia) to Ray Smith. I have had no involvement with that project, so I had no basis for reacting to their complaints, one way or the other. In any case, the persons I visited endorse the FAO-C.I.L.S.S. project, but they expressed doubt as to whether the project would ever get kicked off in time or be managed properly, as to be effective. The AID-Mission, Niger personnel seem to have similar doubts.

NIGER

Dates Visited: October 1-8

Principal Contacts: Harry Dickherber (AID, Niger Cereals Project Liaison Officer), Jay Johnson (AID Mission Director), Harvey Cutman (Johnson's Deputy), Sid Bliss, M. Baker, J. Mullenax/AID Meino Souley, Assistant Director of Service of Agriculture/Government of Niger Salifou W. Mahamane, Coordinator, Niger Cereals Project/Government of Niger René Beique, Jean-Marcel LaFerrière/Pluritec Consultants (Canadian advisors to Niger's crop protection service) James K. Bishop/American Ambassador to Niger

Objectives:

- (1) To identify possible pesticides for use on primary food crops in Niger
- (2) To assist in preparing a draft Initial Environmental Examination and an Environmental Assessment, if required, of pesticide use in Niger Cereals Project
- (3) To determine the inventory of FAO stocks of pesticides (viz. malathion, fenitrothion, or sumuthion ULV) in Niger

Objective (1) was in response to a letter (dated July 31, 1979) to you from Conly of the AID-Mission, Niamey; he requested information on kinds of pesticides registered by EPA for use without restriction on various crops. He submitted the request on behalf of the Government of Niger (GON). However, GON has not submitted a request to AID for purchase of the materials. According to Harry Dickherber (AID, Niger Cereals Project Liaison Officer), GON merely requested the information for internal use (crop protection officials of GON seem to be taking a close look at pesticide use in Niger and are wanting to switch to safer materials than presently used).

In any case, Dickherber suggested I get with GON crop protection officials and examine the current pesticide use situation and suggest future needs. In due course, I obtained some interesting facts concerning the present use of pesticides in the country. Perhaps 50 percent of the pesticides being used by GON's crop protection service have been cancelled or suspended in the USA, are classified for restricted use only, or are on the RPAR list. The Canadian

entomologists (identified above) serving as consultants to GON acknowledge some real problems with the current use of pesticides. They are encouraging GON to phase in safer, "softer" materials in place of materials such as parathion and BHC, now used extensively. Also, they are attempting to develop a pilot pest surveillance/forecasting network in the country. (I suggested to Jay Johnson, AID-Mission Director and Harry Dickherber that they encourage the latter effort. I provided the Canadian entomologists and also Dickherber with the names of persons to contact in the Philippines and India working in similar areas of surveillance/forecasting.) In addition, I agreed to acquire and send to Dickherber (for distribution to GON) pest control guides and other useful information that GON can use in its efforts to find safer pesticides.

With reference to Objective (2), Harry Dickherber indicated that he probably should have advised you precisely of the status of the plans to revise the Niger Cereals Project before I was dispatched to Niger. Presently, the project (actually, there will be two projects--Niger cereals project and a resource development project--that entail use of pesticides) is being revised; it will be several months even before work on the Project Identification Documents is begun. Consequently, because use of pesticides in the projects presently cannot be determined, I obviously could not prepare an IEE or EA. Instead, I provided guidelines on preparation of the IEE and appraised AID personnel of AID regulations specified in Part 216, Environmental Procedures, that must be followed. AID project personnel agree to use only pesticides at acceptable rates and frequencies of application, if these materials can be identified and acquired locally. I agreed to cooperate in seeking and providing pertinent information for this purpose; I shall send you copies of any letters of transmittal. AID personnel at Niamey and the REDSO-WA environmental advisor (V. Fort, Abidjan) will prepare the IEE. They agree to sending the draft to you for review before being put in final form (you had requested this in a cable to the Niger Mission).

I did not succeed at Objective (5) despite a rather substantial effort to acquire the information you requested on FAO stocks of pesticides. Harry Dickherber agreed to keep digging and to send you information he may acquire.

Follow-up: I now am working to fulfill the request by GON and AID-Mission, Niger to identify pesticides registered for use without restriction. As noted, the AID Mission would like for you to review the draft IEE; it probably will be December or later before the draft is available.

Can you provide AID, Niger (attention Harry Dickherber) a "model" IEE (or EA) entailing the distribution of pesticides via supply stores managed by a government? The new AID Niger cereals Project may include provisions (through the Seed Multiplication Centers) for the sale and distribution of fertilizers, pesticides, and other farm supplies through government-managed supply stores. Do you

know of a similar arrangement in another AID-sponsored project that the AID-Niger personnel could use for reference?

Regarding the request for FAO pesticide stocks in Niger, Harry Dickherber is to be in touch with you.

IVORY COAST

Dates Visited: September 13-15; October 8-15

Principal Contacts: Roy Wagner (Director), Ronald Rogers (Deputy Director), William D'Epagnier (Project Manager)/ENTENTE Fund, Abidjan
Gordon Evans (Director), V. Fort (Environmental Advisor)/REDSO-WA
Dr. Bakary Ouagojode, Claude Monnet/IRAT, Bouaké
Drs. P. Cochereau, A. Pollet, G. Tavakilian, M. Tran/ORSTOM, Bouaké

Objectives: (1) To prepare an Environmental Assessment on the use of carbofuran and to recommend steps for minimizing hazards to wildlife in rice in "North-East Savannah Rural Development Project"

The government of Ivory Coast is working to expand agriculture in the North-East Savannah, an area that until recently had been excluded from the mainstream of Ivory Coast Development. Continuous use of arable land, diversification of cash crops, support services (extension, credit, transport, storage, and marketing), and adaptive research programs aimed at developing new farming systems are being emphasized. The Project will support research, training, development, and service activities as required to assist the government in achieving its objective of agricultural expansion in the North-East Savannah. The project (4½ years duration) is being funded by the World Bank (\$7 million) and Conseil de l'Entente (\$5.1 million) for a total of \$US 17 million. Conseil de l'Entente is to be funded by the Fonds de l'Aide et de Cooperation (FAC) of France (\$1.4 million) and USAID (\$3.7 million). USAID's contribution is only for the first 3 years (1979-81) of the Project.

The insecticide carbofuran (Furadan 3G) is the only chemical pesticide proposed for field application in the project; it is to be applied only to field rice growing under irrigated conditions. (Note: the Project eventually may request assistance for the use of rice seed treated with pesticides (insecticide and/or fungicide), but the need for such pesticides presently has not been determined. I informed REDSO-WA personnel that provisions of Para. 216.5 (b)(1)(v) of Environmental Procedures should be followed if the use of such pesticides is determined necessary.)

In Abidjan, I learned that ENTENTE personnel had recruited a consultant (a Dr. Dunford, with a private consulting firm in the USA) to prepare the project's IEE. The IEE apparently had not been approved--

perhaps not even submitted for approval. I examined the section dealing with carbofuran; I thought it was generally satisfactory-- at least the pesticide procedures in Part 216 of Regulation 16 had been followed properly.

Because of the recent rules proposed by EPA for carbofuran granules (2 percent or more active ingredient), I proceeded to draft an Environmental Assessment. The second draft was being typed as I was departing Abidjan, thus I do not have a copy. I assume you will receive the EA when available.

In any case, I was pleased with the agreement the REDSO-WA personnel and I reached regarding the use of carbofuran and alternative techniques in the North-East Savannah Project. Ivory Coast is more prepared than any of the West African countries I visited to develop integrated pest control programs. IRAT (Institute of Tropical Agricultural Research) and ORSTOM (Office de la Recherche Scientifique et Technique Outre-Mer) have several good entomologists working on population ecology, natural enemies, selective pesticides, and other aspects of rice pest management. Throughout the Environmental Assessment, I made recommendations to encourage the linkage of their efforts with the proposed project. The IRAT and ORSTOM personnel were receptive to my recommendations. I particularly was pleased with the attitudes of Roy Wagner, Director of the ENTENTE Fund, who will ride herd on the project. He showed considerable interest in integrated pest control. I am satisfied with the way things were left in Abidjan.

Follow-up: I assume you will receive a copy of the Environmental Assessment.

Roy Wagner requested some information on seed treatments for rice etc., which I agreed to procure and mail to him. I shall send you copies of any correspondence.

One item that requires your attention: Roy Wagner asked if I would send him a letter, summarizing my analysis of the proposed project, especially regarding . . . needs in integrated pest control, etc. Please give me your recommendation on this.

LIBERIA

Dates Visited: October 15-25

Principal Contacts: Van B. S. Henderson, Jack Cornelius/AID-Mission, Liberia
George Butler, Buxton Cooper/Partnership for Productivity
Delvin Walker/Director Plant Quarantine, Liberia Ministry of Agriculture

Objectives: Refer my attached letter to Jack Cornelius, dated October 22

The attached letter regarding my assignment in Liberia provides all essential details of the assignment. I see no point in elaborating further here. I would like to discuss the situation in Liberia with you at your convenience, however.

I want to acknowledge the excellent cooperation of AID personnel in all the countries. Some devoted an entire working week helping me on my assignment. All cooperated fully in answering my questions and fulfilling other requests pertaining to the assignment, and they generally were receptive to my suggestions regarding the use of pesticides and other pest management techniques in the projects I reviewed. It appears that AID is ideally situated to advance economical, stable, and environmentally sound pest control in Africa. There seems to be particularly good opportunities at the regional RCOSO offices in Abidjan and Nairobi for mainstreaming information and effecting intercountry and interagency coordinative linkages as required to strengthen the development and improvement of pesticide management and integrated pest control programs.

Attachment: 1
cc: Dr. Ray P. Smith

TO : Mr. Jack M. Cornelius
Agr. Development Officer

October 22, 1979

SUBJECT: Review of Pesticide use Proposed for
Nimba Rural Technology Project,
Upper Nimba County

With reference to the attached cable concerning pesticide use in the subject Project, I visited Liberia during the period October 15-22. Mr. Van B.S. Henderson, Project Manager, arranged for all activities related to my assignment. He accompanied me to the proposed Project area in Nimba County and arranged sessions with personnel of Partnership for Productivity (PFP), the agency to assume primary responsibility for implementation of the Project. I want to acknowledge Mr. Henderson's excellent cooperation and help on this assignment. He devoted nearly an entire work week helping me on the assignment; he cooperated fully in answering my questions and fulfilling requests pertaining to the assignment; and he was receptive to my suggestions regarding pesticide use in the Project.

As stated in the attached cable, I was sent to Liberia to secure essential data on pesticides, and to assist the USAID Mission in revising the Initial Environmental Examination (IEE) and in preparing the required Environmental Assessment (EA) on pesticide use. The IEE is required of all USAID Project proposals; an EA is required when a Project includes assistance for the procurement or use, or both, of some pesticides, as specified in PART 216 - ENVIRONMENTAL PROCEDURES of Regulation 16 of the Code of Federal Regulations. Lindane, identified in the Nimba County Project IEE sent to Washington, is an example of such a pesticide.

The U.S. Environmental Protection Agency (USEPA) has issued a so-called "rebuttable presumption against re-registration" (RRAR) of Lindane, meaning that the pesticide probably will be cancelled or suspended in the USA. Under these circumstances, in addition to the routine IEE, a detailed risk/benefit analysis (i.e., the EA) of use of the pesticide is required. Only three

other pesticides were identified in the IEE sent to Washington: MCPA and Diazinon on swamp rice and cuprous oxide on coffee and cocoa; use of these latter materials does not require an EA. The use of Lindane was proposed only for coffee and cocoa.

However, in Nimba County last week, Mr. Henderson and I learned that PFP personnel want to use numerous additional pesticides: (conceivably 25 or more) and to include crops and animals that were not identified in the IEE. These proposed additions create some problems:

One; I am not familiar with some of the pesticides. PFP could identify some only by brand name, not chemical name, and some could be identified only by foreign manufacture. I must, therefore, do some searching at USEPA before I can determine the chemical content of the materials and whether or not they are registered for use on the various crops and animals to be included in the Project. Second, some of the pesticides proposed for use on food crops in the Nimba County Project have been suspended or cancelled by the USEPA because of potential human health effects (e.g., cancer). With others, USEPA has issued the RPAR noted above meaning that suspension or cancellation is probably imminent. The use of Lindane on coffee and cacao may be justified; there appears to be no acceptable alternatives, and use of the material is reported to be essential in preventing severe pest damage. If used under close Project supervision and if certain other steps could be followed, a convincing Environmental Assessment may meet approval. But I have my doubts about the justification of Lindane and two other pesticides, BHC and dieldrin, on rice, for example. Diazinon may be an effective alternative for use against some rice pests; perhaps there are other potential acceptable candidates. In any case, if at all possible, only pesticides registered by USEPA for use without restriction should be sought. Without a really convincing argument that acceptable alternatives do not exist, inclusion of other pesticides will complicate approval and implementation of the Project.

I believe the following procedures will be important in facilitating rapid approval and implementation of the Project and offer them to you and Mr. Henderson for consideration.

Immediately upon return to USA, I will apprise Dr. F.W. Whittemore, Food Crops Production Division, Office of Agriculture, Bureau of Development Support, USAID, Washington, D.C. 20523 (Telephone: 703:235-2310), of the problem. I suggest you or Mr. Henderson contact him if new questions arise.

SUGGESTIONS:

(1) According to paragraph 216.3 (b)(1)(v) in the Environmental Procedures mentioned above, if a Project includes procurement or use, or both, of pesticides, but the specific pesticides to be procured or used cannot be identified at the time the IEE is prepared, the procedures, referred to as Pesticide Procedures (paragraphs 216.3 (b)(1)(i) through (iv), will be followed when the specific pesticides are identified and before procurement or use is authorized. Where identification of the pesticide to be procured or used does not occur until after Project Paper approval, neither the procurement nor the use of the pesticides shall be undertaken unless approved in writing, by the Assistant Administrator (or in the case of Projects authorized at the Mission level, the Mission Director) who approved the Project Paper.

I believe these procedures may apply to the Nimita County Project. Presently, the specific pesticides to be procured or used cannot be identified although PFP personnel have some ideas. I suggest that you request approval of the Project with the understanding that the procedures for procurement or use of pesticides will be followed, i.e., neither procurement or use will be undertaken unless approved in writing by the person approving the Project Paper.

(2) In the interim, I suggest that PFP personnel take a hard look at their proposed use of pesticides. I will be glad to assist on this task. In fact, I have prepared the guidelines appearing as the second attachment for this purpose. The material is self-explanatory; if the PFP personnel follow my instructions closely and supply the requested information soon, I can proceed to revise the IEE and to complete the EA, if the latter is required. Upon return to the USA; I will begin work immediately in identifying acceptable pesticides for use in the Project. I hope you and Mr. Henderson will urge PFP personnel to get the requested material to me soon. *You may want to send it via international pouch. In any case, please see that it goes to me c/o Dr. F.W. Whittemore, whereabouts listed above.

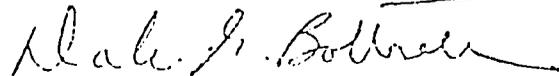
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(3) I suggest that you and Mr. Henderson do everything possible to "up" the level of understanding of proper pesticide use and particularly pest management among PFP Project personnel. As I see it, the primary problem now is lack of expertise in the area of integrated crop protection which includes the use of pest-resistant varieties of crops, crop rotation, regulation of planting dates, biological control, and selective use of pesticides. The PFP personnel, because of lack of expertise in this area, have selected pesticides as a first line of defense; by contrast, persons trained in modern principles of integrated crop protection would have selected pesticides as a last resort, only after the non-chemical and cheaper methods of control failed. I believe this lack is a real weakness of the Project. I discussed the problem at length with PFP personnel and Mr. Henderson and made several suggestions as to how the problem may be corrected. Perhaps Mr. Henderson will want to apprise you of these discussions.

On the positive side, I was impressed with the attitudes and capabilities of the PFP personnel. They were receptive to my suggestions, and they acknowledged their lack of expertise in principles of integrated crop protection. Consequently, I believe with proper guidance and assistance they will strive to seek safe pesticides and desirable alternatives. I like the idea of the Farmer Training Center around which the whole rural development Project is to be centered.

I greatly enjoyed my short visit in Liberia. Please feel free to contact me anytime I can be of assistance.

Best regards.



Dale G. Bottrell
University of California, Berkeley
UC/AID Pest Management and Related
Environmental Protection Project
2288 Fulton Street, Suite 310
Berkeley, California 94704

Attachments: (1) Cable from F.W. Whittemore to J. Cornelius
(2) Material for PFP personnel

cc: ✓ Dr. F.W. Whittemore
Mr. Van B.S. Henderson

September 13, 1979

MEMORANDUM

TO : Ray Love, Director, REDSO/EA

FROM : Dale G. Bottrell *Dale G. Bottrell*
 Consultant, USAID Mission on ICIPE Proposal
 Department of Entomological Sciences
 University of California, Berkeley
 UC/AID Pest Management and Related Environmental
 Protection Project
 2288 Fulton Street, Suite 310,
 Berkeley, California 94704 (USA)

SUBJECT: International Centre of Insect Physiology and Ecology
 (ICIPE) Project Proposal
 "Interim Support for Research Project on Crop Pests
 Critical for Tropical Rural Development"

Attached for your consideration is a report on the ICIPE project proposal. I hope you will find the format acceptable. Please excuse the "rough" form in which it is being submitted. The report was assembled in less than one day and, consequently, I simply did not have time to polish it as I would have chosen. However, I believe the report does include those discussions most pertinent to your needs.

In addition to those aspects which were specified in my terms of reference (refer the cable from USAID Washington, D.C., dated 1 September 1979, regarding the Mission), the report addresses other aspects that you, other USAID REDSO personnel in Nairobi, Dr. Edward H. Smith, and I discussed on various occasions during my visit to Kenya.

Perhaps the report includes more detail in some places than you believe was necessary. But, as we have discussed, the project raises numerous, complex questions concerning ICIPE's capability to carry out the proposed work, ICIPE's future relation to the network of the Consultative Group for International Agricultural Research Centers, its current relation with other international centers and organizations performing work similar to that proposed, and its relation to the Kenya Ministry of Agriculture, among others. Though \$500,000 (US) may appear to some to be a modest request, I have a fairly good basis for knowing that this amount is significant when compared to the overall present allocation for research on integrated pest control (the theme of the ICIPE proposal) in the third world. Therefore, I thought it important that my report include

A

some detail on integrated pest control--to describe what it is (even though it has become a vogue term, very few people, as I am sure Dr. Edward H. Smith concurs, really understand the concept), and especially to describe the complexities germane to its successful development and implementation. As I conclude in the report, I believe the ICIPE personnel who are to carry out the proposed work have a good understanding of integrated pest control; and, if they are provided proper guidelines and the appropriate climate for carrying out the work, I am confident that it can evolve into a decent project. But AID should recognize that integrated pest control is a new endeavor for ICIPE (regardless of what AID personnel in Washington, D.C., may have heard to the contrary); in fact, the work proposed is the Center's first real applied effort in the field. I have seen very successful efforts in integrated pest control evolve, from scratch, on a budget of less than \$500,000. Therefore, I find no reason why ICIPE should not be expected to produce a good product in two years if the project is funded.

As I have stated repeatedly, Dr. Edward H. Smith, Visiting Professor at ICIPE for the next six months, is an important key to the success of the proposed project. He is a true scientist and a man of proven credibility. I believe you will find him agreeable to help you on the proposed project any time you call upon him.

I want to acknowledge the very excellent cooperation I received from all USAID/REDSO personnel in Nairobi; all of you really went out of your way to help me on the assignment, and I do appreciate this.

Please feel free to contact me at the address shown above any time I can be of assistance.

Best regards.

Attachment:
a/s

ANALYSIS OF A PROJECT
PROPOSED BY THE INTERNATIONAL CENTRE
OF INSECT PHYSIOLOGY AND ECOLOGY ENTITLED "INTERIM
SUPPORT FOR RESEARCH PROJECT ON CROP PESTS CRITICAL FOR
TROPICAL RURAL DEVELOPMENT"

(This report submitted by Consultant Dale G. Bottrell, Department of Entomological Sciences, University of California-Berkeley, UC/AID Pest Management and Related Environmental Protection Project, 2286 Fulton Street, Suite 310, Berkeley, California 94704 U.S.A)

Prepared at the request of USAID REDSO Personnel, Nairobi

Date: 12 September 1979

1. BACKGROUND INFORMATION:

1.1 Mission of ICIPE

The International Centre of Insect Physiology and Ecology (ICIPE), Nairobi, Kenya, was established with three primary objectives, as stated in the Project Identification Document (PID):

- To conduct research on the most critical problems blocking the design of new control strategies for the principal insect pest problems related to crops (as well as to livestock production and human health)

- To provide advanced training in research methodology and application of research results to gifted young graduates and postdoctoral research fellows interested in development-oriented research
- To increase the indigenous scientific capacity in Africa in solving this type of problem

Founded in April 1970 on the Chiromo campus of the University of Nairobi, ICIPE is a research centre where scientists from many parts of the world have conducted basic investigations on crop pests and arthropod vectors of tropical diseases. Current research programs entail basic studies of various pest species, viz. African armyworm, sorghum shootfly, harvester termite, livestock tick, tsetse fly, and mosquitoes. ICIPE also performs joint research projects with other international centres, viz. International Rice Research Institute (IRRI), Los Baños, Philippines, and International Institute of Tropical Agriculture (IITA), when common interests in a specific pest species or particular area of research exist.

The centre has focused primarily on basic research, i.e., biology, ecology, physiology, chemistry, and behavior of the pest species, rather than on applied research related to the development of pest control programs. However, ICIPE recently broadened its mission in the applied area to include research on pest management methods such as host plant resistance. Efforts to develop varieties of crop plants (e.g., rice, cowpeas, sorghum) that resist or tolerate pest attack are carried out collaboratively with such

centres as IRRI, IITA, and the International Crops Research Institute for the Semi-Arid Tropics (ICRISAT), Hyderabad, India. Research also is being conducted on other control methods such as insect growth regulators (hormones) and virus diseases. Notwithstanding, ICIPE is recognized primarily in the field of pest management. ~~of basic insect physiology and not in the field~~ ICIPE's annual reports and technical publications clearly show that largely basic research has been emphasized.

1.2 Rationale for Proposed Work

1.2.1 Crops and Pests Selected for Study

The primary emphasis of the proposed work is to conduct research that leads to improved management of primary insect pests of cereal crops (especially maize, rice, and sorghum) and legumes (primarily cowpeas) growing throughout much of Africa. These crops, grown singularly or in various intercropping combinations, are a primary source of food for a significant portion of the farmers in Africa. Because of presently inadequate crop-loss assessment and pest survey procedures, the impact of insect pests on these crops is not known. But entomologists at ICIPE and other institutions (e.g., IITA, ICRISAT, IARI, West African Rice Development Association or WARDA) have identified insect pests and inadequate methods for their control as major factors now limiting increased crop production and yield stabilization on a continuing basis. If left uncontrolled, the insect pests selected for study in the proposed work (viz., spotted stem-borer on maize, rice, sorghum, sugarcane, and millet; rice stem-borer on rice; sorghum shootfly on sorghum and millet; and pod-borer

on cowpeas and numerous other legume crops) may inflict heavy losses.

1.2.2 Present Control Practices

X Presently, most small African crop farmers simply tolerate losses caused by pests. Some farmers use chemical insecticides, however, the rationale for proper chemical control rarely has ^{been} established; for example, guidelines on pest densities at which chemicals should be applied generally do not exist. Therefore, current procedures for using insecticides are considered unsatisfactory.

X ICIPE personnel do not believe that small African farmers can justify the expense of insect control programs that rely heavily on chemical pesticides. In addition to the high costs, frequent and improper use of the chemical materials may disrupt the actions of "beneficial" organisms (insect and spider predators and insect parasites, for example) important in keeping the insect pests in check; repeated use of the materials also may provoke the emergence of ^{genetically resistant} pest strains that cannot be controlled satisfactorily by chemical means.

1.3 Proposed New Control Strategy

X The ICIPE Project Identification Document lists (on pages 12 and 13) eight primary objectives (areas of investigation) for the proposed work. The objectives are stated rather vaguely; it is therefore difficult to determine precisely what is planned or what pest control strategy ultimately will emerge. However, the PID clearly identifies host plant resistance (the use of varieties of crop plants that resist pests or simply tolerate the pests without sacrifice in yield or quality) as the

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foundation component of the control strategy. Further, ICIPE personnel at Nairobi and, particularly, at the Mbita Point field station endorse the concept of "integrated pest control". (Personnel of Mbita Point field station, on the banks of Lake Victoria, will carry out most of the field work.)

Integrated pest control (also known as integrated pest management) is an ecological system of pest management; it utilizes a variety of biological, cultural, chemical, and physical control methods as required to hold pests below economically damaging levels without disrupting the cropping ecosystem and surrounding environment. First consideration is given to the use of naturally occurring mortality elements of the pest environment, including weather, diseases, predators, and parasites. Artificial control measures, notably chemical pesticides, are employed only as required to reduce and maintain the pests at tolerable levels, based on criteria developed to identify when and where control is truly justified. Measures that pose minimal risks to humans, beneficial nontarget organisms, and the environment are sought. The ultimate objective of integrated pest control, or IPC, is to manage pests in an economically efficient and environmentally sound manner.

IPC promises to reduce the pest losses to crops on a continuing basis and at the lowest cost. By systematically spreading the burden of crop protection over a combination of effective control methods, it also promises crop yield increases and yield stability. For subsistence farmers of the developing world, typical of much of Africa, IPC greatly lessens the

probability of serious pest problems erupting as their traditional cropping operations are transformed to a more modern and productive state.

By relying mostly on natural controls, weather and biological controls (predators, parasites, pathogens), and host plant resistance, IPC achieves economy and also safeguards against heavy reliance and improper use of chemical pesticides.

1.4. Requirement for Developing and Implementing Integrated Pest Control Programs at the Farmers' Level

X Because development of a specific integrated pest control program depends on many variables (e.g. the pest complex, the crops, economic values, sociological factors), it is difficult to establish absolute guidelines. However, the ultimate objective is a set of techniques and guidelines for making judgements about what, when, where, and how to optimize the end results. The end results must be measured not only in terms of yield and quality of the crops for which developed, but also in terms of the effect of production practices on environmental quality and public health. The value judgements must be made both from the view of the individual farmer and the entire community as well as for present and future crops. Indeed, IPC is an ambitious undertaking, but its successful development and application on various crops in various areas of the developing world are evidence that it is a realistic goal for subsistence farmers in much of Africa.

Perhaps only a few cropping systems or "agroecosystems" and pest

complexes in Africa justify or even require application of the total spectrum of IPC techniques. A strategy must be tailored for each pest complex within each discrete agroecosystem, and that strategy will vary from year to year depending on value of the crops in relation to the purchased inputs, weather, legislation, ^(logical) socio issues, and other factors. However, the ecological principles fundamental to IPC can be applied to the limits of economic justification.

The ultimate test of an IPC strategy is whether or not the farmer successfully adopts it and profits from it. The development of new IPC technology, therefore, offers no real utility to anyone unless it is adopted successfully by the farmer. Getting it adopted generally requires the input and cooperation of a variety of disciplines and agencies.

Farmers often do very well in integrating bits and pieces of information for short-term solutions to pest problems. However, multipest integrated schemes, closely synchronized and integrated into optimal crop production systems, are essential for long-term successful farming. Crop protection specialists at all levels of research (from the elemental to the applied levels) and extension, therefore, must be committed to develop and to implement IPC programs. Everyone in the crop production system (research and extension crop protectionists, agronomists, plant breeders, and the farmers themselves) must become an integral part of the development and implementation process.

2. ICIPE'S QUALIFICATIONS FOR CONDUCTING THE PROPOSED WORK AND FEASIBILITY OF THE WORK

2.1 Qualifications of Principal Research Personnel

ICIPE personnel at Nairobi and Mbita Point to have primary responsibilities for the proposed work acknowledged need for close interdisciplinary and interagency cooperation, as discussed in section 1.4 above. They also acknowledged the importance of synchronizing their proposed work on host plant resistance (the primary insect control method emphasized) with work on biological control, environmental management (modification of row spacings, crop rotations, and other agronomic practices that affect pest abundance), and other control meth-

The Consultant believes the proposed Programme Leader (Dr. Dabrowski of Poland) and the principal research personnel at Mbita Point understand the concepts of integrated pest control; further, they are qualified to conduct research leading to the development of integrated pest control programs. The Mbita Point group includes an agronomist and several entomologists trained in both theoretical and applied aspects of integrated pest control. Programme Leader Dr. Dabrowski has considerable experience in Poland on host plant resistance and appears to possess qualifications required for coordinating research that synchronizes theoretical and field oriented efforts. An extremely important component of the project team is visiting Professor Dr. Edward H. Smith, Chairman of the Department of Entomology, Cornell University (U.S.A.) who will serve as an advisor to

the proposed project; he also will carry out various aspects of the proposed research. Dr. Smith is uniquely qualified for these roles: he is a proven leader in entomology and brings with him a wealth of knowledge and experience in coordinating interdisciplinary and interagency activities.

Therefore, though ICIPE presently is not recognized as a leader in applied research or integrated pest control, the major team members to perform the proposed work are qualified to carry out a research program in IPC. Especially important is that they understand and appreciate integrated pest control and recognize the difficulties in developing and implementing it at the farmers' level.

Dr. Smith will reside in Nairobi for the next 6 months during which time he will work closely with the Mbita Point group. The Consultant recommends that if possible provisions are made to ensure his continuation as advisor to the project during the proposed 2-year period. The Consultant believes that success of the proposed project is closely linked to Dr. Smith's participation; guidance is especially critical if ICIPE broadens its emphasis in integrated pest control to include pests other than insects and to bring in other disciplines -- economists, sociologists, and others. Dr. Smith is particularly interested in working to train Africans so they may develop and carry out IPC programs; thereby increasing the indigenous capacity for IPC in Africa.

2.2. Linkage of Mbita Point and Nairobi

Research personnel of the Mbita Point experiment station are employees of ICIPE and are responsible to the ICIPE administration in Nairobi.

On the one hand, this arrangement is advantageous: in principle it safeguards against fragmentation of related work at the two locations. On the other, unless the Nairobi group is sympathetic with work underway at Mbita Point, and vice versa, the proposed work will suffer. Dr. Edward M. Smith and, hopefully, Dr. Dabrowski (who will reside in Nairobi but will travel frequently to Mbita Point) can assist to effect proper linkage of the two groups. However, most effective linkage of the two groups cannot be ensured without support from ICIPE. The group at Mbita Point expressed satisfaction with the existing arrangement. One responsibility of ICIPE's newly appointed Deputy Director Dr. Alex Tabori is to effect good relations between ICIPE and Nairobi and the other ICIPE research groups; thus, his role appears critical to the Mbita Point - based project.

2.3 Relation of ICIPE and other International Research Centres

Under the auspices of the Consultative Group ^{for} an International Agricultural Research (CGIAR), several international research centres, viz. IRRI, IITA, ICRISAT, and CIMMYT (the International Centre for Development of Maize and Wheat, El Batan, Mexico), are already conducting work similar to that proposed by ICIPE. Some of this work is fairly advanced; IRRI, for example, has made substantial progress on work on integrated management of rice insect pests and has a program devoted wholly to ^{the} management of pests in multicropping systems, two areas of work being proposed by ICIPE. In addition to the work at the CGIAR centres, WARDA in Western Africa, the Food and Agriculture Organization of the United Nations, the U.S. Agency for International Development, the Centre of Overseas Pest Research (U.K. base)

the Commonwealth Institute of Biological Control, and several national governments (e.g. , Australia, Japan, and the GDR) are supporting work in Africa (or on rice in Asia) related to that proposed by ICIPE.

ICIPE's Director Thomas R. Odhiambo indicated that ICIPE had formalized mechanisms for collaboration with IBRL. Further, ICIPE is working collaboratively with ILTA and ICRISAT (perhaps also other international and regional centres) on specific problems. Because ICIPE's applied program is relatively new, the Centre could gain significantly by increasing its collaborative efforts with other international centres, especially those that focus on the same crops included in the proposed project. It is essential that ICIPE's research scientists, i.e., those actually performing the work, effect good communication and dialogue (via correspondence, exchange of reports, publications, and other information, symposia, and "on-site" visitation of research plots with counterpart scientists at the other centres).

The budget allowance proposed in the ICIPE proposal for international collaboration presently is too modest; the Consultant believes this is a serious deficiency of the proposal. If ICIPE project personnel fail to establish good communication and collaboration with counterpart personnel at the other international centres the project will foster unnecessary duplication of effort, and ICIPE will fall short in maximizing benefits from the experience and expertise at the other centres.

2.4 Relation of ICIPE and the Kenya Ministry of Agriculture

The Consultant and USAID REDSO personnel, Nairobi, unfortunately could not meet with a designee of the Ministry's office before this report was prepared. A meeting is scheduled for 13 September 1979. The Consultant, therefore, may choose following that meeting to offer verbal comments to USAID REDSO, Nairobi, which differ from those here.

If successful, the proposed work eventually may lead to development of a "prototype" IPC scheme in Kenya and other areas of Eastern Africa (and ideally, in similar cropping areas of other continents) for the pests/crops selected for investigation; all individual and agencies concerned should approach the proposed work with this goal in mind. Therefore it is particularly important that ICIPE and the Kenya Ministry of Agriculture develop a favorable working relation and a mutual understanding of integrated pest control. Otherwise, a very effective IPC strategy may emerge, but never be adopted widely simply because Ministry personnel did not recommend it to farmers for various reasons. It appears essential that ICIPE personnel at Mbita Point keep Ministry personnel in that area informed of progress in IPC and that they encourage Farmer Training Centre (FTC) personnel to teach farmers the concepts and techniques of IPC. The Mbita Point experimental plots and pilot trials on farmers' fields perhaps could be made part of the FTC educational program; this approach offers a potentially excellent avenue for increasing the indigenous capacity in IPC of extension workers, in Kenya as well as in neighboring African countries.

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2.5 Realism of the Proposed Work and the Concept of USAID Support for Institutional Building versus the Concept of USAID Support for Specific Project Activities

2.5.1 ICIPE's Acceptance into the CGIAR Network

According to Director Odhiambo, ICIPE's formal application for full membership in the CGIAR network presently is being considered; the Director is optimistic that membership will be granted but not before 1981. Membership would insure more stabilized funding of ICIPE and would, in principle, greatly increase the Centre's capability for developing research programs in IPC. The proposed project submitted to USAID for funding obviously was predicated on the assumption that membership is to be granted in 1981; Director Odhiambo in fact indicated this. Therefore, the money requested from USAID is viewed by the Director as an important source of interim support for a longer-term project, i.e., longer than the 2-year period for which USAID support is requested.

2.5.2. Does the Proposed Project Increase the Institutional Capability of ICIPE as Required for Acceptance in the CGIAR Network?

This question seems important to USAID REDSO staff in Nairobi.

X If the proposed project is funded and ICIPE fails, upon conclusion of the 2-year project to demonstrate its capability in IPC, is the probability for the centres' acceptance in the CGIAR network lessened? Would a highly successful effort affect the probability of acceptance? The Contractor lacks sufficient knowledge about the policies of CGIAR as required to form an opinion, but the question is germane to USAID's decision to fund or to not

fund the ICIFE proposal.

2.5.3 Activities of High Priority

X The Consultant believes that ^{the} chances for successful project accomplishment during the proposed 2-year period will be much greater if USAID provides support earmarked for specific activities (research activities most pertinent to the initial formulation of an IPC strategy) rather than non earmarked support merely granted for purposes of institutional building. The Consultant believes that, properly oriented from the ^C inception, the field work at Mbita Point could lead over a 2-year period to a successful effort, if these areas of research were given priority emphasis:

- X
- Determining the "optimal" intercropping combinations of the principal food crops now being grown by small farmer^s in the Mbita Point area. Study of the actions, reactions, and coactions of the pests, the crops, their natural enemies, and the physical environment (via life table techniques or other techniques that reveal the major mortality factors affecting pest density) would be one aspect of this activity. Analysis of the costs/benefits of the various intercropping combinations would be another. Properly executed, this project activity could contribute significantly in answering questions pertinent to any IPC effort: What are the "real" insect pests, that is, the key pests posing the greatest threat to the crops ~~and~~ and the focal organisms around which the IPC strategy
- X
- 92

must evolve? What key environmental factors (e.g. weather, predation, parasitism) are involved in the regulation and control of the pests' densities under the various intercropping combinations? What are the costs and the benefits (measured in terms of pest losses, external control costs (pesticides use, for example), crop yield, crop quality, etc.) of each of the various cropping combinations?

- Establishing the need to take action, that is, at what level (density of population) do the key insect pests cause significant economic damage and when is control by chemical means truly justified?
- Developing practical monitoring techniques, i.e., pest surveillance procedures, for use by extension workers and farmers when assessing the need for control.
- Establishing and refining techniques appropriate for evaluating pest resistance in crop cultivars.

The work outlined above could realistically be pursued at the existing facilities at Mbita Point and Nairobi.

Recommendation: If USAID chooses to fund the proposed project, the Consultant recommends that USAID RESSO personnel immediately request from the project's principal research personnel at Mbita Point and Nairobi a detailed plan of work describing (on a 2-year timetable) the project activities with most emphasis being given to those outlined above.

3. PROJECT IMPLEMENTATION AND EVALUATION

X The plan of work suggested above should include a timetable which shows^S anticipated target dates for completion of each project activity. As all good researchers know, research accomplishments cannot be predicted accurately -- the key to successful research accomplishment is often serendipity, more than any other factor. However, the project activities should be portrayed on the most realistic time schedule possible.

3.1 Reporting

The Consultant believes it is important that the Programme Leader coordinates the preparation of a quarterly report of project activities for distribution to colleagues at IRRI, IITA, other centres, and other individuals and agencies conducting related work on integrated pest control. The report should include a brief description of project activities, accomplishments, and future plans. The report will effect greater cohesiveness among the various ICIPE project activities and will keep personnel of other centers informed of these activities. The Programme Leader, and not ICIPE administration, is best suited for coordinating this activity.

3.2 Project Evaluation

X As the end of 18 months of work on the project, the project accomplishments^S should be carefully evaluated by an outside review team, unattached to the ICIPE project, appointed by USAID REDSO personnel in Nairobi. The following team members are suggested: one qualified integrator

pest control specialist, one agronomist familiar with cropping practices in Eastern Africa, one sociologist or economist possessing expertise in the socio-economic aspects of rural development, and a representative (or designee) of FAO's Plant Protection Service, Plant Production and Protection Division, Rome, Italy. The latter is suggested because FAO currently is establishing several regional programs in integrated pest control (in Africa and other continents) and the Plant Protection Service has responsibilities for coordinating global efforts in IPC. The review team should prepare a comprehensive report that addresses all aspects of the project, including recommendations concerning ICIPE's continuing role in IPC. One particularly important facet of the evaluation is to determine if the project met its goal in building up the professional IPC capability among the African population. Another is to determine if the project activities and the emerging technologies are being properly synchronized into the existing socio-economic framework of the African rural population.

3.3. Socio-Economic and Environmental Analyses

The proposed project activities obviously will be futile unless emerging pest control technologies can be effectively synchronized into the existing socio-economic framework of the African rural community and especially into the small farmers' operations. The input of one or more socio-economic specialists should be recruited at inception of the project, and this individual or these individuals should perform an active role throughout the project. Presently, the project's proposed

budget does not allow for this input; the Consultant recommends that USAID REDSO make necessary arrangements to ensure such input, that is, if the project is funded.

The Mbita Point Project activity is headquartered on the banks of Lake Victoria, an area rich in natural Kenya fauna and flora. Therefore, safeguards should be established to avoid developing and introducing new pest control or agronomic practices that are ecologically disruptive and environmentally unsound. IPC promises to provide cost effective solutions to pest problems while simultaneously reducing the environmental (and human health) hazards associated with pest control. But one fundamental premise of IPC is that any control method -- even host plant resistance -- can produce unexpected and undesirable consequences to the environment and to humans if not carefully introduced and evaluated. The environmental consideration should be included in the project activity as well as with the socio-economic analyses.

4. THE DESIRABILITY OF LOCATING THE PRIMARY PROJECT ACTIVITY AT MBITA POINT

The Consultant has no basis for determining the desirability of locating the proposed project activity (or the planned Mbita Point experimental and lodging facility) at Mbita Point as compared to other locations in Kenya. Farmers of that area apparently characterize small farmers in other areas of Eastern Africa from the stand point of the kinds and their of cropping systems they manage, size of their farms, /economic status.

The Consultant questions the feasibility of developing a facility at Mbita Point to produce large numbers of laboratory - reared insects,

at least within the time frame of the proposed two-year period. Mass-rearing of insects on artificial diet or natural plant materials is a major undertaking. Its effectiveness generally necessitates highly sophisticated equipment (autoclaves, special air-filtering systems, special temperature regulating techniques, and numerous kinds of laboratory apparatus). Also a substantial staff of specially trained research personnel and technicians may be required to develop and carry out the rearing procedures.

Recommendation: The Consultant recommends that USAID, if it chooses to support the ICIPE project, support only specific aspects of the proposed work on insect rearing; priorities should be given to the support of research on the life histories, survivorship, and behavior of insects on various food substitutes. He advises against support of a large-scale rearing effort until the feasibility of such effort at Mbita Point (or Nairobi) has been clearly demonstrated.

5. BUDGETARY ASPECTS

Mr. Tom Babout, REDSO, Nairobi, is to address all questions pertaining to budget and financial management of the proposed project.

WARDA SEMINAR ON INTEGRATED MANAGEMENT OF RICE
DISEASES AND INSECT PESTS AT BOBO DILOULASSO

UPPER VOLTA

September 17-22, 1979

PROGRAMME

<u>Sept. 14-16</u>	Delegates arrive in Bobo Dioulasso.
<u>Monday, Sept. 17</u>	
10.00 - 11.30	Registration of the delegates at the Chamber of Commerce
11.30 - 12.00	Courtesy visit to the Office of the Governor of Bobo Dioulasso (near the Chamber of Commerce).
12.00 - 15.00	Free
15.00 - 15.30	Delegates and other invitees get seated
15.30 - 15.35	Introduction by the Sub-regional Coordinator of WARDA
15.35 - 15.50	Address by the Executive Secretary of WARDA
15.50 - 16.10	Inaugural address by the Minister of Rural Development of Upper Volta
16.10 - 16.15	Vote of thanks by the Executive Secretary of WARDA
16.10 - 16.40	Break - Refreshment
16.45 - 17.00	Group Photograph
17.00 - 17.15	Objectives of the Seminar by Dr. B.A.C. Enyi, Research Coordinator of WARDA
17.15 - 17.30	Objectives and Structure of Agricultural Research in Upper Volta by Mr. Ibrahim Nebie, Co-Director CERCI, Upper Volta.

Tuesday, Sept. 18 - Technical Session I

International concepts and approaches to integrated control of rice pests.

Co-Chairmen : Dr. B.A.C. ENYI
Madame Rose Marie SANWIDI

Rapporteurs : Mr. G. BOCCARA
Dr. D.N. SRIVASTAVA

- | | | |
|---------------|--|--|
| 08.00 - 08.30 | Concepts of integrated management of crop pests with special reference to rice | Dale Bottrell & Ray F. Smith of University of California |
| 08.30 - 08.40 | Discussion | |
| 08.40 - 09.10 | Factors that contributed to epidemics of rice diseases/pests in South East Asia since mid-sixties. | M. Yoshimiki
FAO, Rome |
| 09.10 - 09.20 | Discussion | |
| 09.20 - 09.50 | Practical approaches to management of rice diseases and insect pests in the tropics | KAUNG ZAN, IRRI |
| 09.50 - 10.00 | Discussion | |
| 10.00 - 10.15 | Coffee Break | |
| 10.15 - 10.45 | Application of blast control methods to rice cultivation in West Africa | J.L. Notteghem
IRAT, France |
| 10.45 - 10.55 | Discussion | |
| 10.55 - 11.25 | The Natural enemies of insect pests of rice and their potential importance in pest management programmes | D.J. Greathead
CIBC, UK. (to be presented in absentia) |
| 11.25 - 11.35 | Integrated control of rice insect pests in West Africa. (Research and suggestions of IRAT) | J. Breniere,
IRAT (to be presented in absentia by C. Bonnet). |

11.35 - 11.50 Concluding remarks by Chairmen

Technical Session II - Integrated management of rice pests in the major rice ecologies of West Africa

Co-Chairmen

- Dr. Dale Bottrell
- Mr. Mohamed Lamine Conte

Rapporteurs

- Mr. C. Monnet
- Mr. Lamin Sesay

12.00 - 12.15	Upland rice	E.A. Akinsola NCRI, Ibadan
12.15 - 12.25	Discussion	
12.25 - 12.40	Irrigated rice	Tahir Diop, WARDA, Richard Toll
12.40 - 12.50	Discussion	
12.50 - 14.30	Lunch Break	
14.30 - 14.45	Mangrove Swamp rice	H.A. Sampong WARDA, Rokupr
14.45 - 14.55	Discussion	<u>JOMALE</u>
14.55 - 15.10	Deep Water and Floating rice	M.A. Dembele WARDA, Nopti
15.10 - 15.20	Discussion	
15.20 - 15.30	Chairmen's concluding remarks	

Technical Session III - Present status of rice diseases and insect pests in WARDA member countries, approach and infrastructure for control operations.

Co-Chairmen

- Dr. Harry Hill
Madame J. Ba

Rapporteurs

- Mr. Tahir Diop
- Dr. A. Agyen-Sampong

15.35 - 16.35	Mauritania	-	To be announced
	Senegal	-	Yacobo Bodian
	Gambia	-	L.K. Jannah
	Guinea Bissau	-	Alcala Barbosa
16.35 - 16.50	Discussion		
16.50 - 17.05	Tea Break		
17.05 - 17.50	Guinea	-	A.L. Conte
	Sierra Leone	-	L. Sesay
	Liberia	-	B. Findley
17.50 - 18.05	Discussion		
18.05 - 18.10	Announcements		

Wednesday, Sept. 19

08.00 - 08.45	Ivory Coast	-	Bakary Guayogode
	Upper Volta	-	Traore Joydou
	Mali	-	Brahima Sidibe
08.45 - 09.00	Discussion		
09.00 - 09.20	Nigeria	-	A.T. Fasasi
	Ghana	-	Not participating
09.20 - 09.30	Discussion		
09.30 - 10.15	Togo	-	Akator Koffi
	Benin	-	Narcisse Djegui
	Niger	-	Bankoula Abdoulaye
10.15 - 10.30	Discussion		
10.30 - 10.40	Coffee break		

Technical Session IV - Individual Papers

Co-Chairmen - Dr. J.L. Notteghem
Dr. Kaung Zan

Rapporteurs - Mr. Akator Koffi
Mr. Edward Findley

10.45 - 11.00	Judicious use of insecticides in rice pest management	Basil Anastasiadis FMC, Greece
11.00 - 11.10	Discussion	
11.10 - 11.25	Results of preliminary investigation on damage to rice by insects in Upper Volta	M. Bonzi, IRAT Parako-Ba, Upper Volta
11.25 - 11.35	Discussion	
11.35 - 11.50	To be announced	Mr. Sere, IRAT Upper Volta
11.50 - 12.00	Discussion	
12.00 - 12.15	To be announced	Mr. Delabarre Ivory Coast
12.15 - 12.25	Discussion	
12.25 - 12.40	Potential insect pests of rice including vectors of virus diseases in West Africa	Mr. Agyen-Sampong and S.J. Fannah, WARDA Sierra Leone
12.40 - 12.50	Discussion	
12.50 - 14.15	Lunch Break	
14.15 - 14.30	Control of rice insect pests in Ivory Coast	C. Monnet, IRAT Ivory Coast
14.30 - 14.40	Discussion	
14.40 - 14.55	To be announced	V.A. Awoderu, NCRI Ibadan, Nigeria
14.55 - 15.05	Discussion	
15.05 - 15.20	Surveillance and monitoring ingredients of integrated disease and pest management in rice	D.N. Srivastava, WARDA Monrovia, Liberia
15.20 - 15.30	Discussion	

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15.30 - 15.45	To be announced	Louvel, IDSSA, Ivory Coast
15.45 - 15.55	Discussion	
15.55 - 16.05	Varietal resistance the most important constituent of integrated control of rice diseases and pests.	A.O. Abifarin, WARDA Liberia (to be presented in absentia)
16.05 - 16.15	Coffe Break	
16.15 - 16.30	Practical approaches to management of rice pests in West Africa.	M. Agyen-Sampong WARDA, Sierra Leone
16.30 - 16.40	Discussion	
16.40 - 16.55	Seed Health - First step in rice disease prevention	B. Larinde and D. Srivastava, WARDA Liberia
16.55 - 17.05	Discussion	
17.05 - 17.20	Rice blast in Sierra Leone - the identification of horizontal resistance and its utilisation in disease management and varietal improvement programme	S.A. Raymundo and S.N. Fomba; PAC-I WARDA, Sierra Leone
17.20 - 17.30	Discussion	
17.30 - 17.45	Rice cultivation and schistosomiasis	J.P. Moreau, Muraz Centre, Upper Volta
17.45 - 17.55	Discussion	
17.55 - 18.10	Rice cultivation and insect transmitted diseases in man	J.P. Hervy, CRSTO Muraz Centre; Upper Volta
18.10 - 18.20	Discussion	
18.20 - 18.35	Chairmen's concluding remarks	
18.35 - 18.40	Announcements	

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Thursday, Sept. 20 - Technical Session V - Informal Panel discussion on future approach and needs for integrated management of rice diseases and insect pests in West Africa

08.00 - 10.00 Discussion Leaders: M. Yoshimeki (Open to all participants)
C. Monnet

10.00 - 10.10 Coffee break

Technical Session VI Informal Panel discussion on Pesticides use in integrated rice disease and pest management in West Africa.

10.10 - 11.00 Discussion Leaders: B. Anastasiadis (Open to all participants)
Mr. Delabarre
Mr. Damotte

11.00 - 13.00 Visit to Parako-Ba Station Laboratories and fields and return to Bobo Dioulasso.

13.00 - 14.30 Lunch break

14.30 - 16.00 Visit to Kou-Valley farmers' rice fields and return to Bobo Dioulasso

16.00 - 16.05 Announcements

Friday, Sept. 21

08.00 - 09.00 Travel to Banfora

09.00 - 09.30 Welcome by the ORD Chief

09.30 - 11.00 Visit to CERCI Experimental Rice Fields

11.00 - 13.00 Travel to Karfiguela Valley and see farmers' rice fields. Return to Banfora.

13.00 - 14.30 Lunch break -
Recommended Restaurant (La Canne Sucre)

14.30 - 15.30 Return to Bobo Dioulasso

16.00 - 18.00 Drafting and finalisation of proceedings/recommendations of Sessions by Rapporteurs and Discussion Leaders under guidance of Mr. G. Boccara, IARDA

Saturday, Sept. 22 - Technical (Plenary) Session VII -

Presentation and adoption of proceedings and recommendations.

Co-Chairmen

Dr. B.A.C. Enyi
Nominee of Upper Volta Govt.

Rapporteurs

Mr. G. Boccara
Dr. Agyen-Sampong

- 08.00 - 08.15 Proceedings of Session I
- 08.15 - 08.45 Discussion
- 08.45 - 09.00 Proceedings of Session II
- 09.00 - 09.20 Discussion
- 09.20 - 09.35 Proceedings of Session III
- 09.35 - 09.55 Discussion
- 09.55 - 10.10 Proceedings of Session IV
- 10.10 - 10.30 Discussion
- 10.30 - 10.45 Coffe Break
- 10.45 - 11.00 Proceedings of (Informal) Session V
- 11.00 - 11.20 Discussion
- 11.20 - 11.35 Proceedings of Informal Session VI
- 11.35 - 11.55 Discussion
- 11.55 - 12.10 Chairmens' concluding remarks

- 12.10 - 12.15 Announcements
- 12.15 - 14.00 Lunch Break
- 14.00 - 15.30 Travel to Banzo
- 15.30 - 15.45 Welcome by Chinese Mission in Banzo
- 15.45 - 16.45 Refreshment by CERCI and WARDA
- 16.45 - 18.15 Return to Bobo Dioulasso

Handwritten note: CALLED OFF BECAUSE OF PROBLEMS OF FLOODING FROM RECENT RAINS

- 18.15 - 18.25 *17:10 17:25* Vote of thanks by WARDA Sub-Regional Coordinator
- 18.25 - 18.35 *17:25 17:35* Closing ceremony of the Seminar by the Minister for Rural Development of Upper Volta or his nominee.

Announcements

Sunday, Sept. 23

Participants leave for their destinations.

WARDA SEMINAR ON INTEGRATED MANAGEMENT OF RICE DISEASES
AND INSECT PESTS AT BOBO DIOULASSO, UPPER VOLTA

SEMINAIRE DE L'ADRAO SUR LES METHODES INTEGREES DE LUTTE
CONTRE LES MALADIES ET LES INSECTES PARASITES DU RIZ;
BOBO-DIOULASSO, HAUTE VOLTA

(17 - 22 Septembre 1979)

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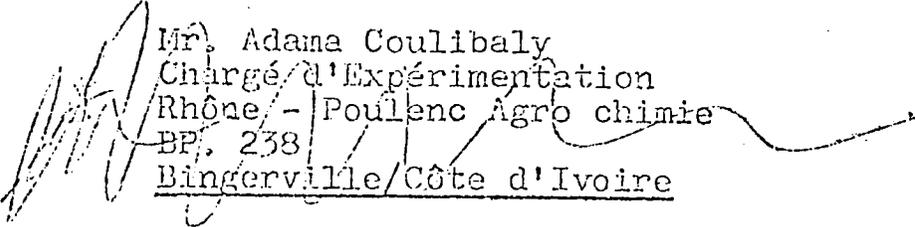
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(continuation)

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CONCEPTS OF INTEGRATED MANAGEMENT OF CROP PESTS
WITH SPECIAL REFERENCE TO RICE*

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Integrated pest control, IPC, also known as integrated pest management, is a convenient term frequently used erroneously to describe any combination of measures for control of pests. To some, IPC even includes the concept of eradication merely because eradication approaches may employ more than one technique of pest suppression. To others, IPC may imply the isolated use of two or more pesticides without an analysis of need or consideration of alternatives. But the meaning of IPC is distinctly different.

The term integrated pest control originally was proposed to describe the integration of biological and chemical control methods (Bartlett 1956, Stern et al. 1959). In the early 1960's, the Food and Agriculture Organization of the United Nations adopted the term and subsequently broadened its definition to emphasize the integration of all compatible tactics into a cohesive pest management system (FAO 1967). A similar broad definition is used here.

Integrated pest control is a system of pest management that utilizes a variety of biological, cultural, chemical, and physical control methods as required to hold pests below economically damaging levels. First consideration is given to the use of naturally occurring mortality elements of the pest environment, including weather, diseases, predators, and parasites. Artificial control measures, notably chemical pesticides, are employed only as required to reduce and maintain the pests at tolerable levels, based on criteria developed to identify when and where control is truly justified. Measures that pose minimal risks to humans, beneficial nontarget organisms, and the environment are sought. The ultimate objective of integrated pest control is to manage pests in an economically efficient and environmentally sound manner.

By systematically spreading the burden of crop protection over a combination of effective control methods, integrated pest control promises rice yield increases and yield stability. For subsistence rice farmers, typical of much of West Africa, IPC promises to reduce pest losses to their crops on a continuing basis and at the lowest cost.

* Paper presented at West Africa Rice Development Association (WARDA) Seminar on Integrated Management of Rice Diseases and Insect Pests at Bobo Dioulasso, Upper Volta, 17-22 September 1979.

PRINCIPLES OF IPC

That integrated pest control is delineated from other approaches to pest control, it is useful to identify principles that characterize the IPC strategy:

1. Potentially harmful species will continue to exist at tolerable levels of abundance.

Integrated pest control rejects the notion that the mere presence of a pest species necessarily justifies action for control. Low level infestations of some pests in the cropping system may in fact be desirable. Noninjurious levels of agricultural insects and mites, for example, may provide important sources of food for natural enemies; complete annihilation of these organisms may starve the natural enemies or force them to migrate from the cropping system and, therefore, produce harmful side effects. The strategy of eradication may be a desirable goal under special circumstances, but the philosophy of pest control based on eradication of pest species is the antithesis of integrated pest control (Smith and van den Bosch 1967).

2. The agroecosystem is the management unit.

Any manipulation of an agroecosystem may aggravate pest problems on the one hand or effectively manage pest populations on the other. Even subtle manipulations may affect the pests. The change to a new variety, rotation to another crop, change in fertilizer, modified row spacing or irrigation schemes, shift from a crop monoculture to a polyculture, or change in pesticide use patterns may cause a rather drastic shift in the status of pest species in a crop or group of crops in a given agroecosystem. The manipulations may productively affect a pest and, therefore, may be used advantageously in integrated pest control programs; but they may also permit establishment of new damaging pest hierarchies.

Integrated pest control strives to manipulate agroecosystems as to hold target pests to tolerable levels while avoiding disruptions that aggravate nontarget pests. Knowledge of the actions, reactions, and interactions of the agroecosystem's components that significantly affect the target pest species, therefore, is requisite to an effective IPC program. With this knowledge the IPC specialist can design the optimal strategy utilizing the natural forces that control or regulate density of the pests (Smith and van den Bosch 1967).

3. Use of natural control agents is maximized.

Integrated pest control emphasizes existing factors in the ecosystem which check the pests' numerical growth: limited resources (food, space, shelter), periodically inclement weather or other hazards (heat, cold, wind, drought, rain), competition within the species or with other plants and animals, and natural enemies. Natural enemies may be insignificant in the control of some pest species; however, they are highly effective against others, particularly insects and mite pests. Although resources rarely seem to be in short supply, weather can be constantly favorable, and competitors scarce or absent, natural enemies of many insect and mite

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species are almost universally present, often significantly so (van den Bosch and Messenger 1973).

Because the combined actions of various natural suppressive forces are potentially significant against all pest species, an important goal of integrated pest control is to alter pest environments so as to enhance the action of the forces. The procedures entail conservation and augmentation of resident natural enemies, introduction of new natural enemies, use of pest-resisting crops and other environmental manipulations, some of which are to be discussed during the WARDA Seminar.

4. Any control procedure may produce objectionable effects.

Use of chemical pesticides has dramatized that any single control procedure can have unexpected and undesirable consequences. But the improper use of any of the alternative techniques, pest-resistant plant varieties, for example, which are generally recognized as highly desirable in integrated pest control, may also produce undesirable consequences. Therefore, a ~~pr~~praise of IPC is that any control technique should be carefully considered in an ecological context both before and after adoption. That there is available today a wider array of techniques of much greater sophistication and potency than ever before makes it extremely critical that pest control be approached in broad ecological terms (Smith and van den Bosch 1967).

5. An interdisciplinary systems approach is essential.

Integrated pest control, if to achieve optimal results on the long term, must be integrated successfully into the socio-economic structure of the farming operation for which developed as well as the surrounding community. Successful integration requires interdisciplinary cooperation in the research and development phases and also in implementation. Cooperating specialists from several disciplines (viz. agronomy, economics, engineering, sociology) in addition to the various pest control sciences are important in collecting the information and formulating the management strategy.

GUIDELINES FOR DEVELOPING IPC PROGRAMS

Because development of a specific integrated pest control program depends on many variables, the kinds of pests involved, resources to be protected, economic values, and availability of personnel, it is difficult to establish absolute guidelines. But the following guidelines generally apply in developing IPC programs, regardless of the pest categories involved:

1. Analyze the "pest" status of each of the reputedly injurious organisms.

A given rice field may be infested with dozens of potentially harmful pest species at any one time. For each situation, however, there are rarely more than a few pest species in sufficient density to cause significant damage. These often recur at regular (and often fairly predictable) intervals.

Of the some 800 species of insects known to cause damage to rice (Grist and Lever 1969), for example, the majority of them do little damage, often only sporadically (Barr et al. 1975). In tropical Asia about 15-20 insect species are considered to be rice pests of major importance and regular occurrence (Pathak 1970, Pathak and Dyck 1973). Rice stem borers, various leafhoppers and planthoppers, rice bugs, rice gall midge, rice hispa, rice leaf folder, and armyworms and cutworms are considered among the most destructive insects (Pathak and Dyck 1973).

Pests that generally recur regularly and cause economic losses if not controlled are the focal point for integrated pest control programs; they are known as "key" pests (Smith and van den Bosch 1967). Most key arthropod pest species lack effective natural enemies.

The key pests contrast to "occasional" pests or secondary pests which attain injurious levels only irregularly when conditions of the natural environment (e.g., optimal weather, low incidence of natural biological control) are particularly favorable for their increase. Another category of pests, "potential" pests, includes potentially harmful species that reside at subeconomic levels unless aggravated by human manipulations of the agroecosystem (e.g., introduction of a new crop variety, use of an insecticide that disrupts biological control) which favor their increase. A final category of pests, "migratory" pests, is exemplified by migratory species (e.g., migratory armyworms or locusts) that do not reside in a given agroecosystem but occasionally enter it, sometimes causing severe damage.

When developing an integrated pest control strategy, it is particularly important that actions taken to manage the focal pests, the key pests, do not aggravate the potential pests. The improper use of insecticides directed at key arthropod pests frequently has resulted in the outbreak of potential pest species. The total fauna of key and potential arthropod pests in a given agroecosystem may be likened to an iceberg in a body of water. The real pests (the key pests), those which usually lack effective natural enemies, are readily recognized above the surface; the potential pests, which may represent 80-90 percent of all the pest species present, are not readily recognized and will remain innocuous if their natural enemies are not destroyed.

A ship navigator views the visible portion of an iceberg as a danger signal to a potentially more serious problem and, therefore, approaches it cautiously. The IPC specialist similarly should approach the management of the key pests cautiously in order to avoid the creation of potentially more serious problems.

The population level that determines whether a reputedly harmful species has attained "real" pest status is the "economic threshold." The economic threshold is defined as the density of a pest population below which the cost of applying control measures exceeds the losses caused by the pest (Stern 1973, Glass 1975). Establishment of economic thresholds for each of the real pests is requisite to any IPC program.

2. Devise schemes for lowering equilibrium positions of key pests.

A key pest varies in severity from year to year, but its average density usually exceeds the economic threshold. This characteristic abundance is known as the pest's "equilibrium position."

Integrated pest control efforts strive to manipulate the environment in order to reduce the key pest's equilibrium position permanently to a level lower than the economic threshold, as illustrated in Figure 1. This reduction may be accomplished using three primary management components singly or in combination:

- a. Deliberate introduction and establishment of natural enemies (parasites, predators, diseases) in areas where they did not previously occur.
- b. Utilization of pest-resistant varieties of crop plants which cause a reduction in the pest's equilibrium position or which simply tolerate the pest at equilibrium position.
- c. Modification of the pest environment in such a way as to increase the effectiveness of the pest's biological control agents, to destroy its breeding, feeding, or shelter habitat, or otherwise to render it harmless. Examples include crop rotation, destruction of crop harvest residues, and soil tillage.

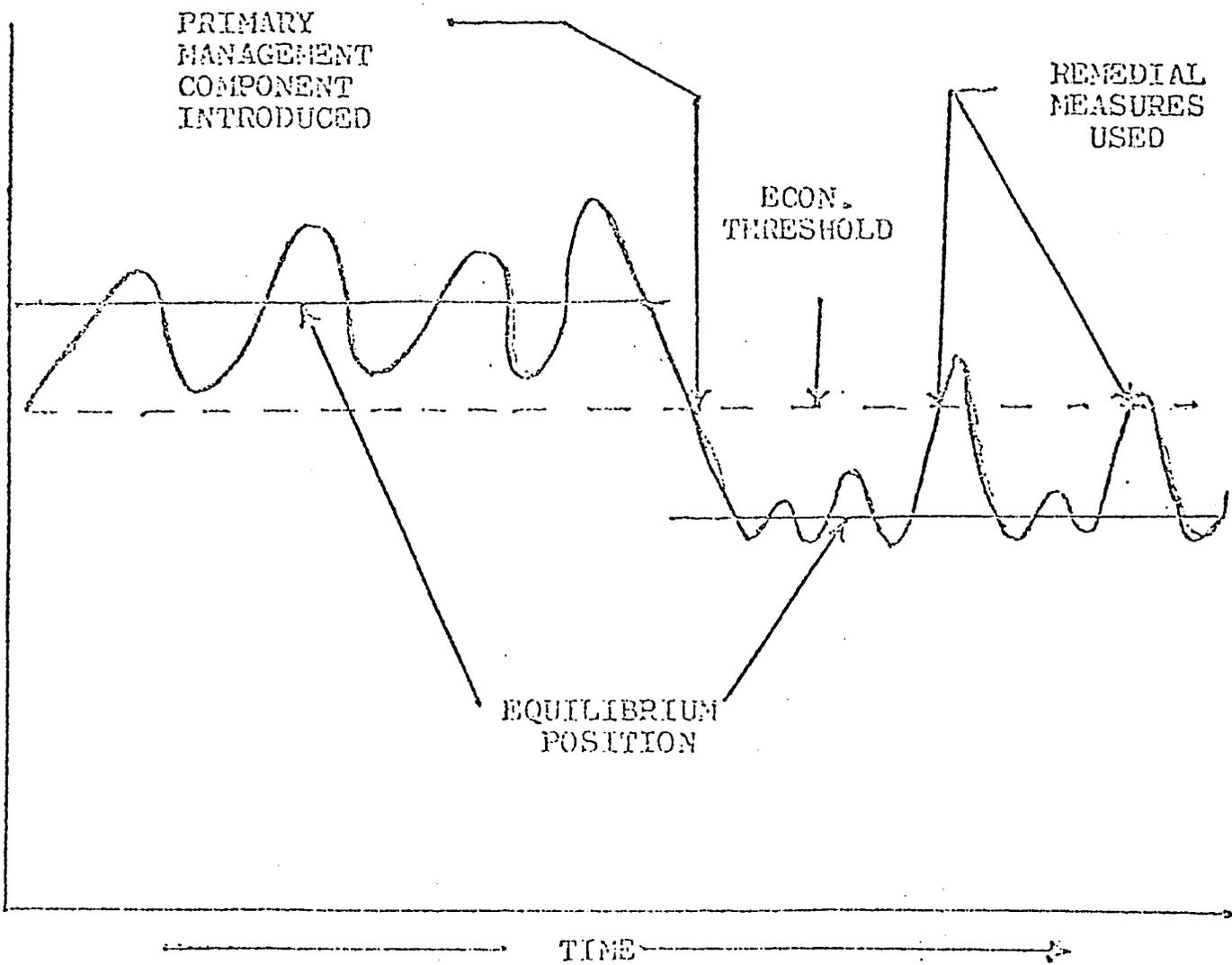
Pest management practices can also raise the equilibrium position of a pest. For example, repeated applications of insecticides may destroy natural enemies, thus creating a higher equilibrium position than when an insect pest was regulated by its enemies. A basic feature of IPC programs is to devise ways to lower the equilibrium positions of major pests while avoiding practices that create environments favorable to pests of secondary importance.

3. During emergency situations seek remedial measures that cause minimum ecological disruptions.

Utilization of the best combination of natural enemies, resistant varieties, and environmental modification may eliminate the need for further action against many key pests except under unusual circumstances. Nearly permanent control of key arthropod and disease pests of some agricultural crops, for example, has been achieved by integrating such cultural practices as plowing and timing of irrigation with pest-resistant crop varieties and conservation of natural enemy populations.

For the occasion when the key pests have flared up or the secondary pests are out of control, remedial measures must be taken (see Figure 1); pesticides may be the only recourse. In integrated pest control programs, selection of the pesticide, dosage, and treatment time are carefully coordinated to avoid ecological disruptions and other problems associated with the improper use of pesticides. Economic thresholds serve to identify when and where the remedial measures are truly justified.

Figure 1
Lowering the Equilibrium Position
of a Pest
(after Rabb 1978)



4. Devise monitoring techniques.

Monitoring is essential to integrated pest control. Pest populations are dynamic, sometimes more than doubling in one day or less or decreasing at a comparable rate. Because weather, crop growth, natural enemies, and other factors that affect population growth and decline are also changing constantly, pest populations and the parts of the environment influencing their abundance must be inspected frequently in order to determine when to apply or relax various control measures. Only through monitoring can the real need for control be known and the natural controls maximized.

How monitoring is conducted depends upon the type of pests involved, environmental conditions, and economic resources. Light traps and traps baited with natural or synthetic lures have been used to monitor a wide variety of insects. Some soil-borne fungal and bacterial pathogens (Baker 1970) and nematodes (Barker and Nusbaum 1971) are detected by soil sampling techniques. More sophisticated IPC monitoring schemes (being implemented in various developed countries) entail the use of computers into which are fed data on pest densities, natural enemies, weather, and other relevant factors. The computers process the information then alert the farmers to what steps, if any, should be taken to correct a pest problem (Tumala et al. 1976). Other monitoring procedures involve no special equipment and very little expense.

OVERVIEW

Perhaps only a few rice agroecosystems and rice-pest complexes justify or even require applications of the total spectrum of integrated pest control techniques. A strategy must be tailored for each pest complex within each discrete rice growing area, and that strategy will vary from year to year depending on value of the crop in relation to the purchased inputs, weather, legislation, social issues, and other factors. Although many rice growing areas in West Africa probably cannot justify the cost requisite to a sophisticated IPC system, the ecological principles of IPC can be applied to the limits of economic justification.

The ultimate test of integrated pest control, of course, is whether or not the farmer uses it. Hence, the development of new IPC technology offers no real utility unless it is adopted successfully by the farmer. Crop protection specialists at all levels of research and extension, therefore, must be committed to develop and to implement IPC programs which meet the needs of farmers and which they can understand and utilize with no great difficulties. Everyone in the rice production system (research and extension crop protectionists, agronomists, plant breeders, and the farmers themselves) should become an effective part of the implementation process.

Farmers are rarely confronted by a single pest problem but rather complexes of pests: different kinds of insects, spider mites, disease-causing organisms, nematodes, weeds, rodents, slugs, and other pests. Measures taken to control one pest or employment of a desirable agronomic practice may unexpectedly create or intensify problems with another pest.

Farmers also have to live with the weather, and pest problems may be multiplied by weather extremes. It is, therefore, obvious that pest control recommendations cannot evolve independently for insects, weeds, nematodes, diseases, or other pests; nor can optimal pest control policies be developed without considering the crop-production system as a whole. Multipest integrated schemes, closely synchronized and integrated into optimal crop production systems, are essential for long-term successful farming. It is clear, then, that all of the people involved in developing and implementing the IPC strategy must communicate and cooperate. Indeed, integrated pest control may appear to some to be an overly ambitious goal, but the recent successful development and implementation of IPC programs in rice in several areas of South-Southeast Asia are proof that the strategy is a realistic goal in rice of the developing world.

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CULTURES : Situation générale au 31 Août 1979

Pluviométrie :

Au cours de cette quinzaine la pluviométrie est améliorée, ce qui a permis à la végétation de reprendre son évolution normale dans les zones ayant subi la sécheresse de la 1^{re} quinzaine.

Dans les départements de Niamey, Dosso, Maradi, Zinder, les pluies ont été fréquentes et abondantes, la répartition a été bonne.

Le département de Tahoua n'a pas bénéficié d'une pluviométrie favorable. Les pluies n'ont pas été très abondantes en général, la fréquence est variable. Les arrondissements de Tahoua et de Keita sont les plus touchés par la faiblesse et la mauvaise répartition des pluies. Dans le département de Diffa les pluies ont été insuffisantes et peu nombreuses. L'arrondissement de Diffa est le plus affecté par la rareté des pluies, ainsi que le Nord du département.

Dans le département d'Agadez, la région d'Ingall a été la plus arrosée. Le niveau de l'eau est remonté dans les puits.

Situation générale des cultures

Sur l'ensemble de la zone des cultures la végétation est satisfaisante, il existe çà et là des zones où celle-ci est médiocre.

Le mil est en cours de récolte plus ou moins avancé pour les premiers semis dans la zone sud de tous les départements. Au fur et à mesure que l'on monte vers le Nord la végétation passe du stade maturation et floraison grenaison à celui de montaison épiaison le sorgho suit les mêmes stades que le mil avec un décalage qui fait que l'on trouve le stade floraison grenaison au Sud, avec un tout début de récolte pour les variétés hâtives, et encore le stade tallage-montaison au Nord en passant par les stades intermédiaires au centre

Dans la zone arachidière les arachides hâtives sont en cours de maturation, mais la plus grande partie

Le niébé est au stade formation des graines et début de maturation pour les variétés hâtives, la ramification et la formation des graines se poursuit.

La culture du riz principalement dans la région du fleuve, pour les ri-

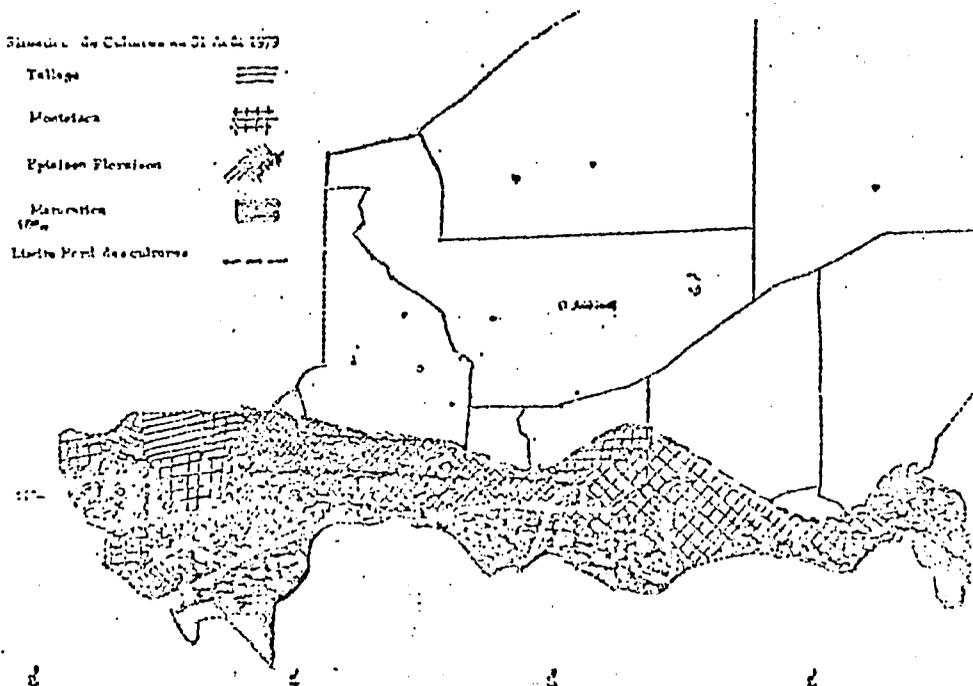
vières traditionnelles, a été perturbée par la crue rapide du fleuve qui a empêché les semis sur des surfaces importantes. La végétation va du stade tallage à montaison.

RAPPEL DES SURFACES ENSEMENCÉES (HECTARES) (ESTIMATION FIN JUILLET)

Départements	Mil	Sorgho	Niébé	Arachide	Riz
Niamey	881.900	86.500	218.500	1.900	22.370
Dosso	600.000	56.000	235.000	16.700	1.900
Tahoua	327.500	184.000	83.000	5.380	420
Maradi	480.900	268.620	220.680	77.010	
Zinder	571.600	156.650	200.000	552.090	
Diffa	38.460	11.900	5200	550	
Total	2.900.360	763.770	960.380	153.630	

Situation des Cultures au 31 Août 1979

- Tallage
- Montaison
- Épiaison Floraison
- Maturation 1700m
- Ligne Vert des cultures



Situation phytosanitaire

Bien que non négligeable, le parasitisme n'a pas été trop préoccupant au cours de cette quinzaine.

Partout les équipes ont pu intervenir efficacement tant avec les moyens terrestres qu'aériens à leur disposition.

Parmi les nombreux parasites auxquels doit faire face la défense des cultures en fin de cycle, la chenille mineuse du mil n'est pas le moindre, mais malheureusement les moyens de lutte s'avèrent souvent inopérants, et le meilleur moyen de limiter les dégâts est la récolte précoce des épis. Parmi les autres prédateurs, les

divers insectes qui s'attaquent aux céréales (Coléoptères, dysdercus, scarabéidés, cantharides) et aux légumineuses (puçerons) ont causé des dégâts qui restent dans des limites normales.

Les sauteriaux, mange mil, se manifestent un peu partout avec plus ou moins d'intensité. La participation à la lutte de l'Oclav a permis de combattre efficacement ces ennemis des cultures. Les rongeurs (gerboises) n'ont été signalés que dans la région de Filingué (Niamey) et Agadez où des appâts empoisonnés ont été mis en place.

Situation alimentaire

Avec le commencement de la récolte du mil, et les apports sur les marchés, les prix ont tendance à diminuer si à Diffa les prix restent stationnaires, dans les départements de Zinder et Maradi ils accusent une baisse plus ou moins importante suivant les marchés.

Le kg de mil est vendu dans le département de Maradi entre 34 et 40 frs, dans celui de Zinder (Mirriah, Magaria, Matamaye) il coûte entre 35 et 40 Frs, par contre dans les arrondissements de Tanout et Gouré les prix restent élevés sur certains marchés, de 45 à 75 Frs à Tanout, de 30 à 125 Frs à Gouré (Kagari).

Dans les départements de Niamey et Dosso la baisse est moins importante de 50 à 98 Frs le kg suivant les marchés. En moyenne le prix est de 80 Frs à Niamey et d'environ 75 Frs à Dosso.

Le prix du kg de sorgho suit les mêmes variations régionales que le mil, généralement un peu inférieur à celui-ci.

DEPARTEMENT DE NIAMEY

Pluviométrie :

Au cours de cette quinzaine les pluies ont été fréquentes et abondantes mettant fin à une période de sécheresse dans les zones de Yatakala (Téra) et Fandou (Filingué).

Situation des cultures

La récolte du mil hatif est commencée sur plus de 15 % des surfaces. Environ 35 % des superficies arrivent à maturité. Sur les surfaces restantes les mils sont aux stades tallage épi-aison.

Le retour à une pluviométrie normale à sauver une situation qui semblait être compromise au cours de la 1^{ère} quinzaine. Il n'en reste pas moins que les dégâts causés çà et là sont importants.

L'insuffisance des pluies de la 1^{ère} quinzaine a empêché d'effectuer les sernis de riz normalement. Par la suite la crue ayant été rapide il n'a pas été possible de semer d'importantes surfaces submergées.

Situation phytosanitaire

Au cours de cette quinzaine la lutte contre les prédateurs s'intensifie. La situation créée par la sécheresse de la 1^{ère} quinzaine a provoqué la pullulement des parasites des cultures.

L'invasion de sauteriaux est importante dans les arrondissements de Filingué et de Ouailam, et a un degré moindre dans ceux de Say, Tera et Niamey.

SUPERFICIES TRAITÉES (hectares)

Départements	Mode de traitement	Surface trait. ha	Produits	Parasites
Niamey (interventions depuis le début de l'hivernage)	Terrestre	4890	20 t 10 kg HCH 920 divers	Sauteriaux insectes divers
	Aérien	10400	8500 kg baraki 2500 fenitrothion	rongeurs tous parasites
Dosso	Terrestre	1654	4605 kg HCH ? Asthoate	tous insectes (mil arachide, niébè)
	aérien	1030	fenitrothion 250 fenitrothion	criquets
Tahoua	Terrestre aérien	5600	1250 kg HCH 1400 fenitrothion	puçerons scarabéidés (mil)
Maradi	Terrestre	4173	18929 kg HCH 1877 divers	tous insectes (mil-arachides-niébè)
	aérien	1206	80 kg thime ? fenitrothion	puçerons
Zinder	terrestre	300		Coléoptères
Diffa	terrestre	en cours		Coléoptères (mil) Cantharides puceron (niébè)
Agadez		20	Frostoxin	gerboises (maïs)

Les oiseaux ont fait leur apparition dans le secteur de Sanam (Filingué) et de Sakoira (Tillabéry).

et de Sakoira (Tillabéry). L'intervention de l'Oclalav a permis d'anéantir la plupart des oiseaux.

Les oiseaux ont fait leur apparition dans le secteur de Sanam (Filingué) et de Sakoira (Tillabéry). L'intervention de l'Oclalav a permis d'anéantir la plupart des oiseaux.

Les traitements terrestres et aériens se poursuivent contre tous les parasites, sautériaux, coléoptères, dysdercus, chenilles etc...

Situation alimentaire

Avec les premières récoltes de mil, la situation alimentaire s'améliore, les prix du mil ont tendance à diminuer ils s'échelonnent de 50 Frs le kg à Téra à 98 Frs le kg à Filingué en moyenne 81 Frs par contre le prix du sorgho est stationnaire 36 Frs le kg.

Situation par arrondissement

Niamey :

Niamey :

Le mil arrive à maturité dans les cantons de Kouré, Kourteré et Dian-tiandou.

L'épiaison est généralisée pour le sorgho.

Le niébé végète dans de bonnes conditions en cours de fructification. Mais la grenaison se poursuit.

Repiquage du riz dans les rizières aménagées.

La situation phytosanitaire est bonne. Attaques de coléoptères nocturnes et chenilles sur les épis de mil 400 ha traités. 4 tonnes HCH.

Say :

Le mil arrive à maturité, la récolte est commencée dans le canton de Kir-tachi. Dans le canton de Torodi la végétation est en retard, du tallage à l'épiaison. Le mil tardif est en montaison-épiation. Le mil en fleur est attaqué par les dysdercus.

Le sorgho est en début de montaison, le niébé est en floraison, l'arachide au stade floraison allongement des gynophores. Le maïs a souffert de la sécheresse les semis ont eu lieu.

Des attaques de dysdercus et de chenilles sur mil. 317 ha ont été traités avec 1070 kg de HCH et 195 l d'as-thoate.

Téra :

Malgré un développement hétérogène dû à la mauvaise répartition des pluies, la végétation est bonne. Le stade dominant est épiation-floraison. 50 %. Le stade grenaison représente environ 10 %.

Le sorgho est à l'épiaison-floraison, le riz tallage montaison.

Arachide floraison-formation des gousses.

Niébé ramification début floraison.

La situation phytosanitaire est bonne, quelques foyers de dysdercus aux environs de Téra et de sautériaux à Yatakala et Méhana. Les interventions ont enrayé les attaques.

Tillabéry :

Dans le Sud de l'arrondissement le mil est en début de maturation la floraison continue. Dans le Nord, Kap-dadji-Ayorou, il n'est qu'au tallage. Le sorgho est au stade nouaison mais a beaucoup souffert de la sécheresse.

Sur les aménagements le repiquage du riz est en cours, en retard sur le calendrier, le riz flottant est au stade tallage, importants dégâts des poissons rizophages. La crue rapide du Niger a limité les surfaces ensemencées. Le niébé est au stade floraison fructification.

Quelques attaques de chenilles dans les cantons Kourtey et Sinder sur mil. La situation phytosanitaire est passable. Les oiseaux sont les prédateurs les plus importants, ils se réfugient dans les parcelles de canne à sucre à Tilla-keina.

Quailam :

Le mil est en épiation-floraison et début maturation dans le centre et le Sud de l'arrondissement, alors qu'il n'est qu'au stade tallage dans le Nord et le Nord-Ouest.

Le tallage est généralisé pour le sorgho. Pour le niébé la ramification et la fructification se poursuivent.

Des attaques de criquets se sont produits dans la zone de Banibangou, des dysdercus dans le canton de Tondikiwindi, des cantharides à Simiri.

Les traitements insecticides se poursuivent.

Filingué :

Le mil est en maturité dans les cantons de Kourtey et Tagazar. Ailleurs

il est en floraison-grenaison, le sorgho est en montaison mais souffre de la sécheresse. Le niébé est en début de floraison.

Toutes les cultures ont été durement touchées par la sécheresse qui a sévit dans l'arrondissement, suivie d'attaques de sautériaux dans le centre du canton de Kourtey et les districts d'Abala et Sanam. Il y a eu également des attaques de scarabéidés dans tous les champs où le mil est en floraison ainsi que des fortes attaques de chenilles.

D'importants dégâts ont été causés par les mange-mil.

DEPARTEMENT DE DOSSO

Pluviométrie :

Au cours de cette quinzaine les pluies ont été importantes régulières et bien réparties sur l'ensemble de l'arrondissement.

Situation des cultures

Avec le retour d'une pluviométrie plus favorable que celle de la 1^{ère} quinzaine, la végétation a repris un développement normal. Mais quelques zones ayant subi des coups de sécheresse (Doutchi), ou ayant des sols épuisés (Dallol-Gaya) auront des récoltes de mil médiocres. Dans le centre du département le stade maturité domine, dans le sud la récolte est commencée dans le Nord c'est le stade épiation-floraison-nouaison qui prévaut.

Situation phytosanitaire

Dans les arrondissements de Bimi, N'Gaouré et de Dogondoutchi ; où la chenille mineuse est apparue et se développe de plus en plus dans les champs de mil à maturité, la situation est préoccupante, le retour des pluies et une récolte précoce permettront peut-être d'enrayer cette attaque.

Dans les autres arrondissements la situation s'est améliorée après les interventions des agents de l'agriculture et le retour des pluies. Néanmoins on enregistre un peu partout des attaques de divers prédateurs pucerons sur niébé à Loga, Bimi, Gaya et Dosso, criquets à Gaya, dysdercus, coléoptères et scarabéidés sur mil à Dosso-Doutchi.

TRAITEMENTS EFFECTUES

Arrondis. semerits	mode de traitement	surface ha	Produits utilisés	Parasites
Dosso	terrestre	80	8 l asthoate	pucerons-sau. dysdercus sca. criquets
Gaya	aérien	250	250 l HCH	
		1030	250 l fenitrothion	pucerons dysdercus coléoptères
	terrestre	184	1500 kg HCH	
		82	235 l asthoate	pucerons dysdercus coléoptères pucerons chenilles
Birni-N'Gou	terrestre	90	575 kg HCH	
Loga	terrestre	1268	29 l asthoate 80 kg HCH	dysdercus-sca- rabeïdés chenil.
			asthoate HCH preprothion	
	terrestre	1654		
	aérien	1030		
	total	2984		

Situation alimentaire

Avec les premières récoltes, la situation s'améliore et les cours de produits baissent légèrement, le prix du mil varie de 60 à 82 Frs le kg et le sorgho de 66 à 90 Frs le kg.

Situation par arrondissement

Dosso :

La récolte du mil est en cours dans le Sud, dans le centre le stade maturité domine, et dans le Nord on observe le stade épiaison-floraison-nouaison. Le sorgho est au stade montaison et dans quelques zones en épiaison floraison.

L'arachide et le niébé sont partout en floraison et début de fructification. Le Voandzou floraison et formation des gousses.

Des attaques de pucerons sur niébé se sont produites dans 5 villages du district de Dosso, des sautériaux dans le district de Tessa, et les dysdercus et scarabéïdés sur 250 ha dans le district de Tounga.

Dogondoutchi :

L'épiaison-floraison est le stade dominant pour le mil dans le Nord et le centre de l'arrondissement, la maturation en cours dans le centre et la récolte est en cours dans les cantons de Guéchémé et Tibiri. Le sorgho est en épiaison floraison. L'arachide, le niébé et le voandzou sont en floraison et formation des gousses.

Des attaques de coléoptères nocturnes se sont produites dans le Nord de l'arrondissement, occasionnant d'importants dégâts. 8000 ha de mil sont attaqués par les chenilles mineuses aux environs de Douthi et la zone touchée s'étend.

La récolte précoce du mil est préconisée pour limiter les dégâts, à défaut d'autres moyens de lutte.

Gaya :

70 % du mil est déjà récolté et ce qui reste, arrive à maturité, 1030 ha ont été traités très efficacement par avion, contre les criquets au Sud-Est de Gaya. Dans le Nord de l'arrondissement le niébé subit les attaques des pucerons.

Birni-N'Gaouré :

Dans le centre et le sud de l'arrondissement le mil est en cours de récolte et de maturation. Dans le Nord il est au stade épiaison-floraison. Le sorgho est lui aussi en épiaison-floraison.

On note la présence de chenilles mineuses sur le mil en cours de maturation et des pucerons sur 30 ha de niébé.

Loga :

Dans quelques villages du Sud-Ouest la récolte est commencée, le stade maturation prévaut à l'Est au centre et au Sud-Ouest, dans le Nord et le Nord-Ouest c'est le stade épiaison-floraison.

Dans le district de Sokorbe les chenilles mineuses sont signalées sur une quinzaine d'hectares, dans le district de Falwel ce sont les pucerons sur niébé TN-88-63.

DEPARTEMENT DE TAHOUA

Pluviométrie :

Répartition très inégale de la pluviométrie provoquant des zones de sécheresse où les cultures séchent sur pied, notamment dans la région de Keïta. Les températures restent élevées, la violence des vents diminue.

Situation des cultures

Malgré la sécheresse persistante dans les régions de Keïta, Tahoua et Illéla, la situation est dans l'ensemble moyenne de nombreuses zones étant médiocres.

Le mil est en cours de récolte dans le Sud du département Konni et Madaoua, en cours de maturation au centre et dans un nombre mesure au Nord.

Le sorgho est en majorité au stade épiaison-floraison, maturation en cours, début de récolte des variétés hatives. Le niébé est en floraison à Madaoua (20 %) et à Keïta. L'arachide est au stade formation des gousses et des graines.

Situation phytosanitaire

La situation n'est pas trop mauvaise, 5600 hectares ont été traités contre les scarabéïdés dans le Nord de l'arrondissement de Madaoua 1400 l de fenitrothion ont été utilisés, dans l'arrondissement de Keïta 1250 kg de HCH ont été utilisés contre les pucerons sur sorgho. L'intervention de l'Oclalav serait souhaitable car dans le Nord du département les mange-mil causent beaucoup de dégâts.

Situation par arrondissement

Birni-N'Konni :

La récolte du mil est en cours dans les districts de Illéla, Guidan-Ider et Konni, les stades montaison épiaison-floraison se rencontrent sur la plus grande partie de l'arrondissement.

Le sorgho est principalement en épiaison-floraison. Dans la région de Galmi le sorgho natif (Mota) est en cours de maturation. Le niébé est en début de floraison, l'arachide est au stade formation des gousses. Le coton pluvial est en début de floraison.

La situation générale est satisfaisante. Des attaques de scarabée des ont été traitées par avion.

Le mil arrive partout à maturité, dans le Sud, la récolte se généralise. L'épiaison 10 % et la floraison 30 % se poursuivent dans quelques zones. La culture du sorgho de vallée est très bonne les stades épiaison-floraison sont représentés sur environ 90 % des surfaces quelques champs arrivent à maturité. Le sorgho dunaire semé en association avec le mil est en floraison et dans quelques zones plus en avance il est en cours de maturation. Le stade tallage est encore fréquent.

L'arachide est en floraison et formation des gousses, le niébé est en début de floraison, dans les zones où la mil se récolte.

Boza : Situation non parvenue.

Kala : La situation est mauvaise, la sécheresse du mois d'août a entraîné le dessèchement des cultures de mil et de sorgho, ainsi que le développement des chenilles mineuses de l'épis sur les mils en cours de maturation.

Le mil souffre beaucoup de la sécheresse dans l'ouest le nord un peu dans l'est de l'arrondissement dans l'ouest et l'est il est aux stades floraison et en cours de maturation. Au nord il est en épiaison, phase végétative nécessitant beaucoup d'eau.

Dans le centre et le sud c'est le stade épiaison qui domine et les pluies sont faibles mais suffisantes. Le sorgho a beaucoup souffert de la sécheresse et des attaques de pucerons, le stade dominant est la montaison avec des cas de tallage et de maturité. Le niébé est en début floraison. Les surfaces sont en extension, et dans le nord il a remplacé le sorgho mal venu.

Ilala : Avec le retour des pluies la végétation est bien répartie le stade principal du mil est l'épiaison grenaison (50 %) et le reste en cours de maturation 30 % et maturité 10 % nulle part la récolte n'est commencée. Le sorgho est principalement en cours de montaison (70 %) et épiaison-grenaison (30 %). Le niébé ramification-floraison 90 % et 10 % en cours de formation des gousses, l'arachide est en floraison 70 % et le reste formation des gousses.

l'ensemble bien que satisfaisante dans le Bambey passable dans celui de Kolfou, mais médiocre dans celui de Tahoua d'importantes superficies n'ont pas résisté à la sécheresse dans les cantons de Tahoua et nord-ouest Kalfou.

Le mil est pour 30 % en montaison-épiaison et le reste en grenaison-montaison. Le sorgho est en épiaison-montaison à 45 % et le reste en grenaison-maturation le niébé début ramification 30 %. Floraison 70 %.

L'arachide floraison 30 %, apparition gynophores 60 % formation des gousses 10 %.

DEPARTEMENT DE MARADI

Pluviométrie : Dans l'ensemble du département la pluviométrie a été satisfaisante. Les pluies sans être très fréquentes ont été assez intenses et bien réparties dans le département ce qui n'exclut pas localement des zones de sécheresse ou d'insuffisance.

SITUATION DES CULTURES

La situation des cultures est satisfaisante, malgré quelques zones de sécheresse (Ouragane). La récolte du mil commence dans le sud du département, en cours de maturation dans le centre et épiaison floraison dans le nord. Le sorgho dunaire est en épiaison, et le sorgho de vallée est au stade tallage montaison. L'arachide est en cours de maturation pour les premiers semis, et formation des gousses pour les autres.

Le niébé hatif est en floraison et début de formation des gousses. Les variétés locales sont en ramification généralisée.

SITUATION PHYTOSANITAIRE

La situation est bonne dans l'ensemble, quelques attaques sont signalées dans diverses localités, mais les traitements sont exécutés immédiatement. Le parasitisme a jusqu'à maintenant peu gêné le développement de la végétation. Toutefois une vingtaine de villages, dans l'arrondissement de Dakoro, sont menacés par les pachnoda et dysdercus.

Les prix des produits ont tendance à baisser. Le mil est en moyenne à 39 F le kg (34 - 40) le sorgho à 36 F le kg (29-40) et celui du niébé à 53,50 francs (27-87,5).

SITUATION PAR ARRONDISSEMENT

Madarounia : Le mil est pratiquement mûr partout la récolte est commencée, il est encore au stade laitex dans quelques poches (Atchidakofoto Maraka - Djirataoua).

Guidan-Rounji : La récolte du mil est commencée, le stade laitex se trouve dans quelques zones des cantons de Chadakori et Sae Saboa.

Dakoro : Le mil est en début de maturation, récolte des Chiara en cours.

Mayahi : Dans le sud et le centre le mil arrive à maturité. Dans le nord il est au stade épiaison début floraison.

Aguié : 80 % du mil est en cours de maturation le reste est en floraison début stade laitex.

Tessaoua : On rencontre 3 stades de développement montaison à l'est d'Ourafane. Début maturation à Dondori, Kona, Est Gabaour Ouast et centre Tessaoua, nord-ouest et sud Ourafane, épiaison floraison dans le reste de l'arrondissement.

DEPARTEMENT DE ZINDER

Pluviométrie

Pluies généralement abondantes et fréquentes dans les 3 M plus faibles et moins fréquentes à Tanout et Gouré. A la suite de fortes pluies quelques inondations se sont produites dans la cuvette de Dan Barto à Matamèye.

SITUATION DES CULTURES

La situation est satisfaisante pour toutes les cultures en particulier pour le mil et le sorgho : la maturation est en cours pour le mil dans les zones les plus avancées. Partout le stade épiaison-floraison domine. A Tanout et Gouré on trouve du mil au stade montaison.

SITUATION PHYTOSANITAIRE

Dans les arrondissements de Magaria, Mirriah et Tanout divers prédateurs se sont manifestés. Coléop-

SURFACES TRAITÉES

Arrondissements	Mode traitement	Surface traitée (ha)	Produits	Parasites
Madarounfa	Terrestre	168	1550 kg HCH	Coléoptères - sur mil
			17 l gamma 20	chenilles
		200	206 l divers	Pucerons sur arachide
			20 kg thimet	niébé
		69	130 l préprothion 2 l 45-12	prévention niébé coton
Guidan-Roudji	Terrestre	250	2.300 kg HCH	Coléopères sur mil
			340 l Asthoate	pucerons sur niébé et arachide
	Avion	1.206	Fénitrothion	pucerons
Da'koro	Terrestre	250	2.500 kg HCH	Coléoptères mil
		120	120 l Asthoate	pucerons arachide
Mayah	néant			
Aguié	Terrestre	1.017	5344 kg HCH	Sautériaux et coléoptères sur mil
		400	437 l Asthoate	Pucerons sur niébé et arachide
Tessaoua	Terrestre	1.341	7235 kg HCH	Sautériaux coléoptères
			625 l Asthoate	Dysdercus, cantharides sur mil
			et Gamma 20	
	Terrestre	4.173	18.929 kg HCH	
			1.877 l divers	
	Avion	1.206	80 kg Thimet	
	Total	5.379		

tères et chenilles sur mil, larves de sautériaux et oiseaux ainsi que des pucerons sur arachide et sorgho.

SITUATION ALIMENTAIRE

Avec d'importants apports sur les marchés, les prix continuent à baisser, le kilo de mil vaut 35 à 40 francs à Magaria et Mirriah-Matamèya. Ces prix sont plus élevés à Tanout de 45 à 75 francs et Gouré de 30 francs jusqu'à 125 francs à Kagari. Les prix du sorgho sont moins élevés de 28 à 32 francs le kg à Matamèya de 32 francs à 45 francs à Tanout et 30 à 95 francs à Gouré.

SITUATION PAR ARRONDISSEMENT

Mirriah : Le mil est au stade épiaison-floraison à 80 % les 20 % restants sont en grenaison maturation. Sorgho tallage 10 % montaison 90 %.

Arachide enfoncement des gynophores 30 % formation des gousses 70 %. Le niébé 50 % en floraison 50 % formation des gousses. Présence d'oiseaux dans la zone Kissambana et Jigawa.

Magaria : Mil floraison 30 %, grenaison maturation 60 %. Sorgho le stade montaison est général 95 %, pour l'arachide c'est le stade formation des gousses 90 %, de même pour le niébé 80 %. Environ 300 ha mil sont attaqués par des coléoptères, dans le canton Gouchy des larves de sautériaux sont signalées.

Matamèya : Dans les districts de Matamèya et Yaouri la stade grenaison montaison domine. Le sorgho est en montaison à 90 %. Les variétés natives d'arachide et de niébé sont en cours de maturation, les tardives au stade formation des gousses.

Tanout : Le mil est au stade épiaison-floraison (60 %) grenaison (20 %) montaison (20 %), le sorgho montaison 60 % tallage 35 %. L'arachide est en floraison et le niébé ramification 80 % début floraison 20 pour cent.

Dans les districts de Adjiri et Tanout se produisent des attaques de chenilles sur le mil, les surfaces ne sont pas encore estimées, dans les cantons de Tarka et Tanout les mange-nil évoluent sur des surfaces assez importantes. L'intervention de l'OCLALAV est envisagée.

Gouré : Un peu partout on trouve le mil au stade grenaison maturation le reste est au stade épiaison sauf alentours de Gouré où il est en montaison, quant au sorgho il est au stade montaison dans tout l'arrondissement. L'arachide est en floraison dans le district de Karguéri, et formation des gousses dans celui de Zagari. Pas de présence importantes de prédateurs signalés.

DEPARTEMENT DE DIFFA

Pluviométrie

En général la pluviométrie a été faible et mal répartie. Le sud et l'ouest du département sont les régions les mieux arrosées.

SITUATION DES CULTURES

La situation des cultures est généralement satisfaisante dans le sud et l'ouest du département. Dans l'arrondissement de Diffa on a observé des zones de sécheresse.

Le mil est en cours de maturation partout, la récolte est commencée à Maïné-Soroa. Au nord de la route nationale on trouve le stade de grenaison. Malgré les faibles précipitations le sorgho poursuit son développement épiaison (70 %) et montaison (30 %).

Le maïs est à tous les stades, des semis à la récolte au bord du Lac et de la montaison à la marutité dans les autres zones.

Le niébé et l'arachide ont un développement satisfaisant mais la rareté des pluies gêne la végétation. Début de la fructification. Pour le riz le tallage est généralisé.

Situation Alimentaire

(suite de la page 22)

SITUATION PHYTOSANITAIRE

Les chenilles de l'épis causent des dégâts, les paysans récoltent précocement. La lutte se poursuit contre les coléoptères nocturnes à Mainé. Contharides et pucerons sont apparus sur la niébé. La recherche des dortoirs d'oiseaux se poursuit, les méthodes traditionnelles sont pratiquées pour sauvegarder les épis mûrs. La situation phytosanitaire n'est pas alarmante.

SITUATION ALIMENTAIRE

Les prix des denrées alimentaires restent fixes, mil 90 F le kg, sorgho 80 F le kg et niébé 140 F le kg.

SITUATION PAR ARRONDISSEMENT

Diffa : Pour le mil les stades observés vont de la floraison à la maturation. Quelques villages commencent la récolte dans l'ouest de l'arrondissement. D'autres villages sont touchés par la sécheresse, 11 dans le sud-est et 4 dans le nord.

Le sorgho de décrue commence l'épiaison, le stade dominant est la montaison, quant au sorgho dunaire la montaison est généralisée et début épiaison. Arachide et niébé floraison-formation des gousses. Le maïs est à tous les stades, de la levée à la récolte au bord du lac. Riz tallage général.

Mainé-Sana : La situation du mil est satisfaisante malgré un début de sécheresse au nord de l'arrondissement. La récolte est en cours dans le sud et l'est. A l'ouest la végétation s'étend du stade floraison au début de maturité. Dans la région de Goudoumaria et nord Kelakam c'est l'épiaison-grenaison.

La végétation du sorgho est retardée par le manque d'eau, les stades montaison-épiaison sont généralisés. Arachide et niébé souffrent de sécheresse la floraison et la fructification sont les stades dominants.

N'Gaïyri : Bon développement du sorgho au bord du Lac les semis ont été échelonnés suivant le retrait des eaux. Les premiers sorghos semés

sont en montaison le stade tallage-montaison domine pour le mil.

DEPARTEMENT D'AGADEZ

Pluviométrie

Les précipitations ont été plus nombreuses, au cours de cette quinzaine, durant la quinzaine précédente. La région de In-Gall a été la plus arrosée. Le niveau de l'eau dans les puits est monté avec les crues des koris.

SITUATION DES CULTURES

Les semis de maïs ont été terminés cette quinzaine la végétation du maïs va de la levée au début de maturation mais la plus grande partie des surfaces est au stade tallage-montaison. Il en est de même pour le mil et le sorgho.

SURFACES SEMÉES (ha)

	Mil	Sorgho	Maïs
Agadez	15	5	305
Arlit	-	-	45
Total	15	5	350

SITUATION PHYTOSANITAIRE

Les gerboises causent des dégâts aux jeunes plants de maïs ou détèrent les graines dans les régions de Tabelot et de Azzel. Les attaques ayant été constatées à temps il a été distribué des appâts empoisonnés aux phostoxine.

SURFACES TRAITÉES

Tabelott 15 ha
Azzel 5 ha

SITUATION ALIMENTAIRE

La baisse de certains produits alimentaires se poursuit le mil est à 66 francs le kg et le sorgho à 55 francs par contre le prix du riz (200 F le kilo) ne bouge pas.



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American Embassy

B. P. 11201
NIAMEY

Dale Bottrell
University of California, Berkeley
UC/AID Pest Management and Related
Environmental Projection Project
2288, Fulton Street, SOITC. 310
Berkeley, California 94704

18 October 1979

Dear Dale,

I am sending you a typed up copy of the guidelines on pesticides prepared for HCP Niger before your departure.

It gives me a good idea of the framework of an IEE and I am sure it will prove to be very useful when the time comes for preparing such a document.

Hope you had a good trip back.

Best Regards,

Yours sincerely,

Harold L. Dickherber
HCP Liaison Officer

To : Harry Dickherber
NCP Liaison Officer

From : Dale G. Bottrell
University of California, Berkeley
UC/AID Pest Management and Related
Environmental Projection Project
2288 Fulton Street, SOITC. 310
Berkeley, California 94704 (USA)

7 October 1979

Harry,

I am depositing some material with you which hopefully will be useful when you begin work on the PID (or PIDS) as required for your new project(s). According to the Terms of Reference Dr. F.W. Whittenmore had given me (Ref. State 239662), my assignment in Niamey had two objectives:

- (1) To evaluate local crop protection problems and to identify possible pesticides (presumably as requested in Conly's letter, dated 31 July 1979).
- (2) Prepare a draft IEE and environmental assessment, if the latter was required.

I believe I received enough information from you et al in Niamey as to complete objective (1). Upon return to the USA late this month, I immediately will begin work on accumulating Insect Control Guides etc., from the Land Grant University Cooperative Extension Services, Federal Extension and other USDA Agencies, and EPA which should allow identification of EPA - Registered Pesticides acceptable for use on major food crops in Niger. Some of the pests for which information was requested (in Conly's letter, dated 31 July) do not exist in the USA. But many of them also occur in the USA, hence, I believe control guides and other information I can get from the Universities/USDA/EPA should nearly satisfy

the requests in Conly's 31 July letter. I'll attempt to identify other sources (DAO, etc.) for the information I cannot locate. I am sure Whittmore will agree to cooperate also. We will get the information to you asap, hopefully by no later than 1 December.

Obviously, because you are several months from beginning work on your PID(s), there is little percentage in putting together an IEE at this time. But I would like to offer some general guidelines for you and/or the Environmental Project Officer in Abidjan to consider. Hopefully, our discussions have been of some value -- at least they should have given you some insight into the kinds of things you will want to avoid (or not to avoid) in the IEE. I strongly suspect that USAID Washington will demand an Environmental Assessment if your project gets into the distribution-supply business via UNCC, as you described. One may be demanded anyway -- things like this are difficult to predict. My best advice to you and/or the Environmental Project Officer in Abidjan is to follow closely the instructions in REG. 16, Part § 216.3 (b), (1)-(3). As I have said repeatedly the best assurance against a delay in Washington (and the ^{battle} that may ensue) is to be convincing in your IEE that you have followed and understand the pesticide procedures.

It is particularly important to follow the outline, (a) - (1), on page no. 42-6 § 216.3 (1) (i), which is fairly straight forward and clearly written (I assume you have access to Reg. 16):

(a). USEPA Registration Status

I suggest you consider a table in the IEE showing all pesticides as follows:

Pesticides	Actual oral LD50 MG/KG	Laboratory Animal	Registered without restriction	Restricted	CROPS ON WHICH TO BE USED				
					IPAR	(Cowpea	Sorghum	Millet	Peanut)

INSECTICIDES

DIAZINON 4EC	300-400	Male white rat	x		x	x	x	x
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(formulation should be shown i.e.-

1EC means a specific formulation,
2EC means another.
The control guides I am to send should help you decide which formulation to use. Of course, you may have to use what's available in the area.)

Note: The crops on which to be used and the crops for which registered may not be the same. When a discrepancy exists, it should be noted.

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(a) (continued) any additional information on registration status (e.g., registration applies only to a given formulation — granular formulation of carbosform 2/3) is desirable. I plan to send you as much information for the purpose as I can scratch up.

(b) The basis for selection of the requested pesticide: (just don't say that the local agencies like to use it!). Such things as local availability, efficacy (citation of hard data to support the pesticides use is particularly useful), costs, lack of information on alternatives, no known alternatives, etc., should be considered.

(c) Extent of use of the pesticide in an integrated pest management program— (This is a very important aspect!). You should carefully describe the way pesticides are to be used in the context of the farming operation (in the case of their use on growing crops): are they to be applied preventively, i.e., independent of the pest density, on the assumption that damaging pests will develop? or are they to be used more or less as a last resort after the non-chemical measures (resistant varieties, natural enemies — predators, parasites, etc.) have been applied but monitoring discloses that the pests still are causing damage. Evidence that the pesticides are being used in integrated pest management (IPM) systems will be viewed favorably. I suggest you reference the "PLANNED" FAO — CIMSS IPM Project, the effort in crop-pest surveillance (described to us by Rene Belque), and any other activities which indicate that efforts are being made to develop IPM Systems into which the pesticides will be integrated.

(In this regard, I hope USAID Miami will do everything possible to encourage crop-pest surveillance and Research/Extension activities leading to the development and implementation of IPM Systems.)

(d)...Methods of application..

You need to be specific — formulation (EC, ULV, GRANULAR) and procedure (aircraft, soil treatment, seed treatments — pesticide dust shaken in sack with seed, etc.) should be described clearly — you may want to consider the information in a table if many pesticides are to be used.

(e)...Routes and Long-Term toxicological hazards....

The Farm Chemicals Handbook provides some toxicological data. The pesticide label is another source. Rene Belque and colleagues should provide additional sources. I suggest you have George Schaeffer's paper as a general guide.

(f)Effectiveness....

I suspect you'll encounter problems in obtaining "Hard Data" for all the pesticides to be used, but it would be desirable to present as much as possible — perhaps in a table.

(g).... Compatibility...

Value judgments enter in here. Rene Beique et al could be of some assistance — Schaeffer's Report also.

(h)Conditions ...

Fairly self explanatory.

(i)...Availability and Effectiveness of other Pesticides or Non-Chemical methods

Here, stress the difficulty in obtaining good information on alternative pesticides in this area of Africa; also, point out that, though the trend here points favorably toward the increased use of IPM Systems and Non-chemical alternatives, the research base is lacking any information on the effectiveness of IPM and alternative pesticides is based largely on experience in other countries where environmental conditions may be much different.

In this regard, Schaeffer's report recommends research to seek alternatives to Thioral. Was there any follow-up? I'll try to salvage (from experiments stations in USA in charge of work on seed treatments) as much information as I can on seed treatment options. The Land Grant University control guides I will send generally are based on back-up research. So when the control guides list a particular pesticide for a pest under consideration in your project, you could cite them as a source for the effectiveness on alternatives to pesticides now being used in Niger. While the alternatives (listed in USA Control Guides) may satisfy USEPA and USAID requirements (that is, their use may be a green light to your project's approval), they may not be effective under Niger conditions. Therefore, you should specify, when appropriate, that your project will strive to use only USEPA registered pesticides (without restrictions) but the question of their effectiveness (and availability) has not been resolved, i.e., be careful about restricting your options too narrowly.

(j)Requesting Country's Ability to Regulate

Schaffer's report addresses this aspect, and the description in his report appears valid today.

(k) and (l) The provisions made for training.... Monitoring....
The use and effectiveness of the Pesticide.

This is an important aspect of the IEE and will be reviewed carefully. The training of a "certified applicator" (trained in USA, working on your project) for your project would seem to eliminate a lot of hassle you are apt to encounter if your project calls for Restricted Pesticides. I'll check into this possibility. The main thing here is that your IEE has to present a convincing argument that any pesticides (particularly the restricted ones or those on the RPAR) used in your project will be applied (and monitored) by project personnel who are qualified to do such.

You'll want to give particularly close attention to § 216.3(b)(1)(ii) on the use of Restricted Pesticides and the evaluation of user hazards (or other hazards, e.g. environmental). Section (iii) that follows explains when an environmental assessment or environmental impact statement will be registered. The rest of §216.3 is very clear and needs no interpretation from me. Section (v) at the bottom of page 43-6 may be an important "hedge" for you in the event time comes to produce a PID and you still haven't located pesticide choices which are apt to be "frowned" upon in Washington. Sections (2) (i) and (iii) on the next page (3 app.43) seem to apply in your case, and I would figure out (if I were you) what constitutes "emergency conditions" and "research" and use these provisions insofar as possible. As a suggestion you may cable Whittemore and request him to send an IEE from a related project which exercised the "exception" options under §216.3 (2).

The attached table is for your use I'd suggest against distributing it outside of USAID. I think it shows in a "nutshell" the problem you are up against in Niger. Most (actually only half) of the materials shown here (3/5 of the five most commonly used) use "no-no's", according to USEPA standards. Though they are still being used freely in Niger, by the crop protection service, they are now restricted or apt to be restricted soon in

the USA if not cancelled or suspended. It is my opinion that restrictions, cancellations, and suspensions will continue to grow and US AID regulations will grow accordingly. Consequently, your problems are apt to worsen so long as your projects continue to employ pesticides. The trend of thought in the USA today (and one I believe is well founded) is to seek non-persistent compounds with high LD 50 values and to use them only as a last resort in IFM systems. These govern guidelines (non-persistence, high LD50 values, IFM), therefore, should probably be followed in putting together any USAID project that is to employ pesticides.

I enjoyed working with you in Niamey. You were most cooperative and receptive to my suggestions, and I especially appreciate your giving so much of your time to me. Please feel free any time I may be of assistance. When I'm in the USA, the address shown on the front page is for my office. My home address is:

S. R. Box 3
Hunting Creek Road
Huntingtown, Maryland 20639 (USA)
Telephone: 301:535:0740

Best Regards,

Dale.

TABLE

PRINCIPAL PESTICIDES USED IN NIGER ^{1/}
 BY SERVICE DE LA PROTECTION
 VEGETALE

PESTICIDE ^{2/}	TOXICITY (Acute Oral LD ₅₀ MG/KG) ^{3/}	Current USEPA Status ^{4/}
* Dimethoate	371	R PAR
* Fenitrothion	500	
* HCH	?	R PAR
* Lindane	88-125	R PAR
* Propanil	95-104	
Ircmophos	3750-7700	
Cararyl	500	Pre R PAR
Blazinon	300-400	
Malathion	1375	
Kevinphos	3.7-12	R
Oxy Demeton-methyl	56-65	
Parathion ^{5/}	13	R
Phorate	2-4	R
Aluminium Phosphide	?	R
Pyrimifos-methyl	?	?
Pyrethrines Synthetiques ^{6/}	?	

^{1/} Information supplied by Service de la Protection des Vegetaux.

^{2/} Pesticides have several names, common, chemical, and trade names, for example. Names shown here generally are common names. The five most commonly used pesticides, administered by Service de la Protection des Vegetaux, are indicated by * (information supplied by Rene Baique of Pluritec Consultants).

^{3/} Milligrams of active pesticide ingredient per kilogram of body weight of laboratory animal (usually rat) required to kill (when injected orally) 50% of the laboratory animal population. LD 50 values generally are considered useful in determining the relative hazards of pesticides to humans: the lower the value, the greater the immediate hazards. The LD50 values presented are from Farm Chemicals Handbook, 1977 which is outdated (there is probably a 1979 edition). The values, therefore, are not necessarily those currently accepted by the U.S. Environmental Protection Agency (USEPA), and should not be reproduced.

^{4/} The status of registration changes very quickly, therefore, the "Current Status" (based on early August 1979 information) may not be exactly current. Unless indicated differently, the pesticide is registered without restriction

TABLE (continuation)

Unless indicated differently, the pesticide is registered without restriction by USEPA, i.e., the user of the pesticide does not have to be certified (as a certified applicator). Of course, the material can only be used, legally. According to registration specifics (on the specific crops which registered and at specified rates and frequencies of application etc).

RPAR - Indicates that a notice of rebuttable presumption against registration has to be issued.

Pre-RPAR - Indicates that a pre-RPAR is being considered.

R - Registered by the USEPA on the basis of user hazard.

5/ Registration of parathion (also known as ethyl parathion) limited to products packed in 1 - gallon containers or larger.

6/ Synthetic pyrethroids are a class of chemical insecticides and include several products, not just one.

TO : Mr. Jack M. Cornelius
Agr. Development Officer

October 22, 1979

SUBJECT: Review of Pesticide use Proposed for
Nimba Rural Technology Project,
Upper Nimba County

With reference to the attached cable concerning pesticide use in the subject Project, I visited Liberia during the period October 15-22. Mr. Van B.S. Henderson, Project Manager, arranged for all activities related to my assignment. He accompanied me to the proposed Project area in Nimba County and arranged sessions with personnel of Partnership for Productivity (PFP), the agency to assume primary responsibility for implementation of the Project. I want to acknowledge Mr. Henderson's excellent cooperation and help on this assignment. He devoted nearly an entire work week helping me on the assignment; he cooperated fully in answering my questions and fulfilling requests pertaining to the assignment; and he was receptive to my suggestions regarding pesticide use in the Project.

As stated in the attached cable, I was sent to Liberia to secure essential data on pesticides, and to assist the USAID Mission in revising the Initial Environmental Examination (IEE) and in preparing the required Environmental Assessment (EA) on pesticide use. The IEE is required of all USAID Project proposals; an EA is required when a Project includes assistance for the procurement or use, or both, of some pesticides, as specified in PART 216 - ENVIRONMENTAL PROCEDURES of Regulation 16 of the Code of Federal Regulations. Lindane, identified in the Nimba County Project IEE sent to Washington, is an example of such a pesticide.

The U.S. Environmental Protection Agency (USEPA) has issued a so-called "rebuttable presumption against re-registration" (RPAR) of Lindane, meaning that the pesticide probably will be cancelled or suspended in the USA. Under these circumstances, in addition to the routine IEE, a detailed risk/benefit analysis (i.e., the EA) of use of the pesticide is required. Only three

other pesticides were identified in the IEE sent to Washington: MCPA and Diazinon on swamp rice and cuprous oxide on coffee and cocoa; use of these latter materials does not require an EA. The use of Lindane was proposed only for coffee and cocoa.

However, in Nimba County last week, Mr. Henderson and I learned that PFP personnel want to use numerous additional pesticides: (conceivably 25 or more) and to include crops and animals that were not identified in the IEE. These proposed additions create some problems:

One, I am not familiar with some of the pesticides. PFP could identify some only by brand name, not chemical name, and some could be identified only by foreign manufacture. I must, therefore, do some searching at USEPA before I can determine the chemical content of the materials and whether or not they are registered for use on the various crops and animals to be included in the Project. Second, some of the pesticides proposed for use on food crops in the Nimba County Project have been suspended or cancelled by the USEPA because of potential human health effects (e.g., cancer). With others, USEPA has issued the RPAR noted above meaning that suspension or cancellation is probably imminent. The use of Lindane on coffee and cacao may be justified; there appears to be no acceptable alternatives, and use of the material is reported to be essential in preventing severe pest damage. If used under close Project supervision and if certain other steps could be followed, a convincing Environmental Assessment may meet approval. But I have my doubts about the justification of Lindane and two other pesticides, BHC and dieldrin, on rice, for example. Diazinon may be an effective alternative for use against some rice pests; perhaps there are other potential acceptable candidates. In any case, if at all possible, only pesticides registered by USEPA for use without restriction should be sought. Without a really convincing argument that acceptable alternatives do not exist, inclusion of other pesticides will complicate approval and implementation of the Project.

I believe the following procedures will be important in facilitating rapid approval and implementation of the Project and offer them to you and Mr. Henderson for consideration.

Immediately upon return to USA, I will apprise Dr. F.W. Whittemore, Food Crops Production Division, Office of Agriculture, Bureau of Development Support, USAID, Washington, D.C. 20523 (Telephone: 703:235-2310), of the problem. I suggest you or Mr. Henderson contact him if new questions arise.

SUGGESTIONS:

(1) According to paragraph 216.3 (b)(1)(v) in the Environmental Procedures mentioned above, if a Project includes procurement or use, or both, of pesticides, but the specific pesticides to be procured or used cannot be identified at the time the IEE is prepared, the procedures, referred to as Pesticide Procedures (paragraphs 216.3 (b)(1)(i) through (iv), will be followed when the specific pesticides are identified and before procurement or use is authorized. Where identification of the pesticide to be procured or used does not occur until after Project Paper approval, neither the procurement nor the use of the pesticides shall be undertaken unless approved in writing, by the Assistant Administrator (or in the case of Projects authorized at the Mission level, the Mission Director) who approved the Project Paper.

I believe these procedures may apply to the Nimba County Project. Presently, the specific pesticides to be procured or used cannot be identified although PFP personnel have some ideas. I suggest that you request approval of the Project with the understanding that the procedures for procurement or use of pesticides will be followed, i.e., neither procurement or use will be undertaken unless approved in writing by the person approving the Project Paper.

(2) In the interim, I suggest that PFP personnel take a hard look at their proposed use of pesticides. I will be glad to assist on this task. In fact, I have prepared the guidelines appearing as the second attachment for this purpose. The material is self-explanatory; if the PFP personnel follow my instructions closely and supply the requested information soon, I can proceed to revise the IEE and to complete the EA, if the latter is required. Upon return to the USA, I will begin work immediately in identifying acceptable pesticides for use in the Project. I hope you and Mr. Henderson will urge PFP personnel to get the requested material to me soon. You may want to send it via international pouch. In any case, please see that it goes to me c/o Dr. F.W. Whittemore, whereabouts listed above.

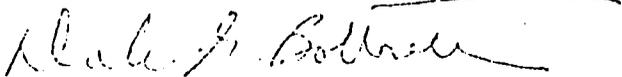
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(3) I suggest that you and Mr. Henderson do everything possible to "up" the level of understanding of proper pesticide use and particularly pest management among PFP Project personnel. As I see it, the primary problem now is lack of expertise in the area of integrated crop protection which includes the use of pest-resistant varieties of crops, crop rotation, regulation of planting dates, biological control, and selective use of pesticides. The PFP personnel, because of lack of expertise in this area, have selected pesticides as a first line of defense; by contrast, persons trained in modern principles of integrated crop protection would have selected pesticides as a last resort, only after the non-chemical and cheaper methods of control failed. I believe this lack is a real weakness of the Project. I discussed the problem at length with PFP personnel and Mr. Henderson and made several suggestions as to how the problem may be corrected. Perhaps Mr. Henderson will want to apprise you of these discussions.

On the positive side, I was impressed with the attitudes and capabilities of the PFP personnel. They were receptive to my suggestions, and they acknowledged their lack of expertise in principles of integrated crop protection. Consequently, I believe with proper guidance and assistance they will strive to seek safe pesticides and desirable alternatives. I like the idea of the Farmer Training Center around which the whole rural development Project is to be centered.

I greatly enjoyed my short visit in Liberia. Please feel free to contact me anytime I can be of assistance.

Best regards.


Dale G. Bottrell
University of California, Berkeley
UC/ATD Pest Management and Related
Environmental Protection Project
2288 Fulton Street, Suite 310
Berkeley, California 94704

Attachments: (1) Cable from F.W. Whittemore to J. Cornelius
(2) Material for PFP personnel

cc: Dr. F.W. Whittemore
Mr. Van B.S. Henderson

TO : Mr. Van B.S. Henderson
Project Manager

FROM : Dale Bottrell

SUBJECT : Request for Additional Information on Pesticides
from Pf? Personnel

DATE : October 22, 1979

Relative to conversations with Jack Cornelius yesterday and you this a.m., I am assuming that you plan to limit procurement and use of pesticides in the Nimba Rural Technology Project to those that are registered by the U.S. Environmental Protection Agency (USEPA) for use without restriction; and that purchases of pesticide materials will be through U.S. suppliers.

This arrangement will eliminate some of the hassle likely to be encountered with some pesticides discussed in Nimba County last week. Over the weekend, I reviewed several Environmental Assessments of pesticide use from other USAID projects that have used materials as Lindane, Dieldrin, and BHC on basic food crops such as rice and vegetables. Although under special circumstances (e.g., the Project agrees to provide regular chemical residue analysis of the treated crops and to purchase and destroy crops contaminated with residues exceeding a specific level) use of the materials may be justified, chances of Project funding and implementation are reduced; definitely, their use would slow down procedures for Project approval.

Because Lindane has been used in the Lofa-Long USAID sponsored project on cocoa and coffee, its use on these crops may be justified in the Nimba County Project, especially in view that there are no known acceptable alternatives.

In any case, your decision to limit procurement and use to USEPA - approved (and U.S. supplied) pesticides (Note: Lindane on coffee and cocoa as one possible exception) simplifies red-tape requirements somewhat, although a revised initial Environmental Examination and Environmental Assessment (if Lindane is used) will be required

(refer to my letter to Mr. Cornelius). Unfortunately, it will require some added work from PFP personnel in Yakepa. However, I have made a special effort to simplify things required of them. I believe the attached material for them is self-explanatory; it should not present any major problems. They may have to consult with personnel of the Ministry of Agriculture for some of the information requested.

As soon as I receive the material requested from PFP, I'll go to work in completing the required Environmental Examination and Environmental Assessment, if I determine the latter is required.

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Request For Pesticide Information
From PFP Personnel Involved in Upper
Nimba Rural Technology Project

- * Please complete Tables 1 and 2 and return to Van Henderson as soon as possible.
- * In Table 1, for each pesticide, except Thuricide, list the Trademark Name and Active Ingredient, using Perfectan, as shown, as the model example. Please consult the manufacturer's label for this information. Please print (or preferably type) legibly.
- * In Table 1, for each pesticide, place an "X" under the crop and/or animals (chickens, swine) to be used. Please list other crops (or other uses) that might have been overlooked; but please be realistic, i.e., don't show a use unless confident that the use is essential.
- * In Table 1, pay close attention to footnote 1/. Use of any pesticide noted with 1/ will require special justification. The use particularly of Perfectan (and other forms of Lindane), BHC, and Perfekthion (note: this latter is also one) should be avoided if at all possible. Suggest you consult with Liberian Ministry of Agriculture (MOA) personnel about possible alternatives to these pesticides, especially to BHC, Perfectan, and Dieldrin for use on rice. Also, seek alternatives for all others noted with 1/, if at all possible.

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- * After visit with MOA personnel and if you still feel strongly about the need for one or more pesticides noted with 1/ in Table 1, you must complete Table 2.
- * Footnote 5/ of Table 1 : If in doubt about whether or agent is not an animal disease control / a "pesticide" go ahead and list the material, showing Trademark Name / Active Ingredient and the use (chickens, swine).
- * Note: Treat spreaders/stickers (i.e., additives to make pesticides more adhesive) as if they were pesticides -- listing Trademark Name/Active Ingredient and use. Also, identify the pesticides in which they are to be used.
- * Table 2 is self explanatory. Consult MOA personnel if necessary to obtain information. Any "back up" data (publications, reports, etc.) should be provided, if available.
- * Ultimately, this material should be sent to Dr. F.W. Whittemore, Food Crops Production Division, Office of Agriculture, Bureau for Development Support, Department State, Washington, D.C. 20523 (U.S.A.), Attn. DALE G. BOTTRELL.

Table 1. Pesticides Proposed For Use In Nimba Rural Technology Project,
Upper Nimba County, Liberia

Pesticide	Trademark Name/ Active Ingredient (Appearing on Label)	Proposed For Use On:												Others		
		Beans	Cabbage	Carrot	Coffee	Cucumber	Eggplant	Lettuce	Onion	Maize	Potatoe	Rice	Tomato		Chicken	Swine
1/ Perfectan	Perfectan/ Lindane 20% w/w (99/100 Gamma BHC)															
1/ Dieldrin																
MCPA																
1/ BHC																
Malathion																
1/ Sevin																
1/ Perfekthion																
Terrachlor																
Dichlone																
1/ Captan 50																
1/ Mocap																
1/ Polyram "M"																
1/ Lindane																
Derris Dust																

1/30

Footnotes for Table 1

1/ Use of any of these pesticides (noted with 1/) in the Project will require special justification. If at all possible, they should be avoided in order to assure greater chances for approval of the Project. It is particularly important to avoid use of Perfectan, Lindane, Dieldrin, BHC, and Perfekthion which already have been suspended or cancelled by the U.S. Environmental Protection Agency or probably soon will be because of evidence that they cause cancer or other harmful effects. If PEP Personnel feel strongly that any of the pesticides noted with 1/ must be used in the Project, then they must complete Table 2, giving all necessary details.

2/ Diazinon is used in some West African countries to control stem borers in lowland irrigated rice. Therefore, it is being proposed here for used in the Project since its use does not entail particularly rigid justification. If at all possible, it should be used in place of Lindane, and perhaps Dieldrin on rice.

3/ Bordeaux mixture and Cheshnut are to be used only experimently.

4/ Thuricide (which is one trademark name; ^{others are} Biotrol and and Dipel) contains the insect biological control agent

Bacillus Thuringiensis (note: PFP personnel are not required to list any more for active ingredient). It is proposed here as a material that PFP should be encouraged to examine experimentally. Insofar as known, it affects only the target insect pests (various caterpillars on a variety of crops) and causes no harm to humans.

5/ The use of these materials must be described if they are to be used to control animal or plant pests, i.e., insects, weeds, plant pathogens, plant nematodes. Poultry disease control and animal disease control agents are exempted (i.e., description of use not necessary).

Table 2. Use of Pesticide Noted With ^{1/} in Table 1. Note Hypothetical Example Offered.

Pesticide	Crops on which to be used (Be specific) ^{1/}	Trademark/ Active Ingredient/ Formulation	Method of Applying-	Rate ^{2/} and volume per unit	When applied	Justification for use, comments
Hypothetical Example (R)	Sweet corn (only)	Hypothetical Example (R)/ 50% Lindane/ Emulsifiable concentrate	Back-pack sprayer	0.5 LB. Active Ingredient Pesticide per Acre/ Total 5 gal. spray solution per acre 0.75 LB./ Total 7 gal.	1st Application, when plants are in 4-leaf stage 2nd Application, at appearance of 1st tables	MOA believes essential for production to control the pink cutworm, <u>Pinki Cutworm</u> ; No known Chemical Alternatives; will be used under careful supervision; etc.

^{1/} Don't just list "vegetables" or "tree crops"; be specific to crop or crops.

^{2/} Be exact, giving rate of active ingredient (not total ingredient) to be applied per acre, per tree, etc.

1/2

ENVIRONMENTAL ASSESSMENT OF PESTICIDE USE

Project title: Nimba Rural Technology

Location: Nimba County, Liberia

Environmental Assessment
prepared by:

Dale G. Bottrell
UC/AID Pest Management and Related
Environmental Protection Project
2288 Fulton Street, Suite 310
Berkeley, California 94704 (USA)
Telephone: 415/642-9950

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This Environmental Assessment (EA) was prepared under the direction of Dr. F. W. Whittemore, Environmental Coordinator, Office of Agriculture, Development Support Bureau, A.I.D., Washington, D.C. Dr. Whittemore and Mr. Carroll W. Collier, also of the Office of Agriculture, provided comments on an earlier draft of the EA which were incorporated here.

In October 1979, I visited Liberia to secure information required to prepare the EA. Personnel of the A.I.D. Mission to Liberia in Monrovia, the Partnership for Productivity Foundation (PPF) in Yekepa, and the Ministry of Agriculture in Monrovia provided background information on the project, current pesticide use in the project area, and the proposed actions involving pesticide use. PFP, a U.S.-based private agency, will be the project's primary implementing agency. PFP personnel in Liberia and in Washington, D.C. cooperated fully in providing information required to prepare the EA.

Dale G. Bottrell
December 21, 1979

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1. INTRODUCTION
1.1. A.I.D. Environmental Procedures

In accordance with the National Environmental Policy Act of 1969 and relevant policies of the Agency for International Development, Environmental Procedures¹ were developed and published by A.I.D. in the Federal Register to insure that environmental factors and values are integrated into the decision making process and to assign responsibility within the Agency for assessing the environmental effects of A.I.D.'s actions.

It is A.I.D. policy:²

- (1) to ensure that the environmental consequences of proposed financed activities are identified and considered by A.I.D. and the host country prior to a final decision to proceed, and that appropriate environmental safeguards are adopted;
- (2) to assist in strengthening the indigenous capabilities of developing countries to appreciate and evaluate the potential environmental effects of proposed development strategies and projects, and to select, implement, and manage effective environmental protection measures, and;
- (3) to identify impacts resulting from its actions upon the environment including those elements of the world biosphere which are the common natural and cultural heritage of mankind.

As a general principle, responsibilities for environmental decisions will be similar to normal A.I.D. organizational responsibilities so that an environmental awareness will permeate the entire organization and environmental considerations will be weighed with others in an integrated manner at each level of responsibility. Each A.I.D. official empowered to authorize funds will be responsible to the Administrator for implementing these procedures and obtaining and managing the required resources.³

1.2. Pesticide Procedures

Except as provided in paragraph 216.3(b)(2) of Environmental Procedures, all proposed projects involving assistance for the procurement or use, or both, of pesticides shall be subject to Pesticide Procedures

¹Part 216-Environmental Procedures of Regulation 16 of the Code of Federal Regulations.

²Paragraph 216.1(b) of Environmental Procedures.

³Paragraph 216.4(a) of Environmental Procedures.

prescribed in paragraph 216.3(b)(1)(i) through (v). The Initial Environmental Examination for the project shall include a separate section evaluating the economic, social and environmental risks and benefits of the planned pesticide use to determine whether the use may result in significant environmental impact. When a project includes assistance for the procurement or use, or both, of any pesticide registered for the same or similar uses in the United States but the proposed use is restricted by the U.S. Environmental Protection Agency (USEPA) on the basis of user hazard, the procedures set forth in paragraph 215.3(b)(b)(1)(i) will be followed. In addition, the Initial Environmental Examination will include an evaluation of the user hazards associated with the proposed USEPA restricted uses to ensure that the implementation plan which is contained in the Project Paper incorporates provisions for making the recipient government aware of these risks and providing, if necessary, such technical assistance as may be required to mitigate these risks. If the project includes assistance for the procurement or use, or both, of any pesticide other than one registered for general use or for restricted use on the basis of user hazard or any pesticide for which a notice of rebuttable presumption against registration (RPAR), notice of intent to cancel, or notice of intent to suspend has been issued by USEPA, an Environmental Assessment or Environmental Impact Statement must be prepared as specified in paragraph 216.3(b)(1)(iii)..

1.3 Rationale for Environment Assessment

Table 1 shows pesticides proposed for use in the Nimba Rural Technology project in Liberia. Although the current regulatory status of the pesticides proposed for use in this project does not require the preparation of an Environmental Assessment (EA), two of the pesticides, Sevin (carbaryl) and Gramoxone (paraquat), are under pre-RPAR review. Accordingly, to preclude the necessity of preparing an EA at a later date, if either or both pesticides become subject to an RPAR, an EA has been prepared at this time and is provided herein.

2. PROJECT DESCRIPTION AND BACKGROUND

2.1. Introduction

It is proposed to make a grant of \$2,969,000 to the Partnership for Productivity Foundation (PPF) over a 5-year period to carry out a program in rural industry and agricultural rural development. PPF is a U.S.-based private and voluntary agency that has been working in Liberia for approximately 5 years. The agency is based in Yekepa, Liberia, the site of the LAMCO iron ore mining concession, 50 percent of which is owned by the Government of Liberia. LAMCO requested PPF to carry out a program to diversify the economic base of the mining area. In the past five years, PPF has assisted a wide range of enterprises through managerial training and assistance, credit, and technical guidance.

2.2 The Project

Funds provided under this project will be used to: (1) expand and extend PPF's existing services in rural industry and appropriate

TABLE 1. PESTICIDES PROPOSED FOR USE IN NIMBA RURAL TECHNOLOGY PROJECT, UPPER NIMBA COUNTY, LIBERIA

PESTICIDE Trade Name and Common Name	Action	ACUTE ORAL LD 50 (mg/kg) ¹	RPAR OR RESTRICTED STATUS	x-Proposed for use on: T-Tolerance established on: E-Exempted from requirement of tolerance on:													
				BEANS	CABBAGE	CACAO	CARROT	COFFEE	CUSCUMBER	EGGPLANT	LETTUCE	ONION	MAIZE	POTATO		RICE	TOMATO
Mocap (ethoprop)	Nematicide Soil Insecticide	61.5	2	X	X		X	X	X	X	X	X	X	X			To be used experimentally only. Dilute in water, spread on soil and mix thoroughly; applied to seed bed, separation bed, and planting bed. Applied at rates prescribed on label.
Basamid - Granular (dazomet)	Nematicide Slimicide	500 (rat)		X	X	X		X	X	X	X	X	X	X			Same as above.
Sevin (carbaryl)	Insecticide	500 (female rat)	Pre-RPAR review	X	X			X	X	X	X	X	X	X			Back pack sprayer. Applied at rates prescribed on label.
Diazinon (diazinon)	Insecticide Nematicide	300-400 (rat)									X		X				Back pack sprayer. Applied at rates prescribed on label.
Gramoxone (paraquat)	Contact herbicide and desic- cant	150 (rat)	Restricted; Pre-RPAR review											X			Back pack sprayer. Applied 2x yearly. Used only on bunds surrounding lowland rice paddies and land being cleared for upland rice production. Applied at rates prescribed on label.
MCP (MCPA)	Herbicide	700-800 (rat)												X			Back pack sprayer. Applied 2x yearly at rates prescribed on label.
Cooper Oxide (cuprous oxide)	Protective Fungicide	?			X		X										Back pack sprayer or manual duster. Applied 3x yearly at rates prescribed on label.

¹ SOURCE: Farm Chemicals Handbook. 1979. Meister Publ. Co.

² On August 1, 1979, USEPA proposed that emulsifiable concentrates 40% and greater of ethoprop be restricted and all granular and fertilizer formulations be evaluated to determine need for restricted classification.

technology, and (2) initiate a major program to raise the income and living standard of approximately 5000 subsistence farm families in the project area.

The project also will seek to organize village development committees that function to implement village self-help activities. The project will be carried out in the two northern-most clan areas of Nimba County. The project will encompass an area of approximately 1800 square kilometers. It includes the urban population at Yekepa, estimated at 30,000. The human population density of the rural area averages 15-27 per square kilometer.

2.2.1 Rural Industries

1. Small business management training
2. Management consultancy services, including bookkeeping services and accounting training
3. Economic and feasibility studies
4. Market development services
5. Financial assistance (credit)

2.2.2. Appropriate Technology

1. Research and development
2. Pilot projects to determine technical and economic feasibility; once proven, they would then be spun-off to the private sector.
3. Maintenance training
4. Technical back-stopping and support for those operations spun-off to the private sector
5. Improved, low-cost building technology and contractor training

2.2.3. Cooperative and Agribusiness Development

1. Cooperative organization and support
2. Input supply
3. Agribusiness development
4. Credit
5. Marketing
6. Contract services (land preparation, clearing, spraying, seedling delivery)

2.2.4. Farmer Training

1. Operation of a demonstration and training farm where short term residential training will be carried out
2. Rural development skills training
3. In-service training for extension staff
4. Varietal trials
5. Seed multiplication
6. Student intern program

2.2.5. Extension Services and Rural Development

1. On-farm extension
2. Organization of village development committee to organize and implement self-help activities
3. Support for self-help activities

3. THE ENVIRONMENTAL SETTING

The project area is mainly rolling upland; a small portion is hilly or mountainous. The valley bottoms of the dense dendritic drainage system are swampy. The difference in altitude between the valley bottoms and upland areas is small, normally 10-50 meters. Ferralsols cover most of the project area. The hills support mainly shallow soils. A main characteristic of the upland soils is a gravel layer with alternating depth and thickness which prevents root development.

The agricultural potential of the soils is low to moderate. The potential for rice production is high in the swamps which encompass about 6 percent of the project area. The project will emphasize the use of techniques that increase the yields of rice in the swampy areas.

The climate of the project area is governed by the movement of a belt of clouds and rain called the Intertropical Convergence Zone (ITCZ). The ITCZ moves northward over the project area in spring and summer and southward in the autumn and winter. The rainy season lasts from April to October. The driest months are December, January, and February. Average annual rainfall is between 2300 and 2700 millimeters.

The average annual temperature is about 26°C; there is little variation in the average monthly temperatures. The temperature during the rainy season is suitable for agricultural production. The average relative humidity is high throughout the year. Annual evaporation is estimated between 1400 and 1800 millimeters. Solar radiation is low because of cloud cover during the rainy season and dust during the dry season; photosynthesis thus is reduced, having a negative effect on yields, especially in the dry season.

The native vegetation is tropical rain forest. About 10 percent of the total land in the project area is now being cultivated; about 95 percent of the cultivated land is occupied by small-scale farmers who employ a wide variety of production practices. Shifting cultivation is common, with upland rice being planted and followed by fallow periods of 7-10 years. Some supplementary food crops also are grown. Some of the better land on flatter areas is planted to coffee and cacao. The valley bottoms of the project area are planted to swamp rice and other food crops.

The average size of the small farms on which the project will focus is about 1.5 hectares. Tribal tenure predominates. Land shortage is not a major problem in the project area. An estimated 5000 farm families reside in the project area. The average farm household has 7.7 members and a labor equivalent of 3.7 persons.

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The small-scale farmer's farming operation now is typically one of subsistence production characterized by minimal agricultural inputs, low yield levels, and low marketable surpluses. The main activity is the cultivation of upland rice used mostly for home consumption. Rice is grown on about 50 percent of the cultivated land. About 25 percent of the cultivated land is planted to coffee and cacao, 14 percent to cassava, and 11 percent to vegetables.

4. LONG-TERM PROJECT OBJECTIVES

A primary goal of the Government of Liberia is to achieve self-sufficiency in rice production in the early 1980's. The potential for increasing rice production in the project area is especially good but the level of technology being applied restricts production to subsistence levels. Less than 1 percent of the farmers use fertilizer and less than 2 percent use improved seed.

The project will provide the training, inputs, and marketing facilities to assist the farmers to increase the production of rice and other crops now being grown and to introduce new food crops. The introduction of supplementary food crops holds special promise for improving human nutrition in the area and for increasing the incremental income of small farmers.

With modern technology, it is estimated that farmers in the project area can double the present crop yields. Rice and tree crops are thought to offer the greatest potential for most small farmers in the area and to contribute most in meeting the national goal of self-sufficiency.

5. PROPOSED ACTION RELATIVE TO SECTION 216.5 (c) OF THE ENVIRONMENTAL PROCEDURES

5.1. Present Pesticide Use in Project Area

As noted above, about 10 percent of the land in the project area is presently being cultivated. The major crops in the area (cacao, coffee, rice, vegetables) now encompass a total of about 790-870 hectares (refer to Table 2). An objective of the project is to expand the area in which these crops are grown; the 5-year target is to increase cacao, coffee, rice, and vegetables from the present level to about 2025 hectares. Pesticides currently are being used on a small portion of these crops. PEP personnel estimate that 10 percent of the cacao is being treated with insecticides, 15 percent with fungicides and 15 percent with herbicides; 5 percent of the coffee is being treated with herbicides and 5 percent with fungicides; 10 percent of the lowland, irrigated rice is being treated with insecticides and 30 percent with herbicides; and 20 percent of the vegetables is being treated with insecticides and/or fungicides.

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TABLE 2. SCOPE OF CROP PRODUCTION AND PESTICIDE USE IN NIMBA RURAL TECHNOLOGY PROJECT AREA,
UPPER NIMBA COUNTY, LIBERIA¹

Crop	<u>ESTIMATED NUMBER OF HECTARES:</u>		Estimated percent of hectares now being treated with pesticides
	Present	Five year target	
Cacao	61	243	10 - insecticides 10 - fungicides 15 - herbicides
Coffee	243	810	5 - herbicides 5 - fungicides
Rice ²	405-486	810	10 - insecticides 30 - herbicides
Vegetables	81	162	20 - insecticides/fungicides

¹The list shows only those crops to be included in the project and treated with pesticides.

²Estimates only for lowland irrigated rice; double-cropped each year. Upland rice normally is not treated with pesticides.

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5.2. Anticipated Effect of Project on Pesticide Use in Project Area

Though an objective of the project is to increase the area being planted to the major crops, PFP personnel do not anticipate a corresponding increase in the percent of the cropping area treated with pesticides. Economics and low yielding potential will prohibit the use of pesticides on much of the agricultural land. Further, PFP personnel believe that traditional, non-chemical pest control techniques (e.g., destruction of postharvest residues, crop rotations, hand weeding, planting vegetables in new and uninfested areas) are applicable throughout much of the area, and these techniques will be encouraged.

RECOMMENDATION:

Project personnel should maintain accurate records on the kinds and amounts of pesticides being used on cacao, coffee, rice, and various vegetables in the project area. A base-line survey should be conducted at the beginning of the project; the survey should be repeated every year of the project to reflect changes in crop hectares and any changes in pesticide use patterns.

Project personnel should encourage the use of the traditional, non-chemical control techniques known to be effective. Pesticides should be recommended only when definitive data demonstrate their superiority to the non-chemical control techniques; pesticides that pose minimal risk to humans, beneficial non-target organisms, and the environment should be sought and encouraged. The use of any pesticide should be based on economic criteria to determine when and where control is truly justified.

5.3 Procedures Prescribed in Paragraph 216.3(b)(1)(i) of Environmental Procedures

(a) The USEPA registration status of the requested pesticides.

Pesticides requested by PFP for use in the project are shown in Table 1. Here, common names of the pesticides will be used. Crops treated with pesticides in the project (Table 1) will be used for human or animal consumption only if appropriate tolerances have been established by USEPA (or recommended by the Food and Agriculture Organization/World Health Organization) and when the rates and frequency of application, together with the prescribed preharvest intervals, do not result in residues exceeding such tolerances.

Two of the pesticides, ethoprop and dazomet, are proposed for experimental purposes only; they will be used for research or limited field evaluation purposes by or under the supervision of project personnel.

As noted in footnote 2 of Table 1, on August 1, 1979, USEPA proposed that emulsifiable concentrates, 40 percent and greater, of ethoprop be restricted because of its acute dermal toxicity; and USEPA proposed that

all granular and fertilizer formulations be evaluated to determine the need for restricted classification. Tolerances have not been established for dazomet on any crops to be grown on soil treated with the pesticide.

Carbaryl is proposed for use on vegetable crops shown in Table 1. and also rice. The insecticide is registered by USEPA for general use on all of these crops except onion (it will be used experimentally only on onion, applied by or under the supervision of project personnel, and the treated onion plants will not be used for human or animal consumption).

Carbaryl currently is undergoing Pre-RPAR review by USEPA on the basis that it may cause teratogenicity (abnormal formation of fetus) and fetotoxicity (toxicity to fetus) in experimental animals.

Diazinon is proposed for use on onion and is registered for that crop. It is also proposed for use on rice. Diazinon is not registered by the USEPA for use on rice although it is registered for use on numerous other food crops. It currently is used on lowland irrigated rice in much of West Africa. The material was approved for use on rice in a similar A.I.D. project in Liberia (Lofa and Bong counties). No known adverse effects to the environment or humans resulted from this use.

Paraquat is proposed for use to clear vegetation from "bunds," the earthen areas separating or surrounding irrigated rice paddies, and from land being cleared for upland rice production. Paraquat is very poisonous to humans and can cause death if swallowed. Inhalation and/or ingestion of the material may cause irreversible lung damage.

The dichloride salt of paraquat is freely soluble in water. It is strongly absorbed and inactivated by soil particles. The formulation and concentration proposed for use in the project have been classified by USEPA for restricted use and are limited to use by or under the direct supervision of a certified applicator. Further, the pesticide is undergoing Pre-RPAR review by USEPA on the basis of its known or suspected adverse effects (e.g., acute toxic effects, chronic effects, reduced fertility, environmental effects.)

MCPA is proposed for use on irrigated rice. This herbicide is now used on an estimated 30 percent of the irrigated rice in Upper Nimba County. Though not registered by USEPA for use on rice, the material was approved for use in a similar A.I.D. project (Lofa and Bong counties) in Liberia; no known adverse effects to the environment or humans resulted.

Cuprous oxide, a fungicide, is proposed for use on cacao and coffee. The pesticide is not registered by USEPA for use on either of these crops, but is exempted from requirements of tolerance. The material was approved for use on the two crops in a similar A.I.D. project (Lofa and Bong counties); no known adverse effects to the environment or humans resulted.

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(b) The basis for selection of the requested pesticides.

The proposed pesticides are available in Liberia, and all are approved for use prescribed herein by the Liberia Ministry of Agriculture. When possible, only pesticides registered by USEPA for use without restriction (without active or proposed regulatory action) were selected, or materials (MCPA, diazinon, cuprous oxide) approved for similar A.I.D. projects in Liberia (Lofa and Bong counties) were selected. Ethoprop and dazomet soil sterilants will be employed only for experimental purposes to demonstrate to farmers the advantage of planting vegetables on soil free of pest nematodes and insects. Carbaryl and diazinon were selected on the basis of their low mammalian toxicity. There is no known cost effective alternative to paraquat for the use proposed herein.

(c) The extent to which the proposed pesticide use is part of an integrated pest management program

There has been no major effort to develop holistic systems of integrated pest management (IPM) in Liberia. Economic thresholds have not been established for a broad range of pests; economic criteria for pest control are generally lacking; the value of natural enemies has not been determined; there has been no work to seek ecologically selective pesticides; and there are no organized systematic pest monitoring or surveillance systems for any crop. Therefore, operational IPM systems are not anticipated for Liberia in the foreseeable future.

The project affords an opportunity to begin work on some of the foundation components of IPM, viz. identification of the major pest species and determination of economic thresholds for the pests; determination of the minimum effective dosages of pesticides that provide satisfactory pest control while sparing important natural enemies of major pests; development of simple pest monitoring techniques that extension personnel, farmers, and others involved in the crop production system can understand and use in IPM programs with no difficulty; and initiation of training and "public awareness" programs on the principles and application of IPM and the proper use of pesticides.

The lack of crop protection specialists properly trained in ecological principles of pest management is the chief obstacle slowing progress in IPM in Liberia and other countries of West Africa. Being cognizant of this, the West Africa Rice Development Association (WARDA), headquartered in Monrovia, recently organized a seminar in Bobo Dioulasso, Upper Volta to review the status and prospects of IPM in rice in West Africa. WARDA currently is determining interest and funding mechanisms required to initiate a program for the development and implementation of IPM in rice in the region.

FAO, A.I.D., and other international organizations are sponsoring some research on the development of IPM systems for various crops in the region. However, international efforts in IPM in the region are minimal, and there are virtually no efforts in IPM in Liberia.

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Because of this lack of expertise in IPM there is a tendency to promote pesticides as a first line of defense against pests, especially in highly productive areas being developed for agriculture. By contrast, persons trained in integrated pest management would lean more heavily on the use of non-chemical methods of control, using pesticides only after the non-chemical and cheaper methods failed to provide effective control.

RECOMMENDATIONS:

The A.I.D. mission to Liberia and the Regional Economic Development Service Organization/West Africa, in Abidjan, should support efforts of WARDA to promote increased emphasis on the development and implementation of integrated pest management of rice in Liberia and other WARDA member countries in West Africa.

A.I.D. should sponsor a training program for PFP employee, Mr. Buxton Cooper, in pesticide management and ecological principles of pest control. Mr. Cooper is a native Liberian in charge of developing pest control recommendations and pesticide training programs for the Nimba Rural Technology project. The training program should not exceed a period of three months in the USA under the direction of the UC/AID Pest Management and Related Environmental Protection Project, University of California, Berkeley.

The intensive training program should be geared to allow maximum exposure to the principles of IPM (via discussions with and lectures by experts in the field) and proper use of pesticides, including familiarization with A.I.D. regulations on pesticides and the USEPA certified applicator program. UC/AID Project personnel and Dr. F. W. Whittemore, Environmental Coordinator, Office of Agriculture, A.I.D., Washington, D.C., should begin immediately to work out details for his training in the USA. The idea of such a training program has been discussed with and is supported by Mr. Cooper, PFP personnel, and A.I.D. personnel in Monrovia.

Upon completion of the training program in the USA, Mr. Buxton should be appointed as project coordinator for pesticides and pest management; a major responsibility would be to coordinate training programs at the Farmer Demonstration Center [refer (d)(2) below].

- (d) The proposed method or methods of application, including availability of appropriate application and safety equipment.

Pesticides will be used in the project at three levels:

- (1) Experimental: Application will be made by project personnel to small experimental plots of the Farmer Training Center [refer (2) below]. Pesticides will be applied by back-pack sprayers, manual dusters, or granule applicators. Project personnel have access to employee safety gloves, masks, boots, and other protective apparel; use of these safety materials will be enforced.

(2) Farmer Demonstrations: PFP in cooperation with the Ministry of Agriculture of Liberia manages a Farmer Training Center which serves as a primary means for farmer education in the project area. The Center periodically offers training programs on the proper methods for applying pesticides, including safety. Part of the training calls for the farmers themselves to apply pesticides at the Center while being supervised by project personnel. In addition, the farmers are instructed on procedures for calibrating back-pack sprayers, disposing of pesticide containers and left-over pesticides, and for avoiding unnecessary hazards from handling the pesticides.

(3) Farmer Field Applications: Once the farmers have satisfactorily completed the pesticide training programs at the Farmer Training Center, they are granted permission to apply pesticides on their own farms.

Only one farm supply store in Nimba County sells pesticides; PFP controls the entire stock and will sell pesticides only to farmers who have satisfactorily completed the pesticide training programs. The store sells all the protective devices recommended to ensure safety.

A responsibility of PFP extension workers operating out of the Farmer Training Center is to follow the progress of the trained farmers; proper use of safety apparel and devices and disposal of used pesticide containers and left-over pesticides are stressed.

- (c) Any acute and long-term toxicological hazards, either human or environmental, associated with the proposed use and measures available to minimize such hazards.

Any pesticide, if improperly used, can cause harm to humans and the environment. The use of some pesticides, especially insecticides, may have harmful effects on beneficial pollinators (honey bees, wild bees, and other insect species) and natural enemies (parasites, predators, and beneficial insect disease agents). Some of the pesticides proposed for use in the project pose greater risks than others.

Ethoprop has an acute oral toxicity (to rats) of 61.5 mg/kg and an acute dermal toxicity (to rabbits) of 26 mg/kg. Emulsifiable concentrates in excess of 40 percent active ingredient present high risks because of the acute dermal toxicity. This material will be used only experimentally as a soil sterilant to control nematodes and will be applied under the supervision of project personnel. The other material, dazomet, proposed for similar use, is less toxic, but it is not registered for use in the USA on the crops listed in Table 1. It will be used only experimentally, and crops grown in experimental plots treated with the material will not be consumed by humans or livestock.

As discussed, paraquat is highly toxic to humans and may cause harmful effects to the environment. It should be used only under strict supervision by trained professional personnel.

MCPA, cuprous oxide, and diazinon, if used properly at rates recommended on the manufacturer's labels, present few potential hazards to humans or the environment, insofar as known.

Carbaryl has a low toxicity to mammals; it is widely used in the USA and many other countries by homeowners, gardeners, and farmers. It is highly toxic to honey bees and other pollinators and should not be used near beehives or where bees are actively foraging; its use may cause the destruction of beneficial insects important in regulating the density of some insect pests.

As noted, USEPA has placed carbaryl on the Pre-RPAR list on the basis of evidence that it may cause teratogenicity or fetotoxicity. Project personnel should keep abreast of any subsequent USEPA ruling on carbaryl.

RECOMMENDATIONS:

All project personnel involved in the use of pesticides shown in Table 1 should be thoroughly informed of the potential hazards. The project managers should enforce, among project personnel and farmer cooperators, the use of essential protective apparel, proper storage of pesticides and application equipment, and proper disposal of used pesticide containers and left-over pesticides. Project personnel should ensure that instructions and precautions, including statements regarding the time of re-entry into the fields after pesticide application and the number of days between application and crop harvest as specified on the pesticide label, are enforced.

A medical doctor, Dr. Kell B. Jakobsen, M.D., employed by the IANCO JV Operating Company Medical Department in Yekopa, where the project is to be headquartered, serves as Public Health Officer for this area of Liberia. He has experience in the field of clinical diagnosis of pesticide poisoning and treatment. It is recommended that PFP personnel appraise Dr. Jakobsen of pesticides to be used in the project. At all times during the project he should have access to an updated list of pesticides being used in the project and also toxicological information on each pesticide as supplied by its manufacturer. Project personnel should request his advice concerning human health hazards with pesticide use and precautionary steps to mitigate these hazards.

The herbicide paraquat probably presents the greatest toxicological hazard of any pesticide proposed for use in the project. The material should be used only under strict supervision by trained professional staff. It should not be made available through the farm supply store for purchase by farmers. All paraquat use should be formulated with a warning odorant having a mecapton like odor or equivalent.

Paraquat will be used to clear vegetation from earthen bunds separating and surrounding irrigated rice paddies and to remove vegetation from non-cultivated land being cleared for upland rice production.

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Project personnel should ensure that the material is applied selectively to these target areas and steps are taken to prevent its drift out of the area. The pesticide does not accumulate in the soil and breaks down rapidly. But farmers, workers, other humans, and livestock should not be allowed to enter the treated area until after there is reasonable assurance, based on information on the pesticide's label, that harmful residues have disappeared.

Project personnel should ensure that crops treated with pesticides for which appropriate tolerances have not been established by USEPA (or recommended by FAO/WHO) are not used for human or animal consumption.

Finally, project personnel should make the Liberian government aware of the potential hazards associated with use of pesticides in the project.

- (f) The effectiveness of the requested pesticides for the proposed use.

The pesticides proposed for the project were selected because of their known effectiveness in various areas of Liberia or in other countries. No quantitative data exist on the efficiency of the pesticides in the project area. PFP recently initiated a study to determine the costs/benefits of agricultural inputs, including pesticides, on farms in the area, but results from the study are incomplete.

The Ministry of Agriculture in Liberia endorses the use of all pesticides proposed for the project.

- (g) Compatibility of the proposed pesticides with target and non-target ecosystems.

[See discussion of (e) above]

- (h) The conditions under which the pesticide is to be used, including climate, flora, fauna, geography, hydrology, and soils.

(See discussion of 3 above)

- (i) The availability and effectiveness of other pesticides or non-chemical control methods.

Due to lack of quantitative data on pesticide efficacy in Liberia, it is not possible to compare the effectiveness of the pesticides proposed for the project with alternative pesticides. Unquestionably, however, the insecticides proposed for the project pose fewer problems to humans and the environment than many others (e.g., parathion, methyl parathion, dieldrin, DDT, chlordane, lindane) now commonly used in the area. There currently is no known cost effective chemical alternative to paraquat, probably the pesticide posing the greatest risks in the project; the non-chemical alternatives (hand weeding, plowing) are cost

prohibitive. The other herbicide, MCPA, proposed for the project is considered safer and cheaper than alternative herbicides in rice. There is no known cost effective alternative to cuprous oxide. Similarly, there are no known cost effective alternatives to ethoprop and dazomet for the experimental use proposed in the project.

The status of non-chemical methods was discussed above under (c).

RECOMMENDATION:

Project personnel should cooperate with the Ministry of Agriculture to obtain efficacy data on pesticides to be used in the project, including data on the costs/benefits of the pesticides and known chemical and non-chemical alternatives. There should be a special effort to find effective and safe alternatives to paraquat.

- (j) The requesting country's ability to regulate or control the distribution, storage, use, and disposal of the requested pesticides.

The ability of Liberia to regulate pesticides presently is inadequate. The Ministry of Agriculture currently determines the pesticides sold by commercial firms and recommends the use of pesticides in Liberia, including those proposed for the project. But it does not have an effective enforcement mechanism for ensuring the regulation or control of the distribution, storage, use, and disposal of pesticides. There is now a proposal within the Ministry of Agriculture to create a crops protection agency which would help meet this need.

As discussed above under (d), through the farm supply store, PFP personnel are able to control the distribution of pesticides to farmers in the project area. Further, the Farmer Training Center program provides a mechanism for encouraging safe use of pesticides, as discussed under (d)(2) above.

- (k) The provision made for training of users and applicators.

[See discussion under (d)(2) above, including the recommendation concerning the training program for PFP employee Buxton Cooper]

- (l) The provisions made for monitoring the use and effectiveness of the pesticides.

Liberia currently does not have the capability to effectively monitor the use and effectiveness of the proposed pesticides. Therefore, any monitoring must be assumed primarily by PFP personnel.

[See recommendation above, under (b), concerning survey of pesticide use in the project area, and under (i), concerning the determination of efficiency and costs/benefits of the pesticides.]

5.4. Relationship of Proposed Action to Plans for Land and Resource Use

There is no known conflict in the proposed action involving pesticide use and plans for land and resource use.

5.5. Reasonably Foreseeable Impact on the Human Environment

The introduction of any pesticide into the environment can have unexpected and unwanted consequences. Section 5.3(e) discusses the potential human and environmental hazards associated with pesticides proposed for the project. These hazards can be minimized by adopting appropriate safety procedures and by applying the pesticides selectively and judiciously based on actual need. Project personnel must enforce the use of all appropriate safety procedures and emphasize the use of pesticides exhibiting the least potential adverse effects.

RECOMMENDATION:

A.I.D.-Washington, D.C. should commission an outside review of the project in 18 months after its inception. The purpose of the review would be to determine the progress of pesticide related activities and the follow-up to recommendations proposed herein.

5.6. Reasonable Alternative to Proposed Action

The proposed action promises to reduce pest losses to crops and increase crop yields. If properly used, the proposed pesticides present fewer hazards to humans and the environment than the pesticides currently being used by farmers in the area. With the appropriate emphasis on training, the project promises to increase the native indigenous capacity for proper pesticide use and integrated pest management in Liberia.

An alternative to the proposed action would be to prohibit the use of any pesticides in the project. This would eliminate risks associated with the use of pesticides but it may result in heavy crop losses.

5.7. Reasonably Foreseeable Adverse Environmental Impacts which Cannot Be Avoided

The use of the proposed pesticides undoubtedly will destroy some beneficial species within the target area, especially natural enemies and pollinators that inhabit the treated crops. Use of insecticides is known to unleash some non-target pest species from natural control, causing them to increase in abundance. Ecological disruptions within the crop ecosystem are commonly associated with heavy and indiscriminate pesticide use. Selective use of pesticides, at the lowest minimum effective dosages, based on actual need and integrated with other techniques (e.g., pest resistant varieties of crops, crop rotation, various non-chemical traditional methods), is the surest way to avoid serious ecological disruptions.

Human health hazards, wide-scale destruction of wildlife, and buildup of harmful pesticide residues in the environment can be mitigated through proper training and by restricting the use of pesticides of greatest known hazards to project personnel.

5.8. Relationship Between Short-Term and Long-Term Effects

The use of pesticides in the project, as described herein, promises a more effective and safer system of pest control than now exists in the project area. However, historically as agriculture of the developing world has expanded and intensified, as the agriculture of the project area in Liberia presently is being increased and intensified, pest problems have worsened. Increased severity with old pest problems and eruptions of new pests are commonly associated with expanding agriculture that is based on new high yielding crop varieties, fertilizers, pesticides, and other "modern inputs". Increased pest problems in rice and other crops of the so-called "Green Revolution" clearly have dramatized this point. Pesticides by themselves cannot be expected to provide an effective long-term solution for the increasing pest problems. The most effective long-term solution to pest problems in the project area and other areas of Liberia will be through integrated systems of pest management that spread the burden of crop protection across the widest array possible of biological, environmental, physical, and chemical factors.

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