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ENVIRONMENTAL ASSESSMENT

FOR THE TARGETED WATERSHED MANAGEMENT PROJECT

AND

ASSESSMENT OF THE NEED FOR PESTICIDE USE IN THE

AGROFORESTRY OUTREACH PROJECT

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List of Abbreviations and Acronyms

AOP	Agroforestry Outreach Project
APHIS	Animal and Plant Health Inspection Service
CICP	Consortium for International Crop Protection
COOP	Cooperative
DAI	Development Alternatives Inc
DARNDR	Departement de l Agriculture, des Ressources Naturelles et du Developpement Rural (GOH)
DCCH	Developpement Communautaire Chretien d Haiti
DPI	Developpement Rural Integre
EA	Environmental Assessment
EEC	European Economic Community
GOH	Government of Haiti
IEE	Initial Environmental Examination
IPM	Integrated Pest Management
IPPC	International Plant Protection Center
LAC	AID Bureau for Latin America and the Caribbean
LOP	Life of Project
NGO	Non Governmental Organization
ORE	Organization for the Rehabilitation of the Environment
OSU	Oregon State University
PADF	Pan-American Development Foundation
PAP	Port-au-Prince
PID	Project Identification Document
PMS	Pest Management Specialist
PP	Project Paper
PVO	Private Volunteer Organization
RDO	Rural Development Officer
REMS/CAR	Regional Environmental Management Specialist Caribbean
RPAR	Rebuttable Presumption Against Registration
SHAG	Secretariat for Hillside Agriculture (Composed of DARNDR staff)
SNPA	Service National de la Protection Agricole (GOH)
ST	AID Bureau of Science & Technology
TA	Technical Assistance
TWM	Targeted Watershed Management Project

UNICOPS	Union des Cooperatives de la Region du Sud
(US)AID	US Agency for International Development
(US)EPA	US Environmental Protection Agency
W	Washington
WHO/FAO	World Health Organization/Food and Agriculture Organization

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1- Introduction

Hillside farming in Haiti is currently faced with severe problems of erosion and low soil fertility, a situation which largely results from the ever-increasing population pressure on the land and the associated desire to produce more and more food on constantly shrinking acreages As a consequence, arable land is not fallowed when it should be and land generally not considered suitable for agricultural production is used for this purpose In order to reverse this trend, farming practices which have resulted in the erosion and degradation of hillside soils must be replaced with farming practices which regenerate and conserve those soils This is what USAID/Haiti is proposing to do through the Targeted Watershed Management Project (TWM 521-0191)

The target zone is located in the Southwestern part of Haiti in the region of Les Cayes, and includes six watersheds flowing south from Pic Macaya This area represents 45% (60,000 ha) of the total land mass of the country and encompasses a population of ca 400,000 people

The proposed interventions include alley cropping improved food crop varieties fruit trees firewood species forage species adopted agronomic practices, perennial cropping methods, inorganic fertilizers and pest management With the alley cropping system nitrogen-fixing leguminous trees or shrubs such as Leucaena sp are planted along the contours of land holdings on steep slopes and act as vegetative barriers to control soil erosion and reduce speed of surface water In addition, these trees add biologically-fixed nitrogen to the soil and produce green manure and mulch for the companion crops

However because the alley cropping system implies that a certain portion of a farmer s land cannot be used for food crop production (that portion is occupied by trees), a peasant may be expected to adopt this system only if crop yields, on the remaining portion of his land are increased This can be achieved in part, through the use of high-yielding varieties fertilizers and pest management

The task of implementing those technologies at the farm level will be given to four private volunteer organizations (PVOs) which are already working in the target area (ORE DPI DCCH and UNICORS) An umbrella NGO will supervise this work and provide technical assistance equipment and funds to the PVOs while coordination with other groups doing similar work in Haiti will be the role of the Secretariat for Hillside Agriculture (SHAG, part of the ministry of Agriculture,

DARNDP) More details regarding the various technical and social aspects of this project can be found in the PP draft as well as in the PID

The PID includes an Initial Environmental Examination (IEE) conducted by Mr James J Talbot REMS/CAR/USAID/Haiti, in which it is made a requirement that a risk/benefit analysis be conducted if pesticides are to be procured or used by the TWM I was contracted to perform this analysis, i e Environmental Assessment (EA), which is in the appendix of this document Also in the appendix is an assessment of the need for pesticide use in the Agroforestry Outreach Project (AOP, 521-0122) a program which has been underway for five years in Haiti and the goal of which is reforestation It works through PVOs, some of which are also expected to participate in the TWM

The following paragraphs give general observations regarding current pest control practices as well as recommendations for anticipated pesticide use and for the development of pest management programs in the target area

2- General observations

2 1 Ministry of Agriculture (DARNDP) Because of the unfavorable political and social atmosphere which has prevailed in Haiti for several years the DARNDP has experienced frequent personnel changes and as a consequence its activities have been characterized by a lack of long-term planning, follow-up, organized and integrated research control policies and data publications This explains the near absence of reasonably recent and dependable literature on common pests of major crops and trees in Haiti as well as on crop loss assessments

2 2 Pest identification Depending on the level of expertise of the various people involved in making decisions or recommendations regarding the selection of "appropriate pesticides the pest problems are usually identified in one of the following three ways

a) In some PVOs, when crude identification of the pest is not possible any broad-spectrum insecticide such as Carbaryl or Malathion is applied if the pest is an insect and any broad-spectrum fungicide such as Captan is applied if the pest is a fungus

b) In most PVOs, however, pesticide applicators can perform a crude identification of the pest, i e caterpillars, ants, crickets, aphids, scale insects, snails, mites, leaf spots, damping-off, anthrocnose, etc , and usually select a pesticide which is known to be effective against a particular group of pests, e g Chlordane for ants or Dicofol for mites Hill (1975) published tables which indicate the effectiveness of various insecticides against different groups of insects

c) Agronomists working for the DAPNDR or private pesticide suppliers may go a little further and compare a specimen to descriptions given in reference books printed in Mexico (CIMMYT) Puerto Rico (de Mayguez 1974), the Dominican Republic (Posario 1970), and Haiti (Wolcott 1927) Occasionally, positive identification is possible and more specific recommendations can be given

2 Plant Quarantine At the present time Haiti does not have plant quarantine facilities at any of its various points of entry DAPNDP officials distribute forms which should be filled out by anyone who wishes to take plant material in or out of the country Permits are issued if inspection of the plant material by personnel at the SNPA does not reveal the presence of any pathogen or insect which may be injurious to Haiti s agriculture (imported material) or any other country s agriculture (exported material) A certain number of legislations were passed regarding the introduction of specific plant materials i e g coffee because of the threat of the leaf rust, Hemileia vastatri , a devastating disease which does not presently occur in Haiti) but there are always provisions made for special cases of importation which with a lack of proper quarantine facilities and a lack of rigor when the inspections are conducted may lead to the introduction of serious diseases and insect pests in Haiti Based on discussions that I had with various people who, in recent years, have been involved in the introduction of plant material into Haiti it appears that inspections are usually very superficial and that the SNPA staffs who conduct those inspections are generally not well qualified for this type of work The risks of introducing pests of major importance are therefore very high

The coffee leaf rust, mentioned above is a particularly critical issue in the context of the TWM This disease could easily wipe out coffee plantations in Haiti which because of their heavy shade, provide very favorable conditions for the rust

organisms and, because of their physiologically old or weak conditions, are very susceptible to attack by rust which occurs in 24 identified races of varying virulence At the present time, the DAPNDP issues a poster showing what the rust looks like and indicating (in Creole) that any similar symptoms that are observed in Haiti should be reported for immediate destruction of infected material However, I did not see this poster anywhere but in the DARNDR office in PAP and in any case, it is a dangerous illusion to believe that the rust organism can be contained or eradicated once introduced into the country (see Development Alternatives, Inc 1977 for more details)

2 4 Use of P- and C-pesticides (see Table 3 in appendix 1) Some EPA Restricted and/or Cancelled pesticides are currently used in all PVOs except DPI and none of the applicators have received proper training Two technicians (at UNICOPS and DCCH) have received some form of training but it cannot be considered adequate

2 5 Use of protective clothing and safety measures (see Table 3 in appendix 1) Protective clothing is used in only one of the PVOs (OPE) In the others little attention is paid to the hazards of pesticides applicators (aspergeurs) often apply dangerous chemicals bare foot and wearing shorts and no shirt At one of UNICOP S COOPs, seed treatment with Lindane and Malathion is conducted on a concrete surface where children often play in bare feet not long after the application

2 6 Use of pesticides by peasants It is unrealistic to expect the average Haitian peasant to use pesticides properly or in many cases, to use pesticides at all First, he often cannot afford a back-pack sprayer (ca $75 US) and some of the costly pesticides that would be required for effective pest control Secondly, if his house is made of bamboo and straw with a thatched roof, we cannot expect him to build a pesticide storage area which would be considered safe by North American standards Finally, the water necessary to clean up the equipment may not always be readily available around the house In sum, the peasant s general standard of living will need to be raised before he can use pesticides safely

2 7 Rodents People who work and live in the targef area claim that rats are the most injurious pests to food crops, more than insects and diseases together This is a particularly serious problem in rice fields

3- General recommendations

3 1 Pest management and the TWM The development of sound pest management practices within the TWM should mean more than merely establishing a list of pesticides considered safe for use in the project In view of the problems dealt with in section 2 6, every effort should be made to steer away from the reliance on chemical pesticides to manage pest problems on hillside farms Pesticide-application-related assistance will likely be provided during the LOP but consideration must be given to the fate of pest management practices after the completion of the project, when such assistance may need to be discontinued Three pest management approaches are particularly suited to the present agricultural situation in the target zone 1) use of crop varieties which show acceptable levels of resistance to the local pests 2) biological control, and 3) cultural control These methods are environmentaly sound and require no capital investment on the part of the farmers

3 2 Pest catalogue The development of sound pest management practices usually requires as a starting point that the target pest species be properly identified If reliable information on pest identification became available in Haiti it would then be possible to conduct a thorough literature search through the various data bases available in the U S and through correspondance with pest management specialists working in neighboring countries which may share some of Haiti s pest problems Such a review of the literature may then reveal that, for some of the pests under consideration, there exist 1) data on crop loss assessment 2) effective monitoring techniques 3) data of efficacy of various chemical and non-chemical pesticides, 4) parasites and predators candidate for introduction as biological control agents, 5) data on plant resistance, 6) data on cultural methods, and 7) data on other pest management components not included in the above list Although few of the pest insects and pathogens which attack crops and trees in Haiti have been properly identified some of them have received final or tentative identification The following is a list of references which may

contain Haiti-related information on 1) insects Wolcott 1927, Jean Baptiste 1945, Ward 1975, Allen 1979, Becker 1981, Solis & Samedy 1980, and 2) pathogens Solis & Samedy 1980

Some insect pest species have been formally or tentatively identified by Mr Bertrand Derouilleres, entomologist at the Faculte d Agronomie, Damien They include Plutella macolipennis, Trichoplusia ni and Myzus persicae on cabbage, Spodoptera fugiperda and Ostrinia nubilalis (??) on maize, Anthonomus grandis and Pectinophora gossipiella on cotton, Leucoptera coffeella on coffee, and Cylas formicarius on sweet potatoes One corn disease Phyllachora maydis has been tentatively identified by Mr Jean-Yves Banatd agronomist for the DARNDP in Les Cayes Further discussions with other professionals working in the field of agriculture in Haiti would very likely yield more of this type of unpublished information

In order to provide Haiti and particularly the target area, with a good base for the elaboration of IPM programs, I recommend that 8 months of short-term TA in the pest management disciplines (entomology, plant pathology, weed and vertebrate pest management) from individuals with extensive experience in the Caribbean and a good knowledge of tropical crops and their commonly associated pests, be provided for during the 5-year LOP This would lead to the development of a Haiti-specific pest catalogue and the initiation and orientation of IPM research in the project area It is recommended that the project explore the possibility of procuring the full-time services of a Peace Corps volunteer to coordinate these efforts

Scope of Work

a) Gather all information already available on the identification of major pests and confirm or correct identification when necessary
b) Visit PVOs and farmers and ask about commonly encountered pests When not previously identified collect specimens and attempt identification or send to a U S laboratory for identification
c) Perform a literature search as described above
d) Describe all currently available management approaches, based on the literature search and on interviews with DARNDR s agronomists and pesticide suppliers, both of whom may conduct small-scale field trials on pesticide efficacy

e) Produce a pest catalogue with recommendations on currently available control measures

f) Assist the DAPNDP, PVOs, private companies, or other organizations which may be indirectly involved in the project, in conducting crop loss assessment studies and small-scale research aimed at developing alternative pest management strategies

g) Prepare a research and extension program for the PhD-level US-trained plant protection specialist (see 3 3) when this one returns from the U S

h) Any other task mentioned in the EA

3 3 Ph D training in plant protection In the PP draft provisions are made for the financing of long-term training at the Masters and Ph D levels in U S universities for SHAG personnel (p III-12) I suggest that the individual who receives Ph D training in agronomy do his/her research work in crop protection, possibly entomology (at the "Section de Protection des Vegetaux of the DAPNDP there is currently one plant pathologist but no entomologist) The trainee may then be able to continue the work undertaken during the 8 months of short-term TA

3 4 Training for pesticide applicators See section 11 of the EA

3 5 Improved varieties and susceptibility to pests A number of new, improved varieties are being considered for utilisation in the TWM It is imperative that consideration be given to potential pest outbreaks when selecting among candidate varieties Some of these improved varieties may be more susceptible to local pests than the local, low-yielding varieties Such enhanced susceptibility may offset the yield increases expected from the introduction of new varieties Alternatively, it may accelarate pesticide use The varieties being considered should be screened by PVOs or other organizations before being released for use on farms The collaboration of Mr Amal Chatterjee (Winrock International), who is currently doing such screening, should be sought

3 6 Plant quarantine If new coffee varieties are introduced during the LOP to replace the old, low yielding Coffea arabica var typica, which represents nearly 99% of all coffee trees in Haiti, it is imperative that the selected varieties be resistant to the rust (preferably horizontal resistance which is not strain-

specific) and that special precautions be taken when introducing coffee plant material not to introduce infected parts Special consideration must be given when selecting the donor country with respect to 1) the occurence of the disease in that particular country, and 2) the existence of plant quarantine and inspection facilities in that same country

Mr Julio Bartholemy, head agronomist at the DARNDR s plant protection section in PAP, has indicated to me that the GOH has plans for the construction of plant quarantine facilities in PAP and Cap Haitien in the coming year This project appears to be more than a politician s promise since Mr Bartholemy was able to show me detailed documentation relative to this project Six DAPNDR technicians will be assigned to those facilities However, one can suspect that such technicians will never receive adequate training without assistance from external sources At least two of these staff members should receive short-term training at the USDA-APHIS station at Hyattsville Maryland, and the cost of such training should be born by USAID/TWM funds

3 7 Rodent control The solution to the rat problem in Haiti requires a sustained national effort which should come from the GOH This is a vast operation which is not feasible within the context of the TWM Punctual temporary efforts are doomed because of subsequent immigration to areas where control measures have been applied from areas where they have not Rodenticide tests are currently conducted at the DAPNDR but no national organized control plan seems to be underway TWM s director should strongly encourage the GOH to adopt a permanent national rodent control program

3 8 Storage and disposal of pesticides A system for safe storage of pesticides and disposal of pesticide containers or unused pesticides should be established at each participating PVO as described by Parasram et al (1980)

APPENDIX 1

ENVIRONMENTAL ASSESSMENT

Introduction

Because AID's financing of pesticides for any project must conform to the provisions of AID Regulation 16 (22 CFR Part 216), it is required that an analysis of pesticide use (EA) be conducted as a condition precedent of the disbursement of AID funds into the TWM

In this EA a list of pesticides the use of which is anticipated during the LOP, is reviewed to determine their acceptability for use in the project Factors considered for this evaluation are listed in paragraph 216 3 (b) (1) (i) of Regulation 16 and include, as a highly determinant criterion for selection, the USEPA registration status of each pesticide under consideration World Bank guidelines for pesticide use are also taken into account in this analysis

1- Basis for selection of the requested pesticides

Because of the current lack of 1) published information on pest identification and, 2) research data on pesticide efficacy in Haiti (see section "General observations in the attached report) the pesticides which DAI/TWM has requested for use in the project have not strictly been selected on the basis of accurate knowledge of present or anticipated pest problems, but mainly on their availability at two agrochemical suppliers in the Les Cayes area and on their current use for the control of various, unspecified pest problems in the same area To this list I have added other pesticides which are currently used by four PVOs that have indicated their willingness to participate in the TWM Most of these pesticides are applied on seedlings of fruit tree and forest tree species which are being considered for adoption in the TWM Some of these pesticides may not be available in the Les Cayes area but they may all be purchased in PAP Approaches to selection of pesticides vary among the different PVOs but are generally based on crude identification of the pest problems (e g aphids, crickets, ants, leaf spots broad-leaf weeds, etc) and on information contained in books and booklets

published in other countries and/or obtained from pesticide suppliers (see attached report for more details)

Finally, the fungicide Metalaxil (Ridomil) was added to the list because of its anticipated use for the control of Phyllachora maydis, a corn disease recently identified in Haiti Field tests conducted by the DARNDR have apparently shown that Metalaxil is very effective in controlling this disease Consult Table 1 for details on the origin of the requests

2- The USEPA registration status of the requested pesticides

Table 2 indicates whether each requested pesticide is registered by USEPA for General Use (G), Restricted Use (R), or whether it has been Cancelled (C) for use in agriculture Restricted pesticides may be purchased and used only by certified applicators because of their very high toxicity and/or environmental hazard General-use pesticides may be purchased and used by the general public Table 2 also gives LD_{50} values and World Bank acceptability for each of the requested pesticides

Most of the pesticides that are currently used by the PVOs are not applied on food crops and therefore do not pose residue tolerance problems (DPI and DCCH run forest tree nurseries whereas OPE runs a fruit tree nursery) Only UNICOPS currently uses pesticides on some food crops, notably Malathion and Trichlorfon on corn and Trichlorfon on tomatoes, cabbage and carrots The latter are not presently being considered for use during the LOP With regard to corn new varieties will be introduced during the LOP and use of Malathion may continue based on established EEC tolerances

It is not known, at the present time which of the pesticides requested by Mr J St-Andre (DAI/TWM) will be used on each of the food crops considered for adoption in the project It is important that the pesticides authorized for the project be applied only on crops which 1) have an EPA registration and/or 2) have established WHO/FAO residue tolerances, especially in the case of crops which are destined for export For domestic crops WHO/FAO residue tolerance levels and/or registration for the same or similar use in selected other countries (e g EEC countries) may be considered sufficient Since TA is provided for in this project, AID/W through ST/AGR/AP and its pest management contractor, the CICP will provide specific guidance on appropriate crop/pesticide combinations and assistance in obtaining any needed residue/efficacy data

Specific recommendations with reference to Table 2

The EPA has ruled that some organochlorine insecticides cannot be used for agricultural purposes in the US (i e cancelled registration) because of their excessive persistence and propensity for bioaccumulation in human tissues and biomagnification in food chains Three of the pesticides considered for use in the TWM are among those cancelled by EPA, namely Chlordane Dieldrin and Aldrin

In the Targeted Watershed where Chlordane is generally used for the control of ants, Orthene (Acephate) may be a suitable replacement Dieldrin is currently employed for rat control by at least one of UNICORS COOPS but should not be used during the LOP See the attached report (section 3 7) for recommendations regarding rodent control Aldrin has been requested by DAI for use in the TWM but since details regarding its anticipated use have not been given, no substitute can be suggested at the present time The same comment applies to Toxaphene which is registered for Restricted use only by EPA Toxaphene should therefore not be used in this project Suitable alternatives to Toxaphene should be sought with the help of STAGP Lindane also belongs to the organochlorine family and although it is registered for use as a seed treatment, it should not be used in this project because of its high acute toxicity and its negative classification based on World Bank standards (it should by pointed out, however, that those standards are based on the toxicity of formulated pesticides while most LD_{50} values available are determined for technical products) Malagrain, a Malathion-based powder recommended for seed treatment may be used as a substitute to Lindane (Lindagrain)

Methomyl (Lannate) is a highly toxic insecticide and is registered for restricted use only by EPA It is currently applied on fruit tree seedlings (ORE) for the control of caterpillars in addition to Malathion If effective, the latter should be considered as a satisfactory alternative Use of Dipel (Bacillus thuringiensis) to control Lepidoptera larvae on fruit tree seedlings should also be explored

The use of herbicides on peasants farms is not anticipated at the present time since weeding is usually done by hand However herbicides are currently used for the mass production of fruit tree seedlings at the ORE nursery and their use may be expected to continue during the LOP when such seedlings are produced for the TWM Only two herbicides -- Glyphosate and Picloram -- are presently

used and one of them, Picloram, has been classified as Restricted by EPA for reasons which include hazards to nontarget organisms, specifically nontarget plants, both crops and noncrops The very high phytotoxicity of Picloram can lead effectively to soil sterilization Its use therefore should be avoided Other safer, general-use herbicides should prove effective for most nursery weed problems If glyphosate alone does not give good control, other substitutes may need to be sought The herbicide 2,4-D is a good candidate However, low-volatility esters of 2,4-D should be used to reduce similar problems with phytotoxicity The IPPC at OSU should be consulted for advice on suitable alternatives and the specific formulations

3- The extent to which the proposed pesticide use is part of an integrated pest management program

IPM programs are rudimentary to non-existent in Haiti Little information is available on the specific and most important pest problems and their economic status The lack of this very basic information may account for the more or less haphazard use of pesticides and absence of alternative methods

Table 3 illustrates the current status of pesticide management and alternative measures in Haiti At only two of the four P' Os are alternative measures employed and these are minimal at best At DCCH neem seed extract (obtained by soaking seeds in water) is applied to forest tree seedlings to protect them from insect attack (although the technician I interviewed believed it was for disease control) The extract of the neem tree Azadirachta indica known as azadirachtin in an insect antifeedant, i e a substance which has been shown to be deterrent to several species of phytophagous insects It does not kill insects but prevents damage by inhibiting insect feeding Although laboratory tests have clearly shown its antifeedant effects these same effects have not been well documented by field studies (see Barnays 1983 for a detailed discussion) However the ease with which it can be obtained and its low cost, warrant some research regarding the potential use of this product Some PVOs might be interested in conducting field tests At present neem seeds are produced in very low quantities and may only marginally meet nursery needs If A indica is grown as part of a reforestation and agroforestry effort small farmers could gain some economic benefit if the project were to explore and promote 1) the use of neem

seed extract by farmers to meet their own pest management needs, 2) possible collection and extract of neem seeds for commercial production of azadiractin and 3) improved methods of extraction to be used both by small farmers and commercial ventures and the testing of relative efficacy of varying concentrations of azadiractin

At one of UNICORS COOPs, table salt is applied along the margin of crop plots to prevent snails from reaching the plants Snails lose a large amount of water and die after crawling over salt Tests should be conducted to determine whether such salt applications have visible detrimental effects on crop health and yields, and soil and water quality

To comply with AID's environmental regulations procurement and use of pesticides should be done as part of integrated pest management programs and where capabilities are weak, efforts should be made to augment crop protection activities The two activities described above represent a very small emphasis on non-chemical pest management and do not require accurate identification of the pest species nor knowledge of pest management Other strategies such as biological control depend on accurate identifications and these capabilities are weak in Haiti It is thus important to provide extensive technical assistance in entomology plant pathology and weed science to stress non-chemical alternatives, safe pesticide use and handling and pesticide management

The strong emphasis on extension in this project provides a suitable vehicle through which to develop and implement training programs in IPM With the assistance of ST/AGP a series of short-term training and technical assistance will be developed through their cooperative agreement with CICP/OSU-IPPC Over the 5-year LOP ten 2-4 week visits (twice yearly) will be arranged for technical assistance by plant protection specialists The length of stay will gradually decline starting at four weeks in the first two years decreasing to three weeks each in years 3 and 4, and two weeks in year 5 These individuals will 1) identify the nature and magnitude of existing pest management problems, 2) assist in the design and identification of a testing, evaluation program on appropriate pesticide use and efficacy 3) design a system of pesticide field trials and evaluation which will include some system of crop insurance for participating farmers, 4) identify appropriate person(s) to monitor and evaluate the field testing programs, and 5) monitor and evaluate the success of the extension programs in pest management from a safety and acceptability perspective and the ability of the program to sensitized farmers to the important safety and environmental issues

Training modules in IPM, safe pesticide use and handling will also be developed for extension officers and promoter associated with the NGO and the DARNDP Training activities should commence after major problems are identified and the monitoring and testing/evaluation programs are begun with participating farmers Sometime in year 2, a two-week course in IPM will overlap with the TA to take advantage of demonstration and field trials The cost of the TA and training will be born by the TWM and the specific SOW will be developed cooperatively by the Mission and ST/AGP to include 1) the IPM approach, 2) current pesticide use and safety, and 3) demonstration of pest protection aspects of on-farm storage of agricultural commodities

There is a serious need to identify the pests of major economic importance to crops and trees adopted by the TWM The TA consultant will advise on this issue It is suggested that the project explore the possibility of identifying a Peace Corps volunteer with some background in crop protection (e g entomology plant pathology)

In addition, given the very similar interests, concerns and implementing PVOs in the TWM and AOP, efforts to obtain and fund TA and training should be coordinated between these two projects

4- <u>The proposed methods of application including availability of appropriate application and safety equipment</u>

All liquid formulations of pesticides will be applied with hydrolic backpack sprayers Each PVO owns at least one such sprayer and the purchase of extra sparyers for PVOs should be borne by the project If the application granular formulations becomes at any point necessary, such formulations should be applied with appropriately adapted shakers and not broadcasted with bare hands The use of fumigants is not anticipated at the present time (see section 11 of this EA for more details)

The reader may consult Table 3 for information on the current use of protective clothing and devices among the PVOs pesticide applicators All pesticide applicators involved in the project should be encouraged to wear protective devices and clothing -- gloves, boots, masks, long-sleeve shirts, long trousers, etc -- whenever possible Also the project should provide such equipment

For risks of contamination, care should be taken not to clean equipment and clothing directly in streams or rivers, especially where people may be expected to swim and/or drink the water

5- Acute and long-term toxilogical hazards, either human or environmental associated with the proposed use and measures available to minimize such hazards

LD_{50} values (oral and dermal) for all requested pesticides are given in Table 2 LD_{50} values give an idea of how acutely toxic pesticides are but, because such values are based on tests conducted with pure or technical products, they may not be very good indicators of how acutely toxic formulated pesticides really are The LD_{50} is, by definition the amount of a chemical necessary to kill 50% of a test animal population (usually laboratory rats) It is a value expressed as the weight of pesticide per unit weight of body (mg/kg), when swallowed (oral LD_{50}), or absorbed through the skin (dermal LD_{50}) A low LD_{50} indicates high acute toxicity whereas a high LD_{50} indicates a low acute toxicity

Although all chemical pesticides are potentially hazardous to humans and the environment, and should be treated with caution none of the authorized pesticides listed in Table 2 present unusual acute or long-term hazards to the applicators, to the general public or to the natural environment if applied according to their labels

With regard to long-term effects special precautions should be taken when mixing and loading some of the authorized fungicides for which EPA has issued RPARs (temporary status given to some pesticides for which recent data indicate that they may present some hazards to humans or the environment This status is meant to stimulate research and public debate until a final decision is made regarding the registsration status of such pesticides Those pesticides include Captan, Maneb, Mancozeb and Methyl thiphanate, all of which are suspected of causing tumors and/or genetic changes Label instructions should be followed particularly closely when using these pesticides

6- Efficacy and residue tolerances of the selected pesticides for proposed use

Among the pesticides authorized for use in this project, those selected by

DAI were not necessarily selected on the basis of their effectiveness against specific pests in Haiti However, those pesticides which are authorized and currently in use within the PVOs, are apparently effective at controlling most pest problems encountered in the PVOs respective environments As pest identification progresses during the five years of the LOP, specific pesticide efficacy tests will be designed by the TA consultants as discussed in section 3 which may then be conducted by the DARNDP, pesticide suppliers such as ASSA, or the PVOs Such tests should be supervised by individuals from the umbrella NGO, identified by the TA consultant

7- Compatibility of pesticides with target and non-target ecosystems

Although mammalian toxicity is a very important criterion in selecting a particular pesticide for a given use, effects of pesticides on honeybees, fish wildlife, and beneficial organisms (i e which may help prevent pest outbreaks), should also be considered

Table 4 gives indications on the periods of the day during which one should apply a particular pesticide in order to protect honeybees when the target crop is in bloom The same Table also shows that the selected pesticides for which bird toxicity data are available are not very toxic to avian species, with the possible exception of Diazinon which has an LD_{50} (oral) of 3 5 when tested on Mallard ducks

With regard to fish toxicity, many of the proposed pesticides are highly toxic to fish including most fungicides This aspect should not, however, pose any problem if precautions are taken to avoid drift or accidental spills in rivers and streams

Finally, in any well designed pest management program a high priority is given to preserving beneficial organisms such as insect predators and parasites This requires the use of narrow-spectrum pesticides which are toxic to only particular taxonomic groups of pests (here, again key target pest species and, if possible, their principle natural enemies must first be properly identified) Unfortunately most of the insecticides authorized for use in this project are broadly toxic to insects It is therefore imperative that measures be taken to reduce the number of pesticide applications to a minimum Such measures include the use of monitoring techniques, and action thresholds, cultural methods etc most of which need yet to be developped by the TA working with the umbrella NGO in collaboration with the DAPNDP

8- Conditions under which the pesticides are to be used, including climate, flora, fauna, geography, hydrology and soils

The TWM area lies between latitudes 18 1 and 18 23 N and longitudes 73 32 and 74 13 W in Haiti s Departement du Sud It extends from the eastern edge of the Cavaillon catchment area to the western edge of the Les Anglais catchment The southern slopes of the Massif de la Hotte and of the Monts du Plymouth form the northern boundery of the Targeted Watershed Pic Macaya at 2,347 m the highest mountain in the region is part of the Massif de la Hotte The Caribbean Sea forms the southern boundary of the Targeted Watershed

The dominant topography of the region is very steep slopes at elevations less than 1,000 m However, elevations within the target zone reach to the top of the Pic Macaya (2,347 m) Topography accounts for climatic changes within short distances and for the general innaccessibility of much of the region

Rainfall in the Targeted Watershed is a function primarily of elevation and ranges from 1,200 mm at the driest sea-level zones in the southwest of the project area to nearly 4 000 mm at the highest elevations of the Massif de la Hotte High-elevation areas have only a winter dry season and have sufficient rainfall to support vegetative growth for the rest of the year In low-elevation areas rainfall follows a bimodal pattern with concentration of precipitation in April-May and September-October

The soils of the Targeted Watershed are highly weathered tropical soils However, ca 75% of the soils are young soils Mollisols These are found at lower elevations, in dryer zones and on calcareous parent materials The highly weathered red tropical soils for which nutrient status is highly organic-matter dependent are those described as having 90% of their nutrients in the upper 10 cm of the top soil Black Mollisols have a good organic matter level as well as active clay throughout their profile which gives them a superior nutrient status vis-a-vis the red soils

With regard to flora and fauna there are about 5000 plant species in Haiti but their endangered/threatened status is uncertain Of those 5000 plant species, there are 600 species of ferns and 300 species of orchids Among animals, of particular importance are the 220 species of birds and the recently discovered species of molluscs in the national parks

Because pesticide applications will generally be punctual (i e will cover very small areas), major environmental contaminations resulting from blanket pesticide applications should not be a concern However, the steep slopes and the heavy raintalls observed during the rainy season could cause local problems of surface runoff and leaching into water supplies Such problems should be lessened by the proposed introduction of good soil conservation practices which would not only reduce soil erosion but which would also reduce the movement of pesticides in surface water In addition, some pesticide formulations may be preferable to others due to varying degrees of mobility in surface water and propensity to leach and contaminate ground water (see Merkle & Bovey 1974) If there is doubt regarding the appropriateness of a given pesticide when applied in conditions where the potential for surface runoff and water supply contamination is high T\/M personnel should consult AID 'ST 'AGP for advice

9- <u>The availability and effectiveness of other pesticides or non-chemical control methods</u>

There are currently several other pesticides available in Haiti, some of which might be more effective at controlling the anticipated pest problems than those which have been authorized for the project Among such pesticides, however, there are some which are more persistent in the environment and/or more toxic to mammals and to other non-target organisms than the proposed pesticides Once the major economic pests have been identified a need for the adoption of some of those other available pesticides may, nevertheless, arise

Two available non-chemical control methods have already been discussed in section 3 of this EA Some other non-chemical control approaches which have a high potential for success in this project include 1) the use of <u>Bacillus thuringiensis</u> a bacteriological insecticide of very low mammalian toxicity which is effective in the control of various lepidopterous larvae (caterpillars), 2) the introduction of parasites and/or predators for the control of various scale insects which occur in Haiti, 3) the introduction of predatory mites for the control of injurious mites on fruit trees, 4) the introduction of a coccinellid predator for the control of a psyllid insect which attacks <u>Leucaena leucocephala</u>, a tree that has been recommended for the alley-cropping technique that will be used in the T\/M, and 5) the use of resistant <u>L. leucocephala</u> varieties Webb and Webb (1986) recently reported psyllid damage as being very serious in the Northwest of Haiti

Although I did not observe many psyllids in the Southwest, the problem may be expected to reach epidemic proportions in this area at one point
Leucaena sp is native to Central America where the psyllid Heteropsylla cubana is kept under check by its natural enemies In many of the countries where Leucaena has been introduced, this psyllid was (accidentally) introduced as well In Hawaii, the coccinellid Curinus coerulus, which was introduced there in 1922 to control the coconut mealybug, has become an efficient predator of the psyllid (McFadden 1987) If the psyllid species found in Haiti turns out to be the same as that found in Hawaii, introduction of C coerulus into Haiti should be seriously considered The TA consultants are expected to take the necessary steps to determine if the above options are feasible

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

The GOH does not have a pesticide control board nor does it have any law or regulation designed to control the use of pesticides in its country One such law is apparently in preparation but the recent political events in Haiti have at least temporarily, interrupted further development of this law In any case, the ability of the GOH to enforce such a law remains questionable

Therefore, in the context of the TWM, it will be the role of the umbrella NGO to verify and control the distribution storage use and disposal of the requested pesticides This should not pose any problem in the early phase of the project when as recommended in section 11, the handling and application of pesticides is done by trained PVO technicians only Control may become more difficult however if later in the LOP, peasants begin applying pesticides themselves

There is one particular control issue over which the umbrella NGO may experience difficulty The issue of labelling When a whole bag or container of pesticide is purchased, the product is normally properly labelled but not in a language (usually English) which most Haitians can read When pesticides are purchased in smaller quantities they are transfered into paper bags or into containers which do not have any label at all The salesman may simply write the name of the pesticide on the bag or the container and give verbal instructions relative to the use of the purchased pesticide Often those bags get ripped or wet and the identification disappears One solution to this problem lies in the production of stickers printed with Creole translations of the original labels

ASSA, a fertilizer company which will soon begin distributing pesticides in Haiti, may be interested in getting such stickers produced It will be the role of the umbrella NGO to make arrangements with the pesticide distributors in order to ensure that pesticides purchased by AID/TWM are labelled as described above Assistance to the umbrella NGO will be provided by ST/AGR with regard to minimum acceptable standards for repackaged pesticides

11- The provisions made for training of users and applicators

Since many of the peasants will not be able to afford the purchase of a backpack sprayer, I suggest that, at least initially pesticide applications for on-farm trials be carried out by trained technicians from the PVOs UNICOPS currently employs such a system although its applicators are not properly trained This institution supervises 8 COOPs each of which is divided into a certain number of sections (e g 5) A given COOP has a technician who in theory is well trained and qualified to apply pesticides This technician trains at least one person in each of the sections and this person applies pesticides on private farms when such measures appear necessary

Adequate training in pesticide application/handling/disposal should be provided for at least two technicians in each of the four PVOs These technicians should then be able to teach other applicators the safe handling of pesticides If the timing is right, I suggest that DCCH and DRI technicians participate in one of the two 1-day courses which will be offered this fall by a pest management specialist hired by USAID/Haiti Cooperative Agreement for Fruit Tree Production This course will be offered at ORE which is relatively near DCCH and DRI Travel would need to be provided for two UNICORS technicians

If the decision is made, later in the LOP to transfer the responsability of applying pesticides to the farmers, it would be wise to develop and implement basic education programs (through the extension/promoter system) in pesticide safety handling and potential environmental impacts

12- The provisions made for monitoring the use and effectiveness of the pesticides

The umbrella NGO will have the responsability of monitoring the use of pesticides in the TWM and ensure that they are handled correctly and safely The

TA consultants, and later a US-trained agronomist/entomologist (see the Recommendation section 33 in the attached report) of the SHAG, will be responsable for routinely taking crop samples in order to conduct pesticide residue analyses for use of pesticides on crops for which residue tolerances have not been established by either EPA or FAO/WHO Funds have been provided for residue analyses in the attached budget Additional analyses may be performed by private chemical companies that are providing the pesticides To the extent possible, analyses will be performed in Belizean laboratories where capabilities exist This will be particularly important in the case of crops exported to foreign countries which may have specific standards regarding pesticide residues

Table 1 List of requested pesticides and origin of requests

PESTICIDE		ORIGIN OF REQUEST					
Common name	Commercial name (if different)	DAI	ORE	DPI	DCCH	UNICORS	Author
Aldrin		X					
Benomyl	Benlate	X	X				
Captan		X		X	X	X	
Carbaryl	Sevin	X	X	X		X	
Chlordane			X		X		
Deltamethrin	Decis		X			X	
Diazinon	Basudin	X					
Dicofol	Kelthane	X	X				
Dieldrin						X	
Glyphosate	Round-up		X				
Lindane	Lindagrain					X	
Malathion		X	X		X	X	
Mancozeb	Dithane M45			X		X	
Maneb	Manzate		X				
+ Metiram	Molosse		X				
" + Methyl-thiophanate	Peltar		X				
Metalaxyl	Ridomil						X
Methomyl	Lannate		X				
Picloram	Tordon		X				
Thiram			X				
Toxaphene		X					
Trichlorfon	Dipterex				X	X	

Table 2 EPA registration status and toxicity of requested pesticides

PESTICIDE Common name	ACTION[1]	EPA REG STATUS[2]	LD_{50}[3] oral/dermal mg/kg	WBA[4]	SIGNAL[5] WORD	PROJECT[6] AUTHORIZATION
Aldrin	I	C	40-60/50-100	NO	Warning	-
Benomyl	F	G	>10000/>10000*	Ok	Caution	+
Captan	F	G	9000/ -	Ok	Caution	+
Carbaryl	I	G	500/>2000*	Ok	Caution	+
Chlordane	I	C	367-515/>200 <2000*	OK	Warning	-
Deltamethrin	I	G	>5000/>2000*	Ok		+
Diazinon	I	G	300-400/3600*	Ok	Caution	+
Dicofol	A	G	684-809/1000-1230	OK	Caution	+
Dieldrin	R[7]	C	40-60/50-100	NO		-
Glyphosate	H	G	4900/ -	Ok	Warning	+
Lindane	I	G	88-125/1000	NO	Warning	-
Malathion	I	G	10090-1375 4100*	Ok	Caution	+
Mancozeb	F	G	>8000/ -	OK	Caution	+
Maneb	F	G	7990/ -	Ok	Caution	+
" + Metiram	F	G	7990-10000/ -	OK	Caution	+
" + Methyl-thiophanate	F	G	7990-9700 8000*[8]	Ok	Caution	+
Metalaxyl	F	G	669 3100	Ok	Warning	+
Methomyl	I	R	17-24/5880*[9]	NO	Danger/Poison	-
Picloram	H	R	8200/ -	Ok	Caution	-
Thiram	F	G	780/ -	Ok	Caution	+
Toxaphene	I	R	69/ -	NO	Warning	-
Trichlorfon	I	G	150-400/>500	OK	Warning	+

1 A = Acaricide, F = Fungicide, H = Herbicide, I = Insecticide, R = Rodenticide

2 C = Cancelled G = General, R = Restricted

3 Based on technical product unless otherwise indicated From Farm Chemical Handbook 1985 Meister Publishing Co , Willoughby Ohio, USA

4 WBA = World Bank Acceptability If a pesticide is in category Ia or Ib of the WHO Recommended Classification of Pesticides by Hazard this pesticide is considered unacceptable Categories Ia and Ib include all pesticides which fall in the following toxicity categories LD_{50} (rat) oral solid < 50 mg
liquid < 200 mg
dermal solid < 100 mg
liquid < 400 mg

5 See ref cited in footnote 3 p C234 for classification criteria

6 - not authorized, + authorized

7 Usually classified as an insecticide but used as a rodenticide by UNICORS

8 Datum for Methyl thiophanate only

9 Based on 24% liquid formulation

* Rabbit instead of rat

Table 3 Summary of pesticide management in the PVOs

CATEGORY	PVO			
	ORE	DCCH[1]	UNICORS	DRI
Use of C-pesticides	YES	YES	YES	NO
Use of R-pesticides	YES	NO	NO	NO
Basis for selection of pesticides	CIP[2]	CIP	±Haphazard and some CIP	CIP
Safety equipment				
mask	YES	NO	NO	Cloth mask
gloves	YES	NO	NO	NO
boots	NO	NO	NO	NO
other	Plastic coat	NO	NO	NO
Storage area	Locked & Safe	Locked & Safe	Locked but also used as a warehouse for grain	Locked & Safe
Identification of pesticides in storage area	GOOD	No pesticide when visited	NOT GOOD	NOT GOOD
Disposal	In an outdoor toilet	Bags are burned	Empty bags are washed and re-used for seed transport	Empty bags are burnt
Use of alternative pest management methods	NO	Use of neem seed extract	Use of table salt to control snails	NO
Particular problems			Seed treatment done on a concrete surface where many children often walk bare foot	Broadcast of pesticides with bare hands
Particularly good feature	Creole guide on CIP, pesticide selection and dosages			

[1] Based on previous use temporary ban on pesticide use at DCCH

[2] CIP = Crude Identification of Pest

Table 4 Toxicity of pesticides to non-target organisms

PESTICIDE	BEES[1]	BIRDS[2] LD_{50} (mg/kg) Mallard, oral	FISH[3]
Aldrin	1-A	520	
Benomyl			T
Captan			T
Carbaryl	1-A	2179	T
Chlordane	1-C	1200	
Deltamethrin	1-C		
Diazinon	1-A	35	T
Dicofol	1-D		
Dieldrin	1-A		
Glyphosate			
Lindane	1-A	2000	
Malathion	1-B	1485	T
Mancozeb			T
Maneb			T
+ Metiram			T
+ Methylthiophanate			T
Metalaxyl			
Methomyl	1-D		T
Picloram		2000	
Thiram			T
Toxaphene	1-C		
Trichlorfon	1-C	700-600*	

[1] 1-A do not apply on crops in bloom, 1-B apply only during late evening when crops in bloom, 1-C apply only during late evening or early morning when crops in bloom, 1-D can be applied at any time with reasonable safety to bees From Handbook for pesticide applicators and pesticide dispensers, 1980 Province of B C , Ministry of environment, Pesticide Control Branch, Victoria, B C , Canada

[2] Same source as that cited in footnote 1

[3] T highly toxic

* Quail instead of mallard duck

Illustrative budget

Technical Assistance -- 8 months Crop protection and pesticide safety and handling	$ 150,000
Training of two plant quarantine specialists (DARNDR staff) at APHIS	$ 12,000
Residue analyses 200 samples at $150 00/sample	$ 30,000
Participants per diem	$ 10 000
Travel	$ 2,000
Purchase of protective devices and safety equipment	$ 1,000
Purchase of additional back-pack sprayers (ca 20) at $75 00/sprayer	$ 1,000
Training supplies	$ 5 000
Total	$ 211,000

(Ph D training for a DARNDR staff has already been budgeted)

APPENDIX 2

ASSESSMENT OF THE NEED FOR PESTICIDE USE IN THE AGROFORESTRY OUTREACH PROJECT

Introduction

Prior to the initiation of the AOP in 1981, an IEE prepared by Mr William Sugrue indicated that the use of pesticides in CARE and PADF nurseries would not be necessary Therefore, AID funding of the AOP was approved with the special condition that pesticides would not be used during the LOP However, several pest problems have since then emerged which may require the use of pesticides in order to avoid substantial losses due to diseases and insect pests

Technicians in CARE and P'/O nurseries of PADF have taken it upon themselves to initiate pesticide treatments in view of the evergrowing pest problems The purpose of this report is to analyse pesticide use and pest management practices in CARE and P'/O nurseries of PADF involved in the AOP

This report is based on a meeting with Steve Goodwin project coordinator for PADF in PAP, visits of two of the P'/O nurseries of PADF (DCCH and DPI), and a meeting with Rick Scott project coordinator for CARE in PAP Because of a lack of time none of the five CARE nurseries which are located in the NW of Haiti were visited

1- List of pesticides proposed for use in the AOP

Common name	Commercial name	Users		Authorization
		CARE	PADF	
Benomyl	Benlate		X	YES
Captan		X	X	YES
Carbaryl	Sevin	X	X	YES
Chlordane			X	NO
Malathion		X	X	YES
Mancozeb	Dithane M45		X	YES
Meneb + Methyl-thiophanate	Peltar		X	YES
Trichlorfon	Dipterex		X	YES

The reader should refer to the EA/TWM for a detailed analysis of these pesticides Chlordane, the only pesticide not authorized for use in the AOP because of its Cancelled EPA status is normally used for ant control in tree nurseries Orthene (Acephate) may be a suitable substitute

2- Use of IPM principles by PADF and CARE

PADF produces a nursery manual titled The Small Container Nursery Manual for Rootrainer Fives This document, printed in both Creole and English gives control recommendations based on crude classification of pests damping-off fungus, crickets, caterpillars, aphids, and ants Pesticides recommended are all broad-spectrum The only non-chemical methods recommended are for 1) crickets hand weeding around the nursery, and 2) damping-off reduced watering and increased ventilation However at the two PVO nurseries visited, the technicians did not appear to be using the manual and, when asked whether they were using non-chemical methods for pest control, they did not mention the two above methods At DCCH, however they do use neem seed extract for the protection of tree seedlings against insect attack (see EA/TWM for a complete discussion)

With regard to CARE nurseries Rick Scott claims that pest problems are not too important at the present time and that all pest problems are controlled with three broad-spectrum pesticides which are relatively safe to use (see table) No non-chemical methods are presently being used (The reader should consult the EA/TWM for more details on potential alternative control methods as some of them also apply to the AOP)

The AOP and the TWM share some basic pest management-related problems including the lack of knowledge on what the pest problems are and how serious these problems really are A short-term consultancy (ca 6 weeks) aimed at identifying the most pressing problems on the commonly grown tree species (i e Cassia siama, Eucalyptus camaldulensis Casuarina equisetifolia, Catalpa longissima and Leucaena leucocephala) is necessary before further actions are taken A pest management specialist with experience in nursery IPM should be hired to identify major pest species and propose non-chemical control methods where appropriate The most important insect problems include 1) caterpillar and

aphids which cause damage to leaves, 2) ants which carry off seeds of Casuarina and Eucalyptus, and 3) seed bugs which burrow into seeds of Leucaena With regard to plant diseases, damping off is the most apparent problem

3- Need for training of pesticide applicators

Based on visits at the DCCH and DRI nurseries, the level of training of PADF pesticide applicators appears somewhat low (see section 2 4 in attached report) It has already been recommended that two technicians in each of DCCH and DRI attend one of the two 1-day pesticide application training courses which will be offered shortly by AID/Haiti Cooperative Agreement for Fruit Tree Production in Camp Perrin (see EA 'TWM section 11) PADF includes several other PVO nurseries however, and pesticide application training should be provided for at least one technician in each of those nurseries The pest management specialist hired for the training course offered by AID/Haiti Cooperataive Agreement for Fruit Tree Production, should be rehired for additional training sessions for the various nurseries involved in the project, including those of CARE The period required for this TA will depend on 1) how many nursery technicians working in different geographical areas can travel to a common point to attend a course and as a consequence on 2) how many locations the consultant will need to travel to

4- Final recommendation

With the condition that 1) Chlordane is not used by PADF or CARE during the remaining part of the LOP, 2) major pest problems are identified and IPM methods adopted when possible and 3) proper pesticide application training is provided for PADF and CARE nursery technicians, the authorized pesticides are recommended for use in the AOP

Illustrative budget

Six-week TA in pest identification and development of IPM methods	$ 8,400
Three weeks of pesticide training courses for PADF and CARE nursery technicians	$ 4,000
Travel	$ 3,000
Purchase of protective devices for all PADF and CARE nursery technicians	$ 2,000
Participants per diem	$ 4,000
Teaching material	$ 1,000
Total	$22 400

APPENDIX 3

Itinerary in Washington, D C and Haiti

Date (July 1986)	Activities
6/Sun	Air travel between Quebec City, Canada, and Washington, D C
7/Mon	Briefing with Mr Carroll Collier crop protection specialist at the AID/ST Office of Agriculture, and with Mrs Marea E Hatziolos, Deputy Environmental Officer at the AID/LAC Bureau
8/Tue	Air travel to PAP, Haiti Arrival at 15 45 Met with Mr James J Talbot PEMS/CAP Haiti and discussed my itinerary in Haiti and details regarding my assignment
9/Wed	Spent morning at the AID Mission in PAP to organize my schedule Visited their library and went through pest management literature which might be related to Haiti Spent part of the afternoon at the DARNDR office of plant protection, making first contacts and getting appointments with Mr Julio Bartholemy Mr Paul Samedy and Mr Guy Hallman who were impossible to reach by telephone Went back to the AID Mission and read reports pertinent to my assignment
10/Thu	9 00 Met with Mr Philippe Mathieu of ASSA a fertilizer/pesticide supplier in Bon Repos near PAP 11 00 Met with Mrs Anne Hauge of Agri-Supply Co in PAP 13 00 Spent some time at the library of the Faculte d Agronomie going through pest management literature related to Haiti 14 00 Met with Mr Bertrand Derouillere, entomologist at the Faculte d Agronomie, Damien 15 00 Met with Mr Guy Hallman, USDA pest management specialist working on a West Indian Fruit Fly quarantine problem

16 00 Met with Mr Julio Bartholemy, agronomist and director of the DARNDR s plant protection section

11/Fri 9 30 Met with Steve Goodwin, AOP coordinator for PADF in PAP
11 00 Met with Rick Scott, AOP coordinator for CARE in PAP
13 00 Returned to the AID Mission and had a discussion with Jean Finnigan of ORE Spent the rest of the afternoon getting organized for my trip to Les Cayes and Chardonniere

12/Sat Morning travelled to Les Cayes (ground transportation)
Afternoon met with Mr Gerard Leger agrochemical supplier for ASSA in Les Cayes

13/Sun Morning read TWM s PP draft and rested
Afternoon read TWM s PP draft and met with Mr Amal Chatterjee of Winrock International (Les Cayes)

14/Mon Morning visited the ORE fruit tree nursery at Camp Perrin Met with Sean Finnigan again
Afternoon visited the DPI forest tree nursery in Bergaud and met with Mike Bannister of PADF

15 'Tue Morning travelled to Laborde to visit DCCH forest tree nursery but was unable to meet the nursery technician Worked on EA instead
Afternoon 14 00 Met with Mr Jean-Yves Banatd, DAP/IDP agronomist in Les Cayes
16 00 Left for Chardonniere Arrived there at 22 00

16/Wed Morning travelled to Les Anglais and met with Mr Jean St-Cyr, president of the Cooperative Agricole Des Anglais one of 8 COOPs coordinated by UNICOPS Discussed pesticide use by the COOP
Afternoon travelled to Randel to visit another COOP but was unable to meet with the pesticide application technician Took advantage of being there to visit a couple of peasant farms Stayed overnight in Chardonniere

17/Thu Morning travelled back to Les Cayes
Afternoon went back to DCCH nursery and met with Mr Gilbert Piard, the technician in charge of pesticide application
16 30 Left Les Cayes for PAP

18/Fri Morning went to the AID Mission for short debriefing and went back to the Mission s library to look up new references
Afternoon 13 00 Met with Mrs Fabienne Latortue of Darbouco an agro-chemical supplier in PAP Spent the rest of the afternoon working on EA

19/Sat Worked on EA and CICP report

20/Sun Worked on EA and CICP report

21/Mon Morning made a few telephone calls to some of the people contacted earlier to ask further questions Called Carroll Collier in Washington D C
Afternoon had a debriefing session with Mr Robert Wilson at the AID Mission

22/Tue Typed the EA at the AID Mission

23/Wed Submitted a draft of the EA to Messrs John Lewis and Robert Wilson at the AID Mission Travelled back to Canada

APPENDIX 4

List of major contacts in Haiti

USAID/Haiti (PAP)

Mr James J Talbot REMS/CAR
Mr Robert J Wilson RDO
Mr John V D Lewis RDO

DARNDR

Mr Julio Bartholemy agronomist (PAP)
Mr Paul Samedy, agronomist (PAP)
Mr Jean-Yves Banatd, agronomist (Les Cayes)

PADF

Mr Steve Goodwin, AOP coordinator (PAP)
Mr Mike Bannister (Les Cayes)

CARE

Mr Rick Scott, AOP coordinator (PAP)

Winrock International

Mr Amal Chatterjee (Les Cayes)

OPE

Mr Jean Finnigan, director (Camp Perrin)

Darbouco, S A (Agricultural supply)

Mrs Fabienne Latortue, agronomist (PAP)

Agri-Supply Co

Mrs Anne Hauge, general manager (PAP)

Agricultural Services S A (ASSA)

Mr Philippe Mathieu, agronomist (PAP)

Faculte d Agronomie, Universite d Haiti, Damien

Mr Bertrand Derouilleres, entomologist

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