PD-AAN-338 ISN 31869

AGENCY FOR INTERNATIONAL DEVELOPMENT

PROJECT DATA SHEET

1. TRANSACTION CODE: A (A = Add, C = Change, D = Delete) — Amendment Number: _____ — DOCUMENT CODE: 3

2. COUNTRY/ENTITY: Worldwide Type c Field Support

3. PROJECT NUMBER: 936-4120

4. BUREAU/OFFICE: S&T/AGR/AP [10]

5. PROJECT TITLE (maximum 40 characters): Pre/Postharvest Rodent and Bird Control

6. PROJECT ASSISTANCE COMPLETION DATE (PACD): MM 12 DD 31 YY 84

7. ESTIMATED DATE OF OBLIGATION (Under "B." below, enter 1, 2, 3, or 4): A. Initial FY 83 B. Quarter II C. Final FY 84

8. COSTS ($000 OR EQUIVALENT $1 =)

A. FUNDING SOURCE	FIRST FY 83 B. FX	C. L/C	D. Total	LIFE OF PROJECT E. FX	F. L/C	G. Total
AID Appropriated Total	600		600	1,200		1,200
(Grant) S&T/AGR Funds	(600)	( )	(600)	(1,200)	(-)	(1,200)
(Loan)	( )	( )	( )	( )	( )	( )
Other U.S. 1. Missions/Bureaus	240		240	480		480
Other U.S. 2. (Anticipated Buy-ins						
Host Country						
Other Donor(s)						
TOTALS	840		840	1,680	-	1,680

9. SCHEDULE OF AID FUNDING ($000)

A. APPROPRIATION	B. PRIMARY PURPOSE CODE	C. PRIMARY TECH. CODE 1. Grant	2. Loan	D. OBLIGATIONS TO DATE 1. Grant	2. Loan	E. AMOUNT APPROVED THIS ACTION 1. Grant	2. Loan	F. LIFE OF PROJECT 1. Grant	2. Loan
(1) ARDN	140 I	070	-	600	-	600	-	1,200	-
(2) ARDN	140 I	070	-	240	-	240	-	480	-
(3)									
(4)									
TOTALS				840	-	840	-	1,680	-

10. SECONDARY TECHNICAL CODES (maximum 6 codes of 3 positions each): 010 | 024 | 337 | - | - | -

11. SECONDARY PURPOSE CODE: 150

12. SPECIAL CONCERNS CODES (maximum 7 codes of 4 positions each)

A. Code	R/AG	INT/L	TECH	TNG	XII	-	-
B. Amount	230	1,680	530	50	1,680	-	-

13. PROJECT PURPOSE (maximum 480 characters)

To assist developing country institutions develop, demonstrate and implement improved rodent, bird and other vertebrate pest control systems for the reduction of pre-and postharvest food losses.

14. SCHEDULED EVALUATIONS: Interim MM 11 YY 85 | | MM 11 YY 88 | Final MM 11 YY 91

15. SOURCE/ORIGIN OF GOODS AND SERVICES: [X] 000 [ ] 941 [ ] Local [ ] Other (Specify) _____

16. AMENDMENTS/NATURE OF CHANGE PROPOSED (This is page 1 of a ____ page PP Amendment)

To extend the life-of-the project by one year and increase the authorization for funding by $840,000 for a total two-year life-of-project funding authorization of $1,680,000.

17. APPROVED BY — Signature: J. S. Robins — Title: J. S. Robins, Director S&T/FA — Date Signed: MM 09 DD 13 YY 83

18. DATE DOCUMENT RECEIVED IN AID/W, OR FOR AID/W DOCUMENTS, DATE OF DISTRIBUTION: MM DD YY

PROJECT AUTHORIZATION

NAME OF COUNTRY: Worldwide

ENTITY : Bureau for Science and Technology

NAME OF PROJECT: Pre/Postharvest Rodent and Bird Control

PROJECT NUMBER : 936-4120

1. Pursuant to Section 103 of the Foreign Assistance Act of 1961, as amended, I hereby authorize a one-year extension of the centrally-funded project entitled Pre/Postharvest Rodent and Bird Control, involving planned obligations not to exceed $840,000 of grant funds over the one-year period of FY 1984 (January 1, 1984 to December 31, 1984), subject to the availability of funds, in accordance with the A.I.D. OYB/allotment process, to help in financing foreign exchange and local currency costs for the project.

2. The purpose of the project is to assist developing country institutions develop, demonstrate and implement improved rodent, bird and other vertebrate pest control systems for the reduction of pre- and postharvest food losses. The activities will be carried out under a Participating Agency Services Agreement (PASA) with the Denver Wildlife Research Center, Fish and Wildlife Service, U.S. Department of Interior.

3. Goods and services, except for ocean shipping, financed by A.I.D. under the project shall have their source and origin in the United States or in the cooperating country, except as A.I.D. may otherwise agree in writing. Ocean shipping financed by A.I.D. under the project shall, except as A.I.D. may otherwise agree in writing, be financed only on flag vessels of the United States.

4. Each developing country where activities take place shall be deemed to be a cooperating country for the purpose of permitting local cost financing.

5. The work envisaged by this project is exempt from the provisions of A-76 because: (1) it is for the provision of technical assistance and, (2) the Fish and Wildlife Service, Denver Wildlife Research Center facilities and resources of the United States Department of Interior are particularly or uniquely suitable for the technical assistance being sought and are not competitive with private enterprise.

J. S. Robins
Agency Director for Food and Agriculture
Bureau for Science and Technology

Date: 9/13/83

Attachments:
1. Project Paper
2. Action Memo

Clearances:
S&T/AGR/AP:JMYohe Date: 8/25/83
S&T/AGR:MMozynski Date: 8/31/83
S&T/AGR:ARBertrand Date: 8/31/83
S&T/PO:BRoche Date:
S&T/PO:GEaton Date:

HRS

Drafted: S&T/AGR/AP:HRShuyler:bw 08/24/83:bw #4351f

August 25, 1983

ACTION MEMORANDUM FOR THE AGENCY DIRECTOR FOR FOOD AND AGRICULTURE, BUREAU FOR SCIENCE AND TECHNOLOGY

FROM: S&T/AGR, Anson R. Bertrand

SUBJECT: Authorization for S&T/AGR's Pre/Postharvest Rodent and Bird Control

Problem: Your approval is required to authorize a one-year extension of Pre/Postharvest Rodent and Bird Control Project (936-4120) at a funding level of $600,000 from S&T/AGR and $240,000 from Mission buy-ins, for a total of $840,000. This extension will provide time to redesign the project in a manner consistent with the new ribbon concept.

Discussion: The Pre/Postharvest Rodent and Bird Control Project, a technical assistance/research project, is designed to assist the collaborative efforts of Missions and LDCs to develop and demonstrate improved rodent, bird and other vertebrate pest control systems for the reduction of food losses in LDCs. Specifically, this project assists LDCs and missions to identify problems, develop and demonstrate improved pest management systems, provide training and disseminate information.

The goal of this project is to improve the standard of living in agricultural areas in participating developing countries by increasing income, employment, agricultural productivity, and available food through the development and sharing of vertebrate pest control technology.

This project is being implemented through a Participating Agency Services Agreement (PASA) with the Denver Wildlife Research Center (DWRC), Fish & Wildlife Service (F&WS), U.S. Department of Interior, and will emphasize research, technical assistance, and training. A major research facility of F&WS, DWRC is internationally recognized for its leadership and uniqueness in the field of vertebrate pest control. DWRC's capability in development assistance has been demonstrated by performance in the "Control of Vertebrate Pests" Project (931-0473). This predecessor project emphasized research and training. It began in 1967 and terminated December 31, 1982.

In just the last year five years of the predecessor project and the first eight months of the present project, DWRC has rendered prompt in-country assistance, as requested by USAID Missions, to 24 countries. In at least eleven countries during that time services of a follow-up nature to previous activities were performed; in five countries TDY assignments led to a specialist or specialists being outposted to that country for long periods of service (one year or more). These requests for additional assistance are the most certain judgement that effective work has been performed. In addition, DWRC assisted thirty five LDCs by correspondence in the last five years of the predecessor project, some countries repeatedly. In just the first ten months of the present project, assistance by correspondence has been rendered as a result of requests from fifteen countries.

DWRC developed a rat control system for wheat in Bangladesh which is expected to result in increased production valued at $10 million per year; currently the techniques are being extended to farmers. Rat control in coconut was developed in Colombia and the Philippines. The net yield of coconut has been increased up to 200 percent. The additional yield is anticipated to be valued at more than $150 million per year. A pilot trial of extension of the technology was conducted in the Philippines in January 1983. Philippine extension agents and a consultant from the S&T/Office of Education for non-formal education assisted without cost to the S&T/AGR Project. DWRC has improved greatly the knowledge of and ability to control the Quelea bird in Africa, the worst bird pest of that continent which causes hundreds of millions of dollars in losses each year. Rodent control developed for irrigated rice in the Philippines is now reducing losses in 1/2 million hectares to about one fifth of those experienced earlier. The savings are valued at about $14 million per year since 1976. In all of these examples the benefit:cost ratios show vertebrate pest management to be very beneficial to the small commercial farmer. Only a few of the improved vertebrate pest management techniques developed by the project have been noted. These few techniques have resulted in savings totalling in excess of $100 million and potential savings of up to $200 million per year. In contrast, the entire investment of S&T/AGR (and its predecessors) in all of the activities, since 1967, is only $8.5 million.

Earlier, DWRC developed in Nicaragua the only two methods known for control of vampire bats and the resulting rabies in livestock. The total ten-year cost for the development of the control method was paid for by the savings realized in less than one year of use of the techniques. Within the last ten years, DWRC was involved in transfer of this technology which has resulted in vampire bat/rabies control programs in thirteen Latin American Countries. DWRC's vertebrate pest control trainees of all levels now number in the thousands. One such trainee now heads the plant protection research and another the vertebrate pest extension of their country. Hundreds of requests by LDC scientists for scientific literature are filled by DWRC each year.

The work in Bangladesh and work started more recently in Haiti are now funded by the USAID Missions. Work in the Philippines, partially funded by the Mission, is expected to terminate September 30, 1983. In Pakistan, DWRC has prepared the vertebrate pest control portion of a Project Paper, mostly with Mission buy-ins. Backstopping for these and other activities has been and is furnished by the S&T/AGR project.

Further requests for long-term specialists are expected from Pakistan, Peru, and Indonesia, and possibly will come from the Central African Republic, Egypt and the Sudan.

The project design permits a small field staff in an LDC, with limited equipment and facilities to call upon the resources, services and expertise of the multi-disciplinary staff of DWRC. (Long-term technicians in LDCs will be funded by Missions, as will TDY travel and per diem generally; salaries for TDYs and all DWRC backstopping will be

funded by S&T/AGR). This avoids expensive duplication of personnel and equipment. Obviously only limited amounts of services can be provided to any one country during each year. Therefore, the policy of cost-sharing of common themes of work by Missions and Regional Bureaus will be followed; the project has provisions for "buy-ins" by Missions and other Bureaus as a means of their gaining access to extended services. Therefore, the one-year funding by S&T/AGR is $600,000; the remainder of $240,000 is reserved for regional bureau and mission "buy-ins." This project is being evaluated to determine if it can be implemented as a ribbon project in further extensions. For this reason, only a one-year extension is requested.

As pointed out in the S&T/AGR portfolio review, the project must be supported by the S&T/AGR budget at a sufficient level to allow the project unit to meet two criteria: 1) DWRC must have the ability to continue to respond promptly to USAID Mission requests; and 2) DWRC must be able to continue the extensive multidisciplinary backstopping and applied research which has achieved great success in the past. It is not thought wise to have more than 20-25 percent of total project costs be funded from "buy-ins." Nevertheless, project planning has allowed for the possibility of up to almost 30 percent "buy-ins." It is our judgment that without S&T/AGR funding at the approximate level planned in the attached Project Paper, the critical mass of multidisciplinary expertise will not be available to respond to USAID missions requests for services.

The Sector Council Subcommittee for Agriculture reviewed and endorsed the Project Paper on September 23, 1982, recommending minor revisions. After these revisions were made, the Sector Council for Agriculture reviewed and endorsed the Project Paper on October 19, 1982, recommending additional minor changes which were made. Copies of both endorsements and the pertinent minutes of each meeting are attached; in the right margins of the minutes the areas where revisions have been made are listed.

Recommendation: That you approve a one-year extension of the Pre/Postharvest Rodent and Bird Control Project, Number 936-4120, and authorize funding at a level of $840,000 ($600,000 from S&T/AGR and $240,000 as Mission buy-ins) which will result in a total two-year life-of-project funding level of $1,680,000.

Attachments:
1. PAF I & II
2. Environmental Threshold Determination
3. a. Sector Council for Agriculture Minutes & Endorsement Sheet
   b. Sector Council Subcommittee for Agriculture Minutes & Endorsement Sheet
4. Project Paper

Clearances:
S&T/AGR/AP:JMYohe — Date: 8/25/83
S&T/AGR:MMozynski — Date: 8/31/83
S&T/PO:BRoche — Date:
S&T/PO:GEaton — Date:
Drafted: S&T/AGR/AP:HRShuyler:bw 43511 8/24/83

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ENVIRONMENTAL THRESHOLD DETERMINATION

TO: S&T/FA, Dr. J.S. Robins

FROM: S&T/AGR, Anson R. Bertrand

SUBJECT:

Project Title: Pre/Postharvest Rodent and Bird Control
Project #: 936-4120
Specific Activity: Field Support Project
Reference: Initial Environmental/Examination (IEE) contained in pp for subject project dated 10/13/82 (page 92-93)

On the basis of the Initial Environmental/Examination (IEE) referenced above and attached to this memorandum, I recommend that you make the following determination:

__X__ 1. The proposed agency action is not a major Federal action which will have a significant effect on the human environment.

_____ 2. The proposed agency action is a major Federal action which will have a significant effect on the human environment, and:

_____ a. An Environmental Assessment is required; or

_____ b. An Environmental Impact Statement is required.

The cost of and schedule for this requirement is fully described in the referenced document.

_____ 3. Our environmental examination is not complete. We will submit the analysis no later than _____ with our recommendation for an environmental threshold decision.

Approved: J S Robins

Disapproved: _____

Date: 9/13/83

Clearance:

S&T/AGR/AP, John M. for Yohe Date: 8/25/83

S&T/AGR/AP:HRShuyler:bw 8/24/83

SECTOR COUNCIL FOR AGRICULTURE

RECORD OF S&T PROJECT REVIEW COMMITTEE MEETING

COMMITTEE MEETING DATE: October 19, 1982

1. Project Office: S&T/AGR Project Number: 936-4120

Project Title: Pre/Postharvest Rodent and Bird Control

Proposed Contractor: Denver Wildlife Research Center

Proposed Project Period: January 1, 1983 Thru December 30, 1992

Proposed Budget Period: 1/1/83 - 12/30/92 Budget: $ 9.15 million

(If any, prior total est. cost: _____)

(Grand total after adding this action: _____)

2. The members of this committee, and their findings are specified below:

Office Symbol	Type Name/Signature	Date	Endorsed	Not Endor
AFR/DR	D. Schaer		for Schaer 10/19	
ASIA/TR	A. Hankins		10/19	
LAC/DR	A. Brown	10/19/82	for Brown	
NE/TECH	R. Cobb		10/19	
PPC/PDPR	D. Caton		10/19	
S&T/AGR	A. Bertrand			

3. It is the decision of this Committee that this project be:

✓ ENDORSED _____ NOT ENDORSED

SIGNATURE J.S. Robins Date 10/19

J.S. Robins
S&T/FA
Chairperson

4. Any dissenting opinions are attached.

8

AGENCY FOR INTERNATIONAL DEVELOPMENT

Sector Council for Agriculture

Minutes of the Regular Meetings

Volume I, No. 37 October 19, 1982

Council members and alternates present included: J.S. Robins, Council Chairman, S&T/FA; Don Wadley S&T/FA; Larry K. Laird, Council Executive Secretary, S&T/FA; Anson R. Bertrand, S&T/AG; Wayne Nilsestuen, LAC/DR/RD; Richard Cobb, NE/TECH/AD; Allen D. Hankins, ASIA/TR/ARD; Joe Hartman, AFR/TR/ARD; Douglas D. Caton, PPC/PDPR; Nick Luykx, S&T/N; John O'Donnell, S&T/MD; James Nielson, BIFAD/S.

Special guests included: Harlan R. Shuyler, S&T/AGR/AP; J. M. Yohe, S&T/AGR/AP; Myron G. Smith, BIFAD/S; Charles Rheingans, Career Counselor, PER; Betty Roche, S&T/PO; Ralph W. Cummings, S&T/FA; and Mary Mozynski, S&T/AGR.

The agenda included four items, the Council discussed the following three; (1) Report on plans for BIFAD cosponsored programs at NASULGC, (2) Review of proposed Pre/Postharvest Rodent and Bird Control Project and (3) A discussion of the Sector Council's relationship to the Office of Personnel. The follow-up discussion of Ms. Murphy's Memorandum on the Agricultural Services Sector (submitted for consideration by PPC/E/S), was postponed due to time constraints.

BACKGROUND to item (1), During the last five years BIFAD actively participated in annual meetings of the National Association of State Universities and Land Grant Colleges (NASULGC). This year's meeting will be held at St. Louis, in the Chase Park Plaza Hotel, from November 7-10. Mr. James Nielson, BIFAD, explained the program for the conference this year and distributed a detailed agenda of sessions to be held at NASULGC.

Because of his retirement this was Mr. Nielson's last meeting with the Sector Council. He announced that his successor as Research Chief of BIFAD will be Mr. John Stoval, formerly of ERS/USDA, and an agricultural economists with much experience in planning agricultural research activities. Mr. Robins expressed the Council's appreciation to Mr. Nielson for his contributions as part of the BIFAD group.

When asked for parting observations on AID-BIFAD relations Mr. Nielson noted that much "soul searching" had taken place during the last year and one-half. It is now more generally agreed that BIFAD will function primarily as an advisory group and likely will not have its own program budget. There is also increased recognition that the JCARD is probably the most important forum for universities and AID to carry on meaningful dialogue about their respective tasks in foreign assistance. Mr. Nielson observed that BIFAD is erroneously perceived by some as only a "body shop" responsible for placing technicians in the field. Nielson emphasized that BIFAD has a much broader role than that of placing technicians, especially as advisor to the Agency in food and agricultural matters.

Mr. Nielson announced that the BIFAD Board meets on October 28, in 1107 NS. Their agenda will focus on "AID Strategy in the Middle Income Countries." The Technical Service to Missions (TSM) contracting mode will also be discussed. Mr. Clifford Wharton will be the featured guest speaker at the meeting. The "open forum" for the BIFAD Board meeting will begin at noon on the 28th. and interested parties are invited to be present. For your information, attached is an updated list of the six current members of the BIFAD Board.

BACKGROUND to item (2), the proposed project for Pre/Postharvest Rodent and Bird Control. The purpose of the proposed project (Number 936-4120) is to "develop and demonstrate improved rodent, bird and other vertebrate pest control systems for the reduction of food losses in LDSs." S&T/AGR designed this project as a follow-on activity to the vertebrate pest control project that began in 1967. The new project is distinctive from the old one in that it shifts emphasis from research activities to technical assistance to LDCs to better assist them in problem identification, problem management and the diffusion of pest control techniques. The proposed life of project grant funding includes $9.146 million to S&T/AGR and $3.659 million for regional bureaus and/or missions, that is a total of $12,805 million. The proposed ten year project is to begin in FY 83. The Project Paper under discussion was endorsed by a subcommittee of the Sector Council on September 23, 1982.

DISCUSSION OF ITEM 2: There was considerable consensus among Council members that the predecessor activity of this project was fairly successful. It was pointed out that success in the control of vampire bats more than compensated for costs incurred in the original project. Because of the substantial accomplishments of the earlier project Council members raised relatively few issues regarding the undertaking of a new one in this area. All representatives of the regional bureaus endorsed the new project but most made specific suggestions as to how the proposed project could be strengthened. These suggestions included:

A. Several regions desired that socio-economic expertise should be made available to enhance technical assistance capabilities under the new program. Many felt that if the Denver Wildlife Research Center (likely to be sole source contractor for implementing the project) did not possess socio-economic expertise they could find it within the U.S. university community. Also it was suggested that USDA's Bureau of Land Management could provide cost/benefit studies and related socio-economic data. See page 31

B. Several members suggested that the impact of the Project Paper presentation would be greater if it included additional statistical data on the extent of production losses in the developing countries. Data is available on losses caused by the "rice-rat" in Asia and could be projected for such pests as locusts in Africa. It was agreed that such data would be added to the final paper. See page 44

C. Concern emerged as to how the proposed project would be fully coordinated with pest management activities of other donors, such as the F.A.O., especially in Africa. Project designers indicated that these were very legitimate concerns but that they would be taken into consideration during the implementation stage of the project. Most agreed that demands See page 1

for pest management experts greatly exceeded the supply available from all international donors who have technicians in the field.

D. Several bureaus asked that a list of criteria be developed so as to systematically identify countries which will participate in the proposed project. Although the PP alludes to adding one country per year (p. 25) it does not specify how this will take place. It was agreed that this issue will be addressed in the final draft of the PP. See page 2

E. It was agreed that an Initial Environmental Assessment will be added with the assistance of Mr. Carol Collier, S&T/AGR. See page 16,91-92

ACTION ON ITEM (2): The proposed project will be put into a final project paper; incorporating suggestions made above, and will be approved by S&T/FA based upon the endorsement of the Sector Council.

BACKGROUND on item (3), a discussion of the Sector Council's relationship to the Office of Personnel. The predecessor to the Sector Council, the Technical Program Committee for Agriculture (TPCA), took an early interest in personnel decisions effecting agriculturalists in AID. Much of the TPCA thinking is summarized in the publication, Building a Cadre of Career Agriculturalists in A.I.D., April, 1981. AID Personnel previously demonstrated recognition of the special situation of agriculturalists by assigning Mr. Donald Mitchell, a Senior Agricultural Officer, to provide counseling to agricultural officers as well as themselves. After completion of an evaluation of the functions of the Advisory Panel on Agricultural Personnel Management and the Senior Agriculture Officer Position (known as APAPM/SAO), AID decided to continue with the position of agricultural Career Counselor. Mr. Charles Rheingans, special guest of the Council at this meeting, heads up the new section on Career Development (and Performance Evaluation backstopping) plus is the assigned Career Counselor for agriculturalists. He met with the Sector Council to listen to members and to discuss personnel matters of mutual interest to all agriculturalists.

DISCUSSION OF ITEM (3): Mr. Rheingans began the discussion by noting that a reorganization in Personnel reduced the number of foreign service assignment branches from three to two and that under the new system the Career Counselor will have a vote on Assignment Board actions. He noted that Personnel recently received approximately 525 CCARS for Assignment Board action during the next few weeks. When fully staffed the Career Counselor's office, consisting of three employees, will backstop 1800 employees (not all of them career agriculturalists). Their responsibilities are being more fully explained in a world-wide cable explaining the new career development program to missions. Following this introduction members raised a number of significant concerns about how the new assignment system would, in practice, be carried out.

SPECIFIC QUESTIONS INCLUDED:

A. How can crossover assignments (from one backstop code to another) be achieved by agriculturalists who desire to have broader experiences working for AID in non-agricultural management positions? It seems crossover is becoming more difficult because backstop codes are being more rigidly interpreted and because personnel surpluses occur in management level positions to which some agriculturalists aspire.

B. Many questioned why AID was hiring 25 new economis ·hile failing to adequately consider agricultural economists in the gro despite specific recommendations by the Sector Council to do so. e suggested that perhaps it was still possible for the Council to ta ›le in this matter and suggest to personnel that at least some agricu onomists be brought in as part of the 25 new hires.

C. The group was reminded that regional bureaus, not Personnel, virtually control the assignment system so that it is difficult for the Career Counselor to have much positive impact on the assignment system. Part of the problem is that missions or bureaus recruit narrow specialists for specific tasks, then these employees become tenured and are sometimes difficult to place once their original assignment terminates.

D. Numerous questions were raised about the new open assignments procedures and many expressed concern as to how openly and equitably the system would work. Many practical examples were provided by members to demonstrate the difficulties of implementing the open assignment approach.

E. Council members and Mr. Rheingans concurred that everyone must remain alert to irregularities in selection and assignment procedures utilized under the open assignments system.

F. Some members questioned whether the COAR could ever be an effective tool for employees to state preferences, simply because all COARS must be reviewed by management and employees are sometimes reluctant to state employment preferences in writing.

G. When it was pointed out that agricultural officers generally do not take advantage of short and long term AID training now available for career enhancement a Council member indicated that field missions are reluctant to release good, scarce agricultural officers for any purpose; including training, because there is no pool from which to seek temporary or long term replacements at the field level.

ACTIONS TO BE TAKEN INCLUDE:

1. The Executive Secretary of the Council will review the archives of the TPCA and the Council in order to provide a written summary of prior Council actions related to personnel matters.

2. The Council agreed that the subject of personnel would be included regularly, once a month, in their agenda.

3. Mr. Albert Brown will continue to work on development of a unified standard for agr.cultural and/or rural development officers and will present it to the Council in a future meeting, and

4. It was agreed that the Council has no authority to discuss individual cases involving routine personnel decisions but that individual cases may be discussed when they were exemplary of generalized problems. Otherwise Mr. Rheingans will continue to work directly with each regional bureau on personnel matters.

UNITED STATES GOVERNMENT

Memorandum

TO : S&G/AGR, Dr. Anson R. Bertrand, Director DATE: September 28, 1982

FROM : S&T/AGR/AP, John M. Yohe

SUBJECT: Pre/Postharvest Rodent and Bird Control, Project 936-4120, Project Paper Issues and Review

The Sector Council Sub-Committee for Agriculture and colleagues of the Office of Agriculture reviewed the Project Paper for Pre/Postharvest Rodent and Bird Control, Project 936-4120, on September 23, 1982, and unanimously endorsed it. The substance of the meeting's discussions are noted in the attached statement of issues raised. The Subcommittee members at the meeting were the first six persons listed below for receiving copies of this memorandum and its attachment.

The Project Paper is being revised and will be distributed together with this memorandum and its attachment, to the Sector Council for Agriculture for the scheduled Project Paper Review by the Council at the regular meeting on October 19, 1982.

cc: AFR/DP, F. Mertens
ASIA/TR, R. Hughes
LAC/DR, C. Weber
NE/TECH, B. Behrens
PPC/PDPR, D. Caton
S&T/PO, B. Roche
S&T/AGR, P. Church
L. Schulze
B. Pollack
C. Haines
R. Morris
H. Shuyler

Drafted: HRShuyler, 9/24/82

RECORD OF S&T PROJECT REVIEW COMMITTEE MEETING

COMMITTEE MEETING DATE:

September 23, 1982 - 2:00 P.M.
ROOM 2840 N.S.

1. PROJECT OFFICE: S&T/AGR/AP PROJECT NUMBER: 936-4120

PROJECT TITLE: Pre-/Postharvest Rodent and Bird Control

PROPOSED CONTRACTOR: Denver Wildlife Research Center
F&WS, USDI
Bldg. 16, Federal Center
Denver, CO. 80225

PROPOSED PROJECT PERIOD: January 1, 1983 through December 30, 1992

TOTAL TEN YEAR LIFE OF PROJECT BUDGET: $9.15 million

FY 1983 PROPOSED BUDGET: $600 thousand

2. THE MEMBERS OF THIS COMMITTEE, AND THEIR FINDINGS ARE SPECIFIED BELOW:

OFFICE SYMBOL	TYPE/NAME/SIGNATURE	DATE	ENDORSED	NOT ENDORSED
AFR/DR	~~Dr Brown~~ Frank Martens	9/22	F. Martens	
~~ASIA/TR~~	~~R. Hughes~~	~~9/23~~	~~R. Hughes~~	
LAC/DR	~~Dr Sage~~ Clem Weber	9/23	Clem Weber	
NE/TECH	~~Dr Meister~~ Bert Schreens	9/23	B. Schreens	
PPC/PDPR	D. Caton	9/23/82	D. Caton	
S&T/PO	~~Roche~~ B. Roche	9/23/82	B. Roche	

3. IT IS THE DECISION OF THIS COMMITTEE THAT THIS PROJECT BE:

✓ ENDORSED NOT ENDORSED

SIGNATURE: [signature] DATE 9/23/82

John M. Yohe, Chairperson
S&T/AGR/AP

4. ANY DISSENTING OPINIONS ARE ATTACHED

Pre/Postharvest Rodent and Bird Control, Project 936-4120

Project Paper Review

Sector Council Subcommittee for Agriculture
and Office of Agriculture Colleagues

Room 6941, N.S.

Issues Raised

Historically, the predecessor Project 931-0473, Control of Vertebrate Pests, is considered to have been less aggressive than desirable in utilizing results of the project's work in seeing to it that information was shared widely, including the development of recommendations in the form of extension training aids. Adequacy of the proposed budget in this regard was questioned. The suggestion was made that Information Sharing could be significantly improved by an estute increase in the budget for this project output; guidance was suggested to be sought from the Director, DIU. It was suggested that cooperative efforts in extension, used successfully in its few trials in the predecessor project, should be pursued more frequently in this project. The suggested increase in information sharing might be accomplished through a slight reduction in the provision for funding of demonstrations of vertebrate pest control programs.

See pages 11, 12, 35

The information sharing should be noted in the Project Paper to include development of brochures, seminars, training, extension, and even briefing papers. It should even be noted to be possible, and desirable, to synthesize the research of others with that of DWRC, and the opportunities for this to be done were considered to be greater than a few years ago.

See page 12

Will the Project Paper allow for the possibility of research, etc., to be subcontracted? It was suggested that local specialists, local industry, and foreign specialists (e.g., those of Taiwan) might well improve the project's impact. It was stated that DWRC needs to have available and utilize an even greater range of expertise. But the list of DWRC personnel available and their abilities should, it was decided, be entered in an annex.

See pages 10, 31, 53-80

The total funding obligation for the project is considered inadequate. Provision needs to be shown for cost sharing. The funding objective should obviously be one to strive for considerable amounts of "buy-in" by USAID Missions and Bureaus. Would a "buy-in" target of 33% of the S&T grant funds be sufficient? This was considered a reasonable first target, that perhaps 40% was not too much, but it was suggested that Missions should be cabled for their opinion. (It was recognized that the time available for receiving responses before the Sector Council Project Paper Review may be inadequate for best decision making.)

See pages 1, 16-17, 35

The funding priority of this versus other S&T/AGR projects should be discussed in the Project Paper. Particularly the other projects "above the line" for FY-84 funding should be kept in mind in such discussion. By facing this subject, the importance of achieving cost sharing may be obvious.

See pages 23-24

It was suggested that a reassessment be made of the essentially equal priority given to identification of problems, technical assistance and research; the priority given to identification of problems may be slightly higher than needed.

See page 35

The Project Paper should include the list of pesticides which can be anticipated will be used in the project. This listing was said to be a means of easing the processes involved in gaining clearance for their use later.

See pages 16, 81-91

The social analysis of the Project Paper was described as weak. Most particularly the description is missing of the impact of situations upon people before and after the project has assisted in improving vertebrate pest control. Examples may be useful. The Project Paper also needs to point out that this is a project with both rural and urban involvement. the latter particularly due to the postharvest aspects.

See pages 17.- 20

DEPARTMENT OF STATE

AGENCY FOR INTERNATIONAL DEVELOPMENT

Washington, D.C. 20523

PROJECT PAPER

PRE/POSTHARVEST RODENT AND BIRD CONTROL

S&T/AGR/AP

PROJECT NUMBER: 936-4120

AGENCY FOR INTERNATIONAL DEVELOPMENT

PROJECT PAPER FACESHEET

1. TRANSACTION CODE: [4] (A = ADD, C = CHANGE, D = DELETE) — PP

2. DOCUMENT CODE: 3

3. COUNTRY/ENTITY: S&T/AGR/AP
Type C. Field Support

4. DOCUMENT REVISION NUMBER: [-] Origina

5. PROJECT NUMBER (7 digits): [936-4120]

6. BUREAU/OFFICE: A. SYMBOL: S&T; B. CODE: [10]

7. PROJECT TITLE (Maximum 40 characters): [Pre/Postharvest Rodent and Bird Control

8. ESTIMATED FY OF PROJECT COMPLETION: FY [9 3]

9. ESTIMATED DATE OF OBLIGATION: A. INITIAL FY [8 3] B. QUARTER [2] (Enter 1, 2, 3, or 4); C. FINAL FY [9 2]

10. ESTIMATED COSTS ($000 OR EQUIVALENT $1 -)

A. FUNDING SOURCE	FIRST FY 83 B. FX	C. L/C	D. TOTAL	LIFE OF PROJECT E. FX	F. L/C	G. TO
AID APPROPRIATED TOTAL	600	-	600	9146	-	9146
(GRANT) S&T/AGR FUNDS	(600)	(-)	(600)	(9146)	(-)	(9146
(LOAN)	( )	( )	( )	( )	( )	(
OTHER U.S. 1.Missions/Bureaus	240	-	240	3659	-	3659
OTHER U.S. xx(Anticipated Buy-ins)						
HOST COUNTRY						
OTHER DONOR(S)						
/AGR+RegBur/Msns. TOTALS	840	-	840	12805	-	1280

11. PROPOSED BUDGET APPROPRIATED FUNDS ($000)

A. APPROPRIATION	B. PRIMARY PURPOSE CODE	PRIMARY TECH. CODE C. GRANT	D. LOAN	E. 1ST FY 83 F. GRANT	G. LOAN	H. 2ND FY 84 I. GRANT	J. LOAN	K. 3RD FY 8 L. GRANT	M. L
(1) ARDN(S&T/AGR)	140	070	-	600	-	650	-	710	
(2) ARDN(R.Bs/Msns)	140	070	-	240	-	260	-	284	
(3)									
(4)									
S&T/AGR + REG. BURs./Missions		TOTALS		840	-	910	-	994	

A. APPROPRIATION	N. 4TH FY 86 O. GRANT	P. LOAN	Q. 5TH FY 87-92 R. GRANT	S. LOAN	LIFE OF PROJECT T. GRANT	U. LOAN	12. IN-DEPTH EVALUATION SCHE
(1) ARDN(S&T/AGR)	775	-	6411	-	9146	-	
(2) ARDN(REG.BURs/Missions)	310	-	2565	-	3659		MM 12 YY 86
(3)							
(4)							
S&T/AGR+R.Bs/Msns TOTALS	1085	-	8976	-	12805		

13. DATA CHANGE INDICATOR. WERE CHANGES MADE IN THE PID FACESHEET DATA, BLOCKS 12, 13, 14, OR 15 OR IN PRP FACESHEET DATA, BLOCK 12? IF YES, ATTACH CHANGED PID FACESHEET.

[1] 1 = NO 2 = YES

14. ORIGINATING OFFICE CLEARANCE

SIGNATURE

TITLE Dr. Anson R. Bertrand
Director
Office of Agriculture, S&T/AGR

DATE SIGNED: MM 10 DD 13 YY 82

15. DATE DOCUMENT RECEIVED IN AID/W, OR FOR AID/W. MENTS, DATE OF DISTRI

MM DD YY

AID 1330-4 (3-76)

18

PROJECT PAPER

PRE/POSTHARVEST RODENT AND BIRD CONTROL

Table of Contents

PART I SUMMARY AND RECOMMENDATION

A. RECOMMENDATION

It is recommended that $9,146,000 in S&T/AGR funds be authorized for a ten year project to mitigate pre- and postharvest agricultural losses to vertebrate pests, primarily to rodents and birds, in developing countries by adapting and applying of appropriate technologies. Project funds will be obligated by a PASA with the Denver Wildlife Research Center (DWRC) of the U.S. Department of the Interior. The obligation schedule of S&T/AGR funds would be as follows: FY 83--$600,000; FY 84--650,000; FY 85--$710,000; FY 86--$775,000; FY 87--$845,000; FY 88--$925,000; FY 89--$1,010,000; FY 90--$1,104,000; FY 91--1,207,000; and FY 92--$1,320,000.

It is recommended that $3,659,000 in cost sharing funds (expected to come mostly from Missions and Regional Bureaus) be authorized for this ten-year project. The anticipated obligation schedule of these cost sharing funds would be as follows: FY 83--$240,000; FY 84--$260,000; FY 85--$284,000; FY 86 --$310,000; FY 87--$338,000; FY 88--$$370,000; FY 89--$404,000; FY 90--$442,000; FY 91--$483,000; and FY 92--$528,000.

Combining the S&T/AGR grant funds and the cost sharing funds, it is recommended that a total of $12,805,000 be authorized for this ten-year project. The combined obligation schedule would be: FY 83--$840,000; FY 84--$910,000; FY 85--$994,000; FY 86--$1,085,000; FY 87--$1,183,000; FY 88-- $1,295,000; FY 89--$1,414,000; FY 90--$1,546,000; FY 91--- $1,690,000; and FY 92--$1,848,000.

B. SUMMARY DESCRIPTION

This project responds to the need for materials, techniques, methods, programs and technical assistance required to reduce successfully the impact in LDCs of vertebrate pests on agricultural production and the resulting produce.

This 10 year project is designed to provide AID and the LDC's with useful tools for managing vertebrate agricultural pests.

The ultimate goal is to increase available food supplies and reduce the risk of severe losses to vertebrate pests. This will be accomplished through a multidisciplinary team effort involving: (1) in-country programs; (2) outreach activities from DWRC; and (3) problem-oriented development activities at DWRC. The objective falls within AID's priorities for technical assistance to improve the quality of life in developing nations, support the economic development of the agricultural sector, and stimulate and strengthen the capabilities of country institutions to be socially and economically self-sustaining.

At the end of the project, a service will be in place, in several countries, which has a cadre of qualified and experienced personnel, the latest technical information available, and access to applicable state-of-the-art advances. This project will provide: (1) easy-to-use

integrated vertebrate pest and damage control technology; (2) training; (3) recommendations and demonstrations of resulting technology; (4) access to the world's literature on the subject; and (5) program development assistance.

The Project Paper has been developed by the Project Manager based on inputs and reviews by the AID Research Advisory Committee, a Project Evaluation Team, and the DWRC.

PART II PROJECT BACKGROUND AND DETAILED DESCRIPTION

A. BACKGROUND

Food--in sufficient quantity for a rapidly increasing world population--is one of the problems facing mankind. About one-half of the world's population is actively engaged in agriculture. In spite of many advances in agricultural technology, millions of people in scores of nations still suffer hunger, malnutrition, and starvation.

Vertebrate pests (primarily rodents and birds) are direct competitors with man and contribute to the widespread and acute disparity between population and available food in many developing countries. Historically, vertebrates have not received the attention given other agricultural pests. Most published materials on food losses and crop pests focus on pathogenic organisms and arthropods and make only passing mention of losses to vertebrates. However, in recent years the impact of vertebrate depredations to agriculture has attracted more interest in developing nations. It has become increasingly evident that vertebrate pests play a major role in limiting agricultural production.

Although precise estimates are difficult to derive, losses unquestionably amount to hundreds of millions, and perhaps billions of dollars annually. Losses for the individual farmer, who may be almost totally dependent on the harvest (and its safekeeping) from a small plot for income or even sustenance, are often devastating. These losses may average up to 10 percent and, in some cases, can be total. Annual losses of rice to rats during the growing period have been estimated at $68 million in the Philippines alone; Bangladesh farmers similarly lose about $120 million of their rice and $16 million of their wheat crop annually to rats; birds consume an estimated $100 million of the grain crop annually before harvest in affected African countries; and the Dominican Republic similarly loses about $20 million annually to rodents and birds in rice, corn and cacao. Rodents cause damages ranging from 4 to 75 percent in major coconut-growing areas of Colombia. The annual loss of coconuts to rats in the Philippines is estimated at 30 percent and about 3 percent of the sugar production is lost to rats. Estimates of the developing world's postharvest grain losses to vertebrate pests range up to 10 percent; studies by FAO specialists in Liberia indicate average losses of rice to rats in farm stores are about 7 percent.

The susceptibility of stored food to attack by insects and molds is increased by the feeding of rats, mice and birds. The cost of this enhanced infestation and infection is unknown, but the impact is greatest on those who can afford it least--those for whom grain is the staple food. Even worse, the rodent-eaten portion of the corn kernel tends to be more frequently the nutritionally rich germ thus depriving the small farmers of large populations of areas such as Africa and Latin America of additional opportunities to have viable seeds and/or improved nutrition. The cost of these losses has never been calculated.

Contamination of stored foods by rodent activity lowers the quality and sale price of produce. Health risks involved in using and consuming food contaminated by rodent saliva, urine and feces are also increased. These contaminations are known to result in human diseases such as amoebiasis,

angiostrongyliasis, hepatic capillariasis, leptospirosis, lymphatic choriomeningitis, murine typhus,and salmonellosis. In addition, the handling, use and consumption of rodent and bird contaminated food may result in botulism, Argentine or Bolivia hemorrhagic fevers, histoplasmosis, Lassa fever, yersiniosis or even bubonic plague.

Rodent contaminated feed or forage is an important source of leptospirosis in domestic animals. This is only one of many animal diseases in which vertebrate pests are involved. Rats maim or kill newborn lambs and kids. In addition, they destroy eggs and baby chicks. In Cuba, in 1979, rats infesting cool stores were destroying thousands of dozens of eggs ready for distribution; this is only a more costly example of such instances as are known.

Failure to protect crops and agricultural produce from vertebrate depredation means that many new developments in agricultural technology may not realize their full potential for improving yields or increasing the availability of food. However, a basic problem common to most developing countries is a lack of personnel trained in vertebrate pest technology and management. Hence, the countries cannot systematically describe problems, evaluate suitable control agents, judge effectiveness of control methodologies, or determine other factors relevant to pre- and postharvest vertebrate damage situations in major staple crops.

Consequently, current attempts, if any, at dealing with these problems are generally inadequate. Materials and methods used are untested and often unsuitable, especially for the specific pests, crops, field and storage conditions, and the cultural practices of the small farmer.

Recognizing these facts, AID has supported a research program at the Denver Wildlife Research Center (DWRC) to investigate the pre- and postharvest impact of vertebrate pests on small-farm agriculture in developing countries and to devise appropriate means for alleviating these problems. The DWRC, a major research facility of the U.S. Fish and Wildlife Service (USFWS), was orginally selected for the program because of its internationally recognized leadership and uniqueness in the field of vertebrate pest control research — characteristics which are even more widely acknowledged today. The staff is comprised of specialists in diverse fields such as ecology, physiology, wildlife biology, pharmacology and toxicology, animal behavior, statistics, taxonomy, chemistry, and electronics.

Development of effective vertebrate pest control methods, materials and programs is a complex, long-term, and expensive process. It involves detailed behavioral and biological studies, damage measurements, toxicological and pharmacological evaluations, laboratory and field trials of techniques, environmental assessments, chemical techniques development and analyses, pilot trials and demonstrations of programs, technology transfer, strengthening of infrastructures and administrative procedures and discipline, and personnel training at several levels. Such development requires technical assistance and extensive information sharing. The Project Evaluation Summary (PES--submitted to AID/Washington January 15, 1981) recognized the excellence of the DWRC project and recommended that "AID should view VPC (Vertebrate Pest Control) technical assistance and supporting research, not only as a high

priority item, but also as one requiring a much longer time frame than has been previously presented in the project documents reviewed in this evaluation."

Since inception of the project, many accomplishments in methodology, materials, and program development have been described in detail in annual progress reports and technical publications by DWRC personnel and counterparts. As stated in the PES, "The current project has demonstrated the feasibility and cost effectiveness of increasing the food supply and protecting food stocks by means of integrated vertebrate pest control." The major accomplishments are summarized in Annex E.

In spite of these accomplishments, the problems of vertebrate pest damage to pre- and postharvest agriculture in developing countries have barely been touched. There remains a paucity of information on many more vertebrate damage situations. Historical evidence suggests that there is an awareness of such problems in many of the LDC's, but few systematic attempts to address them are made because the knowledge and technology required are unavailable. Furthermore, persons with the basic training and background to study the problems are also lacking. Hence, without special action, losses to vertebrate pests are likely to continue unabated in many countries and will probably intensify as agricultural development proceeds. This project can provide the technical assistance needed to reverse this trend.

This proposal is not in conflict with nor a duplication of present or past centrally funded vertebrate pest management activities. It is the logical next step. The predecessor to this proposed project demonstrated that increased food availability can be achieved by reducing preharvest losses to vertebrate pests through problem identification, adaptation of cost-effective technology based on sound research findings, training, and cooperation with local institutions. It has also shown that vertebrate pest damage to agriculture is a serious problem requiring a great deal of continued attention. Special emphasis is needed on pre- and postharvest rodent and bird control.

B. DETAILED DESCRIPTION

The overall purpose of this proposed project is to develop and demonstrate improved rodent, bird and other vertebrate pest control systems for the reduction of food losses in LDCs. The immediate objectives of the project follow.

1. Identify vertebrate pest problems in LDCs as to their nature, extent and importance, emphasizing pre- and postharvest rodent and bird problems. Because of their importance, precedence will generally be given to identification of rodent problems in accordance with the recommendations of the OECD/FAO/WHO Expert Consultation (in which a DWRC expert was a participant) on Rodent Problems, Control and Research, OECD Headquarters, Paris, France, May 2-5, 1978 as submitted to the informal DAC meeting on Crop Protection under Small Farmer Conditions in Developing Countries, June 27-28, 1978. These problems are: a) Rattus argentiventer damaging growing rice in Southeast Asia; b) Bandicota bengalensis as a pest of rice in South Asia; c) Arvicanthis and Mastomys sp. damaging various food crops in Africa south of the Sahara; d) Cricetid rodents damaging various food crops in Latin America;

e) Meriones sp. and other Gerbillids damaging crops in arid and semi-arid areas from Morocco to India; and f) cosmopolitan species of Rattus damaging various crops on Caribbean and Oceanic Islands. (Of these, DWRC is presently working on Southeast Asia, South Asia and Caribbean Island problems.) Thus, the intention of the Expert Consultation will be met by advising on problems which, while national in character, have regional implications. There is no similarly sponsored expert consensus on bird pest problems, except for the Quelea problem in Africa. Quelea is the major pest bird problem south of the Sahara and DWRC is involved in ongoing work on Quelea management.

In order to improve problem identification the project has a sub-objective: to develop and/or improve loss assessment methodologies for pre- and postharvest vertebrate pests with emphasis on rodent and bird problems. Improving these techniques will enable DWRC and USAID Missions to better advise LDCs and allow wiser decisions to be made regarding the appropriate emphasis for LDC governments to give to vertebrate pest management.

2. Develop and further improve vertebrate pest management systems. Within this objective, emphasis will be given to developing improved rodent and bird control systems for the reduction of pre- and postharvest food losses in LDCs. This derivation of better pest management involves such secondary objectives as: a) to provide assistance to AID Regional Bureaus and AID Missions through project design and preparation; b) to provide technical assistance and support to AID regional Bureaus, USAID Missions and LDC organizations; and c) to further develop and improve vertebrate pest management systems directly and indirectly through adaptive research.

3. Demonstrate improved integrated vertebrate pest management (IVPM) systems. Emphasizing rodent and bird control systems for reducing pre- and postharvest food losses in LDCs, this includes sub-objectives such as: a) to assist LDC organizations/governments in the conduct of large scale field trials; b) to plan, assist, guide and evaluate pilot operations of IVPM systems; c) based on results of field trials and/or pilot operations, assist in planning, preparing and implementing early stages of programs; and d) as requested, assist in evaluation and revision of programs.

4. Provide training in vertebrate pest management. This includes secondary objectives such as: a) to provide on-the-job training of host country nationals; b) to assist in providing appropriate in-country training, education and extension at all necessary levels; c) to endeavor to find means to provide appropriate non-formal and formal training and education of LDC nationals in the USA and/or third countries; d) to develop model, and specific, syllabi and training course materials and use and share these and other collected materials with LDCs and other development organizations; and, e) to collect, assemble, develop, use and share appropriate training and extension aids in at least English, French and Spanish and in other forms. (In developing and conducting training and extension it will be kept in mind that improved knowledge is needed not only by the researchers, organizers and practicing specialists, but also "upward" into the hierarchy of administrators and opinion makers as well as "downward" to the users and clients.)

5. To collect, develop and share technical and non-technical information which will improve vertebrate pest control. Sub-objectives include: a) planning, conducting and reporting on adaptive research of DWRC in the USA andLDCs; and b) collecting, abstracting, storing, retrieving and sharing information on the subject from around the world with those who need and request such information.

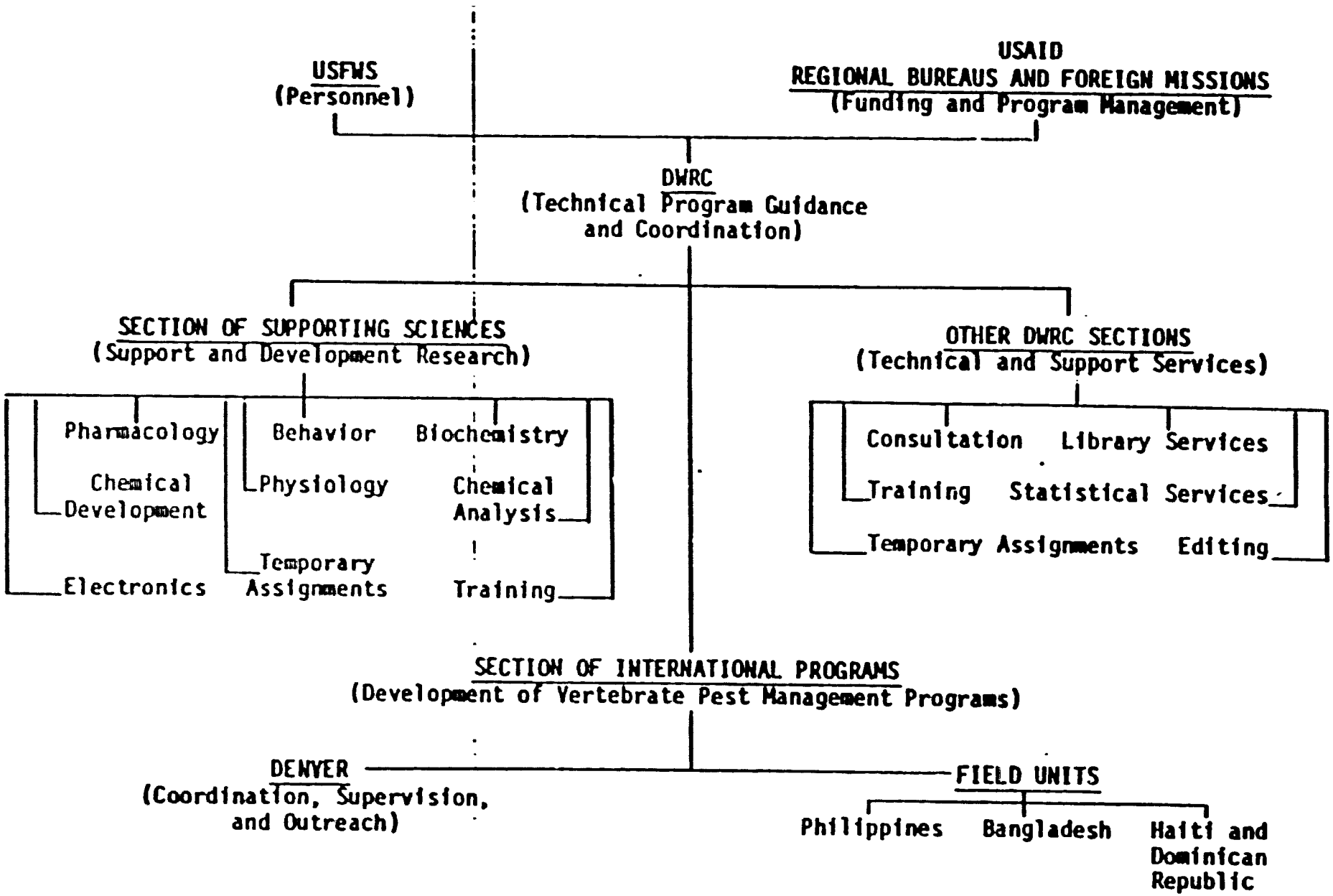
The proposed project is designed to capitalize on the capabilities and experience gained through past efforts of the DWRC. The design permits a small field staff in any LDC, with limited equipment and facilities, to call upon the resources, services, and expertise of the professional and support staff of DWRC. The relationships, interactions, and major areas of responsibility among the units involved is illustrated in the diagram on the following page.

This approach avoids expensive duplication of personnel and major equipment while emphasizing practical application of technology in actual field and storage situations. More importantly, this approach avoids a central difficulty in the historical development of vertebrate pest damage control technology--that being a tendency to ascribe minor importance to species and environmental differences and attempting direct transfer of technology developed for one pest species or geographical location to situations where different pests, crops, produce, and ecological/cultural conditions prevail. Yet it allows the flexibility of direct technology transfer to the extent that is appropriate.

Current field programs are located in the Philippines (S&T-funded), Bangladesh (Mission-funded), and Haiti (LAC-funded) for efforts in both Haiti and the Dominican Republic. Funding arrangements for the Haiti work may be changed soon. Central funding of the Philippine unit is intended to be phased out by FY 84. Efforts are underway which may lead to field programs in Indonesia and Peru.

Attention of the project is focused at the farm level, especially at that of the fields of the small farmers and the produce they store, and on the development of appropriate technologies, trained and experienced technical personnel, viable vertebrate pest control programs, strengthened infrastructure, and increased understanding and appreciation of these pests and the significance of the losses they cause the agricultural sector. The emphasis is on management of rodent and bird pests and it keeps in proper focus the interrelated domestic animal and public health aspects of these problems and their control.

The direct beneficiaries of the project will be the AID target group of small farmers. They will benefit from increased crop production and conservation, income, and reduced incidence and risk of serious pre- and postharvest losses. Indirect beneficiaries will include consumers, for whom a greater food supply will be produced at the same or a reduced cost. Participating government agricultural agencies will benefit, both directly and indirectly, through staff training and increased credibility with the farmers they serve. All categories of farmers--small, large, commercial, and estate--and all public and private organizations involved in agricultural development will benefit from an increased availability of technical information relevant


USFWS
(Personnel)
USAID
REGIONAL BUREAUS AND FOREIGN MISSIONS
(Funding and Program Management)
DWRC
(Technical Program Guidance
and Coordination)
SECTION OF SUPPORTING SCIENCES
(Support and Development Research)
Pharmacology
Chemical Development
Electronics
Behavior
Physiology
Temporary Assignments
Biochemistry
Chemical Analysis
Training
OTHER DWRC SECTIONS
(Technical and Support Services)
Consultation
Library Services
Training
Statistical Services
Temporary Assignments
Editing
SECTION OF INTERNATIONAL PROGRAMS
(Development of Vertebrate Pest Management Programs)
DENVER
(Coordination, Supervision,
and Outreach)
FIELD UNITS
Philippines
Bangladesh
Haiti and
Dominican
Republic

L7

to vertebrate pest management. In addition, where feasible, development and use of opportunities for increased and/or strengthened private enterprise will contribute to national development of LDCs.

The technical, training, extension and information sharing activities of this project will be relevant to other agricultural research and development programs supported by AID, the International Agricultural Research Centers, multilateral and bilateral donors, volunteer agencies, and chemical and other material and equipment suppliers and manufacturers. Project research and technology are also relevant to international environmental and wildlife conservation mandates of various agencies.

Users of project outputs will be those individuals, institutions, organizations and agencies concerned with agricultural production and produce protection in developing countries. Seven general areas of project activity follow.

1) Responding to requests for problem identification. Problem identification involves: a) ascertaining the pest species and gathering and developing basic information regarding their biology, life history, distribution and incidence; b) determining the crops and/or agricultural produce to which losses accrue and other ways in which pests cause damage; c) assessing the principal losses to the state-of-the-art accuracy; d) identifying interrelated factors such as cropping patterns and methods, postharvest practices, community cultural and socio-economic beliefs and practices; e) annual weather variations and medium-range climatic variations; and, f) potential detrimental influences on the environment which pest management activities may engender and ways to avoid them.

In order to assess principal losses it will be necessary in many cases to develop or improve methodology. This will involve gathering, developing and analyzing information on loss assessment problems and will require improved methodology protocols.

Milestones for achievement of the objective of this activity include requests for technical assistance, use of loss assessment methods, and acceptance of prepared reports which identify problems and outline recommendations.

2) Existing materials and technologies will be adapted and applied to specific problem situations. This will involve modifications of known control materials or techniques to fit needs dictated by new species, crops, produce, and/or agricultural settings and the necessary laboratory and field evaluations and pilot IVPM programs to determine efficacy and practicality. Milestones for achievement of the objective of this activity include completion of laboratory and field experiments on previously untested species, field and stored crops, and cultural systems. Progress and direction in this activity will depend heavily on input from the field staff and development of additional information on the biology, ecology, and behavior of pest species. Impetus will likely be gained from ongoing DWRC research on domestic problems and related work by other institutions.

3) New, practical, low-cost control methods will be developed for those specific vertebrate pest situations where adaptation of existing technologies is not feasible. This will involve: identification of materials and/or techniques likely to have application in reducing field and stored crop damage, especially that by rodents and birds; associated evaluation and development functions necessary to determine feasibility; and adaptive technical and research activities needed to apply them to specific problems. Milestones for achievement of the objective of this activity are the identification of candidate methods and materials, successful experimental use in pilot trials and demonstration of them in programs.

In this project, as in its predecessor, subcontracts and consultants will be used, when appropriate, to expand the expertise available at DWRC. In the past, these means have been used to obtain special assistance such as in the following examples.

Use of Non-DWRC Resources

Means	Source of Personnel	Type of Work
- subcontracts	several private USA firms	advanced radio units meeting FDA requirements
	private LDC firm	rodent control strategy
	USA university	socio-economic evaluation
	public LDC university	loss assessment
- consultants	USA specialist	socio-economic evaluation
		research guidance
		technical review
		technical assistance
	LDC specialist	zoological expertise

4) Technical assistance will be provided to enhance the progress of and demonstrate implementation programs involving appropriate vertebrate pest control techniques. Emphasis will be given to providing information and feedback to the field staff and the research team at DWRC concerning specific application problems and needed modifications of available technology. Technical personnel will provide advice to and rely heavily on collaboration with host-country personnel and will use local data sources. The project will strengthen infrastructure necessary for program implementation. Biological and ecological work with some pest species will be useful in pursuing problems with baits, baiting, or animal reactions to various techniques. Chemical analyses will be appropriate in some cases and, if capability is not available locally, will generally be performed by DWRC. Milestones for achievement of the objective of this activity are completion of individual studies, identification and successful resolution of specific problems, development of new vertebrate pest management programs, and demonstration of new or improvement of existing ones in host countries.

5) Training of host-country specialists will provide for development of indigenous capabilities in all aspects of vertebrate pest management. This activity relates primarily to training and professional development of host country personnel. Funds for professional training of counterparts are not included in the proposed project budget. In the past, these have been provided from other sources such as AID Missions or international organizations, and it

is expected that such opportunities will continue to be available. Every reasonable effort will be made to find means for professional training. Project personnel, both at DWRC and overseas, will work with selected graduate trainees with the approval of AID, supporting agencies, and host country institutions when such work will enhance the attainment of project goals. A successful approach has been the direct involvement of host country personnel in research investigations, field trials and demonstrations and giving them due recognition for their contributions. Many of the earlier project's accomplishments can be credited to this practice. Training courses will be provided and evaluated at all necessary levels. Subjects will include: loss assessment; biological, ecological and adaptive research; evaluation of control techniques; and ecological hazards. Model syllabi will be developed together with examples of appropriate training aids. From these, specific syllabi and training aids will be developed as necessary. Since training must finally reach the user, extension aids will be developed as part of the preparation for program implementation, keeping in mind the illiterate of the user population. Training will be provided in development of budgets and efficient administration practices. Training and extension aids will be shared with others. Milestones for achievement of the objective of this activity will be evidenced by: extensive involvement of counterpart personnel in host country programs; completion of graduate studies by them in conjunction with project activities; emergence of trained counterpart investigators actively engaged in the design, evaluation, and application of vertebrate pest management methods and programs; trained control program practitioners; and, evaluations showing successful implementation of control programs.

6) Cooperation by project personnel with country, regional, and international institutions to develop long-term institutional support for implementation, evaluation, and ongoing reassessment of vertebrate pest management programs. This is an important and necessary activity since few countries have made serious prior attempts to place vertebrate pest management within an institutional framework. As a direct result of the prior project's activities in Bangladesh, Colombia, the Dominican Republic, Haiti, Mexico and the Philippines, new institutions or programs exist, though some need strengthening. Such continuation of functions, especially after termination of AID/DWRC participation, is highly dependent on development of institutional frameworks, local funding sources, and career positions for trained personnel. Emphasis will be given to the building of self-reliant indigenous vertebrate pest control programs. Evidence of achieving this will be the milestone regarding the objective of this activity. A second milestone will be evidenced in reports of successful cooperation with other developmental assistance organizations.

This type of cooperation will not be new to DWRC, as the Center has worked closely in the predecessor project with other organizations in research, training and extension. Among these, some of the U.S. institutions include the U.S. Department of Agriculture which DWRC has assisted particularly in training of LDC personnel, the U.S. Peace Corps (particularly in Colombia, Dominican Republic and Guatemala) and Universities. The latter include particularly the University of Arkansas, University of California at Davis, Colorado State University, Bowling Green (Ohio) University, and Texas A and M University. The international organizations with which DWRC cooperation has

been significant include the Food and Agricultural Organization of the United Nations (FAO), Pan American Health Organization (PAHO), World Bank (WB) and World Health Organization (WHO). The cooperation with FAO has been most extensive. In addition to other actions, DWRC has assisted FAO in bird research in several African countries at FAO's request. It may be appropriate to establish a more general cooperative relationship in this connection between FAO and AID/DWRC during the early years of this project.

7) Technical and non-technical information will be collected, developed and shared on all aspects of the vertebrate pest control problem. Emphasis will be on collecting, even more completely, information pertaining to pre- and postharvest rodent and bird control. Because international information-sharing efforts in rodent control are faltering, early efforts will center on this field. This will require close collaboration with the Food and Agriculture Organization of the United Nations (FAO), the World Health Organization (WHO), vertebrate pest control workers in other nations such as the United Kingdom and other interested organizations both public and private. The milestone for this collecting of information, only a part of the objective, will be the updating of the FAO/WHO series of bibliographies on rodent pest biology and control beyond 1974. The achievement of this milestone will depend upon supplemental funding. A second part of this objective will be to update the existing collection of information on pest birds and other important vertebrate pests. This activity should include a non-governmentally sponsored review of the past achievements, and analysis of the future needs, of the program for control of the Quelea bird problems in Africa. Another milestone will be the increased ability of DWRC to store and retrieve vertebrate pest information and provide this knowledge to concerned LDC personnel. Information sharing milestones will include the trend for the increasing request and usage of this information by the LDCs.

A concomitant aspect of the information sharing program will be the planning, conducting and reporting of adaptive research at DWRC stations in the USA and at field stations in LDCs. Milestones will include the numbers, quality, significance and use of reports resulting from the research.

Additionally, USAID Missions will regularly be informed and reminded of services available from the project, and the project will turn recommendations into extension and training aids and distribute them widely. Whenever possible these aids will be developed cooperatively with other institutions. DWRC will also seek opportunities to synthesize the research of others with their own in this information sharing. The activities in information sharing will also include the development of brochures, seminars, workshops and training courses.

Outputs of the project will be:

1. Significant contributions to the body of knowledge about vertebrate pest depredations in pre- and postharvest agriculture with special emphasis on tropical and subtropical agro-ecosystems.

2. Identification of vertebrate pest problems in LDCs in a manner which encourages logical priority and support to their solution.

3. Expanded awareness of vertebrate pest problems, solutions available through improved management systems, and results achieved through viable, country-financed vertebrate pest control programs in participating countries.

4. Demonstration of clearly improved integrated vertebrate pest management systems in participating countries which significantly reduce pre- and postharvest losses.

5. Trained personnel from participating countries, actively engaged in the design, evaluation, development and implementation of vertebrate pest management systems.

6. Technical assistance in areas where serious vertebrate pest problems are recognized but where no significant work is underway. Specific examples include Indonesia and Peru. Each of these countries has requested assistance and preliminary contacts have been made.

7. Research results leading to appropriate, effective, cost beneficial, and safe vertebrate pest management materials and methods.

8. Extensive distribution of results of research, field studies, pilot operations and demonstration of improved vertebrate pest management systems and other collected information from around the world through an efficient information sharing program to all who need and request such information.

Users of project outputs will be AID Missions, other donors and technical assistance agencies, contractors, LDCs, other public and private organizations and large and small farmers.

PART III PROJECT ANALYSES

A. TECHNICAL ANALYSIS

1. Timeliness: AID has, for over 14 years, been financing research to discover technologies useful for improving LDC agriculture production and protection through reduction of losses to vertebrate pests. This funding has also provided technical assistance to improve rodent, bird and other vertebrate pest control systems, principally in preharvest situations. Though much has been accomplished, these efforts have been directed at a relatively few species and problem situations.

Meanwhile, a realization of the overall impact of these pests has begun to emerge and attract increased interest and attention in the LDC's. Though not recognized by many international agencies, Ministries of Agriculture, or even universally by biologists, there are indications that in the developing world vertebrate pests cause pre- and postharvest agricultural losses comparable to those caused by insects.

Most developing countries are giving high priority to expansion of agricultural production and safekeeping of the produce. These efforts will involve environmental changes that influence the types and degrees of vertebrate damage problems. Bringing new lands under cultivation by clearing forest, scrub, or marsh areas is associated with rodent population irruptions. New farmers on these lands may suffer serious crop and produce losses during the critical first years of cultivation and harvesting. In addition, chronic losses often are accentuated when rodents move from adjacent uncultivated lands to exploit newly available food sources. Similar patterns develop with bird pests. And irrigation, which allows year-round planting in areas formerly dependent on seasonal rainfall, as well as year round storage of crops, produces changes favorable to vertebrate pest population increase and, apparently, result in an increase in losses.

AID's mandate to reach small farmers and rural women with technologies aimed at improving their production, and the conservation of it, has influenced development projects in irrigation and other factors which increase agricultural production and plant protection. But the undertaking of such programs without devoting attention to the associated ecological changes and probable consequences with regard to vertebrate pests is indefensible.

Most donor agencies, including AID, have a great deal of experience in agricultural development and technology; however, vertebrate pest management is a relatively specialized field with few experienced personnel. Failure to protect growing and harvested crops from vertebrate pests may negate the potential gains from other advances in agricultural technology.

Existing and past field programs associated with DWRC's international activities (i.e., in Bangladesh, Colombia, the Dominican Republic, Haiti, Mexico the Philippines, and Sudan,), have provided insight into the needs for training, materials and techniques to help farmers reduce their risk of severe losses to vertebrates. In view of the wide diversity of ecological and cultural conditions under which vertebrate damage occurs and the variety of species involved, vertebrate pest management methods need to be constantly evaluated and modified as new information and techniques are developed.

The project will synthesize this information, build on knowledge already gained, and provide assistance in an orderly, coordinated, and systematized manner.

2. Suitability: This project deals with problems that are significant from the standpoint of agricultural productivity and availability of food. The demand for increased food production and preservation has forced concern for protection of crops and stored products from depredations by all manner of pests, including vertebrates. Effective resolution of problems involving vertebrate pests requires: a) careful, precise identification and quantification of the problem; b) selection or development of appropriate solutions based on social, cultural, environmental, economic and institutional constraints; c) testing and evaluation of solutions within the farm and institutional environment; and d) training and technical assistance to facilitate implementation of effective, safe, integrated vertebrate pest management programs. The entire process is dynamic, and as new problems are identified, appropriate action must be taken to modify solutions. It is necessary, therefore, to provide the technical capability to directly address specific problems and conditions in the host countries.

Other agencies and groups are engaged in vertebrate pest control work in LDC's but, because this is a field with a relatively small number of technical personnel, these efforts are few and generally limited in scope. Cooperation with these agencies has generally been easy and informal at the technical level with personnel often working together on specific field or training problems. AID and DWRC have and will continue to engage in specific coordinated activities and joint project planning with FAO, WHO, the German Society for Technical Cooperation (GTZ), the United Kingdom's Overseas Development Administration (ODA), the World Bank, International Rice Research Institute, the Peace Corps, U.S. universities, and other agencies including crop protection research and extension institutions in developing countries. Such cooperation has, in general, allowed each agency to use its own program expertise with little redundancy, while making state-of-the-art technology available to professionals engaged in vertebrate pest management. Many of the international organizations and donor agencies have used the DWRC, its field programs, and counterpart institutions to provide short-term and graduate training opportunities for developing country personnel.

Probably the greatest asset of this project is its unique backstopping capability. Many of the problems encountered by field personnel can be resolved only through use of the facilities and support specialists such as are essentially uniquely available at DWRC. Project personnel are capable of rapid, effective response to requests for assistance from field staff, AID/Washington, USAID Missions, host countries, and cooperating agencies. A parallel approach is used by DWRC for the USA's vertebrate problems.

3. Initial Environmental Examination: The activities of this project fall partly into the area described in environmental procedural regulations parpagraph 216.2(c) "Analyses, studies, academic or investigative research, workshops and meetings." These classes of activities will not normally require the filing of an Environmental Impact Statement or the preparation of .n Environmental Assessment. Under these guidelines, this part of the project clearly qualifies for a negative determination at the time when a threshold decision is determined. In part, the outputs of the project will be a set of -- procedures, training aids, and guidelines which, before they are used or extended will be subjected to an assessment in a timely manner.

Certain types of large-scale field studies, pilot trials and demonstrations may include the preparation of an Environmental Assessment. Historically, the predecessor to this project has shown that hazards to the environment can be kept to the minimum. It is anticipated that most pesticides used will be from among those listed in Annex H. Only a few will be likely to be used in any one country's project activities. Before any pesticide which is restricted by the Environmental Protection Agency (EPA) or proposed as restricted, based on hazard to humans or non-target animals, is used or recommended, an environmental assessment will be prepared and sent through appropriate S&T and Regional Bureau Officers for comment and approval. The Initial Environmental Assessment is attached as Annex I.

4. Design: The project is designed to develop, evaluate, adapt, and apply vertebrate pest control methods and strategies. By drawing together technical findings of diverse investigations, applying them to specific pest problems suffered by small farmers, and supporting detailed evaluation and analysis of pilot control programs, the project will complement existing research and development activities. In addition to all pertinent literature, sources of information will be past and present project experience with relevant additional on-site information collected as needed.

The most cost-effective, safe means of acceptably decreasing losses of agricultural crops and products to vertebrate pests will be the criterion by which control alternatives will be judged and priorities established. Outputs generally should be available in a shorter time period than if the program were beginning from a less-advanced starting point since large segments of the technology are expected to be adaptations of previous developments.

5. Summary: The project is technically sound and will provide needed technology and associated resources which have excellent potential for improving food production and availability. With careful project management, the probability of its success is high.

B. FINANCIAL PLAN

This proposal provides for ten year funding of a non-revenue-producing project. Detailed budget summaries are appended as Annex B. Project costs to be borne by AID/S&T/AGR are estimated at $9,146,000 for the ten year period.

It is anticipated that the Philippine field unit will be financed by the Mission after FY 84. Though discussions are presently underway to effect a change, AID/LAC is presently supporting a regional project in the Caribbean. The AID Mission is supporting the field unit in Bangladesh. AID anticipates additional DWRC field units as this new technical assistance project progresses. For example, preliminary discussions have been held wth AID Missions in Egypt, Indonesia and Peru.

The estimated budget figures include a 7.5-percent annual increment to cover anticipated increases in salaries and benefits. A 12.5-percent annual increment was used in calculating all other budget items. This is partly based upon inflation but principally upon anticipated increased demand for services. The budget includes funds for subcontracts and consultants.

Overhead costs are 28 percent of the subtotal and exclude funds allocated to AID Missions. Excluded from these estimates are funds for emergency and medical travel for resident technicians. These benefits are provided by AID on the same basis as for direct-hire employees.

In the financial environment in which this project is expected to operate, it is not resonable to expect all technical assistance that is requested to be provided by the project as funded by S&T/AGR without additional cost. It is therefore planned that the current policy of cost-sharing of common themes of work by Missions and Regional Bureaus will be followed in the implementation of this project. Provision has therefore been made, based on past activities, for Missions and Regional Bureaus to "buy-in" to this project up to 40 percent of the intended S&T/AGR yearly obligations and these additional funds will be within the total project's authorized levels.

C. SOCIAL ANALYSIS

Success of this project ultimately hinges on its social, cultural, and economic acceptability to the target group(s). Small farmers (the projected primary beneficiaries) are aware that vertebrate pests cause harm to agricultural productivity and reduce the availability of produce but they may not fully appreciate the extent of the losses or their economic implications. In fact, such losses are often tolerated as an unavoidable part of the natural scheme. Any well-conceived program which is capable of generating low-risk, high-return pest control technology will be welcomed throughout the areas presently plagued by the constant threat of serious crop damage. However, perception, acceptance, and diffusion of this new technology among rural men and women will occur within a variety of socioeconomic and cultural institutions which must be carefully considered at all stages of the development process. Successful vertebrate pest management programs and implementation of new damage control methods require that local institutions be encouraged and strengthened. Development of programs, staff and facilities of selected institutions can provide long-term benefits to target groups in host countries and to neighboring countries with similar pest problems. In many countries successful initiation of loss control programs and continuation after project termination will depend on a sound system for distribution of the low-cost, low-volume inputs.

The social impact of the project influences not only primary beneficiaries, but also institutions that will ultimately bear the responsibility for vertebrate pest management programs.

Because of the extreme diversity of ecological conditions in the world, no uniform pattern of pest problems exists. However, farmers generally realize that productivity is drastically curtailed, and extensive labor costs are involved in protecting fields. In fact, over the centuries, a variety of traditional crop protection methods has evolved which aim to reduce loss to vertebrate pests. Any effective pest control project will attempt to improve and incorporate these traditional practices into the project.

For controlling birds. farmers used scarecrows and guards, generally young boys who crack whips, throw rocks, yell, sing, use slingshots and, in recent times, throw firecrackers to disperse the birds. One extensively used method of protecting corn ears and often sorghum, is that of bending the stalk so

that the ears face downward. This process seems to prevent birds from landing on the ear and attacking the head. In some areas, overplanting and deep planting insure at least an acceptable germination and plant survival rate. Sometimes planting is done so that the crops mature when the main pest species have migrated out of the area. Other traditional control methods include employing varieties that are less susceptible to bird damage because of a tougher, resistant husk (corn), the presence of tannins (sorghum), or awns (wheat). Farmers also plant close to houses and human activity, and stretch bright, flickering plastic or cloth strips over the field. Occasionally, heads of corn, sorghum, and millet are covered with bags to reduce loss to birds.

Traditional rodent control techniques are equally varied. In one Central American country for example, bounty trappers are hired to combat a large gopher, the "taltuza." Only larger landholders can afford to hire this kind of help. Many individuals attempt to trap on their own with mechanical snap, tube, and snare traps which can be locally purchased. However, trapping often is prohibitive for small producers. Farmers also attempt to drive away the gopher by destroying its tunnels and den, beating the earth with sticks while making noise, and placing foul-smelling substances (dead chickens, lobsters, and other carcasses) in dens and burrows.

Locally available traps and poisons are regularly used to protect stored grain from rats and mice; farmers, however, agree that the use of these methods needs improvement. They realize that effective storage is the best means to prevent postharvest grain losses and are receptive to suggestions for improving storage structures. In some cases, farmers contend that cats and periodically organized rat-killing parties (150 rats can be killed within a few hours by the cooperation of 10 to 15 people) are the only effective controls against rat infestation.

Despite the wealth of traditional pest control methods, farmers generally agree that they are inadequate. Indeed, individual farm families suffer total loss of a crop in some years. In fact, widespread pessimism prevails over the possibility of effective control either through mechanical or toxic means. Yet, farmers are convinced of the need for control and would no doubt welcome effective methods. It will be necessary to convince them that an appropriate technology can be developed which is inexpensive, low-risk, and appropriate for actual field conditions. Numerous factors influence and determine the reaction of the target groups toward crop protection innovations from the time these management techniques are introduced until they are accepted or rejected. Listed below are some of the real and potential constraints which must be considered.

In traditional agriculture, an innovation is not always readily accepted even if it seems to offer possibilities. Differences in cultural perception must be considered at all stages of investigation and extension. This is especially true where indigenous values and beliefs are still viable. In dealing with established social practices, neither appeals on scientific grounds, economic rationality, nor western logic can easily persuade villagers to give up or change traditional life practices.

Across the Mayan area, for example, the belief is prevalent that each person has an "animal spirit companion." The animal spirit world contains literally thousands of inhabitants. It is further believed that an individual and his animal spirit companion share the same fate, and soul. If the animal spirit is harmed, the human companion is likewise afflicted. Bats, which are thought to be a species of field mice that sprouts wings in adulthood, are known to have been worshipped and considered village patron saints. Rats are perceived by some groups as people of another epoch. Some individuals express the belief that it is good to have mice around the house to clean up bits of food. One folk saying relates the notion that if there is a good harvest of potatoes, there will be few rats in the house while a poor harvest will increase the rat population. These examples demonstrate that the conception of nature may vary enormously among cultures. This is not to say that there exists a sensitivity against controlling pests through killing, as is the case in many parts of Hindu India, but to alert the program developers that such beliefs must be taken into account.

Not only are there sociocultural factors influencing farmer reaction toward innovation but also toward the agents of change. In addition to defining their problems differently, farmers frequently distrust outsiders. All too often, government extension agents or bureaucrats who are of urban origins, do not understand subsistence agriculture and are unable to converse fluently with the local people. Frequently, a condescending paternalistic attitude and lack of respect for the indigenous culture dooms the project from the outset. Thus, from the very beginning, any program must elicit the farmers' confidence by consulting them at every phase.

Farmers are unlikely to accept an innovation unless it is simple in technique, shows visible and immediate results, and can be initially carried out on a limited trial basis. In this regard, the means of communication are very important (e.g. word-of-mouth, radio, local leaders, demonstrations). All methods, if addressed to particular farmer needs and presented in a language they understand, show potential as means of information transfer. Linguisitic differences in particular pose a major problem. Farm leaders, fluent in the respective indigenous languages, will be used whenever possible for this process. Furthermore, every effort will be made to work closely with the various institutions of the Ministry of Agriculture and other development agencies.

Serious constraints on the acceptability of new techniques are the cost and lack of accessibility to capital by small producers. Most farmers live on the very margins of survival and cannot readily afford even such seemingly inexpensive items as small traps or poison baits. Although labor shortages may exist during a migration period, labor-intensive methods may stand a better chance of implementation than capital-intensive ones. For example, recent government programs in Thailand, where bounties were payed for hand-killed rats in rice areas, has reputedly met with amazing success in the eradication of these pests.

Any proposed program must be geared toward the needs and understanding of subsistence and small farmers rather than large, commercial producers. New ideas and techniques must be presented verbally, visually, and conceptually in such a way that the potential advantages are obvious. Complicated techniques developed under laboratory conditions that cannot easily be grasped by farmers

are unlikely to succeed. Poisons, in particular, should be used with utmost caution, given the farmers inexperience and lack of knowledge about toxic chemicals. Many farmers cannot read or follow label instructions and have no understanding of the slow, long-term health damage poisons can induce. Cases have been reported where farmers use double or triple dosages and take no measures to protect themselves or their family members. Pesticide residues have been found in village drinking water. To date, the most successful use of agrochemicals has been on commercial farms. No doubt, agrochemicals hold great potential but must be approached with extreme caution and thorough planning at the small producer level. Farmer education, low costs, and demonstrations of success should be elements of any vertebrate pest program involving toxic substances. It should also be remembered that numerous varieties of rodent and birds are consumed by peasants. Therefore, pest management programs that do not use toxic substances, but are inexpensive and effective will be more likely to be accepted.

Women benefit directly and indirectly from this program in a number of ways. First, women often are in charge of household grain storage. Any effort to reduce losses to pests, either through consumption or contamination, would allow greater return on their labors and assist them in more adequately feeding their families. In many areas, a food such as corn is frequently stored in attics or simply piled in a corner. Improved storage facilities would be an excellent complement to a vertebrate pest management project. Although young boys generally guard fields against birds, this activity may at times be assumed by girls and women as well. When agricultural diversification takes place, such as growing vegetables and fruit as commercial produce, women frequently assume control of these. Both marketing and horticultural activities are, in widespread areas, female endeavors. In one Indian community where weaving is a major source of outside income, women complained of rat damage to thread and cloth, as well as damage to the wooden weaving frame. Any input such as rodent control which increases the productivity of women in handicrafts production will mean more capital available for farm improvement. Quality as well as yield of handicrafts manufacturing can be favorably affected.

D. ECONOMIC ANALYSIS

Development assistance projects dealing with vertebrate pests are economically justified by relating costs of potential or actual losses due to these pests and the increased agricultural production and food availability realized from implementation of control programs. Experience has demonstrated the feasibility of increasing the food supply by means of integrated vertebrate pest control in numerous cost-effective ways (Annex E).

Destruction of food and fiber by vertebrate pests is a non-diminishing problem of global proportions. Most of these ravages are caused by rodent and bird pests. These losses contribute to the social and economic difficulties faced by developing nations. Chronic losses to vertebrate pests remove a significant part of agricultural production before crops are harvested and during postharvest storage. Hence, a sizeable percentage of production and post-production investments and labor are devoted to feeding pests. Frequently the greatest impact is on the poorest farmers who have difficulties

in providing for their own sustenance from small-sized farms many of which are in marginal production areas. Investments in laboratory and field technology and in training of control specialists along with the development and strengthening of implementation and extension programs will make practical and appropriate control methods available to farmers.

As one of the outputs of this project, the physical and economic losses will be assessed and attention will be given to the costs and returns of implementing vertebrate pest control programs. Given that this project will be addressing pest problem situations that have not been investigated previously, indicators of the economic feasibility and benefits of vertebrate pest control must come from prior experience. Several such examples are given in Annex E. A more detailed example is presented in the following table. The data compares the costs and returns for improved and traditional rodent control in paddy rice. The figures demonstrate that profits are higher when improved rodent control technology is used and that the cost of control is a small percentage of total production costs.

Average Cost and Return Comparison ($/ha) of Sustained B ing Treatments vs. Traditional Control Methods in Paddy Rice in Three Areas of the Philippines*

Task	Pangasinan		Mindoro 1		Mindoro 2	
	Sus. B.	Trad.	Sus. B.	Trad.	Sus B.	Trad.
Land Preparation & Cultural Pract.	55.70	44.00	91.50	87.50	85.60	93.40
Harvest	18.40	13.70	57.10	28.60	71.40	35.70
Rat Control	1.90	0.30	2.90	0.90	3.60	1.30
Total Prod. Cost	76.00	58.00	151.50	117.00	160.60	130.40
Gross Crop Value	444.60	332.70	302.10	166.40	378.60	192.90
Profit	368.60	274.70	150.60	49.40	218.00	62.50

*Figures based on actual farm practices.

The potential benefits to be gained from a large-scale vertebrate pest control program are demonstrated in the next table. The information is projected from calculated costs and benefits from experimental trials of control methods to reduce rodent damage to rice and corn in the Philippines. Base data are from replicated small-farm trials which have been extrapolated to depict the situation when applied to an area of 10,000 ha.

Costs [a/] and Returns--Rodent Control [b/]

Crop/Rat Species/ Area/Date	Damage Index: Treated Farms (%)	Damage Index: Untreated Farms (%)	Value of Farm Yield Increase ($)	Cost of Control to Farmers. ($)	Net Increase With Effect. Control ($)
Rice *Rattus rattus mindanensis* Pangasinan, Philippines, 1973	0.15	5.91	1,400,000	15,700[c/]	1,384,300
Rice *Rattus argentiventer* Mindoro Or., Philippines 1974	0.2	4.9	1,357,100	20,000[c/]	1,337,100
Corn *Rattus rattus mindanensis* Bukidnon, Philippines 1976	0.86	5.4	314,300	17,900[d/]	296,400

[a/] No cost to the Government would be entailed except for normal extension activities needed to provide farmers with agricultural production practices.

[b/] Projections assume production increases in treated plots are due to the results of rat control treatments and that damaged plants have no economic value. Labor of small farmers is not included as a cost; baiting programs would generally require between 1 and 2 hours/ha/week.

[c/] Cost increment over traditional methods used.

[d/] Actual cost--no traditional methods practiced.

Benefits in most situations, will be effected relatively soon and repeated over time as new problems are addressed and related to past experience, knowledge, and available technology. Some research and development may be needed for a few of the problems addressed by this project. Project output materials will be generally relevant for many years, but the developing country institutions and the beneficiaries/clients will benefit from continuing investments for further gradual improvement of the programs.

This project must be recognized as filling but one of many priorities for development which is best prompted by a centrally funded project of the Office of Agriculture. These priorities are best viewed in terms of economics. The current priorities of the Office of Agriculture can be determined from the program ranking for the Fiscal Year 1984 budget.

Funding for all of the international agricultural research and development centers takes the highest priority. Four of the CRSPs take the next positions of priority. Thus, before "discretionary" funding of the first of the additional research and technical assistance projects about 80 percent of the proposed FY 84 budget of the Office of Agriculture is earmarked. Among the remaining projects proposed to be funded in the FY 84 this technical assistance project ranks thirteenth, and by funding it and the higher ranked projects, about 92 percent of the proposed FY 84 budget is earmarked. The remaining 8 percent of this proposed budget is utilized in funding 11 other projects. Of these 8 are research projects. Additionally, there are 12 other projects for which the work is considered to fall in the area of priority of the Office of Agriculture and for which it is anticipated funding is unlikely to be available. Funding them would require about an 8 per cent increase in budget. Thus, this project can be considered to have a priority that brings it to a ranking in aobut the 54-60 percentile ranking from the top of the "discretionary" funding for FY 84, or about the 36-43 percentile ranging from the top of the "discretionary" activities needed (and desired) to meet carefully determined priorities of the Office of Agriculture.

PART IV IMPLEMENTATION ARRANGEMENTS

A. ANALYSES OF THE ADMINISTRATIVE ARRANGEMENTS

1. Contractor--It is essential that the contractor have considerable knowledge, experience, and a disciplinary background in vertebrate pest control technology. The DWRC has the necessary capabilities and demonstrated competence.

2. LDC Institutions-- Much of the project output, at least in the initial damage assessment/problem identification phase, the field evaluations, and program development stages will be the result of the use of direct linkages to LDC institutions. Several have already been established and others will be developed as needed.

3. AID--The project is complex in nature but does not require any unusual administrative features from AID. No additional AID staff commitments are considered necessary.

4. Project Officer--The project will benefit from continuing involvement of the Project Officer in S&T/AGR. It is anticipated that the vertebrate pest management specialist will spend at least seventy work days annually on the project, probably more in the first three years. This is important in order that the contractor, though experienced, has AID's specific added assistance with linkages and planning--an area of activity in which the project manager has extensive experience. The AID project manager will assist with detailed planning, analysis of laboratory and field findings, selection of technologies, choice of techniques for institution strengthening and publication review. The Project Officer's experience will supplement that of the contractor, helping to bridge the gap between developing and more developed countries.

AID's involvement will be essential in initial coordination and negotiating requirements with participating countries. AID's role will be vital in monitoring project performance and conducting evaluations. Administrative support and services for resident U.S. technicians, coordination in delivery of equipment and supplies, coordination in arranging short- or long-term training programs, and arrangements for TDY personnel will also be major items requiring AID involvement.

USAID policies and procedures will be adhered to in procurement of goods and services. Monitoring will be accomplished by the Chief, Section of International Programs, DWRC; the AID Project Officer; the Rural Development Office of participating Missions; and cooperating host government agencies. Annual progress reports and copies of all documents resulting from field and laboratory activities will be provided to the Project Officer for clearance.

B. IMPLEMENTATION PLAN

The detailed timetable for project implementation is given in Annex C (Condensed Milestone Life-of-Project Schedule).

Technical assistance for the PASA services with DWRC will be financed by AID using the standard PIO/T procedures. Where appropriate, the Office of Rural Development in the USAID Mission of the respective participating country will serve as the AID representative for the AID/W Project Manager.

The work and the achievements of the predecessor project, Control of Vertebrate Pests, will greatly influence the implementation of this project. Many activities will and must be ongoing.

During the first year's activities, the project will identify an LDC needing technical assistance in vertebrate pest management. An assistance program will be initiated in year two, field trials conducted in year three, demonstrations held in year four, and training emphasized in year five. The cycle will be repeated in other countries on a continuing basis, beginning with another country each year. During year four, the project will begin preparations for an international conference on rodent control to be held in year five. The criteria for guidance on sequential selection of countries for emphasis of project activities include: (a) prior concensus of expert groups on the regional importance of the vertebrate problems; (b) extent of losses; (c) probability of high benefit/cost ratios for loss reduction; and, (d) likelihood of socioeconomic acceptance of recommended practices.

Training activities will be continually expanding during the life of the project. With successful initiation of the increased emphasis on information sharing described earlier, these activities, in cooperation and collaboration with international agencies as well as other nations and other public and private organizations and institutions, will be expanding rapidly throughout the life of the project. Back-up research will remain essentially at the level it is now, except as special problem-solving needs arise.

With regard to technical aspects of implementation, project output will be achieved through certain of the activities which in turn, will provide input to other activities. As an example, each effort resulting in improved loss assessment methodology will provide input to each successive problem identification. Each successful problem identification will provide inputs toward development and/or further improvement of vertebrate pest management systems.

C. EVALUATION PLAN

Routine evaluations will be conducted periodically throughout the project and major AID project reviews will occur near the end of the third, sixth and ninth years of the project. Evaluations will be based on monitoring reports, inspection of physical facilities, DWRC progress reports, technical publications, and reports on participating country vertebrate pest control program activities. The evaluations will determine if project inputs are being provided as planned, that conditions and covenants of project agreements are being met, and that project outputs are being accomplished. These evaluations will be the basis for recommended changes necessary to achieve project goals.

The AID project reviews will be comprehensive (team) evaluations of progress toward achievement of established goals. Evaluation factors will include: project achievement in addressing the needs of small farmers and rural women; LDC adoption of resultant technologies; net reducton of losses to vertebrate pests in LDC's; creation of jobs; increases in crop productivity and improvement in produce preservation; and, achievement of project purposes and goals.

. The nature of this project is such that no major conditions requiring host government action prior to implementation are necessary. Any necessary negotiations can be made through meetings by representatives of DWRC, AID/W, AID Missions, and appropriate officials from participating governments, with terms of agreement and implementation procedures to be set down in memoranda of understanding between DWRC and cooperating institutions.

ANNEX A

SCOPE OF WORK

Pre/Postharvest Rodent and Bird Control

The program goal of this project is to increase the social and economic standard of living in developing countries by reduction of crop losses due to vertebrate pests, emphasizing pre- and postharvest losses due to rodent and bird pests. This will be accomplished through a program which encompasses elements of technology development or adaptation, training, and technology transfer. All of the content of the project paper is deemed pertinent to the understanding of the Scope of Work and the Project Paper is to be considered as an annex to the resulting Participating Agency Support Agreement (PASA).

Wildlife damage problems in agriculture are inherently complex but DWRC experience shows that they can be successfully resolved through a systematic, cooperative effort by a multidisciplinary team. By breaking problems down into more specific areas, they can be investigated more thoroughly and skillfully because of the specialized knowledge, equipment, and abilities peculiar to each discipline. Several aspects of the problem can be looked at simultaneously, thus conserving time. The interchange among specialists tends to stimulate innovative ideas and helps focus the direction of technology and program development.

Technology development is intimately tied to training and technology transfer. At the field units, counterpart personnel will be directly involved in all phases of planning, study and program execution, data analysis, reporting and publication. In addition to providing valuable on-the-job training and experience, this approach leads to more effective transfer of technology since counterpart personnel are better prepared to argue needs, rationale, and details of methodology through the hierarchies of local agencies or interest groups. Such direct involvement of counterpart personnel makes the best use of small numbers of available people and helps develop local professional and institutional relationships that will persist beyond the project. This is the only AID project devoted to vertebrate pests; it is worldwide in scope; it emphasizes assistance toward minimizing the worst of these problems -- those due to rodents and birds in pre- and postharvest situations.

Most project activities will be carried out in the context of specific requests from LDCs endorsed by USAIDs. Responses to these requests will be to further identify the requesting country's needs and fulfill them. In many cases this will lead to planned studies involving one or more team units. The process involves preparation of detailed work units which will be reviewed and critiqued by personnel from the DWRC, AID/W and cooperating agencies. Items to be included are: 1) statement of the problem; 2) literature review; 3) objectives; 4) procedures; 5) personnel and equipment needs; 6) time schedule, and 7) cost. Investigators and practitioners will prepare progress reports, annual reports, and summaries of management implications upon completion. Results will be published in professional journals and distributed to cooperators and colleagues concerned with animal damage control problems throughout the world. Efforts will be made to publish work involving cooperation with foreign investigators in local or regional journals to enhance the impact on individual country programs.

If verterate pest control is considered in a broad context, an overwhelming variety of control methods have been used or proposed as outlined below.

Physical	Chemical	Biological	Others
Barriers	Toxic baits	Sanitation	Bounties
Trapping	Tracking powders	Parasites	Harvest
Flooding	Toxic sprays	Disease	Appeasement
Electrocution	Repellents	Predators	Insurance
Drives	Toxic grease or foam	Habitat modification	
Hunting	Systemics	Cultural practices	
Clubbing	Reproductive inhibitors	Buffer crops	
Crushing	Fumigation	Lethal genes	
Frightening devices	Wetting agents	Resistant crop varieties	
Radiation	Drugs		
Explosives	Glues		
Burning	Frightening agents		
Ultrasonics			
Electromagnetic radiation			

No single method is applicable to all damage situations; even under the most ideal conditions; results of most methods are somewhat variable.

A field technician quickly discovers that the need to explain why a technique farmers have heard about may not be appropriate is equally as important as explaining what will work to protect their crops. Potential control methods must, from the earliest stages of development, be evaluated in terms of: efficacy for reducing damage; appropriateness to the problem, the user, the community and the environment; safety; and economics. This project is designed to consider each of these factors.

The successful development of effective vertebrate pest control technology involves several basic tasks. These include: a) problem identification; b) species identification and biology; c) materials research and laboratory evaluation; d) field trials; e) demonstration; f) training and technology transfer. Prior DWRC research activities and experience will permit efficient and effective accomplishment f these tasks, leading to viable control programs based on sound technology. Final specific details for conducting these activities will be planned and programmed carefully with the AID Project Officer and will follow these general guidelines.

1. Problem Identification

There is a paucity of informaton about vertebrate damage to agriculture and its products in most developing nations. Few of these problems have been addressed in any systematic way. The contractor will review and expand the data base on world vertebrate pest problems and analyze their impact in meaningful economic terms. In some instances, this will require development of quantitative loss assessment methods. Some problems may be only locally serious; others, involving widespread species, will constitute a significant problem in terms of economic impact over a large area. Emphasis will be given to the more important problems. Identification and evaluation of vertebrate

pest problem situations will be a continuing process during the life of the project. Literature reviews, information exchange with other investigators, and on-site observations will be some of the techniques used to accomplish this task. As a result of preliminary problem identification, recommendations will be made as to the next steps necessary for solution.

2. Species Identification and Biology

The contractor will identify the pest species responsible and make detailed studies of their biology as it pertains to the problem in order to recommend specific steps towards solution. On the basis of current knowledge, at least 15 species of rodents and more than twice that number of bird species may be considered major agricultural pests of pre- and postharvest systems. Of these, the most important rodent pests of field crops in Southeast Asia are Rattus argentiventer and Rattus rattus sp. which affect cereal crops and coconuts. Bandicota bengalensis and Nesokia indica are the principal rodent pests in cereal crops and postharvest storage in South Asia. The principal bird pests in this part of the world appear to be several species of the genus Lonchura in Southeast Asia and parakeets of the genus Psittacula in South Asia. Cereal grains are the principal crops affected.

In Africa, several widely distributed rodent species damage cereal grains, peanuts, and tree crops. The Nile rat, Arvicanthis niloticus, occurs through much of northern and central Africa; the multimammate rats (Mastomys sp.) are widely distributed as agricultural pests; a variety of gerbilline species, primarily of the genera Tatera, Taterillus, and Meriones are also important in north and central Africa. The most important bird pest in Africa is the quelea (Quelea quelea). Enormous flocks of these birds cause tremendous crop devastation and adversely affect the agricultural economics of some 25 nations. Other species of regional importance include the village weaver (Ploceus capitalis), golden sparrow (Passer luteus), and several species of doves (Columbidae) and bishops (Euplectes sp.).

In Latin America, a number of Cricetidae, or new world rodents, occur as agricultural pests in numerous countries. Major damage is to rice, corn, sorghum, sugarcane, cacao, and coconut crops. The principal species which have been confirmed as important pests in this area are Sigmodon hispidus, Sigmomys alstoni, Holochilus brasiliensis, and Zygodontomys brevicauda. Of these, Sigmodon hispidus also occurs in the U.S. and is a major pest of sugarcane in Florida and the gulf coast. The cosmopolitan murine rodents, R. rattus, R. norvegicus, and Mus sp. are also important pests, especially in the island nations such as those of the Caribbean. Bird damage is significant in most Latin American countries. Damage to emergent crops (particularly soybeans), maturing grains, and tree crops are caused by doves, especially the eared dove (Zenaida auriculata), a variety of parakeets (Psittaidae), seed eaters (Ploceidae, Spiza americana), gallinules (Gallidae), ducks and geese (Dendrocygna sp., Chloephaga sp.), blackbirds (Icteridae), vultures (Cathartidae), and others.

Considerable information is available on some of these pests while little or nothing is known about others. The basic knowledge and past experience gained in dealing with little known species will enable project personnel to gather the necessary information in a relatively short time.

Loss assessments shall be made as a part of these studies to allow recommendations to be made regarding importance of the problem and the apparent priority with which efforts should be made to reduce it.

3. Materials Selection and Laboratory Evaluation

This is a broad category of studies ranging from basic toxicology to electronics--the specific tasks to be performed being dependent on the particular problem, species, and information available or needed. Once the problem has been defined, the responsible species identified, and a basic knowledge of its habits attained, then work can begin on adapting or developing materials and techniques to alleviate the problem. This is the area of study which is most basic to the success of the project and a point where the facilities and expertise available at DWRC are critical. It is impractical to attempt detailed descriptions of the myriad of studies and the methodologies involved. Therefore, brief descriptions of general work areas and their significance are given. Two representative work units have been appended as ANNEX F to illustrate the type of planning and work involved.

Chemicals are as important for controlling vertebrates as they are for insect and disease pests. A variety of rodenticides, avicides, repellents, and other chemical agents are available commercially for experimental use. Some are available in developing countries, but most have not been adequately tested on major vertebrate pest species. At DWRC laboratories, candidate materials are selected for testing as a result of literature review, information from knowledgeable individuals, the request of chemical manufacturers, or prior knowledge that indicates a potential applicability to the problem and/or species of interest. Selected candidates are tested initially on albino rats or mice or representative bird species. Depending on the preliminary results, further laboratory testing on the same species, non-target animals, and, where possible, the actual target species will be done. Approximately 15-20 chemicals per year will be tested on both rodents and birds. Of these, perhaps one or two will be selected for testing beyond the initial evaluation.

Among the types of evaluations done are: toxicity profiles; bait acceptance; concentration effect bioassays; secondary hazards; and mode of action. Tests are conducted in accordance with standard procedures promulgated by the Environmental Protection Agency (EPA), Food and Drug Administration (FDA), and the American Society for Testing and Materials (ASTM), in applicable situations. In some cases, specific formulation techniques must be developed and evaluated in conjunction with the tests described above. Finally, the most promising chemicals will be evaluated in the field.

Most chemical control agents are developed by private industry and directed primarily toward temperate urban markets, hence additional development is necessary to make them applicable to tropical agricultural situations. This may involve modification of the chemical structure to enhance biological activity, selectivity to certain species, or ability to overcome genetic resistance to previously used chemicals. The development of analytical techniques is an essential aspect of vertebrate control methods technology. These techniques are required to assess environmental persistence and degradation, phytotoxicity, and potential hazards to non-target species.

A control agent is of no use if it cannot be applied to the target species. Hence, design and evaluation of practical delivery systems is an integral part of the technology development of all problems addressed by this project. A delivery system might be chemical or mechanical in nature or a combination. Examples include baits, seed dressings, sprays and spray apparatus, adhesives, bait placement devices, and a host of others. Compared to the predecessor project, added emphasis will be given to rodent bait formulations and bird control measures appropriate for use at the small-farm level, beginning at the Denver Wildlife Research Center, where modifications of present techniques will undergo preliminary screening trials. Site selection for field test areas will be determined and liaison with appropriate host country personnel will begin early in each participating country. Chemosterilants will be further evaluated. Flavor compounds deemed capable of enhancing the palatability of rodent and bird baits will be tested under controlled conditions. Methods to prevent the deterioration of baits and bait acceptability under field conditions will be studied, including tests of the use of micro-encapsulation of volatile flavor compounds. Rat sex pheromones will be added to rodent bait formulas to try to increase their attractiveness.

Subcontracts and consultants will be used as appropriate, to enable special research and local investigations to be achieved in a timely manner. Foreign and local specialists, including local industry, will be given consideration in filling these needs. The expertise anticipated to be used by DWRC in the project is to be found in Annex G. But, no one institution can be expected to have all the expertise which may prove to be needed. The use, as needed, of an even greater range of expertise than listed is therefore encouraged. Specifically, socioeconomic specialists will be utilized to make needed analyses. These will generally be chosen from universities which also have vertebrate pest management courses or from USDA or other parts of USDI.

Very little biological information is available on the principal pest species in developing countries. Their behavioral patterns and physiological responses to chemicals or other control agents are often the determinant factor of efficacy. For example, both physiological and behavioral responses may contribute to development of bait shyness in rodents; behavioral characteristics may dictate an animal's susceptibility to trapping. Knowledge of the behavior and physiology of a pest species may reveal "weak links" which can be exploited in developing a means of control. Such was the case in the development of two vampire bat control methods--vampire bats and cattle were known to be physiologically different in their susceptibility to anticoagulant drugs; vampires were found to be behaviorally gregarious with other vampires and they groomed themselves and each other extensively. This knowledge led to systemic and topical methods of vampire bat control. Such information is critically important to the development of control methods or materials and to understanding of the extent to which technology may be generalized from one species to another.

An understanding of the physiology, behavior, and other characteristics of pest animals can be realized only through observation and measurement, and often there is no effective way to observe or measure certain parameters without specialized equipment and instruments. Development of better techniques for measuring field events, activity patterns, movement, and

physiological responses contributes enormously to the collection of necessary data and the subsequent evolution of effective control methods. Specialized instruments necessary for these measurements are not available commercially. The DWRC electronics laboratory is, therefore, a unique and valuable element in development of vertebrate control technology.

4. Field Trials

Materials and methods developed and tested in the laboratory must be proven under field conditions before they can be recommended as practical and appropriate for operational use. Often some adaptation or modification is necessary to fit specific socio-economic circumstances, unique farming or post-harvest practices, farmer and agency capabilities, or characteristics of local pest species. Problems encountered in the field may be referred back to the specialists at DWRC for resolution.

Field evaluations also serve as effective training vehicles and media for technology transfer. Tests carried out in farm field situations, often with the farmer's active participation, have enormous impact on the farmer's understanding and acceptance of technology. Such field trials are also useful in catalyzing cooperation among country institutions, and developing a coordinated approach for effective use of new technology. Small- and large-scale field studies will be conducted as needed. Field trials in new situations will begin in the second contract year. Pilot trials of full-fledged proposed integrated vertebrate pest control programs will be the last of the investigational steps in most cases.

5. Demonstrations

In many situations, LDCs will not be fully prepared to implement full-scale programs immediately after pilot trials. In other cases, government officials will not be fully convinced of the developmental usefulness of such programs at that time. Upon request, demonstrations will be planned and assisted under this project. Normally, the funding for DWRC backstopping during implementation and evaluation would come from the concerned USAID Mission. Cost of administrative, technical and logistic planning generally would be available from the project.

6. Training and Technology Transfer

Given the lack of trained personnel in general, development of key participating country personnel is requisite before significant inroads to resolution of world vertebrate pest problems and successful implementation of programs can occur. Without such training, the ultimate stated purpose of the project will be unattainable, regardless of the technological achievements that may be forthcoming. The lack of knowledgeable personnel effectively precludes developing countries from giving vertebrate damage in pre- and postharvest agriculture the priority it merits.

The predecessor to this project was active in short-term training, seminars, and workshops. This project will continue to make substantive contributions in this area. Several multilateral or bilateral assistance

agencies are also frequent sponsors of such activities and rely on this project's personnel and counterparts for technical input. FAO, WHO, GTZ, the CICP/AID project and USAID Missions, among others, have been particularly active in organizing such programs and sponsoring participants.

Project personnel will continue to participate annually in international, regional or national workshops and short courses, including those organized by local agencies. The DWRC has generally accepted about five individuals a year to work for brief periods with DWRC scientists in various disciplines. This practice will be continued. A minimum of two persons will be given special training (other than as an on-the-job counterpart) each year in the USA, the host country or a third country. Efforts will be made to obtain non-project funds for professional training.

Technological achievements serve no useful purpose if they are not put to practical use. Hence, the project is designed to facilitate transfer and implementation of technology developed by DWRC scientists and counterparts. These efforts are incorporated throughout all phases of the project by formal and informal training, active counterpart participation from the earliest stages, and development of programs, staff, and facilities in cooperation with host country agencies. These activities contribute to increased interest on the part of host country governments and recognition, on their part, that programs designed to reduce losses of agricultural commodities are to their national interest. Self-sustaining, in-country programs are the expected end product.

7. Information Sharing

During the predecessor project, DWRC gradually increased its ability to collect, store, retrieve and share information upon request with those needing it. The demand for this information sharing has also grown. The success of further rapid growth of this responsibility will depend in part on international cooperative efforts noted in the body of the project paper. Irrespective of that emphasis outside the project, specific efforts will be made to increase the technical and pertinent non-technical input into the collection and dissemination of vertebrate pest knowledge. First emphasis will be on rodent problems; the second on birds and other vertebrate pests.

Special efforts will be made to make the developing world aware of this service. Should the request load become too great, appropriate limitations will be agreed by AID/W and DWRC.

Summary:

This scope of work is intended, together with the body of the project paper and the other annexes, to be guidelines for the project. Reviews and approvals to which AID/W projects are subject will be observed. The intention of the scope of work is to note what is to be accomplished, leaving maximum flexibility as to how to accomplish it. Approved assignment of personnel to project activities will lead to appropriate reports, subject to review and approval. Such reports, will include, e.g., those for a TDY assignment, interim field reports those to signal milestones or major problems and ones to inform of the use of new approaches to reach objectives. Annual reports of the overall project will be prepared and transmitted to AID/W promptly for review and approval.

Years of work and experience on both domestic and foreign vertebrate pest problems have given the DWRC unique capabilities and knowledge. Application of this expertise, emphasizing pre- and postharvest problems due to rodents and birds in developing countries, will make a significant contribution to increased agricultural production and food availability.

ESTIMATED COST

OUTPUT BUDGET - Contract Year	1983	1984	1985	1986	1987	1988	1989	1990	1991	1992	TOTAL
1. Loss Assessment and Methods	78,000	83,000	88,000	93,000	97,000	102,000	107,000	111,000	116,000	127,000	1,002,000
2. Identification of Problems	97,000	102,000	107,000	112,000	117,000	122,000	127,000	137,000	147,000	156,000	1,224,000
3. Expanded Awareness of Problems/Solutions	50,000	70,000	80,000	90,000	110,000	120,000	130,000	144,000	160,000	180,000	1,134,000
4. Demonstrations	29,000	34,000	54,000	72,000	99,000	126,000	149,000	179,000	208,000	237,000	1,187,000
5. Training	60,000	65,000	70,000	75,000	80,000	85,000	90,000	95,000	105,000	115,000	840,000
6. Technical Assistance	101,000	102,000	106,000	121,000	126,000	141,000	165,000	182,000	194,000	208,000	1,446,000
7. Research	152,000	154,000	160,000	165,000	166,000	175,000	185,000	195,000	210,000	220,000	1,782,000
8. Information Sharing	33,000	40,000	45,000	47,000	50,000	54,000	57,000	61,000	67,000	77,000	531,000
TOTAL - S&T/AGR Funds	600,000	650,000	710,000	775,000	845,000	925,000	1,010,000	1,104,000	1,207,000	1,320,000	9,146,000
Total - Cost-Sharing by Missions/Reg. Bureaus Funds	240,000	260,000	284,000	310,000	338,000	370,000	404,000	442,000	483,000	528,000	3,659,000
GRAND TOTAL	840,000	910,000	994,000	1,085,000	1,183,000	1,295,000	1,414,000	1,546,000	1,690,000	1,848,000	12,805,000

INPUT BUDGET - Contract Year	1983	1984	1985	1986	1987	1988	1989	1990	1991	1992	TOTAL
Salary & Benefits	331,078	356,764	382,600	411,295	442,140	475,000	510,750	549,000	590,000	634,000	4,682,627
Travel	45,000	50,000	55,000	62,550	70,200	80,000	90,000	101,160	114,000	128,280	796,190
Print & Reproduction	15,000	16,000	22,000	25,000	28,175	32,000	35,313	40,345	45,500	51,250	310,583
Transportation of Things	5,000	5,048	5,530	6,110	7,107	8,000	9,000	10,035	11,300	12,878	80,158
Other Services	13,816	15,000	17,680	18,884	21,270	23,840	27,000	30,400	34,169	38,346	240,425
Supplies and Materials	45,000	50,000	55,000	62,550	70,000	80,000	90,000	101,160	114,000	128,200	795,910
Contingency	13,816	15,000	16,877	18,880	21,265	23,817	27,000	30,600	34,000	38,346	239,421
Overhead	131,250	142,188	155,313	169,511	184,843	202,343	220,937	241,500	264,031	288,750	2,000,686
TOTAL - S&T/AGR Funds	600,000	650,000	710,000	775,000	845,000	925,000	1,010,000	1,104,000	1,217,000	1,320,000	9,146,000
Total - Cost-Sharing by Missions/Reg. Bureaus Funds	240,000	260,000	284,000	310,000	338,000	370,000	404,000	442,000	483,000	528,000	3,659,000
GRAND TOTAL	840,000	910,000	994,000	1,085,000	1,183,000	1,295,000	1,414,000	1,546,000	1,690,000	1,848,000	12,805,000

ANNEX C

CONDENSED MILESTONE LIFE-OF-PROJECT SCHEDULE

Milestone	Contract Year										
	83	84	85	86	87	88	89	90	91	92	
Identify vertebrate pest problems	S	I1	I2	I3	I4	I5	I6	I7	I8	I9	C
Develop and further improve vertebrate pest management systems.....	S	P	P	I1	I2	I3	I4	I5	I6	I7	C
Demonstrate improved integrated vertebrate pest management systems.....	S	P	P	P	I1	I2	I3	I4	I5	I6	C
Provide training and extension	S	P	I1	I2	I3	I4	I5	I6	I7	I8	C
Collect and disseminate information internationally	S	P	P	P	P	P	P	P	P	P	C

KEY

Starting Event

In Progress

Interim Target (with country number)

Completion Event

ANNEX D

LOGICAL FRAMEWORK

From FY 83 To FY 92
Total U.S. Funding 9,146,000 SBT
Date Prepared: May 1982

Project Title & Number: Pre-/Postharvest Rodent and Bird Control - # 936-4120

NARRATIVE SUMMARY	OBJECTIVELY VERIFIABLE INDICATORS	MEANS OF VERIFICATION	IMPORTANT ASSUMPTIONS
Program or Sector Goal: The broader objective to [illegible] living in agricultural areas of participating countries by increasing income, employment, agricultural productivity and food available through the development and sharing of vertebrate pest control technology.	Measures of Goal Achievement: 1. Reduced losses to major growing and harvested crops caused by vertebrate pests. 2. Increased use of safe, cost-effective integrated vertebrate pest control programs. 3. Increased research on further improvement of vertebrate pest control systems and their implementation.	1. Analysis of participating country statistics on crop production. 2. Analysis of participating country economic development reports. 3. Study of participating country budgets.	Assumptions for achieving goal targets: 1. The participating country supports and maintains consistent agricultural development strategies and policies. 2. Affected farmers can benefit and will participate in integrated vertebrate pest loss reduction programs 3. Technologies to be extended are appropriate to needs of participating countries.
Project Purpose: Develop and demonstrate improved rodent bird control systems for the reduction food losses in LDC's	Conditions that will indicate purpose has been achieved: End of project status. 1. Knowledge of crop loss incidence and distribution and damage assessment methodology improvements. 2. Significance of vertebrate problems, monitored annually. 3. Sensitization actions taken and their description. 4. On-going evaluations of appropriate control techniques and programs and presentation of recommendation packages adapted to local conditions 5. Program results and recommendations published and available to all sectors. 6. Trained persons assuming domestic role in vertebrate pest control. 7. Use of research results in host countries. 8. Increased demand for the sharing of information.	1. Program survey and monitoring reports. 2. Reports of field and laboratory evaluations, pilot trials and demonstrations. 3. Participating country reports. 4. Reports on training and its evaluation 5. Reports on information sharing.	Assumptions for achieving purpose: 1. The technologies developed are economically and socially acceptable. 2. Adequate host country government personnel are available to serve in program. 3. Government strategy includes vertebrate crop and storage protection components with an appropriate institutional base. 4. Continued broad cooperation and support for information sharing.

LOGICAL FRAMEWORK (ANNEX D CONTINUED)

From FY 83 to FY 92
Total U. S. Funding 2,146,000 SDT
Date Prepared: May, 1982

Project Title & Number: Pre/Postharvest Rodent and Bird Control - # 936-4120

NARRATIVE SUMMARY	OBJECTIVELY VERIFIABLE INDICATORS	MEANS OF VERIFICATION	IMPORTANT ASSUMPTIONS
Goal: Knowledge of vertebrate pest losses and assessment methods. Identification of LDC vertebrate pest problems and their import. Expanded awareness of vertebrate pest problems and their solutions. Demonstration of improved vertebrate pest control systems. Trained persons in a manner appropriate to their duties. Technical assistance on serious LDC vertebrate pest problems. Research results on safe, effective vertebrate pest control methods. Extensive world-wide sharing of vertebrate pest control information.	Magnitude of Outputs: 1. 1 Study completed annually; up to several with ongoing continuing work 2. 1 Study completed annually after first year, with several with continuous elements. 3. 1 proposal completed annually after second year; with several with continuous elements. 4. 1 demonstration per year after 3rd year. 5. Minimum of 2 special trainees per year after third year. 6. Minimum of 3 TDY's per year to participating countries, coordinated to maximize outreach activities; and an expected 1 additional field person per year after 3rd year. 7. At least 2 publications per year of pertinent research results. 8. Several thousand requests for information per year.	1. DWRC annual, trip and progress reports, publications. 2. Participating country reports, 3. DWRC/USAID/Government on-site evaluations and technical reviews	Assumptions for achieving outputs: 1. Appropriately trained LDC personnel are available. 2. Adequate USFWS, USAID, and participating country personnel are available. 3. The participating countries fully support the project and meet their commitments. 4. Re-invigoration of international efforts regarding information sharing.
Inputs: Technical assistance by and technical and TDY support from DWRC Commodities and logistical support for laboratory and field studies and pilot trials and demonstrations. Training at DWRC, elsewhere in the USA, in third countries and in host countries. Support for information collecting, storing, retrieving and sharing. Participating Countries Administrative, technical, extension and support personnel. Field sites, facilities and logistical support for testing and demonstrations Training support	Implementation Target (Type and Quantity) ($000) CY 83 600 84 650 85 710 86 775 87 845 88 925 89 1,010 90 1,104 91 1,207 92 1,320 Total 9,146 Salaries, etc. 4,683 Travel 796 Transport 80 Reproduction 314 Supplies 796 Other services 240 Contingency 239 Overhead 2,001 Total 9,146	1. DWRC reports and publications 2. S&T, Regional Bureau, Mission, and DWRC reports and records. 3. Participating country reports and records.	Assumptions for providing inputs: 1. All financing is in place. 2. Fully appropriate and adequate country commitments are finalized. 3. Personnel are available through USFWS and USAID. 4. Potential LDC personnel are available.

ANNEX E

AID/DWRC ACHIEVEMENTS IN REDUCING VERTEBRATE PEST LOSSES

(in predecessor project, "Control of Vertebrate Pests", 931-0470)

PHILIPPINES Sustained baiting has been incorporated into the Masagana 99 technology package offered to subscribed farmers. Rat damage to rice on these farms (500,000 ha or 1,000,000 effective hectarage) was reduced from 5% to 1%.

Annual surveys by the Bureau of Plant Industries on 2.1 million ha showed rat damage of 3.67% (1971-75) and 0.49% (1976-79). The use of sustained baiting method and training of field technicians was an important contribution to this reduction in losses amounting to more than $14 million per year since 1976.

Several recent trials using anticoagulant rodenticides in coconut crowns increased yield 280%. Cost:benefit ratio of the 3-year program based on actual costs of control and copra production at the end of the 3 years was 1:28. Estimated potential gains for the Philippines are $192 million per year.

Experimental trials using sustained baiting with anticoagulant rodenticides in corn reduced damage by 84%. The farmer's profit increased $27.40 per ha. For each $1 spent, $7 were returned.

NICARAGUA Paralytic rabies in livestock caused by vampire bats was eliminated. Annul benefits to the livestock industry was $2.4 million annually, while control program costs were $130,000 annually. For each $1 spent, there was a return of $18.74.

LATIN AMERICA As a result of AID/DWRC training and extension activities, 13 of 18 countries plagued with vampire bats have their own in-country, self-funded control programs.

COLOMBIA Experimental trials using crown baiting of anticoagulant rodenticides in 1972-3 reduced rodent damage to coconuts from 75% to 0%. Based on 1973 prices, it was estimated that treatment of 1 million palm trees would result in a $730,000 savings annually.

SUDAN & EAST AFRICA Field studies in Sudan and East Africa indicate that effective crop protection can be achieved using the chemical repellent, methiocarb, at relatively low levels and with economical application techniques. Since 1976, a 1,012-ha wheat farm in Tanzania has experienced less than 5% losses to pest birds during the 3 years in which methiocarb was applied to those parts of the field being damaged. In 1978 when the chemical was not used, birds were responsible for more than 80% damage.

TRAINING, EXTENSION AND INFORMATION SHARING ACCOMPLISHMENTS

Training and extension activities have been a prominent feature of the project. Most of the institutions with which the project has been associated have young staffs with limited technical experience as it applies to vertebrate pests. The basic approach has been to involve these counterprts in all phases of research--providing valuable experience and encouraging expression of individual capabilities. A total of 35 counterpart personnel from 10 countries have received graduate training leading to advanced degrees (M.S. or Ph.D.) as a result of this project. Many of these individuals now are in positions of importance and influence in their respective governments. Others, including farmers, extension agents, technicians, biologists, veterinarians, administrators, and others concerned with agricultural production have received training in some aspect of vertebrate pest control as a result of this project. This training took various forms from informal workshops, demonstrations, or seminars to short-term training at DWRC, the Philippine station, or other cooperating institutions. Altogether, about 80 such programs involving over 3,000 persons have been undertaken. Approximately 200 technical publications have resulted from this project. It should be noted that these include only those publications resulting from the AID-funded activities of the DWRC. Over 10,000 requests for information for LDC personnel have been filled.

RESEARCH ACCOMPLISHMENTS

Since the inception of the project, many accomplishments in research methodology, techniques, and material development have been detailed in Annual Progress Reports and research publications by DWRC personnel and counterparts. Only notable research findings are summarized in this report.

OUTREACH ACTIVITIES FROM DWRC

a. Major Accomplishments

Two methods were developed for controlling vampire bats that transmit rabies to livestock in Latin America; local personnel have been trained to handle their own in-country programs. Rabies was eliminated in Nicaragua.

In Colombia, successful tests were conducted to control rat damage to coconuts.

In Uruguay, a successful test using the repellent, methiocarb, was conducted on ducks damaging emerging rice.

Demonstrated that rhodamine B is a highly effective marker for rodents when used in a grease formulation.

Determined that DRC-4575 has the potential for use as an acute rodenticide.

Developed an automated computer system for determining daily feeding patterns of rats under laboratory conditions.

Demonstrated that microtaggant plastic particles can be incorporated into baits which will mark birds and rodents.

Developed a technique for using code microparticles to mass-mark social bird species.

Developed miniaturized radio telemetry equipment for studying ranges, activity, and long distance movements of small rodents, birds, and bats.

Developed methods of assessing rodent and bird damage to various agricultural crops.

Developed the technique of using inked tracking tiles to determine rodent activity in relation to crop damage or to evaluate control methods.

Developed standardized laboratory techniques for comparative evaluation of candidate toxicants and repellents on rodent and bird species.

Developed biochemical test procedures to determine bird resistance and nutritional characteristics of sorghum varieties.

Developed a computerized cage system for comparing feeding patterns of different rodent species in relation to different rodenticides or bait formulations.

PHILIPPINES

A. Major Accomplishments

National surveys of rodent damage to rice completed and distribution of rodent pests determined.

Effective method of ricefield rodent control through sustained baiting with anticoagulants developed for small farmers. These recommendations were adopted by the Government of the Philippines.

Vertebrate pest control research and training established and institutionalized with the National Crop Protection Center and its regional field stations. More than 20 graduate students completed thesis work in association with the project.

Government operational rodent control programs reorganized to incorporate improved methods developed by project personnel.

Developed rodent control techniques for coconut and corn damage.

Investigated formulations for fumigant cartridges for use in developing countries.

Developed a simulated burrow system for evaluating fumigants.

Investigated anticoagulant wax bait formulations for use in small farm situations.

Developed a non-lethal electric barrier to prevent crop damage by agricultural rodents.

Investigated the use of wind-powered electric generators for operating high-voltage rat barriers in remote areas.

Evaluated high-energy fence chargers for field use in the tropics.

Supported field programs with specialized equipment and technical expertise for radio tracking animals.

Investigated grooming behavior of rodents in relation to the use of acute rodenticides in grease or dust formulation.

Demonstrated that concentrations of fatty acids in the bodies of rats are highly correlated with percentages of unsaturated fat in their diets.

Developed analytical techniques for determining warfarin and diphacinone concentrations in plant, soil, and water samples and demonstrated that these chemicals will accumulate during field baiting.

EAST AFRICA

a. Major Accomplishments

Initial field trials in three East African countries indicate that effective protection of small grain crops from bird damage can be achieved with relatively low levels of methiocarb repellent head sprays.

Preliminary information on crop losses and economic impact of bird damage in Sudan and other African countries has been compiled.

Obtained information on population reduction efforts as practiced by various organizations. It was found that these overall efforts are largely ineffective in reducing damage except in some local areas.

The most important agricultural rodent pests in Sudan are Arvicanthis sp. and Mastomys sp. They have been determined to damage sorghum, wheat, groundnuts, and vegetables.

Two Sudanese graduate students completed thesis work in association with the project.

Demonstrated that methiocarb is highly repellent to the African finch (Quelea quelea).

Evaluated the importance of size, hardness, color, and taste in seed acceptance by quelea and developed tableted baits for use in field experimentation.

Demonstrated the feasibility of breeding sorghums which are both resistant to bird damage and nutritionally acceptable.

Developed miniature radio transmitters and attachment method for quelea.

Established colonies of Arvicanthis niloticus for laboratory investigations.

BANGLADESH (Funded by AID Mission/Dacca)

a. Major Accomplishments

Vertebrate Pest Division organized within Bangladesh Agricultural Research Institute (BARI), cooperative ties with other agencies established, and counterpart personnel assigned to project.

New laboratory and office facility designed and functional.

Workshop and training sessions held for BARI and other Government personnel.

National survey of rodent damage to wheat completed in 1979 and to rice in 1980. The countrywide loss to wheat was 12% valued at about $15 million, and to rice about $128 million.

National survey of vertebrate pest problems on small farms underway. Pest identification and distribution initiated.

Preliminary laboratory evaluation of candidate rodenticides and bait formulations completed.

Baiting studies in small farm crops implemented.

Studies of burrow systems and behavior of fossorial rodents initiated.

Test trials to discern the most effective method of monitoring field rodent populations completed; included live and snap traps, and tracking tiles.

HAITI (Funded by LAC/AID/Washington)

a. Major Accomplishments

Vertebrate Pest project organized within Haitian Ministry of Agriculture; cooperative ties established with Dominican Republic Ministry of Agriculture, and both countries assigned counterpart personnel.

Construction of new laboratory and office building in Haiti is nearly completed.

Counterparts underwent short-term training at DWRC and received field experience from DWRC TDY personnel.

Initial information on vertebrate pests and associated problems in agriculture has been assembled in both countries.

Information has been assembled on the biology of the yellow-headed weaver (Ploceus cucullatus) through use of radio telemetry.

Basic information has been obtained on the use of pesticides in both countries.

Studied the feasibility of topically treating corn plants with chemical control agents to alleviate damage caused by cotton rats (Sigmodon hispidus).

EXAMPLES OF ECONOMIC LOSSES TO VERTEBRATE PESTS

BANGLADESH	$128 million annually; loss of rice to rats $15 million annually; loss of wheat to rats
PHILIPPINES	$60 million annually prior to 1975; loss of rice to rats 30% annual loss of coconuts to rats 7% damage, 3% total sugar loss in sugarcane to rats
AFRICA	$100 million annually; losses of sorghum and small grains to birds
SUDAN	$15-30 million annually; loss of sorghum to birds
HAITI AND THE DOMINICAN REPUBLIC	$30 million annually; loss of agricultural crops to rodents and birds
LATIN AMERICA	$350 million annually; loss of livestock to rabies transmitted by vampire bats before project actions.

U.S. FISH AND WILDLIFE SERVICE
WILDLIFE RESEARCH CENTER
Denver, Colorado

WORK UNITS 944.02 (Section of Supporting Sciences)
910.1 (Section of International Programs)

1. WORK UNIT TITLES

Physiological and/or mechanical identification marking of wildlife

Development of control techniques for rodents and birds: laboratory, field, and taxonomic studies

Subtitle

Field investigation into marking Quelea with Microtaggants for movement studies in Ethiopia, Africa

2. PROJECT TITLES

Physiological biology applications in wildlife management

Vertebrate damage control research in developing countries--supervision and supporting activities overseas

3. PROGRAM

Animal Damage Control

4. PRINCIPAL INVESTIGATORS

Research is cooperative between DWRC (Brad Johns, Rick Bruggers) and FAO (Bill Erickson, Mike Jaeger)

5. OBJECTIVE

To field test methods of marking Quelea and other pest species for movement studies with reference to crop damage patterns and control operations

6. JUSTIFICATION AND BACKGROUND

Numerous situations exist in Africa in which a better knowledge of the local and seasonal movements of Quelea and other ploceid weavers could improve the understanding of movement patterns and increase the efficiency of crop protection operations. The Quelea situation in the Rift Valley of Ethiopia, where it has been postulated that the birds breed successively from the southwest moving northward, is a prime example. Recapturing in the northern Awash River Basin of birds previously marked in the south would verify this theory.

Because of the extensive time and effort involved in field marking and recapturing large numbers of birds, simple, rapid techniques are required. It also may be desirable to differentially mark spatially separated populations. Both criteria can seemingly be accomplished by using Microtaggants, and the situation in Ethiopia presents good overall location for initial tests.

7. METHODS

Several thousand Quelea will be captured in nesting colonies in SW Rift Valley near Lake Rudolph (4°65'N-35°53'E) and Lake Stephanie near the Sudan frontier during June 1980 and 1981.
The taggants will be sprayed on the birds using hand pump sprayers and techniques already established in the lab. (Aerial applications to nesting or roosting colonies are envisioned for the future.) Attempts to recapture marked birds in the middle Rift Valley (by netting and during control operations) will be made during August and September.

There are two other situations in which Microtaggants may be used in Ethiopia during 1980. Birds from different nesting colonies in the Awash Basin may be marked with different codes of Microtaggants to determine those colonies which are responsible for damage to ripening sorghum. Secondly, Microtaggants may be used to determine the behavior of birds repelled from methiocarb-treated sorghum fields at Melkassa.

The research will be a cooperative undertaking between DWRC and FAO. The laboratory preparations will be made by B. Johns and R. Bruggers (DWRC) and the fieldwork by B. Erickson and H. Jaeger (FAO). Likewise, any publications arising from this work will be jointly authored. The program will be reviewed following the summer 1980 efforts and decisions relative to its continuation will be made at the UNDP/FAO-Regional Quelea Project Meetings in Nairobi in November, 19[illegible] which R. Bruggers will represent DWRC.

8. SCHEDULE

Initiation of fieldwork:	June 1980
Completion:	September 1981
Reporting:	January 1982 (or as part of the overall FY-81 research results of the Sudan project

9. STAFFING

Title	Man-months
Research Physiologist	2 (1 month report and publication)
Wildlife Biologist	2 (1 month report and publication)

10. COST ESTIMATE

DMRC costs	1980	1981	Total
a. Salaries and benefits	$4,000	$4,000	$8,000
b. Operating costs (supplies)	250	250	500
c. Section overhead (15% of a&b)	540	540	1,230
d. TOTAL	$4,890	$4,890	$9.730

Submitted by:

Investigator — Date 10/1/80

Investigator — Date 10/1/80

Approved by:

Chief, Section of International Programs — Date 10/3/80

Chief, Section of Supporting Sciences — Date 10/3/80

U. S. FISH AND WILDLIFE SERVICE
Wildlife Research Center
Denver, Colorado

Work Unit 942.15

1. WORK UNIT TITLE

Development of materials and systems for using contact toxicants for agricultural rodent control.

2. PROJECT TITLE

A. Sensory Biochemistry Applications in Wildlife Management.

B. Vertebrate Damage Control Research in Developing Countries--Supervision and Supporting Activities Overseas.

C. Section of Technical Services,

3. PROGRAM

Animal Damage Control

4. PRINCIPAL INVESTIGATORS

Roger W. Bullard, Charles P. Breidenstein, Michael W. Fall, and Steven R. Kilburn.

5. OBJECTIVES

A. Develop behavioral assay methods (including statistics) to evaluate carrier materials and additives.

B. Determine if contact with carrier materials can be increased by use of candidate enhancers.

C. Develop and evaluate delivery systems and devices to bring candidate formulations to the point of small-scale field tests.

D. Determine suitable rodenticide-carrier formulations for delivering tox doses to rats as they groom the adhering material from their feet or f

6. JUSTIFICATION AND BACKGROUND

The use of tracking dusts and powders in rodent control has been with us for nearly half a century (Mackie, et al., 1932). Such materials, which are accidentally ingested during grooming, are particularly useful in situations where abundant food limits the utility of baiting (Howard and Marsh, 1974; Pratt, et al., 1977). (The general characteristics of the grooming behavior rodents have been described by Barnett (1963)). Tracking powders, however, are generally unsuitable for outdoor use because of caking or erosion by moisture or rainfall. There are numerous field situations where rodent con is made difficult by the presence of abundant food. Use of suitable tracki materials in such situations would improve control and reduce costs by eliminating the need for bait. The goal of this investigation is to discover, evaluate, and develop such materials and delivery systems to the point of field testing.

Suitable materials should be compatible with candidate toxicants and should not adversely affect their toxicity. Such materials should also be moisture resistant, biodegradable, and should not cause aversion in rats. Ideally, additives might be found which would increase rodent contact with the carrie material. DWRC biologists have made preliminary examinations of various petroleum greases and oils as possible carriers for use with contact toxica (Fellows, et al., 1978; Bruggers, ed., 1979). In fact, a closely related method using a petroleum grease and the anticoagulant diphacinone was developed for control of vampire bats (Linhart, et al., 1972). Gibson and Barratt (1974) developed a related technique for house mouse control using propylene glycol containing the toxicant, brodifacoum, delivered through a felt pad from a liquid reservoir.

In preliminary work, we have screened 14 products used as thickeners in hum food as potential toxicant carriers. In these preliminary investigations a group of products, the amorphous silicon dioxides, were found to meet most of the criteria for suitable toxicant carriers. These materials are lightweight, dry, free-flowing powders. When they are mixed with 4% or more of a nonvolatile liquid (for example, oils) a gel forms which has the color and odor properties of the liquid. The viscosity depends on the rati of oil to silicon dioxide and can vary from the consistency of thick grease to that of the liquid.

Because of the uniqueness and broad application of this new approach to rodent control, we have examined the physical properties of amorphous silic dioxide gels and other candidate materials under varying conditions, and propose a systemic investigation involving the development of behavioral and toxicological bioassays to determine the responses of rats to such materials; the development of suitable delivery systems and examination of candidate odor enhancers to increase rodent contact; and the development of suitable statistical techniques based on the use of rodent activity and mortality responses for biological assessment of results.

7. METHODS

Phase I. Comparison of visitation response of rats to gel treated surfaces. In pilot studies, a simulated tree apparatus and switchback test design emerged as a promising means of comparing Rattus norvegicus response to various gel treatments. This apparatus consists of eight 2- X 2-in X ft "branches" attached to a 3-ft diameter X -in high base. Food is provided in a 3-in diameter cup mounted on a 4- X 4-in platform elevated 2-ft above the floor by each of the branches. Water is located in the center of the base so rats must learn to use the apparatus to eat and drink.

A given experiment will involve an ABAB design for the eight branches in four 3-day experimental periods plus a familiarization period of a minimum of 3-days preceeding it. The treatments will be: A = Control, B = Treatmen different from the control only in the parameter being measured.

A group of three rats, two female and one male will be used in the study. The two treatments, A and B, will be applied at random to the eight branches for the first period only; after that, for the second, third and fourth periods, the treatments will alternate from what they were in the previous period. Counting devices will be located in the center of each arm. Activi will be based on the number of counts for the respective arm.

This experimental design will be used for several comparisons. All gels will have 265 ± 10 mm/10 penetration. Rats will be placed in the apparatus for at least four days to allow acclimation before the beginning of a test.

1. Gel patches: Individual tests are as follows (control = bare tile):

Test	Treatment	Pre-enclosure food
a	gel only	lab chow
"	peanut enhanced gel	" "
"	" " "	ground peanuts
b	gel only	lab chow
"	coconut enhanced gel	" "
"	" " "	coconut chunks
c	gel only	lab chow
"	rice essence enhanced gel	" "
"	" " " "	ground rice
d	macademia oil gel	coconut chunks
"	coconut oil gel	coconut chunks
"	coconut essence enhanced gel	coconut chunks

2. Pelage applications - Various candidate devices will be placed on a plank used in earlier laboratory white rat "tracking" studies. We will attempt t improve rat contact with the respective carrier material. Coated devices will be subsequently tested in the tree apparatus as the "B" arms using the ABAB protocol; uncoated devices will be on the "A" arms.

Test	Treatment
a	gel only - on device
"	peanut enhanced gel on device
"	lithium grease on device
b	gel on device - peanut essence 1" above
"	" " " - " " on branch beneath
"	peanut enhanced gel on device

Phase II. Toxicological influences of carriers.

1. Gavage tests. Since amorphous silicon dioxide gels will often be used as carriers for toxicants, it is imperative that we determine their influence on toxicity. Brodifacoum, an anticoagulant, and zinc phosphide, an acute toxicant, will be tested in corn oil gels of Syloid 244 on white laboratory rats.

   From earlier gel removal determinations and previous DWRC LD_{50} values we wi develop a protocol for determining the LD_{50}'s of zinc phosphide and brodifa in Syloid 244 - corn oil gel by gavage. The LD_{50} concentration will subse quently be used to formulate for other matrices, using gavage on 6 rats and measuring number of deaths and time-to-death.

2. Pelage tests. From earlier gel removal determinations and data from the gavage tests, we can estimate that the following formulations are appropria for a range-finding experiment to determine appropriate concentrations to use in field applications. Example: (a) zinc phosphide = 1%, 5%, 10%, 15% etc. and (b) brodifacoum = 0.01%, 0.02%, 0.03%, 0.04%, etc. Initially, 0.8 g of each of these formulations will be applied by syringe to the vente of rats (6 rats/concentration) and smoothed with a spatula. The number of deaths and time-to-death will be determined.

8. SCHEDULE:

Initiation Phase C: January 15, 1981
Completion: O/A January 15, 1984

9. STAFFING AND RESPONSIBILITIES

Roger W. Bullard and Stephen R. Kilburn will be responsible for conducting most of the laboratory aspects of the study. Michael W. Fall will assist on laborat studies and Michael Bornstein of the International Programs Section will help f some of the studies. Charles P. Breidenstein will assist on methods developmen and statistical analysis.

10. COST ESTIMATES:

Salaries	$15,000
Travel and per diem	2,000
Supplies	2,500
Publication	1,500
Miscellaneous	500
Total	$21,500

Submitted by:

Roger W. Bullard — 1-29-

Roger W. Bullard
Research Chemist

Date

Approved by:

John W. DeGrazio — 2/5/

John W. DeGrazio
Section of International Programs

Date

[illegible] — 2/6/

[illegible]
Section of Technical Services

Date

R. Daniel Thompson — 2/4/

R. Daniel Thompson
Section of Supporting Sciences

Date

CURRICULUM VITAE
CONCERNED DWRC PERSONNEL

Richard D. Curnow

Education

North High School, Omaha, Nebraska 1961
University of Nebraska, Omaha, Nebraska, 1961-1962, Industrial Engineering
South Dakota School of Mines and Technology, Rapid City, South Dakota, 1963-1964, Chemical Engineering
Colorado State University, Fort Collins, Colorado, B. S. 1966, Wildlife Management
Colorado State University, Fort Collins, Colorado, M.S. 1968, Wildlife Biology
Colorado State University, Fort Collins, Colorado, Ph.D. 1970, Wildlife Biology/Radiation Biology

Employment

U. S. Fish and Wildlife Service:

Acting Director, Denver Wildlife Research Center, Denver, Colorado, July 1982 - present.

Assistant Director, Denver Wildlife Research Center, Denver, Colorado, September 1979 - July 1982.

Acting Director, Denver Wildlife Research Center, Denver, Colorado, April 1978 - September 1979.

Assistant Director, Denver Wildlife Research Center, Denver, Colorado, January 1977 - April 1978.

Acting Chief, Division of Cooperative Research, Washington, D. C., October 1975 - January 1977.

Staff Specialist, Division of Cooperative Research, Washington, D. C., April 1974 - October 1975.

Assistant Leader, Ohio Cooperative Wildlife Research Unit, The Ohio State University, Columbus, Ohio, February 1971 - April 1974.

Author or Co-Author of 20 publications

Not funded by this project

Donald W. Zielesch

Responsibilities: Responsible for overall supervision of the Center's administrative support services; also provide staff assistance to the Director on administratively related areas.

Position: Administrative Officer, GM-341-13, 1971 - Present
Chief, Section of Administration,
Denver Wildlife Research Center

Education: 1959 BBA, University of Wisconsin,
(Business Administration-Labor Relations)

Previous Positions:

1961 - 1968	Management Assistant, GS-301-9 Division of Wildlife Services (FWS) Colorado State Office Denver, Colorado
1968 - 1970	Program Analyst, GS-345-12 Division of Wildlife Services (FWS) Washington, D.C.

Other Training:

1966-67	Departmental Management Development Program (USD (September 1966 - February 1967)
1967	Principles & Techniques of Management Analysis (
1968	PPB Orientation (OPM)
1970	Institute in the Legislative Function (OPM)
1970	Supervision and Human Behavior (FWS)
1970	Role of the EEO Counselor (OPM)
1971	AID Orientation Program for Overseas Professional Personnel (Dept. of State)
1972	Public Personnel Administrator's Conference (OPM
1974	Collective Bargaining Contract Negotiation (USDI
1975	Employee Development Conference(OPM)
1977	Supervisory Training, Part A (USDI)
1977	Zero Based Budgeting (FWS)
1979	Administrative Officer's Seminar (OPM)
1979	Personnel Officer's Seminar (DFPC)
1979	Supervisory Training Workshop (FWS, Research Administration)
1980	Performance Appraisal Training (OPM)

Not funded by this project

JOHN W. DE GRAZIO

Responsibilities: Administration and Supervision: Research on international animal damage control

Position: Supervisory Wildlife Biologist (Research) GS-486-14
Chief, Section of International Programs,
Denver Wildlife Research Center

Education:

1957 BS Colorado State University, Fort Collins, Colorado (Zoology)

Previous Positions:

1975-78 Supervisory Wildlife Biologist (Research), Chief, Section of International Programs, (GS-486-13)

1959-75 Wildlife Biologist (Research), Denver Wildlife Research Center, (GS-486-7 thru 12)

1957-59 Game Biologist, Colorado Game and Fish Department

1949-53 Staff Sargent, U.S. Marine Corps

Other Training:

1967 Middle Management Institute

1969 Spanish (Berlitz)

1970 Supervision & Human Behavior (FWS)

1977 The Role of Supervisors and Managers in EEO, (OPM)

1977 Pesticide Applicator Certification Demonstration and Research Category Review Seminar (Colorado State University)

Author and Co-Author of 31 publications

Expected to be at least 50% funded by this project

Name: Donna J. Scott

Marital Status: Married, 3 children

Current Position: Program Assistant, Section of International Programs, Denver Wildlife Research Center, Denver, Colorado

Responsibilities: Supervise all office functions, perform all administrative aspects of Section activities--e.g., financial, travel, personnel, purchasing, shipping, files.

Experience:

1974-1977 - Secretary, Sections of International Programs and Mammal Damage Control, Denver Wildlife Research Center.

4/74-7/74 - Secretary, Division of Contracting and Property Management, National Park Service, Denver Colorado.

10/73-4/74 - Clerk-Stenographer, Sections of International Programs and Mammal Damage Control, Denver Wildlife Research Center.

7/73-10/73 - Supervisory Clerk-Steno, U.S. Forest Service, Albuquerque, New Mexico.

7/71-7/73 - Clerk-Steno, U.S. Forest Service, Albuquerque, New Mexico

2/69-1/70 - Clerk-Steno, Army Missile Test & Evaluation, White Sands Missile Range, New Mexico.

5/67-3/68 - Clerk-Steno, U.S. Naval Ship Engineering Center, Port Hueneme, California

1/66-4/67 - Clerk-Steno, U.S. Forest Service, Albuquerque, New Mexico

10/62-7/63 - Clerk-Steno, General Services Administration, Kansas City, Missouri.

Expected to be at least 50% funded by this project

Richard L. Bruggers

Responsibilities: Research on international bird damage control

Position: Wildlife Biologist (Research) GS-486-12, 1981 - Present
Section of International Programs, Denver Wildlife Research Center

Education:

1974 PhD	Bowling Green State University, Bowling Green, Ohio (Ecology/Animal Behavior)
1971 MA	Bowling Green State University, Bowling Green, Ohio (Biology/Ecology)
1969 BA	Hope College, Holland, Michigan (Biology)
1968	University of California at Santa Barbara summer school (Marine Biology)

Previous Positions:

1979-80	Wildlife Biologist (Research), Section of International Programs, Denver Wildlife Research Center (GS-486-11).
1974-79	Bird Control Specialist, United Nations Development Programme, Food and Agricultural Organization, Senegal and Somalia.
1974	Consultant (through Environmental Studies Center, Bowling Green State University), Bowling Green, Ohio.
1973-74	Consultant (through Environmental Studies Center, Bowling Green State University, Bowling Green, Ohio) for the Tanglefoot Company.
1970	Rodent Control Biologist, Rose Exterminator, Michigan .
1969	Fishery Biology Aide, State of Washington, Department of Fisheries, on the Columbia River.

Author and Co-Author of 24 publications

Expected to be at least 75% funded by this project

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G. CLAY MITCHELL

Responsibilities: Coordination of Hispanic program, development of sharing of information internationally, and, as needed, research on vertebrate pest management.

Position: Wildlife Biologist (Research), 1982-Present
Section of International Programs,
Denver Wildlife Research Center, Denver, Colorado

Previous Positions:

1980-82 Wildlife Biologist, Haiti and Dominican Republic, USAID/DWRC, Port-au-Prince, Haiti

1977-80 Hispanic Program Coordinator, DWRC, Denver

1974-80 A centrally based consultant, USAID/DWRC Vertebrate Pest Control Program

1970-73 Station Leader, AID/DWRC Vampire Bat Control Field Station, Mexico City, Mexico

Author and Co-Author of 23 publications

Expected to be at least 67% funded by this project

LYNWOOD A. FIEDLER
Wildlife Biologist (Research)
U. S. Fish and Wildlife Service

NAME: LYNWOOD A. FIEDLER

EDUCATION:

Monroe Senior High School 1957-1959
Bowling Green State University 1959-1963 B. S.

Major - Biology
Minor - Math

Bowling Green State University 1963 M. A.

Ecology and Ornithology
Thesis - Winter Roosting Behavior of the Common Crow

EXPERIENCE:

1971-73 - U. S. Environmental Protection Agency; supervised the planning and implementation of a national pesticide safety training program.

1973-76 - U. S. Environmental Protection Agency, Regional Office; worked with state officials in several states where federal pesticide laws affected state pesticide regulatory programs.

1976-78 - U. S. Environmental Protection Agency, Regional Office; prepared enforcement actions dealing with violators of federal pesticide laws including civil and criminal complaints.

1978 - present - U. S. Fish and Wildlife Service, Denver Wildlife Research Center; conducting research in vertebrate pest problems, Los Baños, Philippines.

Author and Co-Author of two publications

Expected, at present, to be 100% funded by this project

JOE E. BROOKS

Address: USAID, Dacca, Bangladesh

Marital Status: Married, 2 children

Education:

School	Field of Study	Attendance	Degree
University of California Berkeley, California	Zoology	1947 - 1952	A. B.
University of Southern Illinois Carbondale, Illinois	Wildlife Management	1953 - 1954	
University of California Berkeley, California	Zoology	1955 - 1959	M. A.

Experience:

Wildlife Biologist (Research)	USAID/DWRC Vertebrate Pest Management Research Dacca, Bangladesh 1981 - Present
Scientist/Rodent Control Specialist	Rodent Control Demonstrati World Health Organization G.P.O. Box 14 Rangoon, Burma 1976 - 1980
Director	Bureau of Rodent Control New York State Department of Health, Albany, New Yor 1973 - 1976
Rodent Control Consultant	WHO/EMRC Alexandria, Egypt Jan. - March 1975 Qatar - Iraq
Associate Research Scientist	New York State Department of Health, Troy, New York 1966 - 1973

Author and Co-Author of 61 publications

Expected, at present, to be funded by the USAID/Dacca agreement with DWRC

James O. Keith

Responsibilities: Research on international animal damage control

Position: Wildlife Biologist (Research) GS-486-13
Section of International Programs, Denver Wildlife Research Center, Port-au-Prince, Haiti, 1982-Present

Education:

1978	PhD	Ohio State University, Columbus, Ohio (Zoology)
1956	MS	University of Arizona, Tucson, Arizona (Zoology)
1953	AB	University of California, Berkeley, California (Zoology)
1951	AA	College of the Sequoias, Visalia, California (Zoology)

Previous Positions:

1981-82	**Wildlife Biologist (Research), GS-486-13 Section of International Programs, Denver Wildlife Research Center, Denver, Colorado**
1975-81	Wildlife Biologist, Environmental Contamination Evaluation, Patuxent Wildlife Research Center (GS-486-13).
1973-75	Wildlife Biologist, Section of Pesticide-Wildlife Ecology, Denver Wildlife Research Center (GS-486-13).
1969-73	Chief, Section of Pesticide-Wildlife Ecology, Denver Wildlife Research Center (GS-486-13).
1961-69	Wildlife Biologist, Section of Pesticide-Wildlife Ecology, Denver Wildlife Research Center, Davis, California (GS-486-12)
1956-61	Wildlife Biologist, Rocky Mountain Forest and Range Experiment Station, U.S. Forest Service, Grand Junction, Colorado (GS-486-9)
1953-56	Research Fellow, Arizona Cooperative Wildlife Research Unit, Tucson, Arizona

Author and Co-Author of 27 publications

Expected, at present, to be funded by the LAC/USAID/Port-au-Prince agreement with DWRC

A. Lawrence Kolz
Bioelectronics Project Leader

Section of Supporting Sciences
Denver Wildlife Research Center
U. S. Fish & Wildlife Service
Denver, Colorado 80225

Summary: Mr. Kolz has 23 years of electrical engineering experience in research, design, and analysis. Eleven of these years were in the aerospace and missile industry where his work included guidance control research and environmental testing. Mr. Kolz designed, installed, and made operational various types of electronic instrumentation at field test sites such as the Holloman Air Force Base, the Nevada Test Site, and the Dahlgre shock tube facility. For the past 12 years, Mr. Kolz has been responsible for electronics research at the Denver Wildlife Research Center.

Education:

BSEE	Electronic Engineering	Colorado State University Fort Collins, Colorado	19
MSEE	Electronic Engineering	University of Arizona Tucson, Arizona	19

Professional Experience:

Hughes Aircraft Company, Tucson, Arizona 6/58 to 7/64
Title: Member of Technical Staff

Kaman Nuclear, Colorado Springs, Colorado 7/64 to 6/69
Title: Research Scientist

Much of this work involved the development of a mathematical technique to predict the radar reflective characteristics of a hypersonic velocity body entering the earth's atmosphere. In addition, Mr. Kolz assisted in the development of a mathematical model to predict the electromagnetic pulse created by a nuclear explosion upon a metallic object.

U. S. Fish and Wildlife Service, Denver Wildlife Research Center, Denver, Colorado 6/69 to present
Title: Electronics Engineer

As Project Leader of the Bioelectronics Laboratory, Mr. Kolz directs, organizes, and supervises the design and development of specialized electronic instrumentation for wildlife researc Various types of remote sensing telemetry techniques have been developed under Mr. Kolz' direction including miniature wildli tracking transmitters, satellite tracking equipment, and ultra sensitive radio receivers. He is currently involved in the design of high voltage barriers to protect agricultural crops from rodent damage.

Author and Co-Author of 21 publications

Expected to be about 25% funded by this project

Peter J. Savarie
Research Pharmacologist
Leader, Pharmacology and
Formulation Project

Section of Supporting Science
Denver Wildlife Research Cent
U. S. Fish and Wildlife Servi
Denver, Colorado 80225

Summary: Thirteen years professional experience as a research pharmacologist, including two years as a neuropharmacologist for the U. S. Air Force and 11 years on the research staff of the Denver Wildlife Research Center. Major areas of research include: work on chloropromazine depression, biochemical and electrophysiological changes in developing nervous systems, and other neuropharmacological evaluations in guinea pig and monkey; physiological marking agents for animals, and; development of chemicals for use as vertebrate pest control agents.

Education:

B.S. - Biology	State University of New York Albany, NY	1961
Graduate studies - Physiology and Pharmacology	University of South Dakota Vermillion, SD	1963-65
Ph.D. - Pharmacology	Marquette University Milwaukee, Wisconsin	1968

Professional Experience: 1970 - present. Research pharmacologist and Project Leader, Pharmacology and Formulation, Denver Wildlife Research Center. Activities have been primarily in the following areas of pest management control:

a. tranquilizers for capturing wild carnivores.
b. potentiators for chemical vertebrate pest control agents.
c. physiological markers for mammals and birds.
d. selective toxicants for coyote control.
e. rodenticide development and evaluation.
f. vertebrate pest fumigant development and evaluation.

Major accomplishments include: the development of physiological markers, such as iophenoxic acid, which have been used widely by field biologists; the formulation of a tranquilizer combination for use in trap tabs; significant contributions to the toxic collar development program; major input to EPA registration of M-44 device and a pyrotechnic fomigant for control of denning coyotes; significant contributions in the area of chemical potentiation of vertebrate pest control chemicals; acted as consultant on vertebrate pest related matters throughout U. S. and abroad.

Author or Co-Author of 28 publications

Expected to be about 50% funded by this project

Brad E. Johns

Responsibilities:	Project Leader, Physiological Biology Applications in Wildlife Management. Supervises, plans, and conducts experiments in physiology to reduce vertebrate animal damage and address other selected wildlife research needs of the Service.
Position:	Research Physiologist GS-413-12, Denver Wildlife Research Center.
Education:	1960 BS Colorado State University, Fort Collins, Colorad (Biological Science)
Previous Positions:	1959-1960, Research Assistant, Botany Department, Colorado State University, Fort Collins, Colorado.
	1960-1961, Research Assistant, Physiology Department, Colorado State University, Fort Collins, Colorado.
	1962-1964, Biological Research Assistant, MOS 939.3, Specialist 4th Class, Armed Forces Institute of Pathology, U. S. Army, Washington, D. C.
	1964-1965, Wildlife Aid GS-489-4 and 5, U.S. Fish and Wildlife Service, Denver, Colorado.
	1966-Present, Physiologist GS-413-7, 9, 11 and 12, U. S. Fish and Wildlife Service, Denver, Colorado.
Other Training:	1960-1961, Graduate Physiology Student, Colorado State University, Fort Collins, Colorado.
	1961-1962, Secondary Education teacher training, Colorado State University (NCATE certificate requirements met).
	1965-1966, Graduate wildlife course, University of Colorado.
	1970-1980, Statistical, photographic, reproductive biology safety, toxicology, pest control, and supervisory training

Author and Co-Author of 15 publications

Expected to be about 50% funded by this project

10/31

Roger W. Bullard
Research Chemist

Section of Supporting Sciences
Denver Wildlife Research Center
U.S. Fish and Wildlife Service
Denver, Colorado

Summary: Mr. Bullard has 19 years of professional experience with the U.S. Fish and Wildlife Service as a Research Chemist. His work has been in the area of vertebrate pest problems in agriculture and he is leader of the Food Applications project. He has been senior author on 25 and junior author on 12 professional publications.

Education:

B.S.	Agricultural Biochemistry	Oklahoma State University	1963
M.S.	Analytical Chemistry	Denver University	1975

Experience:

1967 to present
Research Chemist
Section of Supporting Sciences
U.S. Fish and Wildlife Service, Denver Wildlife Research Center
Denver, Colorado

1963 - 1967
Research Chemist
Section of Mammal Damage Control
U.S. Fish and Wildlife Service, Denver Wildlife Research Center
Denver, Colorado

1962 - 1963
Chemistry Technician, Lew Wentz Service Scholarship
Biochemistry Department
Oklahoma State University
Stillwater, Oklahoma

Honors: U.S. Fish and Wildlife Service Awards:

Special Achievement Award - September 1978
Outstanding Publication - February 1981

Scholastic Honors:

Phi Kappa Phi	Honorary Scholastic
Phi Lambda Upsilon	Honorary Chemistry
Alpha Zeta	Honorary Agricultural
Phi Sigma	Honorary Biological

Expected to be about 50% funded by this project

Stephen Andrew Shumake
Research Psychologist (Animal)

Section of Supporting Sciences
Denver Wildlife Research Center
U. S. Fish & Wildlife Service
Denver, Colorado 80225

Summary: Dr. Shumake has conducted research in the areas of sensory perception, discrimination thresholds, and conditioning in animals using psychophysical procedures. He has evaluated visual and olfactory sensitivities of birds, rodents, bats, and primates. Aversive properties of drugs, ultrasonics, and pulsed electric shocks have been evaluated in his studies dealing with wild rats. Aversive conditioning, passive avoidance, conditioned suppression, and two-choice preference procedures have been incorporated in these studies. Behavioral bioassay procedures for evaluating olfactory attractants (pheromones), repellent chemicals, and bait enhancers were developed in cooperation with chemists and physiologists in the Supporting Sciences Section.

Education:

M.S.- Experimental Psychology	Florida State University Tallahassee, Florida	1967
Ph.D. Experimental Psychology	Florida State University Tallahassee, Florida	1968

Professional Experience: Department of Psychology, Florida State University, Tallahasse Florida, 1968-1969. Postdoctoral Research Associate. During this 1 year period, Dr. Shumake conducted studies on the olfactory discrimination capabilities and color perception of Rhesus monkeys using a conditioned suppression procedure as an animal psychophysical technique. He also supervised a technician collecting data on color sensitivity of pigeons.

Section of Supporting Sciences, Denver Wildlife Research Cente Denver, Colorado, 1969-present. Research Psychologist (Behavi Biology Project). Dr. Shumake has been involved in the develc ment of odor and taste preference methodology for the isolatic identification, and development of animal attractants. He published a report regarding the development of nonlethal electric barriers for controlling rodent damage to crops in 1979. Other areas of work have included: ultrasonic repeller assessment, conditioned taste aversion as an animal damage control method, and enhanced bird repellency using taste and color cues.

Author and Co-Author of 27 publications

Expected to be about 67% funded by thid project

Donald J. Elias
Wildlife Biologist (Research)

Section of Supporting Sciences
Denver Wildlife Research Center
U.S. Fish and Wildlife Service
Denver, Colorado

Summary: Mr. Elias has 14 years of professional experience with the U.S. Fish and Wildlife Service including 13 years as a research biologist, 4 years of which were in Latin America. His work is in the area of vertebrate pest problems in agriculture. He has 20 professional publications.

Education:

B.S.	Forestry	Colorado State University	1961
B.S.	Wildlife Biology	Colorado State University	1966
M.S.	Natural Resource Management	Colorado State University	1967

Experience:

12/08/74 to present
Wildlife Biologist (Research)
U.S. Fish and Wildlife Service, Denver Wildlife Research Center
Denver, Colorado

10/19/70 to 12/08/74
Wildlife Biologist (Research)
U.S. Fish and Wildlife Service (AID-funded PASA)
Cali, Colombia

02/09/69 to 10/19/70
~~Wildlife Biologist (Research)~~
U.S. Fish and Wildlife Service, Denver Wildlife Research Center
Denver, Colorado

03/14/68 to 02/09/69
Assistant Manager, Seney National Wildlife Refuge
Seney, Michigan

Honors: U.S. Fish and Wildlife Service Awards:

Quality Performance Award - December 1981
Citation for Outstanding Performance - December 1981
Special Achievement Award - March 1981

Expected to be about 50% funded by this project

4/1

Ray Theodore Sterner
Research Psychologist (Animal)

Section of Supporting Sciences
Denver Wildlife Research Center
U. S. Fish & Wildlife Service
Denver, Colorado 80225

Summary: Dr. Sterner has developed tests for the measurement of stress-related responses in rodents and humans. His studies have involved sub-lethal toxicosis, high-altitude exposure (hypoxia), and nutritional restrictions (vitamins A and B_2). He developed a microprocessor-based system for monitoring and analyzing the continuous (minute-by-minute) feeding patterns of rodents when stressed with exposure to rodenticide baits. In the course of his work with human subjects, he developed sensitive psychomotor training and testing procedures for assessing response decrement after exposure to stressful conditions.

Education:

B.S. - Psychology	The Pennsylvania State University, University Park, PA	1963
M.S. - Psychology	University of Wisconsin Madison, Wisconsin	1966
Ph.D. Psychology	University of Wisconsin Madison, Wisconsin	1970

Professional Experience:

U. S. Army Medical Research and Nutrition Laboratory, Fitzsimons Army Medical Center, Denver, Colorado, 1968-1974. Research Psychologist (Physiology Division). The function of the laboratory was to evaluate the effects of rapid high altitude exposure (acute mountn. sickness) on Army personnel and to assess nutritional requirements of soldiers. The research also involved developmental studies for reducing stress-related responses. A series of publications related to psychomotor test battery development, computer programming techniques for analyzing resulting data, hypobaric-hypoxia stress effects, and behavioral recording techniques were generated during this period.

Section of Supporting Sciences, Denver Wildlife Research Center Denver, Colorado, 1974-present. Research Psychologist (Animal) The laboratory is operated by the U. S. Fish and Wildlife Service. One of the main functions of the research is to develop economic means for reducing damage caused by wildlife species (e.g., rodents, birds, predators). During the past 8 years, Dr. Sterner has been involved in a variety of research areas including: drug-induced aversion in coyotes and rats, studies of predator-prey interactions, development of fright-evoking devices for predator control, and the measurement of feeding patterns in wild rodent species when exposed to normal diets, aversive drugs, or rodenticides.

Author and Co-Author of 24 publications

Russell F. Reidinger, Jr.
Project Leader, U.S. Fish and
Wildlife Service and
Assistant Member, Monell Chemical
Senses Center
3500 Market Street
Philadelphia, PA 19104

Phone: (215) 243-4982

Education:

1967 B.S., Albright College with biology major, chemistry minor.

1972 Ph.D., University of Arizona with zoology major, agricultural biochemistry minor. Thesis: "Influence of pesticides on bat populations in Arizona and northern Mexico", Dr. E. Lendell Cockrum advisor.

Professional Experience:

Assistant Professor of Biology, Augustana College, Rock Island, IL. September 1971 - February, 1974.

Research Chemist, Denver Wildlife Research Center (DWRC), Lakewood, CO. July - August, 1973.

Research Physiologist, DWRC. February - April, 1971.

Research Physiologist, DWRC assigned to National Crop Protection Center (Rodent Research Center), Los Baños, Philippines; April, 1974 August, 1978. Team Leader from November, 1975 - August, 1978. Visiting Professor, Department of Entomology and Applied Zoology, and Department of Zoology, University of the Philippines at Los Baños; 1975 - 1978.

Project Leader and Wildlife Biologist, DWRC assigned to the Monell Chemical Senses Center, Philadelphia, PA; September, 1978 - present. Assistant Member, Monell Chemical Senses Center; September, 1978 - present.

Professional Recognition:

Joe Pastorello Biology Award, Albright College, 1967.

NDEA Title IV Fellowship, Graduate School, University of Arizona, 1967-1970.

Special Achievement Award, U.S. Fish and Wildlife Service, 1977.

Author and Co-Author of 25 publications

Not expected, at present, to be funded by this project, though providing assistance as required

Iwao Okuno
Research Chemist

Section of Supporting Sciences
Denver Wildlife Research Center
U. S. Fish & Wildlife Service
Denver, Colorado 80225

Summary:

Nearly thirty years of experience as analytical and research chemist, primarily in the area of analytical methodology of organic and inorganic compounds. Conducted research in the development of chemical methods for the classification of sulfur and nitrogen compounds in petroleum and in the development of analytical methods for the determination of trace amounts of chemicals in biological substances. Experienced in gas and liquid chromatography, ultraviolet-visible, infrared, fluorescence, atomic absorption and emission spectrophotometry, and mass spectrometry.

Education:

B.A. - Chemistry, University of Denver (1951); Denver, CO
University of Colorado (1953-1957); Denver, CO
University of Wyoming (1957-1962); Laramie, WY
University of Denver (1968-1970); Denver, CO

Professional Experience:

Army Chemical Center, Chemical Corp, Department of the Army, Maryland, 1951-1953--Develop test methods and perform analysis of warfare chemicals.

Rocky Mountain Arsenal, Department of the Army, Colorado, 1953-1957--Develop and conduct test methods for warfare chemicals.

Laramie Petroleum Research Center, Department of the Interior, Laramie, Wyoming, 1957-1967--Conduct research in the characterization of chemicals in crude oil and petroleum. Develop analytical methods for the determination and characterization of nitrogen and sulfur compounds in petroleum. Publications--Analytical Chemistry (1962, 1965, 1967), American Society for Testing and Material (1965).

U. S. Fish and Wildlife Service, Department of the Interior, Colorado, 1967-1982--Conduct chemical research and develop analytic methods. Developed analytical methods for trace quantities of heavy metals, zinc phosphide, sodium cyanide, mestranol, warfarin, diphacinone, Compound 1080 (sodium fluoroacetate). Publications--Journal of Association of Official Analytical Chemists (1972, 1978, 1980, 1982), Bulletin of Environmental Contamination and Toxicology (1975, 1977, 1979), Journal of Wildlife Management (1981).

Professional Organizations:

American Chemical Society, American Association for Advancement of Science, Society for Applied Spectroscopy.

Not expected to be funded by this project, though providing assistance as required

Responsibilities: Administration and Supervision of The Section of Bird Damage Control, Denver Wildlife Research Center, Denver, Colorado.

Position: Supervisory Wildlife Biologist GS-486-14
Chief, Section of Bird Damage Control

Education:

1959	BS	University of Wyoming, Laramie (Agronomy)
1961	MS	University of Wyoming, Laramie (Agronomy)
1971-72		Denver University and University of Colorado, Denver-Boulder (Additional Coursework)
1973		U. S. Fish and Wildlife Service (Executive Seminar)
1979		Office of Personnel Management (Seminar for Advancing Managers)

Experience:

1955-58	Farming, self-employed
1958-61	University of Wyoming, Laramie Agricultural Engineering Research
1961-66	Section of Mammal Damage Control, DWRC Plant Physiologist and Project Leader Chemical Screening
1966-70	Section of Mammal Damage Control, Hilo, Hawaii Field Station Leader
1970-73	Section of Mammal Damage Control, DWRC Leader, Agricultural Rodent Unit
1973-76	Section of Mammal Damage Control, DWRC Chief
1976-Present	Section of Bird Damage Control, DWRC Chief

Author and co-author of 2 publications since 1975

Not expected to be funded by this project, though providing assistance as required

MICHAEL W. FALL

Responsibilities: Administration and Supervision; Research on ecology, management methods, and management programs for predator/livestock interactions

Position: Supervisory Wildlife Biologist (Research) ~~GS-486-14~~; Chief, Section of Predator Management Research, 1981-Present Denver Wildlife Research Center

Education:

1978	PH.D.	The Pennsylvania State University (Entomology - Vertebrate Pest Management)
1966	M.A.	Bowling Green State University (Biology)
1963	B.S.	Bowling Green State University (Biology)

Previous Positions:

1975-81	Wildlife Biologist (Research), Outreach Specialist, Mammal Damage Control, Section of International Programs, Denver Wildlife Research Center (GS-486-12/13)
1971-75	Wildlife Biologist (Research), Section of International Programs, Denver Wildlife Research Center (FC-486-9) and Biologist (1971-73)/U.S. Team Leader (1973-75) Rodent Research Center, University of the Philippines at Los Baños; concurrently Graduate Research Adviser in Entomology and Applied Zoology (1972-75) and Visiting Assistant Professor of Zoology (1975)
1970-71	Wildlife Biologist (Research), AID Programs, Denver Wildlife Research Center (GS-486-12)

Other Training:

1981	Western Plants, University of Denver
1977-81	Spanish (Introductory, Intermediate, Adv. Intermediate), University of Denver
1978, 1980	Pesticide Applicator Certification Course, Colorado State University and U.S. Environmental Protection Agency, Ft. Collins, Colorado
1979	Editing Environmental Assessments and Impact Statements, U.S. Civil Service Commission, Denver
1978	U.S. Food Policy, Cooperative Extension Service, Colorado State University
1978	Affirmative Action - Making It Work, NCGT Associates, Denver
1978	Supervisor's Job, U.S. Department of the Interior, Denver

Author and Co-Author of 45 publications

Not expected to be funded by this project, though providing assistance to it

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WILLIAM E. DUSENBERRY
GS-14

Education:

B.A. (1964) University of Wyoming (Mathematics/Statistics)
M.S. (1966) University of Wyoming (Statistics)
M.S. (1970) Virginia Polytechnic Institute & State University (Statistics)
Ph.D. (1973) Virginia Polytechnic Institute & State University (Statistics)

Experience:

-Consulting Statistician, Biological Research Section, Health Effects Research Program, Natl. Air. Poll. Control Admin., USPHS, 1966-1970
-ORAU Graduate Fellow, Statistics Group, Mathematics Division, Oak Ridge Natl. Laboratory, 1971-1973
-Instructor (Statistics), MBA Program, Butler University, 1973-1977
-Senior Statistician (Consultant-preclinical and clinical pharmaceutical research), Statistical & Math. Services Dept., Lilly Research Labs., Eli Lilly and Co., 1973-1977
-Assist. Professor, Division of Biostatistics, University of Utah Medical School, 1977
-Chief and Supervisory Statistician, Section of Technical Services, DWRC, 1977-present

Research Interests/Areas of Expertise:

-Design of Experiments
-Statistical Consulting (especially biologically related)
-Statistical Computing

Author and Co-Author of six publications since 1975

Not funded by this project, though providing assistance to it

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Jerome F. Besser

Education: Iowa State University, B. S., Wildlife Biology

Experience: Wildlife Biologist (Research), Denver Wildlife Research Center, Denver, Colorado, 1950-82. Led research on methods to combat bird damage to agricultural crops in the USA, 1950-Present. Advisor and researcher on crop protection methods to combat bird damage in Central and South America, Africa and Asia through USAID/DWRC and FAO programs, 1962-Present.

Author and Co-Author of over 40 publications

Not expected to be funded by this project, though providing assistance to it

Joseph L. Guarino
GS-486-13
Wildlife Biologist (Research)
Project Leader, Western Crops,
Aviation Problems
Section Bird Damage Control, DWR

EDUCATION:

1959 - University of Connecticut
-- B.S. Wildlife Management

1961 - University of Wisconsin
All course credits towards an MS in Wildlife Management, but did not complete thesis.

EXPERIENCE:

1961 - Present - Section of Bird Damage Control, DWRC
Leader, Ecology Project
Leader, Chemical Development Project
Leader, Field Programs Project, Denver and California Stations

RESEARCH INTEREST/EXPERTISE:

Bird Damage Control Research
Development of Techniques
Methodology
Population Dynamics

Author and Co-Author of 15 publications since 1975

Not expected to be funded by this project, though providing assistance as required

Michael A. Ronan

Responsibilities: Administration and supervision of Ecology Section; cooperative research with Direccion General de Fauna Silvestre; research on ecology and systematics of small mammals.

Position: Supervisory Wildlife Biologist (Research) GS-486-14; Chief, Ecology Section, DWRC, 1981-Present

Education:

1973 Ph.D. University of New Mexico (Biology)

1966 M.S. Fort Hays Kansas State University (Zoology)

1964 B.S. Baker University (Biology and Chemistry)

Previous Positions:

1980-81 Wildlife Biologist (Research), Museum Section, DWRC.

1979-80 Actino Director, National Fish and Wildlife Laboratory.

1978-79 Chief, Ecology Section, NFWL.

1973-78 Wildlife Biologist (Research), Museum Section, NFWL.

1971-73 Instructor, University of New Mexico

1970 Instructor, Fort Hays Kansas State University

Other Training:

1977 Seminar in numerical taxonomy, IPE.

1980 Performance appraisal, USFWS.

1979-81 Associate Editor, Journal of Mammalogy

1973-81 Research Associate, Smithsonian Institution

Author and Co-Author of 14 publications

Not funded by this project, but providing assistance to it

JOHN L. SEUBERT
GS-14

Education:

B.S. (1946) University of Toledo (Biology)
M.S. (1948) The Ohio State University (Wildlife Management)
Ph.D. (1956) The Ohio State University (Wildlife Ecology)

Experience:

-Chief, Section of Mammal Damage Control, DWRC, Denver, CO, 1977 to present
-Chief, Section of Animal Depredations Control Studies, PWRC, Laurel, MD, 1961 to 1977
-Chief of Game Management--Research, South Dakota Department of Game, Fish & Parks, Mitchell/Pierre, SD, 9/57 to 12/60
-Research Biologist--South Dakota Department of Game, Fish & Parks, Mitchell, SD, 9/52 to 9/57

Research Interests/Areas of Expertise:

-Bird damage control research
-Mammal damage control research
-Animal hazards to aviation
-Basic research on animal behavior and physiology as relating to resolving highly applied animal damage problems
-Resource management
-Human ecology
-Pheasant ecology

Author and Co-Author of 25 publications

Not expected to be funded by this project, but providing assistance to it

Education:
B.S. (1967) University of Colorado (Zoology)
Post Graduate (1967-68) University of Colorado (Zoology)

Experience:
-Biological Aid, Denver Wildlife Research Center, 1956-1958
-U.S. Army Medical Corp, 1958-1961
-Biological Technician, Denver Wildlife Research Center, 1961-1967
-Wildlife Biologist, Denver Wildlife Research Center, 1967-present

Research Interests/Areas of Expertise:
-Rodent Biology
-Rodent Damage to Industrial Products
-Rodent Damage to Agricultural Crops
-Non-lethal Animal Damage Control
-Toxicology

Publications:

1. G. K. LaVoie, and J. F. Glahn. 1976. An evaluation of some physical parameters which influence the susceptibility of packages to rat damage. In Proc. Third Intern. Biodegradation Symp. Kingston, Rhode Island, 17-23 Aug. 1975. p. 297-302.

2. N. J. Cogelia, G. K. LaVoie, and J. F. Glahn. 1976. Rodent biting pressure and chewing action and their effects on wire and cable sheath. In Proc. 25th Intern. Wire and Cable Symp. Cherry Hill, New Jersey. Nov. 16-18, 1976.

3. G. K. LaVoie, and J. F. Glahn. 1977. Ultrasound as a deterrent to Rattus norvegicus. J. Stored Product Research. 13:23-28.

4. K. A. Fagerstone, H. P. Tietjen, and G. K. LaVoie. 1977. Effects of range treatment with 2,4-D on prairie dog diet. J. Range Manage. 30(1):57-60.

5. K. A. Fagerstone, G. K. LaVoie, and R. Griffith. 1981. Black-tailed jackrabbit diet and population density in relation to agricultural crops. J. Range Manage. 33(3):229-233.

6. G. H. Matschke, K. A. Fagerstone, N. D. Halstead, G. K. LaVoie, and D. L. Otis. Population reduction of Richardson's ground squirrels with zinc phosphide. J. Wildl. Manage. (In press).

Not expected to be funded by this project, but providing assistance as required

Education:

B.S. (1973) Colorado State University (Mathematics)
M.S. (1975) Colorado State University (Statistics)
Ph.D. (1981) University of Colorado Health Sciences Center (Biometrics)

Experience: (since 1975)

-Statistical Consultant, Addiction Research and Treatment Services, Denver, Colorado, 1977-1979
-Student Advisor, (Computer Center Operator) University of Colorado Health Sciences Center, Denver, Colorado, 1977-1979
-Statistical Consultant, University of Colorado Health Sciences Center, Denver, Colorado, 1975-1979
-Statistician, Section of Technical Services, DWRC, 1979-present

Research Interests/Areas of Expertise:

-Experimental design
-General linear model
-Plotless density estimation
-Statistical consulting
-Statistical computing

Publications*: (since 1978)

1. G.D. Swanson, D.L. Sherrill, R.M. Engeman and R.W. Virtue. 1978. Computer-controlled cycle ergometer for respiratory control studies. Federation Proceedings, 37:534.

2. R.M. Engeman and G.D. Swanson. 1979. Transient response of the Geman-Miller respiratory oscillator model. Journal of Applied Physiology, 46:1191-1195.

3. R.M. Engeman, G.D. Swanson and R.H. Jones. 1979. Input design for model discrimination: application to respiratory control during exercise. IEEE Transactions on Biomedical Engineering, 26:579-585.

4. R.M. Engeman. 1980. One-factor repeated measures analysis of variance, Techniques, 4:30.

5. R.M. Engeman, C.P. Stone, W.E. Dusenberry and M. Hehnke. 1980. Diversity measurements as applied to avian populations along the Sacramento River. Symposium on Estimating the Numbers of Terrestrial Birds, p. 15.

5. R.M. Engeman, G.D. Swanson and R.H. Jones. 1981. Sinusoidal frequency allocation for estimating model parameters. IEEE Transactions on Systems, Man, Cybernetics, 11:243-245.

*In addition, seven other manuscripts are prepared, but not yet accepted.

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lot funded by this project, but providing assistance to it

R. Daniel Thompson
Chief, Section of Supporting Science
(Research Physiologist)

Section of Supporting Sciences
Denver Wildlife Research Center
U. S. Fish & Wildlife Service
Denver, Colorado 80225

Summary: Twenty years of professional experience as research physiologist; currently directs the research activities of an interdisciplinary group of scientists responsible for conducting basic and applied research to help solve wildlife management problems in the United States and other countries. This involves the scientific discipline of physiology, wildlife biology, behavior, pharmacology, electronics, biochemistry, analytical chemistry, and chemical senses.

Education:

B.S. - Dairy Science	Oklahoma State University Stillwater, Oklahoma	1957
M.S. - Dairy Science (Animal Nutrition)	Louisiana State University Baton Rouge, Louisiana	1959
Ph.D. -Dairy Science (Animal Physiology)	Louisiana State University Baton Rouge, Louisiana	1961

Louisiana State University, Louisiana, 1961-1962. Assistant Professor of Dairy Science. Responsibilities included teaching graduate and undergraduate courses and directing research in environmental physiology.

Denver Wildlife Research Center, U. S. Fish and Wildlife Service, Denver, Colorado, 1963-1973, Research Physiologist, and from 1973 to present, Chief, Section of Supporting Sciences. Areas of major research accomplishments during this time include environmental physiology of dairy cattle in subtropical climates; physiological and behavioral responses of wild birds to fright-producing auditory and chemical stimuli and; development of livestock systemic methodology to reduce populations of vampire bats in Latin America. Served as member of U. S. delegation to Soviet Union, 1977, to study effects of chemicals used in agriculture on fauna (Soviet-American agreement on cooperation in the field of environmental protection).

Publications:

Twenty-five technical publications in fields of stress physiology and vertebrate pest control technology involving dairy cattle, pest birds, vampire bats, and rodents. Patentee in field.

Honors:

Traveled extensively in Southeast Asia, Latin America, and the Soviet Union on research assignments for the U S. Fish and Wildlife Service

American Association for the Advancement of Science; Society of Sigma Xi; Listed in Who's Who in the West

Expected to be about 25% funded by this project.

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FEDERALLY REGISTERED PESTICIDES FOR VERTEBRATE PEST CONTROL*

RAYMOND W. MATHENY, Wildlife Biologist, Environmental Protection Agency, Washington, D.C.

INTRODUCTION

At the 1978 Vertebrate Pest Conference, Glenn Hood talked of vertebrate control chemicals, their registration status at that time, the rebuttable presumptions against registration and effects on users. He presented an overview of reregistration, classification, labeling, application certification, experimental use permits, emergency use and state registrations. Essentially, what he stated is as true today as when he addressed this conference. I'll try not to duplicate his fine presentation but rather give you an update about those long awaited for and somewhat controversial Guidelines for registering pesticides in the United States, the current status of strychnine and 1080 in the RPAR process, review briefly the latest congressional amendments to the Federal Fungicide, Insecticide and Rodenticide Act (FIFRA) under which EPA conducts its pesticide programs and, finally, give you a listing of the current federally registered pesticides for use in vertebrate pest control.

It is appropriate to first briefly review the function of EPA in the pesticide arena and outline the current organization. You are aware, of course, that EPA has a number of responsibilities: these include air, noise, radiation, water, waste management, pesticides, and toxic substances. The Agency is charged by Congress under FIFRA, as amended, to regulate the use of pesticides in the United States. To conduct this activity the Office of Pesticide Programs, within the Office of Pesticide and Toxic Substances is comprised of five Divisions:

Registration, Hazard Evaluation (HED), Benefits and Field Studies, Special Pesticide Review and Program Support. I am currently assigned to the Ecological Effects Branch of HED. The four other branches in HED are Toxicology, Environmental Fate, Residue Chemistry, and Health Effects. Of the 27 sections in FIFRA we deal routinely with Section 3 (Registrations), 5 (Experimental Use Permits), 18 (Emergency Use Permits, Crisis Exemptions), and 24(c) (State Special Local Needs).

GUIDELINES

I wish that I could announce to you that my Agency has published the final Guidelines for Registering Pesticides in the United States. For several years over 200 persons within the Agency have contributed to drafting these Guidelines to inform registrants and the public about the registration process, procedures to follow; and test standards and requirements for the many kinds of pesticide products. On June 25, 1975, the Agency first published proposed Guidelines for Registering Pesticides in the U.S. These proposed guidelines describe the kinds of data which must be submitted to satisfy requirements of the registration regulations. They include sections explaining the scope and the intent of the guidelines; detailing the product performance, hazard evaluation and chemistry data requirements for registration of a pesticide product, and providing guidance on proper label development. It is the intent of the Agency that Guidelines provide meaningful instruction to applicants, registrants, and the general public on the specific data requirements for registration of a pesticide product.

The Agency since 1975 has published four subparts: B, D, E and F which establish the requirements for product chemistry, environmental chemistry, fish and wildlife toxicity data and toxicology data for human and domestic animal safety evaluation.

In March 1980 three subparts (G, I and J) will be published as proposed. They deal with product performance, experimental use permits, and hazard evaluation to nontarget plants and microorganisms, respectively. Other subparts to be published in late 1980 involve label development, hazard evaluation to nontarget insects and proposed guidelines for registering biochemical and microbiological pesticides.

RPAR

There have been delays in the processing of some 50 pesticides involved in the Agency's "Rebuttable Presumption Against Registration" (RPAR). Recently the Special Pesticide Review Division rescheduled completion periods for a number of RPAR compounds. By October of this year position documents 2 and 3 are to be completed for both strychnine and 1080. For those of you not familiar with the RPAR process, it is one of gathering data, both on the hazards and the benefits of a particular chemical and use pattern. The process determines whether a particular pesticide will be afforded continued use as previously registered or requested to be registered, restricted use or cancellation and removal from the market. Section 162.11 (a) (3) (B), (C) of FR. Vol. No. 129 lists the criteria for determinations of unreasonable adverse effects of pesticides. An RPAR shall arise if a pesticide's ingredient(s), metabolite(s) or degradation product(s) meet or exceed certain criteria for risk. These include acute toxicity to humans and domestic animals, hazard to wildlife and chronic toxicity which can reasonably be anticipated to result in local, regional, or national population reductions of nontarget organisms, or fatality to members of endangered species. In the final analysis the benefits are weighed against the risks and the Administrator renders the ultimate decision. The outcome of the RPAR does not, as some imagine, mean automatic cancellation of a product. It may result in label amendments, changes in use patterns, dosage rates or restrictions as to who is authorized to handle the pesticide. There could be very little, or extensive, alteration in labeling. In any event, the RPAR process is intended to reduce environmental hazards in the use of pesticides.

*Proceedings: Ninth Vertebrate Pest Conference, March 4-6, 1980, Fresno, CA, p.63-71

CONGRESSIONAL AMENDMENTS TO FIFRA

As far as vertebrate pesticides are concerned, the September 1978 congressional amendments to FIFRA, apply primarily to the waiver of some pesticide efficacy requirements. However, they do not apply to those pesticides which may impact on public health, such as commensal rodenticides. Thus, efficacy data requirements remain in force for products used to control commensal rats and mice, potential rabies vectors (e.g., bats, skunks, raccoons, canids), significant plague vectors and birds in situations where potential threat of disease is a primary reason for control. However, the waiver of efficacy data for most pesticidal products is experimental. All, or some, waived requirements may be enforced at any time by the Administrator, if product failure is reported. A risk/benefit analysis will be conducted prior to conditional registration of all products which contain active ingredients that have been cancelled, suspended or are subject to RPAR proceedings.

Of the approximate 35,000 pesticides containing some 1400 active ingredients, only 1100 comprise the vertebrate pesticides. As Glenn Hood indicated two years ago, the number of new registrations for use in vertebrate pest control are few.

The appended tables show, by category, which products are currently registered. Anyone who wishes to inquire further about the status of any product should contact either William Miller or Dan Peacock of EPA's Office of Pesticide Programs, Registration Division/Insecticide, Rodenticide Branch at (202) 426-9458.

SUMMARY

Vertebrate pesticides include lethal agents; irritants; repellents based on odor, taste, post-ingestional psychophysiological reaction or pharmacological reaction; repellents based on mechanical action such as tackiness or stringiness; anesthetizing chemicals, reproductive inhibitors; and fumigants.

Vertebrate pesticides, properly used, can benefit man by controlling offending animals, whether rats or mice, gophers or prairie dogs, black birds or pigeons, starlings or gulls. However, vertebrate pesticides like all pesticides, if used improperly, can endanger man and nontarget species due to their toxicity. In addition, potential future hazards to human health and wildlife may be created by residues from some long lived pesticides that build up in the food chain and cause widespread contamination of the environment. The EPA endeavors to regulate pesticides under FIFRA to prevent misuse and adverse environmental effects.

Table 1. Federal registrations for sodium cyanide capsules in the M-44 ejector device to control predation to livestock (December, 1979).

	Registrant	Pest Species
1	U.S. Dept. of the Int. Fish and Wildlife Service	Coyotes, red fox, gray fox, wild dogs
2	Wyoming Dept. Agric.	" "
3	Montana Dept. Livestock	" "
4	Oregon Dept. Agric.	" "
5	Calif. Dept. Food & Agric.	coyotes
6	So. Dak. Dept. Game, Fish and Parks	coyotes, red fox, gray fox, wild dogs
7	Colorado Dept. Agric.	" "
8	M-44 Safety Pred. Control Co.	" "
9	Nevada Dept. Agric.	" "
10	New Mexico Dept. Agric.	coyotes and wild dogs
11	Texas Dept. Agric.	coyotes, red fox, gray fox, wild dogs
12	Navajo Nation (Fish and Wildlife Department)	" "
13	Wash. Dept. of Game	coyotes, wild dogs

Table 2. Federally registered commensal rodenticides for use in and around buildings; total products 514 (December, 1979).

Chemical	Number of Products	Type Product	Homeowner Restrictions
I. Multiple-dose chemicals	(438 products)		
1. Chlorophacinone	20	baits	no restrictions
	2	tracking powder	PCO* or Certified Applicator only
2. Diphacinone	75	baits	no restrictions
	1	tracking powder	PCO
3. Fumarin	40	baits	no restrictions
4. Pival	40	baits	no restrictions
5. PMP	5	baits and tracking powders	PCO
6. Talon	4	bait and place packs	no restrictions
7. Warfarin	250	baits	no restrictions
	1	tracking powder	PCO
II. Single-dose chemicals	(77 products)		
A. Baits & tracking powder	(55 products)		
1. ANTU (Norway rat only)	9	bait & tracking powder	PCO
2. Arsenic trioxide	1	bait 1.5% active or less	no restrictions
3. Compound 1080	1	bait	may not be used in home by anyone
4. Phosphorus	2	bait	no restrictions
	1	bait	may not be used in home by anyone
5. Red Squill (rat only)	15	bait	no restrictions
6. Strychnine (mouse only)	8	bait	Certified applicator
7. Zinc Phosphide	18	1-2% bait	no restrictions
		>2% concentrates for dilution	PCO

Table 2 (continued)

Chemical	Number of Products	Type Product	Homeowner Restrictions
B. Fumigants	(22 products)		
1. Calcium Cyanide**	2	powder	certified applicator
2. Hydrocyanic Acid	1	solid disk	certified applicator
3. Chloropicrin	6	liquid	PCO
4. Sodium Chlorate + Sodium Cyanide	1	solid	certified applicator
5. Gas Cartridge (rats only)	1	solid (2 parts)	no restrictions
6. Carbon Tetrachloride + Ethylene Dichloride + Paradichlorobenzene	1	liquid	no restrictions
7. Methyl Bromide	10	liquid	certified applicator

*PCO = Pest Control Operator
**may be temporarily unavailable

Table 2-A. Federal Registration of Mammal Control Pesticides Exclusive of Commensal Rodenticides (December, 1979).

Mammal	Arsenous oxide	Bismet-12	Calcium cyanide	Carbon disulfide	Carbon detrachloride	Endrin	Ethylene dichloride	Gas cartridge	Gophacide	Naphthalene	Paradichlorobenzene	R-55	Sodium cyanide	Strychnine	Thiram	Zinc phosphide	Ziram
Cotton rats												x		x		x	
Coyote													x				
Ground squirrels				x	x		x	x			x			x			
Harvest mice						x										x	
Kangaroo rats														x			
Meadow voles						x								x		x	
Moles	x		x		x		x	x			x			x			
Muskrat																x	
Nutria																x	
Pine vole						x								x		x	
Pocket gophers	x			x			x	x	x					x			
-Northern									x			x		x			
-Plains									x			x		x	x		
Pocket mice						x											
Porcupine														x			
Prairie dogs								x						x			
-Black tailed														x		x	
-White tailed																x	
Rabbits										x					x		x
-Jackrabbit										x				x			
Skunks								x									
White-footed mice Peromyscus spp.						x								x		x	
Woodchuck			x					x						x			
Woodrats		x										x			x		

Table 3. Federally registered avian repellents separated into tactile, taste, and odor repellent categories.

Chemical	Percent Active	Product Name	Pest Species	Site	Method of Application
A. TACTILE REPELLENTS					
1. mineral oil 94.45 diakyl dimethyl 5.25 and alkyl benzyl dimethyl ammonium bentonite	99.7	Repel-O-Film	birds	outdoors ledges	hand
2. polybutenes hydrogenated castor oil	48.5 1.5	Bird Tanglefoot pressurized	birds	outdoors buildings	"
3. polybutenes hydrogenated castor oil	97 3	Bird Tanglefoot	birds	"	"
4. polybutenes polyethylene	95 5	Excelcide Bird Repellent	sparrows pigeon starlings	"	"
5. polybutenes hydrogenated castor oil	97 3	Hub States Bird Repellent	birds	"	"
6. polybutenes paloja resins petroleum solvents petrolatum	10 20 20 20 30	Guardian Ava-Tac	sparrows pigeon starlings	"	"
7. polybutenes mineral oil lithium sterate soap diphenylamine	100	Grosley's Original "No-Roost" Bird Repellent	pigeons starlings	"	"
8. polisobutylene	95.5	Bird Stop	pigeons starlings	outdoors buildings	hand "
9. polisobulylene water kerosene	50.34 42.56 7.10	Roost No More Bird Repellent liquid	birds	outdoors buildings small trees indoors	
10. polybutenes and related alkenes	76	Roost No More Bird Repellent	pigeons starlings sparrows	outdoors buildings	"
11. polybutenes and related alkenes	96	Roost No More	pigeons starlings	"	"
12. mineral oil calcium soap polyisobutylene zinc oxide	73 12 5	Bird-Ban	pigeons, sparrows starlings	"	
13. polybutene	80	4 the Birds	pigeons sparrows	"	"
14. polybutene mineral oil lithium sterate soap diphenylamine	100	Tower Grezall NP-4 Bird Repellent	birds	"	"
B. TASTE REPELLENTS					
1. lindane	75	Ortho Isotox Seed Treater (75)	pheasant	outside	seed treatment
2. lindane captan	25 12.5	Ortho Isotox Seed Treater (F)	"	"	"
3. coal tar creosote oil	62.67 31.33	Stanley's Crow Repellent	crow	"	"
4. copper oxate	4	Crow-Chex Repellent	crow	"	"
5. thiram	42	Arasan 42-S	birds	"	"

Table 3 (continued).

Chemical	Percent Active	Product Name	Pest Species	Site	Method of Application
6. endrin*	50	Red-top Endrin 50	birds	outside	seed treatment
7. measurol	50	Mesurol 50% Hopper-Box Treater	blackbirds	corn	"
8. measurol	75	Mesurol 75% Wettable Powder	robins, starlings, finches, greckles, sparrows, bluejays, cedar waxwings	cherries	sprayer
9. mesurol*	50	Hopkins Mesrepel	blackbirds	outdoor (corn)	seed treatment
10. mesurol*	50	Bonide Cro-x	"	"	"
11. mesurol*	18.75	Borderland Black	"	"	"
C. ODOR REPELLENTS					
1. naphthalene	100	Wil-Kil	pigeons sparrows	indoors	hand

*restricted

Table 4. Federally registered avian toxicants and chemiosterilants.

Chemical	Percent Active	Product Name	Pest Species	Site	Method of Application
AVIAN TOXICANTS					
A-1 4-Aminopyridine (Avitrol)	0.5	Avitrol Bird Trip	house sparrows pigeons blackbirds cowbirds	inside/ outside structures	hand spot treatment
A-2 "	0.5	Avitrol Wheat	sparrows blackbirds cowbirds	outside feedlots	"
A-3 "	1.0	Avitrol Pelletized Feed	starlings	inside/ outside structures	"
A-4 "	0.5	Avitrol Sorghum	sparrows blackbirds cowbirds	"	"
A-5 "	0.5	Avitrol Mixed Grain	"	"	"
A-6 "	1.0	Avitrol Double Strength Corn Crops	blackbirds cowbirds starlings	"	"
A-7 "	0.5	Avitrol Corn Crops	sparrows blackbirds cowbirds	"	"
A-8 "	0.5	Avitrol Whole Corn	pigeons	inside/ outside structures	hand spot treatment
A-9 "	1.0	Double Strength Whole Corn	crows	outdoors feeding areas	"
A-10 "	0.8	Avitrol Corn Chops peanut butter	starlings	outdoors feedlots	"
A-11 "	25	Avitrol Concentrate	gulls	outdoors feeding areas	"

Table 4 (continued).

Chemical	Percent Active	Product Name	Pest Species	Site	Method of Application
A-12 4-Aminopyridine (Avitrol)	50	Avitrol Powder Mix	starlings	outdoors cattle feed-lots	hand spot treatment
A-13 "	0.3	Avitrol Corn Chops-99	starlings blackbirds cowbirds	outdoors ripening sweet and feed corn	air or ground
A-14 "	0.3	Avitrol F C Corn Chops 1-10 Concentrate	reformulation repacking	n/a	n/a
A-15 "	.03	Avitrol F C Corn Chops -99S	red-winged blackbird yellow-head blackbird common grackle starlings	sunflowers	broadcast air high clearance
B-1 Endrin*	91.4	Rid-A-Bird Control Liquid	starling english sparrow pigeon	outdoors/ indoors buildings pipeyards loading docks bridges	
C-1 Fenthion (entex)	"	Rid-A-Bird 1100	"	"	
D-1 Starlicide	1	Purina Starlicide	starlings blackbirds	outdoors (livestock and poultry operations)	
D-2 "	97	Purina Starlicide Technical	n/a	n/a	
D-3 "	0.1	Purina Starlicide Complete	starlings blackbirds	outdoors (livestock & poultry operations)	
D-4 "	98	Compound DRC-1339	starlings blackbirds	outdoors (livestock & poultry operations (concentrate for reformulating use only)**	
D-5 "	98	1339 Gull Toxicant 98% Concentrate	herrings, great black-backed gulls	coastal area of northeastern U.S. near breeding area of colonial nesting birds**	
E-1 Strychnine*	0.6	Ehrlich's Pigeon Bait Poison Grain	pigeon	outdoors (buildings)	hand
E-2 "	0.6	Ehrich's English Sparrow Bait Poison Grain	house sparrows	"	"
E-3 "	0.6	Poisoned Grain	pigeon	"	"
E-4 "	0.6	Guardian Strych-nine Whole Grain Poisoned Grain	pigeon	"	"
E-5 "	0.6	Sparrow-Cracks	house sparrow	"	"
E-6 "	0.6	Pigeon-9	pigeon	"	"

Table 4 (continued).

Chemical	Percent Active	Product Name	Pest Species	Site	Method of Application
F-T Compound PA-14**	99.5	Compound PA-14 Stressing Agent	blackbirds starlings cowbirds	outdoor roost	by air
AVIAN CHEMOSTERILANTS					
A-1 20,25 diazacholestenol dihydrochloride	0.112	Ornitrol	pigeons	outdoor ground	hand

*restricted
**for use by U.S. Fish & Wildlife Service personnel trained in bird control or persons under their direct supervision

Table 5. Federally registered tracking powders for the control of rats and mice.

Chemical	Company Name, Address	For Control of Norway Rat	Roof Rat	House Mouse	Indoor Use Only	Method of Application Tracking Patches	Foot/Power Duster	PCO Use Only
Multiple-dose Rodenticides								
1. 0.2% Chlorophacinone	Chempar Chemical Co., Inc. 260 Madison Ave.,N.Y., N.Y. 10016	YES	YES	YES	YES	?	?	YES
2. 0.2% Diphacinone	Velsicol Chemical Co., 341 E. Ohio St.,Chicago, IL 60611	YES	YES	YES	?	YES	No	Yes
3. 2.18% PMP	American Fluoride Corp. 17 Huntington Place, New Rochelle, N.Y. 10801	YES	YES	YES	?	?	Yes	Yes
4. 2.18% PMP	Motomco, Inc. Clark, N.J. 07066	YES	YES	YES	?	Yes	No	No
5. 2.18% PMP	Clarence Board and Sons, Inc., 105 E. Commercial, Leon, IA 50144	YES	YES	YES	Yes	No	Yes	
6. 1.0% Warfarin	Prentiss Drug and Chemical Co., 3637 7th Ave., N.Y., N.Y. 10001	YES	YES	YES	Yes	Yes	No	Yes
7. 0.2% Chlorophacinone	Chempar Chemical Co., Inc. 260 Madison Ave., N.Y., N.Y. 10016	YES	YES	YES	Yes	Yes	No	Yes
Single-dose Rodenticides								
8. 20% ANTU	American Fluoride	YES	NO	NO	No	Yes	Yes	No
9. 92% ANTU	American Fluoride	YES	NO	NO	No	Yes	Yes	No
10. 25% ANTU	Master Laboratory Beaver Falls, PA 15010	YES	NO	NO	No	Yes	Yes	No
11. 92% ANTU	Fine Organics, Inc., 205 Main St., Lodi, NJ 07644	YES	NO	NO	No	?	?	No
12. 20% ANTU	Insect Control Sales and Service, 341 E. Fulton St., Ephrata, PA 17522	YES	NO	NO	No	Yes	Yes	No
13. 20% ANTU	Stephenson Chemical Co., Inc., Box 87188 College Park, GA 30337	YES	NO	NO	No	?	Yes	Yes

Table 5 (continued).

Chemical	Company Name, Address	For Control of Norway Rat	Roof Rat	House Mouse	Indoor Use Only	Method of Application Tracking Patches	Foot/Power Duster	PCO Use Only
14. 92% ANTU	Hub States Chemical & Equipment Corp., Indianapolis, IN 46202	YES	NO	NO	No	Yes	Yes	No
15. 0.2% Scilliroside	MGK, 8810 10th Ave. N., Minn., MN 55427	NO	NO	YES	Yes	Yes	No	No
16. 10% Zinc Phosphide*	Bell Laboratories Madison, WI 53705	NO	NO	YES	Yes	Yes	No	Yes

*restricted

Table 6. Federally registered pesticides for vertebrate control separated by use groupings.

ANTICOAGULANTS

- Chlorophacinone
- Diphacinone
- Fumarin
- Pival
- PMP
- Prolin
- Talon
- Warfarin

BAT TOXICANT

- DDT**

BAT REPELLENT

- Naphthalene

BIRD CHEMOSTERILANT

- Ornitrol

BIRD REPELLENT (ODOR)

- Naphthalene

BIRD REPELLENTS (TACTILE)

- Aromatic petroleum solvents
- Castor oil
- Diphenylamine
- Mineral oil
- Petrolatum
- Polybutane
- Polyethylene
- Resins
- Zinc oxide

BIRD REPELLENTS (TASTE)

- Captan
- Coal tar
- Copper oxala**
- Endrin
- Lindane
- Mesurol
- Thiram

BIRD TOXICANTS

- Aminopyridine
- Endrin
- Fenthion
- Starlicide
- Strychnine

DOG ATTACK REPELLENTS

- Allyl isothiocyanate
- Capsaicin
- Diethanolamide condensate of cocon
- Triethanolamine salt of lauryl sul
- Methylene choride

DOG AND CAT REPELLENTS

- Allyl isothiocyanate
- Amyl acetate
- Anethole
- Bittrex*
- Blood*
- Bone oil
- Capsaicin
- Citral
- Citronella
- Citrus oil
- Cresylic acid*
- Essential oils
- Eucalyptus
- Geranium oil
- Lavender oil
- Lemongrass oil
- Menthol
- Methyl nonyl ketone
- Methyl salicylate
- Naphthalene
- Nicotine
- Paradichlorobenzene
- Pentanethiol*
- Pyridine
- Thiram
- Thymol
- Ziram

DEER REPELLENTS

- Bone oil
- Putrescent whole egg solids
- Thiram
- ZIP

FISH AND LAMPREY TOXICANTS

- Antimycin A
- Bayluscide
- Rotenone
- TFM

Table 6 (continued).

FUMIGANTS

Calcium cyanide+
Carbon disulfide
Carbon tetrachloride
Chloropicrin
Ethyl dichloride
Gas cartridges
Hydrocyanic acid
Methyl bromide
Paradichlorobenzene
Sodium cyanide

MOLE REPELLENTS

Paradichlorobenzene
Thiram

MOLE TOXICANTS

Arsenic trioxide
Strychnine
Zinc phosphide

RABBIT REPELLENTS

Blood
Naphthalene
Nicotine
Thiram
ZIP

RABBIT TOXICANTS

Strychnine

RODENT REPELLENTS

Biomet-12
Endrin
Naphthalene
Polybutenes
R-55
Thiram

RODENT ACUTE TOXICANTS

Antu
Arsenic trioxide
Endrin
Fluoroacetamide
Gophacide
Phosphorus
Red squill
Sodium fluoroacetate
Strychnine
Zinc phosphide

*Dog repellent claims only
**For use where rabies has been documented through Center for Disease Control, Atlanta, GA.
+may be temporarily unavailable

Table 7. Vertebrate pesticides registered as intrastate products (total of 783 products)*.

Chemical	Total No. Products In Category	Number of Products
I. CHEMOSTERILANTS	0	
II. MULTIPLE-DOSE TOXICANTS	297	
1. Chlorophacinone		27
2. Diphacinone		104
3. Pival		47
4. PMP		0
5. Fumarin		39
6. Warfarin		58
7. Warfarin + Sulfaquinoxaline		22
III. SINGLE-DOSE TOXICANTS	465	
A. Mammal, Bird and Reptile Toxicants (463)		
1. 4-aminopyridine		9
2. Arsenious oxide		5
3. Compound 1080		50
4. Endrin		2
5. Fumigants		24
6. Gophacide		1
7. Red Squill		4
8. Sodium fluoride		1
9. Starlicide		0
10. Strychnine		277
11. Sulfur		0
12. Toxaphene		1
13. Zinc phosphide		83

Table 7 (continued).

Chemical		Total No. Products In Category	Number of Products
B. Fish Toxicants			
1. Rotenone	(2)		2
IV. REPELLENTS	(8)	21	
A. Dog and Cat Repellents			7
B. Dog Attack Repellents			1
C. Mammal and Bird Repellents	(13)		
1. Polybutenes			
2. Misc. taste			10

*Does not include 24-c registrations

ANNEX I

INITIAL ENVIRONMENTAL EXAMINATION

The Denver Wildlife Research Center (DWRC) is the Federal Institution in charge, inter alia, of developmental research in the United States for vertebrate pest management techniques and agents. They have been charged with this responsibility for more than 40 years. The full scope of responsibilities of DWRC is stated in the brochure, "The Denver Wildlife Research Center" (April, 1979). Throughout the history of the Environmental Protection Agency (EPA), DWRC has worked with it in : (1) the development of the needs in types of data which can lead to vertebrate pesticide registration; (2) the development of data to meet vertebrate pesticide registration requirements; and (3) in helping its parent organization, the Fish and Wildlife Service, to request and obtain registration of vertebrate pesticide formulations needed for special minor uses.

DWRC has had a long association with A.I.D. in international developmental assistance, dating back to 1967. During this time the DWRC personnel have become well acquainted with the development of requirements of A.I.D. to analyze potential hazards to the environment which might result from their activities. Having done so, DWRC avoids these hazards and/or shows that the probable benefits far outweigh the risks of potential hazards.

DWRC has worked in many countries during this period of association with USAID. These include Bangladesh, Colombia, Costa Rica, Dominican Republic, Egypt, Ethiopia, Guatemala, Haiti, Indonesia, Kenya, Mexico, Nicaragua, Pakistan, Peru, Somalia, Sudan and Tanzania. In no instance has the project or its personnel been known to be criticized for lack of attention to protection of the environment.

Pesticides used in the project, which generally will be from among those listed in Annex H, usually will have the same or similar uses for which they are approved by EPA in the USA. When this is true and the pesticide is in no manner restricted by EPA in its use in the USA, then project approval for its use will be accompanied by a simple Initial Environmental Examination consisting of a risk:benefit analysis.

When the pesticide under consideration for use does not have the same or similar use in the USA for which it is proposed in an LDC, and/or when the pesticide is in some manner restricted in use in the registration of it by EPA and/or if the pesticide is under rebuttable presumption against (re-)registration (RPAR) procedures, the pesticide individually will be subjected to an environmental assessment which is passed through appropriate S&T and Regional Bureau offices for comment and approval. These reviews will be done in accordance with the requirements of A.I.D. Regulation 16.

As stated in the project paper, before any outputs of the project such as a set of procedures, training aids or guidelines are used, recommended or extended these outputs will be subjected to an environmental assessment in a timely manner. Each of these assessments will be submitted to appropriate S&T and Regional Bureau offices for comment and approval.

This project will be using vertebrate pesticides as a part of a pest management program (of research, pilot trials and/or demonstrations) for which the aim is: (1) increase in usable production of agricultural crops; and/or, (2) increase in availabilty of agricultural produce. The need for these increases is widely recognized as being of great benefit to the LDCs and to the aims of A.I.D., as stated in its Agricultural Policy. Indeed by being the two principal elements of the first of two parts of this Policy, these needs can be considered to be of the greatest possible benefit. The use of pesticides in a vertebrate pest management program requires minimal amounts of such materials which are registered without restriction for the same or similar use in the USA. The benefits of the use of pesticides in a vertebrate pest management program thus far outweigh the risks of their use. (All possible exceptions to this conclusion are stated above and require special subsequent approval action.)

RECOMMENDED THRESHOLD DECISION: A Negative Determination is recommended.