

AGENCY FOR INTERNATIONAL DEVELOPMENT		1. TRANSACTION CODE <input type="checkbox"/> A = Add <input type="checkbox"/> C = Change <input type="checkbox"/> D = Delete		Amendment Number _____		DOCUMENT CODE 3	
PROJECT DATA SHEET				2. COUNTRY/ENTITY Bureau for Science and Technology		3. PROJECT NUMBER 936-4173	
4. BUREAU/OFFICE Office of Agriculture				5. PROJECT TITLE (maximum 40 characters) Vertebrate Pest Management Systems R&D			
6. PROJECT ASSISTANCE COMPLETION DATE (PACD) MM DD YY 09 30 91				7. ESTIMATED DATE OF OBLIGATION (Under 'B.' below, enter 1, 2, 3, or 4) A. Initial FY 86 B. Quarter 2 C. Final FY 90			

8. COSTS (\$000 OR EQUIVALENT \$1 =)						
A. FUNDING SOURCE	FIRST FY 86			LIFE OF PROJECT		
	B. FX	C. L/C	D. Total	E. FX	F. L/C	G. Total
AID Appropriated Total	675		675	3,910		3,910
(Grant) S&T Bureau	(425)	()	(425)	(2,445)	()	(2,445)
(Loan)	()	()	()	()	()	()
Other U.S.						
1. Mission/Reg. Bureau	250*		250*	1,465*		1,465*
2. "buy-Ins"						
Host Country						
Other Donor(s)						
TOTALS	675		675	3,910		3,910

9. SCHEDULE OF AID FUNDING (\$000)									
A. APPROPRIATION	B. PRIMARY PURPOSE CODE	C. PRIMARY TECH. CODE		D. OBLIGATIONS TO DATE		E. AMOUNT APPROVED THIS ACTION		F. LIFE OF PROJECT	
		1. Grant	2. Loan	1. Grant	2. Loan	1. Grant	2. Loan	1. Grant	2. Loan
(1) FN	140	070		-0-		3,910		3,910	
(2)									
(3)									
(4)									
TOTALS				-0-		3,910		3,910	

10. SECONDARY TECHNICAL CODES (maximum 5 codes of 3 positions each) 010 024 333						11. SECONDARY PURPOSE CODE			
12. SPECIAL CONCERNS CODES (maximum 7 codes of 4 positions each)									
A. Code	R/AG	TECH	TNG	INTR	XII				
B. Amount	1,509	1,854	547	3,910	3,910				

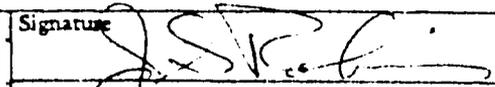
13. PROJECT PURPOSE: (maximum 480 characters)

To help LDCs improve their capabilities to develop and utilize vertebrate pest management systems which will reduce pre/postharvest losses.

14. SCHEDULED EVALUATIONS						15. SOURCE/ORIGIN OF GOODS AND SERVICES							
Interim	MM	YY	MM	YY	Final	MM	YY						
	0	1	8	8		0	1	9	1	<input checked="" type="checkbox"/> 000	<input type="checkbox"/> 941	<input type="checkbox"/> Local	<input type="checkbox"/> Other (Specify)

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

*Funds contributed by missions and/or regional bureaus under separate project authority.

17. APPROVED BY	Signature:  Title: Dr. J. S. Robins Agency Director for S&T/FA	Date Signed MM DD YY 11/10/81	18. DATE DOCUMENT RECEIVED IN AID/W, OR FOR AID/W DOCUMENTS, DATE OF DISTRIBUTION MM DD YY 11/11/81
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PROJECT AUTHORIZATION

ENTITY : Bureau for Science and Technology
PROJECT TITLE : Vertebrate Pest Management Systems R&D
PROJECT NUMBER: 936-4173

1. Pursuant to Section 103 of the Foreign Assistance Act of 1961, as amended, I hereby authorize the "Vertebrate Pest Management Systems R&D" project involving centrally funded planned obligations not to exceed \$2.445 million in grant funds over a period of five years from FY 1986 to FY 1990 subject to the availability of funds in accordance with AID/OYB allotment process, to help finance foreign exchange and local currency costs for the project. The project may also include such additional funding, up to \$1.465 million, as may be contributed for this purpose by regional bureaus, A.I.D. missions, and AID/W offices other than S&T/AGR.
2. The goal of this project is to increase the availability of food and feed to improve human and animal nutrition and productivity. The purpose of this project is to help LDCs improve their capabilities to develop and utilize vertebrate pest management systems which will reduce pre- and postharvest losses. The goal and purpose will be accomplished by assisting LDC governments, parastatals, extension services, and private sector entities, and national, regional and international organizations to develop and adapt vertebrate pest management systems aimed at decreasing losses from vertebrate pests and thus increasing production.
3. The project has four interacting and overlapping components: applied research; technology transfer, including problem solving services; multi-level training; and progressive networking. These components are designed to assist LDCs with the development and improvement of effective and efficient vertebrate pest management systems.
4. The Participating Agency Service Agreement (PASA) which may be negotiated and executed by the officer(s) to whom such authority is delegated in accordance with AID regulations and delegations of authority shall be subject to the following essential terms and covenants and major conditions, together with such other terms and conditions as AID may deem appropriate.

A memorandum to SER/AAM has been prepared for your signature (Attachment D) which justifies the selection of DWRC for this activity under the authority of Section 621 (a) because: 1) the requested services are for technical assistance; 2) DWRC is uniquely and particularly suited to provide the services; 3) this work will be utilizing the excess capacity of DWRC and will not interfere with its domestic program; and 4) this action is not competitive with the private sector.

S&T/AGR's FY 1986 OYB will contain \$425,000 for this project. This project was not included in the FY 1986 Congressional Presentation, but a Congressional Notification has been prepared and will be submitted in October 1985.

Recommendation:

1. That you sign the Project Data Sheet (Attachment B)
2. That you sign the project authorization (Attachment C)
3. That you sign the memorandum to Mr. Phillip Casteel, SER/AAM requesting the selection of DWRC for the "Ribbon" PASA (Attachment D)
4. That you sign the Environmental Threshold Determination (Attachment E)

- Attachment:
- A. Project Paper
 - B. Project Data Sheet
 - C. Project Authorization
 - D. Memo to SER/AAM for "Ribbon" PASA
 - E. Environmental Threshold Determination
 - F. Sector Council Endorsement Sheet

Clearance:	S&T/AGR/AP:	R. I. Jackson	<u>RJJ</u>	date	<u>10/21/85</u>
	S&T/AGR	: F. Li	<u>M.B. Lee</u>	date	<u>10/25/85</u>
	S&T/MGT	: M. Thome	<u>M</u>	date	<u>10-27-85</u>
	GC	: S. Tisa	<u>by AAM</u>	date	<u>10-30-85</u>
	S&T/PO	: G. Eaton	<u>Kim for</u>	date	<u>11/8/85</u>

Drafted: S&T/AGR/AP: M. Mozynski: H. R. Shuyler, 9/30/85: Revised: 10/17/85
WANG: 2371f

3 0 OCT 1985

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

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

SUBJECT: Authorization for Vertebrate Pest Management Systems R&D Project

Problem: Your approval is required to implement a five-year project entitled "Vertebrate Pest Management Systems R&D" which requires an authorized life of project cost of \$2,445,000 from the Agriculture, Rural Development and Nutrition Account, Section 103 of the Foreign Assistance Act of 1961, as amended.

Discussion: Since 1967, AID has provided funds to Denver Wildlife Research Center (DWRC), Fish and Wildlife Service (FWS) of the U.S. Department of Interior (USDI) to provide technical assistance in vertebrate pest management systems R&D to LDC, regional and international institutions and scientists. Scientists at DWRC provided the breadth of expertise required to meet the challenge of reducing food and feed losses caused by vertebrate pests without the need to duplicate such efforts in every country. Countries with permanent facilities were encouraged and supported, however, to build their own capabilities. For example, the original Philippine Rodent Research Center (RRC), developed into the National Crop Protection Center (NCPC), with local staff of about 100 and a network of 12 field stations supported by the Philippine Government. In addition, the DWRC scientists supported research and training at DWRC and in LDCs, and transferred appropriate technology to LDCs, successfully reducing losses caused by vertebrate pests.

This new project will place emphasis on applied and developmental research and networking under the S&T/AGR core budget. Missions, regional bureaus and other AID/W offices will fund much of the technology transfer and training activities. DWRC will also contribute scientists and facilities from their own resources to backstop these activities.

The goal of this project is to increase the availability of food and feed to improve human and animal nutrition and productivity. This goal will be achieved by helping LDCs improve their capabilities to develop and utilize vertebrate pest management systems which will reduce pre/postharvest losses. The new project will capitalize on the results of the previous activities by funding the following four interacting and overlapping project components to develop and adapt effective, acceptable management techniques to reduce losses from vertebrate pests.

Applied and developmental research - Research to solve vertebrate pest problems has at best just begun. This is true for problems ranging from the widespread crop destruction by gophers in Central America, to the ravaging of corn and sorghum by the multimammate rat of Africa (which also carries plague), to the much studied grain-eating quelea birds of Africa, and to parakeets feeding on ripening corn in Asia.

4

Nineteen specific vertebrate pest problems, each of which is important in more than one country, have been identified as serious constraints to increasing agricultural production and food availability. Little or no research has been conducted on any of these vertebrates. To reduce the crop destruction by these vertebrates, problem-solving research must be undertaken.

More information is needed on the biology, ecology, and behavior of almost all pests. This project will backstop such research. It will also backstop essential studies of various management techniques and their combination in programs to manage particular pest complexes in specifically defined crop ecological environments.

Institution building - For LDCs to conduct vertebrate pest management research and transfer the resulting technology appropriately to the farmers, an institutional framework is necessary. Many LDCs lack this capability. However, DWRC has strengthened many LDC institutions allowing them to plan and implement policies and institutional self development. These activities catalyze them to design and implement programs in vertebrate pest management.

Technology transfer - Vertebrate pest control research that forms the basis of pest management programs is of little value until the technology is transferred to the farmers. Frequently those requiring the technology most are the traditional and small commercial farm families. This project will ensure that these farm families benefit from the research and technical assistance provided. This will be accomplished by: 1) simplifying recommendations; 2) avoiding costly inputs; 3) using readily available inputs; 4) drawing recommendations to and for credit programs; and 5) designing recommendations around the socio-economic patterns of traditional small farmers.

Training - The lack of trained people is the greatest constraint to progress in vertebrate pest control in many LDCs. An organization requires trained personnel to effectively and efficiently manage a vertebrate pest management program. Under previous projects, thousands of individuals, including farmers, extension agents, technicians, biologists, veterinarians, administrators, and others have received both informal and formal training ranging from on-the-job training to Ph.D. degrees.

Training programs of varying intensity, duration, depth and emphasis will continue to be designed and implemented at DWRC, FWS field stations, U.S. Universities and at national and international institutions with the help of DWRC scientists. Training for African specialists will be emphasized to the extent possible within the availability of funds. These training programs will range from graduate degrees in vertebrate pest management to in-service or on-the-job training at the LDC operational level.

Building Networks - DWRC has long established linkages to a "network" of human and technical resources with FWS, USDI, U.S. public and private institutions, LDC national, regional and international organizations. As indicated in Appendix XIII of the Project Paper, DWRC is the hub of a very extensive, but mostly informal network of persons, units and institutions in more than 45 LDCs with especially close and resourceful linkages with FAO, IRRI, ICRISAT, OAU, and UNDP.

LDC institutions and individuals, involved in vertebrate pest management in countries where this ribbon project is being implemented, will be encouraged to expand this network to other institutions working on vertebrate pest management. The project will coordinate and backstop network activities, and support periodic communications and promote even short-term exchange of professionals between countries, where feasible. All of these activities, except exchange of professionals, will be funded at least in part by the S&T/AGR core funding.

During the project development it became apparent that a "Ribbon" Participating Agency Service Agreement (PASA) with DWRC is the most efficient and economical method to successfully implement the scope of work outlined in the attached project paper (Attachment A). The S&T/AGR funded portion of the PASA agreement will provide DWRC with the needed assistance to: 1) maintain its international resource base in vertebrate pest management research and extension developed over the past years of cooperation with the Agency and other donors; 2) expand the level and range of its collaboration with U.S., LDC, regional and international institutions; 3) provide assistance for carrying out research to solve problems caused by vertebrate pests which will allow LDC farmers to increase yields and improve production efficiency of food and feed crops; 4) provide training course offerings for LDC students at DWRC and in the field stations; and 5) prepare handbooks based on their years of experience in international vertebrate pest management.

Detailed budget summaries are attached to the Project Paper as Appendices II, III, and IV. Project costs to be borne by S&T/AGR are estimated at up to \$2,445 million for the five-year period. However, S&T/AGR's contribution to the "Ribbon" PASA will be incrementally funded on an annual basis depending on the availability of funds.

The "buy-in" portion of the PASA will allow missions, regional bureaus and other AID/W offices the opportunity to provide LDCs with short- to medium-term DWRC technical advisory services for: 1) planning, designing and evaluating programs and projects concerned with vertebrate pest problems; 2) U.S., in-country and regional training programs; and 3) testing research results in LDC environments. The practical experiences and on-site information and insights gained during the activities under the "buy-in" portion of the PASA will be fed directly back into the DWRC's training programs, informational development activities, and the applied research agenda developed and implemented under the core funding. It also is intended that the need and opportunity for "buy-in" work will be identified by DWRC in its work under the core budget and proposed to the Office of Agriculture, regional bureaus and missions for approval and funding.

The previous project was evaluated in September 1985 by an evaluation team that recommended continuation of the program with DWRC at a level commensurate with the demand for vertebrate pest management systems services. The Agricultural Sector Council reviewed and unanimously endorsed the project paper on October 15, 1985. A copy of the endorsement is attached as Attachment F.

A memorandum to SER/AAM has been prepared for your signature (Attachment D) which justifies the selection of DWRC for this activity under the authority of Section 621 (a) because: 1) the requested services are for technical assistance; 2) DWRC is uniquely and particularly suited to provide the services; 3) this work will be utilizing the excess capacity of DWRC and will not interfere with its domestic program; and 4) this action is not competitive with the private sector.

S&T/AGR's FY 1986 OYB will contain \$425,000 for this project. This project was not included in the FY 1986 Congressional Presentation, but a Congressional Notification has been prepared and will be submitted in October 1985.

Recommendation:

1. That you sign the Project Data Sheet (Attachment B)
2. That you sign the project authorization (Attachment C)
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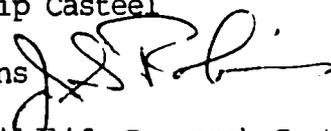
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Clearance:	S&T/AGR/AP:	R. I. Jackson	<u>RJJ</u>	date	<u>10/21/85</u>
	S&T/AGR	: F. Li	<u>M. Li</u>	date	<u>10/21/85</u>
	S&T/MGT	: M. Thome	<u>M</u>	date	<u>10-27-85</u>
	GC	: S. Tisa	<u>by ASM</u>	date	<u>10-30-85</u>
	S&T/PO	: G. Eaton	<u>km for</u>	date	<u>11/8/85</u>

Drafted: S&T/AGR/AP: M. Mozynski: H. R. Shuyler, 9/30/85: Revised: 10/17/85
 WANG: 2371f

MEMORANDUM

NOV - 8 1986

TO: SER/AAM, Mr. Phillip Casteel
FROM: S&T/FA, J. S. Robins 
SUBJECT: PASA with Denver Wildlife Research Center for
Vertebrate Pest Management Systems R&D

I request that you consider only Denver Wildlife Research Center (DWRC), Fish and Wildlife Service (FWS) of the U.S. Department of Interior (USDI) for the subject Participating Agency Service Agreement (PASA) to provide technical assistance in vertebrate pest management systems R&D to LDC, regional and international institutions and scientists. Scientists at DWRC have been providing the breadth of expertise required to meet the challenge of reducing food and feed losses caused by vertebrate pests without the need to duplicate such efforts in every country.

DWRC is recognized world-wide for its organizational structure and excellent qualifications to implement a vertebrate pest management systems project. The organizational structure and qualifications are listed below:

Organizational Structure - The Center's unique and particular suitability for implementing this project is addressed below:

- a. The authority for the U.S. Fish and Wildlife Service (FWS) to conduct research on nonpredatory mammal damage control is found in part or in all of the Organic Act of 1897, the Predatory Control Act of 1909, and the Animal Damage Control Act of 1931. The increasing complexity and cost of this research is, to a significant extent, the result of several laws. They include: 1) the Federal Insecticide, Fungicide, and Rodenticide Act of 1947, (FIFRA); 2) the Federal Environmental Pesticide Control Act of 1972 (FEPCA), which requires that all economic poisons be registered with the Environmental Protection Agency (EPA), or that if a substance was judged too hazardous to the environment, its use must be suspended; and 3) the National Environmental Policy Act of 1970 (NEPA) that established the EPA and sets standards for the registration of animal damage control materials.
- b. The DWRC is responsible for implementing the Service's Animal Damage Control (ADC) research program. The various research and support components of the program are organized into three branches and three sections: the Wildlife Damage Branch that includes the Sections of Bird Damage, Mammal Damage, and International Programs; the Predator Studies Branch; and the Research Support Branch.
- c. The facilities and resources of DWRC are particularly and uniquely suited for the technical assistance to be provided by this project. Since 1967, through these projects, DWRC has provided a specialized resource for support to AID Missions and host countries for improvement of rodent and bird control research and development (R&D) and/or implementation of integrated vertebrate pest control and management systems in the developing countries.

Qualifications, including key personnel, facilities and equipment

- a. Since the first PASA was signed, DWRC scientists have provided extensive research and development activities to the missions which has resulted in billions of dollars being saved through improved vertebrate pest management systems; e.g., there have been 235 consultative visits to 54 countries involving 4,232 person-days; seven in-country projects have been established and implemented; and approximately 275,000 people have received training and 40 scientists from 11 countries have received graduate degrees. DWRC professionals, frequently with LDC co-authors, have published more than 275 scientific papers regarding their international work. Extension materials and aids have been widely disseminated. This work has resulted in the saving of food, otherwise lost, scientifically but conservatively estimated at more than \$2.6 billion.
- b. DWRC is uniquely qualified, through its base of 100 plus technical staff members and resulting capability in multi-disciplinary backstopping to address these concerns. No other institution in the world has amassed a similar, critical core of scientists to attack the problems of crop losses caused by vertebrate pests. The qualifications of these scientists range from biologists, pharmacologists, chemists, electronic engineers and technicians, to physiologists, vertebrate pest behaviorists, zoologists, and support staff.
- c. DWRC has devised research, development and evaluation techniques specific to vertebrate pest control and through the S&T/AGR and other PASAs has been transferring this methodology to various LDCs. As was true for the applied research methodologies and the resulting pest management techniques developed and already in use in LDCs, the Center relies heavily on the multi-disciplinary R&D approach it originated.
- d. Based on its unique research and development capabilities, projects with DWRC are maintained to support AID efforts worldwide in this highly technical area. The techniques developed by DWRC, or currently under development, are considered to be especially applicable to LDC needs.
- e. The estimated replacement costs of DWRC's buildings are \$9.0 million. The major laboratory equipment which is as advanced as possible given the state-of-the-art is similarly valued at \$5.0 million. These buildings and laboratory equipment are available for use as needed by this project. No other entity has such a complete range of equipment. DWRC's unique capability is further enhanced by being able to use as needed, the facilities, equipment and personnel of the 22 field stations in the U.S.

DWRC Domestic Programs

- The furnishing of services to AID will not interfere with DWRC's domestic program. This is because the specialists, facilities and equipment needed for domestic programs are available part-time for the AID project.

Private Sector

There is no other satisfactory source from either the public or private sector in the U.S. (i.e., vertebrate pest management research and extension) for these services. This has been determined repeatedly since 1967, and most recently in connection with S&T/AGR's PIO/T 936-4120-5361068 (signed on March 14, 1983) and is still true as discussed below:

- a. DWRC participation in technology development, transfer and evaluation to be provided by this project is not competitive with private enterprise. R&D of integrated vertebrate pest control and management techniques for pre- and postharvest systems is one area in which private firms do not compete.
- b. Instead, private firms engage in R&D for development and exploitation of specific techniques for control of some species of vertebrate pests. Or such firms make commercial use of various combinations of such techniques, which have been developed by others, in the control of vertebrate pests. The individual techniques used may have been developed by DWRC and/or private firms.
- c. Furthermore, private firms which use such combinations of techniques do not have overseas experience in problems caused by most of the vertebrate pest species in the developing world. Overseas experience is critical to resolve vertebrate pest problems; experience which gives appropriate consideration to the pest species, the ecology, the pre- and postharvest agricultural practices and the socio-economic factors of each situation.
- d. The largest single element of activity and cost for individual private sector corporations involved in some way in vertebrate pest control is the development and sale of rodenticides. Among pesticides, the potential annual sale of each and all rodenticides, in total, is considered to be relatively small. As a group, rodenticides are considered by EPA to be products of "minor use".
- e. It is a concern of all involved in this field that the development costs of new rodenticides are rapidly approaching the point at which they will exceed the potential profits during the product's patent life. To keep costs as low as possible, these firms must keep their professional staff number to a minimum. This is another reason why DWRC's technical assistance services are unique and do not compete with the private sector.

Technical Assistance

- a. The services desired by AID under this new project meet the definition of technical assistance. They include both the actual on-site provision of assistance overseas and various support services and activities which directly facilitate such assistance. Support services are to be performed both inside and outside the U.S.

- b. In addition, each host country and mission will be benefited by the broadly multi-disciplinary backstopping services provided by this project. Provision of such backstopping is a major purpose of the project and is available to all missions and LDCs requesting technical assistance under it.
- c. Finally, missions and LDCs will benefit from the technological transfer, through DWRC's International Program Section, from the broadly ranging, ongoing research programs designed to solve domestic vertebrate pest problems in the U.S. and those in locations overseas.
- d. Additional benefits will accrue from the planned participation of LDC counterparts in the International Vertebrate Pest Management Network, being developed under the guidance of this project.

Recommendation:

It is for the above reasons and in accordance with OMB Circular A-76 and the criteria of Section 621(a) of the Foreign Assistance Act of 1961, as amended, the Office of Agriculture and the Directorate for Food and Agriculture recommend that the Office of Acquisition and Assistance Management negotiate a PASA with DWRC because it is: 1) for technical assistance, 2) the DWRC is uniquely and particularly suited for this scope of work, 3) this action is not competitive with the private sector, and 4) this work will not interfere with the Center's domestic program.

Cleared:	S&T/AGR:	A. R. Bertrand	<u>ARS</u>	Date	<u>10/21/85</u>
	S&T/MGT:	M. Thome	<u>ARS</u>	Date	<u>10/29/85</u>
	S&T/PO:	G. Eaton	<u>ARS</u>	Date	<u>11/8/85</u>

Drafted: S&T/AGR/AP:MMozynski:HRShuyler:9/30/85:Revised:10/18/85:WD2374f

MEMORANDUM

TO : S&T/FA, J. S. Robins
FROM : S&T/AGR, Anson R. Bertrand *Anson R. Bertrand*
SUBJECT: Environmental Threshold Determination
REF : Vertebrate Pest Management Systems R&D

On the Basis of the Initial Environmental Examination (IEE) on Page 46 of the Project Paper (PP) and the attached Initial Environmental Examination, I recommend that you make the following environmental threshold 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: _____

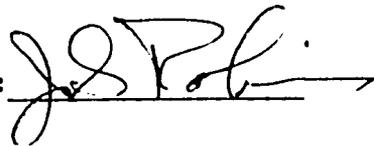
DATE: 11/08/85

Clearance:
Environmental Officer *C. W. Allen* Date 10/19/85

VERTEBRATE PEST MANAGEMENT SYSTEMS R&D
INITIAL ENVIRONMENTAL EXAMINATION

Project Location : Worldwide
Project Title : Vertebrate Pest Management Systems R&D
Project Number : 936-4173
Life of Project : Five Years
IEE Prepared By : H. R. Shuyler
Date : October 7, 1985
Action Recommended: Negative Determination

Concurrence:



Date: 11/08/85

Vertebrate Pest Management Systems R&D

INITIAL ENVIRONMENTAL EXAMINATION

1. Project Description

This project, to be implemented by the Denver Wildlife Research Center (DWRC), is designed to increase the availability of food and feed by improving the capabilities of LDCs to reduce pre/postharvest losses due to vertebrate pests. This development process requires the use of environmentally sound programs. The project provides technology transfer, including problem solving assistance, training, and applied research. It also promotes networking and disseminates information regarding these and related activities.

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). DWRC has worked with the Environmental Protection Agency (EPA) since its inception in the following areas: 1) the development of the needs of EPA 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 AID in international developmental assistance, dating back to 1967. During this time, the DWRC personnel have become well acquainted with the development of AID's requirement to analyze potential hazards to the environment which might result from its 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 AID. These include Bangladesh, Colombia, Costa Rica, Dominican Republic, Egypt, Ethiopia, Guatemala, Haiti, Indonesia, Kenya, Mexico, Nicaragua, Pakistan, Peru, Philippines, 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 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 normally 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 AID Regulation 16.

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) an increase in usable production of agricultural crops; and/or 2) an increase in availability of agricultural produce. The need for these increases is widely recognized as being of great benefit to the LDCs and to the aims of AID, 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 thus far outweigh the risks of their use. (All possible exceptions of this conclusion are stated above and require special subsequent approval action.)

The activities of this project generally fall into the area described in Environmental Procedural Regulations paragraph 216.2 (c). "Analysis, studies, academic or investigative research, workshops and meetings". These classes of activities normally will not require the filing of an Environmental Impact Statement or the preparation of an Environmental Assessment.

The grantee will assure that: (1) all testing of vertebrate pesticides will be performed under closely controlled laboratory and/or small scale field conditions; (2) data on toxicological and environmental aspects will be available to safeguard the health of research personnel and the quality of the local environment in which the pesticides are used; and (3) no unauthorized use for human or animal consumption will be made of treated crops. All recommendations and/or extension of pesticide use and practices will require an environmental assessment and approval by the S&T/AGR project officer, environmental officer within S&T/AGR and the appropriate Regional Bureau Environmental Officer(s).

2. Recommendations

From the discussion above and the analysis contained on the following "Impact Identification and Evaluation Form," it is determined that the project will not have a significant direct effect on the environment. A negative determination is recommended.

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IMPACT IDENTIFICATION AND EVALUATION FORM

Impact Areas and Sub-Areas	<u>Impact Identification*</u>
A. Land Use	
1. Changing the character of the land through:	
a. Increasing the population	N
b. Extracting natural resources	N
c. Land clearing	N
d. Changing soil character	N
2. Altering natural defenses	N
3. Foreclosing important use	N
4. Jeopardizing man or his work	N
5. Other factors:	
Reducing pesticide pollution and contamination	N
B. Water Quality	
1. Physical State of water	N
2. Chemical and biological states	L
3. Ecological balance	L
4. Other factors	N
C. Atmospheric	
1. Air additives	N
2. Air pollution	L
3. Noise pollution	N
4. Other factors	N
D. Natural Resources	
1. Diversion, altered use of water	N
2. Irreversible, inefficient commitments	N
3. Other factors	N
E. Cultural	
1. Altering physical symbols	N
2. Dilution of cultural traditions	N
3. Other factors	N

Impact Areas and Sub-Areas	<u>Impact Identification*</u>
F. Socio-Economic	
1. Changes in economic/employment patterns	M+
2. Changes in population	N
3. Changes in cultural patterns	M+
4. Other factors	M+
G. Health	
1. Changing a natural environment	N
2. Eliminating an ecosystem element	N
3. Other factors Reducing pesticide poisoning	M+
H. General	
1. International impacts (Cooperation in pest management)	M+
2. Controversial impact	N
3. Larger program impacts	N
4. Other Factors	N
I. Other Possible Impacts (not listed above)	
1. Introduction of new plant species	N
2. Agricultural chemicals	M-
3. Other factors	N

*The following symbols are used for Impact Identification

N = No	Environmental Impact	+ = Beneficial Impact
L = Little	Environmental Impact	- = Negative Impact
M = Moderate	Environmental Impact	
H = High	Environmental Impact	
U = Unknown	Environmental Impact	

SECTOR COUNCIL FOR AGRICULTURE

RECORD OF S&T PROJECT REVIEW COMMITTEE MEETING

COMMITTEE MEETING DATE: 10/15/85

Harlan Shuyler,

1. Project Office: S&T/AGR PID PP Project No: 936-4173

Project Title: Vertebrate Pest Management Systems R&D

Proposed Contractor: Denver Wildlife Research Center

Proposed Project Period: January 1, 1986 - December 31, 1990

Proposed Budget Period: FY 1986-FY 1990 Budget: \$2,445,000

(If any, prior total est. cost: None)

(Grand total after adding this action: \$2,445,000)

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

<u>Office</u>	<u>Name/Signature</u>	<u>Date</u>	<u>Endorsed</u>	<u>Not Endorsed</u>
AFR/TR/ARD	Marc L. Winter	<u>10-15-85</u>	<u>MLW</u>	
ANE /TR/ARD	Charles Antholt	<u>10-15-85</u>	<u>CA</u>	
BIFAD/s	John Stovall	<u>10/15/85</u>	<u>JS</u>	
LAC/DR/RD	Albert L. Brown Dwight Steen	<u>10/15/85</u>	<u>WS</u>	
PPC/PDPR	Donald McClelland	<u>10/15/85</u>	<u>DMC</u>	
S&T/AGR	Anson R. Bertrand	<u>10/15/85</u>	<u>ARB</u>	
S&T/RD	Kenneth Swanberg	<u>10-15-85</u>	<u>KS</u>	

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

ENDORSED

NOT ENDORSED

SIGNATURE

J. S. Robins
J. S. Robins, S&T/PA
Chairperson

Date 10/15/85

Any dissenting opinions are attached.

cc: S&T/PO, J. Holt

VERTEBRATE PEST MANAGEMENT SYSTEMS R&D
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VERTEBRATE PEST MANAGEMENT SYSTEMS R&D

ACRONYM LISTING

ACSAD	Arab Center for the Studies of Arid Zones and Dry Lands, Damascus, Syria
ADC	Animal Damage Control
AGIES	Agricultural Information Exchange System
AGR	Office of Agriculture
AGRICOLA	Agriculture On-Line Access Information System, USDA
AGRIS	Computerized Agricultural Information System of FAO
AID	Agency for International Development
AID/W	AID/Washington, D.C.
AVRDC	Asian Vegetable Research Development Center, Taipeh, Taiwan
BARI	Bangladesh Agricultural Research Institute, Dhaka, Bangladesh
BAU	Bangladesh Agricultural University
BGSU	Bowling Green State University, Bowling Green, Ohio
BRI	Bangladesh Rice Research Institute, Joydebpur, Bangladesh
CDIE	Center for Development Information and Evaluation
CIAT	International Center for Tropical Agriculture
CIP	International Potato Center
CIMMYT	International Maize and Wheat Improvement Center (Mexico)
CRSP	Collaborative Research Support Program
DAE	Department of Agricultural Extension, Bangladesh
DANIDA	Danish International Development Agency
DWRC	Denver Wildlife Research Center, FWS, USDI
EMBRAPA	Brazilian Institute of Agricultural Research
EPA	U.S. Environmental Protection Agency
FAA, FAct	Foreign Assistance Act of 1961, as amended
FAO	Food and Agriculture Organization, UN
FEPCA	Federal Environmental Pesticide Control Act of 1972
FIFRA	Federal Insecticide, Fungicide, and Rodenticide Act of 1947
FRG	Federal Republic of Germany
FWS	Fish and Wildlife Service, USDI
FY	Fiscal Year of the U.S. Government (10/1 - 9/30 of stated year))
GASGA	Group for Assistance on Systems Relating to Grains after Harvest
GTZ	German Agency for Technical Cooperation
IARCs	International Agricultural Research Centers
ICA	Colombian Agricultural Institute, Palmira, Colombia
ICRISAT	International Crop Research Institute for Semi-Arid Tropics
IEE	Initial Environmental Examination
IFPRI	International Food Policy Research Institute

IITA	International Institute for Tropical Agriculture
IPM	Integrated Pest Management
IPPC	International Plant Protection Center, Oregon State University, Corvallis, Oregon
IRRI	International Rice Research Institute
ISNAR	International Service for National Agricultural Research
KSU	Kansas State University, Manhattan, Kansas
LDCs	Less Developed Countries
LD50	Dosage that kills 50% of organisms tested
MAFF	Ministry of Agriculture, Food and Fisheries, UK
NAL	National Agriculture Library, USDA
NEPA	National Environmental Policy Act of 1970
NCPC	National Crop Protection Center, College, Laguna, Philippines
OAU	Organization for African Unity
OCLALAV	Common (International) Organization for Locust and Bird Control, Dakar, Senegal
ODA	Overseas Development Administration, U.K.
OECD	Organization for Economic Cooperation and Development, Paris, France
ORSTOM	Organization for Overseas Research, Science and Technology, France
PAHO	Pan American Health Organization
PASA	Participating Agency Service Agreement
PERT	Project Evaluation and Review Technique
PIO/T	Project Implementation Order/Technical
PP	Project Paper
PPC/CDIE/DI	Bureau for Program and Policy Coordination-Center for Development Information and Evaluation, Development Information Division, AID
R&D	Research and Development
RPAR	Rebuttable presumption against (pesticide) registration by EPA
RRC	Rodent Research Center, Philippines
R50	Dosage that repels 50% of animals tested
S&T	Bureau for Science and Technology
S&T/AGR	Bureau for Science and Technology, Office of Agriculture
SIP	Section of International Programs, DWRC
TDY	Temporary Duty Assignment
UK	United Kingdom
UN	United Nations
UNDP	United Nations Development Program
UPLB	University of the Philippines at Los Banos, College, Laguna, Philippines
USAIDS	AID Missions Abroad
USDA	United States Department of Agriculture

USDI	US Department of Interior
VPM	Vertebrate Pest Management
VPRL	Vertebrate Pest Research Laboratory, Joydebpur, Bangladesh

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PROJECT PAPER

VERTEBRATE PEST MANAGEMENT SYSTEMS R&D

PROJECT NUMBER: 936-4173

PREFACE

S&T/AGR recommends that \$3.91 million be authorized for a new five-year project, "Vertebrate Pest Management Systems R&D". It is also recommended that this project be implemented under a "Ribbon" Participating Agency Service Agreement (PASA) with the Denver Wildlife Research Center (DWRC), Fish and Wildlife Service (FWS) of the U.S. Department of the Interior (USDI). Of the total \$3.91 million, up to \$2.445 million will be provided from S&T/AGR for the core budget. However, the actual funding for the core budget will be determined annually subject to the availability of funds within S&T/AGR's budget. It is anticipated that another \$1.465 million will be provided through "buy-ins" by missions, regional bureaus and other AID offices. In addition, DWRC is expected to contribute another \$1.172 million in services and equipment to achieve the purpose and goal of this new project.

DWRC has the unique capability to implement this project as it is the Federal Institution in charge, inter alia, of development research in the United States for vertebrate pest management techniques and agents. The Center is a major research facility of the Fish and Wildlife Service (FWS), U.S. Department of Interior (USDI) charged with this responsibility for more than 40 years. It is a pioneer animal damage control research institution in the United States and has, for many years, been a recognized leader throughout the world in development of methods and materials for vertebrate damage control.

Research activities include damage assessment, laboratory and field studies of animal behavior and ecology to define the damaging species and its habits; and development and testing of chemical, physical, or cultural methods for ameliorating or minimizing the problem situation. Emphasis is given to ensuring that the methods developed are biologically sound, effective, safe, economical, and acceptable within the broader context of environmental concerns. The estimated replacement costs of the Denver facilities and equipment which will be available under this project are estimated at \$17.8 million.

Since 1967, AID has supported scientists at DWRC who provided the breadth of expertise required to meet the challenge of vertebrate pests without the need to duplicate such efforts in every country. Countries with permanent facilities were encouraged and supported, however, to build their own capabilities. For example, the original Philippine Rodent Research Center (RRC), developed into the National Crop Protection Center (NCPC), with a local staff of about 100 and a network of 12 field stations supported by the Philippine Government. In addition, the DWRC scientists supported research and training at DWRC and in LDCs, transferred appropriate technology to LDCs, and achieved success in reducing losses caused by vertebrate pests.

This new project will place emphasis on applied and developmental research and networking under the S&T/AGR core budget. Missions, regional bureaus and other AID/W offices will fund much of the technology transfer and training activities. DWRC will also contribute scientists and facilities to backstop these activities.

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1.0 Project Rationale, Perceived Problem, Development Assistance Background, Purpose, Goal and Beneficiaries

1.1. Project Rationale - Vertebrate pests (primarily rodents and birds) compete directly and indirectly with man for food in LDCs. Vertebrate pests thus contribute to the widespread and acute disparity between population and available food in many developing countries. This project will assist LDCs to increase the availability of food by reducing food losses from vertebrate pests, including bats.

1.2. Perceived Problem - 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 the LDCs still suffer from hunger, malnutrition, and starvation.

Historically, less effort has been expended on reducing pre- and postharvest losses due to vertebrate pests than on lowering damages due to plant diseases and insects.

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. In several LDCs, farmers have informed surveyors and extensionists that vertebrate pests are their most critical problem.

1.2.1. Food and Feed Losses due to Vertebrate Pests - Although precise estimates are difficult to derive, vertebrate pest losses in LDCs unquestionably total at least \$1.0 billion annually. Listed on page 3 are a few examples of estimated annual losses that occurred before AID initiated the vertebrate pest control program in the LDCs. (DWRC Annual Reports are available for reference in PPC/CDIE/DI).

Damage caused by vertebrate pests occurs in the pre- and/or postharvest stages for nearly all crops. Vertebrate pests also play a role in spreading human and domestic animal diseases. The table on page 3, "Estimates of Some Annual Economic Losses to Vertebrate Pests" refers to preharvest losses only, except for rice (in storage) listed as the second crop in Bangladesh.

Postharvest losses are often devastating for the individual farm family, as the family may be almost totally dependent for sustenance on the harvest and its safekeeping. These losses may average up to seven percent, but on some farms may be several times as great.

Since AID projects prior to 1983 dealt mostly with preharvest problems, less information is available at DWRC about postharvest losses. However, DWRC has been able to identify losses during postharvest periods. For example, from preliminary laboratory studies, it has been observed that birds can contaminate in about 3 weeks the top inch of stored sorghum or millet. In another study, over a five month period, a moderate infestation of mice contaminated with their urine about half of the top four inches of stored wheat, and each mouse ate 440 grams -- almost a pound -- of the grain.

ESTIMATES OF SOME ANNUAL ECONOMIC LOSSES TO VERTEBRATE PESTS*

<u>Country/Region</u>	<u>Crop</u>	<u>Pest</u>	<u>Value of loss</u> (Millions of Dollars)
Bangladesh	rice (in field)	rats	128
	rice (in storage)	rats	161
	wheat	rats	15
	crops and livestock	jackals	197
Philippines	rice	rats	60
	coconuts	rats	192
	sugarcane	rats	31
Sudan	cereals	birds	15
Africa (excl. Sudan)	sorghum, millet	birds	85
Haiti & Dominican Republic	agricultural crops	rats, birds	30
Latin America	cattle	rabid vampire bats	350

* Sources: DWRC research publications and Annual Reports, 1977-84

Village studies in the Philippines showed some of the grain present in 54 to 75 percent of the storage facilities was being eaten and damaged by rodents. Among 25 Bangladesh farmers surveyed, losses of stored foods to rodents averaged 5.6 percent per year, or the equivalent of \$59 per household per year. Studies by FAO specialists in Liberia indicate average losses of rice to rats in farm storage range from 3.5 to 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, rodents frequently eat the nutritionally rich germ of the corn kernel thus depriving the small farmers of viable seeds and/or improved nutrition. This is particularly critical to farmers in Africa and Latin America where quality seeds are not readily available. Contamination of stored foods by rodents not only reduces the quantity available, but also reduces the quality. This results in a lower sale price for the commodity. The cost of these losses has never been calculated.

Health risks to farm families and others involved are also increased by handling, using and consuming food contaminated by rodent saliva, urine and

feces. These contaminations are known to result in debilitating and fatal human diseases such as amoebiasis, angiostrongyliasis, hepatic capillariasis, leptospirosis, lymphocytic 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. Leptospirosis is common among workers in rice and sugarcane throughout most of the world.

Rodent contaminated feed or forage is a dangerous source of leptospirosis in domestic animals. Infected vampire bats transmitted rabies to cattle and other animals in much of Latin America before DWRC worked on the problem. These are only two 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 storage destroyed thousands of dozens of eggs ready for distribution; this is only a more costly example of such instances as are known.

1.2.2. LDC Situation - Except for those countries assisted extensively by DWRC under the projects funded by AID, only a few LDCs have research, action or extension programs in vertebrate pest management. Correspondingly, relatively few LDC nationals are professionally trained in vertebrate pest control. Countries with a program staffed by trained persons have received some development assistance. Most of these countries, however, do not have balanced programs, as the assistance has generally been designed to ameliorate the worst single vertebrate pest problem of the country.

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, lacking adequate personnel trained in vertebrate pest technology and management, many organizations in the LDCs cannot systematically describe problems well. Similarly, it is difficult for them to 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 and commodities.

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

1.2.3 Common Theme Aspect of Vertebrate Pest Control - Many LDC governments are interested in reducing the pre/postharvest losses caused by rodents and birds. In several countries within a region, the same crops often suffer ravages by some of the same species.

To the extent that these governments share mutual concern about reducing losses to the same crop(s), caused principally by the same pest(s), common research and technology transfer needs exist. This project will exploit these common needs by promoting subdivision of the research and sharing of the results, to the extent possible. This approach will decrease the total amount

of effort needed to be expended, while increasing the speed and efficiency of development of improvements in vertebrate pest control.

The need for sorghum cultivars which are resistant to bird damage, yet palatable to humans, is an example of a common theme for many countries, especially in Africa. Potential solutions exist. Research on this problem has led to project involvement in molecular biology to investigate the cellular structure of the sorghum seed testa and the microchemical nature of enzymes involved there. Further molecular, laboratory and field studies of many types are needed. The effort is to be divided among the concerned workers. Among other groups, it already involves three U.S. universities, AID's Sorghum/Millet CRSP, and Haitian researchers.

Missions and regional bureaus express concern for improved pest management in their stated strategies and research priorities. Missions in all three regions specifically designated pre/postharvest crop protection as a top research priority. Several missions have already shared the cost of S&T/AGR's technical assistance, training and research to develop improved vertebrate pest control. This project will maintain and extend the network of professional scientists involved in the common theme of vertebrate pest management systems approach to solving pre/postharvest losses in the LDCs.

1.2.4 Vertebrate Pest Control and Networking - Networks are one means for professionals to share technical information. However, networks among LDC professionals will not likely develop without a special catalyst, which includes necessary funding.

It is intended that this project will coordinate and backstop common theme networks. Through workshops and scientific information sharing, opportunities to improve vertebrate pest control will be enhanced. Studies and results obtained from national groups of professionals will be passed along to other groups. Where feasible, interchange of workers among LDCs will strengthen the vertebrate pest control work even more.

1.3. Development Assistance Background

1.3.1 Development Assistance to Date - Donors providing development assistance for vertebrate pest control include: AID; German Agency for Technical Cooperation; UNDP/FAO; United Kingdom; France; and, Denmark. The AID program is among the oldest and has had the most continuity. AID recognized the need for vertebrate pest management in the LDCs two decades ago and initiated a PASA in 1967 with the Denver Wildlife Research Center (DWRC). The Center was and still is responsible for implementing the U.S. Fish and Wildlife Service (FWS)'s Animal Damage Control (ADC) research program.

Since the program was initiated, there have been 235 consultative visits to 54 countries involving 4,233 person days. The general types of assistance and services provided under the predecessor projects have included assistance in: planning, organizing and implementing vertebrate pest research and management projects; designing facilities, deriving equipment specifications and installing equipment; conducting environmental assessments; providing technical assistance in the management of vertebrate pest control projects; training, ranging from on-the-job operational training of base-level

supervisory personnel to Ph.D. degree programs in vertebrate pest management; and, economic and technical analyses to determine the need for and feasibility of projects in this area.

Seven in-country projects have been established and implemented. The S&T/AGR PASA with DWRC has funded some of these; other AID sources have funded the remaining country efforts or have done so in conjunction with the centrally-funded PASA.

The project has provided training in some aspect of vertebrate pest control for about 275,000 people. In addition, 40 people from 11 countries have received graduate degrees as a result of the project. Extensive research has been conducted in and for the countries with vertebrate pest control projects. In connection with this research, DWRC personnel have published more than 275 scientific papers. Annual Reports, brochures, extension materials and research papers have been widely disseminated. These combined activities have led to the establishment in LDCs of 16 programs dealing with vertebrate pest control and the strengthening of 12 other programs.

Listed below are some outstanding instances of preharvest loss reduction that have resulted from DWRC research and technology transfer efforts.

ANNUAL REDUCTION IN VERTEBRATE PEST LOSSES*
RESULTING FROM THE DWRC PROJECTS

<u>Country/ Region</u>	<u>Crop</u>	<u>Pest Controlled</u>	<u>Actual (A) or Potential (P)</u>	<u>Loss Reduction Value (Millions of Dollars)</u>
Bangladesh	wheat	rats	A	1
Colombia	coconuts	rats	P	10
Philippines	rice	rats	A	14
	coconuts	rats	P	140
Latin America	cattle	rabid vampire bats	A	270

* Sources: DWRC research publications and Annual Reports, 1977-84

Vertebrate pest control techniques developed by DWRC resulted in actual savings of more than \$296 million in FY 1984. In contrast, the entire investment of S&T/AGR (and its predecessors) in all of the activities since 1967 was only \$8.8 million. This translates into a one-year benefit that is 33 times greater than the 18-year cost to S&T/AGR. In addition, those countries where the DWRC scientists were stationed made an estimated direct and indirect contribution of approximately \$2.2 million.

Through the network of world renowned scientists, research results are readily shared. This avoids duplication and encourages complementary activities. Research results obtained in one area are applied to other areas with similar ecologies. This has contributed to the project's success.

Reliable worldwide data on reduction of postharvest losses are not readily available. However, FAO projects in Cuba and Liberia showed that reduction of grain losses from vertebrate pests (mostly rice) could be achieved at a very favorable benefit:cost ratio of more than 4 to 1. This ratio included the total preharvest investment.

On May 21, 1984 the PID for the new project was unanimously endorsed by the members of the Sector Council for Agriculture. This endorsement was with the understanding that greater emphasis be given to networking and to facilitating and supporting priority research. Needed technical services to host country cooperators are to be continued through missions. Because rodent and bird pest problems vary in different crops and environmental settings, the approaches to resolving these problems may be quite specific. Thus building and strengthening institutions in certain countries may be necessary to address different mixes of problems.

This project paper expands the research and networking activities previously funded under project 936-4120, Pre/Postharvest Rodent/Bird Control R&D. In addition, assistance will be provided to LDCs for building and strengthening institutions which deal with vertebrate pest management systems.

In May and August 1985 cables were sent to all missions requesting comments on this S&T/AGR project, an indication of future needs for assistance, and the level of mission anticipated "buy-ins". The mission responses received have been very favorable and recommended the continuation of the activities. While most of the missions were not in a position to indicate the level of funding that would be provided, many did indicate that there will be future needs for DWRC to provide technical assistance, research, and training. The mission responses are summarized in Appendix XIV.

1.3.2. Future Development Assistance Needs - Effective, acceptable management techniques to reduce losses from vertebrate pests are either not known or not applied in many LDCs due to lack of qualified personnel to administer successful control programs. In any ecological area, a complex of species of vertebrate pests may be causing damage to one or more crops. The pests and the crops they damage differ from place to place.

But, for our convenience in considering these problems, the principal pest(s) and the most important crop(s) being damaged are frequently referred to as "the problem" of an area. Thus, references can be seen stating that the bandicoot rats are damaging rice in South Asia, or that quelea birds are feasting on sorghum and millet in African savannahs. In both cases, the problems are more complex.

Applied and developmental research - Research to solve vertebrate pest problems has, at best, just begun. This is true for problems ranging from the widespread crop destruction by gophers in Central America, to the ravaging of corn and sorghum by the multimammate rat of Africa (which also carries plague), to the much studied grain-eating quelea birds of Africa, and to parakeets feeding on ripening corn in Asia.

Nineteen multinational vertebrate pest problems are known which are judged to be serious constraints to increasing agricultural production and food availability. Little or no research has been conducted on any of these vertebrates. To reduce the crop destruction by these vertebrates, problem-solving research must be undertaken. The expansion of the research program will result from careful choice of priority problems and collaboration with all pertinent institutions. Criteria for the choice of research problems, and suggestions for establishment of an agenda for the studies are stated in Section 6.4 below.

More information is needed on the biology, ecology, and behavior of almost all pests. This project will backstop such research. It will also backstop essential studies of various management techniques and their combination in programs to manage particular pest complexes in specifically defined crop ecological environments.

Institution building - For LDCs to conduct vertebrate pest management research and transfer the resulting technology appropriately to the farmers, an institutional framework is necessary. As noted earlier, many LDCs lack this capability. However, DWRC has strengthened many LDC institutions allowing them to plan and implement policies and institutional self development. These activities catalyze them to design and implement programs in vertebrate pest management.

For example, in the Philippines, DWRC assisted in the development of an effective organization to manage an efficient vertebrate pest management program, the National Crop Protection Center. The new project will continue to foster essential institution-building efforts through training and technology transfer.

Technology transfer. Vertebrate pest control research that forms the basis of pest management programs is of little value until the technology is transferred to the farmers. Frequently those requiring the technology most are the traditional and small commercial farm families. This project will ensure that these farm families benefit from the research and technical assistance provided. This will be accomplished by: 1) simplifying recommendations; 2) avoiding costly inputs; 3) using readily available inputs; 4) drawing recommendations to and for existing credit programs; and 5) designing recommendations around the socio-economic patterns of traditional small farmers.

This project will concentrate on appropriate transfer of pest management technology, as DWRC has done for rat problems associated with wheat in Bangladesh and rice in the Philippines. DWRC's technology transfer efforts were similarly successful in connection with the vampire bat/rabies problem in livestock in Latin America.

Training - The lack of trained people is the greatest constraint to progress in vertebrate pest control in many LDCs. An organization requires trained personnel to effectively and efficiently manage a vertebrate pest management program. In connection with the predecessor projects, thousands of individuals, including farmers, extension agents, technicians, biologists, veterinarians, administrators, and others have received both informal and formal training ranging from on-the-job training to field days to Ph.D. degrees. Formal training promoted by DWRC has resulted in 40 LDC scientists from 11 countries receiving graduate training leading to advanced degrees (M.S. or Ph.D.). Most of these individuals have returned to their countries and are working in some aspect of agriculture or vertebrate pest management.

1.4. Project Goal - The goal of this project is to increase the availability of food and feed to improve human and animal nutrition and productivity.

1.5. Project Purpose - The purpose of this project is to help LDCs improve their capabilities to develop and utilize vertebrate pest management systems which will reduce pre/postharvest losses.

1.6 Beneficiaries - The most important beneficiaries are the families with small farms who, by using improved vertebrate pest management systems, increase their agricultural productivity and the availability of food. This has particularly occurred in Bangladesh, Haiti and the Philippines. Pest management institutions in these countries have directly benefited from DWRC's institution-strengthening activities. Since DWRC emphasizes institution building, even during short TDY consultations, institutions in several other countries, especially in Africa and Latin America, have also benefited.

2.0 Project Description - The new project will impact directly on AID's Policy and Strategy and complement bilateral vertebrate pest management projects. It will fund field research, support long-term U.S. and LDC based research for workable LDC adaptation, provide academic and technical training, transfer technology, provide technical assistance, and build networks of vertebrate pest management scientists and experts, policy makers, international institutions and/or aid donors in the U.S., Asia, Near East, Africa, Europe and Latin America. It will be concerned principally with bats, birds and rodents as pests of agriculture.

To achieve the project objectives, four interacting and overlapping components are foreseen: applied research; technology transfer, including problem solving services; multi-level training; and progressive networking. These components are designed to assist LDCs with the development and improvement of effective and efficient vertebrate pest management systems.

The project will provide the services of highly skilled and experienced scientists with expertise in vertebrate pest problems and their management. Included are wildlife biologists, zoologists, research pharmacologists, and research chemists who will promote the transfer of technology from results achieved by research to the farmers' fields in the LDCs. Attached as Appendix XII is a schematic diagram which illustrates how technology flows from the research component at DWRC and in LDCs to the farmers. The results are systematically improved based upon feedback of technical or socioeconomic problems identified at each step.

Activities in Africa will be emphasized. This region is especially subject to severe vertebrate pest problems which require additional investigations to adapt known techniques or to develop new ones. The extension service of many African LDCs needs to be strengthened in order to extend integrated vertebrate pest management programs adequately. This will be investigated with the Africa Bureau and the appropriate missions.

This project will be implemented under a five-year "ribbon" PASA. Thus, as a ribbon project, the S&T/AGR core-funding serves primarily to assist DWRC to maintain a research base to provide international backstopping and a response capability for mission projects. It is anticipated that missions and regional bureaus will contribute approximately \$1.465 million through "buy-ins" to the S&T/AGR Ribbon PASA.

In addition, the missions in Bangladesh and Pakistan have negotiated PASAs directly with DWRC which total \$1.15 million and \$0.99 million respectively. S&T/AGR's "Ribbon" PASA will be expected to provide some of the multidisciplinary backstopping for these agreements and for the program in Haiti. The Haiti program is to be funded through a "buy-in" under the "Ribbon" PASA.

DWRC also makes a substantial contribution to the international program in the form of scientific support, backstopping, research, receiving visitors, providing training and networking with world renowned scientists in the developed and less developed countries.

Activities of the four components are noted below. The stated number of occurrences of each activity over the life of project represents an estimate of the order of magnitude of the activity relative to other aspects of the project and anticipated mission funded "buy-ins".

2.1. Applied and Developmental Research - Research has been an important aspect of the previous project. It is planned that research will be an even more important part of this new project. Much of the research has been and will be concerned with the development of certain technologies and methodologies that do not exist in the LDCs, but which are crucial for resolution of vertebrate pest problems. Priority research topics will be identified each year by the Project Manager in consultation with the Chief, SIP, DWRC. Investigations pertaining to African problems will be emphasized to the extent possible and within the funding constraints.

Two priority topics which happen to pertain to African problems are: 1) the development of methodology to give early warning of an upsurge of rodent numbers; and, 2) the development of palatable sorghum cultivars which are resistant to attack by birds.

With regard to any particular problem, the initial research to be undertaken generally will be of an applied nature with this leading to developmental research. Much of this investigational work will be designed to: 1) solve food and feed problems that are caused by vertebrate pest infestations; 2) improve the effectiveness and efficiency of vertebrate pest management systems; and 3) develop low-cost methods to solve specific problems in the LDCs. Many problems potentially will require an in-depth research approach.

Based on past experience, such an approach often requires the joint effort of ongoing U.S. sponsored research combined with research in the host country by DWRC and LDC personnel. The Annual Work Plan will respond to the priority research topics and state the implementation plan for the year's research component.

The research on problems affecting the LDCs will be performed at DWRC; at collaborating LDC institutions; and when feasible, at international organizations such as the IARCs. DWRC will fully utilize its position and long established relationships to draw on resources from public and private institutions and companies in the U.S. and the more advanced LDCs such as Brazil, to facilitate and enhance the program of applied research.

Research in the U.S. that is appropriate to solving pest problems in LDCs will be funded by this project. Research in LDCs will usually be funded by missions.

The applied and developmental research areas to be covered are:

1. Methods Showing Improvement for Control of Distinctly Different Pest Problems - The process defined below should identify, in one specific area, an integrated program to solve the problem of that area. Most often the problem will be critical in several regions of one LDC. The process will be confirmed through regional verification trails. Since an earlier test has indicated a program's usefulness, these verification trials can also initiate the demonstration to administrators, trainers and extension supervisors of the validity of the proposed improved VPM program. The research scientists generally are in charge of verification trials. Being conducted in LDCs, these trials call for mission buy-ins.

Solutions will be developed for at least 2 distinctively different pest problems and confirmed by in-country verification trials during the life of the project.

- Develop Damage Assessment Methods (field work in LDCs)
Missions and LDCs will request assistance regarding vertebrate pest problems for which little or no information is available. The first step is to assess the losses caused by the vertebrate pests to determine the relative importance of these problems in comparison with other problems of the LDC. To assess the losses an acceptable method must be developed and used.

In many instances the losses cannot be assessed directly, and studies must be undertaken to determine the pest damage. This can be accomplished by using methodologies to be developed by DWRC which determine the relationship of pest damage to yield loss. In-country studies will determine an appropriate method by which to assess the damages. Then by determining the relationship of pest damage to yield loss, the monetary losses per hectare can be calculated.

It is expected that it will be necessary to develop six of these damage assessment methods for different types of losses during the life of the project.

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- Conduct Assessment of Vertebrate Pest Damage (field work in LDCs) - In LDCs where the determination has been made as to the appropriate method for damage assessment, data will be collected to estimate yield loss. The estimated yield loss analysis will be the basis for LDC governments to assign priority to research and other activities to reduce vertebrate pest losses during the pre/postharvest period. These data collection activities will be funded as mission "buy-ins". Problem solving research and development will normally follow this step.

It is expected that four assessments will be undertaken during the life of the project.

- Laboratory and Field Studies in Pest Biology, Behavior and Ecology related to Control (in LDCs and at DWRC) - In certain instances where the vertebrate pests or the affected farming systems are different than problems studied earlier, it may be necessary to gain additional biological knowledge in order to solve these problems. This could involve laboratory studies at DWRC and field studies in the LDCs to gain data on pest biology, behavior and ecology related to control. The S&T/AGR budget will fund the studies at DWRC and the missions will be required to fund the field studies in the LDCs.

It is expected that eight laboratory or field studies will be undertaken during the life of the project.

- Laboratory Toxicity, Bait Acceptance or Efficacy Studies (in LDCs and at DWRC) - Initial studies of control techniques for vertebrate pests are generally conducted in the laboratory. Toxicity or repellency of specific vertebrate pest management agents to the specific pest of concern must be known. In the event a bait is expected to be used, the acceptability of various baits to the pest will be studied.

Known control materials or techniques will be modified through applied research, involving laboratory and field studies, to address specific problems. Development of modifications will frequently involve new or ongoing DWRC research in the U.S., with impetus likely to be gained from ongoing research on U.S. domestic problems.

Indications of the efficacy of pest management techniques can be gained from these studies. S&T/AGR will fund the studies at DWRC and the missions will fund the more definitive and extensive studies in the LDCs.

It is expected that fourteen studies will be undertaken during the life of the project.

- Preliminary Field Control Tests (in LDCs) - All the information gained from the studies noted above leads to projections and preliminary trials of technology(ies) expected to be highly useful in management or control of the pests. In many instances several preliminary trials are required to gain adequate knowledge to move to the next stage of research. This work must be done in LDCs to be valid; mission buy-ins are required.

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During the life of the project, it is anticipated that six such investigations will be conducted.

- Integrated Vertebrate Pest Management Field Studies (in LDCs) - With sufficient information from preliminary trials, it is necessary to move to the next stage. Integrated vertebrate pest management is the goal. So, field studies are devised to test combinations of techniques which preliminary field trials indicate are useful. The most efficacious combination will be determined. These investigations, conducted in LDCs will be funded by mission buy-ins.

Three of these studies are expected to be conducted during the life of the project.

2. LDC Nationals Competent to Perform Research (in host country, U.S., or third country) - As has been the practice in predecessor projects, DWRC expects to be involved in the development of study programs so that LDC graduate students can perform the necessary research. As participants are selected for the advanced degrees, DWRC project scientists will assist in selection of the institution at which the research will best be conducted. As desired and feasible, project scientists can see that arrangements are made for the conduct of the research.

Funding of the graduate training will be by the host countries, the missions or other organizations, such as FAO. For training in the host country or a third country, provisions must be made that proper equipment, materials and supplies are available for the research as well as provisions for needed transportation for field studies. Charges, if any, for use of facilities and equipment will need to be met by the "sponsor".

For training at DWRC or one of its field stations, these needs may be easier to arrange. The Center has absorbed the cost of the use of its facilities and equipment from its FWS/DWRC budget in past years and is expected to be able to continue to do so in the future.

Subject to funding availability for graduate training, the project is expected to arrange for ten graduate students to perform research over the life of the project. Research competency will be demonstrated.

2.2 Technology Transfer - Under technology transfer, DWRC will continue to provide problem solving assistance, technical transfer and information services to missions, LDC governments, national and international organizations and institutions. In the process of providing assistance, DWRC scientists also will collect information on successful vertebrate pest management control systems and models which may be appropriate for further research, development and adaptation in other LDCs. Thus, there will be a continuous feedback of information from and to DWRC and LDCs under this project.

2.2.1 Technical Transfer of Information - Under this sub-component, technology developments and research results will be analyzed by scientists familiar with LDC problems and conditions. These scientists will identify those results applicable and appropriate for adaptation and exploitation for resolving vertebrate pest problems in LDCs and/or improving the efficiency of operations. Appropriate technology will be transferred to and disseminated in LDCs through technical assistance, visits, training courses and workshops, and reports and specially prepared informational materials.

Information on research and technical papers will continue to be available for retrieval for researchers concerned with LDC problems. Special emphasis will be placed on collection of pre/postharvest rodent and bird control information. This information will be shared with workers in LDCs and in other interested organizations, upon request. S&T/AGR core funding generally will be used for this activity. (Payment will be requested for fulfilling requests in excess of that foreseen as within budgeted amounts.) The most widely shared single document in recent years has been the Annual Report. It is principally a technical paper and goes to about 700 scientists and specialists in LDCs.

This type of information sharing is a highly cost efficient means of providing development assistance. For this reason links with other systems such as AGIES, AGRIS, and NAL's AGRICOLA will be developed or strengthened to the extent possible.

Types of assistance and outputs are listed below:

1. DWRC and other research findings disseminated to LDC public and private institutions and IARCs on safe and effective vertebrate pest control methods

Publications of DWRC scientists or others concerning improved laboratory or field research methodology or about vertebrate pests and their management, if pertinent to LDCs, will selectively be sent to scientists and specialists concerned with LDC problems. Formal research publications frequently will be used as the vehicle for this technical information transfer. Obviously most of the persons to whom these publications are sent will be members of the network of VPM and other concerned specialists developed over the years. These activities normally have been funded partly by the S&T/AGR budget and partly by the FWS/DWRC budget. This pattern is expected to continue.

Twenty-five formal publications will be distributed during the life of the project which will result in increased demand by missions, LDCs and IARCs for DWRC publications and demonstrations.

2. Demonstrations of Improved Vertebrate Pest Control Systems - Following regional verification trials, noted under the research component, DWRC will assist in demonstration of the integrated, improved, VPM systems. Extension supervisors are expected to be in charge of demonstrations; the

DWRC and LDC project researchers will be the resource personnel. Administrators, trainers of extension personnel, extension workers and persons that are influential in the farm communities will be targets of the technical transfer of information in this activity. DWRC involvement will be funded through mission buy-ins.

Demonstrations of two systems are expected during the life of the project.

3. Training Manuals and Syllabi Developed and Disseminated - To speed the technical information transfer, DWRC will develop and disseminate training manuals and syllabi. Concurrence of at least one concerned mission will be sought before launching a specific activity of this nature. The preparation of these materials in English is expected to be funded by S&T/AGR. Reproduction in English, and translation into and reproduction in French and/or Spanish likely will require mission funding.

Material for five training courses will be developed during the life of the project and used by institutions in at least 2 LDCs.

Responses to Inquiries by Correspondence - DWRC will continue to respond to letters/telex/telephone inquiries concerning vertebrate pest management from scientists and specialists in LDCs and those with international organizations. The cost of much of this activity has been funded under the "regular" FWS/DWRC budget. Obviously, a member of the Section of International Programs, DWRC, will oversee the work.

Approximately two hundred responses to inquiries will be made annually or 1,000 during the life of the project.

Short-term visitor reception at DWRC - The many visitors to DWRC from LDCs and international organizations will participate in workshops and seminars and/or in discussion groups. In the past, many visitors have spent up to 5 - 10 days at the Center. Under this new project, discussions will be arranged with appropriate DWRC scientists by the Section Chief. Reprints and reports will be supplied as requested. These activities will be funded both by S&T/AGR and FWS/DWRC.

Sixty technology transfer sessions are expected during the life of the project.

4. Distribution of Select Information on Pre/Postharvest Vertebrate Pest Control - DWRC will continue collecting worldwide information on VPM research and development activities. Pertinent VPM materials will be distributed in summarized format and/or reproduced R&D reports to alert recipients to the latest research results, and new technologies developed. In addition, these activities will note upcoming scheduled workshops, and international meetings and conferences. Most of the costs will be funded by S&T/AGR. In addition, FWS/DWRC's budget will also be used.

Twenty or more summaries will be sent, selectively, to up to 700 recipients during the life of the project.

- 5 Handbooks on Vertebrate Pest Research and Control - DWRC will develop handbooks dealing with vertebrate pest research and control based on their extensive experience. This very important activity of the project will contribute substantially to the success of transferring technology to the LDCs. DWRC scientists will draw from the many years of extensive experience to develop these handbooks. Three handbooks have already been developed and are being used in LDCs. Topics to be considered for the new handbooks include the following: management of quelea birds; management of rats in floating rice, management of rats in wheat; management of bird damage to emerging rice; management of parakeet damage to ripening wheat or sunflowers; and management of rodent loss in stored grain.

Four handbooks will be developed and disseminated to LDCs and IARCs and will be used in at least two LDCs and one IARC.

2.2.2 Problem Solving Assistance - Under problem solving, DWRC will provide the services of the most appropriate scientists and experts to LDCs upon request from S&T/AGR, missions, LDCs, regional bureaus and other AID/W offices. These experts and scientists will be drawn from DWRC and FWS to implement and successfully complete the various assignments to be funded by AID. The development of improved vertebrate pest management systems and their introduction into the agricultural systems of the LDCs, along with the handbooks, continues as a major tactic of the strategy for decreasing crop losses to vertebrate pests and increasing world food and feed supplies. Short- and medium-term problem solving assistance will include the following important areas of effort concerning vertebrate pest management systems.

1. Identifying, analyzing, and recommending action regarding vertebrate pest problems or managerial, financial and operational problems in vertebrate pest management systems - Problem identification involves: a) ascertaining the pest species and their biology; b) determining the crops and produce damaged; c) assessing the principal losses; d) identifying interrelated factors; e) defining potential detrimental influences on the environment and how to avoid them. DWRC personnel will assist in problem identification, usually beginning by a TDY visit to the LDC. Such a TDY will be funded by the USAID Mission concerned.

Twenty responses will be made to requests during the life of the project and the resulting recommendations implemented in at least 10 LDCs.

2. Designing, Planning, Organizing, Reorganizing and Implementing projects or components of projects dealing with vertebrate pest management systems in the LDCs - DWRC scientists will assist LDCs during all stages of program development; i.e., during the project identification; during feasibility studies; during project paper preparation; during research and development of improved vertebrate pest control programs; or, during the implementation of these programs. Missions will be required to fund these activities.

At least ten such activities will be designed and at least seven cleared technically by the missions involved.

3. Perform Environmental Assessments and Evaluate the Environmental Effects of Vertebrate Pest control chemicals - Upon request, DWRC will prepare environmental assessments and evaluations to determine the environmental effects of vertebrate pest control chemicals. Projects will be designed to assure the safe use of effective measures to protect LDC environments. These actions will also assure the AID requirements of Regulation 16 are met. Missions will be required to fund these activities.

Five environmental assessments will be prepared and cleared by the appropriate AID environmental officer(s) during the life of the project.

4. Evaluate projects dealing with pre/postharvest vertebrate pest control problems - DWRC will evaluate projects dealing with pre/postharvest vertebrate pest management problems upon request. Mission funding will be required.

Two evaluations of projects will be conducted by DWRC scientists during the life of the project.

5. Provide advice on organization, management and conduct of research, control and extension - Institution-building, except for training (see Section 2.3 below), is considered to be a part of the problem solving assistance component. Yet, to the extent that research institutions are strengthened, it is part of the research component. Advice will be offered regarding the type(s) of organization(s) needed to: a) conduct vertebrate pest management research on a continuing basis; b) select and organize the necessary control programs; and c) to successfully conduct extension programs of vertebrate pest control. Funding will be arranged by the Mission.

To help sustain the efforts of host country institutions, advice will be offered on providing for adequate recurring costs through normal budgets, not those of special projects. Suggestions on requirements for developing the necessary organizational infrastructure will be provided. DWRC has been quite successful in developing support in several countries for continuing national activities after AID involvement is terminated. Mission funding will be required for support of these DWRC efforts.

DWRC will provide advice on two institution-building needs in LDCs during the life of the project.

2.3 Training - Training programs of varying intensity, duration, depth and emphasis have been and will continue to be designed and implemented at DWRC, FWS field stations, U.S. Universities and at national and international institutions with the help of DWRC scientists. Training for African specialists will be emphasized to the extent possible within the availability of funds. These training programs will range from graduate degrees in vertebrate pest management to in-service or on-the-job training at the LDC operational level. Professional development will be fostered in other ways. A successful approach in AID's vertebrate pest control projects has been to

involve host country personnel directly in research investigations, field trials, and demonstrations, as well as administrative aspects of the project. Due recognition is always given to LDC scientists and experts for their contribution. Many accomplishments from earlier projects can be credited to this practice. On-the-job training, in many forms, will also be part of this activity.

The types of training and the expected outputs are listed below:

1. Regional and In-country Workshops and short courses on pre/postharvest vertebrate pest problems - DWRC will promote workshops and short courses. Upon request, DWRC will take the leadership in holding regional and in-country workshops and short courses on pre/postharvest vertebrate pest problems and their management. These may be held to foster interest in critical problems. Usually, however, such an event will be designed to improve vertebrate pest management research or extension programs. Missions and/or regional bureaus will usually be required to fund these activities, especially if they are country specific.

Ten workshops and short courses are expected to be held among the three regions during the life of the project.

2. Basic Training Courses Adapted to Meet Specific Needs of LDC Trainees at DWRC using Audio Visual and other Techniques - As a part of the S&T/AGR core-funded activities, DWRC will adapt existing basic training courses for use with LDC trainees. In this manner, using audio-visual and other techniques, DWRC will meet the specific needs of LDC scientists and/or experts receiving training at the Center. It is anticipated that five versions of the basic courses will meet the needs of most LDC trainees. It must be noted that trainees will not be funded by the S&T/AGR core budget.

Five versions of training courses will be developed and at least two used more than once during the life of the project.

3. In-service and on-the-job training at operational levels within:
 - a. Appropriate LDC Organizations - Routinely, as an important part of DWRC in-country activities, in-service and on-the-job training (frequently in a one-on-one relationship) will be provided for LDC experts assigned duties in connection with vertebrate pest management. This training actually may be short-, medium-, or, in association with research in LDCs, it may be long-term in nature. Missions will be required to fund the DWRC scientists either through "buy-ins" to the "Ribbon" PASA or through a direct PASA with DWRC.

Two on-the-job training activities will be conducted in the LDCs and a repeat request will be received during the life of the project.

b. In U.S. Organizations - LDC persons receiving training in vertebrate pest management in the U.S. will usually be recipients of on-the-job training from DWRC scientists. Such trainees may be graduate students, participants in study tours, or participants in a non-university-credit course of training at DWRC or at any of the DWRC domestic field stations.

It is not practical to budget for the on-the-job aspect of this training. To the extent that non-Section of International Programs, DWRC (SIP) scientists are involved, historically, this on-the-job training has been covered by the FWS/DWRC budget. SIP personnel involvement would be charged to the appropriate AID funding source.

Two such training activities will be held at DWRC and a repeat request received during the life of the project.

4. DWRC Scientists Assist Major Professors of LDC Students in Guiding Their Thesis Research - Every reasonable effort will be made in this ribbon project to professionally train and develop host country scientists. This often requires training in a degree program in the U.S. S&T/AGR core funding does not cover professional training of LDC scientists or other training in the U.S. Historically, missions, AID Regional Training Projects, FAO, other UN organizations and host governments have provided the needed funds.

The most prominent professional training in vertebrate pest management has been the pursuit of advanced degrees in the U.S. by newly-appointed LDC specialists. The major professors of nearly all such trainees have been and will be offered thesis research guidance from DWRC scientists in any of the many disciplines. This has been a major AID benefit over the years, for which the FWS/DWRC budget has provided most of the funds to cover salaries and fringe benefits of the DWRC personnel.

In many instances the thesis research, or part of it, will be conducted at DWRC or one of its field stations. In those cases, the cost of use of the equipment and facilities has been funded from the FWS/DWRC budget.

Due principally to the efforts of DWRC scientists, there are now a few institutions in LDCs where graduate training in vertebrate pest management is provided; e.g., at the University of the Philippines at Los Banos, Laguna, Philippines. DWRC scientists will also be available to backstop guidance to major professors for the thesis research of enrollees at these institutions.

These services normally will be provided without direct cost to the organization funding the graduate training. If a specific TDY is needed, funds from sources other than S&T/AGR will be required.

Backstopping will be provided to major professors regarding thesis research of fifteen graduate students during the life of the project.

5. Training-of-Extension Trainers in LDCs - The project will foster extension training and develop extension aids, and tailor them to small farmers among the user population. Thus, training will be designed to reach the user of improved vertebrate pest control. Mission funding will be required.

DWRC scientists will provide and evaluate training courses of different types and levels. At every opportunity, the training-of-trainers will be emphasized. Syllabi and training aids will be developed as necessary. On-the-job training is frequently an important aspect of this activity. Full mission funding may be required.

In all of the training needed to strengthen the LDC's infrastructure, the training-of-extension trainers is frequently the most important. An improved, integrated VPM program stands little chance of wide adoption and use unless the extension workers can pass along all of the information necessary. Otherwise, farm families will not be motivated to utilize the new technologies. DWRC, with the aid of a mission buy-in, will assist in this training.

Two courses will be held during the life of the project.

2.4. Building Networks - DWRC has long established linkages to a "network" of human and technical resources with FWS, USDI, U.S. public and private institutions, LDC national, regional and international organizations. As indicated in Appendix XIII, DWRC is the hub of a very extensive, but mostly informal network of persons, units and institutions in more than 45 LDCs with especially close and resourceful linkages with FAO, IRRI, ICRISAT, OAU, and UNDP.

LDC institutions and individuals, involved in vertebrate pest management in countries where this ribbon project is being implemented, will be encouraged to expand this network to other institutions working on vertebrate pest management. The project will coordinate and backstop network activities, and support periodic communications and promote even short-term exchange of professionals between countries, where feasible. All of these activities, except exchange of professionals, will be funded at least in part by the S&T/AGR core funding.

Under the network approach, the following activities will be undertaken:

1. Continue Linkages with International and Regional Institutions, such as FAO, IRRI, and ICRISAT and Establish New Linkages with Additional Institutions -

Two new collaborative research activities will be initiated, including at least one with an IARC and research activities with others will be expanded during the life of the project.

2. Continue Linkages and Establish new linkages with LDC Institutions

DWRC will continue its network with LDC institutions (e.g., National University of Costa Rica; Charles Darwin Research Foundation, Ecuador; Wildlife Management Unit, Zimbabwe; National Crop Protection Center, Los Banos, Philippines, Vertebrate Pest Management Unit, Thailand. EMBRAPA, Brazil; Arid Zone Research Institute, India; Agricultural Research Institute, Bangladesh and Agricultural Research Council, Pakistan) and establish three new linkages with other LDC institutions.

Communications among LDC institutions will be facilitated and cooperation in research intensified in the present network groupings and activities will be extended to at least three new institutions in LDCs.

3. Continue Linkages with other Organizations Involved in International Assistance Dealing with Problems of Vertebrate Pests - DWRC will continue active collaboration with other International Organizations; e.g. GTZ, Germany; ORSTOM, France; MAFF, U.K.; and DANIDA, Denmark.

Regular communications and mutual awareness of each other's projects and activities will be maintained during the life of the project.

4. Continue Collaboration with Public and Private U.S. Organizations

DWRC will continue collaboration with public and private U.S. organizations; e.g., Bowling Green State University, University of Arkansas, University of California, Davis, Colorado State University, Purdue University, Texas A&M, and U.S. vertebrate pesticide manufacturers.

5. Develop Additional Linkages with U.S. Organizations

DWRC will develop linkages with two additional U.S. organizations which have activities related in some way with this project.

6. Hold International Workshops in LDCs and International Centers - Common theme workshops will be encouraged. Some workshops of a more general nature will be planned for information dissemination. Workshops will also be needed to expand awareness of vertebrate pest problems and their solutions. The project will plan, publicize, and promote workshops. Network members ideally would have the opportunity to attend one international workshop each year. Some small amount of the S&T/AGR core funding, moneys from the appropriate regional bureau(s), missions and host country(ies) will be combined to support these workshops.

Five workshops will be held, including one in Africa, one in Asia and one in Latin America.

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3.0 Project Conformity with the Strategy for Food and Agriculture Development Assistance - The objectives of A.I.D.'s Food and Agricultural Policy and Strategy are to enable LDCs to become self-reliant in food, assure food security and contribute to broadly-based economic growth. This project is consistent with these objectives and the four (4) elements of the policy listed below:

3.1 Improving Country Policies - This project is designed to improve the standard of living in agricultural areas by increasing agricultural productivity and the availability of food. It fosters and assists LDCs with the development and improvement of policies, institutions, technologies and manpower resources needed to maintain and improve vertebrate pest management systems which will lead to increased income and employment.

3.2 Providing Food Aid and Food Security - Improvement in agriculture production is necessary in most developing countries to reduce the need for food aid and increase food security. The technical transfer of information and institutional development of this project foster improvement in agriculture. This new project also will improve agriculture by using the latest technology in vertebrate pest management under the research, technology transfer, training and networking components.

3.3 Expanding the Role of the Private Sector - The private sector will be used to strengthen project work and enhance opportunities for continuation of usage of the improved technology. Where government policies allow private sector participation, the project will work with interested private sector organizations to encourage them to formulate and/or distribute needed vertebrate pest control materials. In LDCs where the private sector is not used, the project will work with AID personnel engaged in policy dialogue to effect change. DWRC has been successful in working with the private sector under past agreements. For example, in the Philippines, private sector organizations were heavily involved in pesticide distribution in connection with the successful reduction of losses in irrigated rice. In Bangladesh, DWRC was instrumental in developing private sector initiative to engage in formulation and distribution of baits used in the successful reduction of losses due to rats in wheat.

3.4 Development of Human Resources and Institutional Capacity - DWRC will strengthen human and institutional resources used in the implementation of improved vertebrate pest management programs to reduce food losses during the preharvest and postharvest stages. Technical assistance will be provided to strengthen LDC institutional capabilities to improve Vertebrate Pest Management Systems; LDC scientists and experts will be trained at U.S. universities, in their home countries and at DWRC; and the network of world scientists will be maintained and expanded.

3.5 Conformity with S&T's Ribbon Project Approach - This project will continue the ribbon approach established under the previous projects to link with and support the efforts of a range of bilateral, regional, and global projects related to vertebrate pest management systems. Networks are one means for professionals to share technical information. However, networks among LDC professionals will not likely develop without a special catalyst, which includes the necessary funding.

It is intended that this project coordinate and backstop common theme networks. Through workshops and scientific information sharing, opportunities to improve vertebrate pest control will be enhanced. Some of the benefits of fostering the ribbon approach are as follows:

- Sharing of expertise among several aid donors and international institutions (e.g., ICRISAT, IRRI, FAO and CIMMYT) promises in the long term to reduce the LDCs' dependency on any one donor for assistance.
- By pooling the resources of scientific organizations and personnel, each will have access to a much greater level of interdisciplinary expertise. This is especially beneficial to scientists and experts in the small and poor LDCs. The results in one country can be effectively applied to other countries of similar environments.
- International collaboration results in a holistic approach and effort which increases efficiency and productivity. International linkages provide countries with new information, ideas and technologies and contribute to breaking down the barriers of scientific isolation so commonly found in the LDCs.

3.6 Conformity with Regional Bureau Priorities - The agricultural research priority of the regional bureaus is to increase crop production. This project is designed to increase and improve crop production by reducing losses caused by vertebrate pests. Further, it supports and complements key agricultural projects in agricultural production and supply systems in less favorable environments; minimum-purchased-input systems; and pre- and postharvest systems to prevent food and feed losses. It also strengthens LDC institutional capability by providing technical assistance and academic, technical and on-the-job training at DWRC and at LDC national, regional and international institutions.

3.7 Relationship to Other S&T Projects - To use available technology better, DWRC will investigate the possibility of collaboration with contractors, grantees and agencies which have agreements with the Office of Agriculture, the Office of Rural and Institutional Development, and the Office of Education:

3.7.1 Office of Agriculture Projects

- Collaborative Research Support Programs: to reduce crop losses from vertebrate pests during pre- and postharvest periods:
 - Sorghum/Millet - University of Nebraska
 - Peanuts - University of Georgia.
- Storage and Processing of Fruits and Vegetables - University of Idaho: to reduce losses of fruits and vegetables.
- Agricultural Policy Analysis - Abt Associates: to identify policies and constraints affecting use of pesticides to reduce vertebrate pest losses.

- Farming Systems Support - University of Florida: to identify areas in farming systems research and extension where vertebrate pest management systems can be promoted.
- International Agricultural Research Centers:
 - IRRI - to continue the work to prevent rice losses from rats and birds.
 - CIMMYT - to prevent losses from vertebrate pests in corn, wheat, barley and triticale.
 - IITA - to identify areas in agriculture and cropping systems where vertebrate pest management systems can be utilized to prevent crop losses, such as in sweet potatoes and other root crops.
 - CIAT - to prevent losses from vertebrate pests in beans, forage, cassava, rice and maize.
 - CIP - to prevent losses from vertebrate pests in potatoes.
 - ICRISAT - to prevent losses from vertebrate pests in sorghum, pearl millet, pigeon peas, chickpeas, groundnuts and to identify areas where vertebrate pest management systems can be introduced in farming systems practices.
 - IFPRI - To identify national policies which could promote vertebrate pest management systems in the LDCs to reduce losses.
 - ISNAR - To identify areas within national research programs to introduce vertebrate pest management systems to reduce crop losses and promote national food security.
 - AVRDC - To reduce losses of tomatoes, sweet potatoes, Chinese cabbage, soybeans and mung beans.
- Soybean Utilization and Research - University of Illinois: to reduce losses of soybeans.
- Integrated Pest Management and Environmental Protection - new project: to identify areas which can be collaboratively developed to reduce losses from vertebrate and other pests.
- Improved Seed Production and Utilization - Mississippi State University: to identify varieties of grains resistant to bird damage which could be adapted to other environments.
- Postharvest Grain Systems R&D - Kansas State University: to develop collaborative programs to reduce grain losses from vertebrate and other pests.
- Technology Development Transfer and Feedback Systems in Agriculture - University of Illinois: to use the technology development, transfer and feedback system to disseminate information on vertebrate pest management systems to the farmers.

3.7.2 Office of Rural and Institutional Development

- Employment and Enterprise Policy Analysis and Research - Harvard Institute of International Development: to identify and foster policies that will promote vertebrate pest management systems in the LDCs.
- Small Enterprise Approaches to Employment - Michigan State University: to identify and promote small and micro-entrepreneurs who are capable handling a small business to formulate and distribute pesticides needed to implement a vertebrate pest control program.
- Food Security in Africa - Michigan State University: Jointly funded with AID's Africa Bureau; to collaborate in improving food security and vertebrate pest management systems.
- A.T. International - Appropriate Technology International: to identify areas where ATI can promote the development of vertebrate pest control programs in the LDCs.

3.7.3 Office of Education

- Non-formal Training - Creative Associates: to improve technology transfer to farm families through extension services. Cooperation has already been initiated for the preparation of an extension manual for protection of coconuts from rat damages in the Philippines.
- Communications for Technology Transfer in Agriculture - Academy for Educational Development: to improve vertebrate pest management through improved communications.

3.7.4 Other programs

In addition to these projects, DWRC should investigate the development of methodology for controlling vertebrates through biotechnological innovations with institutions such as Montana State University.

4.0 Cost Estimates, Financial Plan and Person Months

4.1 Cost Estimates - The total cost of this five-year "Ribbon" project is estimated at \$3.91 million, which includes a S&T/AGR core budget of up to \$2.445 million, and an expected \$1.465 million to be contributed by the missions, regional bureaus and other AID/W offices. In addition, FWS/DWRC is expected to contribute another \$1.172 million to achieve the purpose of the project stated above. These cost estimates are based on the calculated level of effort; i.e., personnel, travel and allowances, supplies and services and other requirements necessary to achieve targeted outputs of the types and magnitude as set forth in the logical framework (Appendix I).

In addition, separate PASAs which are "add-ons" to the project have been negotiated by the missions with DWRC to serve the governments of Bangladesh and Pakistan. These PASAs are expected to total \$2.1 million over the five year period covered in this project.

Annual and total budgets for the five-year "Ribbon" PASA are attached in the following Appendices:

- Appendix II - Grand Total Budget and Percent by Project Component
- Appendix III - Projected Input Budget by Project Component - FY86 - FY90
- Appendix IV - Projected Input Budget by Line Item - FY86 - FY90

4.1.1 Summary Obligational Schedule - The following obligational schedule is designed to meet estimated project requirements:

Table 1
(in thousands)

	FY 1986	FY 1987	FY 1988	FY 1989	FY 1990	Total
S&T/AGR	\$ 425	\$ 455	\$ 487	\$ 521	\$ 557	\$2,445
Mission Buy-Ins <u>1/</u>	250	270	290	315	340	1,465
USFWS/DWRC	205	219	233	249	266	1,172
Total	<u>\$ 880</u>	<u>\$ 944</u>	<u>\$1,010</u>	<u>\$1,085</u>	<u>\$1,163</u>	<u>\$5,082</u>
Bangladesh	242	273	212	212	212	1,151
Pakistan	228	258	258	143	100	987
Grand Total	<u>\$1,350</u>	<u>\$1,475</u>	<u>\$1,480</u>	<u>\$1,440</u>	<u>\$1,475</u>	<u>\$7,220</u>

1/ Includes funding from missions, regional bureaus and other AID/W offices from a combination of programmed and unprogrammed sources and will be implemented under the "ribbon" PASA.

4.1.2 Summary Budget Tables - The following tables summarize the total five-year budget by Project Components (Table 2) and by Line Item Expenses (Table 3). The funding of the research component from all sources is estimated at 42 percent; technology transfer, 34 percent; training, with the various workshops and courses, 15 percent; and networking at 9 percent.

DWRC's contribution in cost sharing over the five-year period is estimated at \$1.172 million or just a little under 50 percent of S&T/AGR's contribution to the Ribbon PASA.

Table 2
Summary Costs by Project Component
(in thousands)

Component	Ribbon PASA					Percent
	S&T/AGR	DWRC	Total	Buy-Ins	Total	
Research	\$ 956	\$ 609	\$1,565	\$ 553	\$2,118	42%
Technology Transfer	879	311	1,190	513	1,703	34%
Training	366	131	497	293	790	15%
Networking	244	121	365	106	471	9%
	<u>\$2,445</u>	<u>\$1,172</u>	<u>\$3,617</u>	<u>\$1,465</u>	<u>\$5,082</u>	<u>100</u>

A pie chart is included on page 28 which reflects only S&T/AGR's and missions funding and percentages by project component over the five year period.

Table 3
Summary Costs by Line Item Expenses
(in thousands)

Line Item	Ribbon PASA					
	S&T/AGR	DWRC	Total	Buy-Ins	Total	Percent
Salaries & Benefits	\$1,280	\$ 535	\$1,815	-0-	\$1,815	36%
Consultants	-0-	-0-	-0-	\$ 363	363	7%
Travel	217	36	253	646	899	18%
Direct Costs	290	144	434	60	494	10%
Indirect Costs	658	185	843	396	1,239	24%
Equipment	-0-	272	272	-0-	272	5%
Total	\$2,445	\$1,172	\$3,617	\$1,465	\$5,082	100%

4.2 Annual Projections by Person Months - The following table lists by activity, discipline, and/or type of employment the person months to be funded by S&T/AGR and DWRC in support of this project. Note that it is estimated that S&T/AGR will fund a total of 59 person months; whereas USFWS/DWRC plans to contribute 27.25 person months from its own resources for the same period to assure successful achievement of the goal and purpose defined in the Logical Framework, Appendix I. A list of DWRC Personnel (scientists and others) to provide assistance to AID is attached as Appendix VI. The qualifications of the key personnel to be working under this new project are listed in Appendix VII.

Table 4
Person Months per Year

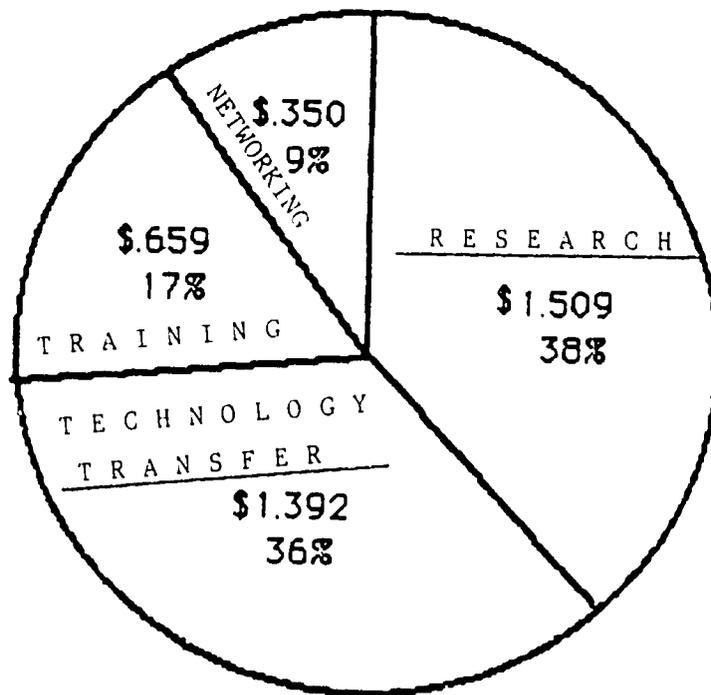
	S&T/AGR	USFWS/DWRC
Director, USFWS/DWRC		0.50
DWRC Section Chief	6.0	
Administrative, Supervision, Library	8.0	4.50
Animal Damage Control		12.75
Environmental Specialists		1.00
Bioelectronics Services		1.25
Chemical Analytical Services		3.0
Laboratory Support Services	15.0	4.0
Ecological Services		0.25
Biologists	21.0	
Pharmacologists	3.0	
Chemists	3.0	
Other DWRC scientists	3.0	
Total	59.0	27.25

Vertebrate Pest Management Systems R&D

Project Components

Total Five Year Funding Levels for the Ribbon PASA

(In Millions and Percentages)



Research	\$1.509	38%
Technology Transfer	1.392	36%
Training	.659	17%
Networking	.350	9%
Total	<u>\$3.910</u>	100%

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5.0 Method of Implementation - This project will be implemented under a five-year "Ribbon" project which will cover the cost of the core staff funded by S&T/AGR and the "buy-ins" to be funded by the missions, regional bureaus and other AID/W offices. The predecessor, centrally funded projects on vertebrate pest control have an excellent success record. The long-term funding commitment of S&T/AGR is therefore considered assured with the approval of this new five-year project.

USAID/Bangladesh has signed a PASA with DWRC for a vertebrate pest control project through FY 87. The mission anticipates an additional commitment of another three years. USAID/Haiti anticipates modest commitments for DWRC services for the country project through FY 90. Pakistan's separate PASA for the country project extends through FY 89.

Listed below in tabular form are additional USAIDs which possibly will join this ribbon project. This is based on information obtained separately from the worldwide cable responses.

Possible USAID Missions to Participate in this Ribbon Project

<u>Regional Bureau</u>	<u>USAIDs</u>	<u>Participation Status*</u>
Africa	Botswana	Starting FY87
	Central African Rep. (received from USAID/Cameroon)	Starting FY 87
	Guinea-Bissau	Starting FY 87
	Kenya	Starting FY 86
	Sudan	Starting FY 88
Asia and Near East	Bangladesh	Separate PASA
	Burma	Starting FY 87
	India	Starting FY 88
	Nepal	Starting FY 87
	Pakistan	Separate PASA
	Sri Lanka	Starting FY 88
Latin America & Caribbean	Egypt	Starting FY 87
	Haiti	Starting FY 86
	Honduras	Starting FY 87

* Estimated starting dates

In view of the dependence of the project on buy-ins, the priorities among the outputs must be stated annually. At the time of project initiation, the preparation of handbooks and training manuals have the highest priority.

5.1 S&T/AGR funding - Through S&T/AGR and FWS/DWRC funding, a critical mass of multidisciplinary scientists (listed on Table 4 above) will be available to backstop vertebrate pest control projects. In addition, the core funding will provide the necessary administrative support to implement the following activities:

5.1.1 Applied and Developmental Research - To plan and implement at the earliest opportunity mutually agreed priority research at DWRC and in the LDCs on laboratory and field studies on pest biology, behavior and ecology related to control; laboratory toxicity, bait acceptance and efficacy studies; improved, integrated vertebrate pest management systems; and to provide guidance which assists graduate students in carrying out their research.

To place emphasis on Africa, it will be necessary to give priority rankings to the major problems of the region. Thus identified, in some cases it will be necessary to request mission concurrence to investigate a problem. Some of the small degree of flexibility of the project will then need to be used to gather sufficient information to convince the host country and mission of the importance of finding a solution to the problem.

5.1.2 Technology Transfer

Technical Transfer of Information - To disseminate DWRC and other research findings to LDC public and private institutions; to prepare and disseminate training manuals and syllabi; to distribute latest information about VPM; and to prepare handbooks on vertebrate pest research and control.

Problem Solving Assistance - to assist LDCs to identify problems, design projects and otherwise analyze and recommend solutions to research, managerial, financial and operational problems pertaining to VPM systems.

5.1.3 Training - To adapt basic training courses at DWRC using audio visual and other techniques as well as to use other training activities to meet specific needs of LDC trainees.

5.1.4 Networking - A small amount of funds will be available for continuing and expanding the long established network of human and technical resources with U.S., LDC national, regional and international organizations. (See Appendix XIII for details on the network.) Common theme workshops will be promoted and DWRC scientists will be encouraged to attend seminars and workshops on vertebrate pest management systems and problems sponsored by other donors.

5.2 Missions, Regional Bureaus and Others - Normally, missions will be expected to fund those activities which are country specific through "buy-ins" to the "Ribbon" PASA. This will include all international and in-country travel, shipments of personal goods for those scientists who will be assigned in the mission for a long period of time, and salaries, fringe benefits, and per diem, as applicable. Most especially, local currency costs will be covered by the concerned mission.

In FY 1985, certain missions contributed approximately \$0.6 million as "add-ons" to this project: i.e., Bangladesh Mission under a separate PASA contributed about \$215,000; Pakistan Mission about \$373,000; and Haiti Mission approximately \$21,000. By S&T/AGR funding the core staff of scientists, it was possible to provide adequate backstopping support to these mission projects. These country projects form an important component of the vertebrate pest management network.

Inasmuch as additional Missions and LDCs will join this ribbon project, provision is being made for buy-in funding for various purposes, some of which have already been enumerated. The buy-ins may be arranged as an addition to the "Ribbon" PASA, through a separate PASA, or by other mechanisms. The "Ribbon" PASA buy-in arrangement is strongly recommended.

Missions and LDCs will fund in-country training courses and training-of-trainers. They will also fund participation in workshops by appropriate LDC and expatriate personnel as part of this ribbon project's networking efforts. The missions hosting a network workshop will be expected to make a substantial contribution towards the cost of such workshop.

In many instances, neither an LDC government nor a mission can predict the need for assistance and do not budget for DWRC services. When S&T/AGR and mission funds are not available for needed TDY assistance, it is appropriate for the regional bureau concerned to fund the activity. In a recent case, neither the Mission nor the African Bureau could fund DWRC scientists to investigate further the serious vertebrate pest problems in Sudan. The investigation had to be postponed for another year to correspond to the time when the problem will recur.

In addition, it is appropriate for regional bureaus to provide funding for training regional scientists and experts in this area. This would begin with funding of personnel from LDCs not in the ribbon project, to serve as trainee-observers at network workshops. A regional bureau could also co-sponsor and fund one-third or more of the cost of a workshop within the region, as well as funding other training needs as they arise.

Participating national institutions will contribute to the project, both directly and indirectly (in kind). They will provide or arrange facilities for administrative support, research, training, and workshops. In addition, these institutions provide counterparts and support training of personnel. The value of these contributions is estimated, very conservatively, at \$500,000 over the 5-year life of this project.

6.0 Implementation Plan. Upon project approval, a brief worldwide information cable will inform missions of the implementation plan. Research priority criteria will be stated in it.

6.1 S&T/AGR Project Management Responsibility - This project will be managed by S&T/AGR in consultation with the Sector Council for Agriculture and the regional bureaus, as required. Current AID staff and procedures are adequate to implement this "Ribbon" project. The project manager will spend approximately 30 percent of the time managing this project. Missions and LDC requests for assistance under the Ribbon PASA will be channelled by the regional bureaus through S&T/AGR to DWRC.

The project manager will identify research priorities and transmit them to DWRC for implementation planning. The prior consensus of expert groups on the regional importance of the vertebrate problems, the apparent extent of losses, and the probability of ameliorating the problem, are among the criteria for these priority decisions.

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In addition, the project manager will ensure that the objectives of the project are achieved, facilitate acquisition of mission requests and funding, monitor project operations, approve certain administrative actions within the project, maintain close liaison with the grantee, and communicate regularly with the Section Chief and Director of DWRC. Specifically, the project manager also will be responsible for the following actions:

- Prepare for DWRC a listing of mission projects concerned with vertebrate pest management systems. This list to be updated annually in time to permit DWRC to consider this information when developing the annual work plan.
- Prepare for DWRC a listing of all S&T projects which are related to vertebrate pest management systems or which generate data that may be used by DWRC in the development of programs and research.
- Maintain contact with regional bureaus and missions to identify and expedite receipt and response to requests for assistance in vertebrate pest management systems.
- Communicate directly with the Section Chief at DWRC on matters related to mission requests or other information required in the performance of the Section Chief's duties.
- Establish liaison with project managers in project areas set forth in Section 3.7 above and assist DWRC to develop relationships with the project contractors, grantees and participating agencies.
- Approve consultants hired by DWRC under the Ribbon PASA.
- Monitor project operations by assuring that the DWRC reports meet the reporting requirements as set forth in Section 7.2 below.
- Schedule and coordinate project evaluations.
- Clear travel requests for DWRC scientists and experts traveling to LDCs.
- Approve the annual work plan, including research to be undertaken.
- Monitor progress of the annual work plan and overall program.

6.2 DWRC Management Responsibility and Qualifications - The scope of work of this project is entirely in the area of vertebrate pest control. It does not require the assignment of new functions or activities nor the expansion of an existing function or activity which would increase capital investment or annual operating costs at DWRC.

6.2.1 DWRC Management Responsibility - The DWRC management responsibility will rest with the Section Chief of the International Program Section who will be responsible for the following functions:

- Designing the annual work plans in collaboration with the S&T/AGR project manager and obtaining final approval prior to implementation. The annual work plans will include the activities described in Section 2.0 above.
- Maintaining close working relationships and communicating regularly with the S&T/AGR project manager, regional bureaus, missions and IARCs.
- Developing and implementing the required reporting structure to conform with the project reporting requirements.
- Overseeing the timely completion of all reports set forth in the reporting requirements section of this project paper.
- Proposing for approval by the S&T/AGR project manager new DWRC staff persons to implement the activities in this project paper.
- Selecting consultants and securing the approval of the S&T/AGR project

manager and the user missions.

- Responding to the output and research priorities in each work plan, with proposals for the design, time and resource requirements, and the specialists to be involved.

6.2.2 DWRC Qualifications- The Center's unique and particular suitability for implementing this project is addressed below.

- The authority for the U.S. Fish and Wildlife Service (FWS) to conduct research on nonpredatory mammal damage control is found in part or in all of the Organic Act of 1897, the Predatory Control Act of 1909, and the Animal Damage Control Act of 1931. The increasing complexity and cost of this research is, to a significant extent, the result of several laws. They include: 1) the Federal Insecticide, Fungicide, and Rodenticide Act of 1947, (FIFRA); 2) the Federal Environmental Pesticide Control Act of 1972 (FEPCA), which requires that all economic poisons be registered with the Environmental Protection Agency (EPA), or that if a substance was judged too hazardous to the environment, its use must be suspended; and 3) the National Environmental Policy Act of 1970 (NEPA) that established the EPA and sets standards for the registration of animal damage control materials.
- The DWRC is responsible for implementing the Service's Animal Damage Control (ADC) research program. The various research and support components of the program are organized into three branches and three sections: the Wildlife Damage Branch that includes the Sections of Bird Damage, Mammal Damage, and International Programs; the Predator Studies Branch; and the Research Support Branch.
- The facilities and resources of DWRC are particularly and uniquely suited for the technical assistance to be provided by this project. Since 1967, through these projects, DWRC has provided a specialized resource for support to AID Missions and host countries for improvement of rodent and bird control research and development (R&D) and or implementation of integrated vertebrate pest control and management systems in the developing countries.
- Since the first PASA was signed, DWRC has provided extensive research and development activities to the missions which has resulted in billions of dollars being saved through improved vertebrate pest management systems; e.g., there have been 235 consultative visits to 54 countries involving 4,232 person-days; seven in-country projects have been established and implemented; and approximately 275,000 people have received training and 40 scientists from 11 countries have received graduate degrees. DWRC professionals, frequently with LDC co-authors, have published more than 275 scientific papers regarding their international work. Extension materials and aids have been widely disseminated. This work has resulted in the saving of food, otherwise lost, scientifically but conservatively estimated at more than \$2.6 billion.
- The furnishing of services to AID will not interfere with DWRC's domestic program. This is because the specialists, facilities and equipment needed for domestic programs are available part time for the AID project.

- There is no satisfactory source (i.e., vertebrate pest management research and extension) for these services in the private sector. This has been determined repeatedly since 1967, and most recently in connection with S&T/AGR's PIO/T 936-4120-5361068 (signed on 14 Mar. 1985) and is still true as discussed later on.
- DWRC has devised research, development and evaluation techniques specific to vertebrate pest control and through the S&T/AGR and other PASAs has been transferring this methodology to various LDCs. As was true for the applied research methodologies and the resulting pest management techniques developed and already in use in LDCs, the Center relies heavily on the multi-disciplinary R&D approach it originated.

Based on its unique research and development capabilities, projects with DWRC are maintained to support AID efforts worldwide in this highly technical area. The techniques developed, or currently under development, by DWRC are considered to be especially applicable to LDC needs.

- DWRC participation in the additional technology development, transfer and evaluation provided by this project is not competitive with private enterprise. R&D of integrated vertebrate pest control and management techniques for pre- and postharvest systems is one area in which private firms do not compete.

Instead, private firms engage in R&D for development and exploitation of specific techniques for control of some species of vertebrate pests. Or such firms make commercial use of various combinations of such techniques, which have been developed by others, in the control of vertebrate pests. The individual techniques used may have been developed by DWRC and/or private firms.

- Furthermore, private firms which use such combinations of techniques do not have overseas experience in problems caused by most of the vertebrate pest species in the developing world. Experience leads to the conclusion that vertebrate pest problems must be solved through appropriate consideration of the pest species, the ecology, the pre- and postharvest agricultural practices and the socio-economic factors of each situation. Otherwise various techniques used elsewhere would have been combined for successful use in LDCs, and no technical assistance would be required.
- DWRC is uniquely qualified, through its base of 100 plus technical staff members and resulting capability in multi-disciplinary backstopping to address these concerns. No private firms have this capability.
- The largest single element of activity and cost for individual private sector corporations involved in some way in vertebrate pest control is the development and sale of rodenticides. Among pesticides, the potential annual sale of each and all rodenticides, in total, is considered to be relatively small. As a group, rodenticides are considered by EPA to be products of "minor use".

- It is a concern of all involved in this field that the development costs of new rodenticides are rapidly approaching the point at which they will exceed the potential profits during the product's patent life. To keep costs as low as possible, these firms must keep their professional staff number to a minimum. This is another reason why DWRC's technical assistance services are unique and do not compete with the private sector.
- The services desired by AID under this new project meet the definition of technical assistance. They include both the actual on-site provision of assistance overseas and various support services and activities which directly facilitate such assistance. Support services are to be performed both inside and outside the U.S.
- In addition, each host country and mission will be benefited by the broadly multi-disciplinary backstopping services provided by this project. Provision of such backstopping is a major purpose of the project and is available to all missions and LDCs requesting technical assistance under it.
- Finally, missions and LDCs will benefit from the technological transfer, through DWRC's International Program Section, from the broadly ranging, ongoing research programs designed to solve domestic vertebrate pest problems in the U.S. and those in locations overseas.
- Additional benefits will accrue from the planned participation of LDC counterparts in the International Vertebrate Pest Management Network, being developed under the guidance of this project.

The use of a PASA to implement this project meets the criteria of Section 621(a) of the Foreign Assistance Act (FAA) of 1961, as amended, which permits the use of Federal agencies when the facilities and resources of those agencies are uniquely suited for certain technical assistance activities and are not competitive with the private sector. Additional information on the qualifications of DWRC is attached as Appendix XI - The Denver Wildlife Research Center.

6.3 Country Selection Criteria - The criteria for guidance on sequential selection of countries for emphasis of project activities include: a) prior consensus of expert groups on the regional importance of the vertebrate problems; b) degree of mission support; c) need for VPM knowledge in the region; d) apparent extent of losses; e) probability of high benefit/cost ratios for loss reduction; and f) likelihood of socioeconomic acceptance of recommended practices.

7.0 Project Monitoring Plans - Monitoring will be accomplished by the Chief, Section of International Programs, DWRC; the S&T/AGR Project Officer; the Agricultural/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.

7.1 Annual Work Plans - DWRC will develop the annual work plan as a working document to guide the operations and achievements expected from the project.

It will be submitted to S&T/AGR for approval each year. The first plan will be submitted to S&T/AGR no later than 30 days after the ribbon PASA is signed and will cover the period January 1, 1986 to December 31, 1986. Thereafter, the annual work plans will be due 60 days prior to the end of the calendar year; i.e., October 31.

S&T/AGR will review the contents of the work plan submitted, ask for points of clarification, if required, and grant final approval of the contents as proposed or modified by agreement between DWRC and S&T/AGR. This process of review and approval will be completed not later than 30 days after receipt of the original work plan from DWRC.

This annual work plan will include, but not be limited to, the following with final details agreed on by the S&T/AGR project manager and the Section Chief, International Programs:

- A list of activities to be undertaken (including private sector initiatives) during the year, categorized by project components; i.e., research, technology transfer, training and networking.
- A response to the output and research priorities.
- The number and description of each activity listed.
- The projected beginning time frame for execution of the activity.
- The projected ending time frame for completion of the activity.
- The projected expenditure of person-months of input for each activity.
- The projected stage of activities at the end of the work plan or the projected outputs at the end of the work plan.
- Specific qualifications which may be required for certain activities given that many of the activities within the project are predicated on the amount of mission funding to be obligated for project activities.
- Notation of the specific activities planned to emphasize assistance to Africa.
- Baseline data on pricing, policy, marketing and agricultural inputs will be collected to the extent necessary to update the economic analysis and keep within the availability of funds for this project.
- Attachments to the work plan may include, but are not be limited to the following: PERT charts, specific activity reports, and time qualification conditions.

7.2 Reporting Requirements - In addition to the Annual Work Plans described above, DWRC will submit the following reports containing the information required within the specified time frame to assist S&T/AGR in the monitoring of project activities.

7.2.1 Technical and Research Reports - Technical research activities of the project will be summarized in reports to encourage use of the information in technology transfer. Normally such reports should be completed about 60 days after completion of the activity. Journal articles and other external publications are encouraged. Manuscripts should be submitted to the S&T/AGR Project Manager as well as a copy of the resulting publication.

7.2.2 Annual Activity Reports - An Annual Report of DWRC's international vertebrate pest control activities will be prepared. Being principally a technical document, it nevertheless must include pertinent statistics

pertaining to the project and its activities. This report will be considered a tool for use in technology transfer and therefore a minimum of five copies should be submitted to the S&T/AGR Project Manager within about 180 days of the end of each project year.

7.2.3 Training Activities - Summary of training activities undertaken under and in conjunction with this project, including the numbers of trainees by gender, nationality, training site, type of training activity, duration and purpose.

7.2.4 Annual Expenditure Reports - DWRC will submit annual expenditure reports by: 1) project line item; and 2) estimated distribution by project component. The format will be collaboratively developed by S&T/AGR project manager and the Section Chief.

7.2.5 Impact Analysis Report - An annual report will be submitted as an annex to the annual activity report (Section 7.2.2 above) which summarizes the impact of DWRC activities in the public and private sector in terms of reduction of losses from vertebrate pest management systems. This will provide a feed-back system for measurement and evaluation of the impact of services and training provided.

The impact analysis is herein defined as a measurement of results generated by activities undertaken by DWRC in accordance with the project description in the project paper and the scope of work in the PASA. For the most part, the impact analysis will be qualitative in nature, and quantified only as appropriate and will cover activities funded under this project and/or the previous projects only to the extent that they can be measured without extra expenditure of project funds. Once an individual activity has been measured, then it need not be given further consideration.

7.2.6 Trip Reports - Trip reports will be prepared for each TDY assignment or trip to LDCs. The report will contain, but not be limited to, information in the following format: 1) summary of logistical information composed of type of activity, geographical area of activity, dates of TDY, and team composition; 2) summary of objective of TDY, including scope of work, as appropriate; 3) summary of activities of TDY; 4) summary of any technical report resulting from TDY; 5) summary of identifiable techniques or information which could be transferred to other LDCs; and 6) summary of future potential needs of, or opportunities for, assistance to LDCs or missions, including possible networking potential. One copy of this report will be forwarded to S&T/AGR not later than 30 days after the staff member returns to DWRC. The trip report generally does not need to exceed 4 pages.

7.3 Reviews and Evaluations

7.3.1 Management Reviews will be conducted annually by the S&T/AGR project manager in consultation with DWRC, missions, regional bureaus and other institutions, as appropriate. Since such reviews may involve visits to DWRC or specific LDCs, the review process will be funded by S&T/AGR. Such annual reviews will be undertaken after submission of the annual reports as described in Section 7.2 above. The annual reports (activity and Impact) will become an integral part of the review process.

7.3.2 In-depth Evaluations will be scheduled near the end of the third and fifth years of the project. Evaluations will be based on monitoring reports, inspection of physical facilities, DWRC progress reports, technical publications, impact analysis reports 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 purpose and goal.

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

8.0 Project Analysis

8.1 Technical Analysis

8.1.1 Timeliness - AID has, for over 18 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 and training to improve rodent, bird and other vertebrate pest control systems. 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 LDCs. Though not recognized by all international agencies, Ministries of Agriculture, or even universally by biologists, there are indications that in the developing world vertebrate pests cause pre- and postharvest agriculture losses comparable to those caused by insects. Many farmers consider vertebrate pests as their most critical problem.

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. Agricultural areas recovering from an extended drought period, such as has been occurring in Africa, also suffer from rodent outbreaks.

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 frequently result in an increase in losses.

AID's mandate to reach small commercial farm families 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, Sudan, and Tanzania), 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.

8.1.2. 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 pests.

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 develop 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 LDCs 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.

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AID and DWRC have and will continue to engage in specific coordinated activities and joint project planning with FAO, WHO, the German Agency 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 scientists and experts can be resolved only through use of the facilities and support specialists such as those 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.

The research conducted internationally and domestically is applied and developmental. At all times it is aimed at gaining answers needed now to solve critical problems created by vertebrate pests.

8.1.3. Design - The project is designed to develop, evaluate, adapt and apply vertebrate pest control methods and strategies. The project draws together technical findings of diverse investigations, and applies them to specific pest problems suffered by small farmers. By supporting detailed evaluation and analysis of pilot control programs, the project will complement existing research and development activities. In addition to all pertinent literature, the sources of project information will consist of 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.

8.1.4. 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 extremely high.

8.2. Financial and Economic Analysis

8.2.1. Financial Analysis - Detailed budget summaries are attached as Appendices II, III, and IV. Project costs to be borne by S&T/AGR are estimated at up to \$2,445,000 for the five year period.

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This project assists LDC national agencies that as a rule generate no revenues and have no profit and loss statements. For such projects the analysis of financial viability is limited to an assessment of: 1) financial management competency of participating institutions; and 2) the likelihood that adequate long-term government financial support will be forthcoming. Included in such assessments is the capacity of participating institutions to fulfill obligations during project implementation and to continue project efforts and meet recurring costs after the project has been completed.

It is not possible to identify all entities that will be involved in project implementation. All participating LDC institutions and international research organizations will possess adequate administrative expertise and financial capability to undertake project responsibilities. These institutions will have: 1) adequate accounting systems; 2) sufficient administrative expertise, and; 3) a sustainable revenue base. These criteria will be examined for each host-country institution which will be involved in project implementation and the networking effort. Missions will be encouraged to offer institutions with marginal capability upgrading assistance of other S&T projects such as that of "Food Security in Africa."

Contributions to the project by cooperating host-country institutions and research organizations will be "in-kind" financed from their local revenues. Host country governments have recently shown strong financial support to programs in general pest management as evidenced by current levels of expenditures in crop protection.

It is not anticipated that this project will result in large recurrent costs to host-country institutions since the primary focus is to strengthen existing capabilities and establish effective networks among already functioning institutions. Vertebrate pest control material costs will be relatively small. Other additional recurrent costs would most likely result from increased staffing levels caused by the increased demands for control services. As a result of training received from project personnel, staff will be able to respond more effectively to farmers' needs. Increased costs to the host country will be met from special host country budgets at first, but later must be met from regular recurrent cost budgets.

Some services in some countries may be financed by assessing small fees to beneficiary farmers or farmers groups. Alternatives would be to turn over such activities to the private sector or to increase government allocations to pest control programs on the one hand while collecting tax revenues at some point in the marketing process to pay for these costs. These alternatives should be examined by technical advisors and host country representatives during project implementation.

8.2.2. Economic Analysis - The economic feasibility of development assistance projects dealing with vertebrate pests can be assessed by relating costs of control and/or 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.

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Destruction of food and fiber by vertebrate pests is a recurrent problem of global proportions. Most of this vertebrate pest loss is caused by rodents and birds. 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 the postharvest storage. Hence, a sizeable percentage of production and post-production investments and labor are devoted to feeding pests. Frequently this burden is relatively greater for the poorest farm families 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 in some countries that have not been investigated previously, indicators of the economic feasibility and benefits of vertebrate pest control must come from prior experience.

A detailed example is presented in the following table. The data compare 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. Also notable is the small added cost of sustained baiting control as part of total cultivation costs and the high relative returns apparent from this investment.

Control Methods in Paddy Rice in Three Areas of the Philippines*
Average Cost and Return Comparison of Sustained Baiting Treatments
(Sus.B.) vs. Traditional (Trad.)

Item	(Figures in \$US per hectare)					
	Pangasinan		Mindoro 1		Mindoro 2	
	Sus. B.	Trad.	Sus. B.	Trad.	Sus. B.	Trad.
Cultivation Costs	55.70	44.00	91.50	87.50	85.60	93.40
Harvest Costs	18.40	13.70	57.10	28.60	71.40	35.70
Rat Control Costs	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.

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The potential benefits to be gained from a large-scale vertebrate pest control program are demonstrated in the next table. The information is projected using 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 and Returns of Rodent Control^{a/}

Crop Rat Species Area Date	Damage Index		Value of Farm Yield Increase ^{b/} (\$)	Cost of Control to Farmers (\$)	Net Increase With Effect. Control (\$)
	Treated Farms (%)	Untreated Farms (%)			
<u>Rice</u>					
<u>Rattus rattus</u> <u>mindanensis</u> Pangasinan, Philippines, 1973	0.15	5.91	1,400,000	15,700 ^{c/}	1,384,300
<u>Rice</u>					
<u>Rattus</u> <u>argentiventer</u> Mindoro, Philippines, 1974	0.2	4.9	1,357,000	20,700 ^{c/}	1,337,100
<u>Corn</u>					
<u>Rattus rattus</u> <u>mindanensis</u> 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 in improved 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 begin relatively soon and will repeat over time as new problems are addressed. Research and development will be needed for problems addressed by this project. Project output materials will generally be relevant for many years, but the developing country institutions and the beneficiaries/clients will benefit from continuing investments in program improvement.

More recent research in Bangladesh gives a measure of the cost-effectiveness of a typical rodent control program, in another instance, in wheat. Based on the success of the multimedia "National Rat Control Campaign in Wheat, 1982/83," a similar campaign was conducted during the 1983/84 crop season to retain the level of motivation for control activities by farmers. The preparation, organization, and evaluation of the 1983/84 campaign involved staff of the Department of Agricultural Extension (DAE) at the head office (mainly the Vertebrate Pest Control Section of the Plant Protection Programme, DAE) and in the field, the Bangladesh-German Plant Protection Programme and the Vertebrate Pest Research Laboratory (VPRL) of the Bangladesh Agricultural Research Institute (BARI).

Of all wheat fields, 18.8 percent were treated with ready-made baits (151 of 805 respondents). Projecting to a total of 4,250,000 wheat fields in Bangladesh, approximately 797,000 were treated, indicating that about 300,000-400,000 bait packets (One packet for two to three fields) were sold to wheat farmers. In 1984, damage reduction in fields treated with ready made bait vs. fields without control was 41 percent as shown below:

Comparison of Control Methods and Rat Damage to Wheat,
Bangladesh 1984

Control Methods	Number of Fields	Damage (%)	Damage Reduction Relative to No Control (%)
No control	165	4.90	
Locally available methods	130	4.65	5
Mechanical or physical	50	3.69	25
Ready-made bait	150	2.88	41

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Savings Through the Use of Ready-Made Bait in Standing Wheat
in Bangladesh, 1983/84

	<u>Tons</u>
Total wheat production, 1983/84	1,314,000
Production in rat-infested plots (68%)	893,500
Production in plots treated with ready-made bait (30% of infested fields)	268,050
Loss at 4.90% (if no control)	13,134
Loss at 2.88% (if treated with ready-made bait)	7,720
Production saved through ready-made bait application	5,414
U.S \$ saved through ready-made bait application at \$136/ton	\$736,304

The amount of wheat saved was estimated from the reduction in rat damage in fields where ready-made baits were used. The dollar savings (\$US 736,304) as compared to program costs for the year (\$US 36,000) represent a benefit to cost ratio of about 18:1. This may be slightly high when adjusted for a prorated share of DWRC and national research costs but is probably fairly accurate given that some baits covered in the \$US 36,000 program costs for the year were actually used on other crops, the savings in which were not included along with wheat in the estimate of benefits.

8.2.3 Project Cost-Effectiveness - In selecting the proposed project design several approaches presented themselves for consideration. One alternative was individual mission or regionally funded research activities involving a range of technical assistance teams. This arrangement would be more costly to the extent that research results are duplicated, an unfortunate outcome given limited available research resources and talent.

Another alternative would be to invest the resources in credit and production inputs in hopes of compensating for the crop losses that research would help reduce. The limited resources utilized by the project, if invested in crop price support programs, would not stimulate a production response equivalent to that from newly developed technologies at lower and, more likely, competitive world market prices.

The research approach utilized in this project aids in establishing linkages and supports efforts in a range of bilateral, regional and global activities by pooling expertise and infrastructure to address vertebrate pest problems. USAID Missions, AID regional field offices and AID/W Regional Bureaus, which 'buy-in' to the project will have access to project personnel for backstopping the design, management and implementation of national research and control programs. Such buy-in arrangements offer a cost-effective method of conducting research and fostering the establishment of linkages among international research organizations and host-country institutions.

8.2.4 Social Analysis - The intended beneficiaries of this project are low income consumers, and producers and wage earners, especially those in the food grains sector in developing countries. On the consumption side, grains are a basic staple in many LDC diets. Lower grain prices and increased availability that results from lower pest loss translates into more food and less income required to buy it.

Benefits to producers, particularly small farmers, will result as farmers are able to achieve higher total returns from their land and labor due to less food loss. The emphasis on reducing pest losses also means more acreage can be safely and profitably cultivated.

The introduction of new rodent control practices does raise a number of social considerations such as compatibility with current farm practices and safety in poison bait use. These concerns must also be addressed as part of project research activities.

8.2.5 Women in Development - Women benefit directly and indirectly from this program in a number of ways. First, women often are in charge of household grain storage. Losses occur either through contamination or consumption by the pests. Any effort to reduce losses to pests would allow greater return on the labors of the women 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.

Women are heavily involved in planting, transplanting, weeding and harvesting of many crops, especially rice. They are frequently "paid" by a "share of the crop harvested". Increased harvests means a greater share taken home as payment for their services.

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 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.

9.0 Initial Environmental Examination - The activities of this project fall into the area described in environmental procedural regulations paragraph 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 an Environmental Assessment. Under these guidelines, the project clearly qualifies for a negative determination. Research of this project will be performed in an environmentally safe manner which will result in minimal adverse impact to the environment.

Historically, it has been shown that hazards to the environment can be kept to the minimum.

This project makes reports and recommendations to missions and/or host governments. When recommendations are implemented by the mission or host government an environmental assessment may be necessary. As it stands, this project is a "proposed Agency action that is not a major Federal action which will have significant effect on the environment." The Initial Environmental Assessment is attached as Appendix XV.

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9/16/85:Revised 9/23/85:10/7/85:10/18/85

V E R T E B R A T E P E S T M A N A G E M E N T S Y S T E M S R & D

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PROJECT DESIGN SUMMARY
LOGICAL FRAMEWORK

Life of Project: From FY 1986 to FY 1990
Total U.S. Funding \$3,910,000
Date Prepared: 9/11/85

Project Title & Number: Vertebrate Pest Management Systems R&D

NARRATIVE SUMMARY	OBJECTIVELY VERIFIABLE INDICATORS	MEANS OF VERIFICATION	IMPORTANT ASSUMPTIONS
<p>Program or Sector Goal: The broader objective to which this project contributes: To increase the availability of food and feed to improve human and animal nutrition and productivity.</p>	<p>Measures of Goal Achievement: 1. Reductions in losses caused by mammals, birds and other vertebrate pests 2. Farmers have more grain to sell 3. More food and feed reaches the market places 4. Consumers have more food to eat.</p>	<p>1, 2, & 3 - - Analysis of participating country statistics on crop production - Analysis of participating country economic development reports and marketing surveys 4. Household budget surveys</p>	<p>Assumptions for achieving goal targets: - LDCs give high priority and financing to agricultural sector. - Affected farmers can benefit and will participate in integrated vertebrate pest loss reduction programs. - Reduction of losses from vertebrate pests will be translated into more food availability. - Effective marketing and distribution networks are in place in the LDCs</p>
<p>Project Purpose: To help LDCs improve their capabilities to develop and utilize vertebrate pest management systems which will reduce pre/postharvest losses.</p>	<p>Conditions that will indicate purpose has been achieved: End of project status. 1. Reductions in pre/postharvest food and feed losses due to vertebrate pests 2. LDC researchers and agencies are extending control technologies to families with small farms. 3. DWRC trained specialists in key positions in LDCs and international agencies. 4. Increased private sector involvement in providing inputs for control of vertebrate pests. 5. Expanded awareness of vertebrate pest problems and their solutions</p>	<p>- Program survey and monitoring reports - DWRC reports of field & laboratory evaluations, pilot trials and demonstrations. - Participating country reports - Reports on training and evaluation.</p>	<p>Assumptions for achieving purpose: - Adequate host country government personnel are available to serve in program. - Government strategies promote vertebrate pest protection components with an appropriate institutional base. - LDC government policies will promote private sector involvement.</p>

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PROJECT DESIGN SUMMARY
LOGICAL FRAMEWORK

Appendix I
Life of Project: Page 2 of 6
From FY 1986 to FY 1990
Total U. S. Funding \$3,910,000
Date Prepared: 9/23/85

Project Title: Vertebrate Pest Management Systems R&D

NARRATIVE SUMMARY	OBJECTIVELY VERIFIABLE INDICATORS	MEANS OF VERIFICATION	IMPORTANT ASSUMPTIONS
<p>Output: 2.1 Applied and Developmental Research.</p> <p>1. Methods showing improvement for control of distinctly different pest problems (this will be accomplished through the following process.)</p> <ul style="list-style-type: none"> - Develop damage assessment methodologies (field work in LDCs - six LOP) - Conduct assessment of vertebrate pest damage (field work in LDCs - four LOP) - Laboratory and field studies on pest biology, behavior and ecology related to control. (Eight LOP at DWRC & LDCs) - Laboratory Toxicity, bait acceptance and efficacy studies (14 LOP at DWRC & LDCs) - Preliminary control field trials (six LOP in LDCs) - Integrated vertebrate pest management field studies (three LOP in LDCs) <p>2. LDC nationals competent to perform research in the process stated above at LDC Institutions and/or at DWRC laboratory and/or field stations</p>	<p>Magnitude of Outputs:</p> <p>Solutions to at least 2 distinctively different pest problems are confirmed by in-country verification trials</p> <p>2. Ten (10) LOP</p>	<p>1,2</p> <ul style="list-style-type: none"> - DWRC annual, trip and technical reports and publications - Participating country reports - DWRC, Missions, and LDC on-site evaluation and technical reviews <p>2. Student theses, transcripts, publications and research progress reports</p>	<p><u>Assumptions for achieving outputs:</u></p> <p>1,2</p> <ul style="list-style-type: none"> - In LDCs there is a recognizable need and support for vertebrate pest research activities. <p>2. Qualified LDC nationals are available and funded by missions, LDC governments and other Donors</p>

PROJECT DESIGN SUMMARY
LOGICAL FRAMEWORK

Life of Project: From FY 1986 to FY 1990
Total U.S. Funding \$3,910,000
Date Prepared: 9/23/85

Project Title & Number: Vertebrate Pest Management Systems R&D

NARRATIVE SUMMARY	OBJECTIVELY VERIFIABLE INDICATORS	MEANS OF VERIFICATION	IMPORTANT ASSUMPTIONS
<p>Outputs: 2.2 Technology Transfer 2.2.1 Technical Transfer of Information:</p> <ol style="list-style-type: none"> DWRC and other research findings disseminated to LDC public and private institutions and IARCs on safe and effective vertebrate control methods. Demonstrations of improved vertebrate pest control systems (in LDCs). Training Manuals and Syllabi developed and disseminated, as required. Distribute information on pre/post-harvest vertebrate pest control to alert recipients of the latest technologies developed worldwide. Handbooks on Vertebrate Pest Research and Control; such as management of quelea birds or management of rats in floating rice. 	<p>Magnitude of Outputs</p> <ol style="list-style-type: none"> 25 formal publications LOP and increase demand by LDCs for DWRC publications and demonstrations Two (2) LOP in LDCs Five (5) developed and used by institutions in at least 2 LDCs Twenty (20) mailings LOP, and at least five requests for follow up information or service. Four (4) developed and disseminated and each used in at least two (2) LDCs and one (1) IARC. 	<p>1, 2, 3, 4, 5</p> <ul style="list-style-type: none"> DWRC annual, trip and technical reports and publications Participating country and international organizations reports DWRC/USAID/Government on-site evaluations Expanded awareness of vertebrate pest problems and solutions. <p>Communications with IARCs</p>	<p>Assumptions for Achieving outputs</p> <ol style="list-style-type: none"> 2, 3, 4, 5 <ul style="list-style-type: none"> Appropriately trained LDC personnel are available Adequate USFWS, USAID, and participating country personnel are available. The participating countries, USAID missions, and regional Bureaus fully support the project, can and will stay committed to vertebrate pest control improvement. Expanded awareness of vertebrate pest problems and solutions as a result of technical transfer of information.

PROJECT DESIGN SUMMARY
LOGICAL FRAMEWORK

Life of Project: From FY 1986 to FY 1990
Total U.S. Funding \$3,910,000
Date Prepared: 9/23/85

Project Title & Number: Vertebrate Pest Management Systems R&D

NARRATIVE SUMMARY	OBJECTIVELY VERIFIABLE INDICATORS	MEANS OF VERIFICATION	IMPORTANT ASSUMPTIONS
<p>Outputs: 2.2 Technology Transfer</p> <p>2.2.2 Short & Medium term Problem Solving Assistance</p> <ol style="list-style-type: none"> 1. Identify vertebrate Pest Problems and recommend action 2. Design projects and/or components of projects dealing with pre/postharvest vertebrate pest control. 3. Perform Environmental Assessments and evaluate the environmental affects of vertebrate pest control chemicals 4. Evaluate projects dealing with pre/postharvest vertebrate pest problems 5. Provide advice on organization, management & conduct of research, control and extension. 	<p>Magnitude of Outputs:</p> <ol style="list-style-type: none"> 1. 20 responses to requests LOP and recommendations implemented in at least 10 LDCs. 2. At least 10 designed and at least seven cleared technically 3. Five (5) LOP Env. Assessments cleared by Appropriate AID Environmental Officer(s). 4. Two (2) LOP 5. Two (2) LOP 	<p>1,2,3,4,5.</p> <ul style="list-style-type: none"> -DWRC annual, trip, program, and technical reports and publications -Participating country reports -DWRC/USAID/Government on-site evaluations and technical reviews. 	<p>Assumptions for Achieving Outputs</p> <p>1,2,3,4,5</p> <ul style="list-style-type: none"> - Missions, LDCs and other request assistance. - Mission funding levels as shown in the projected budget will be met. - S&T/AGR funds will be available for backstopping by DWRC.
<p>2.3 Training</p> <ol style="list-style-type: none"> 1. Regional and in-country workshops and short courses on pre/postharvest vertebrate pest problems 2. Basic training courses adapted to meet specific needs of LDC trainees at DWRC using audio visual and other techniques. 3. In-service and on-the-job training sessions at operational levels in: <ol style="list-style-type: none"> a. Appropriate LDC organizations b. U.S. Organizations 4. DWRC scientists assist major professors of LDC students in guiding their thesis research. 5. Training-of-extension trainers in LDCs 	<ol style="list-style-type: none"> 1. Ten (10) LOP workshops among 3 regions. 2. Five (5) LOP and at least 2 used more than once. 3. (see below) 4. Fifteen (15) thesis of LDC students LOP 5. Two (2) courses LOP. At least one of which results in an LDC offering extension training in vertebrate Pest Management. 	<p>1,2,3,4,5.</p> <ul style="list-style-type: none"> - DWRC annual, trip, program, and technical reports and publications - Participating country reports - DWRC/USAID/Government on-site evaluations and technical reviews 	<p>1.2.3.4.5</p> <ul style="list-style-type: none"> - LDCs and missions will fund trainees - Qualified LDC participants are available to train at DWRC. - Mission funding levels as shown in projected budget will be met. - LDC national and international organizations will continue to sponsor participants. - U.S. universities will continue to include thesis research at DWRC as part of academic training for LDC graduate students.

PROJECT DESIGN SUMMARY
LOGICAL FRAMEWORK

Life of Project:
From FY 1986 to FY 1990
Total U.S. Funding \$3,910,000
Date Prepared: 9/23/85

Project Title & Number: Vertebrate Pest Management Systems R&D

NARRATIVE SUMMARY	OBJECTIVELY VERIFIABLE INDICATORS	MEANS OF VERIFICATION	IMPORTANT ASSUMPTIONS
<p>Outputs: Networking</p> <p>1. Continue linkages with International and regional institutions, such as FAO, IRRI, and ICRISAT and establish new linkages with additional institutions</p> <p>2. Continue linkages with LDC institutions; e.g., National Univ. of Costa Rica; Charles Darwin Research Foundation, Ecuador; Wildlife Management Unit, Zimbabwe; Vertebrate Pest Management Unit, Los Banos; Vertebrate Pest Management Unit, Thailand; EMBRAPA, Brazil; Arid Zone Research Institute, India; Agricultural Research Institute, Bangladesh; and Pakistan Agr. Research Council; and establish new linkages</p> <p>3. Continue linkages with other organizations involved in international assistance dealing with problems of vertebrate pests; e.g., GTZ, Germany,</p>	<p>Magnitude of Outputs</p> <p>1. Two (2) new collaborative research activities with at least one IARC and expanded linkages with others</p> <p>2. Facilitate communications among LDC institutions and intensify research cooperation and expand activities to at least 3 new institutions in LDCs.</p> <p>3. Regular communications and mutual awareness of each other's projects and activities.</p>	<p>Means of Verification</p> <ul style="list-style-type: none"> - IWRC annual, trip and technical reports and publications - Participating country reports - IWRC/USAID/Government on-site evaluations and technical reviews. - Proceedings of workshops and meetings. - Reports from the international and national institutions regarding linkages. 	<p>Assumptions for Achieving Outputs</p> <ul style="list-style-type: none"> - National, regional and international institutions are interested in collaboration and other networking activities. - Funding is available from Missions, LDC or other sources to pursue networking activities. - IWRC will continue to contribute to networking activities.
<p>ORSTOM, France, MAFF, U.K.; DANIDA, Denmark</p> <p>4. Continue collaboration with public and private U.S. organizations; e.g., Bowling Green State University, Ohio, University of Arkansas, Univ. Cal. Davis, Colorado State University, Purdue Univ., Texas A&M, Vertebrate Pesticide manufacturers</p> <p>5. Develop linkages with additional U.S. organizations as required</p>	<p>4. Continue active collaboration with public and private U.S. organizations.</p> <p>5. Establish two (2) additional linkages.</p>		<ul style="list-style-type: none"> - U.S. Universities will continue to work closely with IWRC to enhance vertebrate pest management activities.
<p>6. Hold International workshops in LDCs and International Centers</p>	<p>6. Hold five (5) workshops, including One (1) in Africa, one (1) in Latin America, and one (1) in Asia.</p>		

PROJECT DESIGN SUMMARY
LOGICAL FRAMEWORK

Life of Project:
From FY 1986 to FY 1990
Total U.S. Funding \$3,910,000
Date Prepared: 9/11/85

Project Title & Number: Vertebrate Pest Management Systems R&D

Inputs	NARRATIVE SUMMARY							MEANS OF VERIFICATION	IMPORTANT ASSUMPTIONS
	FY86	FY87	FY88	FY89	FY90	Total			
Participating Agency Service Agreement								Obligation and expenditure documents and reports. Obligation and expenditure documents and reports. USFWS/DWRC records.	S&T/AGR funds will be obligated according to plan. Grantee is able to provide the services and use funds. Missions will contribute funds to this project and continue funding participants outside the project for training and research. USFWS/DWRC will continue to place high priority on vertebrate pest management systems R&D. Equipment will continue to be purchased by USFWS/DWRC and USFWS/DWRC will provide operating costs. National, Regional, and International and other LDC facilities will be provided.
Research	166	178	190	204	218	956			
Training	64	68	73	78	83	366			
Technology Transfer	153	164	175	187	200	879			
Networking	42	45	49	52	56	244			
Total S&T/AGR	425	455	487	521	557	2445			
Mission Funding	250	270	290	315	340	1465			
Total Project Funding	675	725	777	836	897	3910			
Bangladesh	242	273	212	212	212	1151			
Pakistan	228	258	258	143	100	987			
Total AID	1145	1256	1247	1191	1209	6048			
USFWS/DWRC	205	219	233	249	266	1172			
Grand Total	1350	1475	1480	1440	1475	7220			
Modern and sophisticated equipment is purchased by USFWS/DWRC.	Approximate value of equipment and facilities is \$17.0 million.								
National, Regional, and International centers and LDC facilities.									
Note: See Appendix II for budget by cost component and Appendix III for budget by line item.									

VERTEBRATE PEST MANAGEMENT SYSTEMS R&D
Grand Total and Percent by Project Component
(in thousands)

Appendix II

	Agency for International Development															
	S&T/AGR		Project Paper				Mission PASAs ^{2/}				AID Total		USFWS/DWRC		Grand Total	
			Other ^{1/}		Total		Bangladesh		Pakistan							
Amount	%	Amount	%	Amount	%	Amount	%	Amount	%	Amount	%	Amount	%	Amount	%	
Research	\$ 956	39%	\$ 553	38%	\$1,509	38%	\$ 229	20%	\$432	44%	\$2,170	36%	\$ 609	52%	\$2,779	39%
Technology Transfer	879	36%	513	35%	1,392	36%	694	60%	352	36%	2,438	40%	311	27%	2,749	38%
Training	366	15%	293	20%	659	17%	102	9%	140	14%	901	15%	131	11%	1,032	14%
Networking	244	10%	106	7%	350	9%	126	11%	63	6%	539	9%	121	10%	660	9%
Total	\$2,445	100%	\$1,465	100%	\$3,910	100%	\$1,151	100%	\$987	100%	\$6,048	100%	\$1,172	100%	\$7,220	100%

^{1/} Anticipated Mission "Buy-Ins" under the "Ribbon" PASA.

^{2/} Individual Mission funded PASAs not under the "Ribbon" PASA.

Appendix II

VERTEBRATE PEST MANAGEMENT SYSTEMS R&D
By Project Component
Projected Input Budget - FY 1986 - FY 1990
(In thousands)

	TOTAL									FY 1986						
	Project Paper			Mission PASAs ^{2/}		AID	USFWS		Project Paper			Mission PASAs ^{2/}		AID	USFWS	
	S&T/AGR	Other ^{1/}	Total	Bangladesh	Pakistan	Total	DWRC	Total	S&T/AGR	Other ^{1/}	Total	Bangladesh	Pakistan	Total	DWRC	Total
Research	\$ 956	\$ 553	\$1,509	\$ 229	\$432	\$2,170	\$ 609	\$2,779	\$166	\$ 94	\$260	\$ 48	\$137	\$ 445	\$108	\$ 553
Technology Transfer	879	513	1,392	694	352	2,438	311	2,749	153	88	241	146	68	455	54	509
Training	366	293	659	102	140	901	131	1,032	64	50	114	12	23	149	23	172
Networking	244	106	350	126	63	539	121	660	42	18	60	36	-0-	96	20	116
Total	\$2,445	\$1,465	\$3,910	\$1,151	\$987	\$6,048	\$1,172	\$7,220	\$425	\$250	\$675	\$242	\$228	\$1,145	\$205	\$1,350

	FY 1987									FY 1988						
	Project Paper			Mission PASAs		AID	USFWS		Project Paper			Mission PASAs		AID	USFWS	
	S&T/AGR	Other	Total	Bangladesh	Pakistan	Total	DWRC	Total	S&T/AGR	Other	Total	Bangladesh	Pakistan	Total	DWRC	Total
Research	\$178	\$102	\$280	\$ 55	\$129	\$ 464	\$115	\$ 579	\$190	\$110	\$300	\$ 42	\$103	\$ 445	\$121	\$ 566
Technology Transfer	164	95	259	164	77	500	58	558	175	101	276	128	90	494	62	556
Training	68	54	122	27	39	188	24	212	73	58	131	21	39	191	26	217
Networking	45	19	64	27	13	104	22	126	49	21	70	21	26	117	24	141
Total	\$455	\$270	\$725	\$273	\$258	\$1,256	\$219	\$1,475	\$487	\$290	\$777	\$212	\$258	\$1,247	\$233	\$1,480

	FY 1989									FY 1990						
	Project Paper			Mission PASAs		AID	USFWS		Project Paper			Mission PASAs		AID	USFWS	
	S&T/AGR	Other	Total	Bangladesh	Pakistan	Total	DWRC	Total	S&T/AGR	Other	Total	Bangladesh	Pakistan	Total	DWRC	Total
Research	\$204	\$119	\$323	\$ 42	\$ 43	\$ 408	\$129	\$ 537	\$218	\$128	\$346	\$ 42	\$ 20	\$ 408	\$136	\$ 544
Technology Transfer	187	110	297	128	57	482	66	548	200	119	319	128	60	507	71	578
Training	78	63	141	21	29	191	28	219	83	68	151	21	10	182	30	212
Networking	52	23	75	21	14	110	26	136	56	25	81	21	10	112	29	141
Total	\$521	\$315	\$836	\$212	\$143	\$1,191	\$249	\$1,440	\$557	\$340	\$897	\$212	\$100	\$1,209	\$266	\$1,475

1/ Anticipated Mission "Buy-ins" under the "Ribbon" PASA.

2/ Individual Mission funded PASAs not under the "Ribbon" PASA.

VERTEBRATE PEST MANAGEMENT SYSTEMS R&D
By Line Item
Projected Input Budget - FY 1986 - FY 1990
(In thousands)

Appendix IV
Page 1 of 2

	TOTAL									FY 1986						
	Agency for International Development									Agency for International Development						
	Project Paper			Mission PASAs 2/			AID	USFWS	Project Paper							
	S&T/AGR	Other 1/	Total	Bangladesh	Pakistan	Total	USFWS	Total	S&T/AGR	Other 1/	Total	Bangladesh	Pakistan	Total	USFWS	Total
Salaries & Benefits	\$1,280	\$ -0-	\$1,280	\$ 522	\$ 474	\$2,276	\$ 535	\$2,811	\$222	\$-0-	\$222	\$109	\$109	\$ 440	\$ 93	\$ 533
Consultants	-0-	363	363	-0-	-0-	363	-0-	363	-0-	62	62	-0-	-0-	62	-0-	62
Travel	217	646	863	93	79	1,035	36	1,071	38	110	148	20	18	186	5	191
Direct Cost																
Printing & Repro.	24	-0-	24	21	18	63	29	92	4	-0-	4	4	4	12	5	17
Transportation	7	-0-	7	21	16	44	-0-	44	1	-0-	1	4	4	9	-0-	9
Other Services	39	-0-	39	92	71	202	86	288	5	-0-	5	20	18	43	15	58
Supplies & Material	166	-0-	166	56	53	275	29	304	30	-0-	30	13	11	54	5	59
Contingency	54	60	114	36	8	158	-0-	158	10	10	20	7	2	29	-0-	29
TOTAL Direct Cost	290	60	350	226	166	742	144	886	50	10	60	48	39	147	25	172
Indirect Cost	658	396	1,054	310	268	1,632	185	1,817	115	68	183	65	62	310	32	342
Equipment	-0-	-0-	-0-	-0-	-0-	-0-	272	272	-0-	-0-	-0-	-0-	-0-	-0-	50	50
Grand TOTAL	\$2,445	\$1,465	\$3,910	\$1,151	\$987	\$6,048	\$1,172	\$7,220	\$425	\$250	\$675	\$242	\$228	\$1,145	\$205	\$1,350

1/ Anticipated Mission "Buy-Ins" under the "Ribbon" PASA.

2/ Individual Mission funded PASAs not under the "Ribbon" PASA.

Projected Input Budget - FY 1986 - FY 1990

Appendix IV
Page 2 of 2

	FY 1987								FY 1988							
	Agency for International Development				AID	USFWS	DWRC	Total	Agency for International Development				AID	USFWS	DWRC	Total
	Project Paper		Mission PASAs ^{2/}						Project Paper		Mission PASAs ^{2/}					
	S&T/ACR	Other ^{1/}	Total	Bangladesh	Pakistan	Total			S&T/ACR	Other ^{1/}	Total	Bangladesh	Pakistan	Total		
Salaries & Benefits	\$238	\$-0-	\$238	\$125	\$124	\$ 487	\$100	\$ 587	\$255	\$-0-	\$255	\$ 96	\$124	\$ 475	\$106	\$ 581
Consultants	-0-	67	67	-0-	-0-	67	-0-	67	-0-	72	72	-0-	-0-	72	-0-	72
Travel	41	119	160	22	21	203	6	209	43	128	171	17	21	209	7	216
Direct Cost																
Printing & Repro.	4	-0-	4	5	5	14	5	19	5	-0-	5	4	5	14	6	20
Transportation	1	-0-	1	5	4	10	-0-	10	1	-0-	1	4	4	9	-0-	9
Other Services	7	-0-	7	21	17	45	16	61	8	-0-	8	17	17	42	17	59
Supplies & Material	32	-0-	32	13	15	60	5	65	33	-0-	33	10	15	58	6	64
Contingency	10	11	21	8	2	31	-0-	31	11	12	23	7	2	32	-0-	32
TOTAL Direct Cost	54	11	65	52	43	160	26	186	58	12	70	42	43	155	29	184
Indirect Cost	122	73	195	74	70	339	35	374	131	78	209	57	70	336	37	373
Equipment	-0-	-0-	-0-	-0-	-0-	-0-	52	52	-0-	-0-	-0-	-0-	-0-	-0-	54	54
Grand TOTAL	\$455	\$270	\$725	\$273	\$258	\$1,256	\$219	\$1,475	\$487	\$290	\$777	\$212	\$258	\$1,247	\$233	\$1,480
	FY 1989								FY 1990							
	Agency for International Development				AID	USFWS	DWRC	Total	Agency for International Development				AID	USFWS	DWRC	Total
	Project Paper		Mission PASAs ^{2/}						Project Paper		Mission PASAs ^{2/}					
	S&T/ACR	Other ^{1/}	Total	Bangladesh	Pakistan	Total			S&T/ACR	Other ^{1/}	Total	Bangladesh	Pakistan	Total		
Salaries & Benefits	\$273	\$-0-	\$273	\$ 96	\$ 69	\$ 438	\$114	\$ 552	\$292	\$-0-	\$292	\$ 96	\$ 48	\$ 436	\$122	\$ 558
Consultants	-0-	78	78	-0-	-0-	78	-0-	78	-0-	84	84	-0-	-0-	84	-0-	84
Travel	46	139	185	17	11	213	8	221	49	150	199	17	8	224	10	234
Direct Cost																
Printing & Repro.	5	-0-	5	4	2	11	6	17	6	-0-	6	4	2	12	7	19
Transportation	2	-0-	2	4	2	8	-0-	8	2	-0-	2	4	2	8	-0-	8
Other Services	9	-0-	9	17	11	37	18	55	10	-0-	10	17	8	35	20	55
Supplies & Material	35	-0-	35	10	7	52	6	58	36	-0-	36	10	5	51	7	58
Contingency	11	13	24	7	2	33	-0-	33	12	14	26	7	-0-	33	-0-	33
TOTAL Direct Cost	62	13	75	42	24	141	30	171	66	14	80	42	17	139	34	173
Indirect Cost	140	85	225	57	39	321	40	361	150	92	242	57	27	326	41	367
Equipment	-0-	-0-	-0-	-0-	-0-	-0-	57	57	-0-	-0-	-0-	-0-	-0-	-0-	59	59
Grand TOTAL	\$521	\$315	\$836	\$212	\$143	\$1,191	\$249	\$1,440	\$557	\$340	\$897	\$212	\$100	\$1,209	\$266	\$1,475

1/ Anticipated Mission "Buy-Ins" under the "Ribbon" PASA.

2/ Individual Mission funded PASAs not under the "Ribbon" PASA.

VERTEBRATE PEST MANAGEMENT SYSTEMS R&D
Estimated FY 1986 Person Months by Project Component

	FY 1986 Person Months							
	Project Paper			Mission PASAs ^{1/}		AID	USFWS	Total
	S&T/AGR	Other ^{2/}	Total	Bangladesh	Pakistan	Total	DWRC	
Research	23	7	30	7	19	56	10	66
Technology Transfer	21	7	28	20	10	58	10	68
Training	9	3	12	2	3	17	4	21
Networking	<u>6</u>	<u>2</u>	<u>8</u>	<u>5</u>	<u>0</u>	<u>13</u>	<u>3</u>	<u>16</u>
Total	59	19 ^{a/}	78	34	32	144	27	171

^{a/} Includes 4 person months for Haiti.

	FY 1986 Percentages							
	Project Paper			Mission PASAs ^{1/}		AID	USFWS	Total
	S&T/AGR	Other ^{2/}	Total	Bangladesh	Pakistan	Total	DWRC	
Research	39%	37%	39%	20%	60%	39%	37%	39%
Technology Transfer	36%	37%	36%	59%	31%	40%	37%	40%
Training	15%	16%	15%	6%	9%	12%	15%	12%
Networking	<u>10%</u>	<u>10%</u>	<u>10%</u>	<u>15%</u>	<u>0%</u>	<u>9%</u>	<u>11%</u>	<u>9%</u>
Total	100%	100%	100%	100%	100%	100%	100%	100%

^{1/} Anticipated Mission "Buy-Ins" under the "Ribbon" PASA.

^{2/} Individual Mission Funded PASAs not under the "Ribbon" PASA.

VERTEBRATE PEST MANAGEMENT SYSTEMS R&D
Estimate Annual Person Months
List of IWRC Personnel Providing Assistance to AID Project

Name	Title	Work Activity	USFWS/DWRC		AID Missions	Total
			Estimated contributed person months	S&T		
Dr. Paul A. Vohs, Jr.	Director	Administration and Supervision	0.50			0.50
Dr. Richard D. Curnow	Assistant Director	Administration and Supervision	0.50			0.50
Mr. Glenn A. Hood	Branch Chief	Administration and Supervision	1.00			1.00
Dr. John L. Seubert	Section Chief	Animal Damage Control--Mammals	0.25			0.25
Dr. David L. Otis	Section Chief	Animal Damage Control--Birds	0.50			0.50
Dr. Michael W. Fall	Branch Chief	Animal Damage Control--Mammals	1.00			1.00
Dr. Richard M. Engeman	Statistician	Statistical Services	0.50			0.50
Ms. N. Paige Grouinger	Computer Operator	Computer Services	0.75			0.75
Ms. Diana L. Dwyer	Librarian	Library and Information Services	0.75			0.75
Mr. A. Larry Kolz	Electronics Engineer	Bioelectronics Services	0.25			0.25
Mr. Jean B. Bourassa	Electronics Technician	Bioelectronics Services	0.50			0.50
Mr. Richard E. Johnson	Electronics Technician	Bioelectronics Services	0.50			0.50
Mr. John L. Glitts	Chemist	Chemical Analytical Services	1.00			1.00
Mr. Dennis L. Meeker	Technician	Chemical Analytical Services	1.00			1.00
Mr. Stephen R. Kilburn	Technician	Chemical Analytical Services	1.00			1.00
Mr. Brad E. Johns	Physiologist	Laboratory Support Services	1.50	1.00		2.50
Mr. Kenneth A. Crane	Technician	Laboratory Support Services	1.50	2.00		3.50
Mr. Stanley E. Gaddis	Technician	Laboratory Support Services	1.00	3.00		4.00
Mr. Samuel B. Linhart	Biologist	Animal Damage Control--Predators	0.25			0.25
Dr. Frederick F. Knowlton	Biologist	Animal Damage Control--Predators	0.25			0.25
Dr. Paul L. Hegdal	Biologist	Environmental Impact	1.00			1.00
Dr. James O. Keith	Biologist	Endangered Species	1.50			1.50
Dr. George H. Matschke	Biologist	Animal Damage Control--Mammals	0.25			0.25
Mr. Jerome F. Besser	Biologist	Animal Damage Control--Birds	0.50			0.50
Dr. Richard A. Dolbeer	Biologist	Animal Damage Control--Birds	0.50			0.50
Mr. Paul P. Woronecki	Biologist	Animal Damage Control--Birds	1.00			1.00
Mr. Edward W. Schafer, Jr.	Chemist	Animal Damage Control--Birds	0.50			0.50
Dr. Melvyn V. Garrison	Physiologist	Animal Damage Control--Birds & Mammals	1.50			1.50
Mr. Joseph L. Guarino	Biologist	Animal Damage Control--Birds	0.25			0.25
Dr. R. Daniel Thompson	Physiologist	Animal Damage Control--Birds & Mammals	1.00			1.00
Mr. Donald J. Elias	Biologist	Animal Damage Control--Birds & Mammals	0.50			0.50
Dr. Ray T. Sterner	Physiologist	Animal Damage Control--Birds & Mammals	0.25			0.25
Dr. Stephen A. Shunake	Behaviorist	Animal Damage Control--Birds & Mammals	0.75			0.75
Dr. Michael A. Bogan	Branch Chief	Ecological Services	0.25			0.25
Mr. Dewey L. Beck	Administrative Officer	Administration and Personnel Support	1.00			1.00
Mr. Edwin R. Thurston	Fiscal Officer	Fiscal Services	1.00			1.00
Mrs. Myrna L. Seifler	Support Services Supervisor	Property and Payroll Services	1.00			1.00
Dr. Michael L. Jaeger	Zoologist	ADC--Vertebrates			12.00	12.00
Mr. Joe E. Brooks	Biologist	ADC--Vertebrates			12.00	12.00

S&T/AGR:9/2/85

VERTEBRATE PEST MANAGEMENT SYSTEMS R&D
 Estimate Annual Person Months
 List of DWRC Personnel Providing Assistance to AID Project

Appendix VI
 Page 2 of 2

Name	Title	Work Activity	USFWS/DWRC		AID	
			Estimated contributed person months	S&T	Missions	Total
Mr. John W. Degrazio	Section Chief	Administration and Supervision				
Mrs. Donna J. Scott	Program Assistant	Administrative Support	6.00		6.00	12.00
Dr. Richard L. Bruggers	Biologist	ADC--Vertebrates	4.00		8.00	12.00
Mr. Lynwood A. Fiedler	Biologist	AOC--Vertebrates	5.00		7.00	12.00
Dr. G. Clay Mitchell	Biologist	ADC--Vertebrates	5.00		7.00	12.00
Mrs. Annaliese Valvand	Editorial Assis at	Editorial Services	11.00		1.00	12.00
Mr. Michael S. Bornstein	Technician	Laboratory Support Services	4.00		8.00	12.00
Mr. David G. Hayes	Technician	Laboratory Support and Travel	4.00		8.00	12.00
Dr. Peter J. Savarile	Pharmacologist	ADC--Vertebrates	2.00		1.00	3.00
		(Travel and Laboratory Support)	3.00		.	3.00
Mr. Roger W. Bullard	Chemist	ADC--Vertebrates				
		(Travel and Laboratory Support)	3.00			3.00
DWRC Scientists (7)		Field Studies (LDC's) (7)			5.00	
DWRC Scientists (3)		Laboratory and Library Support (3)	3.00			3.00
Other		USFWS/DWRC	3.00			
TOTAL			27.25	59.00	15.00	15.00
					85.00 ^{a/}	171.25

^{a/} Includes 34 person months for Bangladesh, 32 person months for Pakistan, 4 person months for Haiti, and 15 person months for other mission buy ins.

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CURRICULUM VITAE

John W. De Grazio. Chief, International Programs Section. GS-14. B.S. (1957) Colorado State University. With DWRC since 1959. Administrative and supervisory responsibilities. Technical expertise in bird damage research. Author or coauthor of 35 scientific publications on vertebrate pest problems and management. Vertebrate pest work under AID/DWRC project since 1969 in about 32 developing countries. Reading and speaking fluency in Spanish.

Donna J. Scott. Program Assistant, International Programs Section. GS-7. One year college. Employed by DWRC since 1973. Office manager and responsible for all administrative functions of the AID program including accounting, purchasing, shipping, travel, personnel, and property. Liaison between DWRC and AID and other domestic and international organizations concerning administrative functions. One official overseas trip.

Richard L. Bruggers. Wildlife Biologist (Research), International Programs Section. GS-13. Ph.D. (1974) Bowling Green State University. Present position since 1979; previously employed by Food and Agriculture Organization of the United Nations in Africa. Technical expertise in bird damage research and management, with experience in 23 developing countries. Responsibilities include assessing bird pest problems in developing countries, planning and coordinating appropriate research, and training foreign nationals. Author or coauthor of 50 research publications. Reading and speaking competency in French.

Lynwood A. Fiedler. Wildlife Biologist (Research), International Programs Section. GS-12. B.S. (1963) and M.A. (1969) Bowling Green State University. Plans and coordinates international rodent damage research and training programs and serves as technical consultant on rodent problems worldwide. Technical expertise on tropical agricultural rodent pests since joining DWRC in 1978. Author or coauthor of 12 scientific publications and numerous unpublished reports on vertebrate pest problems. Have worked in 14 foreign countries with a limited proficiency in Filipino (speaking, reading) and German (speaking, reading).

G. Clay Mitchell. Wildlife Biologist (Research), International Programs Section. GS-13. B.S. (1958) SW Missouri State; M.Ed. (1961) Arizona; M.S. (1965) Arizona; Ph.D. (1969) Arizona. Assists in studies dealing with postharvest losses to vertebrate pests. Analyzes data from field studies in developing countries. Station leader at AID/DWRC field stations in Mexico (1970-1973) and Haiti (1980-1982) in vertebrate pest damage control. Author or coauthor of 27 scientific publications. Experience in developing countries worldwide. Language proficiency in Spanish, Portuguese, and French.

Michael M. Jaeger. Zoologist, International Programs Section. GS-12. B.S. (1967) College of St. Thomas; M.S. (1969) Creighton University; Ph.D. in Zoology (1976) Michigan State University. Responsibilities and expertise in vertebrate pest research with emphasis on birds. Author or coauthor of 15 scientific publications. Foreign experience with Food and Agriculture Organization of the United Nations in Ethiopia (1975-1982), Mozambique (1980), and Eastern Africa (1984/1985). Read French and speak some Amharic.

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Joe E. Brooks. Wildlife Biologist (Research), International Programs Section. FC 9/10. B.S. (1952) University of California; M.A. (1959) University of California. With DWRC since 1980 as Project Leader, Vertebrate Pest Project, Bangladesh. Technical expertise in rodent damage control and rodent-borne disease research. Author or coauthor of 70 scientific publications on vertebrate pest problems and management. Vertebrate pest work under World Health Organization and AID/DWRC since 1976 in about seven Southeast Asian and Middle East countries. No expertise in any language other than English.

Annaliese E. M. Valvano. Editorial Assistant, International Programs Section. GS-6. One year Business College, Bremerhaven, Germany. With DWRC since April 1971. Prepares scientific manuscripts and reports for publication which involves typing on Wang Word Processing System, editing, and layout. Responsible for several chapters of Section's Annual Report. German is native language; fair knowledge of French and Spanish.

Michael S. Bornstein. Wildlife Biological Technician, International Programs Section. GS-6. B.S. (1975) Colorado State University; M.A. (1985) University of Colorado at Denver. Duties include providing assistance on laboratory studies, maintaining animal care facilities, and procuring and dispersing supplies for overseas field stations.

Peter J. Savarie. Research Pharmacologist, Predator Studies Branch. GM-13. Ph.D. (1968) Marquette University. With DWRC since 1970. Research and supervisory responsibilities in development of predacides, rodenticides, and avicides. Author or coauthor of 36 scientific publications on vertebrate pest problems, management, and toxicology. Served as consultant to AID/DWRC on toxicology and safety training at projects in four developing countries. No reading, speaking, or writing fluency in foreign languages.

Roger W. Bullard. Research Chemist, Bird Damage Section. GS-13. B.S. (1963) in Agricultural Biochemistry, Oklahoma State University; M.S. (1975) in Analytical Chemistry, Denver University. Technical expertise in chemical and sensory aspects of animal damage control research. Senior author of 30 and coauthor of 12 scientific publications on vertebrate pest problems and management. Have conducted research for AID/DWRC project since 1969 on vertebrate pest problems in Asia, Africa, and Latin America.

Payroll Costs for the Denver Wildlife Research Center since 1980.
estimates for 1985 and 1986 were made with information available on
February 28, 1984

PAYROLL TABLE

<u>Fiscal Years</u>	<u>DWRC Payroll</u>	<u>Appropriated Federal Funds</u>
1980	\$ 4,292,452	\$ 4,615,875
1981	5,665,432	6,777,000
1982	5,642,501	6,134,513
1983	6,248,857	6,971,290
1984	5,357,385*	6,593,400
1985	5,547,047**	5,004,000**
1986	6,939,870***	6,364,240***

* From FY-84 AMP

** From FY-85 PAWP

*** FY-85 + 6% for increases in salary and benefits

ESTIMATED REPLACEMENT COSTS
DENVER FACILITIES AND EQUIPMENT

Building	\$ 9,000,000
Major laboratory equipment	5,000,000
Computers, printers, etc.	500,000
Vehicles, boats, etc.	300,000
Major office equipment	1,000,000
Library holdings	1,000,000
Outside animal holding pens and parking areas	<u>1,000,000</u>
Total	\$17,800,000

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DWRC SPACE AND FACILITY DESCRIPTION (ft²)

Appendix VIII
Page 3 of 3

Bldg	Office	Laboratory	Library, conference	Inside storage	Pens and outside storage	Parking	Remarks
2	140	650	-	260	60	6,900	Physiology lab and office; houses bird section personnel.
2A	-	-	-	-	860	-	Upland game and other bird holding facilities.
3	1,055	910	-	1,195	1,195	-	Office and laboratory space for bird section and electronics personnel.
3A	-	-	-	-	785	-	Bird holding and incubator facilities.
13	-	-	-	1,110	1,045	-	Aviary, storage, and shop area.
14	1,855	965	-	540	-	-	Bioassay, biopsy, and electronics labs; houses bird section personnel.
16	9,410	8,765	2,365	2,085	-	24,000	Main DWRC building. Dry, wet, bioassay, biopsy, and chemical labs; chemical storage, dark, supply, library, conference, printer, reprint, and computer rooms.
45	3,185	2,700	-	3,220	-	6,600	Houses mammal, predator, and ecological section personnel offices and laboratories.
83K	575	325	-	75	160	2,400	Predator studies office, laboratories, and outside holding pens.
83D, E, H, I, L	-	-	-	480	-	-	Storage.
Total	16,220	14,315	2,365	8,965	4,105	39,900	
Grand Total = 85,870 ft ²							
Annual rental cost for space from GSA: \$378,852							

Appendix VIII
Page 3 of 3

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Field Stations of the Denver Wildlife Research Center, their location, and their area of emphasis.

<u>Location</u>	<u>Area of Emphasis</u>
U.S. Fish and Wildlife Service Denver Wildlife Research Center 6924 Tremont Road Dixon, CA 95620 FTS 8-916/756-1975 (Commercial) 916/756-1975	Bird damage control research on fruits and vegetables and aviation hazards.
U.S. Fish and Wildlife Service Denver Wildlife Research Center 2820 East University Avenue Gainesville, FL 32601 FTS 8-946-7238 (Commercial) 904/375-2229/2230	Development of control methods for roosting blackbirds, damage to rice, and rodent damage to sugarcane.
U.S. Fish and Wildlife Service Denver Wildlife Research Center Kentucky Research Station 334 - 15th Street Bowling Green, KY 42101 FTS 8-502/842-0341 (Commercial) 502/842-0341	Research to alleviate economic, health, and nuisance problems caused by blackbirds and starlings.
U.S. Fish and Wildlife Service Denver Wildlife Research Center Ohio Field Station c/o Plum Brook Station Taylor and Columbus Roads Sandusky, OH 44870 FTS 8-294-1621 (Commercial) 419/625-0242	Research on bird damage to corn and population dynamics.
U.S. Fish and Wildlife Service Denver Wildlife Research Center 1027 Trenton Avenue Bend, OR 97701 FTS 3-422-6283 (Commercial) 503/382-6922, Ext. 233	Develops methods to reduce pocket gopher damage to conifer seedlings.
U.S. Fish and Wildlife Service Denver Wildlife Research Center Forestry Sciences Laboratory 3625 93rd Avenue, S.W. Olympia, WA 98502 FTS 3-434-9450 (Commercial) 206/753-9450	Control methods research to reduce mammal damage to conifers.

Continued.

<u>Location</u>	<u>Area of Emphasis</u>
U.S. Fish and Wildlife Service Denver Wildlife Research Center U.S. National Museum of Natural History 10th and Constitution Avenue, NW Washington, DC 20560 FTS 8-357-1930 (Commercial) 202/357-1920	Taxonomic/systematic and zoogeographic studies of birds, mammals, reptiles, and amphibians in relation to land use and resource management practices.
U.S. Fish and Wildlife Service Denver Wildlife Research Center P.O. Box 67 San Simeon, CA 93452 FTS 8-805/927-3893 (Commercial) 805/927-3893	Studies of California sea otter ecology, reproduction, and foraging behavior.
U.S. Fish and Wildlife Service Denver Wildlife Research Center Applied Science Building University of California Santa Cruz, CA 95064 FTS 8-408-429-2820 FTS 8-408-429-2357 (Commercial) 408/429-2820 or 2357	Studies of California sea otter populations, movements, and community ecology.
U.S. Fish and Wildlife Service Denver Wildlife Research Center 412 N.E. 16th Avenue, Room 250 Gainesville, FL 32601 FTS 8-946-7239 or 8-946-7234 (Commercial) 904/372-2571	Studies of manatee population dynamics, ecology, and behavior.
U.S. Fish and Wildlife Service Denver Wildlife Research Center Mauna Loa Field Station P. O. Box 44 Hawaii Volcanoes National Park, HI 96713 (Commercial) 808/967-7396	The development of methods for controlling populations of mongooses that prey upon endangered wildlife species.

Continued.

Appendix IX
Page 3 of 4

<u>Location</u>	<u>Area of Emphasis</u>
U.S. Fish and Wildlife Service Denver Wildlife Research Center 1300 Blue Spruce Drive Fort Collins, CO 80524 FTS 8-323-5277 (Commercial) 303/493-4855	Ecological relationships between land uses, natural resources management, habitats and wildlife populations on National Wildlife Refuges, other Federal lands, and areas of special concern.
U.S. Fish & Wildlife Service Denver Wildlife Research Center 1011 East Tudor Road Anchorage, AK 99503 FTS 8-907/786-3448 (Commercial) 907/786-3448	Conducts research on population dynamics, distribution, and ecology of walruses, sea otters, and polar bears with specific reference to FWS responsibilities under the Marine Mammal Protection Act of 1972. Gathers baseline data and conducts studies on the status and distribution of seabirds, shorebirds, and waterfowl in Alaska with specific reference to the potential impacts of energy development.
U.S. Fish and Wildlife Service Denver Wildlife Research Center Arctic National Wildlife Refuge 101 12th Street, Box 20 Fairbanks, AK 99701 FTS 3-907/456-0250	Ecology, behavior, and physiology of caribou and other species on National Wildlife Refuge lands in Alaska.
• U.S. Fish and Wildlife Service Denver Wildlife Research Center Kodiak National Wildlife Refuge P.O. Box 825 Kodiak, AK 99615 FTS 3-907/487-2600	Ecology, behavior, and physiology of brown bear and other species on National Wildlife Refuge lands in Alaska.
U.S. Fish and Wildlife Service Denver Wildlife Research Center Museum of Southwestern Biology University of New Mexico Albuquerque, NM 87131 FTS 3-474-3903 (Commercial) 505/243-4013	Population and community ecology studies in southwest arid and semi-arid systems.
U.S. Fish and Wildlife Service Denver Wildlife Research Center P.O. Box 916 Sheridan, WY 82801 (Commercial) 307/672-5326 or 5327 thru FTS 3-323-1110	Impacts of coal strip mining upon wildlife and their habitats in the Northern Great Plains.

Continued.

<u>Location</u>	<u>Area of Emphasis</u>
U.S. Fish and Wildlife Service Denver Wildlife Research Center P.O. Box 593 Twin Falls, ID 83301 FTS 8-554-6557 (Commercial) 208/733-0186	Depredation control methods, management systems research, and damage assessment.
U.S. Fish and Wildlife Service Denver Wildlife Research Center Cynthia Ann Building 326 Main Street Dallas, OR 97338 FTS 8-503/623-5200 (Commercial) 503/623-5200	Predator control methods evaluation.
U.S. Fish and Wildlife Service Denver Wildlife Research Center Predator Ecology & Behavior Project 118 Maranjo Avenue Laredo, TX 78041 FTS 8-734-6224 (Commercial) 512/723-6542	Substation on predator ecology and coyote population dynamics studies.
U.S. Fish and Wildlife Service Denver Wildlife Research Center USU, Department of Wildlife Resources, UMC 52 Logan, UT 84322 FTS 8-801-750-2505 (Commercial) 801/750-2505	Predator ecology and behavior studies.
USAID/Dhaka Department of State Washington, DC 20520	Bangladesh project addresses vertebrate pest problems in small-farm agriculture.
USAID/Islamabad Department of State Washington, DC 20520	Pakistan project addresses vertebrate pest problems in small-farm agriculture.
U.S. Fish and Wildlife Service Denver Wildlife Research Center c/O Monell Chemical Senses Center 3500 Market Street Philadelphia, PA 19104 FTS 8-215/898-4982 (Commercial) 215/898-4982	Chemical senses research related to control of vertebrate pests.

Requests to DWRC for assistance during 1985. This table does not include requests to DWRC biologist stationed at Bangladesh field station.

Type of request or activity	Months												Total
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Information on International Programs	3	1	1	4	2	3	0	1					
Literature or information on research and crop protection methods	12	16	11	4	12	3	6	3					
No. reprints provided	117	150	299	32	33	108	286	169					
Graduate school inquiries	1	0	1	0	1	0	0	0					
Workshops/symposia/conferences	0	1	4	0	0	0	1	0					
Materials/photographs	0	0	0	1	3	0	1	0					
IDY's/visits/project requests	0	1	1	1	2	2	0	0					
Hiring possibilities	0	0	2	0	0	0	1	0					
International visitors to DWRC	0	0	1	0	4	2	9	4					
Funding	0	0	0	0	0	0	0	0					
TOTAL	133	169	320	42	57	118	304	177					

Originating countries:

Jan Poland, Cameroon, United Kingdom, North Quay, Israel, Malawi, Tanzania, Pakistan, Egypt, Indonesia, Kenya, Nigeria.

Feb Cuba, Morocco, Niger, Senegal, Greece, Kenya, Scotland, Rwanda, Sudan, India, Switzerland, New Zealand, Tanzania, Peru, Zambia, USA.

Mar South Africa, Niger, Australia, Bangladesh, USA, Italy, Morocco, Costa Rica, Australia, Uruguay, Argentina, Chile.

Apr Italy, Philippines, USA, Kenya, Ecuador, Sweden, South Africa.

May Liberia, Italy, India, Galapagos, Argentina, Philippine, Guinea (Conakry), Uruguay, Colombia, Somalia, Sri Lanka, Costa Rica, Niger, Syria, Nicaragua, Dominican Republic, Nigeria, West Germany.

Jun Kenya, Ethiopia, India, West Germany, United Kingdom, Peru, Pakistan.

Jul Uruguay, India, Pakistan, Kenya, India, Maldives, Costa Rica, Tanzania, Hong Kong, Western Samoa, Uganda, Somalia, Argentina, Philippines.

Aug Uganda, Malaysia, Colombia, Somalia.

THE DENVER WILDLIFE RESEARCH CENTER



The Denver Wildlife Research Center (DWRC) is a major research facility of the U. S. Fish and Wildlife Service. Its purpose is to provide information necessary for the intelligent management and conservation of the nation's wildlife resources. Established in 1940 with a staff of less than 20 people, the DWRC now employs approximately 150 scientists, technicians, and support personnel. About half of them work in offices and laboratories at DWRC headquarters located in a federal complex near Denver, Colorado. Others work at field stations throughout the United States and in several foreign countries.

Research activities at DWRC emphasize two of the Service's major concerns: (1) protecting wildlife from the adverse effects of man's continual modification of the land; and (2) reducing the damage wildlife causes to agriculture, forests, industry, or other areas of human endeavor.

The development of energy resources, forestry, agriculture, and the expansion of living space are a few of man's activities that often conflict with the well-being of wildlife. Conversely, disease transmission and damage to agricultural crops, domestic livestock, and forest plantations are some of the ways in which wild animals conflict with the interests of man. Resolution of these conflicts requires factual information about the animals, the environments in which they live, and how man's activities affect them. These problems are complex and a number of scientific disciplines are required to successfully resolve them. Hence, the staff of the Center includes specialists in diverse fields such as wildlife biology, ecology, pharmacology, animal psychology and behavior, statistics, physiology, analytical chemistry, and electronics. Well-equipped laboratories, a broad-based technical library, and computer systems are some of the tools available to the scientists.

A variety of information is needed to enhance and maintain wildlife habitats and ensure that land use is compatible with the interests of both wildlife and man. One of the most complex problems facing land managers is that of evaluating how energy development projects will affect habitat and animal populations. For example, DWRC researchers are studying the effects of surface mining for coal. This research will help define the steps needed to restore the land to its former value and provide



recommendations for ways to avoid excessive disturbance of wildlife in the mining process. Other investigations are conducted to provide various natural resource agencies with information needed to evaluate and improve resource management practices for the benefit of wildlife. For example, U. S. Forest Service policies regarding removal of dead trees during timber harvests were changed to provide habitat for cavity-nesting and snag-dependent wildlife. DWRC research defined the characteristics of dead trees that should be left standing to meet the needs of cavity-nesting birds.

No wild animal is undesirable in itself, but almost any bird, mammal, or other wild creature can become a problem. Deer and smaller mammals such as pocket gophers destroy newly planted tree seedlings, thus reducing reforestation potential. Birds, sometimes numbering in the millions, can decimate grainfields. Rodents destroy growing crops or stored foodstuffs and predators attack domestic animals. Diseases like rabies, plague, typhus, and others may be spread by wild creatures. The objectives of the animal damage research program are to evaluate these situations and, if circumstances warrant, develop methods to reduce or eliminate the damage. The Denver Wildlife Research Center is a pioneer animal damage control research institution in the United States and has, for many years, been a recognized leader throughout the world in development of methods and materials for vertebrate damage control. Research activities include damage assessment; laboratory and field studies of animal behavior and ecology to define the damaging species and its habits; and development and testing of chemical, physical, or cultural methods for minimizing or eliminating the problem situation. Emphasis is given to ensuring that the methods developed are biologically sound, effective, safe, economical, and acceptable within the broader context of environmental concerns.

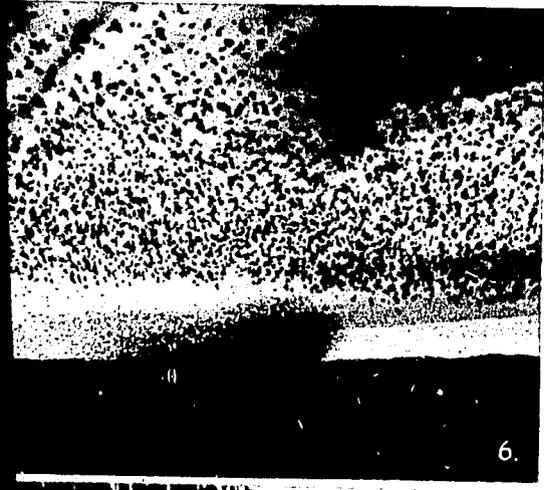
Predators are an important part of the natural environment, but they sometimes conflict with man's economic interests. Of particular concern is the impact of coyote predation on livestock, especially sheep. Center scientists study such aspects of predator-prey ecology as the distribution and population dynamics of predators in relationship to their food base and they seek selective and humane means to protect livestock from attack by coyotes and other predators.



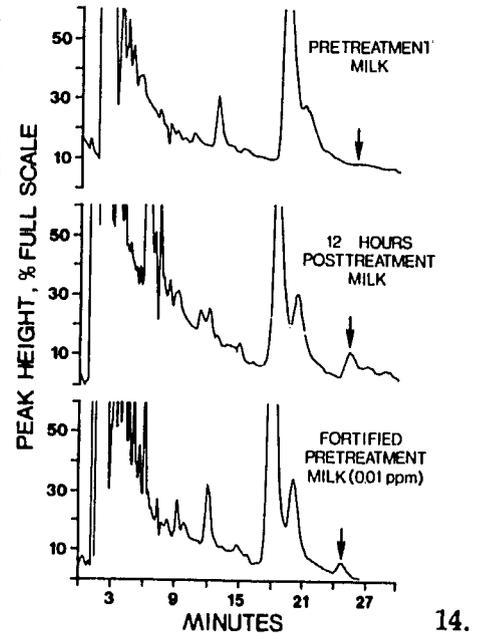
The international activities of the Center, which are carried out in cooperation with the U. S. Agency for International Development, are a reflection of the Center's recognized leadership in animal damage control research. Center scientists at Denver and overseas field stations are developing methods for reducing severe agricultural damage by a variety of rodents, birds, and vampire bats in Latin America, Africa, and Asia. The international programs are designed not only to develop and test appropriate technology for reducing animal damage in developing countries but also to train scientists of the host countries in this specialized type of research and management.

The many active research programs of the Center require a broad spectrum of laboratory support. Center chemists continue to develop new analytical methods to identify and measure the many chemical substances that may be present, often at very low concentrations, in wildlife, their foods, and their environment. Electronic specialists develop and improve designs for specialized equipment such as field event counters and radio telemetry transmitters large enough to track polar bears by satellite or tiny enough to be carried by small birds.

Research conducted at the Denver Wildlife Research Center will continue to provide information needed to resolve wildlife-related problems and help manage our wildlife resources wisely and effectively in the future.



6.



14.



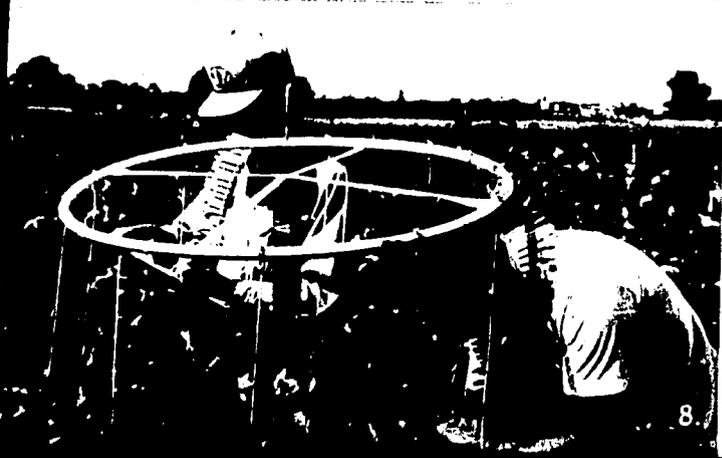
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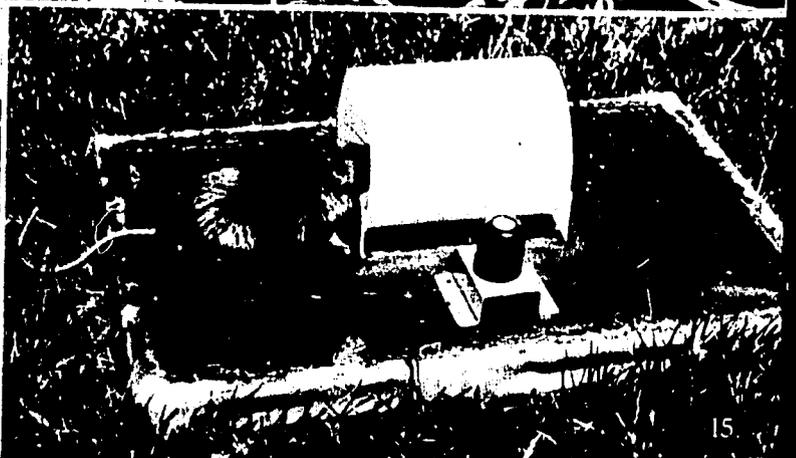
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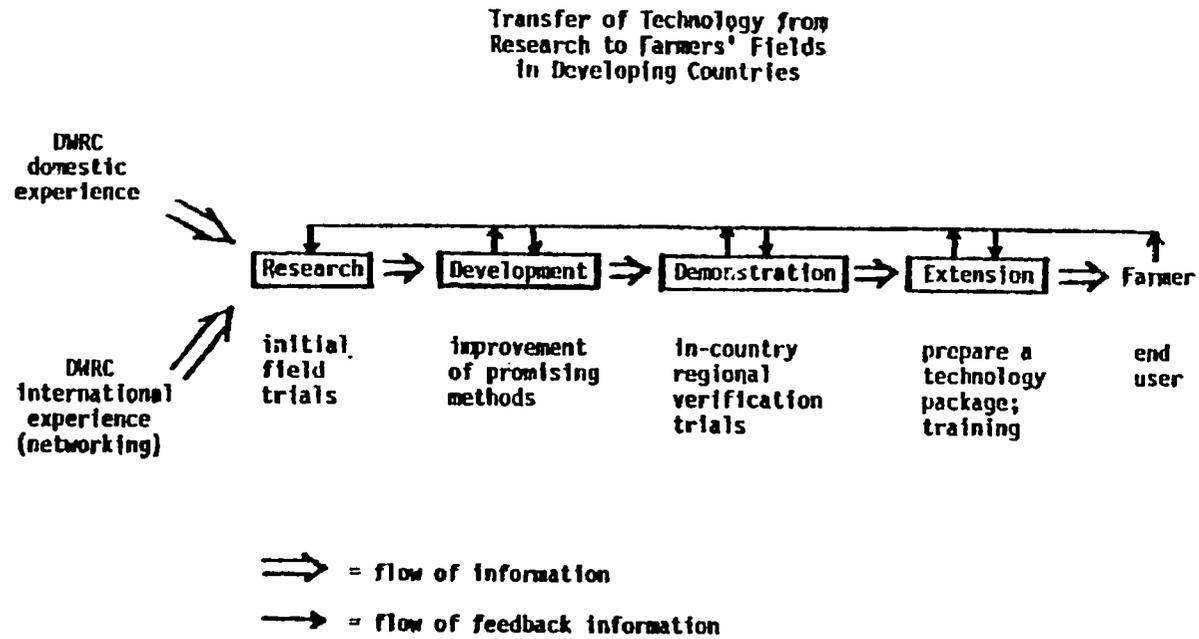


Figure . A schematic representation of how vertebrate pest research in LDC's leads to useful recommendations for traditional farmers. Technology progressively flows (⇒) from the research component to the farmer and is systematically improved upon by feedback (→) of technical or socioeconomic problems identified at each step.

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NETWORKING

1. Networking

The objective in developing vertebrate pest management (VPM) networking activities is to promote the use of VPM techniques in countries within regions that have or potentially have similar vertebrate pest problems. The purpose is to maximize the cost-effective transfer of technology from primary sites where techniques are already developed to secondary sites in need of appropriate technical assistance to increase food production by reducing vertebrate losses. Areas with similar cropping systems and pest species and/or damage would thus benefit through cooperative networking efforts.

Global and regional VPM networking will be accomplished through improving on the existing network established by the DWRC during the last 17 years by:

- 1) identifying specific locations for networking in suitable regions and developing countries.
- 2) promoting existing national programs through graduate student assistance and information exchange
- 3) organizing regional training and working group meetings
- 4) promoting research and planning within selected national and international programs and
- 5) directly transferring appropriate VPM methods and techniques.

The networking concept is not new to the DWRC. Regional and international cooperation in promoting and developing VPM programs and in transferring existing technology where appropriate has been an active part of past programs. This project will encourage increased efforts and expand the current network, particularly at the regional level.

2. Existing Networks

Vertebrate pests include diverse groups of crop damaging animals including rodents, birds, bats, and canids. About 60 different rodent species alone have been identified as causing economic damage throughout the world. Numerous species of birds, bats, and canids have similarly been identified. Despite this diversity, certain regions of the developing world have common vertebrate pest problems, i.e. the vampire bat in Central and South America; the quelea bird and the multimammate rat in Africa; riceland rats in southeast Asia and the bandicoot rats in south Asia. Networking may span the entire tropical agroecosystem where common crops and similar vertebrate damage occurs. An example is riceland rat control technology developed in the Philippines being used in southeast Asia, the Caribbean and applicable in South America as well. Other identified crop/pest situations subject to similar VPM techniques such as rat control in coconut are prime candidates for networking - either global or regional - through DWRC.

DWRC has worked in cooperation with a number of U.S. and international organizations concerned with vertebrate pests (see Attachment A and B). Through in-country projects and outreach activities including temporary assignment (TDY's) to about 45 countries since 1967, DWRC has established contacts with key vertebrate research and extension counterparts, assisted in formal graduate training and conducted or participated in VPM workshops and other informal training outlets. Attachment C summarizes individual LDC contacts that DWRC has made and that should now be included as candidates for the proposed networking activities.

3. Potential for Network Development

Countries included in Attachment C will be encouraged to develop and formalize networks based on common themes of similar crops and vertebrate pests. In-country mission funded VPM projects would best serve as focal points for regional networking. The combination of S&T/AGR core funding and mission funding supplemented with Regional Bureau and host country contributions (and possibly outside international donor funds) would be required to implement effective regional workshops and working group meetings. The inclusions of international research centers where appropriate would certainly benefit network development and should be encouraged.

The selection of some common themes such as rat control in deepwater rice, rat control in transplanted or direct-seeded rice, rat control in wheat or bird control in ripening cereal grains would facilitate global networking as well as some regional networking. Focusing on specific problems and solutions in which technology is now available and ready for transfer would lead to initial successes that would stimulate involvement in other VPM common theme networking.

An example of one regional networking system is proposed. The Bangladesh mission funded VPM project located within the Bangladesh Agricultural Research Institute (BARI) at Joydebpur could host a regional workshop for countries in south Asia with rat (Bandicota spp) damage in rice and wheat. One or two LDC VPM experts representing several countries including Pakistan, India, Burma, Thailand, Sri Lanka and other with these and similar pests and crops would attend, share information and become members of that particular network. The DWRC/USAID mission VPM project would continue to be the focal point for

building the network by sharing information, providing technical assistance and monitoring progress. Periodic working group meetings involving network members would be held. Such a proposal has already been made and with S&T/AGR support could proceed in 1986.

DWRC will continue to backstop networking activities by providing information, responding to USAID mission requests, and participating in regional workshops or working group meetings. DWRC will also provide guidance and teaching for foreign graduate students at cooperating US universities with vertebrate pest management programs. DWRC will identify other regions (Africa, southeast Asia, South and Central America and the Caribbean) and common themes suitable for networking. DWRC will continue its leadership role as a hub of VPM resources and build on the existing informal network with LDC's and international institutes to formalize networking.

Attachments

- A Potential U.S. Network members
- B Potential International Network members
- C Potential LDC Network members

Attachment A

U.S. Organizations Potentially Involved
In Networking Based on Previous Cooperation

Organization

Agency for International Development
Bell Laboratories
Bowling Green State University
Bureau of Land Management
Centers for Disease Control
Central Missouri State University
Colorado State University
Department of Defense (Army)
Department of Energy
Dow Chemical Company
Eli Lilly Company
Environmental Protection Agency
Federal Aviation Administration
Florida State Museum
Hawaiian Macadamia Producers Association
Hawaiian Sugar Planters Association
Hooker Chemicals & Plastics Corporation
ICI Americas, Inc.
Mobay Chemical Corporation
Monell Chemical Senses Center
National Aeronautics and Space Administration
National Institutes of Health
National Park Service
New York State College
New York State Agricultural Experiment Station at Geneva
Oregon Rodent Control Outfitters
Rhone-Pollenc Chemical Company
Smithsonian Institution
Texas A&M University
Texas Tech University
Union Carbide Agricultural Products Company, Inc.
United States Department of Agriculture
University of California, Davis
University of Florida
University of Georgia
University of Illinois
University of Wyoming
U.S. Forest Service
U.S. Geological Survey
Velsicol Chemical Corporation
Virginia Polytechnic Institute & State University

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International Organizations Potentially Involved
in Networking Based on Previous Cooperation

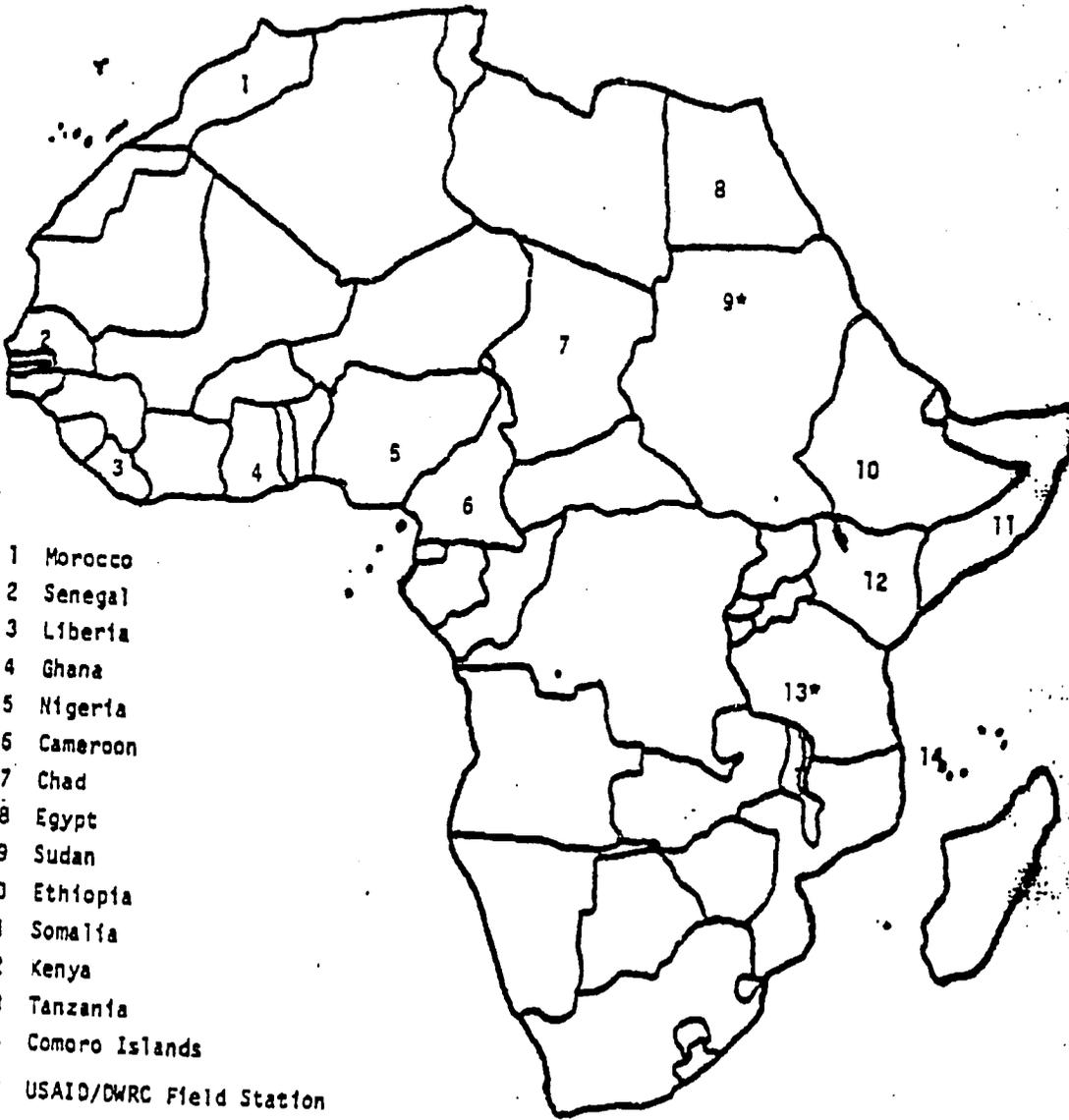
<u>Organization</u>	<u>Location</u>	<u>Function</u>
ACAZDL	Syria	Agriculture development
Avitrol	USA	Avicide manufacturer
Chemagro	USA	Avicide manufacturer
Chempar	USA	Rodenticide manufacturer
CIAT	Colombia	Crop production and protection
CICP	USA	Crop protection
DANIDA	Denmark	Developing country - technical assistance
DLCO	Ethiopia	Crop protection
GASGA	Ad-Hoe	Post-harvest crop protection
GTZ	Germany	Developing country - technical assistance
IADS (Winrock Int.)	USA	Agricultural development
ICI	England	Rodenticide manufacturer
IPCX	USA	Crop protection
IRRI	Philippines	Crop production and protection
MAFF	England	Animal damage control
OAU	Kenya	Agriculture development
OCLALAV	Senegal	Crop protection
OECD	France	Economic cooperation - technical assistance
ORSTROM	France	Developing country - technical assistance
PAHO	Panama	Disease control
TDRI	United Kingdom	Developing country - technical assistance
Union Carbide	USA	Avicide manufacturer
UNDP - FAO	Rome, Italy	Agricultural development, crop protection
UNDP - WHO	Geneva, Switzerland	Disease control
Veisicol	USA	Rodenticide manufacturer
WS	New Zealand	Animal damage control

LDC Countries Potential Involved in Networking
Based on Previous Involvement

<u>Africa</u>		<u>Latin America</u>		<u>Asia</u>	
Burkina Faso	MOA	Argentina Univ. of Cordoba		Bangladesh	BARI
Cameroon	MOA	Barbados	MOA	Burma	MOA
Chad	MOA	Belize	MOA	India	CAZRI
Comoro Islands	MOA	Bolivia	MOA	Indonesia	MGADI
Egypt	MOA	Brazil	MOH	Kuwait	MOH
Ethiopia	MOA	Colombia	ICA	Malaysia*	MARDI
Ghana	MOA	Costa Rica	MOA	Maldives	MOA
Kenya	MOA	Dominican Republic	MOA	Nepal	MOA
Liberia	MOA	Ecuador	MOA	Pakistan	YPCC
Morocco	PP	El Salvador	MOA	Philippines	NCPC
Niger	MOA	Guatemala	MOA	South Korea*	MOA
Nigeria	MOA	Guyana	MOA	Sri Lanka	MOA
Rwanda	MOA	Haiti	MOA	Taiwan*	MOA
Senegal	MOA	Honduras	MOA	Thailand	MOA
Somalia	MOA	Jamaica	MOA	Turkey	MOA
Sudan	PPD	Mexico	INIP	Vietnam	MOA
Tanzania	MOA	Nicaragua	MOA		
Uganda	MOAF	Panama	IICA		
Zimbabwe	DWMP	Paraguay	MOA		
		Peru	MOA		
		Uruguay	MOA		
		Venezuela*	MOA		

*not an LDC but an important network contributor within the region.

AFRICA



- 1 Morocco
- 2 Senegal
- 3 Liberia
- 4 Ghana
- 5 Nigeria
- 6 Cameroon
- 7 Chad
- 8 Egypt
- *9 Sudan
- 10 Ethiopia
- 11 Somalia
- 12 Kenya
- *13 Tanzania
- 14 Comoro Islands
- * USAID/DWRC Field Station

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SOUTH AMERICA



- 1 Colombia
- 2 Venezuela
- 3 Guyana
- 4 Ecuador
- 5 Peru
- 6 Brazil
- 7 Bolivia
- 8 Paraguay
- 9 Argentina
- 10 Uruguay
- * USAID/DWRC Field Station

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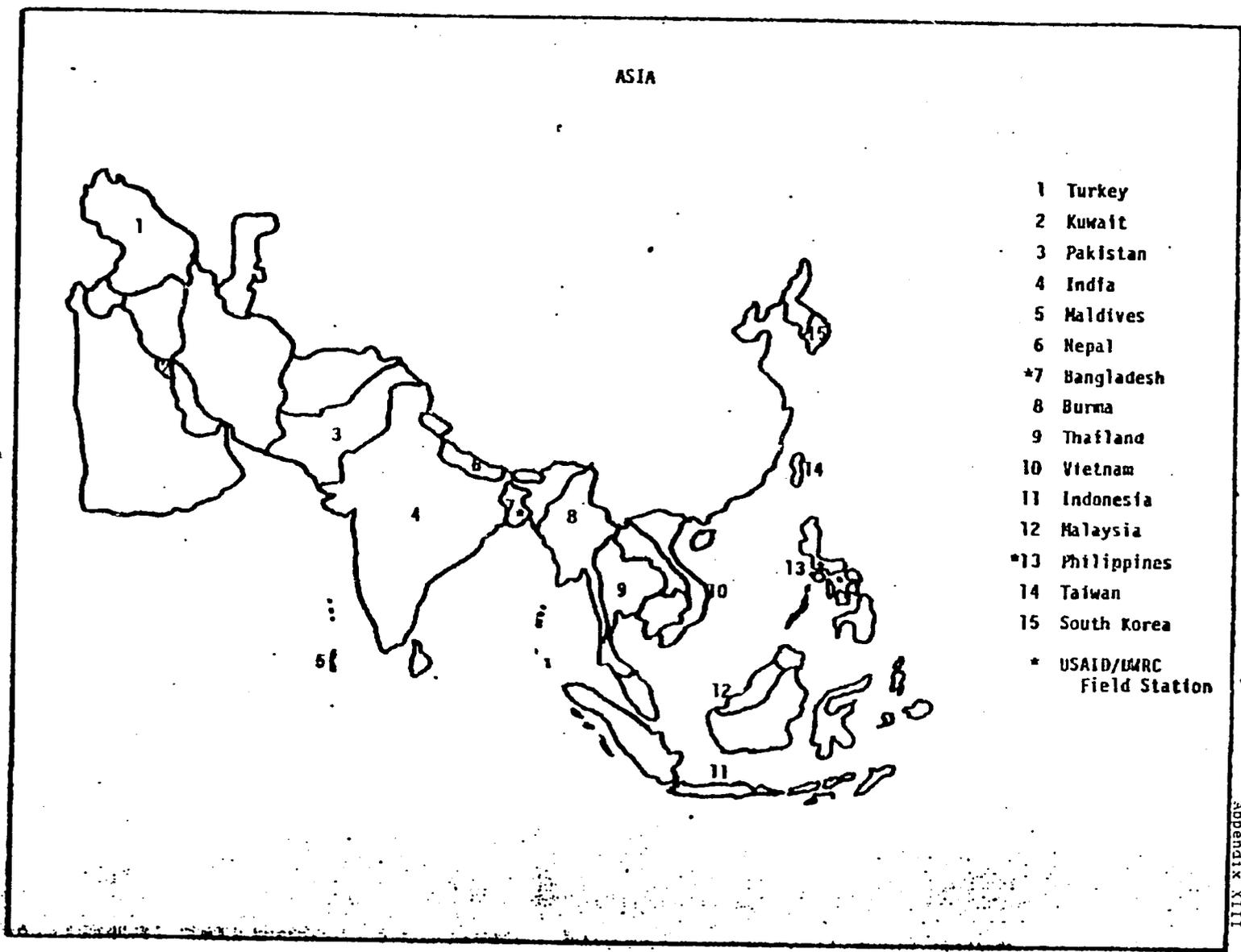
MEXICO, CENTRAL AMERICA, CARIBBEAN



- *1 Mexico
- 2 Guatemala
- 3 Belize
- 4 El Salvador
- 5 Honduras
- 6 Nicaragua
- 7 Costa Rica
- 8 Panama
- 9 Jamaica
- *10 Haiti
- 11 Dominican Republic
- 12 Barbados
- * USAID/DMRC Field Station

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Vertebrate Pest Management Systems R&D
Summary of Mission Responses

Appendix XIV
Page 1 of 3

Region/ Country	Applied Research	Technical Information Transfer	Problem Solving	Training	Networking	Private Sector	Comments
Africa							
Botswana		Limited use might be requested	TDYs might be requested for specific needs				Mission is supportive of centrally-funded "Ribbon" PASA
Burundi							Lack of funding support regretted
Chad							Need for project not foreseen
Djibouti							Need for services not foreseen
Ethiopia							No project now or anticipated
Ghana		Wish to share information			Want to share information		Interested in supporting the project through information sharing
Guinea-Bissau	None planned at present, despite need	None	Pest species and loss studies needed - \$5000	One summer internship with DWRC planned	Wants mailings & workshop invitations	None	Decision to continue DWRC's work is encouraging
Kenya	Being planned	Will request reports	May have more needs later	Six-weeks in-country training planned - \$5000			Have used DWRC services. Will use more in FY 86-89
Madagascar							Negative response
Mali			Regretfully no funds available				Very appreciative of past help
Mauritania	Extent not yet known	Will draw on DWRC's Senegal work	Extent not yet known	Extent not yet known	Will work with Senegal		Bird damage a major concern. Mission project involvement indefinite
Senegal							No budget for DWRC services
Somalia	Possibility of inclusion in new mission project						No funds presently; future extent of needs indefinite
Swaziland			See comments	See comments	Want networking on bird resistant sorghum		UK's ODA and FAO meet present problem-solving and training needs
Togo							No present or planned needs
Zambia							Future use not anticipated
Zimbabwe							Need for services not expected

Appendix XIV
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Region/ Country	Applied Research	Technical Information Transfer	Problem Solving	Training	Networking	Private Sector	Comments
Asia & Near East							
Bangladesh	DWRC is to provide a researcher for more than 20 months	Assistance being received	More than 36 months of TDYs to be funded	Assistance being received	Continued network building desired		Separate PASA to provide \$1 million to FY 91
Egypt	IPM needs to be defined		VPM needs to be determined				Buy-ins to be coordinated
India			No accurate estimate of need	No accurate estimate of need			VPM an important area. DWRC will be used as need arises
Indonesia							Use of DWRC not foreseen
Jordan							DWRC services not foreseen as needed
Morocco							Use of DWRC not anticipated
Nepal	Research on control may be included		3 months of TDYs foreseen to quantify losses	In-country training may be included			Support requirements are tentative to start in FY 87
Pakistan	DWRC will provide a researcher for 48 months	Assistance anticipated	15 months of TDYs scheduled	75 PM of in-country and up to 100 PM of overseas training scheduled	Seed money provided for research workshop and other networking		Separate PASA to provide \$0.9 million up to FY 89. Mission supports this S&T/AGR effort through DWRC
Philippines	Agroforestry/plantation crops and postharvest long-term research needed	Need continued work with appropriate agencies	Some need for medium-term assistance		Benefits of networking are anticipated. Limited workshop support possible		Value of DWRC resources and importance of VPM recognized, and buy-in support may be possible
Sri Lanka	Anticipate DWRC involvement	Now using research and other reports	DWRC involvement anticipated	Encouraging use DWRC non-degree training			Expect needs to be minimal with work starting in FY 88
Tunisia							Need for services not anticipated

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Region/ Country	Applied Research	Technical Information Transfer	Problem Solving	Training	Networking	Private Sector	Comments
Lat. America & Caribbean							
Belize	Perhaps adaptive research needed	Technology transfer may be needed					VPM problems impor- tant. Project responds to great need. Budget pre- cludes use now, but maybe later as un- programmed activity
Bolivia							VPM is important, but not high priority. Support not anticipated
Caribbean (Barbados)			Probable require- ment for 1 month TDY per year			Probable need for initiatives in private sector	Welcomes project
Costa Rica							DWRC provided ex- cellent services, but buy-ins not foreseen
Dominican Republic							No VPM buy-in in FY 86
Ecuador							VPM involvement not planned in FY 86
Guatemala							VPM services not anticipated
Haiti	Six weeks per year anticipated to continue their 5-year program	See applied re- search. French language docu- ments needed	Two to three TDYs anticipated annually - \$20,000 per year	Will continue use of services as needs are identified	French language documents needed. Appropriate network forum suggested	Mission of- fers DWRC help to hold private sec- tor workshop	Mission pleased with decision to continue DWRC activities
Honduras							Unable to estimate buy-ins. Wish to review PP
Jamaica							This IDC will use FAO as donor
Nicaragua							Negative response
Panama							VPM R&D need not anticipated
Peru		Requesting research and extension information	Requesting TDY by VPM extension specialist	Requesting help with "training of trainers" in VPM			Until new project starts in '87, these are the needs
Portugal							VPM not a priority. Funds fully in use.

MEMORANDUM

TO : S&T/FA, J. S. Robins
FROM : S&T/AGR, Anson R. Bertrand
SUBJECT: Environmental Threshold Determination
REF : Vertebrate Pest Management Systems R&D

On the Basis of the Initial Environmental Examination (IEE) on Page ___ of the PP and the attached Initial Environmental Examination, I recommend that you make the following environmental threshold 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: _____

DISAPPROVED: _____

DATE: _____

Clearance:
Environmental Officer _____

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VERTEBRATE PEST MANAGEMENT SYSTEMS R&D
INITIAL ENVIRONMENTAL EXAMINATION

Project Location : Worldwide
Project Title : Vertebrate Pest Management Systems R&D
Project Number : 936-4173
Life of Project : Five Years
IEE Prepared By : H. R. Shuyler
Date :
Action Recommended: Negative Determination

Concurrence: _____

Date: _____

Vertebrate Pest Management Systems R&D

INITIAL ENVIRONMENTAL EXAMINATION

1. Project Description

This project, to be implemented by the Denver Wildlife Research Center (DWRC), is designed to increase the availability of food and feed by improving the capabilities of LDCs to reduce pre/postharvest losses due to vertebrate pests. This development process requires the use of environmentally sound programs. The project provides technology transfer, including problem solving assistance, training, and applied research. It also promotes networking and disseminates information regarding these and related activities.

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). DWRC has worked with the Environmental Protection Agency (EPA) since its inception in the following areas: 1) the development of the needs of EPA 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 AID in international developmental assistance, dating back to 1967. During this time, the DWRC personnel have become well acquainted with the development of AID's requirement to analyze potential hazards to the environment which might result from its 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 AID. These include Bangladesh, Colombia, Costa Rica, Dominican Republic, Egypt, Ethiopia, Guatemala, Haiti, Indonesia, Kenya, Mexico, Nicaragua, Pakistan, Peru, Philippines, 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 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 normally will be accompanied by a simple Initial Environmental Examination consisting of a risk:benefit analysis.

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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 AID Regulation 16.

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) an increase in usable production of agricultural crops; and/or 2) an increase in availability of agricultural produce. The need for these increases is widely recognized as being of great benefit to the LDCs and to the aims of AID, 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 thus far outweigh the risks of their use. (All possible exceptions of this conclusion are stated above and require special subsequent approval action.)

The activities of this project generally fall into the area described in Environmental Procedural Regulations paragraph 216.2 (c). "Analysis, studies, academic or investigative research, workshops and meetings". These classes of activities normally will not require the filing of an Environmental Impact Statement or the preparation of an Environmental Assessment.

The grantee will assure that: (1) all testing of vertebrate pesticides will be performed under closely controlled laboratory and/or small scale field conditions; (2) data on toxicological and environmental aspects will be available to safeguard the health of research personnel and the quality of the local environment in which the pesticides are used; and (3) no unauthorized use for human or animal consumption will be made of treated crops. All recommendations and/or extension of pesticide use and practices will require an environmental assessment and approval by the S&T/AGR project officer, environmental officer within S&T/AGR and the appropriate Regional Bureau Environmental Officer(s).

2. Recommendations

From the discussion above and the analysis contained on the following "Impact Identification and Evaluation Form," it is determined that the project will not have a significant direct effect on the environment. A negative determination is recommended.

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IMPACT IDENTIFICATION AND EVALUATION FORM

Impact Areas and Sub-Areas	<u>Impact Identification*</u>
A. Land Use	
1. Changing the character of the land through:	
a. Increasing the population	N
b. Extracting natural resources	N
c. Land clearing	N
d. Changing soil character	N
2. Altering natural defenses	N
3. Foreclosing important use	N
4. Jeopardizing man or his work	N
5. Other factors: Reducing pesticide pollution and contamination	N
B. Water Quality	
1. Physical State of water	N
2. Chemical and biological states	L
3. Ecological balance	L
4. Other factors	N
C. Atmospheric	
1. Air additives	N
2. Air pollution	L
3. Noise pollution	N
4. Other factors	N
D. Natural Resources	
1. Diversion, altered use of water	N
2. Irreversible, inefficient commitments	N
3. Other factors	N
E. Cultural	
1. Altering physical symbols	N
2. Dilution of cultural traditions	N
3. Other factors	N

Impact Identification and Evaluation Form

Impact Areas and Sub-Areas	<u>Impact Identification*</u>
F. Socio-Economic	
1. Changes in economic/employment patterns	M+
2. Changes in population	N
3. Changes in cultural patterns	M+
4. Other factors	M+
G. Health	
1. Changing a natural environment	N
2. Eliminating an ecosystem element	N
3. Other factors	
Reducing pesticide poisoning	M+
H. General	
1. International impacts (Cooperation in pest management)	M+
2. Controversial impact	N
3. Larger program impacts	N
4. Other Factors	N
I. Other Possible Impacts (not listed above)	
1. Introduction of new plant species	N
2. Agricultural chemicals	M-
3. Other factors	N

*The following symbols are used for Impact Identification

N = No	Environmental Impact	+ = Beneficial Impact
L = Little	Environmental Impact	- = Negative Impact
M = Moderate	Environmental Impact	
H = High	Environmental Impact	
U = Unknown	Environmental Impact	

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