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A REGIONAL VERTEBRATE PEST CONTROL RESEARCH PROGRAM FOR SOUTHEAST ASIA

Personal Service Contract

This is a part of regionalization of the Philippine part of research on rats

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ABSTRACT

This report proposes a regional vertebrate pest control research program for Southeast Asia, specifically for the Philippines, Indonesia, Malaysia and Thailand. Rodent and bird problems are very serious throughout the region and rodents in particular exact a heavy toll on the basic food crops, especially rice and corn. Rodent and bird problems are particularly difficult to manage in the region because of very high pest population, extreme complexity both of the pest species and of the environment, great variety of human cultural practices, a bewildering maze of institutional relationships involving pest research, extension and control, and rapidly changing agricultural practices related to efforts to upgrade and modernize crop production.

The current program, organization and funding of the Philippine Rodent Research Center is reviewed. This AID-Philippine government sponsored center is the only well organized and funded institution in Southeast Asia dedicated to rodent control research. The bulk of its funding and support for an American research team is coordinated by the Denver Wildlife Research Center, a world leader in vertebrate pest research.

The proposal to regionalize vertebrate pest control research includes the following facets:

1) that a five year program be initiated to convert the Rodent Research Center to an all Filipino program, serving the national needs of the country. It should remain the largest research center of its kind in the region and thus serve a leadership role.

2) that organizational funding and program changes be made in the RRC to strengthen it and increase its operational efficiency.

3) that the regional program include development, with expatriate help, of vertebrate pest control research capabilities in each of the other three currently stable Southeast Asiatic countries. That these in-country programs include:

    a) an expatriate research specialist with commodity and technical support to initiate the research program over a 5-year period,

b) a fellowship program to train national counterpart personnel up to the Ph.D. level at overseas institutions,

c) a program to strengthen university capability to produce the necessary specialists in the region.

4) that the regional in-country programs be tied together by a coordinator, associated with the RRC, but administratively independent, whose task would be to promote the interchange of information and techniques through conference, workshops, publications and periodic visits to each program. He is also expected to actively promote the university strengthening program. Total annual budget for the expatriate phase of the regional program is estimated to be $379,650.

An assessment of current problems, control procedures, research capabilities, and recommendations for each country included in the proposal are given.

CURRENT SITUATION

Rodent and bird damage is known to occur in almost all agricultural crops in Southeast Asia. Losses resulting from such damage are important because of the role such crops play in the economy of the countries in this region. For example, these crops represent approximately 18% of the gross domestic product for the Philippines, 22% for Thailand, 28% for Malaysia and 45% for Indonesia. The bulk of these crops include rice, corn, sugar cane, copra, and oil palm, all highly susceptible to rodent damage. Rice and corn together constitute over 50% of the agricultural production in three of the countries mentioned above (excluding Malaysia). While reported losses in rice and corn are heaviest and sometimes spectacular, almost any edible crop may suffer damage. All cereals are damaged as are also such crops as fruits, cocoa and even, on occasion, tea and rubber. In addition to rodent damage, birds are a problem, particularly in small grains and fruits such as grapes.

Our ability to cope with damage by rodents and birds in Southeast Asia is hampered by a nunber of complicating factors. Rodent and bird damage is particularly difficult to assess, especially on a large scale. Rodents are typically nocturnal and thus cannot easily be detected in the act of causing damage. Their depredations are frequently widely diffused throughout a crop area and only occasionally so heavy locally as to be conspicuous. Yet, they may cause consistently important losses. Recent rice damage surveys

over a large area of the Philippines by the Rodent Research Center at Los Banos reveal an overall loss of 3.4% in this one crop. Losses have been reported from every other SE Asiatic country. Such reports are based largely on visual estimates and are essentially non-quantitative. There is, however, little question of the authenticity of most damage reports, especially when losses have been heavy.

Another complicating factor in rodent and bird control is the difficulty of transferring knowledge gained in one problem area to other regions. The general principle underlying rodent and bird pest management are well known, having been worked out over the last three decades largely by research workers in North America and Europe. Applying these principles to the rodent and bird problems of SE Asia, however, requires a very considerable amount of translation. First, the species themselves are mostly different, involving also other genera, with species-specific responses to control efforts. Second, the tropical environments are vastly different and more complex than those encountered in temperate regions. This richness complicates the task of discovering what environmental variables regulate rodent and bird numbers and makes generalization difficult. Third, the human cultural context is different and varies enormously within the region itself.

Since rodent and bird management problems are also "human" problems involving changes in such things as ways of farming,

acceptable levels of sanitation, and construction of shelters, rodent and bird control research must have a strong local flavor which takes pecularities of human enterprise into account. Most importantly, the existing institutional structures vary within the region and control research, extension and operations must be adapted to locally acceptable ways of doing things.

Important and very extensive changes in agricultural practices in S.E. Asia resulting from development of large irrigation schemes and introduction of new varieties of cereals and other crops have increased the rodent and bird pest problems. Irrigation makes possible double cropping in such cereals as rice and new varieties and techniques holds out promise of triple cropping. This sharply increases available food for rodent and bird pests, creates for them a more stable environment and avoids population depletion during unfavorable, off-season conditions. New high-yielding varieties of rice give more grain/unit area on a shorter, more accessible plant. The introduction of alternative crops, as in multiple cropping schemes increases the variety and amount of rodent and bird food. Projects to bring new lands into production are particularly vulnerable to damage as predators are destroyed and environmental disruption favors pest rodents and birds. Thus, improvements in agriculture per se tend to make rodent and bird damage problems even more severe.

For these reasons it is highly desirable to extend rodent and bird control research in S.E. Asia beyond the immediate area served

by the Philippine Rodent Research Center. This report explores these other regional situations and proposes a program aimed at increasing rodent and bird control research capabilities. It is an unfortunate but fairly accurate observation for S.E. Asia, that, despite the severity of rodent problems especially, the hard fact is that we have precious little to extent to the farmer in the way of effective acceptable control procedures. Clearly control research is needed to correct this situation.

Existing Regional Research

The Denver Wildlife Research Center (DWRC) looms large in its influence on vertebrate pest damage control research in S.E. Asia despite its physical remoteness from the region. As the Chief Agency involved in the initiation and support of the Philippine Rodent Research Center it has been in a position for the past four years to determine the nature and thrust of regional control research. The Rodent Research Center (RRC) has been actively engaged in extension of its research at workshops given by the International Rice Research Center (IRRI) and by FAO-WHO. The center has been visited by an impressive number of professionals in agricultural work in the region. What research is currently being carried out in S.E. Asia (see sections on individual countries) has in part, at least, been patterned after RRC approaches.

The Pest Infestation Control Laboratory of the Ministry of Agriculture, Fisheries and Food, at Tolworth, England is, along with the DWRC, a world center for vertebrate pest control research. It has had an important influence in Africa, the Indian sub-continent and the South Pacific. Its impact on S.E. Asia is harder to assess and does not appear to be substantial.

At present the Federal Republic of Germany is supporting a rodent control demonstration project in the Philippines. This project, initiated in 1969 has at present two German technicians and a project leader and ten Filipino project managers who are

responsible for 100 hectare demonstration plots utilizing continuous anticoagulant baiting. This program is an attempt to transfer to the villages and agricultural areas of S.E. Asia the German program of rat-free towns. The program is not particularly involved in research on rodent control, save for the evaluation techniques to measure degree of control. Rather, it si an attempt to demonstrate the effectiveness of a particular control technique. Relations between this program and the RRC are cordial but distant.

Japanese interest in rodent control research in S.E. Asis has been sporadic and done largely on an individual basis. Some limited work in the past has been done in Indonesia and Malaysia but it has had no impact in the region.

Considerable interest in expansion of rodent and bird control research has been shown by the Regional Office for Asia and the Far East (RAFE) of FAO. The Plant Protection Office of RAFE has developed a project proposal during 1970-71 for a Regional Coordinated Project on Vertebrate Pest Control. A copy of this proposal is contained in Appendix IV of this report. It clearly identifies the interest of RAFE in the problem and proposes establishment of strengthened national programs and regionally coordinated research. It encompasses a larger region than S. E. Asis, including Ceylon, Bangla Desh and India.

The RAFE project is more limited in scope and overall objectives than this proposal, lacking a fellowship component and a local

university strengthening program. It would consist largely of one or more experts in each participating country, coordinated by an expert stationed in Thailand at Kasetsart University, Bangkhen.

At present, according to Dr. Kahn Jalavicharana, Senior Plant Protection Officer at RAFE/FAO, the initial stage of the proposal, for a 2-man survey team, is under consideration by FAO/Rome.

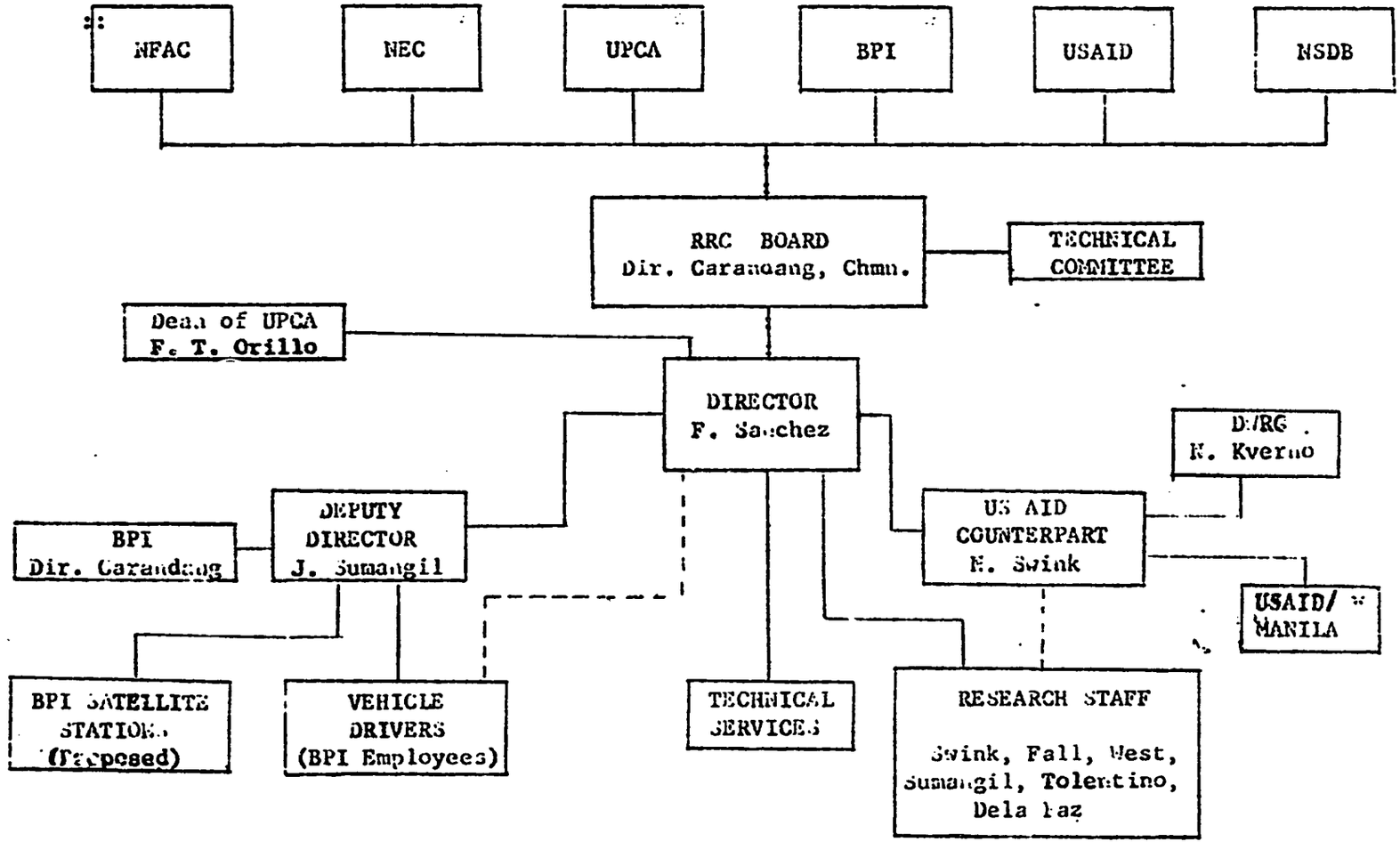
RODENT RESEARCH CENTER

The Rodent Research Center (RRC) established in 1968 as a joint project between the Government of the Philippines (GOP) and the U.S. Agency for International Development (AID), represents the only well organized and financed organization conducting rodent control research in Southeast Asia. It is located on the campus of the University of the Philippines College of Agriculture (UPCA) at Los Banos, Laguna adjacent to the International Rice Research Institute (IRRI). As a joint venture involving AID and several GOP agencies it has both a complex organization and funding pattern.

Organization

Policies for the RRC are established by a Board composed of members from each of the cooperating agencies. At present this includes the Bureau of Plant Industry (BPI), UPCA, the National Economic Council, the National Food and Agricultural Council, the National Science Development Board, the Philippine Atomic Energy Commission and AID. Chairman of the Board is Director of the BPI, Director Eliseo Carandang who is currently Acting Undersecretary of Agriculture. The Board meets infrequently.

A Technical Committee to advise the Board is made up of the BPI research biologist, J. Sumangil, Dr. B. dela Cruz of the



·· Funding Agencies

FIGURE I. - Current Organizational Structure of the Rodent Research Center

Philippine Atomic Energy Commission, Dr. R. Lantican, UPCA Director of Research and N. Swink, AID team leader. In point of fact the committee rarely functions as such and advice is sought from any appropriate individual or group.

The Chief Administrative Officer of the Center is the Director, Dr. Fernando F. Sanchez. This position, only recently defined is one of great complexity and requires considerable coordination of the inputs from the various agencies involved in operation of the Center. Our perception of these relationships is shown in Figure 1, a diagram of the organizational structure. The Director is on the faculty of the UPCA and receives his salary from the College. By agreement the chairman of the RRC Board and the RRC Director are not chosen from members of the same GOP agency in order to avoid domination by one group. The Deputy Director is an employee of the BPI. He will presumably be in charge of four BPI satellite stations in Luzon, Occidental Mindoro, Panay and Mindanao. He also has the supervisory control over the RRC vehicle drivers who are BPI employees. This, he exercises through the Director. The AID team leader is responsible to the Director, but in fact is answerable to the AID program coordinator at the Denver Wildlife Research Center. He also acts as liaison with the AID mission in the Philippines. The research staff is made up of two AID research biologist plus the team leader, three BPI plant pest control biologists, the director (UPCA) and support technicians (UPCA and AID). It is responsible for research,

control programs, and extension. In theory each of these responsibilities is allocated to certain individuals. In fact clear-cut distinctions are hard to make and all share these functions in part.

In effect, then, the Director is a coordinator, acting as a broker among the funding and cooperating agencies. He exercises little real administrative power, for this finally rests with UPCA, BPI and AID. That this system works at all is a tribute to the high degree of cooperation and tolerance exhibited by the members of the Center. It also reflects the fact that no really fundamental differences of opinion have been allowed to surface.

Funding

The funding pattern is also complex and involves a variety of loosely integrated budgets. An outline of this funding pattern is presented in Appendix 1. The figures presented have been variously arrived at and represent in some cases "ball-park" figures. They are used only to convey some idea of the nature of the budget.

Several features of this budget deserve comment. The salary scales in US dollars are vastly different for the U.S. and the Phillippine personnel. Some salaries are a major item in the budget, this is important in assessing the contributions of the U.S. and the Philippines. The man-hour contribution of the Philippines to the program is very substantial and functionally their contribution is much greater than the US dollar figure suggests.

The AID funding pattern is somewhat complicated because it involves inputs to the Denver-based back-up staff which serve all three DWRC programs (bats, birds and rats), inputs to the Philippine Center, and a substantial contribution directly from the AID Mission in the Philippines. A rough idea of the AID budget breakdown is given at the end of Appendix I.

At the present time a little under 45% of the total AID contribution to the budget goes for support of the Denver-based program. This is an important consideration in any projections of a future budget for operation of the RRC under a regional program (see later). The technical and coordinative contribution from Denver must be accounted for in any structural and funding alterations. It should also be noted that the AID Mission in the Philippines makes a substantial non-salary contribution. The bulk of this contribution is in the form of support for overseas education for Philippine staff members of the RRC, but it also includes considerable commodity support.

Physical Facilities

When construction is completed this year on the new wing the RRC will have approximately 6,000 sq. ft. of laboratories, offices, a library and a training area. This building is located on one hectare of land with more available. Building and available land would seem to be of adequate size for the foreseeable future. At present the chief vehicles are two carryall trucks. Research equipment would appear to be adequate, provided replacement is found for the computer recently stolen.

Program

The objectives of the RRC as stated in the 1971 Annual Report are:

1. Research on crop protection for rice and other agricultural crops damaged by rice.
2. Assisting in training of Filipino scientists in rodent research.
3. Bringing research findings to the farmers through extension workers.

An additional goal is dissemination of crop protection information and techniques throughout S.E. Asia.

A listing of the current and pending research projects of the Center may be found in Appendix II. The three major areas of effort involve biology of the pest species, damage assessment, and research on control procedures. Work to date has centered exclusively on problems in rice in a variety of circumstances, i.e. irrigated, non-irrigated, various geographic regions. The chief difficulties encountered appear to be associated with the great variability which characterizes the problem regions and the rats themselves, experimental design difficulties stemming from lack of satisfactory models, and the very time-consuming travel and accommodation situation.

Damage survey work on rice appears to be in good shape and extensive survey assistance is available through RRC-trained personnel from the BPI.

Extension and control work directly related to the RRC do not at present appear to be extensive. However, one of the AID staff members is transferring his activities into Manila and will work with the BPI.

The RRC plans to hold three vertebrate pest management workshops in October and November of this year.in Thailand, Korea and the Philippines. Each workshop will involve about 20 participants. They will last for twelve days and involve nominees from Indonesia, Malaysia and Vietnam (although the latter may be unable to attend) in addition to personnel from the host countries. This is the first major effort on the part of the RRC to hold a major regional workshop program.

DENVER WILDLIFE RESEARCH CENTER

The AID contract to do control research on vertebrate pest damage in developing countries is actually with the Denver Wildlife Research Center (DWRC) of the Fish and Wildlife Service, Bureau of Sport Fisheries and Wildlife. The contract covers projects on bird and vampire bat control in addition to the rodent control research.

The functions of the DWRC are to provide administrative coordination, budget management and development, and technical back-up to the field projects, such as the RRC. The DWRC is a well-established, staffed and equipped research center providing extensive capabilities in pesticide screening and bioassay, basic research in physiology, behavior, and other aspects of pest biology, and development of sophisticated electronic tracking and monitoring equipment. It is the only center in the world so well equipped and extensively involved in the variety of vertebrate pest damage problems.

Its contribution to the RRC program include development of electronic tracking equipment suitable for field work on rodents, provision of basic data on rodenticide effectiveness, information on reproductive physiology, and a detailed analysis of food habits of the rice field rat R.r. mindanensis. It maintains a staff of specialists who are available for consultation on problems arising in the field. These include a pharmacologist, physiologist, biochemist, animal behaviorist,

electronics engineer and two laboratory technicians. The current annual budget for AID projects contracted to the DWRC is roughly $550,000 of which a little over one-third supports the Denver back-up program.

REGIONAL PROGRAM PROPOSAL

Requirements:

A strong regional program in SEAsian vertebrate pest damage control has the following requirements:

1. At least one very strong national center with adequate organizational structure and funding, the latter a commitment on the part of the local government.
2. Rodent research programs in each of at least three other SE Asiatic countries with sufficient in-country capability and support to operate independently of the major national center in the region.
3. A regional coordinating office, associated with the major national center, whose function is to maintain an appropriately high level of communication with other national programs, arrange international conferences and workshops, and in general, to tie the several national programs together in a working relationship to promote sharing of knowledge, techniques and, when possible, expert personnel.

4. A program designed to educate the necessary research and control specialists up to and including the doctorate level to insure the appropriate calibre of research and extension programs on a continuing basis. Such capability should rest ultimately with one or more universities in SE Asia, but initially will involve foreign study outside of the region.

Rationale

The program should be Asian in character with staffing and funding largely a local responsibility. By developing one very strong center, supported by the country in which it is located, the necessary leadership can be established on a long term basis within the region by a center whose work is clearly in the best local national interests. This avoids cumbersome and tenuous international agreements on staffing and funding in a geographic region marked by rapidly shifting political relationships. It does not, of course, preclude bilateral contracts between the host country and other countries or international agencies. It does simplify such arrangements by reducing the number of concerned parties. It should be clear that such a center must have a firm organizational affiliation and budgeting mechanism within the country's institutional structure.

Essentially independent rodent research programs in the other currently stable SE Asiatic countries are desirable for several reasons.

These programs are viewed as being small enough to encourage ultimately in-country support and funding. Their control research capabilities should be sufficiently comprehensive and independent of the need for outside support to survive any isolation brought on by factors beyond their control. Programs of research must be located where the control problems exist and the biological and cultural complexity of S.E. Asia mandate a decentralized approach. Vertebrate pest species vary from one area to the next, and at least among rodents, may vary within species in different localities. Rodent and other vertebrate control problems are in reality human cultural problems and solutions are only workable when integrated into local customs and agricultural practices.

Intraregional cooperation is highly desirable, despite the need for local independence, and responsibility for this should rest with some particular office, associated with but relatively independent of, the major national center. Knowledge, techniques and specialists should be shared and responsibility for this should be vested in someone familiar with the various elements of the program, i.e. control research, extension, workshop and conference management, and development of university support programs. Preferably the coordinator should also have a broad familiarity with programs and organizations outside the region.

No program of the scope and requirements outlined here can continue without available specialists and technicians for staff replacement and expansion. This is the responsibility of the universities. Given current circumstances this will require development of curricular materials and programs in the fields of ecology and economic zoology. These areas, particularly the former, are not at present well-represented in S.E. Asiatic institutions despite widespread popularity in the developed countries. Close working relationships with the universities are also desirable in order to have access to other disciplines where knowledge and expertise have a bearing on control problems (e.g. economics, rural sociology and chemistry).

Implementation

This proposed implementation of the S.E. Asian Regional Vertebrate Pest Research Program is expected to require a period of three to five years, probably the latter. Funding proposals assume a five year input.

1. Changes in the Rodent Research Center - Clearly the Philippine Rodent Research Center should remain as the strongest national center in S.E. Asia. It has an appropriate location adjacent to the UPCA and IRRI. It has had over four years of experience as a control research center, considerable

competence is currently lodged in it, and it is strongly backed by AID/Washington through the DWRC. It should serve as a model for the development of other research organizations in the region and should be a leader in research, extension and control development.

However, as it now operates the RRC is not a suitable organization around which to develop a regional program. The following recommendations are aimed at correcting this situation and should increase the effectiveness and efficiency of the center.

a. The current organizational structure should be simplified so that the center, through its director, is answerable to only one agency. At present (see organizational chart) too many agencies, each with funding leverage, are involved in direct policy and management inputs. The director becomes a broker among competing agencies and his role is that of a coordinator rather than an administrative officer. A decision on which single agency shall have responsibility for the RRC is of the highest priority.

b. Concurrently, the funding pattern should be simplified.

With four agencies currently funding the program (Actually five if the AID input is divided between Washington and Manila) the role of the director is badly diluted by necessary adjustments to the requirements of each agency. There appears to be a lack of real commitment on the part of anyone agency with the exception of AID.

c. The RRC Board should meet more frequently as a policy making body but it should deal only through the director of the center.

d. The position of Director should be more clearly defined as that of an executive officer rather than a coordinator. This problem of the role of the Director is complicated by his being on secondment from the UPCA rather than directly employed by the center. Philippine employees, in particular, should be in a position to feel that a major share of their future rests with continued success of the center, rather than always having another agency position to retreat to under duress.

e. There is a need for generally agreed upon and formalized research objectives that are concretely stated and

clearly tied to current and pending research. At present a certain program definition is needed. It is recommended that more study plans be developed and cleared through the Director's office, to replace the variety of projects currently underway for which no well-organized plans exist. Only the most preliminary and exploratory research should be permitted before a formal plan is required. In this way excessive fragmentation of effort is minimized and plans and goals are more carefully and effectively tied together.

f. An improvement in coordination of the research, extension and control phases of the program should be accomplished, again through the office of the Director. At present it is quite difficult to determine the relationships among these three and personnel are operating pretty much as free agents as far as the center is concerned. The roles of each program and the staff concerned should be clearly defined. It should be relatively easy to detect an orderly pattern by which research information is passed on to the extension and control phases.

Nationalization of the RRC should be thought of as a process of gradual change over the next five years. Despite its problems, referred to above, the Center functions well at about the present staff level. This level is, however, clearly minimal and it would be highly desirable to add at least one additional biologist whose responsibilities would be to investigate rodent problems in crops other than rice.

It is particularly important that the phasing out of AID-supported staff be carried out at a pace slow enough to insure that Philippine replacements have made an appropriate transition to their new roles in the Center's program. Hasty withdrawals with serious continuity problems are not exactly unknown in the annals of U.S. involvement in developing countries and it would be extremely unfortunate were the fine start made by the RRC be jeopardized in this way.

The following table gives a recommendation on changeover from AID support to a Philippine national program. It refers only to professional and technical personnel.

Status of Staff	Fiscal Year '72	'73	'74	'75	'76
AID Professionals	3	4	4	3	2
AID Technicians	2	2	2	1	0
AID Denver Staff	4.5	———	———	———	1
Philippine Professionals	3	4	5	6	7-8
Philippine Technicians	3	4	5	7	8

As can be seen, support by AID continues at or above its current

level until the end of FY '74 after which there is a two-year period of termination of AID support. After FY '76 the Center should be entirely Philippine in support and staffing.

During this five-year period research of the type currently underway should be continued, subject to the tightening-up recommendations listed above. The control program should be handled by liaison with the BPI and carried out at the planned satellite stations. At least much of the extension work should be handled the same way.

Budget changes over the AID phase-out period will be substantial. As a guide to these changes a budget has been developed to indicate the annual operating costs of an all-Philippine center as proposed for FY '77. Costs are, of course, based on the current situation. This budget is in Appendix III-A. Salaries and wages are based on UPCA scales as listed in Appendix III-B.

2. Regional Research Programs - Individual programs of vertebrate pest control research patterned after the RRC approach in each of the three currently stable S.E. Asiatic countries are the best approach to regionalization. This assumes that each program will be of the right size to remain viable and funded and still be effective. It also assumes that coordination of

these programs occurs through a regional office (see later). The countries recommended are Indonesia, Malaysia and Thailand. The situation in each of them is dealt with in later sections.

To initiate a vertebrate pest control research program in each of these countries the following are necessary:

a. An expatriate control research specialist with appropriate support from outside funding sources to establish the program. Ideally this person should have research and organizational capabilities at the Ph.D. level or equivalent. He should be capable of considerable independent activity, able to identify high priority rodent or other vertebrate pest problems, organize and conduct appropriate research, and have some familiarity with both extension and actual control work. He should be able to develop institutional relationships to foster his program. This would involve not only the organization to which he is attached, but also university programs. The most appropriate background would be in vertebrate ecology, wildlife management or economic zoology. A prime requisite is sufficient "peripheral vision" to recognize and handle the institutional, cultural and biological contexts in which

vertebrate pest problems occur. The contract term for the expatriate specialist should be not less than three years, preferably five.

b. Identification and training of national counterpart personnel to assume responsibility for the program beyond tenure of the expatriate specialist. In most cases, perhaps all this will involve support for advanced post graduate education at a U.S. university up to the Ph. D. level. An ideal arrangement for education of the counterparts would be to take the course work for the Ph. D. abroad and conduct the thesis research in-country under the local guidance of either the expatriate or an acceptable designate from the local university system. A training period at the RRC would also be highly desirable.

c. Identification of an appropriate national institution to which the vertebrate pest research program could be attached. Such an institution should be engaged in agricultural research and development, be administratively and functionally stable, contain considerable capability and

expertise in the crops most seriously damaged by vertebrate pests, and be organized in such a way as to relieve the vertebrate pest research program of much administrative detail. It should be able to make available the space necessary on some appropriate basis. This space would include an office, small laboratory, animal quarters and equipment storage.

d. The program would require funding as indicated in Appendix III-C. Exact local requirements would vary but not widely. Support for a period of five years is the most desirable.

3. Regional Coordinating Office - Coordination for all four national vertebrate pest control research programs should be handled by a regional coordinator operating out of an office associated with, but not administratively subservient to, the Philippine Rodent Research Center. It is necessary that the coordinating office have a wider scope of activities and responsibilities than those of any one center and it is in the best interests of the regional functions and funding possibilities that this office be administratively separate from the RRC. This plays down the possibility

that coordination should be thought of as the responsibility of any one national center.

The functions of the coordinator are:

a. Dissemination of knowledge and procedures concerning control research among the national programs in the region and outside the region where appropriate.

b. Development and operation of regional workshops and conferences to share knowledge and train additional specialists in research, extension and control.

c. Provide liaison between the regional program and international centers for vertebrate pest research such as the DWRC, Tolworth Laboratory in England, FAO, WHO and the South Pacific Commission.

d. Oversee the programs of education of national counterparts by consultation on selection procedures, study programs, and university relations.

e. Promote the development of university programs within the region to supply specialists and technicians trained in ecology, economic zoology and wildlife management or allied fields. This may include participation in such program development, as appropriate.

Initially the coordinator should be an outside-funded expatriate whose tenure should be no less than three years and preferably five. The necessary background and capability does not appear presently available within the region. As soon as possible a S.E. Asian counterpart should be identified, receive education up to the Ph.D. level and begin an internship program within the Regional Coordinating Office.

The annual budget for the Regional Coordinating Office is indicated in Appendix III-D.

4. University Strengthening Program. Four agricultural universities in S.E. Asia have been identified as having the potential for strengthening of their graduate programs in the areas of ecology, economic zoology and/or wildlife management. These are the University of the Philippines College of Agriculture at Los Banos, the Institute Pertanian, Bogor in Indonesia, the Agricultural University at Serdang, Malaysia and Kasetsart University, Bangkhen, Thailand. The relative capabilities of each of these institutions is referred to briefly below and dealthwith in greater detail in the respective country reports.

Ranked in descending order of current capabilities the U.P. College of Agriculture is first, Kasetsart second, Institute Pertanian, Bogor is third and the University of Agriculture at Serdang

is fourth.

The U.P. College of Agriculture is one of the strongest in S.E. Asia, having had considerable support from the U.S. government, foundations and international development agencies. Its programs in ecology (the highest priority among the three mentioned above) are not strong and need personnel and program inputs. It does have a strong internationally educated crop of Ph.D.'s on its faculty, is associated with IRRI and the RRC is adjacent to its campus. The headquarters of SEARCA (an AID funded S.E. Asiatic regional program in graduate agricultural education) are on campus.

Kasetsart University has also had strong international support for program development and is closely associated with the agricultural programs of the government of Thailand. It is not as potentially useful for regional training because of the language barrier, Thai being rather unusual among languages and not typical of those used in much of the other countries under consideration.

The Institute Pertanian, Bogor is receiving assistance from an AID funded university improvement progtam and it is anticipated that it will reach Ph.D. producing capabilities in rough three years.

The Agricultural University at Serdang is in process of initial expansion and will acquire the bulk of the Faculty of Agriculture from the University of Malaya during the next few years. It should be a reasonably strong institution once it gets further along.

The most immediate need is development of appropriate curricular materials and a program in ecology based on S.E. Asiatic characteristics and needs. Such materials should be designed to translate ecological principles into terms and examples understandable in local geographic and cultural contexts. It is difficult when using textbooks written in North America, using examples drawn from the prairies of Nebraska, the forests and fields of Pennsylvania or the slums of Baltimore to translate this into meaningful education for students used to rice paddies, rain forests, and the teeming cities of Manila, Djakarta or Bangkok.

It should be a responsibility of the regional coordinator to promote actively the development of such materials. He should also be involved in promoting education of an acquisition of faculty members in ecology, particular animal ecology, and economic zoology and wildlife management. Cooperation with such programs as SEARCA and MUCIA (see Indonesia

report) are highly recommended, as these agencies have goals supportive of such university strengthening.

Sources of Potential Support

The guiding principles in developing support for this Regional Vertebrate Pest Control Research Program should be to emphasize the regional nature of the program, to include a national contribution for each country from the beginning, and, if at all possible, to keep the number of donors to an absolute minimum.

Additional technical problems include the personnel ceilings imposed on direct hire and PASA contracts for U.S. federal government funded projects, the control to be exercised over selection of staff members if an international agency is involved (and has certain national "quotas" to contend with), the restrictions on AID support for Malaysia which has no such direct support, and the administrative complexities arising from complex or atypical funding arrangements.

A potential source of support for the regional research and coordinating portions of the proposal is the Regional Economic Development (RED) program of AID. It currently supports a variety of regional programs in S.E. Asia, such as SEARCA, BIOTROP, etc. and has considerable experience and

freedom of movement within the region. It has the potential through its regional arrangements to support the necessary Malaysian program. It might be worthwhile to investigate the attractive possibility of administering this regional program through SEARCA, as this would appear to come somewhere under its umbrella of responsibilities.

If U.S. funding is sought it should probably be thought of in terms of a contract arrangement in order to manage ceiling limitations. The coordinator should be the chief instrument by which appropriate staff members are sought out and selected.

Another potential source is FAO/UNDP funding via the Regional Office for Asia and the Far East. Considerable interest in such a development has been expressed in the past by Dr. D. L. Umali, Assistant Director for Asia and the Far East, and the accompanying project proposal indicates support from the Plant Protection Office. The advantage of FAO/UNDP support lies in the genuinely international thrust of this source and its potential access to UNDP funds which lack some of the limitations on use characteristic of U.S. funds. However, UNDP funds are hard to come by, require commitments by donor nations and involve their own brands of red tape. Additionally,

funding will be more complex since RRC support is from AID and the staffing control passes to an international agency.

Potential support from such internationally oriented foundations as Ford and Rockefeller is unlikely. These institutions are heavily commited to funding a series of international institutes for agricultural development in the Philippines, Nigeria and Colombia. In general, they are loathe to participate in schemes involving major contributions from other agencies, especially of the U.S. government. This proposed program would make it very difficult for them to achieve a satisfactory level of visibility and independence of action.

Appropriate national inputs from Indonesia, Malaysia and Thailand should be considered a necessity in this program. Minimally this should involve providing adequate physical facilities, administrative and clerical assistance, support for local technical help and common labor, and some support for fellows chosen for foreign education. This latter may take the form of support for travel abroad and salary support if the fellow is a government employee. The amounts necessary for each country have not been calculated because of national differences in salary scales and commodity prices.

COUNTRY REPORTS

INDONESIA

Current Problems. Serious rodent problems exist throughout Indonesia at present. There have been especially heavy losses to crops reported from the islands of Sulawesi (Celebes) and Java, particularly in the eastern region. Losses have been reported from rice, sugar cane, soybeans, peanuts and coconuts. In the Subang region, an area west of Djakarta on the north coast, a survey conducted by the Division of Plant Pests and Diseases, Central Research Institute for Agriculture, indicated that rodents accounted for 43% of all damages to rice and were ranked as the number one pest. Insofar as reporting of rodent damage reveals with any accuracy what the current situation is, it would appear that widespread chronic rodent problems are punctuated periodically by very heavy local outbreaks with attendant high losses.

The damage is largely the work of rats of the genus Rattus, in particular R. argentiventer, R. r. diardii, and R. exulans. In addition, the mouse (Mus) and Bandicota indica, the giant Mole Rat are implicated.

Plant protection officers traveling in East Java and Sulawesi are also repeatedly asked for information on protection of crops from bird damage. The problem is particularly serious with the small grains.

Damage to fruit crops by the giant fruit bats is also reported. Again, Sulawesi seems to be particularly plagued, especially in bananas.

Fruit bat damage was reported to us personally at Bogor in West Java and a large and very active colony of these bats lives in tree tops at the Botanical Gardens in Bogor.

Control Efforts. Rodent control work at present appears to be somewhat haphazard and poorly coordinated. It is in part the responsibility of the Plant Protection Division of the Directorate for Agricultural Techniques. It consists largely of the use of burrow fumigation with HCN, poisoning with zinc phosphide, and a procedure similar to the "blanketing" program in the Philippines. In "blanketing" a large team of local farmers surrounds an area and forces rodents into an ever-decreasing space. Those seeking to escape are clubbed to death. In Indonesia, at least in some areas a bounty is paid on each rat so killed, at present amounting to 5 Rupiahs/tail (approx. $.01). Rodent control is not particularly effective on a country-wide basis and may amount to nothing at all locally unless the problem is very serious.

Bird control consists largely of erection of scarecrows of various types. It is not very effective. We were unable to ascertain what, if any, bat control efforts are mounted.

Control Research. Rodent control research is currently being contemplated by the Plant Protection Division of the Directorate for Agricultural Techniques under the supervision of Mr. Soenardi. Actual field research on rodenticides is being done in a small project under

the Division of Plant Pests and Diseases of the Central Research Institute for Agriculture.

The proposed research under the Directorate for Agricultural Techniques is to be carried out by Mr. Sadji under contracts with Dr. Soelaksono and Dr. Sri Soedarwati, both on the biology faculty of the Institute of Technology, Bandung. Mr. Sadji has a master's degree from the Agricultural Institute at Bogor and has two entomologists with master's degrees working with him. He is the leader of the project. Dr. Soelaksono has his degree from the University of Illinois in entomology and Dr. Sri Soedarwati has her degree in embryology from the Netherlands.

The project thus represents a cooperative arrangement between an agency of the Department of Agriculture and two university faculty members. This sort of arrangement is apparently not uncommon in Indonesia and stems from a number of circumstances. The bulk of trained scientists are at the universities where salaries are so low as to make outside employment almost a necessity. The laboratories and other facilities and the funding are controlled by the Department of Agriculture. To tap the manpower supply it has become commonplace for the Department of Agriculture to enter into contract arrangements with university faculty members. There appears to be little coordination of these contract procedures with university administration and the institution has no official way of knowing what outside work their

faculty members are engaged in.

The program outlined by Mr. Sadji involves research over a period of one year on each of the following:

1. Collection and distribution of rodents by species and habitat.
2. Population ecology in irrigated rice areas.
3. Baiting and rodenticide screening by field trials.
4. Laboratory studies on bait acceptance, rodenticide screening and reproduction.
5. Population ecology in habitats other than irrigated rice.

The program outline was reasonable in that it covered a very broad range of areas for investigation and if carried out would probably yield valuable control information. It appears to be far too ambitious despite inclusion of two Ph.Ds, 3 M.A.s, 10 assistants with some college background and perhaps 50 laborers. Budget was set at 3 million Rupiahs ($7,110) for the year. The impression is that the senior research people are sincere and probably capable, but none has really done any rodent control research, and methodological problems may well be very serious.

At Bogor the Central Research Institute for Agriculture (CRIA) maintains the Division of Plant Pests and Diseases under the direction of Mr. Oka. His own view is that there is not one qualified rodent specialist in all of Indonesia. At present his division has a contract arrangement of some sort with an entomologist, Mr. Turngadi, of the

Department of Plant Pests at the Institute of Agriculture at Bogor (IPB). A graduate student from IPB is currently at work on rodenticides and baiting in the Subang area (see above). At the CRIA laboratories in Bogor they are maintaining a breeding colony of R. argentiventer to be used for rodenticide screening. They seek a rodenticide safer than zinc phosphide. By Mr. Oka's own admission his program is minimal and really does not answer to the needs of the situation.

Recommendations. There is no doubt of the need for extensive rodent control research in Indonesia. A case could also be made for bird and bat control research but must be assigned a much lower priority. The chief agricultural problem with rodents involves rice and it is on this crop that control research should be initiated.

Institutional affiliation and support for such research is the chief problem, especially the location of the expatriate research specialist needed to initiate the program.

In order to understand these problems it is necessary to understand something of the current institutional structure associated with agricultural development in Indonesia. The structure for the Ministry of Agriculture is shown in figure two. As can be seen, the Department of Agriculture has five directorates and three research institutes each answerable to the Director for Agriculture. Rodent control research, as has been indicated, is being contemplated by two of these, Agricultural Techniques and the CRIA.

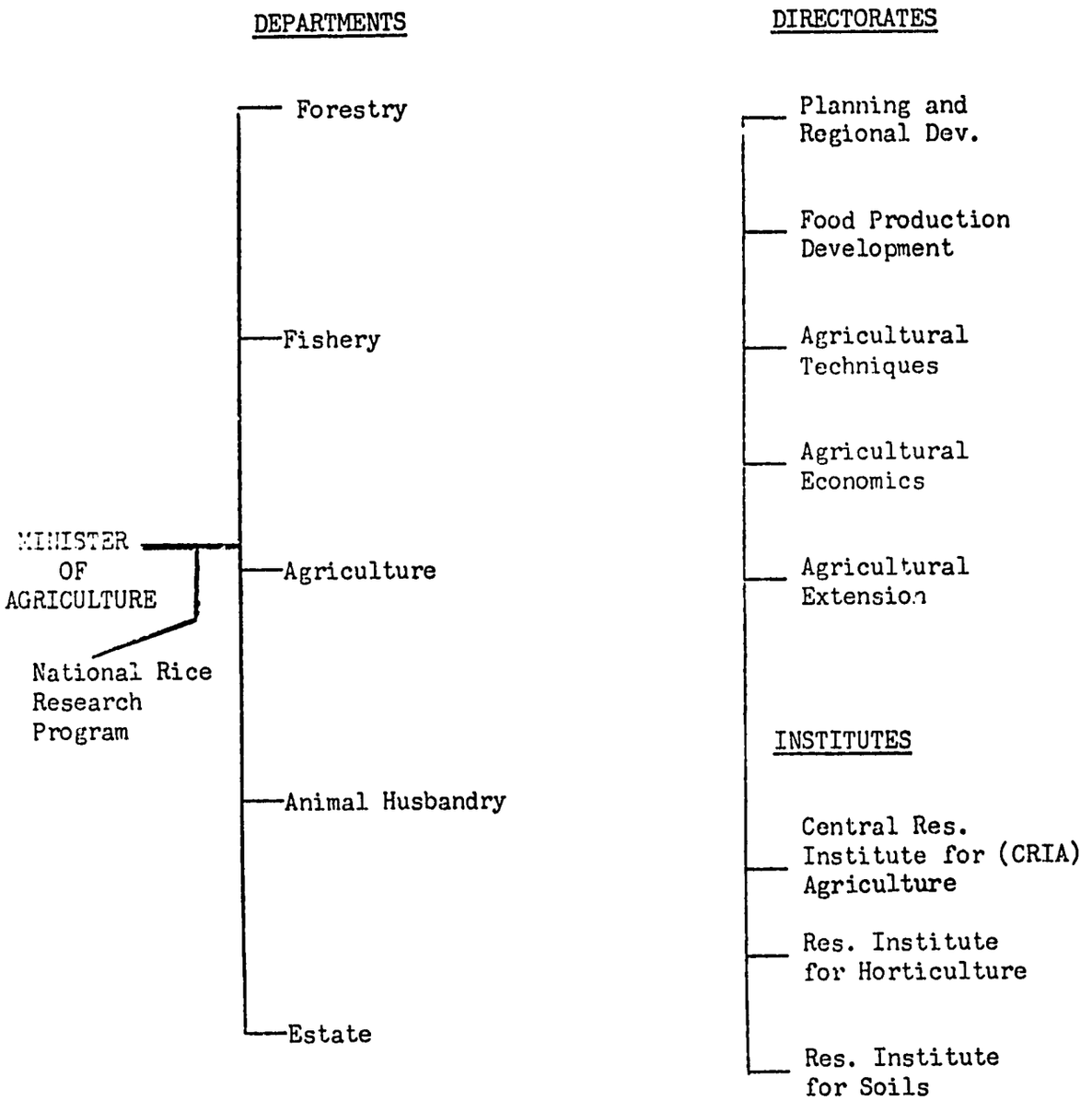


Fig. 2. Organization of Ministry of Agriculture, Government of Indonesia

There are 24 universities in Indonesia with agriculture programs. Of these, two are considered superior to the rest, the Institute for Agriculture, Bogor (Institut Pertanian Bogor) and Gadja Mada University, Jogjakarta. The universities are under the jurisdiction of the Ministry of Education. An AID-supported organization, Midwestern Universities Consortium for International Assistance (MUCIA) is working primarily with Bogor and Gadja Mada to upgrade their capabilities, especially in the ability to sustain quality graduate programs including the doctorate level. Dr. D. K. Smith, Resident Director of the MUCIA-AID project and Dr. Bird, MUCIA representative at Bogor were both confident that Bogor would reach Ph.D. capabilities in its graduate program in 3-4 years. Dr. Smith felt that the institute at Bogor (IPB) was the most likely university in Indonesia to be in a position in the near future to provide the personnel necessary for a high quality rodent control research capability. The MUCIA project appears to enjoy a good reputation for reliability and accomplishment among the AID Mission specialists.

The National Rice Research Program (NRRP) is a relatively new national organization established outside the main hierarchy of the Ministry of Agriculture. It is directly answerable to the Minister himself. It represents an attempt to establish a complete research, extension and production team approach to answer the major national goal of adequate rice production. It includes as partners the Central Research Institute for Agriculture, the agricultural universities, other

elements of the Department of Agriculture, and the Ministry of Education. Elements of the program are funded by outside agencies. It is expected to provide a model for future organization within the Ministry of Agriculture.

The NRRP functions under a coordinator and has three task forces, Production Research, Economics and Education. Each task force has a number of working groups. Of most interest for our purposes is the Production Research task force. The working groups are Breeding, and Agronomy and Physiology, funded and staffed by IRRI with an AID contract; Entomology, staffed and funded by the Netherlands; and Pathology, staffed and funded by the Japanese. The plant protection work and operating base for this task force is at Bogor.

The most effective institutional affiliation for our proposed rodent control research program in Indonesia is with the NRRP program. Conversations with Dr. Robert Jackson, the AID-IRRI team leader and a member of the board of directors of NRRP indicated that explorations should be initiated into the possibility that the expatriate rodent research specialist could be part of the AID-IRRI contract. By hiring the specialist on contract we avoid the problem of AID mission ceilings for Indonesia. At the same time we avoid much direct AID/Djakarta involvement, a situation which seems to be preferred within the agricultural program of the Mission.

This would place the rodent control research program in association with the most effective team concerned with rice and would help to round out the plant protection picture for the program. Interest in rodent control is considerable at CRIA in Bogor (see before). In addition, the IPB is considered the most promising agricultural university and would be in a possible position to provide the necessary technical and educational inputs to the program. A minor but supporting factor is the cooperation which already exists between the RRC and IRRI in the Philippines.

The BIOTROP program supported by the Regional Economic Development (RED) program of AID is also located in Bogor. It is in the midst of serious program and operational difficulties at present and could only lend "moral" support. Dr. T.B. Slattery, SEAMES consultant to BIOTROP, did indicate that pest control was one of the areas they felt they might be interested in pursuing. This again would provide some additional inputs, probably not financial, to a rodent control research program centered in Bogor.

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MALAYSIA

Current Problems

Rodent problems in Malaysia are most conspicuous in the rice growing areas and in oil palm estates. In addition damage is reported from cocoa and vegetable crops. In the rice growing area particularly heavy losses have been reported in the Muda River Irrigation Schemeabout 50-50 miles from Penang in northeast Malaysia. In that region there are no less than five different rice field rats, Rattus argentiventer, R. jalorensis, R. rattus diardii, R. exulans, and Bandicota indica. Throughout much of West Malaysia R. argentiventer is the most abundant rice field pest although the other species may be equally abundant in certain areas. The bandicoot is restricted to the northeastern region.

Damage to oil palms is largely the work of Rattus jalorensis and populations in untreated estates may run as high as 100-200 rats/acre. Damage has been estimated at around $9.00/rat/annum. Cocoa is another crop hit rather hard and rat damage occurs as soon as the pods begin to develop. Vegetable damage, reported from the Cameron Highlands is locally serious but not on the same scale as rice and oil palm damage.

Bird damage is reported in oil palms where parrots destroy quantities of the fruit, much of it because of their wasteful feeding habits. They drop more than they eat. The presence of scarecrows in vegetable and rice growing fields indicates that

farmers consider birds to be a problem. No estimates of bird losses exist.

Control Efforts

Rodent control in rice growing areas is done mainly by the use of zinc phosphide and "blanketing" locally referred to as "gotong-royong" (to cooperate). A warfarin bait made largely of maize and oil has been developed by B. J. Wood of the Chemara Research Station, Kumpulan Guthrie Sendiran Berhad. This is a commercial company largely in the business of growing rubber and oil palms. Wood claims a very high degree of success for his preparation and Guthrie has marketed it under the trade name KG-22. The field trials in oil palm and rice reported by Wood have been very successful. Other workers question the spectacular increase in rice yields reported and are critical of the lack of replicates. The manager of Guthrie's Chemara Station admitted that KG-22 sales to farmers had been an "abysmal failure". He feels that this is due to reluctance of the farmer to pay for a poison that does not produce immediately visible results and the fact that the Department of Agriculture gives away zinc phosphide free. The most promise for KG-22 sales appear to be among other oil palm farmers.

Until recently, a Peace Corps volunteer has been working on rat control with the Malaysian Agricultural Research and Development Institute (MARDI), largely at the Rice Research Center, Bumbong Lima,

Province Wellesley near Penang. He has written an informative and potentially useful manual entitled "Control of Rice-Field Rats in West Malaysia" (by Ralph A. Otto). It is published as a MARDI Crop Protection Research Bulletin. B. J. Wood has published a number of report reports of rat control efforts by his organization. Some of these are clearly aimed at promoting KG-22.

Control Research

No rodent or bird control research is underway at present. Mr. Lim Boo-Liat, Director of the Division of Medical Ecology, Institute for Medical Research has been investigating rodent biology as it affects disease problems for well over a decade. He has amassed an impressive volume of data on abundance and distribution and is in process of preparing it for publication. Clearly he is the most knowledgeable rodent biologist in Malaysia and is respected internationally for his competence. The Crop Protection Research Division of MARDI, headed by Dr. Ting Wen Poh, anticipates initiating rodent research as soon as authority for hiring can be secured (see later). Mr. Gurchum Singh of the Faculty of Agriculture, University of Malaya, is very interested in both rodent and bird control research and has a cooperative agreement with MARDI. The situation at the University is, however, anything but settled and no funds are available there for research. B. J. Wood at the Chemara Agricultural Station is not contemplating new research on rodent control, apparently having been satisfied with the effectiveness of KG-22 techniques.

Recommendations

Despite the fact that a certain amount of high quality work on rodent control research has been carried out there remains a clear need for a viable rodent control research program. No one at present in Malaysia has achieved the necessary level of competence or is in the appropriate organizational situation to carry out work at the level characteristic of RRC staff members. Again, rice would appear to be the high priority crop, the oil palm situation being satisfactorily handled by the estates themselves using B. J. Wood's techniques.

Clearly, the institutional affiliation should be with the Crop Protection Research Division of MARDI. This organization is responsible for the bulk of agricultural research in Malaysia and the Crop Protection Research Division has most capable leadership in Dr. Ting. He is quite anxious to initiate such research. The current difficulty in locating suitable in-country people stems from a government policy requiring that 50% of all positions be filled by people of Malay extraction. Unfortunately, the vast majority of educated and qualified people are Chinese and this has blocked, at least temporarily, appointments to key positions in the MARDI program. This is not an insurmountable difficulty however, although it may slow the process considerably.

The Institute of Medical Research is very willing to cooperate in such a program and has available a fine taxonomic collection for reference. In addition, the Chemara Agricultural Research Station

Director, M. C. J. Piggott, offered not only to cooperate but to seriously consider some sort of financial assistance. Thus, a broad base of knowledge and cooperation are already in existence.

The situation at the Faculty of Agriculture, University of Malaya is quite confusing at present, and we could not expect much organized support for some time to come. The government has decided to build a new agricultural university at Serdang, adjacent to the new MARDI headquarters. It is expected that the bulk of the Faculty of Agriculture at the University of Malaya will be transferred there. To this end the phasing out of that Faculty program has already begun and no new students are being accepted. The situation will probably not stabilize for 3 or 4 years.

The best location for the rodent control research program would be at the MARDI Rice Research Center, Bumbong Lima, near Penang. The city of Penang is considered one of the most pleasant in Malaysia and should provide quite adequate living accommodations. The Chief disadvantage is a slow ferry connecting the city to the mainland but, again, this is one of the hazards of the trade and can be managed.

Current plans advanced by Dr. Ting call for three mammalogists and an ornithologist, all at the M.S. level to work on rodent and bird problems within the MARDI program. This would greatly ease the problem of counterpart identification and provide a better than

expected local support staff for the rodent research program. In addition, MARDI has its own group of economists etc. available for consultation.

THAILAND

Current Problems

Rodent problems in rice dominate the vertebrate pest situation in agriculture. The species involved are Rattus argentiventer, Rattus rattus, Bandicota indica, Bandicota savilei (originally thought to be bengalensis, Rattus norvegicus, Rattus exiguus, Rattus exulans, Rattus, losea and the mice Mus caroli, M. castaneus and M. cervicolor. The first four species constitute the bulk of rodent pests and R. norvegicus, normally not a field rat, is found in the Central and Southern regions. R. exiguus, the garden rat, is found occasionally in the North. Bandicota indica and B. savilei are found in the Central and Northeastern Regions.

Damage occurs at all growth stages and is also severe in stored rice. In recent years particularly heavy losses in the Central Region have attracted considerable attention and much pressure for control is currently being generated.

Rodent damage is also reported from soybeans, corn, and peanuts.

Changes in the agricultural picture in Thailand have been accompanied by changes in rodent problems. There have been important changes in water availability as a result of damming of the Chao Phyra River. Water no longer flows freely to flood rice areas of the Central Plain and the region is now being planted earlier a to adjust to the new water regimen The floating rice varieties are being replaced with new shorter hybrids and rat accessibility is increased because of shorter stems and longer growing period. Excellent rat habitat exists in the region during the off-season.

Bird damage is reported in small grains and particularly in grapes but no quantitative measurements have been made.

Control Efforts

Organized control efforts are largely the responsibility of the Pest Control Division of the Department of Agricultural Extension, a separate administrative unit under the Ministry of Agriculture. The chief control program involves distribution of free zinc phosphide to the farmers. Rodent killing campaigns using this rodenticide receive a lot of publicity, even on TV, with the usual pictures of piles of dead rats. Rodent kills, however, spectacular, have not been particularly successful because of very high populations in the fields and because of ignorance among farmers on proper baiting techniques. Instructions for rodenticide use have been inadequate and ignore known species differences in acceptance. As of recently, there has been little improvement in the actual Thai rodent control capability because they simply do not have enough to extend to the farmers. Rats are on a sustained yields basis.

Control Research

The chief research program on rodent control is being conducted by the Vertebrate Pest Research Laboratory, Rice Protection Research Center, Department of Rice. This laboratory is under the direction of Dr. Sawart Ratanaworabhan and is located at Kasetsart University.

At the present time Dr. Sawart is engaged in a variety of extra administrative duties and the research is being carried out under his direction largely by Mr. Kasem Tongtavee, an M.A. from Dr. Walter Howard's laboratory at the University of California, Davis and Mr. Songsak Yenbutia, a biologist and student of Dr. Sawart. Another biology student, Miss Puangtong Boonsong is assistant.

Mr. Kasem is working primarily on the utilization of zinc phosphide which is not accepted uniformly by all species. He has mostly been concerned with laboratory testing of acceptance and few field trials have been run. He is also working on utilization of warfarin in the field.

Mr. Songsak is working on the growth and reproductive biology of rice field rats, largely in the laboratory. A certain amount of field research is underway but the impression is that it is at a very low level and in its infancy.

Some limited research on warfarin baiting is being done by Mr. Boonchob Patraruji, an entomologist in the Division of Plant Industry, Department of Agriculture. This research is not coordinated with that of Dr. Sawart. In fact, the lack of coordination is quite serious administratively and is well illustrated by current circumstances surrounding development of a rodent control research proposal within the Division of Plant Industry.

This proposal, for $345,000 over a three year period, was developed by Mr. Boonchob apparently at the request of Dr. Riksh

Syamananda, Chief of the division. It was his response to interest expressed nine months ago by Dr. Harlan Schuyler, Rodent Control Specialist with FAO in Rome. The proposal includes support for an expatriate research team and a fellowship program, plus support for Thai personnel. The expatriate team proposed includes a taxonomist (6 man months), an ecologist (24 man months) and a control specialist (12 man months). Thai specialists (each at 18 man months) are an animal ecologist, an embryologist and a biologist. The fellowship program is designed for an overseas training period of 2 years, or anough time for a masters degree. The program shows evidence of lack of background in developing programs of this sort. The tenure periods for specialists is too short, the specialists asked for are unusual and some are probably unnecessary (taxonomist, embryologist), budget estimates are 50% of requirements in the fellowship program, and heavily inflated in commodity prices (10 dissecting kits @ $60.00/kit, 3 automobiles at $22,800). This proposal was designed for FAO-UNDP funding.

In addition to the deficiencies in the proposal several other problems have surfaced during discussions concerning it with Dr. L.C. Knorr, Project Manager, FAO Strengthening Plant Protection Services project within the Thai Ministry of Agriculture, Dr. G. Schutz, Senior Agricultural Advisor, FAO Country Representative in Thailand, Dr. Riksh, and Dr. Sawart. First, the proposal is not included in

the FAO listing of country priorities. Second, it would have to be a part of the "Overprogram" listing, a category of additional priority items above the FAO budgeted program, for which a special appeal must be made to donor countries. Dr. Schutz clearly stated that this was "out of the question". Third, lack of response by FAO/Rome to recent inquiries about the proposal cast doubt on the degree of current interest in funding. Fourth, the proposal was developed completely without even the knowledge of Dr. Sawart, despite frequent contact with Mr. Boonchob who availed himself of literature from Dr. Sawart's laboratory.

In a subsequent conversation Dr. Riksh indicated that he was going ahead anyhow and submit the proposal through the Department of Technical and Economic Cooperation, a division of the Office of the Prime Minister of Thailand. It would appear to face on uncertain future. Recommendations were made concerning modifications to the proposal which would bring it more into line with the program proposed in this report.

Recommendations

In the month of August this year a merger is scheduled between the Department of Rice and the Department of Agriculture. The new department will probably be headed by Dr. Bhakdi Lusananda, currently Director General of the Department of Rice. Under this scheme it is expected that a pooling of research activities will occur.

According to Dr. Tanongchit Wongsiri, Assistant Chief, Crop Protection Research Division of the Rice Protection Research Center, the vertebrate pest control research will be centered in a new Department of Entomology and Zoology.

It is apparent that vertebrate pest research, while in existence, is functioning at a low level, clearly inadequate for country needs. Thus, the expatriate - initiated research program recommended in this report is very desirable, in this case to strongly buttress a lagging research effort. The appropriate place for this research strengthening program would be in the Department of Entomology and Zoology. Since some rice protection research is in progress, although in serious need of closer supervision and expansion, it seems possible that some attention should be given to other crops, notably corn and soybeans.

Development of university capability to produce qualified specialists appears to be possible at Kasetsart University. It has a closer working relationship with agricultural development than was apparent in Indonesia or Malaysia and the agricultural research facilities are located on its campus. These facilities receive strong international support. A possible drawback is the fact, that university education is largely enjoyed by the financially well off Thais and the great majority of students in the agricultural universities or from urban areas. This is not, however, esclusively a Thai problem and is an often repeated pattern throughout S.E. Asia.

Appendix I

Current RRC Funding Pattern

Item	Source	Amount ($)	
Salaries and Wages+			
Coordination (2/3*)	AID/W	16,640	
Denver-back up (4 1/2)	AID/W	71,230	
Philippine Staff			
Director (1)	UPCA	1,730	
	AID/W	135	
Total		1,865	
Research Staff			
Denver-based (1)	AID/W	19,060	
Philippine-based (3)	AID/W	67,600	
(3)	BPI	3,900	
Salary supplement	AID/W	450	
Total		91,010	
Technicians			
(2)	AID/W	2,380	
(1)	UPCA	1,200	
Total		3,580	
Secretary (1)	UPCA	800	
Driver (2)	BPI	600	
Laborers (3)	UPCA	900	
Total salaries and wages		2,300	186,625

Note: AID/W refers to AID-DWRC funding, AID/Manila refers to funding via the Philippine AID Mission.

+Includes benefits.

*Two-thirds (2/3) of Denver-based coordination

Appendix I (cont'd)

Item		Source	Amount ($)	
Travel				
Philippine		AID/W	1,550	
		UPCA	490	
		BPI	720	
	(PL 480)	NEC	1,500	
Total			4,260	
International		AID/W	6,000 (Incl. 2,300 for Denver)	
Total Travel				10,260
Equipment				
Denver back-up		AID/W	900	
Philippines		AID/W	980	
		AID/Manila	10,330	
Total			12,210	12,210
Vehicles				
Care & Operation		UPCA	610	
		AID/Manila	570	
Total			1,180	1,180
Material and Supplies				
Denver back-up		AID/W	11,550	
Philippines		AID/W	2,460	
		UPCA	225	
Total			14,235	14,235

Item	Source	Amount ($)	
Other Services			
Denver back-up	AID/W	1,200	
Philippines	AID/W	1,380	
	UPCA	750	
Total		3,330	3,330
Utilities			
	UPCA		1,500
Training			
NEC Fellowships (4)	NEC	2,100	
	USAID		
International (2)		24,000	26,100
Living Quarters	NEC		1,090
Construction			
Architect	UPCA	540	
Construction	AID/W	20,000	20,540
FY 1971-72 Total Budget			277,070
USAID			258,415
UPCA			8,745
BPI			5,220
NEC			4,690

AID Budget Breakdown

	Amount ($)
Salaries and Wages	
Denver back-up staff	71,230
Coordination (Denver-based)	16,640
Philippine (Denver-based)	19,060
Total Denver Salaries	106,930
Philippine-based staff	70,565
Total Salaries	177,495
Non-Salary Expenditures	
Denver back-up program	15,950
Philippine program	30,070
AID/Manila Contribution	34,900
Total non-salary	80,920
Total AID Contribution	258,415

Appendix II

RRC Control Research Program

A. Programs for which study plans exist.

Biology	Completion Date
1. Systematics of rats	Active
2. Rat movement to crops during flooding	1970
3. Monthly census in rice	1970 (Jan)
4. Age determination, R. r. mindanensis	Active
5. Comparison of population sampling techniques	1971 (June)
Damage Assessment	
1. Evaluation of damage during rice development	1968 (Dec)
2. Philippine Rice Damage Survey	Active
3. Damage trends on Philippine regional basis	Active
Control Procedures	
1. Selection of bait carriers	Completed
2. Pharmacological evaluation of lethal agents	Active
3. Evaluation of current control programs	1969 (Nov)
4. Weatherability of zinc phosphide treated rice and binlid	Completed
5. Evaluation of zinc phosphide and DRC714 baits	1971 (Mar)
6. Aerial dispersal of zinc phosphide	1972 (Jan)
7. Field trial, multiple treatment with zinc phos.	Completed
8. Preliminary studies of habitat manipulation	Active

B. Programs active for which no study plan exists.

Biology

1. Census techniques
2. Food habits
3. Behavioral comparison of R. argentiventer and R. r. mindanensis
4. Home range and movements
5. Rice mill species

Damage Assessment

1. Correlation of damage and rat numbers
2. Reliability and sample size
3. Regeneration of rice tillers .after damage
4. Rice mill losses

Control

1. Baiting studies

    a. Placement
    b. Formulation and bait size
    c. Pre-baiting time
    d. Rate of effectiveness
    e. Area size for poisoning

2. Anticoagulant baseline work

3. Habitat modification--especially field cleaning

C. Potential research problems on which work is not under way.

Biology

1. Species succession after removal of competitors
2. Role of irrigation development
3. Home range studies via telemetry
4. Development of alternatives to recapture census.

Damage Assessment

1. Aerial photography for assessments
2. Site classification for damage control
3. Site classification for reservoir problems
4. Census techniques reliability

Control

1. Anticoagulant monitoring for resistance
2. Cost analysis of alternative control schemes for each situation.

Appendix III-A

PROPOSED RRC ANNUAL BUDGET WITH ALL PHILIPPINE STAFF BASED ON CURRENT COSTS

Item		Amount	
		Dollars	Pesos
Salaries and Wages			
Director	(1)	2,985	20,000
Research Biologists	(3)	4,985	33,400
Control Biologists	(3)	4,985	33,400
Extension Specialists	(2)	3,490	23,400
Technicians	(10)	11,340	76,000
Secretary	(1)	800	5,340
Clerk-typist	(1)	720	4,800
Security Guard	(1)	730	4,900
Drivers	(4)	2,540	17,000
Laborers	(6)	2,690	18,000
Total Salaries and Wages	(32)	35,265	236,240
Travel			
Local		4,300	28,800
Inter-island (Common Carrier)		1,490	10,000
International		1,100	7,400
Total (Based on 1 round trip to Denver, 1 round trip to Regional Prog. every two years)		6,890	46,200
Equipment		7,460	50,000
Vehicles			
Acquisition (1 vehicle/year)		5,970	40,000
Maintenance & Operation (5) (Ave. cost/ vehicle at present x 5)		2,960	19,800

Item		Amount
Material and Supplies	746	5,000
Other Services		
Publication costs, photos.,	2,240	15,000
Utilities	1,790	12,000
Training		
2 Workshops @ $20 men/period	3,730	25,000
2 Conferences/year	746	5,000
Total Budget (Annual)	67,797	454,240
Total Budget (Minus Training)	63,421	424,240
Part-time Services		
Statistician, 1/2 time	1,040	7,000
Biochemist, 1/4 time	520	3,500
Agricultural economist, 1/4 time	520	3,500
Rural sociologist, 1/4 time	520	3,500
	2,600	17,500

Appendix III-B

CURRENT SALARY SCALE, U.P. COLLEGE OF AGRICULTURE

	Dollars	Pesos
Academic		
Instructor	986 - 1,361	6,600 - 9,120
Assistant Professor	1,325 - 1,728	8,880 - 11,580
Associate Professor	1,701 - 2,149	11,400 - 14,400
Professor	2,069 - 3,206	13,860 - 21,480
Non-Academic		
Senior Clerk	797	5,340
Clerk-Typist	690 - 761	4,620 - 5,100
Clerk	582 - 654	3,900 - 4,380
Driver	582 - 690	3,900 - 4,620
Technician	582 - 690	3,900 - 4,620
Security Guard (Supervising)	690 - 797	4,620 - 5,340

Appendix III-C

PROPOSED ANNUAL BUDGET FOR INITIAL EXPATRIATE PHASE OF REGIONAL IN-COUNTRY PROGRAMS

Direct Research Project Costs	U.S. $
Expatriate Specialist (Includes quarters, travel to station, benefits)	50,000
Equipment, vehicles and supplies	25,000
Operational costs (Includes technical help and laborers)	8,000
Sub-Total	83,000
Counterpart Fellowship and Training	
Overseas Fellowship (Assumes 2 trainees over 5-year period)	8,000
Technician Training at RRC	2,000
Sub-Total	10,000
GRAND TOTAL	93,000

$93,000/country x 3 = $279,000/year.

Appendix III-D.

PROPOSED ANNUAL BUDGET FOR THE INITIAL EXPATRIATE PHASE OF REGIONAL COORDINATING OFFICE

Direct Operating Costs	U.S. $
Expatriate Coordinator (Includes quarters, travel to station, benefits)	58,000
Secretary (Local Scale)	1,000
Driver	650
Vehicle, equipment, supplies	10,000
Travel	7,000
Research Conferences, Workshops	12,500
Publication Costs, Miscellaneous	3,500
Sub-Total	92,650
Counterpart Fellowship	
Overseas Fellowship	8,000
GRAND TOTAL	$100,650
Total Annual Cost for Initial Expatriate Phase of Regional Program (excluding RRC budget)	$379,650

Appendix IV

RAFE/FAO REGIONAL PROJECT PROPOSAL

PLANT PROTECTION

Plant protection is essential for sustaining agricultural production, ensuring the maximum yield potential, safe storage of agricultural produce and prevention of introduction of exotic pests and diseases that might endanger agricultural and forest industries. Plant protection should form an important part of all crop improvement and production programmes and projects on quick growing species of forest trees.

I. 1. Project: REGIONAL COORDINATED PROJECT ON VETEBRATE PEST CONTROL (RODENTS AND BIRDS)

2. Need, Objective and Justification

Realizing the damage to agriculture by rodents and birds and the need for a regional effort, the 9th and 10th FAO Regional Conferences for Asia and the Far East and the International Rice Commission's Working Party on Production and Protection in 1970, supported and recommended a regional approach and the establishment of a Regional Institute for Vertebrate Pest Control.

The main purpose of the Regional Coordinated Project would be to strengthen the national programmes on rodent and bird research and control and to carry regional research programmes on certain aspects and to coordinate the research and control activities of

participating centres to ensure maximum utilization of regional resources and to avoid duplicative efforts. Aspects of work will include determination of most crucial vertebrate pest problems of national and regional significance, basic ecological studies including migration with reference to population dynamics, ecological approach to damage and control through manipulation of environment, strengthening national research programmes and developing regional coordinated programmes, training of technical and research personnel, development of communications, exchange of information and public educational programmes.

Annually, rodents and birds cause serious losses in the field and in storage. The work in the past has been generally preliminary in nature and on an ad hoc basis. Some aspects of rodents and birds can best be dealt with at the national level but some aspects yield better and rapid results when handled at a regional or sub-regional level.

3. Means

The project objectives are proposed to be achieved by reviewing the present situation in some countries in the Region where some work is in progress. A small survey team or study mission will examine the development of rodent and bird research, identify the aspects of work for national and regional effort, identify national centres where certain

aspects of work can be strengthened in view of the local capabilities and develop a programme of work for the regional coordinated project. The study mission will consist of two members and may spend two months. The Regional Plant Protection Officer will coordinate the work of the study mission.

The coordinated regional project will consist of 5-7 experts, with a few consultants. The project will be operated from each selected national centre and will be coordinated by one of the experts who will be stationed at Bangkhen. The whole project will be under the overall guidance of RAFE in consultation with Headquarters.

The project envisages meetings of international and local experts at least twice a year at the selected national centres in rotation for the reviewing of the programme and exchange of information and experience.

Ceylon, India, Malaysia, Bangla Desh, Philippines, Thailand and Vietnam had supported the project and have agreed to a study mission. The Governments of the Philippines, Thailand and Vietnam had communicated their support to UNDP and the last two have sent letters of Intent to the UNDP.

4. Priority

Since it is of urgent nature and several governments have already given their support, it is of a high priority.

AD/AD
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