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# INTEGRATED CROP PROTECTION PLANNING STUDY

# INTERIM REPORT

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Interim Report

INTEGRATED CROP PROTECTION PLANNING PROGRAM

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# INTERIM REPORT

## SUMMARY

The Joint Research Committee and the Board of International Food and Agricultural Development recommended to the Agency for International Development that Purdue University be awarded a Title XII Planning Grant for Integrated Crop Protection (ICP) collaborative research. The award was made to Purdue effective September 24, 1979.

An Advisory Committee for Integrated Crop Protection was established to assist the grantee in Phase I assessment of the planning efforts. The Committee first met on October 22 and 23, 1979, and subsequently on January 28 and 29, 1980.

AID countries have been ranked according to needs and the important commodities for each tropical country and/or region have been identified.

All eligible Title XII Institutions have been requested to provide feed back concerning cropping practices, pest related production constraints, and possible LDC collaborators. In addition, cables have been sent to all AID Missions and International Griculture Research Centers requesting similar information.

Site visit teams have been established for each of the four geographic regions. The proposed visitations will be conducted between April 15 and May 30, 1980. A standard survey guide has been developed for use by the site teams.

Countries in each of the geographic regions have been selected for visits by study teams based on initial ranking concerning needs and farming systems, ecological diversity, infrastructure, and Mission and country concurrence.

Initial literature retrieval for the State of the Arts documentation has been completed and work continues on this important portion of the assessment process.

# FORWARD

In this document Integrated Crop Protection (ICP) is used synonomously with "integrated pest control" and "integrated pest management". The former terminology is commonly employed in Europe while the latter is customary in the United States. ICP is a pest management system that is based on ecological factors and considers the interactions of environment and the population dynamics of the pest species, and utilizes all suitable control methods in a compatible system which will maintain pest populations below the density resulting in economic injury (FAO, 1968, 1973). By definition ICP is a multidisciplinary approach to pest control and therefore relies on integration between crop protection disciplines as well as integration within a particular discipline. The Food and Agriculture Organization of the United Nations (FAO) Panel of Experts on Integrated Pest Control (1973) has concluded that "Pest management includes all approaches ranging from single component control methods to the most sophisticated and complex control methods".

Review of current documentation supplied by The World Bank, The International Agricultural Development Service, and FAO leaves no doubt that the food situation is most critical in the developing countries, and in many cases a matter of life or death to the small farmer, with an additional direct affect on the local agriculturally based economy as well as the national economy. If food production is to be increased in Least Developed Countries (LDC's) it will have to be accomplished mainly through the efforts of the small holder who works some 65% of the arable land (Haskell, 1977). In addition, evidence indicates that the multiple effects of increase in small-holder (farm) income are great than those of comparable increments in income of large farms, suggesting that a small holder oriented agricultural development strategy would enhance the expansion of a domestic market for industry (World Bank, 1979). Increasing agricultural productivity is therefore not only important in alleviating nutritional deficiencies for the populations of LDC's but also basic to the progress of development in those countries.

Continual or recurrent food production shortages in developing countries are due in a large part to losses caused by insect, nematode, and disease attack and through competition with weeds for adequate nutrition and water. It is recognized that crop losses in developing countries are particularly devastating with annual losses having been estimated at 30-40% due to pre-harvest pests. The estimates do not include losses resulting from the activity of birds and rodents, pests which often play a larger role in causing losses than the pests mentioned above. Adequate data

to establish economic injury levels will not be available until quantitative loss estimates can be made through research on each of the key pests. Economic injury levels are the basis for integrated crop protection techniques and it is of utmost importance that quantitative information be obtained on losses due to pests in various regions and in different countries. A major pest in one country, for example the pink borer, may be important, but in another country or region the shoot fly replaces the pink borer as the major pest on the same crop, as in the case of maize.

In addition, lack of credit, poor water resources, sociological factors, marketing problems, and inappropriate policy are examples of other factors which play a role in agricultural productivity reduction in the developing countries.

The continual or recurrent food losses as mentioned above do not provide an adequate indication of the severity of pest problems. It is known, for example, that vegetable crops such as tomatoes cannot be grown in some countries because of the severity of the pest problems. In such cases the direct effect on the small farmer and his family is nutritional disease due to vitamin deficient diets. Nutritional diseases are either generally debilitating or sometimes more severe as in the case of blindness due to the lack of vitamin A. Research in integrated crop protection will result in sufficient vegetable (or other commodities) production to avoid these types of nutritional deficiencies as well as other health related problems, losses which can't be assessed directly through agricultural statistics. Smith (1979) has concluded that as a consequence of improved health the small farmer and his family will be more resistant to other diseases and thus more productive, as well as more receptive to educational inputs.

The application of cheap effective control measures can sufficiently alter the balance of pest populations to avoid malnutrition and its consequence of further reducing productivity. Integrated crop protection technology based on information obtained in the developed countries can be rapidly and economically incorporated through in-country research into the small farmer multiple cropping system. It is well documented that seemingly small initial pest management inputs may result in increases in productivity for the small farmer of the developing countries (Haskell, 1977). Experience has demonstrated that the use of modern inputs (crop protection methods, fertilizer, etc.) pays off quickly. The response of the small farmer in a developing country is apparently as positive as that of his counterpart in developed countries once he has overcome his traditional suspicion of outside help (Anonymous, 1977).

Traditional, subsistence type farming, in many of the developing countries is gradually giving way to modern agricultural technology in an overt effort to alleviate food shortages by increased productivity. To accomplish increased productivity it is necessary to expand the area of land currently under cultivation or to intensify production on presently cultivated land.

Expansion of agricultural lands is limited, but large arable areas such as those of Central Africa currently dominated by the tsetse fly will become available as pests of this type are eliminated, thus permitting man to inhabit and farm these potentially valuable hectares. Expansion agriculture is occurring in those arid areas where modern irrigation systems are being developed.

Intensification of production is being accomplished through modern agricultural techniques such as the development of high yielding rice varieties through breeding programs, the movement of crop plants from one continent to another as in the case of cassava introduction into West Africa, the impact of modern pesticides, and the use of fertilizers. The application of more sophisticated agronomic techniques as in multiple cropping patterns has also brought about more intensive farming.

It is well documented that as intensification of modern agricultural practices has been put in place there has been a concurrent increase in number and type of pest problems. Expansion of agriculture into new lands with the introduction of new plants has been accompanied by the appearance of new pests or the increased density of known pest populations. In some cases plant introductions have successfully avoided the introduction of pest complexes with their hosts.

Modern agricultural technology has not been a failure; millions have benefited by alleviating starvation and as a result have derived economic benefits from the introduction of modern agricultural practices. Nevertheless, agricultural systems which have evolved over centuries with low but stable production of food, can be seriously jeopardized by modern technology if such inputs are not thoroughly tested prior to introduction. The impact of modern technology on pest problems is emphasized by the results of misuse and over use of pesticides. The numerous problems of pesticide resistance in insects and mites and the appearance of previously unimportant species as economic pests as a result of the pesticide destruction of their natural enemies attests to the significant impact of modern technology (Glass and Thurston, 1978).

It is axiomatic that traditional agriculture has to undergo technical transformation to be more productive to feed the world's expanding populations. There are many potential crop protection problems which will require solution by

agricultural scientists. Historically, many of these problems were solved temporarily by the extensive use of pesticides. However, the current solution to pest problems is based on a holistic approach resulting in the development of ecologically sound pest management systems which utilize all available tactics such as crop resistance to pests, biological controls, cultural controls, and the judicious use of pesticides (Glass and Thurston, 1978).

To impose modern agricultural technology, particularly easily used pesticides, on traditional farming systems without first learning from existing traditional methods of pest control in subsistence agriculture, will invite serious problems, both biologically and economically. Such problems will not be avoided easily because in most cases a knowledge of the pest organisms and its interactions in the small farm cropping system (agroecosystem) has not been obtained. As pointed out by Glass and Thurston (1978) it is necessary to evaluate the traditional farming system for what it is: determine what is essential, to be preserved or augmented, and finally make changes in a rational manner consonant with the environment. This is the holistic research approach as mentioned above, and which is the basis for Integrated Crop Protection concepts. Putting such research into practice will provide a basis in which the "weakest link" in the biological chain may be broken for the various pest species. The results will not only provide a program of ICP for developing countries, but will also provide information and examples to be incorporated into agricultural systems of the developed countries.

In the foregoing discussion we have been concerned with the small farmer and multiple cropping subsistence agriculture. Not to be overlooked in many cases is the reliance of the small farmer on cash crops, such as tea, coffee, tobacco, etc., and the resulting income from which is purchased the required agricultural inputs such as seed, fertilizer, and to a lesser extent pesticides. These cash crops, some of which are perennial, are of significant importance to the well being of the farmer and his family. Many times the cash crops provide the only "real income" to the farmer which influences his standard of living by having an impact on his household practices, health practices, artifacts and adornment, home construction, animal ownership, food storage capability, production potential, communications, social participation and attitudes (Harwood, 1979).

Integrated Crop Protection concepts apply equally well to the cash crops, whether or not food crops. Inclusion of the cash crops is mandated in the research program dealing with ICP because of the overall importance of these commodities to the farmer's agricultural farming system as well as his well being.

There are numerous advantages of ICP for the small farmer as well as those already established for the farmer of developed countries. Control of pre-harvest pests will, over the long run, result in more stability in crop yields and thus reduce risks to the individual small farmer. This reduction in risk may bring about changes in the multiple cropping systems and directly result in higher farm income. Integrated crop protection in contrast to single component pest control utilizing pesticides has the advantage of avoiding the "pesticide treadmill" and associated problems experienced by developed countries over the past 30-35 years. The integrated crop protection method of pest management is usually more economical because of minimized use of agricultural chemicals. Agricultural chemical costs are currently prohibitive for the farmers of many of the developing countries and promise to be even more so as petroleum costs increase, thus production intensification should not be based solely on agricultural chemicals. In many cases ICP relies on labor intensive practices resulting in lower energy inputs into the farm system as compared to most of the developed countries. A major advantage is the incorporation of farming practices which have evolved over centuries to avoid pest problems. Because ICP relies on variable combinations of biological controls, cultural controls, breeding of resistant cultivars, microbial pesticides, and limited use of chemicals, the resulting management system is more stable with fewer periodic outbreaks of target and non-target species.

The pest management problem is complex in the extreme. The LDC farm production process is faced with multiple pests whose potential for damaging crops are not necessarily independent. The production system typically involves a variety of crops, each of which is susceptible to some combination of pests. The susceptibility of the total cropping system to pest damage is some function of not only the crops grown but also the manner in which they are combined in a cropping system and the production practices employed. On the control side, as mentioned above, there are numerous means of reducing pest related yield losses. Each measure has its own set of costs and benefits. The cost/benefit ratio of any single protection measure is not independent of other measures which are or might be employed.

A single measure seldom will constitute the least cost means of achieving the level of pest control associated with maximum profitability of the farm enterprise. It is far more likely that some combination of protective measures must be employed. This combination will tend to be specific to particular farming systems in specific ecological areas and the relative costs of the alternative control measures in these locales. The problem faced by the ICP is to identify the particular package of control measures which will "fit" best the physical, biological, economic, social and cultural milleu characteristic of the various farming systems in the LDC's.

# INTRODUCTION

More than ninety percent of all tropical farms are less than five hectares in size. In Asia averages are often less than three hectares, as in the Philippines, or between one and two hectares as in Bangladesh (Harwood, 1979). Poor crop protection, poor soil structure and low fertility, poor seed, and water shortages all limit the capacity of the small farmer of the tropics and sub-tropics to produce food.

With such multiple limitations, each a significant problem, agricultural assistance programs have tended to concentrate their efforts on the factors most crucial to production. Advances from these efforts eg., high yielding varieties of key grain crops such as rice have helped developing countries keep food production in step with rapidly expanding demands due to population increases. So far these production increases have come from the most favored farming areas (Harwood, 1979) where constraints are least influential on yields. However the small farmers have not benefited from the transfer of the new technologies and because of the continuing need for additional food, the small farmer contribution to productivity, as well as his general well being, has focused our planning.

In addition, traditional development programs have often been aimed at a single commodity (Harwood, 1979). The small farmer more often than not finds such programs irrelevant or unacceptable because they are not useful in his typically varied cropping practices characteristic of the multiple cropping system. For this reason research planning efforts should be based on agricultural systems actually used by small farmers in tropical areas.

The following report presents the details of the progress to date on Phase I of the ICP Planning Program. Phase I is devoted to assessing the potential of counterparts in LDC's to conduct collaborative research on priority researchable pest related production constraints. The Phase I activities have focused on LDC's within current AID programs as suggested in the Board of International Food and Agricultural Development "Request for Expression of Interest" in the ICP Planning Program. It is recognized that non-AID, medium income countries are in need of assistance with pest related production constraints and that these countries probably offer as great or greater opportunity than LDC's for significant research because of their better developed research and administrative infrastructure. The inclusion of non-AID, medium income countries in ICP research programs will be considered during Phase II of the Planning Program.

Due to the diversity of crops in the tropics of the major geographic areas of the world we have divided our attention between the Near East, Africa, Latin America and Southeast Asia. In this system we have planned accordingly for the differences in geographic area, commodities, and multiple cropping as practiced by the small farmers of each of the regions.

Crop protection was ranked by JRC (Joint Research Committee of the BIFAD) as a priority problem confronting the improvement of crop production of small farmers in Least Developed Countries (LDC), especially in tropical or sub-tropical regions. It was also established that solutions to these problems may best be undertaken through the development and application of Integrated Crop Protection (ICP) systems. It was recommended that funds be set aside in FY 79 budget to undertake a planning program to determine the feasibility of developing a Collaborative Research Support Program (CRSP). The JRC-BIFAD recommended to AID that Purdue University be awarded a Title XII planning grant for Integrated Crop Protection collaborative research. The award was made to Purdue effective September 24, 1979.

Soon after the award was made to Purdue an indoctrination trip was made by the Principal Investigator (PI) with Drs. Ray F. Smith, University of California, and F. W. Whittemore, DS/AGR, AID, to Guatemala and Costa Rica. The majority of the time was spent at CATIE (Centro Agronomico Tropical de Investigacion y Ensenanza) Turrialba, Costa Rica, in connection with the UC/AID pest management workshop. In addition the PI attended the International Symposium on "Integrated Control in Agriculture and Forestry", Vienna, October 8-12, 1979. Reports on these international trips will be found in the Appendix I.

One of the first efforts under the terms of the grant award was the establishment of an Advisory Committee to assist the grantee in the assessment phase of the planning. This committee is composed of members of various pest management disciplines some of whom were selected because of their current participation in USAID supported pest management programs. The committee first met on October 22-23, 1979 in St. Louis, Missouri and more recently on January 29-30, 1980. Minutes of these meetings and committee membership will be found in the Appendices II and III.

Subsequent to the first Advisory Committee meeting, and based on the advice of that group, we have ranked countries (LDC's) and determined cropping practices using a farming systems approach based on major commodities. These commodities were then matched with countries so that we have summarized the crops of the tropical multiple cropping systems.

Of first order importance was the development of site teams responsible for making in-country visits early in April to mid-June. We developed a list of potential consultants from each of the pest management disciplines and now have four member teams designed by expertise and language capabilities for each of the geographic regions in which we will visit.

A standard survey guide has been developed for use by each team so that consistency will be achieved in each of the country reports.

Using Purdue Library information retrieval systems we have accumulated approximately 1000 citations concerning integrated pest management (control) published since 1970. Most deal with insects and diseases and almost one third of these are from the foreign literature. Dr. G. F. Warren has initiated work on the weeds portion of the State of the Arts documentation.

All eligible Title XII institutions were requested by letter and enclosed questionnaire to provide information concerning LDC cropping practices, production constraints, and potential country collaboration (Appendix IV). These letters were forwarded in November but to date we have had little response (only nineteen answers) on the part of the institutions. With the assistance of AID, DS/AGR, we have sent cables to all AID Missions and to the CGIAR, International Agriculture Research Centers requesting similar information as requested from the Title XII institutions. An example of the cable (Appendix V) and the number of responses are given in Appendix VI.

The information which follows concerns our methodology and results concerning the early stages (seven months) of the planning process.

## RANKING OF COUNTRIES

In attempting to describe priority countries for our planning efforts we first explored the International Agricultural Development Service document which includes Agricultural Development Indicators and The World Bank, World Development Indicators, as sources for criteria to be used as a means of determining the relative agricultural-economical status of one country as compared to another.

In considering some of the main indicators, in consultation with our collaborator, Dr. Gerald Wheelock, Alabama A & M, it was concluded that we could use the four main indicators as presented in the IADS document, supplemented with the World Bank data.

Those indicators which best indicates LDC's are derived from a number of sources and can be defined as follows.

1. LEAST-DEVELOPED COUNTRIES

   This classification is based on the per capita gross domestic product of U. S. $100 or less in 1968, share of manufacturing in gross domestic product of 10% or less, and 20% literacy or less in the age group of 15 years or older around 1960. This classification was originally developed by the Committee for Development Planning of the Economic and Social Council of the United Nations.

2. MOST SERIOUSLY AFFECTED COUNTRIES

   This category originated in 1974 when the United Nations Emergency Operations was set up to help countries affected by the economic crisis brought on by the sudden rise in petroleum prices. This classification is based on a per capita income of less than U. S. $400 in 1971 and for which projections showed the likelihood of an overall balance of payment deficit in 1974 amounting to 5% or more of imports.

3. FOOD PRIORITY COUNTRIES

   The World Food Council defined these countries as those which meet at least three of the following five criteria:

   a. Per capita income below $500 (1975 prices). This level is comparable to the figure of $400 (1971 prices) used above but somewhat higher than the limit of $100 (1968 prices) used to define LDC's.

b. A projected cereal deficit by 1985 of 500,000 tons or more, or a cereal deficit of 20% or more of estimated cereal consumption. This criterion encompasses both countries with large absolute food deficits and those with large relative food deficits.

c. Undernutrition in terms of a high proportion of population which is undernourished or in terms of a low average availability of calories in relation to minimum requirements.

d. Inadequate agriculture performance in terms of average increase in food production during the past decade.

e. Low potential for more rapid and efficient increase in food productivity.

4. PRIORITY FOOD-DEFICIT COUNTRIES

This classification originated with the Consultive Group on Food Production and Investment in Developing Countries. The criteria were that the country is likely to face, by 1985, a deficit of more than one million tons of cereal just to maintain present inadequate level of nutrition, or that its food deficit, although small in absolute terms, poses a major problem because current per capita dietary energy supplies are less than 95% of the country's nutritional requirements.

In addition, we have included the GNP data for low and middle income countries obtained from The World Bank, World Development Indicators, as well as a consideration of other statistics in decision making in some less clearly defined cases. It is realized that this methodology of determining priority countries is one of subjectivity, but the results of classifying countries using the criteria as spelled out above appears to be reliable. In examining the data on countries of West Africa it was possible to pull out countries which are, according to IADS data, considered as "Least Developed" and if one compares those countries with the World Bank Basic Indicators it will be found that the GNP of each of these countries is in the lowest twenty.

Dr. Wheelock suggested that we test the validity of the summary IADS Agricultural Development Indicators by using an SPSS discriminant analysis based on GNP per capita, GNP growth, import content in cereal consumption, cereal consumption per capita, and annual change in cereal output. Using the above

information and analytical procedures generally supported our more subjective rankings.

Tables 1, 2, 3, and 4 present the priority ranking and classification of LDC's from Africa, the Near East, Central and South America, and Southeast Asia. We have included only those countries which have AID Missions or AID Title XII programs, and those of a population of one million or more.

In ranking African countries there was a group with populations of less than one million and which clearly fit into the Least Developed category. These countries may be included as part of the resulting planning program, but because of the low population and relatively small size of the countries, they were omitted from the Tables. Those countries not included were Gambia, Botswana, Cape Verde, Swaziland, Guinea-Bissau.

Table 1. PRIORITY COUNTRY LISTING - AFRICA

(In order of importance, popl. 1 million or more)

| COUNTRIES | INCOME (GNP/Capita)[b] | INDICATORS |
|---|---|---|
| Mali<br>Ethiopia<br>Benin<br>Chad<br>Burundi<br>Rwanda<br>Upper Volta<br>Niger<br>Somalia<br>Tanzania<br>Sudan<br>Guinea<br>Lesotho<br>Uganda | Low Income Countries | Least developed countries[a]<br>Food priority countries[a]<br>Priority food deficit countries[a]<br>Most seriously affected countries[a]<br>Low per capita daily caloric intake as % of total required[b] |
| Mauritania<br>Kenya<br>Senegal<br>Cameroon<br>Zaire<br>Malawi<br>Mozambique<br>Sierra Leone<br>Guinea-Bissau | Low Income Countries | Food priority countries<br>Most seriously affected countries<br>Low per capita daily caloric intake as % of total required (with exception of Cameroon) |
| Togo<br>Liberia | Low Income Countries | Low per capita caloric intake substantially less than % required |
| Zambia<br>Ghana | Middle Income Countries | Daily per capita caloric intake equal to or greater than required (except Zambia - 90%) |

(a) Agricultural Development Indicators, International Agricultural Development Service, New York. 1978.

(b) World Development Indicators, The World Bank, Washington, D. C. 1979.

Table 2. PRIORITY COUNTRY LISTING - NEAR EAST

(In order of importance, popl. 1 million or more)

| COUNTRIES | INCOME (GNP/Capita)[b] | INDICATORS |
|---|---|---|
| Afghanistan | Low Income Country | Least developed countries[a]<br>Food priority countries[a]<br>Priority food deficit countries[a] |
| Yemen | Middle Income Country | Most seriously affected[a]<br>Low per capita daily caloric[b] intake as % of required total |
| Egypt | Middle Income Country | Most seriously affected country<br>Food priority country |
| Jordan | Middle Income Country | Low per capita daily caloric intake as % of required total |
| Morocco | | |
| Tunisia | Middle Income Countries | |
| Syria | | |

(a) Agricultural Development Indicators, International Agricultural Development Service, New York. 1978.

(b) World Development Indicators, The World Bank, Washington, D. C. 1979.

Table 3. PRIORITY COUNTRY LISTING - LATIN AMERICA

(In order of importance, popl. 1 million or more)

| COUNTRIES | INCOME (GNP/Capita)[b] | INDICATORS |
|---|---|---|
| Haiti | Low Income Country | Least developed country[a]<br>Most seriously affected country[a]<br>Food priority country[a]<br>Priority food deficit country[a]<br>Low per capita daily caloric[b] intake as % of total required |
| Honduras<br>El Salvador | Middle Income Countries | Most seriously affected countries<br>Food priority countries<br>Low per capita daily caloric intake as % of total required |
| Guatemala | Middle Income Country | Most seriously affected country<br>Low per capita daily caloric intake as % of total required |
| Bolivia<br>Colombia<br>Dominican Republic<br>Ecuador | Middle Income Countries | Low per capita daily caloric intake as % of total required |
| Paraguay<br>Nicaragua<br>Peru<br>Jamaica<br>Chile<br>Panama<br>Costa Rica | Middle Income Countries | |

[a] Agricultural Development Indicators, International Agricultural Development Service, New York. 1978.

[b] World Development Indicators, The World Bank, Washington, D. C. 1979.

Table 4. PRIORITY COUNTRY LISTING - ASIA

(In order of importance, popl. 1 million or more)

| COUNTRIES | INCOME (GNP/Capita)[b] | INDICATORS |
|---|---|---|
| Nepal | Low Income Country | Least developed country[a]<br>Food priority country[a]<br>Priority food deficit country[a]<br>Most seriously affected country[a]<br>Low per capita daily caloric[b] intake as % of total required |
| Bangladesh<br>Sri Lanka<br>India | Low Income Countries | Food priority countries<br>Priority food deficit countries<br>Most seriously affected countries<br>Low per capita daily caloric intake as % of total required |
| Pakistan | Low Income Country | Food priority country<br>Most seriously affected country<br>Low per capita daily caloric intake as % of total required |
| Indonesia<br>Philippines | Low Income Countries | Food priority countries<br>Low per capita daily caloric intake as % of total required |
| Thailand | Low Income Country | |
| Malaysia | Low Income Country | |

(a) Agricultural Development Indicators, International Agricultural Development Service, New York. 1978.

(b) World Development Indicators, The World Bank, Washington, D. C. 1979.

# FARMING SYSTEMS

Utilizing the advice and discussion of the Advisory Committee we proceeded to develop a system of ranking the major cropping systems within the tropics. It became apparent that the process which would best accomplish the identification of countries and commodities would take form of (1) selection of target countries (above) (2) identification of significant cropping systems in each of the countries and (3) verification that important cropping systems or major commodities had not been omitted.

It should be pointed out that in our Advisory Committee discussions the terms "cropping systems", "farming systems","multiple cropping systems" were all used interchangeably and without due consideration to the complexities involved in describing a given system.

The above mentioned terminology problems emphasize the difficulties in describing "farming", "cropping", or "multiple cropping systems". If one focuses attention on the small farmer cropping system the difficulties become even more apparent. For example, Table 5 presents data on consumption of a shifting cultivators' family in Mozambique. The table indicates the variety of products the tropical smallholding produces over a 12 month period. Similar complexities exist in the semi-permanent cultivation systems or systems with regulated fallow type farming and those of more permanent cultivation on rain fed land. The magnitude of complexity decreases with the tendency towards more permanent types of farming operations but even systems of permanent cultivation in the tropics are complex multiple cropping systems. The same phenomena hold true for Latin America and Asia as well as Near East systems.

For the sake of clarity in future discussions it seems essential that the terms of reference should be defined. Ruthenberg (1971) has defined farming systems in the tropics. They are as follows:

<u>Shifting Cultivation Systems</u> - Agricultural systems that involve alternation between cropping for a few years on selected and cleared plots with a lengthy period when the soil is rested (fallow). The intensity of shifting cultivation varies widely.

<u>Semi-permanent Cultivation Systems</u> - Clearly defined holdings with largely permanent field divisions where short fallow systems replace the long fallow systems as mentioned above.

Table 5. CONSUMPTION CHART
OF A SHIFTING CULTIVATOR'S FAMILY
IN MANHAUA, MOZAMBIQUE

| PRODUCT | MONTH 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 12 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| CROPS PRODUCED BY THE FAMILY | | | | | | | | | | | | |
| (1) Staple foods containing starch | | | | | | | | | | | | |
| Manioc | + | + | | | | | | | + | + | + | + |
| Maize in milk-ripeness | | | + | + | | | | | | | | |
| Maize as ripe corn | | | | | + | + | | | | | | |
| Rice | | | | | | + | + | | | | | |
| Sweet potatoes | | | | | | | + | + | + | | | |
| Sorghum | | | | | | | | + | | | | |
| Sorghum-corn (ecumunga) | | | | | | | | + | | | | |
| Sorghum-cane (maele) | | | | | | | + | + | | | | |
| (2) Staple foods containing protein | | | | | | | | | | | | |
| Beans (boer boer) | | | | | | | | | + | + | | |
| Beans (jugo) | | | | | | + | | | | | | |
| Beans (manteiga) | | | | | | + | | | | | | |
| Green beans (boer boer) | | | | | | | + | + | | | | |
| Green beans (nyemba) | | | + | | | | | | | | | |
| Green beans (jugo) | | | | + | + | | | | | | | |
| Manioc leaves | + | + | + | + | + | + | + | + | + | + | + | + |
| Sweet potato leaves | | | | | | + | + | | | | | |
| Bean leaves of all kinds | | | | | | + | + | | | | | |
| (3) Additional foods and spices | | + | + | + | + | + | + | | | | | |
| Onions | | | | | | | | | | | + | + |
| Tomatoes | | | | | + | + | | | | | | |
| Gherkins | | | + | | | | | | | | | |
| Egg-plant (2 kinds) | | | | | | | | | | + | + | + |
| Quiabo (hibiscus esculentus) | | + | | | | | | | | | | |
| Groundnuts | | | | | + | + | + | + | + | + | | |
| Sugar-cane | | | + | | | | | | | | | |
| Pumpkins | + | + | + | | | | | | | | | |
| Sorghum-cane (ecumunga) | | | | | + | + | | | | | | |
| COLLECTED FOOD | | | | | | | | | | | | |
| (4) Staple foods (animal protein) | | | | | | | | | | | | |
| Grasshoppers | + | + | + | | | | | | + | + | | |
| Mice and other rodents | | | | | | + | + | + | | | | |
| Caterpillars | | | | + | + | | | | | | | |
| Larvae of butterflies | | | | | | | | | | | + | + |
| (5) Additional foods | | | | | | | | | | | | + |
| Fungi (9 kinds) | + | | + | | | | | | | | + | + |
| Wild fruits (7 kinds) | + | | | | | | | | | | | |
| Honey | | | | + | + | + | | | | | | |

From: Possinger, H. 1967. Plantagenbetriebe oder Bauernbetreibe am Beispiel des Sials in Ostafrika (Afrika-Studien no. 13). IFO Institut, Munchen.

Systems with Arable Irrigation Farming - Permanent cultivation on irrigated land supplemented in some cases with rainfall.

Systems with Perennial Crops - Humid savanas or rain forest, primarily tree and shrub crops with growth cycles of several decades. Sugar cane, pineapple, sisal, and bananas are in this category.

Grazing Systems - Either nomadism or ranching in the production of livestock.

With the possible exception of the farming system defined as grazing systems, all of the previously defined systems may involve multiple cropping practices.

Multiple cropping for food production is in wide spread use by farmers in the warmer parts of the world at all levels of agricultural technology. The form of multiple cropping will vary from area to area and is dependant upon the farmers total resources. In much of the developing world farmers operate with difficulties which arise from insufficient capital, rudimentary infrastructure, unsophisticated markets, or unfavorable price relations.

Multiple cropping can be broken down into various cropping patterns. The two major subdivisions being sequential cropping where two or more crops are grown in sequence on the same field per year. The succeeding crop is planted after the preceding crop has been harvested and the only crop intensification is in a time dimension. In this system there is no intercrop competition and management is for only one crop at a time within the same field. Sequential cropping may take the form of growing two crops a year, three crops a year in sequence or growing four crops per year in sequence. Ratoon cropping is the cultivation of crop regrowth after harvest, but not necessarily for grain eg. sugarcane.

The second major subdivision of multiple cropping is that of intercropping. Intercropping is the growing of two or more crops simultaneously in the same field. Crop intensification is in both time and space dimension. There is intercrop competition during all or part of the period of growth and farmers manage more than one crop at the same time and in the same field. Intercropping may be subdivided into mixed intercropping in which there is no distinct row arrangement, row intercropping where two or more crops are grown simultaneously and where the crops are planted in rows, strip intercropping in which two or more crops are grown simultaneously in strips which allow for

independant cultivation but the strips are narrow enough that the crops interact agronomically, relay intercropping where two or more crops are grown simultaneously during only part of the growing cycle for each and where a second crop is planted after the first crop has reached its productive stage of growth but prior to the stage which it may be harvested.

As pointed out by MacArthur (1971) the range and the balance of farming combinations that are reflected in any actual farming system is limited by a number of constraining factors. It has been suggested that five main types of factors limit the possible occurance and importance of different types of crops that may exist in any actual farm system. These are:

(1) Ecological Factors determine what different types of production are possible and which plant species can survive and thrive in the defined climatic soil and biological conditions and which includes the manner in which different species interact agronomically within a single system.

(2) Infrastructural Features which concerns things such as land tenure and the supply of inputs such as water, power, expertise and advice, and things of this kind which further restrict the choice of the possible combinations which can be grown within the ecological framework.

(3) External Economic Constraints which profoundly influence the choice of possibilities through such things as location, organization of marketing systems, the existance of alternative sources of food which can remove the need for subsistence farming, the availability of credit, subsidies, all of which affect the attractiveness of different multiple cropping practices.

(4) Internal Operational Factors like farm size, the availability of labor, and fixed improvements are also important determints.

(5) Personal Acceptance of the adopted system can have influence in those types of farming where a range of possibilities permits personal choices to be made.

Within the structure of successive limitations of this type, development paths can be observed for different major types of tropical ecological situations.

Because of the ecological variations due to latitudinal or elevational differences and the complex nature of the tropical farming systems, it became apparent that for operational simplicity we should utilize the system of

farming regions in making decisions regarding the major crops grown in the tropics. In this manner we have defined the crops of importance to the populations of the different geographic areas. Subsequent decisions on the importance of specific multiple cropping practices in specific countries and/or geographic regions will, by necessity, be made by site teams in consultation with in-country technical personnel and input from International Agricultural Research Centers, assistance of AID and other agencies, as well as documentation from previous team visits eg., the UC/AID Pest Management Multidisciplinary Study Team Reports.

In attempting to define major commodities through a farming systems approach we have adopted a system which is described in Supporting Papers: World Food and Nutrition Study, Vol. II, The National Research Council, 1977. The approach used in the reference mentioned is based on data obtained by the Food and Agricultural Organization (FAO) and uses several types of systems which can be identified based on world wide data. The classification of countries of the world into Farming Regions is that utilized and which lists no country in more than one of the regions, although obviously it would be desirable to do so, and it may also be an important consideration later on. This classification omits China, India, Europe, and Oceania which are considered to be distinct regions. The ten regions are listed in Table 6 and lists those countries which belong in the respective regions. Tables 7 and 8 present data based on production of the most important commodities on a hectare basis (Table 7), and also on the basis of hectares per thousand people (Table 8).

Using the data from Tables 7 and 8 and combining that with the data from Tables 1-4 (Priority Country Listing) we developed the ranking of major commodities grown in prioritized countries of each of the geographic regions. Tables 9, 10, 11, and 12 present the results of our ranking system and with a summarized ranking of commodities in order of importance to prioritized countries. Table 12 includes information for India because of the many similarities in cropping practices of the Asian Rice Region (VII).

Additional information which was obtained by using this system was the quantitation of the number of countries in which major commodities are produced. If we examine these data it will be found that rice is grown in 9 of the prioritized countries, wheat in 13, corn in 27, sorghum in 13, millet in 15, roots and tubers in 27, pulses and oil seeds in 18 and fruits in 5.

Using the system employed has some obvious disadvantages of omission and it should be pointed out, for example, in the case of Mali, one of the major cereal crops in that particular country of the African sorghum-millet region is rice, as well as

sorghum and millet. If one examines Table 9 it will be noted that rice was not included in the data for Mali. The same problem exists if one examines the table data concerning commodities for Guinea-Bissau in which case sorghum is not included as a major cereal crop. To rectify the problem of omission we have used the data supplied in the Agricultural Development Indicators handbook published by the International Agricultural Development Service in 1978.

Table 6. TEN WORLD FARMING REGIONS[a]
and
ASSOCIATED COUNTRIES[b]

| | FARMING REGION | PRIORITY COUNTRIES |
|---|---|---|
| I | North African Wheat | Morocco, Tunisia |
| II | African Sorghum-Millet | Cameroon, Chad, Ethiopia, Gambia, Mali, Mauritania, Niger, Rwanda, Senegal, Somalia, Sudan, Uganda, Upper Volta, Zambia |
| III | Guinean Zone of Africa, Rice, corn, roots and tubers | Benin, Ghana, Guinea, Guinea-Bissau, Liberia, Mozambique, Sierra Leone, Togo, Zaire |
| IV | African Corn | Burundi, Kenya, Lesotho, Malawi, Tanzania |
| V | Asian and Near Eastern Wheat | Afghanistan, Egypt, Jordan, Pakistan, Syria |
| VI | Asian Sorghum-Millet | Yemen |
| VII | Asian Rice | Bangladesh, Indonesia, Nepal, Philippines, Sri Lanka, Thailand |
| VIII | Latin America Wheat | Chile, Uruguay |
| IX | Latin America, Corn, beans, roots and tubers | Bolivia, Colombia, Paraguay, Peru, Haiti, Jamaica, Costa Rica, El Salvador, Guatemala, Honduras, Nicaragua, Panama |
| X | Latin America Sugar, rice | Dominican Republic |

[a] From Supporting Papers: World Food and Nutrition Study, Vol. II. The National Research Council. 1977.

[b] Includes only those listed as priority countries in Tables 1, 2, 3, and 4.

Table 7. CHARACTERISTICS OF TEN FARMING REGIONS

| | FARMING REGION[a] | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | I | II | III | IV | V | VI | VII | VIII | IX | X | WORLD |
| Rice (000 ha) | 5 | 776 | 2,513 | 150 | 2,716 | 371 | 47,556 | 131 | 6,075 | 235 | 134,087 |
| Wheat (000 ha) | 5,447 | 1,212 | 17 | 1,809 | 25,969 | 269 | 708 | 4,719 | 2,814 | | 222,267 |
| Corn (000 ha) | 470 | 4,602 | 2,279 | 10,020 | 2,103 | 481 | 7,441 | 3,877 | 22,828 | 31 | 112,680 |
| Sorghum (000 ha) | 86 | 10,165 | 308 | 673 | 542 | 1,400 | 100 | 2,416 | 1,514 | | 40,979 |
| Millet (000 ha) | 8 | 12,173 | 503 | 1,067 | 975 | 651 | 340 | 198 | 290 | | 67,928 |
| ALL CEREALS[b] (000 ha) | 9,128 | 32,331 | 6,073 | 13,041 | 39,916 | 3,568 | 56,790 | 13,219 | 34,442 | 266 | 720,435 |
| Roots and tubers[c] (000 ha) | 82 | 4,857 | 3,499 | 1,906 | 362 | 210 | 3,975 | 291 | 4,019 | 55 | 51,559 |
| Pulses[d] (000 ha) | 721 | 7,386 | 744 | 1,996 | 3,030 | 423 | 2,217 | 222 | 6,851 | 64 | 64,589 |
| Oilseeds[e] (000 ha) | 8 | 4,558 | 785 | 7,001 | 101 | 410 | 2,311 | 536 | 4,306 | 71 | 62,728 |
| 17 Vegetables[f] (000 ha) | 641 | 118 | 48 | 477 | 2,664 | 102 | 1,630 | 667 | 761 | 8 | 19,345 |
| 14 Fruits[g] (000 tons) | 1,900 | 593 | 1,744 | 4,390 | 7,843 | 197 | 25,997 | 2,965 | 30,791 | 767 | 137,063 |
| Population (000) | 40,287 | 158,449 | 79,364 | 70,573 | 221,747 | 31,181 | 555,949 | 38,808 | 258,090 | 10,299 | 3,827,588 |

(a) See Table 6 for the country makeup of the numbered regions.
(b) Besides those listed above, "All Cereals" includes rye, barley, oats, mixed grain, unspecified millet and sorghum, buckwheat, and miscellaneous cereals.
(c) Potatoes, sweet potatoes and yams, cassava, and other starchy roots.
(d) Dry beans, dry peas, dry broad beans, chickpeas, lentils, pigeon peas, cowpeas, vetch, lupine, and other pul
(e) Soybeans and groundnuts.
(f) Cabbage, tomatoes, cauliflower, squash and pumpkins, cucumbers, eggplant, chillies, green onions, dry onions, garlic, string beans, green beans, green peas, carrots, waterrelons, other melons, and grapes (including wine grapes).
(g) Apples, pears, peaches, plums, apricots, cherries, oranges, tangerines, lemons and limes, grapefruit, figs, mangoes, pineapples and bananas.

From: SUPPORTING PAPERS: WORLD FOOD AND NUTRITION STUDY, VOLUME II. The National Research Council. 1977.

Table 8. RELATIVE CHARACTERISTICS OF TEN FARMING REGIONS

| | FARMING REGION[a] | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | I | II | III | IV | V | VI | VII | VIII | IX | X | WORLD |
| Rice (ha per 1,000 people) | 0.1 | [illegible].9 | 31.7 | 2.1 | 12.2 | 11.9 | 85.5 | 3.4 | 23.5 | 22.8 | 35.0 |
| Wheat (ha per 1,000 people) | 153.4 | 7.6 | 0.2 | 25.6 | 117.1 | 8.6 | 1.3 | 121.6 | 10.9 | | 58.1 |
| Corn (ha per 1,000 people) | 11.5 | 29.0 | 28.7 | 142.0 | 9.5 | 15.4 | 13.4 | 99.9 | 88.4 | 3.0 | 29.4 |
| Sorghum (ha per 1,000 people) | 2.1 | 64.2 | 3.9 | 9.7 | 2.4 | 44.9 | 0.2 | 62.3 | 5.9 | | 10.7 |
| Millet (ha per 1,000 people) | 0.2 | 76.8 | 6.3 | 15.1 | 4.4 | 20.9 | 0.6 | 5.1 | 1.1 | | 17.8 |
| ALL CEREALS[b] | 223.5 | 204.0 | 76.5 | 184.8 | 180.0 | 114.4 | 102.2 | 340.6 | 133.4 | 25.8 | 188.2 |
| Roots and tubers[c] | 2.0 | 30.6 | 44.1 | 27.0 | 1.6 | 6.7 | 7.2 | 7.5 | 15.6 | 5.3 | 13.5 |
| Pulses[d] | 17.6 | 46.6 | 9.4 | 28.3 | 13.7 | 13.6 | 4.0 | 5.7 | 26.6 | 6.2 | 16.9 |
| Oilseeds[e] | 0.2 | 28.8 | 9.9 | 99.2 | 0.5 | 13.2 | 4.2 | 13.8 | 16.7 | 6.9 | 16.4 |
| Commercial Crops[f] | 2.4 | 35.0 | 57.8 | 29.6 | 23.1 | 3.0 | 7.6 | 23.6 | 57.6 | 61.6 | 19.3 |
| Vegetables[g] | 15.7 | 0.7 | 0.6 | 6.8 | 12.0 | 3.3 | 2.9 | 17.2 | 3.0 | 0.8 | 5.0 |
| Kilograms of fruit[h] per 1,000 people | 46,516 | 15,671 | 21,975 | 62,205 | 35,369 | 6,318 | 46,761 | 76,402 | 119,303 | 74,473 | 35,809 |
| Average size of holding in hectares[i] | 8.9 | 4.2 | 1.8 | 18.5 | 3.6 | N.A. | 1.4 | 104 | 25.0 | 8.9 | 12.7 |

(a) See Table 6 for the country makeup of the numbered regions.
(b) Besides those listed above, "All Cereals" includes rye, barley, oats, mixed grain, unspecified millet and sorghum, buckwheat, and miscellaneous cereals.
(c) Potatoes, sweet potatoes and yams, cassava, and other starchy roots.
(d) Dry beans, dry peas, dry broad beans, chickpeas, lentils, pigeon peas, cowpeas, vetch, lupine and other pulses.
(e) Soybeans and ground nuts.
(f) Seed cotton, cocoa beans, green coffee, sugarcane, sugar beets, tea, coffee, and jute.
(g) Cabbage, tomatoes, cauliflower, squash and pumpkins, cucumbers, eggplant, chillies, green onions, dry onions, garlic, string beans, green beans, green peas, carrots, watermelons and other melons, and grapes (including wine grapes).
(h) Apples, pears, peaches, plums, apricots, cherries, oranges, tangerines, lemons and limes, grapefruit, figs, mangoes, pineapples, and bananas.
(i) Computed from Table 2, Production Yearbook, 1973 (FAO 1974b).

From: SUPPORTING PAPERS: WORLD FOOD AND NUTRITION, VOLUME II. The National Research Council. 1977.

Table 9. RANKING OF MAJOR COMMODITIES[a]
GROWN IN PRIORITIZED COUNTRIES[b] OF AFRICA

| PRIORITIZED COUNTRIES | MAJOR COMMODITIES (Ranking based on ha of each) | | | | | | | | | SUMMARIZED RANKING OF COMMODITIES IN ORDER OF IMPORTANCE TO PRIORITIZED COUNTRIES |
|---|---|---|---|---|---|---|---|---|---|---|
| | RICE | WHEAT | MAIZE | SORGHUM | MILLET | ROOTS/TUBERS[c] | PULSES[d] | OIL SEEDS[e] | FRUITS[f] | |
| Mali, Ethiopia, Chad Rwanda, Upper Volta, Niger, Somalia, Sudan, Uganda | | + | ++ | ++++ | ++++ | ++ | +++ | ++[g] | | Sorghum, millet, pulses, roots/tubers, maize, oil seeds, wheat |
| Benin, Guinea | +++ | | +++ | | | ++++ | ++ | ++ | - | Roots/tubers, rice, maize, pulses, oil seeds, fruits |
| Burundi, Tanzania, Lesotho | | + | ++++ | | + | + | + | ++++ | ++ | Maize, oil seeds, fruits, pulses, roots/tubers, millet, wheat |
| Mauritania, Senegal, Cameroon | | + | ++ | ++++ | ++++ | ++ | +++ | ++ | | Sorghum, millet, pulses, roots/tubers, maize, oil seed, wheat |
| Kenya, Malawi | | + | ++++ | | + | + | + | ++++ | ++ | Maize, oil seeds, fruits, pulses, roots/tubers, millet, wheat |
| Zaire, Mozambique, Sierra Leone, Guinea-Bissau, Togo, Liberia, Ghana | +++ | | +++ | | | ++++ | ++ | ++ | + | Roots/tubers, rice, maize, pulses, oil seeds, fruits |
| Zambia | | + | ++ | ++++ | ++++ | ++ | +++ | ++ | | Sorghum, millet, pulses, roots/tubers, maize, oil seeds, wheat |

[a] Based on data from Supporting Papers: World Food and Nutrition Study, Vol. II. The National Research Council. 1977.

[b] From Table 1

(c),(d),(e),(f)
Refer to footnotes - Table 7

[g] ++++ indicates most important commodity

Table 10. RANKING OF MAJOR COMMODITIES[a]
GROWN IN PRIORITIZED COUNTRIES[b] OF THE NEAR EAST

| PRIORITIZED COUNTRIES | MAJOR COMMODITIES (Ranking based on ha of each) | | | | | | | | | | SUMMARIZED RANKING OF COMMODITIES IN ORDER OF IMPORTANCE TO PRIORITIZED COUNTRIES |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | RICE | WHEAT | MAIZE | SORGHUM | MILLET | ROOTS/TUBERS[c] | PULSES[d] | OIL SEEDS[e] | VEGETABLES[f] | FRUITS[g] | |
| Afghanistan | +++ | ++++ | +++ | | | | +++ | | +++ | +[i] | Wheat, rice, maize, vegetables, pulses, fruits |
| Yemen | ++ | + | ++ | ++++ | +++ | + | ++ | ++ | | | Sorghum, millet, pulses, rice, maize, oil seeds, wheat, roots/tubers |
| Egypt, Jordan | +++ | ++++ | +++ | ++++ | | | +++ | | +++ | + | Wheat, sorghum, rice, maize, vegetables, pulses, fruits |
| Morocco, Tunisia | | ++++ | + | | | | + | | + | + | Wheat, maize, pulses, vegetables, fruits[h] |
| Syria | +++ | ++++ | +++ | | | | +++ | | +++ | + | Wheat, rice, maize, pulses, vegetables, fruits |

[a] Based on data from Supporting Papers: World Food and Nutrition Study, Vol. II, The National Research Council. 1977.

[b] From Table 2

[c],[d],[e],[f],[g] Refer to footnotes - Table 7

[h] With exception of wheat and fruits, all others less than 1 million ha

[i] ++++ indicates most important commodity

Table 11. RANKING OF MAJOR COMMODITIES[a]
GROWN IN PRIORITIZED COUNTRIES[b] OF LATIN AMERICA

| PRIORITIZED COUNTRIES | MAJOR COMMODITIES (Ranking based on ha of each) | | | | | | | | | | SUMMARIZED RANKING OF COMMODITIES IN ORDER OF IMPORTANCE TO PRIORITIZED COUNTRIES |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | RICE | WHEAT | MAIZE | SORGHUM | MILLET | ROOTS/TUBERS[c] | PULSES[d] | OIL SEEDS[e] | VEGETABLES[f] | FRUITS[g] | |
| Haiti, Honduras El Salvador, Guatemala, Bolivia, Colombia | +++ | + | ++++ | + | | ++ | +++ | ++ | | +++[h] | Maize, rice, pulses, fruits, roots/tubers, oil seeds, wheat, sorghum |
| Dominican Republic | ++++ | | + | | | +++ | +++ | +++ | | | Rice, roots/tubers, pulses, oil seeds, maize |
| Paraguay, Nicaragua Peru, Jamaica | +++ | + | ++++ | + | | ++ | +++ | ++ | | +++ | Maize, rice, pulses, fruits, oil seeds, roots/tubers, sorghum, wheat |
| Chile | | ++++ | ++++ | +++ | | + | + | ++ | ++ | ++ | Wheat, maize, sorghum, oil seeds, vegetables, fruits, roots/tubers, pulses |
| Panama, Costa Rica | +++ | + | ++++ | + | | ++ | +++ | ++ | | +++ | Maize, rice, pulses, fruits, oil seeds, roots/tubers, sorghum, wheat |

[a] Based on data from Supporting Papers: World Food and Nutrition Study, Vol. II, The National Research Council. 1977.

[b] From Table 3

(c),(d),(e),(f),(g)
Refer to footnotes, Table 7

[h] ++++ indicates most important commodity

Table 12. RANKING OF MAJOR COMMODITIES[a] GROWN IN PRIORITIZED COUNTRIES[b] OF ASIA

| PRIORITIZED COUNTRIES | MAJOR COMMODITIES (Ranking based on ha of each) | | | | | | | | | | SUMMARIZED RANKING OF COMMODITIES IN ORDER OF IMPORTANCE TO PRIORITIZED COUNTRIES |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | RICE | WHEAT | MAIZE | SORGHUM | MILLET | ROOTS/TUBERS[c] | PULSES[d] | OIL SEEDS[e] | VEGETABLES[f] | FRUITS[g] | |
| Nepal, Bangladesh, Sri Lanka, India | ++++ | | +++ | | | ++ | + | + | + | +[h] | Rice, maize, roots/tubers, vegetables, pulses, oil seeds, fruits |
| Pakistan | +++ | ++++ | + | | | | +++ | | + | + | Wheat, rice, pulses, vegetables, fruits, maize |
| Indonesia, Philippines, Thailand | ++++ | | +++ | | | ++ | + | + | + | + | Rice, maize, roots/tubers, pulses, oil seeds, vegetables, fruits |

[a] Based on data from Supporting Papers: World Food and Nutrition Study, Vol. II, The National Research Council. 1977.

[b] From Table 4

(c),(d),(e),(f),(g) Refer to footnotes, Table 7

[h] ++++ indicates most important commodity

Table 13 presents data on significant crop omissions from the ranked commodities listings. The listed crops are deemed important to those countries according to the International Agricultural Development Service (IADS) Agricultural Development Indicators.

Another shortcoming of the approach using ranked commodity by agricultural region is the incorporation of some cereal crops not considered to be of major importance by the IADS listing for certain specific countries.

Table 13 SIGNIFICANT OMISSIONS
FROM COMMODITY RANKINGS
IN TABLES 9-12

| FARMING REGION AND COUNTRIES | MAJOR CEREAL OMITTED[a] |
|---|---|
| African Sorghum-Millet | |
| Mali, Chad, Senegal | Rice |
| Ethiopia | Teff |
| Guinean Region of Africa - Rice, corn, roots/tubers | |
| Benin, Zaire, Mozambique | Sorghum-millet |
| Guinea-Bissau, Togo | |
| Ghana | |
| African Corn Region | |
| Burundi, Tanzania | Rice |
| Asian Rice Region | |
| Nepal, India | Sorghum-millet, wheat |
| Asian and Near Eastern Wheat Region | |
| Pakistan | Sorghum-millet |

[a] Included as Major Cereal Crops in Agricultural Development Indicators, International Agricultural Development Service, N. Y. 1978.

# IMPORTANT PEST RELATED PRODUCTION CONSTRAINTS OF FOOD CROPS IN TROPICAL AND SUB-TROPICAL REGIONS

In the following Tables (14, 15, 16) are listed important pest related production constraints as determined from various sources such as AID study team reports, FAO documents, cables from AID Missions, and other documents pertaining to agricultural pest problems in developing countries. No attempt has been made to rationalize these pests into categories of most injurious as any attempt to do so would be necessarily subjective in many instances.

Pests of grazing lands, fiber crops, sugar cane and plantation crops (coffee, tea, cocoa, rubber, coconut and oilpalm) are not considered in developing the tables and only those crops found in Table 7 are included here. Also omitted are aquatic weeds except those that are important in paddy rice fields.

In selecting the weeds listed in Table 14, the problems of the small farmer in dealing with weeds was given major consideration together with extent of their occurrence in LDC's. The weeds listed are some of those causing greatest problems in food crops on small traditional farms of the tropics and sub-tropics.

In contrast to many insects and diseases, weeds, except for parasitic species, are not specific to certain crops. Their prevelance is related more to the cropping system and climate, and it should be emphasized that weeds are naturally a pest of low mobility. Weeds usually move only short distances in any one year except as they are transported by man. Thus a weed may be serious on farms in one area, but not in another with similar climate and cropping systems, because its spread in distribution has not yet been accomplished. Therefore, many weeds not listed below may be serious on individual farms or areas.

In spite of the apparent surplus of labor in most LDC's, small farmers are unable to cope with many weed problems when using only traditional methods of control. Some of these problems are:

<u>Perennial weeds</u> such as purple nutsedge, cogon grass and Bermuda grass. These weeds regrow very rapidly after hand hoeing. The farmer is rarely able to actually kill perennials that are common in tropical and sub-tropical climates.

Parasitic weeds - The most serious of these are witchweeds (Striga sp.) which infest vast areas of cropland in Africa and Asia and broomrape (Orobanche sp.) which is present in the Mediterranean area and some countries in Asia. Traditional farmers in heavily infested areas are completely unable to cope with these weeds.

Certain other annual weeds including itchgrass (Rottboellia exaltata) and purslane: itchgrass germinates all season, is shade tolerant and will outgrow corn and sugar cane. In addition it has spines on the leaf sheaths that are irritating and hand laborers often refuse to work in infested fields. Purslane is a xerophyte that re-roots readily and continues to grow after cultivation or hand pulling.

Peak labor loads - Farmers are short of labor during peak weeding periods for many crops. They are unable to complete weeding before damage occurs to the crop. Yield losses from weeds in developing countries commonly average at least 20 percent. Often the amount of land planted to crops is limited by the area the family can keep weeded. If the farmer is able to afford hired labor, the cost is much higher and availability much lower during peak weeding periods than at other times.

Because the effect of a given pest may be considered to be serious in one country while relegated to a role of less importance in another we have not attempted to indicate the most important pest species. A major pest in one country, for example, the pink borer may be important, but in another country or region the shoot fly replaces the pink borer as the major pest on the same crop. Similar differences occur when a crop plant has been introduced into a new geographic area without its pest complex. At the same time it may acquire a new pest complex in the area of the introduction.

As discussed previously the traditional farming systems of the tropics are extremely complex and vary according to geographic regions. This complexity of the agroecosystem results in a corresponding diversity in many of the pest problems and the resulting damage caused by these organisms. It is known that tropical ecosystems are quite stable and large population density flucuations in the animal populations are not observed as they are in the temperate and artic ecosystems. The stability of populations in the tropical ecosystem has probably played a major role in the development of

traditional farming systems and has aided the traditional farmer in evolving practices to avoid the ravages of some pest species.

For the above reasons, information concerning key pest problems, quantitative loss estimates (when available), ongoing ICP programs, and input to ICP programs from IARC's will be acquired through information obtained by site visit teams sent to selected countries within regions.

Table 14. IMPORTANT WEEDS OF FOOD CROPS
IN
TROPICAL AND SUB-TROPICAL REGIONS

| COMMON NAME | | CROPS[a] |
|---|---|---|
| | SEDGES | |
| Perennials | | |
| Purple nutsedge | Cyperus rotundus | 8 |
| Yellow nutsedge | Cyperus esculentus | 7 |
| Annual or Perennial | | |
| Fimbristylis | Fimbristylis sp. | 1 |
| Annuals | | |
| Umbrella plant | Cyperus difformis | 1 |
| Umbrella sedge | Cyperus iria | 1 |
| | GRASSES | |
| Perennials | | |
| Cogon grass | Imperata cylindrica | 7 |
| Bermuda grass | Cynodon dactylon | 8 |
| Guinea grass | Panicum maximum | 7 |
| Torpedo grass | Panicum repens | 3 |
| Johnson grass | Sorghum halapense | 7 |
| Para grass | Brachiaria mutica | 3 |
| Dallis grass | Paspalum dilatatum | 3 |
| Annual or Perennial | | |
| Sour paspalum | Paspalum conjugatum | 3 |
| Annuals | | |
| Barnyard grass | Echinochloa crusgalli | 6 |
| Jungle rice | Echinochloa colonum | 6 |
| Itchgrass | Rottboellia exaltata | 5 |
| Goosegrass | Eleusine indica | 5 |
| Crabgrass | Digitaria sanguinalis | 4 |
| Sandbur | Cenchrus sp. | 4 |
| ---- | Ischaemum rugosum | 4 |

Table 14. Cont'd.

| COMMON NAME | SCIENTIFIC NAME | CROPS[a] |
|---|---|---|
| | DICOTS | |
| Perennial | | |
| Sensitive plant | Mimosa pudica | 9 |
| Annual or Perennial | | |
| Pickerel weed | Monochoria vaginalis | 1 |
| ---- | Salvinia auriculata | 1 |
| Annuals | | |
| Amaranthus | Amaranthus spinosis | 2 |
| ---- | Amaranthus spp. | 4 |
| Purslane | Portulaca oleracea | 9 |
| | PARASITIC WEEDS | |
| Annuals | | |
| Witchweed | Striga sp. | 10 |
| Broomrape | Orobanche sp. | 11 |

[a] Food Crops Affected - no ranking intended
1. Rice
2. Upland rice
3. Rice, fruits[b]
4. Upland rice, maize, sorghum-millet, pulses, oil seeds, roots/tubers, vegetables
5. Upland rice, maize, sorghum-millet, pulses, oil seeds, roots/tubers, vegetables
6. Rice, maize, sorghum-millet, pulses, oil seeds, roots/tubers, vegetables
7. Maize, sorghum-millet, pulses, oil seeds, roots/tubers, vegetables, fruits
8. Rice, maize, sorghum-millet, pulses, oil seeds, roots/tubers, vegetables, fruits
9. Pulses, oil seeds, roots/tubers, vegetables
10. Upland rice, maize, sorghum-millet, pulses
11. Pulses, vegetables

[b] See footnotes Table 7 for explanation of pulses, oil seeds, roots/tubers, vegetables and fruits.

Table 15. IMPORTANT INSECT AND VERTEBRATE PESTS OF FOOD CROPS IN TROPICAL AND SUB-TROPICAL REGIONS

| COMMON NAME | SCIENTIFIC NAME | CROPS[a] |
|---|---|---|
| | INSECTS | |
| Earworm, bollworm, fruit worm | *Heliothis armigera*, *H. zeae*, *Heliothis spp.* | 2,4,5,6,7 |
| Green leafhopper | *Nephotettix apicalis* | 1 |
| Green leafhopper | *N. impicticeps* | 1 |
| | *N. cincticeps* | 1 |
| Brown planthopper | *Niloparvata lugens* | 1 |
| Striped rice borer | *Chilo suppressalis* | 1,3 |
| | *Chilo spp.* | 3,5 |
| Yellow stem borer | *Tryporyza incertulus* | 1 |
| Pink borer | *Sesamia inferens* | 1,2,3 |
| Gall midge | *Pachydiplosis oryzae* | 1,3 |
| Diamond-back moth | *Plutella maculipennis* | 4 |
| Shoot fly | *Antherigona soccata* | 2,5 |
| Sorghum midge | *Coutarinia sorghicola* | 5 |
| Army worm, cutworm | *Prodenia spp.*, *Spodoptera spp.* | 2,4,6,7 |
| Fruit flies | *Dacus spp.* | 8 (many) |
| | *Ceratitis capitata* | |
| Desert Locust | *Schistocerca gregaria* | General feeder |
| | VERTEBRATE PESTS | |
| Rodents, Rats, Mice, etc. | *Rattus* spp., *Mus* spp. *Bandicota* spp., *Sigmodon hispidus* | 1,5 |
| Birds, Weaverbirds | *Quelea Quelea*, *Ploceus cucullatas* | 1,5 |

[a] Food crops affected - no ranking intended

1. Rice
2. Maize
3. Wheat, barley, grasses
4. Vegetables[b]
5. Sorghum-millet
6. Pulses
7. Oil seeds
8. Fruits

[b] See footnotes Table 7 for explanation of pulses, oil seeds, roots/tubers, vegetables and fruits.

Table 16. IMPORTANT PATHOGENS AND NEMATODE PESTS OF FOOD CROPS IN TROPICAL AND SUB-TROPICAL REGIONS

| COMMON NAME OF DISEASE | SCIENTIFIC NAME | CROPS[a] |
|---|---|---|
| | PATHOGENS | |
| Bacterial blight | Xanthomonas oryzae | 1 |
| | Xanthomomas spp. | 4,6,8 |
| Grassy stunt | Virus | 1 |
| Tungro | Virus | 1 |
| Rice blast | Piricularia oryzae | 1 |
| Sheath blight | Rhizoctonia sp. | 1 |
| Leaf blight | Helminthosporium | 1,2,3 |
| Anthracnose | Colletotrichum lindemuthianum | 6 |
| | Colletotrichum spp. | 6,8 |
| Bean rust | Uromyces phaseoli | 6 |
| Rusts | Puccinia spp. | 3 |
| Covered smuts | Tolyposporium penicillariae | 5 |
| | Sphacelotheca sorghi | 5 |
| Downy mildews | Sclerospora spp. | 2,5 |
| Bacterial wilt | Pseudomonas solanacearum | 4,7 |
| Viruses, Mycoplasma | Virus and/or mycoplasma | 9 |
| Maize streak | Virus | 2 |
| Casava mosaic | Virus | 9 |
| | NEMATODES | |
| Root-knot nematode | Meloidogyne spp. | 2,4,6,7,8,9 |
| Reniform nematode | Rotylenchalus reniformis | 4,8 |
| Lesion nematode | Pratylenchus spp. | 1,2,4,5,8,9 |
| Burrowing nematode | Radopholus similis | 8 |
| Cyst nematode | Heterodera avenae | 3 |

[a] Food crops affected - no ranking intended
1. Rice
2. Maize
3. Wheat, barley, grasses
4. Vegetables[b]
5. Sorghum-millet
6. Pulse[b]
7. Oil seeds[b]
8. Fruits[b]
9. Roots and tubers[b]

[b] See footnotes Table 7 for explanation of pulses, oil seeds, roots/tubers, vegetables and fruits.

## FINAL SELECTION OF COUNTRIES

Using the country rankings (Tables 1, 2, 3, 4) for each geographic region we developed the listing presented in Table 17. The selection of these countries for visitation was based on priority food deficits, ecological diversity and therefore crop diversity, complementarity with on going FAO and bilateral programs, and a knowledge of existing infrastructure and the potential for collaborative counterparts. In addition cable responses resulting from our original communication transmitted in December, 1979, were considered in making decisions whenever possible.

We contacted the AID Agriculture Bureau personnel for assistance because we had no cable responses from some of the countries we believed important to our research planning, and because we believed it advisable to obtain the opinions of AID concerning the feasibility for inclusion in the program of each of the selected countries. Notes regarding these meetings with Bureau personnel are to be found in Appendix VII. After discussion with the AID Bureaus we arrived at the final selection of the countries as listed in Table 18.

AID Missions in each of the listed countries were once again contacted by cable requesting Mission and country clearance as well as assistance in making in-country travel and scheduling arrangements for each of the teams. We have since eliminated Niger from the list of countries because of the similarities of the agroecosystems with those of Upper Volta. It was necessary to maintain Upper Volta on our list of countries to be visited because of the need to visit with personnel involved with the management of the FAO IPM and AID projects.

At this writing, 3-11-80, no cable responses regarding Mission and country clearances have been received. It is anticipated that an answer to our request for assistance and country clearance will be received shortly. Travel plans for each of the visits in each of the proposed countries are currently in the final stages. Itineraries are established, visa applications are processed, and air reservations are being made.

Table 17

PRIORITY COUNTRIES AND POTENTIAL SITES
SELECTED FOR TEAM VISITS
LISTED BY GEOGRAPHIC REGION

---

**TEAM I - NEAR EAST AND EAST AFRICA**

| | |
|---|---|
| Jordan, Tunisia | ecologically distinct and unique food crops |
| Sudan, Tanzania, Burundi, Rwanda | high priority East African countries |
| Burundi, Rwanda | select Burundi or Rwanda, but not both |
| Egypt | contact on a tertiary basis only |

**TEAM II - WEST CENTRAL AFRICAN**, Sahelian as well as coastal zones

| | |
|---|---|
| Senegal, Cameroon, Chad, Niger, Upper Volta | high priority and ecologically diverse<br>complementary with CILSS and FAO programs |
| Liberia | collaboration with LSU and WARDA |
| Nigeria | complementary with IITA |
| Zaire | investigate possibility of inclusion in program |

**TEAM III - LATIN AMERICA**
objectives - to include Caribbean countries, lowland tropics and high land tropics

| | | |
|---|---|---|
| Haiti | possible, but language problem for study team if mostly Spanish speaking team members | |
| Dominican Republic | alternative to above - high priority country | |
| Honduras, Guatemala | high priority countries | |
| Colombia | high priority country | |
| Ecuador (?), Paraguay | high priority country | Collaboration with CIAT |
| Costa Rica (?) | we included Costa Rica because of CATIE | |
| Peru (?) | possible collaboration with CIP | |
| Panama, Jamaica | of lower priority but possible addition depending on scheduling the non-availability of target countries | |

Table 17 (continued)

| | |
|---|---|
| TEAM IV - ASIA | |
| Nepal<br>Sri Lanka | high priority |
| India (?)<br>Pakistan (?) | check with Bureau for possibility |
| Indonesia (?) | check with Bureau for possible renegotiation with Mission |
| Philippines | of lower priority but should visit IRRI, should be included in program, particularly if Indonesia not able to collaborate |
| Malaysia | check status with Bureau |

Table 18

PROPOSED COUNTRIES TO BE INCLUDED

IN SITE VISITS ACCORDING TO GEOGRAPHIC REGION

| | APPROXIMATE DATES OF VISIT - 1980 |
|---|---|
| TEAM I - EAST AND NORTH AFRICA, NEAR EAST | |
| Tanzania | April 15 - 26 |
| Egypt | April 26 - May 1 |
| Jordan | May 2 - 8 |
| Sudan | May 9 - 14 |
| Tunisia | May 15 - 23 |
| TEAM II - WEST AFRICA | |
| Senegal | April 26 - May 2 |
| Upper Volta | May 2 - 9 |
| Nigeria (IITA) | May 9 - 14 |
| Cameroon | May 15 - 24 |
| TEAM III - LATIN AMERICA | |
| Guatemala | April 26 - 29 |
| Costa Rica (ROCAP, CATIE) | April 30 - May 10 |
| Panama | May 11 - 14 |
| Colombia | May 15 - 23 |
| Peru | May 24 - 31 |
| TEAM IV - SOUTHEAST ASIA | |
| India (ICRISAT) | April 27 - May 3 |
| Sri Lanka | May 4 - 9 |
| Indonesia | May 10 - 16 |
| Philippines (IRRI) | May 17 - 24 |

# TEAM VISITS

At the first meeting of the Advisory Committee considerable time was devoted to a decision concerning the make-up and the proper utilization of in-country site teams. it was concluded that each team should include one member from each of the principle crop protection disciplines, nematology, entomology, plant pathology, and weed science, plus the addition of a social scientist, a rural sociologist or an agricultural economist. In addition it was apparent that those present believed it advisable to have the team leader visit the country(ies) in advance of the balance of the team to better establish contacts and to arrange the visitations which seemed most productive. Unfortunately five or six per team and team leader advance visits cannot be accomplished due to budget restrictions.

The estimated per diem cost based on teams composed as originally planned and for a period of our weeks was approximately $48,500. The additional costs of reimbursement for the time spent by consultants was estimated to be approximately $60,000, based on a minimal consulting fee or salary day and a five day work week. We were well beyond the originally budgeted amount for team visits without including the air fare to each of the countries. As a result we reduced the size of each of the teams to four persons with the exception of the team visiting East Africa and Jordan. This is essentially a three person team and will utilize the expertise of Dr. Clauzell Stevens, Alabama A & M, who will travel on funds other than the Planning Project resources. Dr. Mark Smith, USAID, Grant Monitor, will serve in a similar capacity on the Southeast Asia team. By reducing the number of paid consultants on each team and eliminating Niger as indicated earlier in discussing country selection we reduced the estimated per diem to $26,000, and with associated reductions in consultant fees and air fare, we estimate the team visits will require approximately $97,000, only slightly greater than the amount originally budgeted.

The following is the final make-up of team members for each of the regions.

# SITE TEAM MEMBERS

## WEST AFRICA - NORTH AFRICA

Dr. Jack Drea - Entomologist
USDA - SEA
European Parasite Laboratory
47, rue des Fontenelles
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Dr. T. T. Hebert - Plant Pathologist
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North Carolina State Univ.
Raleigh, North Carolina

Dr. Barbara Yates - Rural Sociologist
1218 W. Armory Ave.
Champaign, Illinois 61820

Dr. J. D. Paschke - Project Coordinator
Purdue University
Entomology Hall
West Lafayette, Indiana 47907

## NEAR EAST - EAST AFRICA

Dr. George S. Abawi - Nematologist
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N.Y.S. Ag. Experiment Station
Cornell Univ.
Geneva, New York 14456

Dr. George Schaefers - Entomologist
Dept. of Entomology
N.Y.S. Ag. Experiment Station
Geneva, New York 14456

Dr. Larry Burrill - Weed Scientist
Office of International Agriculture
Gilmore Annex
Oregon State Univ.
Corvallis, Oregon 97331

Dr. Stan Miller - Ag. Economist
Office of International Agriculture
Gilmore Annex
Oregon State Univ.
Corvallis, Oregon 97331

# SITE TEAM MEMBERS

## SOUTHEAST ASIA

Dr. W. G. Yendol - Entomologist
Pesticide Research Lab.
and Graduate Study Center
Pennsylvania State Univ.
University Park, Pennsylvania 16802

Dr. F. H. Tschirley - Weed Scientist
Michigan State Univ.
Dept. of Plant Pathology
East Lansing, Michigan 48824

Dr. Gerald Wheelock - Rural Sociologist
Dept. of Agribusiness
Alabama A & M Univ.
Normal, Alabama 35762

Dr. Richard M. Riedel - Nematologist
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Dept. of Plant Pathology
210 Botany and Zoology Bldg.
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Columbus, Ohio 43210

Dr. Mark Smith - Plant Pathologist
DS/AGR/FCP
RPC 413
Washington, DC 20523

## LATIN AMERICA

Dr. Michael Irwin - Entomologist
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Dept. of Agricultural Entomology
Univ. of Illinois
Urbana, Illinois 61801

Dr. James McGrann - Ag. Economist
Texas A & M
Dept. of Ag. Econ.
College Station, Texas 77843

Dr. Richard Stuckey - Plant Pathologist
Univ. of Kentucky Nematologist
Dept. of Plant Pathology
Lexington, Kentucky 40506

Dr. G. F. Warren - Weed Scientist
1130 Cherry Lane
West Lafayette, Indiana 47906

Dr. Delmar Broersma - Entomologist
Purdue University
Entomology Hall
West Lafayette, Indiana 47907
(Adjunct team member)

We have selected our site visit teams from names solicited from the Advisory Committee as well as scientists in the different disciplines. Team composition was based on availability for the period of time anticipated for visits as well as on the expertise of the individuals (past experience), and fluency in foreign language where language is critical to proper communication.

Prior to embarkation on site visits the members of the site teams will meet in Washington for briefing by AID. AID will provide team members with a two day briefing session on April 24 and 25, and will provide additional background material concerning the countries to be visited. This will include information on languages and dialects, religions, population and percent of population in agriculture that is rural, miles of paved roads and railroads, average annual cash income, climate, soils, crops and cropping systems, major crop pests and other available information considered valuable.

Other preparations for teams will include the following:

1. Identification of in-country persons and sites to be visited. This has been done by contacting AID agricultural staff in the country as well as others known to have knowledge of the country and its agriculture. In addition we have solicited names from persons involved with other bilateral programs. This step is a key to success of a team visit.
2. Determine the regular work days and holidays for each country to be visited. In strict Moslem countries, such as Sudan, Friday is the holy day while Sunday is a work day. As much as possible, we have planned between country or long distance in-country travel for holidays or weekends. This has not always worked out to our advantage because of the schedules of airlines in the countries to be visited.
3. We have cabled AID Missions giving proposed dates, requesting Mission and country clearances, and requesting local arrangements for ground transport, hotels, interpreters and guides. We indicated persons and locations we wish to visit and whenever possible named the individuals we want to help with arrangements.

In addition to visits to key research stations, ministry of agriculture staff, etc., it is important to visit farms and villages with a guide who speaks English and the local language or dialect. In francophone African countries most of the rural people do not speak French, and in the Philippines, Indonesia, and Thailand, farmers do not speak English. Only by communicating with farmers and local agricultural leaders can the important details of farming methods and pest problems be obtained. In the cables to the Mission the importance of arranging as much ground travel for the team as possible has been stressed.

We also felt it necessary to produce a standard format conveying the kind of information desired as presented below so that each team would request similar information and obtain similar responses from their respective countries thus making analysis somewhat simpler. Similar questionnaires will be developed in the languages of the countries to be visited.

We propose to bring team leaders together for a debriefing session at the conclusion of the team visits in an effort to identify key problems and counterparts with whom a collaborative effort may be undertaken.

# STANDARD FORMAT FOR TEAM VISITS

## INTRODUCTION

Integrated Crop Protection (ICP), (=Integrated Pest Management or Integrated Pest Control) must, by definition, be multidisciplinary and as such is an integral part of farming systems. To date, much of what has been done in ICP has been conducted within discipline, and without an approach to integrated pest management practices across the disciplines involved. In considering multiple cropping practices encountered on the predominantly small holdings in the tropics, conventional research based on single crop approaches, and therefore the application of the resulting technology, are not suitable. It is essential that the multidisciplinary approach be utilized when evaluating the multiple cropping practices and in the analyses of possible solutions of pest problems. Each team member should attempt to interact with the other disciplines in the evaluation of identified problems.

Each team should follow the format and questions asked and with answers to all questions whenever possible. This will assist us in analysis of LDC needs and capabilities for collaborative efforts.

## APPROACH

I IDENTIFY THE PRIORITY TARGET SYSTEMS(S) - Visit "typical" small holdings and observe when practical.

1. What are the most important multiple cropping systems? What crops belong in the systems?
2. How do cropping systems (kinds of crops) change with a change in latitude and/or elevation?
3. What are the reasons for change?
   a. Rainfall
   b. Temperature
   c. Other

II IDENTIFY CONSTRAINTS

1. What are the most important pest related production constraints? Identify by name, weeds, diseases, insects, nematodes, and vertebrates whenever possible. Relate to specific crops.

II IDENTIFY CONSTRAINTS (continued)

2. Have detectable changes in pest complexes been noticed in recent years? If so, is there an explanation(s) known?
3. What are the crop losses (percentage and/or dollar amounts) due to pest related constraints?
   a. How estimated?
   b. By whom estimated?
4. What are the non-pest related production constraints?
   a. Water, soil and other similar constraints.
   b. Policy and institutional constraints.
   c. How do the identified production constraints rank as priority items as compared to pest related production constraints in the same cropping system?

III IDENTIFY IMPORTANT SOCIO-ECONOMIC COMPONENTS OF THE FARMING SYSTEMS UNDER CONSIDERATION

1. Goals of the farmer.
   a. Long term
   b. Short term
2. Labor availability and requirements for labor inputs.
   a. Family
   b. Use of additional hired laborers
3. Role of women
   a. As managers
   b. As part of family enterprise
4. Place of livestock in the farming system.
5. Availability of markets and cash crops.
   a. Transportation
   b. What cash crops are grown and sold?
6. Policy, incentive, and institutional arrangements, (tenure, labor, market, etc.).

IV IDENTIFY CURRENT PEST CONTROL PRACTICES

1. What are pesticide use practices? What pesticides?
   a. What percentage of small farmers use pesticides?
      (1) Methods of application?
   b. What percentage of estate farm operations use pesticides?
      (1) Methods of application?

IV IDENTIFY CURRENT PEST CONTROL PRACTICES (continued)

2. What information on pesticides does the farmer receive and how is it delivered?
3. What regulations, if any, cover the use of pesticides (import, manufacture, formulation, application, etc.)?
4. Are pesticide residues monitored and if so how?
5. What are the non-pesticide practices? What is expected from non-pesticide practices?
   a. What is the extent of knowledge concerning natural enemies of insects and mites?
6. What are pest problems which have impacted on multiple cropping systems?

V IDENTIFY COMPONENTS OF IN-COUNTRY ORGANIZATION OF RESEARCH, EXTENSION, AND EDUCATION

1. What is the administrative structure for agricultural programs? Who are the people in charge at the administrative level for each stage in the infrastructure?
2. What are the levels of funding and what are the sources of funding?
3. Characterize the research arm.
   a. What form does the research component take?
   b. What is the available technical expertise? Names of people contacted or as indicated administratively.
   c. What is the willingness on the part of researchers to cooperate in Title XII research? Names of potential counterpart research personnel.
   d. What is the willingness of administrators to cooperate in Title XII research?
4. What are the ongoing research programs and FTE's in each of the pest related disciplines?
   a. What cooperation with foreign assistance agencies, if any, such as FAO, AID, CID, etc.?
5. Is there an outreach (extension type) program?
   a. How many specialists, if any?
   b. What is the structure of the system of delivery of new technology to farmers?

V IDENTIFY COMPONENTS OF IN-COUNTRY ORGANIZATION OF RESEARCH, (continued)
EXTENSION, AND EDUCATION

6. What are the average salaries for research and extension personnel?
   a. Is compensation a deterrent to staffing?
7. What is the potential for training and education?
   a. Technologist - less than BS training
   b. Technologist - BS or MS training
   c. Researchers - MS or Ph.D training
8. What educational resources are available?
   Faculty, funding, facilities, and library.
9. What is the availability of policy analysis?
   a. How many specialists?
   b. Where located?

VI IDENTIFY POTENTIAL

1. What is the potential for counterpart collaborative research effort? Technical support, facilities, etc.
2. What is the potential for successful implementation of Integrated Crop Protection programs: what is the chance for success?

VII NARRATIVE STATEMENT

General observations, etc. Special notes regarding administration, etc. which may have bearing on the possible outcome of decisions regarding collaborative research.

VIII RECOMMENDATIONS CONCERNING INTEGRATED CROP PROTECTION RESEARCH

1. What key pest related production problems are most researchable and with greatest probability for successful conclusion through an integrated crop protection program?
   a. Highest priority key pest problems.
2. Key pest problems not included in (1) above.
3. Can an ICP program successfully assist the particular country in question?
4. Is a collaborative research mode recommended?
   If not, what mode is recommended?

Oral de-briefing of team leaders following return from visitation.
The team leader will prepare a final report based on inputs from team members to be submitted to the ICP Planning Coordinator no later than July 1, 1980.

# CONCLUSION

Subsequent to the debriefing of the team leaders in which key pest related researchable problems are identified as well as potential collaborating LDC's a list of short and long research problems will be developed. In addition, a description of the potential socioeconomic impact resulting from solution of priority problems will be included in summarizing program activities.

Analyses and evaluation of the relationships between priority research needs and ongoing U. S. research concerns will be made. Key research groups in the U. S. and developing countries having a technical capability in ICP technology will be identified as potential sources of collaborative effort.

Assuming U. S. manifest interest and capabilities in ICP research, the advantage (or disadvantage) of the CRSP mode as compared to centrally funded projects will be determined.

A report will be made to JRC/BIFAD concerning the results of the Phase I assessment and with accompanying documentation a recommendation concerning Phase II planning will be presented.

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# APPENDIX I

# TRIP REPORTS

PURDUE UNIVERSITY INTERNATIONAL PROGRAMS IN AGRICULTURE

Office of the Director

TO: Dr. F. W. Whittemore

FROM: J. D. Paschke

DATE: October 26, 1979

SUBJECT: Trip report, visitation in Guatamala and Costa Rica, September 19-21, 1979

The objective of this visitation was to meet some of the scientists of Latin America and to establish contacts which will be valuable in the planning process for Integrated Crop Protection research, and to become familiar with Central America agricultural techniques, cropping practices, and general topographical and cultural features. I was fortunate to accompany Dr. F. W. Whittemore (DS/AGR) and Dr. Ray F. Smith (University of California, Berkeley), both of whom have broad experience in Central America.

An additional benefit of this trip was to observe the instructional process as conducted in the Short Course offered to Central America entomologists under the auspices of Dr. Smith's UC/AID Pest Management and Related Environmental Protection Project held at CATIE, Turrialba Costa Rica, August 27 - September 21, 1979.

MONDAY, SEPTEMBER 17, 1979, Guatamala. We were met and transported to the Regional Office of Central American Programs (ROCAP) where we met Dr. Donald L. Fiester and Dr. Harry Ackerman. Discussion with Dr. Fiester centered around certain phases of Dr. Smith's AID supported program and to a lesser extent our ICP planning process. We were introduced to Mr. Clem Weber, a member of AID Mission who briefed us on an AID/Michigan State University project which is in the planning and assessment stages and which is oriented toward high elevation cropping systems.

Mr. Weber arranged a visit with Mr. Ramiro Ortiz, a scientist at the Institute de Ciencia y Technologia Agricolas (ICTA). Mr. Ortiz is director of ICTA technical programs. He was very cooperative in explaining their programs dealing with assistance to small farmer multiple cropping systems and the conduct of the program in cooperation with the Rockefeller Foundation. In addition we discussed our Planning grant and the type of project we are working toward. Mr. Ortiz seemed genuinely interested in the project and approaches, and I believe he can be considered a useful contact in Guatamala. I was impressed with his enthusiasm and intellect concerning crop protection problems.

In our discussions it was stressed by Mr. Ortiz that our participants in any Central American activity should be fluent in Spanish, and he was critical of the MSU team for lack of fluency, with the exception of one individual.

IPIA Agricultural Administration Building
West Lafayette, Indiana 47907
(317) 494-8753

Guatemala Trip - Continued

We left Guatemala in the evening of 9/17/79 and proceeded to San Jose, Costa Rica.

TUESDAY, SEPTEMBER 18, 1979. We were met and transported by car from Centro Agronomico Tropical de Investigacion y Ensenanza (CATIE), Turrialba, Costa Rica. The trip from San Jose offered an opportunity to observe agricultural production including small farms as well as large coffee and sugar operations. It also aided in better understanding topography of Costa Rica, and presumably other Central American steep land agroecological zones.

During our visit at CATIE I met Dr. Santiago Fonseca, the Institute Director. Dr. Fonseca is a Purdue University graduate (Ph.D 1965), and we discussed his background with Dr. Fred Patterson (PU). I believe Dr. Fonseca has an interest in our program since much of the work done by CATIE is directed to assist the small farmer of Costa Rica. He was knowledgeable about Title XII programs having been briefed by an earlier visit by a team from the MSU Bean and Cow pea Planning project. Whether or not we should be involved with CATIE is questionable since they are already funded by AID, and colloboration with a different Costa Rica institution would help strengthen research on a broader base and not tend to center research strengths at CATIE. However it appeared that CATIE has the staff, equipment, etc. to be effective.

We sat in on the instruction sessions conducted for the short course students, and I was able to get a first hand impression of the method employed. It was apparent that the students were extremely interested and not reluctant to ask questions. It was my feeling that the program was a success, and not only because of the scientific expertise of the staff, but because all lectures were delivered in Spanish.

I had the opportunity to meet Professor Fausto Cisneros from the Universadid Nacional Agraria, La Molina, Peru. Dr. Cisneros was a member of the teaching staff for the Short Course. This meeting with Dr. Cisneros was important because it established a personal contact for me in Peru. Dr. Cisneros and colleagues offer an opportunity for collaborative effort in our planning for ICP research in South America.

In addition I met other CATIE staff and renewed acquaintances with others I had known previously, as well as Dr. Murray Schenk from the Oregon State/AID weed program. Dr. Schenk is stationed at CATIE as a weed control specialist working on small farm cropping systems.

We returned to the United States September 21, 1979.

PURDUE UNIVERSITY INTERNATIONAL PROGRAMS IN AGRICULTURE

Office of the Director

TO: Dr. F. W. Whittemore

FROM: J. D. Paschke

DATE: October 26, 1979

SUBJECT: Trip report, attendance at the International Symposium on "Integrated Control in Agriculture and Forestry", Vienna, October 8-12, 1979.

This symposium sponsored by the Organization Internationale de Lutte Biologique (OILB), was attended by approximately 600 scientists, mostly European, and with only six participating Americans. Each scientific session was aided by simultaneous translation, but the associated workshop topics did not have this convenience. However this arrangement was only a problem to the American scientists and some of us could understand some of the workshop discussion particularly those presented in French.

I found the scientific sessions to be rewarding because much of the European integration pest management research results for various commodaties was presented. Considerable of the research conducted was of significance to agricultural production, and in some cases was ahead of similar U. S. programs.

I was particularly interested in the status of pest management in deciduous fruits and the efforts put forth in this area by INRA scientists in France, and their colleagues from the Netherlands and West Germany.

A paper presented by W. Koch of the University of Hohenheim, Stuttgart (BD) was one of the outstanding presentations and presented quantitative aspects of weeds in integrated pest management systems. I judged this paper to be of more significance in weed management than other research results presented at other meetings recently attended, most notable, the International Congress of Plant Protection, Washington, DC.

During the course of the symposium I had the opportunity to meet scientists from Europe and the Middle East and renew acquaintances with old friends from Germany, the U. K., Greece and France. Unfortunately there were not as many people from Africa as I'd hope to meet. I did have the opportunity to spend considerable time with Dr. Lukas Brader (FAO), and we established lines of communication for future reference. In addition we discussed at length our planning program, possible approaches, problem areas and cropping systems. We also discussed FAO programs in pest management in Africa and Dr. Brader will forward their most recent program information on FAO research in Africa.

IPIA Agricultural Administration Building
West Lafayette, Indiana 47907
(317) 494-8753

My overall impression of this meeting was definitely positive. Dr. Russ and colleagues had done a magnificient job in organizing and subsequently conducting the symposium. I believe it is unfortunate that more scientists from North America were not in attendance. This indicates a certain amount of provincial attitude on the part of American scientists dealing with integrated pest management.

# APPENDIX II

## MINUTES OF ADVISORY COMMITTEE MEETINGS

MINUTES

INTEGRATED CROP PROTECTION ADVISORY COMMITTEE

Monday, October 22, 1979, Evening

Present: J. L. Apple, L. Burrill, J. L. Collom, E. M. Glass, S. Miller, J. D. Paschke
G. C. Sharma, R. F. Smith, and F. W. Whittemore.

Dr. Paschkedescribed the background to date of the Integrated Crop Protection Program. He indicated the purpose of the Advisory Committee in helping the Grantee to make decisions regarding the development of the planning effort. He described our current needs as those involving decisions necessary to get prepared to field site visit teams shortly after the first of the year. Discussion covered the need for a second meeting after this one prior to that time and calendar considerations indicated the apparent advisability of meeting either the fourth or ninth of February.

The importance of having appropriate liaison with the other Crop Protection oriented AID programs was indicated. Dr. Miller discussed briefly the Oregon State International Plant Protection Center and their activity in the weed control area. Oregon State is working on two contracts, one a research contract oriented to the development of weed control technology for small farmers in LDC's, and the second, a technical assistance program designed to assist LDC's worldwide in the development of weed control activities. The contracts provide for issuing a variety of publications, including a newsletter, development of short courses and other activities in addition to research.

Dr. Smith described, briefly, the University of California Pest Management Project, which is a technical assistance project providing AID/Missions and LDC governments with assistance in pest management. He described particularly the Agro-Medical approach to pest management covering the full range of activities and people who may be involved in the manufacture, use, disposal, etc., of pesticides. The project provides for a number of regional seminars and workshops attempting to meet the needs of all of the people involved in pesticide use integrating their various responsibilities and approaching safety and effective use as a mutual problem of all concerned. The project has been conducting integrated pest management workshops in various regions as well as short-term consulting assistance to missions or country governments. The project has a subcontract with the Medical School at the University of Miami which deals with quality control programs for laboratories dealing with pesticide residue analysis. The University of California contract has utilized people from a number of universities in short-term assignments and in developing integrated teams who have, over a period or years, surveyed a number of countries. The contract draws on an advisory committee made up of people from a number of universities who are interested in this particular problem area. From that has been created the new Consortium on Integrated Crop Protection.

Dr. Apple described briefly the North Carolina State Root-Knot Nematode Project. This is specifically a research project dealing with, generally, a single genus of nematodes. The genus upon which work is focused is the most widely distributed of the nematodes and is an important pest in a lot of LDC's. This approach serves as an entre to nematology generally in LDC's. The impact is intended to be broader than the single genus. A large number of countries are involved in the project, organized on a regional basis with a regional coordinator and individual country cooperators. The project is providing for development and organization of considerable knowledge about species of nematodes and in regard to resistant cultivars. Basic understanding of genetics and

adaptation of nematodes is also being developed. The North Carolina project has resulted in the development of an excellent collection on a world-wide basis of root-knot nematodes and they are now in one location, therefore able to screen new cultivars for resistance to world populations. Good relationships are being developed with cooperating researchers. The program has conducted workshops in five major regions of the world and has issued several important publications.

General discussion of these programs indicated realization of the importance of utilizing the contacts developed through all of these programs in getting the Integrated Crop Protection planning process done.

A broad discussion of the anticipated focus of the ICP planning process covered the following: focus on food and cash crops of small farmers; use of a cropping system orientation; recognition, that while labor intensive practices may be desirable, that labor is not always available; need to consider integration, not only in inter-crop situations, but also across sequential sets of crops and neighboring crops; use of a broad definition of multiple cropping, meaning simply that more than one or two crops are important to the small farm enterprise.

Additional discussion covered the need to resolve how the project can identify high-priority research needs which can most viably be met by an Integrated Crop Protection Program, and which are not now being met by other CRSPs and other research efforts of AID as well as other donors, international centers and other agencies.

Additional discussion of the over-all approach indicated agreement that a commodity-type approach is not adequate. Another alternative, that of focusing on a specific important pest, as has been followed in the nematode project, for instance, while possible, also does not seem to be totally adequate. It was recognized that a number of research needs may be identified and suggested by the ICP planning effort. Some of the research needs may be specific pest oriented while others should be considerably broader. While the planning effort may recommend research on a variety of these, it may also recommend that some of them be dealt with by single centrally-funded research projects rather than by a collaborative-type research program approach. The group was reminded that the total sum of research funds ultimately available to resolve problems identified by this program is going to be very small by any standard.

A strong suggestion was made that the planning effort focus on opportunities and needs to do some relatively site-specific research. The suggestion was made that this be oriented to a farming systems approach with emphasis on creating a methodology which can then be used for crop protection research in other sites or other regions. We were reminded that in many LDC's both the commodity line approach and the discipline line approach to research are even stronger and more rigid than here and that especially in crop protection research work we must assist in crossing these lines in order to deal with the realities. In this regard, it was pointed out that there are two real characteristics that differentiate the ICP approach in potential from other CRSPs and from commodity approaches and that is that we are dealing with, in many cases, (a) pests that cut across commodity lines and (b) a multiplicity of both crops and pests in any given farm situation.

Tuesday, October 23, 1979

Present: J. L. Apple, L. Burrill, J. L. Collom, J. F. Fulkerson, E. H. Glass, S. Miller, D. W. Norman, J. D. Paschke, G. E. Schuh, R. F. Smith, and F. W. Whittemore.

R. Smith distributed two papers by L. Brader, "Advances in Applied Entomology", a paper presented at the University of Reading, and "Transfer of Integrated Plant Protection Techniques to Developing Countries", a paper presented at the recent meetings in Vienna.

Discussion covered the need to identify cropping systems on which work in the planning exercise can be focused. As one means of narrowing the scope, the suggestion was made that cropping systems might be identified by ecological zones. Reference was made to the ecological zones being used in the North Carolina Soils CRSP. Twelve criteria were used by North Carolina to narrow down from a number of ecological zones to five high-priority zones as follows: humid tropics, seasonal non-acid, seasonal acid steep lands, and wet lands.

In consideration of this approach, objections were raised to the general concept of limiting the search for problems to certain zones or subareas which was countered by the recognized need to simplify and restrict the search at various points. Discussion of the North Carolina zones as well as the criteria utilized by them in selecting their ecological zones resulted in general agreement that this particular set of zones was probably not appropriate for our use. The point was made that the criteria used to select the zones and the zones themselves were established to do quite a different job in the North Carolina Soils Project and used not in problem identification, but in the establishment of priority problems and site locations in which research should be conducted. It was also indicated, however, that the intent in using the zones was not to reach a definition of research location for the ICP program, but merely to simplify and organize the task of selecting farming systems upon which we could focus as we identified problems.

The suggestion was made that we eliminate the concept of ecological zoning and simply procede to identify major cropping systems directly. Discussion which ensued served to remind us that a principal starting point should be the point of view of why crop protection is important, and the need to focus on alleviating the most critical causes of crop production losses. Discussion included a brief summary of the U.S. crop loss reporting system and its focus on identifying more or less homogeneous cropping systems as the basic unit.

Discussion of the means of identifying cropping systems independent of their location brought up the point that it will be necessary to keep in mind the basic AID focus, i.e., the poorest of the poor, the countries on which AID programs are focused, and AID's regional organization and the need to serve each region in some way. The discussion of somewhat political considerations to be kept in mind raised the issue of the necessity of interacting with and identifying the areas already adequately covered by other AID, FAO, CIDA, Australian, German and other donor agency programs.

Discussion of the ultimate necessity of visiting only certain countries in the site visit program and the acceptance of the realistic point of view that research can only be conducted ultimately in a certain number of countries raised the possibility of selecting initially target countries which would be used in the planning process as a means of narrowing focus, selecting cropping systems to look at in those countries which would hopefully be representative of other countries. Considerable discussion

of this approach resulted in identification of generalized criteria which should be used to select such countries as follows:

a. countries of priority food needs
b. countries with a diversity of ecology or environments
c. countries where research may be possible
d. high pest related food production losses
e. good response from missions
f. potential for increasing food production as a result of research.

With additional discussion, this list of criteria was refined and subdivided into seven major criteria which would reflect the nature of the problem and two additional criteria which should be reflected generally in the choice of target countries. The seven principal criteria which are stated in preliminary form and which will need to be further adjusted and perfected are as follows:

1. per capita consumption (or per capita food deficit)
2. per capita production (perhaps with indication of annual change)
3. ecological diversity
4. pest related food production losses
5. number of people (population and/or number of people expected to benefit including by extension of results to other countries)
6. potential for the conduct of research
7. significance of the small or subsistence farm (dependence upon it for national food production).

As indicated, in addition to these seven, then it will be necessary to consider in selecting target countries the responses received from the missions as well as the need for adequate consideration of problems of significance in each of the AID regions.

It appeared, with discussion, that the process which is beginning to be developed may then be to:

1. select a set of target countries
2. identify the significant cropping systems in each of these countries
3. verify that important cropping systems have not been left out.

In the continued discussions, a plea was made to start with the major cropping systems found around the world and then proceed to select the countries. The point was also made that it may well be possible, given this approach, to fail to consider major pests and that a way to bring this in should also be considered. In consideration of this concern over which will take precedence, the farming system or the target country, it was determined that an effective approach would be to utilize a grid system with the target countries being listed on one side of the grid and the significant cropping systems being listed across the grid and selection of target countries be made utilizing the criteria indicated above as well as the representativeness of countries within the major cropping systems. It is believed that with this joint use it will be possible to narrow down to locations for site team visits which will, in fact, result in adequate identification of significant pest related problems for the major cropping systems. The criteria generally useful in selecting target countries can also be used in assigning some level of priority to the cropping systems. The suggestions was made that in the site visits to be made in Phase I that information gathering be maximized and that it focus on the representative nature of what is being seen, the extent to which the locations visited and the problems seen represent problems of significance across a

fairly large number of individual farms utilizing a particular crop production system, and that considerably less attention be given to whether or not the site is an appropriate one for research to be done at in the long run.

The role of the committee was discussed briefly, with indication by Dr. Paschke that the Advisory Committee would not be expected, as a group or individually, to produce major documents, but that they were expected to advise Purdue on the conduct, that some committee members may be able to serve as members of the site teams, that they would be asked to review and comment on documents being produced during the course of the planning exercise, and that they were not the proposal review committee, which will be required in Phase II and which will be composed of individuals with no conflict of interest concerns regarding the ultimate development of the research program.

The committee discussed the nature, make-up and the approach to fielding site visit teams. R. Smith described, briefly, the earlier multi-disciplinary teams sent out under the U.C. Crop Protection Program indicating that while the Crop Protection disciplines were represented, a deficiency was the lack of a social scientist. Discussion indicated that other approaches are possible and that the team composition may be the most important decision to be made in Phase I. The committee indicated that while language ability will be important on the team, that not every member has to be fluent in the language to be used in discussions, but that some general self-sufficiency among team members is crucial. The committee agreed that in preparing for team visits a standardized format with a set of observations to be made and/or questions to be answered be used by all of the teams in all countries. Recommendations included the following:

a. insure that the team is reasonably well prepared prior to arrival
b. teams should draw heavily on existing contacts of prior efforts in the area
c. teams should be able to respond to our needs for generalized evaluation, drawing on their professional judgment
d. team make-up should consider not only the basic disciplinary requirements but also need for good understanding of breeding approaches, ag. engineering principles, biochemistry, etc.
e. teams should be visiting extension people, farmers and others in addition to researchers.

Additional discussion on team effort considered the desirability of placing an LDC scientist on the team. Further elaboration of this discussion included consideration of the desirability of dividing the countries to be visited into two groups, including primary countries and secondary countries with the majority of the time spent in primary countries. With this concept, was included the idea that a counterpart team would be identified among professionals in that country to assist and work with the team making the visit. The point was made that this would not necessarily do away with the need to put a distinquished LDC scientist on the team working in a region. Consideration of the approach to be used also indicated the desirability of having an advance visit made in each country by the team leader or another individual who would make contacts with country officials and introduce the team and its objectives and purposes to country officials, assisting the development of a counterpart team where appropriate, make contact with other donor groups, etc.

Consideration was given to the timing for site visits and the steps required between now and that time. The time available is recognized as being reasonably short, but it appears that site visits should be proceeding no later than the latter part of March or first of April and should be completed by some time in May. Discussion covered the need to indicate by cable to all AID/Missions that the ICP planning process is under way. This telegram should identify the anticipated March-May time period for team

visits and ask for a preliminary response regarding interest in receiving this problem identification team. The telegram should indicate that followup with more information will be forthcoming. The same cable should also inquire about any data or observations existing about the importance of pest related food crop losses in the country.

The grantee responsibility of advising Title XII institutions on the status of this effort was also discussed. Purdue will, in the near future, issue a letter to all Title XII institutions indicating the nature of the planning exercise underway and indicating the desirability of having all institutions and scientists indicate important problem areas which they believe to be of high priority in the pest management area. The same letter should indicate that site visit teams will be developed in the near future and that the grantee is interested in identifying people with relevant interest and experience.

JLC:hg

MINUTES

INTEGRATED CROP PROTECTION ADVISORY COMMITTEE

January 29-30, 1980

Present: J. L. Apple, L. C. Burrill, J. L. Collom, J. F. Fulkerson, E. H. Glass, J. D. Paschke, G. E. Schuh, M. A. Smith, R. F. Smith, D. W. Thomas, G. F. Warren, and G. C. Wheelock.

Dr. Paschke advised the committee that the major item of business for this meeting would be to go through the draft of the Interim Report to the JRC emphasizing particularly our attempt to prioritize countries to be visited by the teams and then to reach tentative agreement on the team make-up and the other items on which we need to agree before the teams are put in the field.

The discussion was initiated with the question of the prioritization for Latin America countries. The overall effort involved in reaching the breakdown of countries as indicated in the tables in the document was described and discussed somewhat. In regard to the countries listed the following comments were made: Peru was described as having dropped substantially in per capita food production in the last ten years and therefore might be placed higher on the list.
- Ecuador was left out inadvertently from the list and will be reincluded at the appropriate place, apparently in the group of Bolivia, Colombia and Dominican Republic.
- Colombia was described as a country to be phased out of AID programs by July 1.

The committee members indicated that they felt that the indicators being used were not the sole source of appropriate information and that individual reactions to the rankings and appropriateness of a country for a visit also has some merit. The committee seems to be comfortable with the concept that the priority listing included in the Interim Report is only one of the bases for selection of countries to be visited. We will have several kinds of justification for elimination and/or inclusion of a specific country. In this regard it was pointed out that there will be several levels at which countries will be sorted, including:

1. Elimination or selection of high priority countries on the relatively concrete bases provided by the indicators as discussed in the Interim Report.

2. Further sorting based on the judgment of the committee and other knowledgeable individuals with criteria including the degree of crop losses, ecological diversity, and the specific crop production systems of interest which may be present in the country.

3. The reactions of Bureau personnel and the AID Missions to our indicated interest in including a given country in the visits.

The Missions have responded to the initial communication in some cases, but the majority have not. Only 19 countries have currently responded. It is recognized that many have not responded because of heavy work load and the request being somewhat complicated if they in fact responded to it totally. The Missions had the option of not responding at all or responding immediately indicating interest or lack of interest, but we were in hopes that Missions would respond with some

substantive reaction to some of the questions or informational needs which we expressed. To the extent they can do so this will in some cases delay the response. There was considerable discussion in regard to the level of Mission response. A number of the cables were read and/or summarized by Mark Smith and J. D. Paschke. There seemed to be clear agreement on the part of the committee that a response will be needed fairly soon from a much larger number of Missions. We agreed to re-cable some key Missions requesting a response. Discussion also covered the possibility of doing some telephoning to Missions where a visit is clearly desired in order to speed up the response. In addition it was agreed that we needed to have a document prepared which summarized on a single page or two the nature of the responses received so far from Missions.

In regard to countries listed on the Latin American table, there is agreement that in order to see the significant problems in the environment in which they are of most importance, visits should be made to some of the poorer countries, but that good opportunities exist also to gain understanding of the problems by visiting some of the important middle income countries. The group indicated that priority should probably be given to Haiti, Honduras, Guatemala, and Dominican Republic as well as Ecuador and Colombia. Some feeling was evident that Paraguay should perhaps be moved up in the priority list to join the above indicated countries. Visits may well be warranted also to Peru and Costa Rica because of the presence of CIP and CATIE respectively. Obviously it may also be very useful to visit CIAT in Colombia. While Panama may not be a high priority country from some standpoints, there may be valid reason to visit Panama, particularly in light of the very positive cable response from the Mission there.

In regard to the countries of the Near East region, the committee indicated that Yemen, Jordan and Tunisia appear to be clear possibilities. Considerable concern was indicated among committee members about the usefulness of a visit to Egypt given the enormous magnitude of other programs underway there at this moment, which would appear to make a useful team visit difficult. While Morocco initially looked like a possibility it was noted that there was a negative response from the Mission there. The concept of combining the team visiting the most important countries in the Near East region with the countries of high priority in East Africa was discussed and seemed to be agreed to.

As the priority countries listed for Africa were discussed it appeared that on the East side the highest priority countries which appear to be politically viable and useful would include either Burundi or Rwanda and Sudan and Tanzania. It would appear that Ethiopia is not appropriate nor Somalia and there are negative reactions from the Kenya Mission. Uganda appears to be unlikely and Lesotho not particularly useful to the team. On the Western and Central side it appears as though priority should probably be given to Senegal, Cameroon, Zaire, Niger and Chad and Upper Volta. Liberia also may be a possibility, although somewhat low on the priority list. There is a positive response from the Mission, and the team could interact with people at WARDA. It was also noted that the team from this region should probably spend some time at IITA in Nigeria. A number of countries will obviously have to be left out in the team visits in this region and further information will be needed from the Bureau and Missions in order to make that additional selection. It would appear that at least some visits should be made to a relatively dry Sahelian type situation as well as to the more tropical, humid coastal regions.

Within the Asia region it was noted that a negative response has been received from Indonesia. In addition it was noted that Thailand is at the very bottom of the priority listing and could be eliminated on that basis. It was noted further that there will need to be some more interaction with both Bureau and Mission people in order to make a final choice in the Asia region. The apparent difficulties in timing in being able to get into India and work effectively there within the next few months was an area of considerable concern to the committee. It was felt nevertheless that India should not be eliminated at this point. High priority would then seem to be in Nepal, Sri Lanka, and India. It was felt that Bangladesh is not appropriate nor Pakistan likely at this time. It may be useful to re-negotiate with Indonesia, although a positive response has been received from the Philippines which would make another good country in this region. Some additional feedback particularly on Pakistan will be necessary from Bureau people before we can determine whether or not that should be eliminated.

The usefulness of visiting and working with people from both ICRISAT and IRRI in the Asian region was noted.

The committee went on to spend some time working with the overall Interim Report. The suggestion was made that the initial paragraphs should emphasize more of the importance of crop losses to pests. The impact of pest related problems extends also to such things as the selection of crops by farmers. The types of production systems used may also reflect particular past experiences with pest problems. Some concern was indicated by Dr. Schuh in regard to the emphasis placed on food crops to the extent of potentially ignoring important cash crops. He would prefer a focus on the entire farm enterprise including the combination of the cash crops and food crops. Dr. Schuh agreed to write a paragraph or two in regard to this to be used in the Interim Report. Discussion of this area resulted in the reminder that there are often interactions between food and cash crops, particularly in regard to protection systems. Cash crops may control the pesticides available and the price and systems of application.

The point was also made that teams will need for each country a specific country profile and orientation document that will guide them. Additional assistance from AID will be needed in this regard. It is recognized that the Interim Report does not contain enough specific information to indicate to the teams how best to proceed.

Dr. Schuh requested that the constraint discussion should cover in the paragraph on external economic constraints something specific on price and trade policies.

Considerable discussion ensued among the committee members as to whether or not the approach being taken in the ICP program will "require", as stated on the initial page, an interdisciplinary approach or if room exists for single component research in our long term research program. The concept of concern here is what we are defining as the "unique research approach" that ICP will propose to use in regard to crop protection that justifies this particular CRSP effort as compared with all the other research efforts underway in other programs. Dr. Burrill particularly believes that we have narrowed our approach unnecessarily at this point. An additional question was raised in regard to whether in the introductory paragraph we have adequately discussed the particular strength of the ICP approach as applied to the mixed cropping systems common on small farms in LDC's.

Under the discussion of the team preparation it was indicated that the teams should all be brought together to the extent possible for a single joint orientation session. Some comments were made in regard to the standard format for team visits. Several corrections were suggested and additions made and these will be incorporated into a second draft of this document for subsequent review. Some concern was raised about the breadth of material being requested from the teams and the suggestion was made that while some of this information might be interesting to have, it was not crucial to the job and could be indicated as low in priority. In addition it seemed to be clear that some of the information requested might perhaps be available from other sources particularly within other AID documents and could thus be obtained prior to team departures. There may also be non-AID sources containing some of this information. Dr. Schuh reminded us that there have been substantive studies done on the level of research expenditures in a number of the target countries.

The committee also discussed at length the tentative indication of team make-up. A number of valuable suggestions were made in regard to the teams and the potential scheduling was discussed in part. Several suggested changes in team make-up were provided and Dr. Paschke agreed to revise and rework the potential team make-up.

The committee discussed briefly the concern over failure of Title XII institutions to respond to the initial announcement. The committee believes that the contractor has complied with the concern of BIFAD and JRC that all Title XII institutions be kept informed. It now appears, however, that there will need to be a follow up communication more directly to the professional people in a number of the significant institutions if we are to get definite responses from them that will be of value to us as we proceed through the planning process. The initial broad communication directed to Title XII officers has simply not resulted in the kind of response needed. In achieving this additional level of communication it was determined to go back to Title XII officers and request from them the names of pest related people in their institutions advising them that we will then go to these people directly with the series of questions. There was some minimal discussion of the status of the State of the Arts document. Dr. Paschke has done some initial surveying of literature and collection of appropriate kinds of citations. Dr. Warren will be doing a major portion of the work on the weed area. Dr. Paschke indicated that he is searching for other individuals to do some of the other work on the State of the Arts document. It was agreed that there were a number of modifications which should be done as indicated above in the Interim Report prior to delivery to JRC. Dr. Paschke indicated that prior to the delivery of this report to the JRC he would be working with Bureau people in Washington to get additional responses from AID personnel in regard to the country selection process.

JLC/pp

# APPENDIX III

## ADVISORY COMMITTEE

## ADVISORY COMMITTEE

## ICP PLANNING

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# APPENDIX IV

## LETTER TO TITLE XII INSTITUTIONS

PURDUE UNIVERSITY INTERNATIONAL PROGRAMS IN AGRICULTURE

Office of the Director

TO: Title XII Representatives, U. S. Eligible Institutions

FROM: J. D. Paschke, Coordinator, Integrated Crop Protection Title XII Planning Grant
Entomology Hall, Purdue University, West Lafayette, Indiana, 47907

DATE: November 6, 1979

The Joint Research Committee and the Board of International Food and Agriculture Development recommended to the Agency for International Development that Purdue University be awarded a Title XII Planning Grant for Integrated Crop Protection (ICP) collaborative research. The award was made to Purdue effective September 24, 1979. An abstract of our approved proposal is attached. Note that the planning is to be developed in two phases, the first of which is Assessment.

We are also in the process of acquiring a list of consultants fluent in relevant languages to serve on site visit teams. Please forward names and addresses of qualified, experienced scientists known to you that may serve as consultants on the teams.

Contact will be made with International Research Centers located in Africa, Asia and Latin America to assist in determining major small farm cropping systems and production constraints.

To assist me in establishing a prioritized list of small farm multiple cropping systems and their pest related production constraints I am soliciting your assistance in the Assessment Phase of this grant. Input from interested and qualified scientists of your faculty should be transmitted directly to me and will be greatly appreciated.

Please answer the attached questions and use the same format in responding to assist us in tabulation of the data acquired. Because we are conducting Phase I in a limited time frame I will appreciate receiving the information no later than November 30, 1979. At the present time I am not soliciting institutional

IPIA
ENTOMOLOGY HALL
West Lafayette, Indiana 47907
(317) 494-8793

proposals because we are in the Assessment Phase of the grant; therefore I am requesting assessments only from the individual scientists. After the Assessment Phase is completed and assuming we will proceed with Phase II we will solicit proposals from eligible Title XII institutions.

I hope to have an informal discussion of the planning process at the Annual Meeting, Entomological Society of America, Denver, November 25-29, 1979, and subsequently at the Weed Science Society of America Meeting, Toronto, February 5-7, 1980. As yet the time and date for the ESA session has not been set. All of those interested are invited to participate. Please check the Bulletin Board for announcement of time and place.

The assistance of interested and qualified scientists is of utmost importance to the success of Phase I of this important project. I will be most appreciative of the assistance offered by individual scientists from the various disciplines involved in Integrated Crop Protection.

Sincerely yours,

J. D. Paschke, Coordinator
ICP Planning Study

JDP:pp

enc. 2

copy: BIFAD members
JRC members
F. W. Whittemore
J. Collom
Advisory Committee members

**Prioritization of Small Farmer**
**Multiple Cropping Systems in**
**Less Developed Countries**
**for**
**Integrated Crop Protection Planning Study**

1. Based on significant experience please list the most important small farmer cropping systems for one or more LDC's.
2. For each of the above indicate the key pest related pre-harvest production constraints.
3. Indicate the most appropriate LDC(s) in which to establish linkages with national institutions and individuals with whom we can have further contact regarding primary problem areas.
4. Indicate the potential for increasing food production through ICP research.

Abstract of a Proposal

for a

Planning Study

INTEGRATED CROP PROTECTION

Research

## Objectives and Approach

The Grantee will conduct a study and planning effort which will provide a basis for determining how major future efforts on Integrated Crop Protection may be implemented in support of U. S. development assistance efforts. This study will focus on the needs of small farmers in the developing nations, and will attempt to identify ways in which U. S. expertise can effectively be brought to bear on the problems identified. The study will take as a basic approach:

a. The identification of pest related constraints on crop production within the mixed crop production systems in use on small farms in LDC's.

b. Identification of significant opportunities to relax high priority constraints through research on integrated systems of crop protection which can potentially be employed by the target farmer group.

For the purposes of this planning effort, emphasis will be placed on protection systems for food crops and related cash crops important to small farmers in LDCs. Pest organisms of concern in these environments include weeds (including parasitic plants), pathogens, and vertebrate and invertebrate animals.

The study and planning exercise will be developed in two major phases. In Phase I, with a duration of one year or less, emphasis will be placed on the identification of pest related constraints on production within the production systems in use on LDC farms, describing the existing "state-of-the-art" of integrated crop protection under these conditions, selection of high priority researchable problems in ICP, and analysis of the means of developing subsequent research efforts within the scope of the U. S. development assistance program. The Grantee will complete Phase I by recommending to JRC/BIFAD and AID the appropriate means of implementing the research efforts required.

Phase II will be implemented after AID and JRC/BIFAD evaluate Phase I recommendations, if a collaborative and/or cooperative type research effort is approved. Phase II will analyze and recommend the research program to be undertaken, the institutions to be involved in the U. S., level and form of LDC institutional involvement, and the management structure/process to be utilized.

## APPENDIX V

## CABLE OF INQUIRY TRANSMITTED TO AID MISSIONS

ILCA
CIAT
FID

State 331181
Sent Dec 27, 1979

UNCLASSIFIED
COMMERCIAL

RECD

DS/AGR/FCP:MASMITHSON
12/27/79 EXT:202-3477
DS/AGR/JRUELSON

DS/AGR:FWILLIAMS (DRAFT)
DS/AGR/FCP:FWHITTEMORE

DS/AGR/FCP:KMEYERGO

JRU
MAS
FW
KMG
FWW

INTEGRATED CROP PROTECTION

1. FOR YOUR INFORMATION, THE FOLLOWING CABLE HAS BEEN SENT TO DESIGNATED AID MISSIONS WORLDWIDE.

2. ACTING ON THE RECOMMENDATION OF THE JOINT RESEARCH COMMITTEE COMMITTEE (JRC), OF THE BOARD FOR INTERNATIONAL FOOD AND AGRICULTURE DEVELOPMENT (BIFAD), AID HAS AWARDED A TITLE XII PLANNING GRANT FOR INTEGRATED CROP PROTECTION (ICP) COLLABORATIVE RESEARCH TO PURDUE UNIVERSITY.

3. THE GRANTEE WILL CONDUCT A PLANNING EFFORT WHICH WILL PROVIDE A BASIS FOR DETERMINING HOW MAJOR FUTURE RESEARCH AND METHODS DEVELOPMENT (SHORT AND INTERMEDIATE TERM APPLIED RESEARCH - E.G., ASSESSMENT OF ECONOMIC INJURY LEVELS AND MODIFICATION OF PESTICIDE APPLICATION SCHEDULES) EFFORTS ON ICP MAY BE IMPLEMENTED IN SUPPORT OF U.S. DEVELOPMENT ASSISTANCE EFFORTS. THIS STUDY WILL FOCUS ON NEEDS OF SMALL FARMERS IN DEVELOPING NATIONS, AND WILL ATTEMPT TO IDENTIFY WAYS IN WHICH U.S. INSTITUTIONAL EXPERTISE CAN EFFECTIVELY WORK ON THE PROBLEMS IDENTIFIED. THE STUDY WILL:

UNCLASSIFIED

77

4. IDENTIFY PRE-HARVEST PEST RELATED CONSTRAINTS ON CROP PRODUCTION WITHIN MIXED CROP PRODUCTION SYSTEMS IN USE ON SMALL FARMS IN LDCS.

5. IDENTIFY SIGNIFICANT OPPORTUNITIES TO RELAX HIGH PRIORITY CONSTRAINTS THROUGH RESEARCH AND METHODS DEVELOPMENT ON INTEGRATED SYSTEMS OF CROP PROTECTION WHICH CAN POTENTIALLY BE EMPLOYED BY TARGET FARMERS.

4. EMPHASIS WILL BE PLACED ON PROTECTION SYSTEMS FOR FOOD CROPS AND RELATED CASH CROPS IMPORTANT TO SMALL FARMERS IN LDCS. PESTS INCLUDE WEEDS (INCLUDING PARASITIC PLANTS), PATHOGENS, AND VERTEBRATE AND INVERTEBRATE ANIMALS.

5. THE PLANNING EXERCISE WILL BE DEVELOPED IN TWO PHASES. PHASE I, WITH A DURATION OF ONE YEAR, EMPHASIZES IDENTIFICATION OF PEST RELATED CONSTRAINTS ON PRODUCTION WITHIN PRODUCTION SYSTEMS IN USE ON LDC FARMS, DESCRIBING THE EXISTING "STATE-OF-THE-ART" OF ICP UNDER THESE CONDITIONS, SELECTION OF HIGH PRIORITY PROBLEMS IN ICP, AND ANALYSIS OF THE MEANS OF DEVELOPING SUBSEQUENT RESEARCH AND METHODS DEVELOPMENT EFFORTS WITHIN THE SCOPE OF THIS AND RELATED TITLE XII PROGRAMS. GRANTEE WILL COMPLETE PHASE I BY RECOMMENDING TO JRC/DIFAD AND AID APPROPRIATE MEANS OF IMPLEMENTING THE RESEARCH AND DEVELOPMENT EFFORTS.

6. PHASE II WILL BE IMPLEMENTED AFTER AID AND JRC/DIFAD EVALUATE AND APPROVE PHASE I RECOMMENDATIONS. PHASE II WILL ANALYZE AND RECOMMEND RESEARCH AND DEVELOPMENT PROGRAM(S) TO BE UNDERTAKEN, INSTITUTIONS TO BE INVOLVED IN THE U.S., LEVEL AND FORM OF LDC INSTITUTIONAL INVOLVEMENT, AND MANAGEMENT STRUCTURE/PROCESS.

7. THE PURPOSE OF THE PLANNING PROJECT IS TO FACILITATE COLLABORATION AMONG SELECTED U.S. UNIVERSITIES, INTERNATIONAL CENTERS AND LDC INSTITUTIONS IN A COMMON RESEARCH AND DEVELOPMENT EFFORT TO IMPROVE FOOD CROP PRODUCTION THROUGH ICP AMONG LDC FARMERS. TO ACHIEVE THIS THE PROGRAM WILL BE DESIGNED TO PROVIDE LONG-TERM COLLABORATION ON MAJOR PEST RELATED PRE-HARVEST PRODUCTION CONSTRAINTS. THE PROGRAM WILL BE JOINTLY SUPPORTED BY AID AND THE COLLABORATING U.S. INSTITUTIONS.

8. PRIMARY COLLABORATING LDC INSTITUTIONS WILL BE IDENTIFIED ON THE BASIS OF MISSION INTEREST, INSTITUTIONAL CAPABILITY, IMPORTANCE OF ICP AND THE INTEREST OF HOST GOVERNMENTS. COLLABORATION WILL BE ACHIEVED BY INTEGRATING



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ONGOING, LOCAL ICP PROGRAMS WITH THE PROPOSED PROGRAM. LOCAL SCIENTISTS WILL BE INVITED TO WORK DIRECTLY WITH U.S. SCIENTISTS WITH WHOM THEY WILL COORDINATE THEIR EFFORTS. EFFORTS.

9. SECONDARY COLLABORATION SITES WILL ALSO BE IDENTIFIED WHERE ICP IS SOMEWHAT LESS IMPORTANT, INSTITUTIONAL CAPABILITY IS LESS ADEQUATE, AND/OR THE LDC DESIGNATES ICP AT A LOWER PRIORITY. FOR SUCH CASES, FIELD TRIALS AND PROGRAMS WILL BE INITIATED TO THE EXTENT POSSIBLE.

10. A TERTIARY LEVEL OF COLLABORATION WOULD BE AVAILABLE FOR COUNTRIES WITH CONSIDERABLY LOWER LEVELS OF ICP IMPORTANCE, INSTITUTIONAL CAPABILITY, AND/OR INTEREST. THIS WOULD INVOLVE PRIMARILY RECEIPT OF INFORMATION ON RESEARCH RESULTS, AND TECHNICAL GUIDANCE FROM COLLABORATING INSTITUTIONS SUPPORTED FROM OTHER THAN PROJECT FUNDS.

11. TO ASSIST IN ESTABLISHING A PRIORITIZED LIST OF SMALL FARM MULTIPLE CROPPING SYSTEMS AND THEIR PEST RELATED PRODUCTION CONSTRAINTS WE ARE SOLICITING YOUR ASSISTANCE IN THE ASSESSMENT PHASE OF THIS GRANT. PLEASE PROVIDE THE INFORMATION REQUESTED BELOW:

A. BASED ON YOUR EXPERIENCE PLEASE LIST THE MOST IMPORTANT IN-COUNTRY SMALL FARMER CROPPING SYSTEMS.

B. FOR EACH OF THE ABOVE INDICATE THE KEY PEST RELATED PRE-HARVEST PRODUCTION CONSTRAINTS.

C. INDICATE THE POTENTIAL FOR INCREASING FOOD PRODUCTION THROUGH IN-COUNTRY ICP PROGRAMS.

IT IS ANTICIPATED THAT MISSION AGRICULTURE AND RURAL DEVELOPMENT OFFICERS CAN PROVIDE MUCH OF THE INFORMATION REQUESTED ABOVE BASED ON PERSONAL KNOWLEDGE AND THUS SHOULD NOT REQUIRE A GREAT DEAL OF STAFF TIME.

12. IN PREPARATION FOR DISPATCHING THE SITE VISIT TEAMS AT THE APPROPRIATE PERIODS OF THE YEAR, IT IS REQUESTED THAT INFORMATION BE PROVIDED ON EXTENT OF MISSION AND HOST COUNTRY INTEREST IN PARTICIPATION IN THIS PROJECT, AND IF THERE IS INTEREST IN PARTICIPATION, THE LEVEL OF PARTICIPATION DESIRED AND LIKELY TO BE APPROPRIATE, THE PRINCIPAL SUBSTANTIVE AREAS, AND CANDIDATE INSTITUTIONS AND INDIVIDUALS. WE NEED AS MUCH OF THE ABOVE INFORMATION AS POSSIBLE BY FEBRUARY 1 IN ORDER TO FINALIZE ARRANGEMENTS FOR TRAVEL AND DETAILED PLANNING IN THE 1980 CROP YEAR.



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FOOD
17. CONTACT WITH APPROPRIATE TAPES WILL BE MADE REGARDING TEAM SITE VISITS AT THE APPROPRIATE PERIODS OF THE YEAR. IT IS ANTICIPATED THAT SUCH VISITS WILL GREATLY ASSIST IN THE DECISION MAKING PROCESS CONCERNING IMPORTANT CROPPING SYSTEMS AND THEIR PRE-HARVEST PRODUCTION CONSTRAINTS. UU

MARK A. SMITH
FOOD CROPS PRODUCTION DIVISION
OFFICE OF AGRICULTURE
BUREAU FOR DEVELOPMENT SUPPORT
AGENCY FOR INTERNATIONAL DEVELOPMENT
WASHINGTON, D.C. 20523 UU

# APPENDIX VI

# CABLE RESPONSES

INITIAL MISSION RESPONSE

TO CABLES OF INQUIRY

REGARDING PARTICIPATION IN ASSESSMENT

PHASE OF ICP PLANNING

| REGION/COUNTRY | POSITIVE | NEGATIVE | KEEP INFORMED | MORE INFORMATION TO COME |
|---|---|---|---|---|
| WEST AFRICA | | | | |
| Ghana | | X | X | |
| Senegal | X | | | |
| Chad | X | | | |
| Liberia | X | | | |
| Mauritania | X | | | |
| Niger | X | | | |
| Gambia | X | | | |
| Mali | | X | X | |
| Cameroon | X | | | |
| Upper Volta | X | | | |
| NEAR EAST/EAST AFRICA | | | | |
| Ethiopia | | X | X | |
| Egypt | X | | | |
| Botswana | X | | | |
| Somalia | X | | | |
| Tunisia | X | | | |
| Morocco | | X | | |
| Tanzania | X | | | |
| Kenya | | X | | |
| Syria | X | | | |
| Sierra Leone | X | | | |

INITIAL MISSION RESPONSE

TO CABLES OF INQUIRY

REGARDING PARTICIPATION IN ASSESSMENT

PHASE OF ICP PLANNING

| REGION/COUNTRY | POSITIVE | NEGATIVE | KEEP INFORMED | MORE INFORMATION TO COME |
|---|---|---|---|---|
| SOUTHEAST ASIA/PACIFIC | | | | |
| India | | | | X |
| Sri Lanka | | | | X |
| Fiji | | | | X |
| Philippines | X | | | |
| Nepal | X | | | |
| Thailand | | X | | |
| Indonesia | | X | | |
| Pakistan | | X | | |
| LATIN AMERICA/CARIBBEAN | | | | |
| Peru | | X | | |
| Dominican Republic | | X | | |
| Jamaica | X | | | |
| Panama | X | | | |
| Bolivia | | X | | |
| Columbia | | | X | |
| Costa Rica | | | X | |
| Barbados | X | | | |
| Guatemala | X | | | |
| Nicaragua | | X | | |

# APPENDIX VII

## VISIT TO AID AGRICULTURAL BUREAUS

NOTES ON VISIT TO

AID AGRICULTURAL BUREAUS

NEAR EAST BUREAU - Dr. Victor Lateef and Dr. Robert Morrow

In conservation about Jordan; Jordan has had a contract with the University of Washington for five years, and they apparently have developed a good university. They have one AID agricultural officer. Nematode problems are severe because of heavy soil type. Dr. Lateef recommended that we send another cable to request cooperation because Jordan is considered to be a good place to work.

Tunisia is also a good place to work. The agriculture officer is ex-USDA and appreciates pest problems. They have a good college of agriculture. In addition we can expect cooperation from INRAT.

Yemen - Considered - AID has pulled its people out of Yemen. Not good. Very complex as far as getting clearance to go in to consult. In general, Dr. Lateef favors country with agricultural institutes.

Morocco is not a good selection.

Egypt, we can consider it but perhaps not at a primary level. We should visit there however. Have agricultural institutes and trained many people - counterpart people - there to work with. Small farmers and horticultural crops are important.

Somalia is a possibility but has a poor infrastructure and not recommended highly.

LATIN AMERICAN BUREAU - Richard Hughes

We discussed Peru, and he suggested going ahead with another cable of the informational type and indicate that we would like to visit the Ministry as well as the Potato Institute.

Ecuador is opening a new AID Mission. It is a sensitive area. New rural development officer. Some question regarding possible AID assistance at this time.

Barbados - RDOC gives full support - worth visiting. Represents several countries in Eastern Caribbean.

Haiti - outreach maybe, but no primary cooperators. Not recommended for cooperation.

Costa Rica, Honduras, Guatemala, Panama should contact ROCAP and CATIE with regard to visit. Should check out Guatemala through ROCAP. The AID Mission officer's name is James Bliden. He is in Guatemala City in the ROCAP office.

Paraguay is not to be considered because of the problems with human rights issues.

Peru would represent the Andean countries and is recommended. Hughes recommends sending another cable.

We should go to Colombia if for no other reason than to visit CIAT. Contact GOC with regard to cooperation.

AFRICAN BUREAU - Dr. Norman Alsacker

Talked about West Africa, Senegal, Gambia, Cameroon. FAO doesn't operate in Cameroon. Gambia is a very progressive country, probably more so than Senegal. USDA Food Crop Protection Project is extension type and institutional building project rather than research. Cameroon has good people and Cameroon would be a good place to work.

Upper Volta is headquarters for FAO work. REDSO West is only an operative linkage to CILSS.

Nigeria is okay for IITA but not considered viable.

Liberia probably is not a good location to attempt collaborative effort.

Mauritania - not viable.

Ghana - not viable.

Gambia - as mentioned above.

ASIAN BUREAU - Edward Rice

He filled us in on Pakistan which is a good possibility, but not under current conditions. Perhaps Pakistan will re-stabilize and should be considered at a later date.

He suggested that Nepal probably is not good for collaborative effort because of infrastructure problems.

Indicated that we should go back to Indonesia with another cable requesting permission to visit with scientists.

Sri Lanka is good and should be included if we can obtain Mission clearance.

India - should go to India for ICRISAT but probably should not arrange a collaborative effort at this time.

# APPENDIX VIII

## EXPRESSION OF INTEREST IN CRSP PLANNING

ATTENDANCE FORM

| | | |
|---|---|---|
| Category I | _____ | We will attend the meeting to participate in selection of a recommended list (3-5) of potential institutions for being the planning entity for the Integrated Crop Protection CRSP to be recommended to the Joint Research Committee of the BIFAD Board. |
| Category II | X | We will attend the meeting and are interested in being considered as a candidate for becoming the planning entity for the Integrated Crop Protection CRSP. Attached is our Response to the expression of interest questionnaire. Please return by July 25, 1979. |

Indicate the following for those planning to attend:

| NAMES | TITLE | ADDRESS | TELEPHONE NUMBER |
|---|---|---|---|
| James L. Collom | Assistant Director Int'l Programs | Purdue Univ. | (317) 494-8753 |
| Eldon E. Ortman | Head, Dept of Entomology | " | (317) 493-9185 |
| J. D. Paschke | Prof., Dept. of Entomology | " | (317) 494-8501 |
| T. N. Jordan | Assoc. Prof, Dept. of Botany & Plant Pathology | " | (317) 749-6445 |

Please return to:

Dr. Elmer R. Kiehl, Chief BIFAD/RES
Room 2244D
Agency for International Development
State Department
Washington, D.C. 20523

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CONSIDERATIONS FOR THE EXPRESSION OF INTEREST
BY INSTITUTIONS INDICATING WILLINGNESS IN
BECOMING THE PLANNING ENTITY

(Integrated Crop Protection - CRSP)

1. Administrative Commitment to the Planning Process. Indicate with a brief statement on the administrative support by your institution for this activity and awareness of key administrators for the necessity of collaborative planning of the CRSP.

   1. Purdue University, with clear recognition of the complex nature of the CRSP planning process, is prepared to take responsibility as the planning entity for the Integrated Crop Protection CRSP. The Department Head and staff in Entomology have committed themselves to this effort. Department heads in related areas are supportive of this involvement. The Dean of Agriculture and the Vice-President for Research have specifically endorsed Purdue's willingness to become the planning entity for the ICP CRSP. The University has conducted international programs collaboratively with other institutions here and abroad and is fully prepared to draw on the knowledge and capacity of individuals in a wide variety of institutions in the U.S. and abroad in each phase of the planning process. The University has an administrative staff with considerable experience in planning and executing development oriented research and assistance programs. The Office of International Education and Research and International Programs in Agriculture are implementing a variety of Title XII related activities and will support Purdue's effort in planning the ICP CRSP.

2. Prepare a brief statement indicating your institutions understanding of the need to involve LDC scientists and/or LDC institutions, International Research Centers (IRRI, ICRISAT, etc.) and A.I.D. Regional Bureau Representatives in the planning process. Give an indication to the extent which implementation of the CRSP should be undertaken in collaboration with LDC institutions and the necessity for obtaining and sharing support of the program (see JRC Guidelines).

   2. It will be especially important in planning for a manageable, well-focused CRSP in Integrated Crop Protection that an approach and program be devised which:

      (a) Emphasizes whatever unique potential integrated crop protection presents for resolving some of the critical constraints on LDC food production.

      (b) Builds on contributions and related research efforts already underway or planned in commodity CRSP's, International Research Centers, and in a wide variety of research institutions, both in the U.S. and abroad.

      (c) Mobilizes a critical set of scientists from among a rather diverse spread of disciplines in a research effort involving pest organisims, crops and environments somewhat different than those with which they normally work.

Clearly, accomplishing this will require full utilization of existing experience and knowledge held by LDC scientists and staff of A.I.D. and the International Centers in the planning process, as well as integration of these institutions and individuals in the ultimate research effort.

3. Describe briefly the nature and scope of research underway and planned in the area of integrated crop protection at your institution.

3. Nature and Scope: The Purdue Agricultural Experiment Station stresses integrated crop protection through collaborative interdepartmental Experiment Station projects involving the Department of Entomology, Botany and Plant Pathology, Agronomy, Horticulture and, to a lesser extent, Agricultural Economics and Agricultural Engineering. These production oriented projects involve a variety of commodities, pest organisms, and crop protection techniques. Selected on-going projects are listed below to exemplify Purdue's pest management programs and collaborative research efforts. Undergirding commodity oriented research programs are strong basic programs in biochemistry, pathology, physiology, and toxicology. Graduate student research is an important component of each of these projects and foreign nationals from Latin America, Africa, Asia and the Near East are currently engaged in research in most departments.

New staff members specializing in integrated crop protection will be added to the faculty as a result of normal attrition. For example, the Department of Entomology has only recently added a faculty member who specializes in biological control of pests.

As we address present and future agricultural production problems, continued and increased emphasis will be placed on the need to integrate traditional disciplines to achieve the most beneficial and economical crop protection methodology.

Examples of the Nature and Scope of On-Going Programs:

F. T. Turpin, V. R. Ferris, J. M. Ferris (Entomology) and B. G. Bergeson, R. L. Nicholson (Botany and Plant Pathology)-"Interaction of Corn-Soil Insects, Pathogens, and Nematodes".

F. T. Turpin (Entomology) and D. H. Doster (Agr. Economics)- "Economics of Insect Management Strategies for Corn Production".

F. T. Turpin, H. D. Vail (Entomology) - Six state, EPA Sponsored, Corn-soil pest management research program (1973- ).

M. C. Wilson (Entomology), D. C. Petritz (Agr. Economics), C. L. Rhykerd (Agronomy) - Alfalfa pest management, economic thresholds.

A. C. York (Entomology), R. R. Romanowski (Horticulture), W. R. Stevenson (Botany and Plant Pathology) - "Insect, Weed and Disease Management in Organic Farming".

J. D. Paschke (Entomology), A. O. Jackson (Botany and Plant Pathology)- "Virus-Vector Relationships in Corn".

L. L. Murdock (Entomology), R. L. Gallun, J. E. Foster, O. Sosa, (Entomology) : USDA-SEA), F. L. Patterson, H. W. Ohm, J. Roberts (Agronomy), G. E. Shaner (Botany and Plant Pathology) - Integrated Pest Management through Plant Breeding.

In addition, Dr. F. T. Turpin, (Entomology) is a member of the Inter-Society Consortium for Pest Management.

4. Discuss briefly the adequacy of facilities at your institution for carrying out a planning activity. Indicate your plans for release of staff and/or facilities to carry out effective planning activities.

   4. Recognizing the need for full time energetic staff committed to the planning process, Purdue University is willing to release Dr. J. D. Paschke from normal activity, to permit him to direct the activity of the planning entity (see resumé attached). It is anticipated that other University staff will also become involved in planning activities on a short-run basis. Clerical and administrative staff assistance will be available within the existing university structure.

   The Division of International Programs in Agriculture will assist in rapid development of necessary administrative and logistical support capacity required in the planning process.

   Adequate office space is available for professional and clerical personnel to be associated with the CRSP planning entity. Word processing equipment is available for editing and producing correspondence, survey documents, reports, etc. On-line computing capabilities are available through the School of Agriculture Data Processing Network to allow storage, retrieval, and processing of survey data. Applications and systems programmers are available for consultation and development of specialized routines.

   Purdue maintains excellent facilities for conduct of meetings as may be required in the CRSP planning process.

   The Division of Conferences is available for organizing and coordinating such workshops, symposia, and similar types of meetings. Meeting rooms in the Stewart Center are available for such activities. Adequate housing and food service are available in the Purdue Union Club and nearby motels.

   Purdue University access to major air travel routes is facilitated by connecting flights through Indianapolis or Chicago.

5. Discuss your institutions prior international experience. This should include information on past and current activities on research collaboration, training and institution building in international food and agricultural programs.

   5. Purdue University has conducted a wide variety of international activities which, with our strong domestic programs, ensure ability to conduct the planning activities required by the Integrated Crop Protection CRSP. Attachments A and B list our major international research and institution building activities. The University has, furthermore, made a strong commitment to participate in Title XII activities based on a thorough study of the implications of Title XII for Purdue and careful determination of an appropriate role

for the University in Title XII programs. Based on that analysis, as described in the "Title XII Task Force Report" there is a very favorable environment at Purdue for conduct of this proposed planning activity.

Purdue University
Name of Institution

T. K. White, Director International Education and Research and Title XII Officer/ by J. L. Collom
Representative and Title

July 25, 1979
Date

If you wish to be considered as planning entity, return by July 25, 1979 to:

Dr. Elmer R. Kiehl, Chief, BIFAD/RES
Room 2244D
Agency for International Development
State Department
Washington, D.C. 20523

# APPENDIX IX

# PURDUE PROPOSAL FOR

# A

# PLANNING STUDY GRANT

A PROPOSAL
TO USAID

# PLANNING STUDY - INTEGRATED CROP PROTECTION RESEARCH

Prepared by

SCHOOL OF AGRICULTURE
PURDUE UNIVERSITY
WEST LAFAYETTE, INDIANA

Submitted to

DS/AGR
AGENCY FOR INTERNATIONAL DEVELOPMENT

through

Division of Sponsored Programs

WEST LAFAYETTE, INDIANA
August 1979

J. D. Paschke
Planning Program Coordinator

T. K. White
Title XII Officer and
Director, International Programs
in Agriculture

E. E. Ortman
Head, Dept. of Entomology

R. L. Kohls, Dean
School of Agriculture

A PROPOSAL
FOR A
PLANNING STUDY - INTEGRATED CROP
PROTECTION RESEARCH
SUBMITTED TO DS/AID
BY
PURDUE UNIVERSITY

## Background

Crop protection has been ranked by JRC (Joint Research Committee of the Board for International Food and Agriculture Development - BIFAD - as a priority problem confronting the improvement and/or expansion of crop production in most LDCs, especially those having tropical or subtropical environment. It has also been identified as an area needing urgent and extensive research if these problems are to be overcome; and, further determined that solutions to these problems may best be addressed through the development and application of Integrated Crop Protection (ICP) practices and systems.

Integrated crop protection is a broad philosophy of pest management involving many disciplines including those of socioeconomic science as well as those of classical agricultural sciences. Because of the breadth of the proposed studies, the diversity of problem areas, and the significant inputs from many scientific disciplines, an intensive assessment will be best accomplished utilizing the expertise of a group of scientists and agencies. It will be the responsibility of the grantee to develop a document and final recommendation as discussed below for consideration by JRC/AID.

Purdue University (PU) was one of three universities recommended to the JRC after considerable deliberation at a "Meeting of Interested Institutions in Integrated Crop Protection" held in St. Louis, MO. August 2, 1979, and attended by 31 eligible Title XII Universities. Purdue University was selected as the JRC's first preference to conduct the two phase planning activity for a proposal to conduct research on Integrated Crop Protection on small farm cropping systems. Purdue University is recognized for its long term involvement in international programs with AID, as well as its established programs and expertise in integrated crop protection research. Furthermore, it was documented that Purdue will provide for participation of a full time staff member (1.0 FTE) and active participation by the University staff of International Programs in Agriculture. Purdue will be an active participant for consideration in ICP research programs resulting from the second phase of the research planning activity. The first phase of the planning activity, a major portion of which is assessment, is described below.

## Objectives and Approach

The grantee will conduct a study and planning effort which will provide a basis for determining how major future research efforts on Integrated Crop Protection may be implemented in support of U.S. development assistance efforts. This study will focus on the needs of small farmers in the developing nations, and will attempt to identify ways in which U.S. expertise can effectively be brought to bear on the problems identified. The study will take as a basic approach; a) the identification of pest related constraints on crop production within the mixed crop production systems in use on small farms in LDCs and b) identification of significant opportunities to relax high priority constraints through research on integrated systems of crop protection which can potentially be employed by the target farmer group.

For the purposes of this planni[illegible] ort, emphasis will be placed on protection systems for food crops and rela[illegible] ish crops important to small farmers in LDCs. Pest organisms of concer[illegible] these environments include weeds (including parasitic plants), pathogens, and vertebrate and invertebrate animals.

The study and planning exercise will be developed in two major phases. In Phase I, with a duration of one year or less, emphasis will be placed on the identification of pest related constraints on production within the production systems in use on LDC farms, describing the existing "state-of-the-art" of integrated crop protection under these conditions, selection of high priority researchable problems in ICP, and analysis of the means of developing subsequent research efforts within the scope of the U.S. development assistance program. The grantee will complete Phase I by recommending to JRC/BIFAD and AID the appropriate means of implementing the research efforts required.

Phase II will be implemented after AID and JRC/BIFAD evaluate Phase I recommendations, if a collaborative and/or cooperative type research effort is approved. Phase II will analyze and recommend the research program to be undertaken, the institutions to be involved in the U.S., level and form of LDC institutional involvement, and the management structure/process to be utilized.

This document proposes the conduct of Phase I, but describes in several instances the anticipated activity to be undertaken if Phase II is implemented. A proposal for grant extension through Phase II, including budgets, will be developed by the grantee prior to initiation of Phase II.

Implementation - Phase I

1. Create an Advisory Committee composed of members drawn from existing AID crop protection programs. The responsibility of the committee will be to act as liaison between the grantee and existing crop protection programs. The committee shall advise the grantee concerning strategies and activities in Phase I. In addition to crop protection experts, the committee will include the expertise of a socioeconomist to aid in developing a recommendation which includes the socioeconomic importance of ICP programs.

2. Identify, with the assistance of AID Bureaus, International Agriculture Research Centers (IARC's) personnel, and others, an appropriate set of small farm multiple crop production systems which are representative of the principle ecological/cultural zones within each of the major geographic regions.

3. Determine by survey of U.S. and LDC personnel and in country LDC visitation with mission and IARC staffs and country research extension and production personnel, those pest related constraints which impact on each of the crop production systems identified in 2. above. Documentation for such site visits will be prepared in English, Spanish, French, and Arabic as required.

4. The grantee will develop a State-Of-The-Art (SOTA) document summarizing completed research and in place programs at the farm level, as well as ongoing research efforts in developed countries and in LDCs. The SOTA will be based on information retrieved from published literature sources, reports, etc., and attendance at scientific meetings, workshops and symposia.

5. The grantee will develop a prioritized list of short- and long-term researchable problem areas from the above. Initial prioritization of problem

**Best Available Document**

areas will be made by questionnaires directed to eligible Title XII institutions, AID Missions and LDC personnel with manifest interest in identified problem areas. Further refinement of priority research problems will be derived from inputs obtained from expert opinions resulting from a structured symposium using the results of the questionnaire survey. In addition, a description of the potential socioeconomic impact resulting from resolution of priority problems will be included.

6. Analyses and evaluation of the interrelationships between the above prioritized research needs and ongoing U.S. research concerns will be made. Additionally, the projected benefits to long term U.S. goals from the conduct of such research will be evaluated.

7. The grantee will identify key groups in the U.S. and developing countries having a technical capability in and/or knowledge of use of ICP methodology through:

a) Contacts developed (with assistance of AID/W regional bureaus, and field missions) with potential LDC participants, obtaining a tentative indication of the type and level of interest in participating in an integrated crop protection research program. These contacts should include IARCs and other regional research centers, and institutions located within LDCs.

b) Similar contacts with U.S. academic institutions and federal agencies having well known capabilities in the area of ICP and manifest interest in participating in International ICP activities.

c) Contacts with individuals and groups not covered in 1. and 2. above who are identified by: 1) review of published literature in area of ICP; 2) queries to relevant professional societies; 3) referral by recognized experts in international crop protection; and 4) contacts with FAO, WHO, IAEA, OAS, etc.

8. Based on 6. above and apparent U.S. research capability and manifest interest in such research, determine the advantage (or disadvantage) of the CRSP mode as compared to centrally funded, or country/regional projects.

9. Subsequent to the above assessment and accompanying documentation, a report will be made to JRC/BIFAD concerning the results of Phase I activities, with a recommendation of Phase II planning if appropriate.

Implementation - Phase II

While the specific activities required in implementing Phase II will be dependent upon the results of Phase I and further development of JRC/BIFAD and AID policy in the interim, the following general steps are expected to be included in Phase II:

1. The grantee, with the concurrence of JRC/AID, will select a Steering Committee representing expertise in the area of Integrated Crop Protection and composed primarily of nonparticipating parties to assist in assuring fair representation of all interested groups.

2. The grantee will propose the magnitude, general location and approach to be utilized on conduct of LDC site research based on:

a) Consultation with AID and JRC/BIFAD staff.

b) Interaction with key LDC institution personnel and IARC staff through multidisciplinary team site visits. (Final definition of the overall scope and focus of the total research program based on LDC reaction will be an additional output of this step).

3. With information developed from on-site visits and previously established expression of interest and capability (from both LDC and U.S. institutions), the grantee will formulate a research concept incorporating them into a Preliminary Integrated Crop Protection Research Proposal. This proposal should include but not be limited to the following:

a) State-of-the-art summary of ICP as prepared in Phase I.

b) A conceptual program of research, noting priority of the research elements, identifying constraints, a l interaction with other CRSPs, and probability of success.

c) Identification of interested U.S. and LDC institutions and the levels of interest of the latter.

d) A tentative indication of funding levels for various sub-elements of the proposal.

4. The grantee will solicit specific research proposals, sending the preliminary technical program proposal, after JRC/AID concurrence, using appropriate techniques for public notice, to all previously indentified U.S. institutions and other interested agencies with a solicitation for specific research proposals. Copies of this proposal would also be sent to LDC entities previously identified as being potential primary participants. Sufficient background information will be included so that any proposals submitted would be consistent with the CRSP Program Proposal and realistically structured to conform to reasonable budgetary limits. At least two budget estimates will be required - one minimal and one based on an optimal program.

5. A project evaluation committee will be named by the grantee with the concurrence of JRC and A.I.D. to assist in the selection of the strongest participants and projects. The project evaluation committee will review each proposal for strengths and weaknesses as well as for relevancy to alleviation of specific LDC crop protection constraints.

6. The grantee will with the assistance of JRC and AID develop criteria for establishing priorities among the proposed projects and host country work sites. The scheme of project prioritization may include, but not be restricted to, the following items with weighting factors assigned to each: 1). capabilities of potential U.S. and LDC collaborators; 2) number of countries involved; 3) degree of improvement of subsistence level; 4) time required to develop viable field methods; 5) time to transfer technology to small farmers; 6) number of farmers involved; 7) cost; and 8) interaction with other research programs.

7. After establishment of priorities and recommended work sites, the grantee, with the assistance of the Steering Committee, will delimit the number of projects and participating U.S. institutions to a level consistent with budgetary

constraints, available primary host country work sites, and compatability of LDC/U.S. institution interests.

8. Following JRC and AID approval of the draft CRSP plan, regional workshops, meetings, or conferences will be held in LDC settings whereby the specific proposals by the U.S.institutions can be discussed in detail with potential LDC collaborators and modified to provide a program mutually acceptable to AID, JRC, the LDC(s) involved, and the U.S. institution(s).

9. The grantee will develop a final detailed plan for the collaborative research program to be submitted to JRC/BIFAD and AID.

The plan will describe in detail the following:

- Background
- Rationale
- Goal (Output Milestones)
- Beneficiaries
- Strategy
- Program Inputs
  1. Financial
  2. Institutional (including worksites)
  3. Personnel
- Interactions between individual projects and program subentities
- Socioeconomic impact predictions.

10. The grantee will propose a management process and management entity for the proposed ICP CRSP which will define the functions and operational procedures of the management entity including staff, policy body, technical control body, external evaluation mechanism, financial and reporting arrangements.

Additional Considerations

The grantee will during the entire planning process maintain close relationships with the JRC, making periodic reports to this committee. The grantee will consider, particularly in Phase II, the apparent conflict between the need to prepare a collaborative program having a manageable number of principal institutions involved and the need to draw on potentially valuable contributions of a large number of individuals in less involved institutions. The grantee will also consider, in the development of its recommendations, the desirability of substantive relationships between research which supports development assistance efforts and the technical assistance activities which are conducted in the related problem area.

The grantee recognizes that the funding likely to be provided for ICP research will be limited relative to the extent of the problem areas defined. A major concern of this planning process will be careful selection of the problems to be addressed and of the research efforts to be applied to them. In the process, the long run interests of the U.S. universities, AID's overall program, and the need of LDC small farmers must be kept in proper perspective. Problems and approaches which are included in other CRSP programs, in other donor programs, in IARC efforts and which do not draw heavily on the unique strengths of an integrated crop protection methodology, should in general be excluded from efforts proposed in this planning exercise.

The grantee will attach as appendixes to the Final Activity Report:

1. Final ICP Collaborative Research Support Program Proposal

2. Copies of preliminary and detailed research project proposals submitted by potential participants

3. Minutes of all meetings leading to definitive action.

In addition to distribution of reports, mentioned above, three copies of all reports listed as a product of the planning process shall be submitted directly to the Documentation Coordinator, DS/DIU, Agency for International Development, Washington, D.C. 20523.

Project Staffing

The grantee will assign one staff member full time to the planning effort required in Phase I to serve as planning program coordinator. Short-term staff inputs will be obtained on a half-time basis for approximately six months from outside normal university staff to provide backup to the planning program coordinator and to provide additional disciplinary expertise.

Staff will be obtained on a short-term basis to compose teams required for in-country visitation. These staff will be drawn from other universities, USDA and other organizations and to a lessor degree from grantee staff.

Through a sub-grant agreement, an 1890 land-grant institution will be asked to furnish a portion of the short-term staffing needs of the project. The grantee has advised JRC that it will give first priority to establishment of this agreement with Alabama A & M based on existing inter-institutional cooperation between Purdue and that institution.

Guideline Dates

| | |
|---|---|
| August 31, 1979 - | Submission of planning grant proposal to AID |
| September 28, 1979 - | Awarding of planning grant to Purdue University |
| October 30, 1979 - | Create advisory committee |
| November 1, 1979 - | Initiate State-of-the-Art |
| December 1979 - | Report to JRC with synopsis of programs |

| | |
|---|---|
| January 8, 1980 - | Initiate LDC visitation |
| March 1980 - | Report to JRC with synopsis of progress |
| March 31, 1980 - | Interim written report to JRC/AID |
| June 1980 - | Report to JRC with synopsis of progress |
| July 31, 1980 - | Priority research programs identified |
| August 30, 1980 - | State-of-the-Art report completed |
| September 1980 - | Report to JRC with synopsis of progress |
| September 30, 1980 - | Recommendation and final report for Phase I completed |

Budget

(See attached.)

## Budget - Phase I

| | | | October 1, 1979 to September 30, 1980 |
|---|---|---|---|
| I. | Personnel | | |
| | (a) J. D. Paschke | 100% Effort | $37,140 |
| | (b) J. L. Collom | 10% Effort | 2,341 |
| | (c) Clerical | 100% Effort | 9,360 |
| | Subtotal Personnel | | $48,841 |
| II. | Fringe Benefits | | |
| | (a) TIAA/Social Security | | $ 7,699 |
| | (b) Insurance | | 977 |
| | (c) Workmen's Compensation | | 602 |
| | (d) Unemployment | | 6 |
| | Subtotal Fringe Benefits | | $ 9,284 |
| III. | Consultants and/or Short-Term Staff | | |
| | (a) Consultant to be named, 50% - 6 months | | $10,000 |
| | (b) Short-term staff, estimated 227 person days at $150 | | 34,050 |
| | Subtotal Consultants + Short-term Staff | | $44,050 |
| IV. | Sub-grant | | $15,000 |
| V. | Travel and Per Diem | | |
| | (a) Domestic Travel | | $12,500 |
| | (b) Foreign travel | | $56,010 |
| | Per Diem plus Air fares | | |
| | (359 days at $70/day = $25,130) | | |
| | (16 people at $2,000/air fare = $32,000) | | |
| | Subtotal Travel | | $68,510 |
| VI. | Symposium | | $11,000 |
| VII. | Supply and Expense | | |
| | (a) Communication | $6,000 | |
| | (b) Office supply | 4,000 | |
| | (c) Equipment | 2,500 | |
| | Subtotal Supply and Expense | | $12,500 |
| VIII. | Total Direct Costs | | $209,185 |
| IX. | Indirect Costs ($48,841 x .696%) | | $ 33,993 |
| X. | TOTAL COSTS | | $244,298 |

# APPENDIX X

## REPORTS TO JOINT RESEARCH COMMITTEE

Report to Joint Research Committee

Integrated Crop Protection Planning Study

AID/DSAN - G-0203

November 13, 1979

J. D. Paschke, Coordinator, Purdue University

The above referenced grant was officially initiated September 24, 1979. Prior to that date I attended the International Congress of Plant Protection, Washington, D. C. under the auspices of the Title XII Strengthening Grant awarded to Purdue International Programs in Agriculture. Attendance at this Congress was of importance to our Title XII, CRSP Planning grant proposal, particularly from the standpoint of meeting scientists currently engaged in international agriculture, but also from the standpoint of the subject matter of numerous symposia dealing with problems of pest management in international agriculture.

I visited Guatemala and Costa Rica September 19-21 with Dr. F. W. Whittemore (DS/AGR) and Dr. Ray F. Smith (University of California, Berkeley). The objective of this visitation was to meet some of the scientists of Latin America and to establish contacts which will be valuable in the planning process for Integrated Crop Protection research, and to become familiar with Central America agricultural techniques, cropping practices, and general topographical and cultural features.

In October I attended the International Symposium on "Integrated Control in Agriculture and Forestry", Vienna, October 8-12. This symposium, sponsored by the Organization Internationale de Lutte Biologique (OILB), was attended by approximately 600 scientists, most European, and with only six participating Americans. Each scientific session was aided by simultaneous translation, but the associated workshop topics did not have this convenience.

Early in October an Advisory Committee was established to assist the grantee in Phase I of the Planning Study. The membership of that committee is attached. We conducted our first meeting of the Advisory Committee in St. Louis, Mo., October 22 and 23, 1979.

A broad discussion of the anticipated focus of the ICP planning process covered the following: focus on food and cash crops of small farmers; use of a cropping system orientation; recognition, that while labor intensive practices may be desirable, that labor is not always available; need to consider integration, not only in inter-crop situations, but also across sequential sets of crops and neighboring crops; use of a broad definition of multiple cropping, meaning simply that more than one or two crops are important to the small farm enterprise.

Additional discussion covered the need to resolve how the project can identify high-priority research needs which can most viably be met by an Integrated Crop Protection Program, and which are not now being met by other

CRSPs and other research efforts of AID as well as other donors, international centers and other agencies.

Further discussion of the over-all approach indicated agreement that a commodity-type approach is not adequate. Another alternative, that of focusing on a specific important pest, as has been followed in the nematode project, for instance, while possible, also does not seem to be totally adequate. It was recognized that a number of research needs may be identified and suggested by the ICP planning effort. Some of the research needs may be specific pest oriented while others should be considerably broader. While the planning effort may recommend research on a variety of these, it may also recommend that some of them be dealt with by single centrally-funded research projects, eg. Striga, rather than by a collaborative-type research program approach. The group was reminded that the total sum of research funds ultimately available to resolve problems identified by this program is going to be very small by any standard.

Additional discussion covered the need to identify cropping systems on which work in the planning exercise can be focused. As one means of narrowing the scope, the suggestion was made that cropping systems might be identified by ecological zones. Reference was made to the ecological zones being used in the North Carolina Soils CRSP. Twelve criteria were used by North Carolina to narrow down from a number of ecological zones to five high-priority zones as follows: humid tropics, seasonal non-acid, seasonal acid, steep lands, and wet lands.

In consideration of this approach, objections were raised to the general concept of limiting the search for problems to certain zones or subareas which was countered by the recognized need to simplify and restrict the search at various points.

The suggestion was made that we eliminate the concept of ecological zoning and simply procede to identify major cropping systems directly. Discussion which ensued served to remind us that a principal starting point should be the point of view of why crop protection is important, and the need to focus on alleviating the most critical causes of crop production losses. Discussion included a brief summary of the U. S. crop loss reporting system and its focus on identifying more or less homogeneous cropping systems as the basic unit.

It was pointed out that there are two real characteristics that differentiate the ICP approach in potential from other CRSPs and from commodity approaches, and that is that we are dealing with, in many cases, (a) pests that cut across commodity lines and (b) a multiplicity of both crops and pests in any given farm situation.

Discussion of the means of identifying cropping systems independent of their location brought up the point that it will be necessary to keep in mind the basic AID focus, i.e., the poorest of the poor, the countries on which AID programs are focused, and AID's regional organization and the need to serve each region in some way. The discussion of somewhat political considerations

to be kept in mind raised the issue of the necessity of interacting with and identifying the areas already adequately covered by other AID, FAO, CIDA, Australian, German and other donor agency programs.

Discussion of the ultimate necessity of visiting only certain countries in the site visit program and the acceptance of the realistic point of view that research can only be conducted ultimately in a certain number of countries raised the possibility of selecting initially target countries which would be used in the planning process as a means of narrowing focus, selecting cropping systems to look at in those countries which would hopefully be representative of other countries. Considerable discussion of this approach resulted in identification of generalized criteria which should be used to select such countries as follows:

a. countries of priority food needs
b. countries with a diversity of ecology or environments
c. countries where research may be possible
d. high pest related food production losses
e. good response from Missions
f. potential for increasing food production as a result of research.

With additional discussion, this list of criteria was refined and subdivided into seven major criteria which would reflect the nature of the problem and two additional criteria which should be reflected generally in the choice of target countries. The seven principal criteria which are stated in preliminary form and which will need to be further adjusted and perfected are as follows:

1. per capita consumption (or per capita food deficit)
2. per capita production (perhaps with indication of annual change)
3. ecological diversity
4. pest related food production losses
5. number of people (population and/or number of people expected to benefit including by extension of results to other countries)
6. potential for the conduct of research
7. significance of the small or subsistence farm (dependence upon it for national food production).

As indicated, in addition to these seven, then it will be necessary to consider in selecting target countries the responses received from the Missions as well as the need for adequate consideration of problems of significance in each of the AID regions.

It appeared, with discussion, that the process which was beginning to be developed may then be to:

1. select a set of target countries
2. identify the significant cropping systems in each of these countries
3. verify that important cropping systems have not been left out.

In the continued discussions, a plea was made to start with the major cropping systems found around the world and then proceed to select the countries.

The point was also made that it may well be possible, given this approach, to fail to consider major pests and that a way to bring this in should also be considered. In consideration of this concern over which will take precedence, the farming system or the target country, it was determined that an effective approach would be to utilize a grid system with the target countries being listed on one side of the grid and the significant cropping systems being listed across the grid and selection of target countries be made utilizing the criteria indicated above as well as the representativeness of countries within the major cropping systems. It is believed that with this joint use it will be possible to narrow down to locations for site team visits which will, in fact, result in adequate identification of significant pest related problems for the major cropping systems. The criteria generally useful in selecting target countries can also be used in assigning some level of priority to the cropping systems. The suggestion was made that in the site visits to be made in Phase I that information gathering be maximized and that it focus on the representative nature of what is being seen, the extent of which the locations visited and the problems seen represent problems of significance across a fairly large number of individual farms utilizing a particular crop production system, and that considerably less attention be given to whether or not the site is an appropriate one for research to be conducted in the long run.

The committee discussed the nature, make-up and the approach to fielding site visit teams. R. Smith described, briefly, the earlier multi-disciplinary teams sent out under the U. C. Crop Protection Program indicating that while the Crop Protection disciplines were represented, a deficiency was the lack of a social scientist. Discussion indicated that other approaches are possible and that the team composition may be the most important decision to be made in Phase I. The committee indicated that while language ability will be important on the team, that not every member has to be fluent in the language to be used in discussions, but that some general self-sufficiency among team members is crucial. The committee agreed that in preparing for team visits a standardized format with a set of observations to be made and/or questions to be answered be used by all of the teams in all countries. Recommendations included the following:

a. insure that the team is reasonably well prepared prior to arrival on site
b. teams should draw heavily on existing contacts of prior efforts in the area
c. teams should be able to respond to our needs for generalized evaluation, drawing on their professional judgment
d. team make-up should consider not only the basic disciplinary requirements but also need for good understanding of breeding approaches, ag. engineering principles, biochemistry, etc.
e. teams should be visiting <u>extension</u> people, <u>farmers</u> and others in addition to researchers.

Additional discussion on team effort considered the desirability of placing an LDC scientist on the team. Further elaboration of this discussion included consideration of the desirability of dividing the countries to be

visited into two groups, including primary countries and secondary countries with the majority of the time spent in primary countries. With this concept, was included the idea that a counterpart team would be identified among professionals in that country to assist and work with the team making the visit. The point was made that this would not necessarily do away with the need to put a distinguished LDC scientist on the team working in a region. Consideration of the approach to be used also indicated the desirability of having an advance visit made in each country by the team leader or another individual who would make contacts with country officials and introduce the team and its objectives and purposes to country officials, assisting the development of counterpart team where appropriate, make contact with other donor groups, etc.

Consideration was given to the timing for site visits and the steps required between now and that time. The time available is recognized as being reasonably short, but it appears that site visits should be proceeding no later than the latter part of March or first of April and should be completed by some time in May.

The grantee responsibility of advising Title XII institutions on the status of this effort was also discussed. Purdue will, in the near future, issue a letter to all Title XII institutions indicating the nature of the planning exercise underway and indicating the desirability of having all institutions and scientists indicate important problem areas which they believe to be of high priority in the pest management area. The same letter should indicate that site visit teams will be developed in the near future and that the grantee is interested in identifying people with relevant interest and experience.

REPORT TO JOINT RESEARCH COMMITTEE

INTEGRATED CROP PROTECTION PLANNING PROGRAM

AID/DSAN-G-0203

Correspondence has been forwarded to eligible Title XII universities explaining our planning processes, requesting the names of potential consultants, and requesting specific information regarding small farmer cropping systems, key pre-harvest production constraints, appropriate LDC(s) and technical in-country linkage, and the potential for increasing food production through ICP research. These were mailed on November 6 and to date we have had minimal response, this undoubtedly due to the rather short period of time involved. Of those seven institutions responding, only three showed interest.

We have also forwarded letters to potential counsultants as suggested by the Advisory Committee and the response has been encouraging. To date we have sent out 77 inquiries and have received 42 answers of which 32 have been positive. The least response has been obtained from agriculture economists; hopefully more from this discipline will respond in the future.

Dr. Gerald Wheelock, Alabama A & M University, our sub-contractor, has reviewed Agricultural Development Indicators and has made suggestions regarding those of the most significant to our assessment efforts in determining those countries in the most need with regard to food problems. Dr. Wheelock also suggested certain analytical procedures to develop indices of need. The analytical procedures will be programmed and run on our departmental computer facilities.

We have also been developing means by which we can most easily determine cropping systems in LDC's. We have consulted with Agricultural Economists at Purdue as well as other institutions, the pertinent literature, and we hope to narrow the systems into a workable format in the near future. It is the opinion of the socio-economists thus far contacted that the approaches using the agriculture development indicators, and the cropping systems is the proper approach to prioritizing research needs.

During the recent annual meeting of the Entomological Society of America, November 25 - 30, an informal meeting was held with those interested entomologists. Approximately 20 persons attended this meeting at which our planning program was explained. A short period of discussion followed. A similar meeting will be held in conjunction with the International Weed Science meeting in Toronto, January, 1980.

In addition to the announced session conducted at the ESA meeting, personal contacts were made with interested scientists in attendance, but who were unable to attend the informal session.. These persons numbered nearly equal to those at our meeting.