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PROJECT ON RESEARCH AND DEVELOPMENT SYSTEMS IN RURAL SETTINGS

FINAL REPORT

Amilcar O. Herrera
Project Co-ordinator

THE UNITED NATIONS UNIVERSITY

Centro de Documentação em
Política Científica e Tecnológica
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I. INTRODUCTION

In December 1975 the IDRC convened a meeting in Dar es Salaam, Tanzania, to discuss the problem of how developing countries could best use their scientific research capabilities to solve the technological problems of rural development. The participants came from eight developing countries and most of them were involved with research on this problem in their own societies. The starting point for their discussions was a background paper prepared by Amilcar Herrera, which analysed the existing situation and which suggested a new approach whereby scientists and peasants would work together to combine modern and traditional knowledge to generate technologies of greatest benefit to the rural poor.

The Tanzania meeting provided a useful opportunity for an exchange of views between the participants but it was unable to define the details of an international collaborative project on this theme. Subsequently Dr. Herrera visited most of the groups who had participated in the Tanzania meeting and, following discussions with these and other interested groups, prepared a new paper. This paper contained an outline of a possible international collaborative project which would unite groups in several countries that were trying to find new ways of harnessing their R&D systems to solve the technological problems of rural development.

The papers was accepted, in principle, as the basis of a project to be supported by the UN University. It was also used as the background document for a second meeting hosted by the Ethiopian Science and Technology Commission, which took place in Nazareth from 2 to 7 April 1977. Participants from seven developing countries attended this meeting and formulated a research proposal to the two sponsoring institutions.

In the second half of 1977 the IDRC and the UNU considered that the methodology to be used needed to be tested on the field previous to its application in a long term project. It was decided to implement a one year pilot project to test and refine the methodology. The continuation of the original project, and the exact form of its implementation, would depend on the results of the pilot phase.

The central objective of the project was to integrate the modern R&D system with the experience and knowledge of the traditional societies, to tackle the technological problems of rural development.

Specifically the project intended to test a methodology for:

-- the generation of technologies for use by the rural poor through a process that involves their interaction with research groups;
-- the utilization of the capabilities and knowledge of the traditional societies, linking these to the R&D systems to optimize the benefits for the rural poor;
-- the assessment of the strategy utilized by the participating research groups to develop technologies for the rural areas, and to undertake a comparative analysis of these strategies in different socio-economic situations.

The project started with the participation of research teams from Ethiopia, the Philippines, Mexico, and Iran. The Iranian team abandoned the project in the second year of the exercise, as a consequence of the political situation created by the Iranian Revolution.

In what follows I will present a brief preliminary review of the results of the project.

As is clear from the above, the Project on Research and Development Systems in Rural Settings was devised to test a methodology of research; in other words, it was "research on how to do research." Consequently, this report deals basically with the results of the application of the methodology, and with the conditions under which it was applied by each of the teams.

I have tried to present a synthesis, admittedly incomplete but as accurate as possible, of the results of the joint effort represented by the project, and to that purpose have used extensively the written material produced by the teams. Any error or misinterpretation is my exclusive responsibility.

II. METHODOLOGY OF THE PROJECT

The overall methodology of the project is divided into two specific areas: a methodology for research, and a methodology for monitoring the project and evaluating its results.

A. THE METHODOLOGY FOR RESEARCH

In what follows we will describe briefly the main stages of the methodology. It is obvious that these steps do not constitute a strict sequence, as they will greatly overlap in time. The main task -- to construct a set of comprehensive, valid assumptions or paradigms -- constitutes a dialectic process. A few initial assumptions will form the framework for the definition of technologies, but the experience acquired in their formulation and application will be used to modify, enlarge, or complete the assumptions.

The steps of the methodology are as follows.

Step 1: The general socio-economic characteristics of the selected region should be evaluated, in order to understand the dynamic social elements in which a technological problem is always immersed. The approach of the study is based on the principle that

> the technological problems that can be identified as obstacles to the development of backward rural sectors of poor countries can only be understood in their true dimensions, by taking as a starting point the socio-economic processes and conflicts in which each social group is involved, that is, by recognizing that such problems are but one of the aspects of a "problem situation."

As is well known, in many cases the solution of a technological problem depends more on issues of political, social, and economic power than on scientific research. The failure to recognize this fact has led many well-meaning scientific institutions to solve the wrong problem, in the sense of devising a technological solution that does not fit the conditions of the "problem situation." One of the reasons for these mistakes is that the organizations involved tend to forget that the problem situation cannot

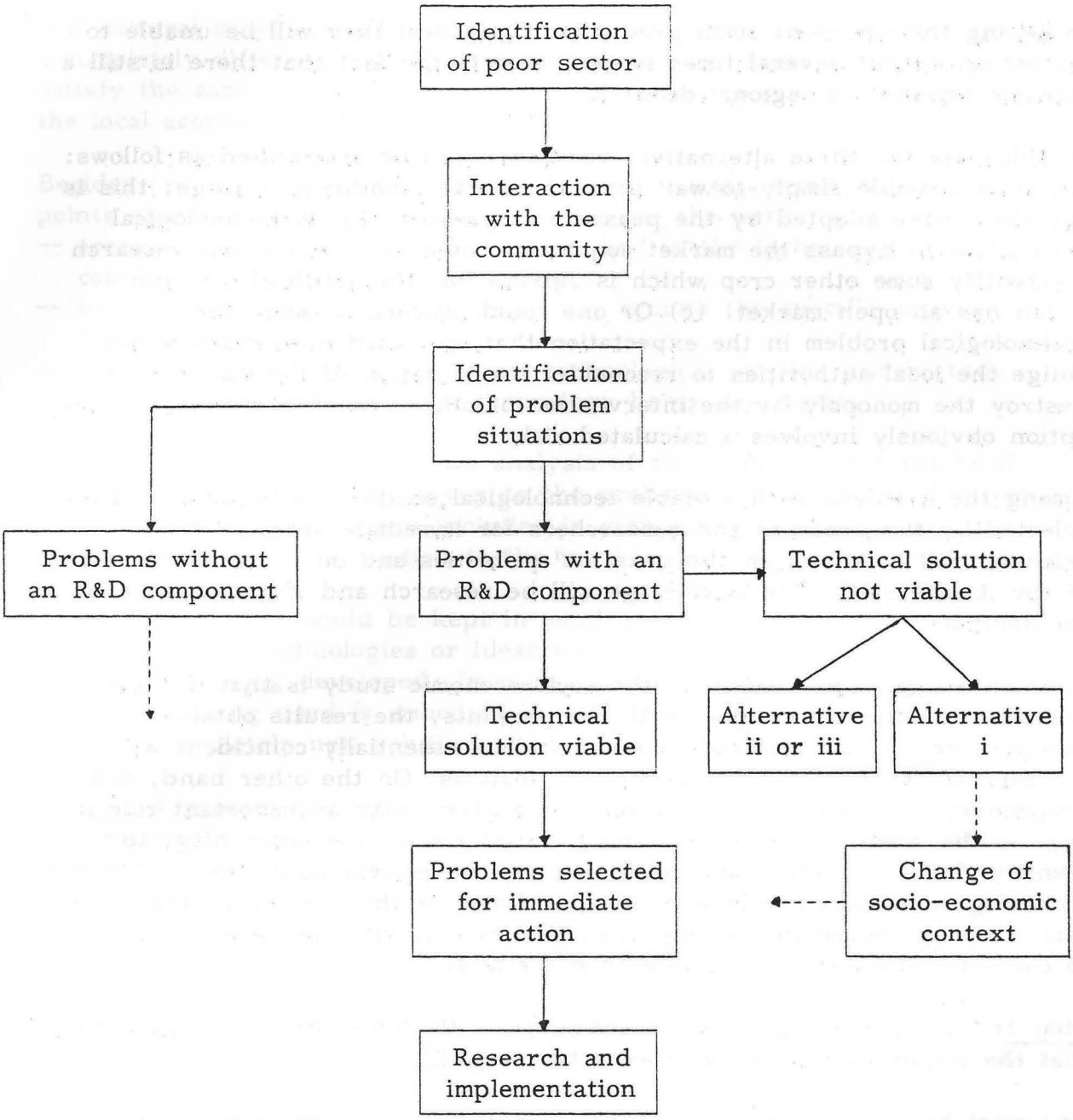
be adequately identified without the participation of the local people, as the power problems are normally "ignored" in the higher echelons of decision making. The final results of this stage should be the selection of the technological problems on which research should be concentrated (see the accompanying diagram).

The first step of the process is to identify the poor sector of the population. As is well known, in many projects intended for improving the lot of the poorer sectors of the community, the final results was just the opposite: due to the lack of adequate socio-economic studies and local participation, the projects mostly benefited the richer sector of the peasants.

Through the interaction with the peasants the problems of the community will be identified. It is important to remember that in any community there is a whole hierarchy of levels of problems. The first one is what can be called "the problem situation"; it arises as a consequence of the type of insertion of the community in a global socio-economic and political system at the national level. In most cases the type of problems posed at this level cannot be solved by technological means. Typical examples of this kind of problem are those related to the structure of land property that can only be solved through a land reform, or the price changes of exportable products determined by international trade.

At a lower level in the hierarchy, problems appear that, although related to the overall problem situation, vary widely in their degree of control by the socio-economic and political context. The problems identified here are broadly divisible into two classes: those with and those without an R&D component. The latter are not the concern of the R&D systems and consequently are left out of the picture; an example of this kind of problem -- frequent in the rural areas of Mexico, for instance -- is the case where more appropriate technologies do not substantially improve the peasant's condition because the middlemen and money-lenders take all or most of the added profits.

The problems with an R&D component are divisible into two categories: those in which the technical solution is not viable at the time owing to socio-economic or political constraints, and those for which a technical solution is viable. In the first category three alternatives are possible: (a) to leave the problem until a change in the socio-economic conditions allows tackling the technological component, (b) to find a technological alternative to bypass the socio-economic constraints, (c) to use the solution of the technological problem to overcome the socio-economic constraints. An example based on the MAYA report on the henequen-growing region of the Yucatan, Mexico, can be used to illustrate the three alternatives we are referring to.



Henequen is cultivated for its fibre, which is extracted by mechanical means. As a by-product of the process a large amount of bagasse (solid waste) is obtained. The bagasse can be spread in a layer about 35 centimetres thick and used as high-fertility artificial soil to grow vegetables. However, a great deal of research is still needed to control pests and plant diseases, as there is not yet enough experience with the behaviour of this artificial soil in relation to those factors. The peasants, however, do not want to support the research because, owing to the fact that the vegetable market is monopolized in the region, they have problems

in selling their present small production; they feel they will be unable to market an output several times larger, despite the fact that there is still a sizeable unsatisfied regional demand.

In this case the three alternatives mentioned can be exemplified as follows: (a) It is possible simply to wait until the market conditions change; this is the alternative adopted by the peasants at present. (b) A technological alternative to bypass the market constraint could be to carry out research to identify some other crop which is suitable for the artificial soil and which has an open market. (c) Or one could proceed to solve the technological problem in the expectation that increased production would oblige the local authorities to reconsider the situation of the market or destroy the monopoly by the intervention of other economic interests. This option obviously involves a calculated risk.

Among the problems with a viable technological solution, some or all will be selected by the peasants and researchers for immediate action. The selection will be based on the peasants' priorities and on the possibilities of the R&D system. The next stage will be research and implementation of the solutions.

The central point in relation to the socio-economic study is that if there has been effective interaction with the peasants, the results obtained through the process just described should be essentially coincident with the interpretation of the socio-economic analysis. On the other hand, the preliminary results of the socio-economic analysis play an important role in helping the scientists to understand the problems of the community, to identify the poor sector, and to appreciate the importance of the technological factors involved in the problems. At the same time, the information gathered in the continuous interaction with the peasants serves to correct and enrich the socio-economic study.

Step 2: This part of the work is concerned with determining the functions that the required technology is expected to fulfil.

One must begin -- as in any scientific research into a new area -- by asking the very basic questions referring to the specific technological field selected: What is the purpose of the technology? What need or needs must it satisfy? Who will really benefit from the solution? These are only a few of the many questions to be answered. What we want to emphasize is that it is necessary to start by rejecting, as far as possible, any preconception or prejudice about the nature of the multiple needs (social, economic, psycho-social) it has to satisfy.

It seems obvious that this kind of question is always asked when a technology is being developed. The real point is that in the customary work of R&D systems the answers generally seem obvious because the scientist is working in problems that belong to his own economic, social,

and cultural milieu, and so he has a tendency to apply the same criteria to a completely different environment. He frequently assumes that he has to satisfy the same needs but on a lower level, due to limitations posed by the local economic conditions.

Besides the analysis of the strictly technological elements, the following points should also be studied in this phase of the work:
-- areas of activity of the community implied in the technology being considered,
-- forms of organization of the community around the specific activities being considered,
-- natural resources involved in the technological solution under study,
-- ecological implications of the technology being developed.

Step 3: This part consists of an analysis of the solutions that the local community has traditionally given to the problems identified. In this part of the study, the four items included in step 2 above should also be analysed, but in close relation to the traditional technologies being used.

A final point that should be kept in mind is that this analysis does not imply that local technologies or ideas necessarily have to be incorporated into the one being developed. In some instances, it will be found that no idea worth being used is embodied in the traditional technologies. In these cases, a completely new solution has to be generated.

Step 4: A general survey of the natural resources of the area should be carried out. A very important point to keep in mind here is the concept that natural resources are generated by the combination of some natural object with science and technology; there are no natural resources in an absolute sense. This elementary concept is frequently ignored in developing countries, and there is the tendency to consider natural resources as those taken as such by the industrialized countries. So the research must include not only the natural resources already used, but also those that can have potential application for the problem area being studied.

Step 5: With the information gathered above a set of assumptions or paradigms will be derived, which will be the frame of reference for the final step of developing the required technology. The set of assumptions -- which will contain scientific, technological, economic, social, psycho-social, and anthropological information -- will define a "technological space."

In finally building the technology, all possible solutions that fit the technological space should be considered. As is well known, from a certain body of scientific knowledge many technological solutions to a given problem can be devised. The existence of an adequate frame of reference allows the exploration of a multiplicity of possible paths and the selection

of the one best suited to the particular situation. Another result of this procedure is to give coherence to technologies pertaining to different fields of activity.

It is obvious that once the set of paradigms has been completed, in some cases the required technology will already exist, and it may simply be a question of adaptation and introduction into the area. In other cases, it may be a problem of combining existing technological elements in a different way. Finally, in other cases it will be necessary to devise an entirely new technology. In most instances, however, it will probably be a problem of combining some of these alternatives.

It should be emphasized, finally, that in this methodology endogenous generation of technology refers to the process through which the characteristics that the technology should have are determined. That which is endogenous is the process of definition and not necessarily the technology itself, which can be imported, provided it is appropriate. In this way the transfer of technology becomes an integral part of the process of generation of technology.

THE METHODOLOGY OF MONITORING AND EVALUATION

The methodology refers to the monitoring of the progress of the participating groups, with respect to the following:

- links of the R&D units involved with the rural milieu, and the effects of those links on the process of generation of technologies,
- effects of those links on the local population,
- effects of the connection with the rural milieu on the R&D system,
- acceptability and dissemination of generated technologies,
- contribution to the development of a new set of paradigms for the R&D system.

Each of the above items could be evaluated through the use of several variables and parameters.

To apply the methodology of evaluation, two qualifications must be borne in mind. First, the fact that the exercise represents a considerable departure from established strategies of research necessarily means that the methods of evaluation to be used must also, to a considerable extent, be regarded as novel and experimental, and therefore they themselves are subject to revision in the light of experience. In other words, the people responsible for evaluation will learn in much the same way as the scientists and the peasants who participate in the programme. Secondly, it must be recognized that the particular skills required for evaluation of certain parts of the activities will vary with the subject chosen. For these

reasons, it would be a mistake to attempt to establish a rigid framework of evaluation in advance, since this may rapidly turn into a strait-jacket restricting, rather than facilitating, the kind of understanding which is desired.

Another important point to keep in mind is the necessity to distinguish those phenomena which are familiar, and where existing methods of measurements are available, from those where a more exploratory and qualitative approach to evaluation will have to be adopted. Within the latter category, it should also be possible to differentiate those phenomena which may potentially be amenable to quantification (and hence to "formal" comparison) from those which will have to be treated in a qualitative way, even when they are much more fully understood than is presently the case.

III. PARTICIPATING TEAMS

The character of the research teams reflects what we call participation at the macro or micro level.

In the case of Ethiopia the organization in charge of the supervision and co-ordination of the project is the highest authority on science and technological policy in the country. At the implementation level the institutions involved -- the Institute of Agricultural Research, the Ministry of Agriculture, and Addis Ababa University -- are the most important research organizations of the country. Another indication of the importance given to the project by the Government is the number of scientists involved in the project. Ethiopia is a country with a small R&D system. Besides, the process of transformation initiated by the recent revolution generates an enormous demand on the R&D system, due to the need to modernize an extremely backward productive structure. In those conditions to directly engage 30 scientists on the project represents a truly considerable effort.

In the case of Mexico and the Philippines, the teams involved, although belonging to the R&D system of the countries, entered the project on their own initiative. There was no direct involvement of the governments, although some governmental research organizations gave scientific support to the project.

ETHIOPIA

The project is carried out under the co-ordination and supervision of the Ethiopian Science and Technology Commission, the organization in charge of the overall planning of science and technology in the country. The project leader is Tewolde Berhan Gebre Egziabher, and the associate project leader is Dr. Getaneh Yemane.

The institutions in charge of the field work are the Institute of Agricultural Research, responsible for research; the ministry of Agriculture, responsible for extension and research; and Addis Ababa University.

The project has been developed in two sites: Welmera Wereda and Luma Wereda (a wereda is an administrative unit equivalent to a county).

The research centre directly responsible for the field activities of the project in Welmera Wereda is the Holeta Research Station, located in the proximity of the area. The R&D unit is composed of the director of the station, scientists selected to represent the disciplines involved in the problems identified, leaders of the wereda peasant association, leaders of the pre-producers co-operative associations, the chairman of the Food and Agricultural Research Council of the Ethiopian Science and Technology Commission (ESTC), the wereda head of the extension service, and the project and associate project leaders.

Luma Wereda is much nearer to an agricultural research unit of Addis Ababa University than to the Institute of Agricultural Research. As a consequence, the scientists participating in this area belong to Addis Ababa University, the Junior College, and the Agriculture and Research Station at Debre Zeit. Some scientists were also employed by the Ethiopian Science and Technology Commission specifically for the project.

In overall charge of the project is the Project Supervisory Committee, composed of the head of the Agricultural Development Department (Extension Service of the Ministry of Agriculture), the general manager of the Institute of Agriculture Research, the commissioner of the Science and Technology Commission, the officer in charge of the IAR Station at Holeta, the chairman of the Food and Agricultural Research Council of the Ethiopian Science and Technology Commission, the wereda extension officer, and the project and associate project leaders.

During the phase of problem identification the wereda was divided into nine substations. The wereda R&D unit will serve the district through those substations. These units are still in the stage of organization, although they performed most of the work during the stage of problem identification.

Each substation will have participatory demonstration plots for its local peasant associations, which will be cared for by the peasants themselves with the assistance of the scientists and the agricultural development (extension) agents of the substation. Similar participatory demonstration activities in the making and running of other technologies will also be carried out.

An area under a local peasant association on the average covers about 800 hectares, with a population usually of 250-300 farm families. Each association is regarded as the locality development unit in the structure being implemented by the project.

The total number of scientists directly involved in the project is 29. The disciplines involved are ecology, agricultural economics, statistics, social anthropology, plant sciences, geology, botany, weed sciences, development planning, soil science, veterinary medicine, agronomy, economics, entomology, and extension agents.

The number of scientists involved changes with time, as new ones are incorporated as problems are identified or as the project is extended to new sites.

THE PHILIPPINES

The participating organization in the project is the Economic Development Foundation (EDF), a private, non-profit co-operative established in 1964 by representatives of the private business sector to provide research and management-related services in the Philippines and to train professionals to undertake such services. Consultancy, training, and development services were at the time not readily available on a professional level for the relatively advanced type of enterprises that had begun to emerge. The National Economic and Development Authority (NEDA) and the US Agency for International Development (USAID) endowed the EDF with a soft loan with a private sector counterpart. These contributions and the loan from USAID constituted the EDF capital fund.

From the time it was founded, EDF has been a major source of professional services in the Philippines for a wide variety of businesses, institutions, and government agencies in the planning, development, operation, and expansion of industrial as well as government organizations. It entered fully into engineering and industrial research in 1970 and into the rural development and co-operative fields in 1972. The engineering and industrial research service has been concentrating its efforts in the transfer of technology studies, plant design, non-conventional energy systems, and the utilization of agricultural wastes. It has been working with both local and international institutions.

The research team

The project director is Purita Festin. The field work is carried out full-time by a team composed of the project director, an engineer, an agriculturalist, and two or three social scientists depending on the demand of the project. The team was given scientific support by the central research staff of EDF in Manila. Scientists from other research organizations were also engaged whenever the need for their expertise arose.

MEXICO

The participating organization in Mexico was the Instituto para el Desarrollo Rural (MAYA), a non-profit research organization concerned with rural problems. It was created by a group of scientists whose specialities are mainly economics, sociology, engineering, chemistry, agronomy, and political science.

A most important characteristic of MAYA is that it was created with the specific purpose to perform action-oriented research in rural areas in close collaboration with the peasants. As a result, it has accumulated an almost unique experience on mechanisms of participation and on peasant organization.

Until MAYA became involved in the project, its activities were mainly related to the social and economic problems of the rural areas. Besides their direct participation in the solution of specific problems, the MAYA researchers made important theoretical contributions to the understanding of economic and social dynamics of Mexican peasantry. As a consequence of its wide experience in rural problems, MAYA also became active in consultancy for the Mexican government and for various international organizations.

The work in the project was carried out by full-time researchers in the field, supported by the central staff of the organization. For the study of the problems identified they also have the support of the Mexican CONICIT and of researchers of several universities with which they have links, among them the UNAM (Universidad Nacional Autónoma de México), the Universidad de Yucatán, and the Universidad de Chapingo. The project director is Miguel Szekely.

IV. THE PROJECT SITES

The descriptions of the project sites that follow are preceded by brief historical reviews because the historical background has proved to be a most important element in understanding the behaviour of the peasants in relation to participation and in their general attitude towards the project. Given the length limitations in this report, we will give only the very basic elements of the recent historical past, those which are necessary to interpret some of the results of the project.

ETHIOPIA

Historical Background

Until 1974 Ethiopia was probably the only country in the world to which the much abused word "feudalism" could be properly applied, at least to a considerable part of the country. Ethiopian peasantry -- which constitutes 85 or 90 per cent of the population -- was the poorest in all Africa.

The backwardness of the country is clearly reflected in the distribution of the GDP. Some 50 to 60 per cent of the GDP comes from agriculture (the highest in the world). About 15 per cent is derived from small-scale industry and handicrafts, building and construction, 15 per cent from distribution services (trade and transport), and the rest from other services. Crop production accounts for about 70 per cent of the total agricultural productions. Before 1974 the annual growth rate of agriculture was about 2 per cent, while the rate of population growth was estimated at 2.5 per cent.

The 1974 revolution radically changed the conditions of the country. We will refer only to the main changes introduced in the rural areas.

In a March 1975 proclamation all rural land became the collective property of the Ethiopian people, and the old feudal relationship of tenancy was abolished. That proclamation also provided for the formation of peasant associations, organized at various levels. The kebele, or local community-level, association is the smallest -- approximately one for every

800 ha unit of land. Adjacent kebele associations form a wereda association, and adjacent wereda associations form the awraja (province) associations, which in turn form regional associations; and all the regional associations constitute the "All-Ethiopia Peasant Association."

The associations are endowed with certain administrative and judicial powers. One of the regulations of the revolutionary Government -- which is particularly important in relation to the project -- established that the introduction of new technologies in the rural areas should be done with the participation of the peasants. As we have seen above, the leaders of the peasant associations and the co-operative associations are members of the committee in charge of the field work of the project.

In 1979 the Government issued the directives to transform -- in a step-by-step process -- the peasant associations into producer co-operatives (peasant collectives). Today there are over 1,000 organized producer co-operatives. Of these, seven are in Welmera and eleven in Luma Wereda, the two project sites.

The Project Areas

Welmera

The main project area -- Welmera Wereda -- is located in Menagesha Awraja, in the Ghoa administrative region. It is situated between Addis Ababa in the west and Addis-Alen town in the east, and between Tefki town in the south and Mount Foela in the north. The administrative town, Holeta, lies 44 km west of Addis Ababa.

The area is 42,000 hectares (420 km^2), and the population is about 78,000 inhabitants. The area has a variable topography, comprising high mountains, flat and rolling plains, steep cliffs, and moderately sloping hills. The land consists of steep mountainsides, undulating country, flat, well-drained stretches, and in several places very flat swampy areas.

Throughout the project area mixed agriculture cultivating various cereals, legumes, and oil crops is the general rule. Cattle are used mainly for draught and milk production. In the lower areas the important crops are tef, durom, wheat, chick pea, and grass pea with some fenugreek. In the red oxisoils, tef, wheat barley, linseed, lentil, pea, and horse bean are the important crops. Noug and some sorghum are also grown on the lower altitudes. In the yellowish red soils of altitudes above 2,700 m, barley is the only viable crop, with some wheat being grown in certain sheltered locations of good soil fertility.

Much of the eastern and central parts of the area are covered by Eucalyptus globulus. These plantations are the most important energy

sources for home use in Addis Ababa and the surrounding towns, including Holeta.

The main problems of the area -- from the point of view of production -- are the high rate of erosion, as a consequence of the destruction of the original forest, and the loss of soil fertility caused by the impact of the system of agricultural production traditionally used. The combined effect of erosion and loss of soil fertility has been summarized as follows:

> The reduction of soil fertility has repercussions in all aspects of rural life. The ever increasing need for land area to produce the same amount of food has meant the putting into farming of areas suited only for grazing or forest development. This in itself has meant the reduction in grazing land for domestic animals, and the dwindling of wood for construction purposes and for fuel. The reduction in animal fodder has also meant the debilitation of both draught and pack animals, and a net reduction of the ability of the peasant farmer to produce food and a further reduction of the only additive to the soil for restoring fertility known to the peasant, via farmyard manure. This reduced vigor of the rural environment has also meant that human, animal and crop diseases as well as crop pests and weeds have their effectiveness increased and the productivity of the rural environment kept being reduced by an apparently multitude of factors but which are, in fact, all interrelated and form components of the vicious circle of the peasants "problem situation."1/

During the first part of the project, the research team implemented a very detailed socio-economic survey of the area. The survey was conducted using a sample, the sampling frame being the peasant associations, of which there are 53 in the area. The peasant associations were classified in categories according to type of soil, location, and distance from the main road. The judgement was made that at least ten associations should be included to generate the necessary data. The final stage of sampling was determining the number of household heads to be interviewed and selecting them. It was decided that 400 household heads should be included, and they were subsequently selected on the basis of random sampling.

Besides the socio-economic survey, two additional studies were performed: one on the geology of the area, and the other on its biological characteristics. All the studies were conducted by scientists from Addis Ababa University.2/

Luma

Luma Wereda was incorporated into the project when the work was well advanced in Welmera. The decision to add a new site to the project was based on the encouraging results obtained in the first one.

Mojo, the administrative town of Luma Wereda, is located 70 km south-west of Addis Ababa on the country main trunk road which joins Addis Ababa with the Rift Valley. At Mojo this trunk road branches south and east. Besides these main roads, there are several tracks which make most of the area accessible by car.

The area has a general slope in a north-east/south-westerly direction. The highest point is Mount Boru Toru in the north-east, at 2,509 m above sea level, and the lowest is Koka reservoir in the south-west at 1,590 m. The average altitude is below 2,000 m.

A shortage of precipitation is often felt, especially in the lowest parts of the south-west. Most of the streams in the wereda are seasonal, and shortage of water is a serious problem. The wereda has been largely deforested and over-grazed, so that at the height of the dry season the sandy soil suffers from severe wind erosion and big dust storms are common.

The Koka reservoir supplies electricity to the grid system which supplies the main towns in central and eastern Ethiopia.

The wereda is an area of mixed agriculture with cereals, pulses, and oil crops being cultivated and cattle, sheep, goats, donkeys, and, at higher altitudes, horses being reared. Most households also keep chickens. The fertile north-western part grows mostly tef, with small quantities of wheat, chick peas, broad beans, and sorghum. Sunflower is often grown with tef. The higher altitude of the north-east grows wheat, grass peas, and lentils in the heavy vertisoils, with barley, tef, sorghum, peas, chick peas, and lentils on the better drained redder soils. The sandier and drier soils of the south grow tef, barley, sorghum, haricot, and peas.

Throughout the wereda land is scarce, and woodland and grazing land are very limited. This, together with the shortage of water in the dry season, makes it a difficult environment for man, but more so for his animals.

There are 65 peasant associations in Luma Wereda, and the total population is 71,000.

THE PHILIPPINES

Historical Background 3/

The Philippines was a Spanish colony from 1872 to 1898, and a colony of the United States from 1900 to 1945. At the end of the colonial period -- and despite the long struggle of the peasants to improve their condition --

the situation in the rural areas was basically the familiar one found in many countries of the Third World: most of the land in the hands of landlords, and most of the peasants working under the oppressive condition of tenancy.

The situation started to change radically with the Land Reform Code of 1963, which abolished tenancy. It ordained the leasehold system to replace share tenancy. In September 1971 the Congress created the Department of Agrarian Reform, which was later replaced by the Ministry of Agrarian Reform. In 1972, after the country was placed under martial law, the Government declared the whole country a land-reform area. This modified the 1963 Code, under which the leasehold conversion was implemented district by district.

In the same year a decree was promulgated transferring outright ownership of tenanted rice and corn lands to the tiller, thus dispensing with the intermediate or transitional leasehold system prescribed in the 1963 Code. Known as the "Tenant Emancipation Decree," it ordained that all tenant farmers on private agricultural land "shall be deemed owner of a portion constituting of a family-size farm of five (5) hectares if not irrigated and three (3) hectares if irrigated." The decree set seven hectares as the limit of the area a landlord could retain for himself out of his entire holding "if such landowners is cultivating such area or will cultivate it himself"; established the cost of land to be transferred to the tenant farmers at a value "equivalent to two and one half (2 1/2) times the average harvest for three normal crop years immediately preceding the promulgation of the Decree"; and prescribed a 15-year equal annual amortization within which tenants concerned shall pay for the land transferred to them at 6 per cent annual interest.

The decree also established a clear linkage between land reform and co-operatives. It makes the co-operatives guarantors of their members' amortization, and places the condition that, in order to be granted title to land, farmer tenants must be full-fledged members of a duly recognized co-operative. In 1973 the Government launched a massive programme of co-operatives. To implement the programme, a Bureau of Co-operatives Development was created, which now is in the Ministry of Agriculture. A whole programme of credit support to the co-operatives was also implemented.

The result of the above measures is that, by conventional standards, the peasantry and the rural residents in general have made substantial gains during the last decade or so. Farm production, particularly in rice, has risen significantly, prices of farm products have been going up, and a host of opportunities for productive employment is available with credit and technical support in various government projects and programmes. Wages for labour, including farm labour, have likewise risen; and essential social services -- health, education, family planning, and others -- though far

from being adequate, have nevertheless improved. All these have increased the income, in cash terms, of rural as well as of urban families. Perhaps even more important, almost all the rice and corn farmers have realized -- or are on the way to realizing -- their cherished centuries-old dream of having a piece of land they can call their own.

Despite all those improvements, the peasants have not reached the measure of social and economic security -- their rightful share of development -- which could have been expected. The reasons for the seemingly paradoxical situation are clear enough. The farmers and the landless farm workers earn less than what they must expend. What gains they have made in higher cash incomes are more than offset by a much higher rate of increase of farm inputs and of all items they and their families need for daily consumption.

Two indicators of the difficult economic situation of the farmers are of special significance. One is the fact that farmers participating in the relatively liberal Masagana 99 credit programme -- a massive programme to increase rice production to attain national self-sufficiency -- have sharply decreased in number, down to only one-fourth of those who availed themselves of loans in the initial years of the programme. The other indicator refers to the rate of amortization payments by CLT holders. More than half of those agrarian reform beneficiaries failed to pay even one instalment. It is known that amortization payments do not reach 10 per cent, a situation which has serious implications on the vital issue of whether or not the "emancipated tenants" will, in fact, receive full title to the lands transferred to them under the CLT phase of the agrarian reform programme.

Finally, the whole system of co-operatives is now in total disarray, if not in bankruptcy. Most of the 21,000-odd grass-roots foundation pre-co-operatives now hardly exist; they have become inactive or are only nominally functioning.

The Project Site

The project site forms part of the province of Pangasinan, situation in the northern section of the central plain of Luzon, with its shores meeting the South China Sea to the west, and its eastern section bounded by other land-locked Luzon provinces. On the north, its border meets those of La Union and Benguet; on the north-east it is bounded by Nueva Vizcaya, on the south-east by Nueva Ecija, and on the south by the provinces of Tarlac and Zambales.

Pangasinan is predominantly rural, with most of its population concentrated in the eastern lowlands, where agriculture is the major industry. Although it is designated a first-class-A province, development in some areas,

particularly in western Pangasinan, has been comparatively slow. This portion of the province is mountainous, while the central and eastern sections are flat land where rice is a major crop.

The project covers the municipality of Bani, located at the westernmost tip of Pangasinan Province some 50 kilometres north-west of Lingayen, seat of the provincial government and about 250 kilometres from Manila. Bani is a fifth-class municipality of 26 barangays (villages) and approximately 28,000 inhabitants. It is typical of the municipalities of western Pangasinan, which are relatively depressed in comparison with the eastern towns where infrastructure and development projects have been concentrated. The municipality is divided geographically into two regions by the tail of the Zambales mountain range running through its middle. Behind the mountain range to the north and west is an extensive plateau which comprises the upland region. This stretches toward the South China Sea -- closely paralleling the shoreline. At the foot of the range to the south and east is a comparatively flat region where the bulk of the municipality's rice farms are located.

Agriculture forms the largest portion of the municipality's economy. About 85 per cent of the households obtain all or at least a part of their income from agriculture-based activities. Households solely dependent on rice farming predominate, accounting for 58.26 per cent of the total. Another 26.44 per cent of the households have some other form of income-generating activity in conjunction with rice farming. This involves employment as farm labour outside their own landholdings, livestock/poultry raising, fishing/fish culture, and other forms of employment not associated with agriculture (professionals, artisans, semi-skilled workers). An analysis of the relationship between income source and income sufficiency shows that the most economically well-off are those with non-agricultural occupations in addition to farming, those with purely non-agricultural employment, and farmer livestock/poultry raisers, in that order.

During the first phase of the project the Philippine team conducted a detailed socio-economic survey of the site.4/ The problems that affect the area studied will be described in the section on application of the methodology.

MEXICO

Historical Background

It would be impossible in this document to present an account of the complex rural history of Mexico, even of the period following the 1910-1920

Revolutionary War, the great dividing line in the modern history of the country. For the purpose of this document it is enough to present a brief view of the general conditions of rural Mexico today, as described in a report of the MAYA team.

As an introduction to this report, we will make a brief statement about the general conditions in rural Mexico today, in order to give a general idea about the environment in which MAYA team has worked in the R and D Project.

Mexico has a peculiar agrarian structure with two distinctive elements: on one hand, there is an agrarian bourgeoisie who owns about 33% of the land of the country, in private property; on the other hand is the ejido system 5/ with about 51% of the land, which is the result of the Agrarian Reform started after the 1910-1920 Revolutionary War (in which the peasant armies played a major role).

The creation of the ejido initiated a process of dismantling of the large hacienda system;6/ however, there are still many large landholdings devoted to extensive-rudimentary production. A new prosperous modern sector of the rural bourgeoisie holds the best agricultural lands, with most of the infrastructural services (irrigation, etc.) created through official investments; they also have the majority of the resources (tractors, etc.) and the capital needed for modern agricultural production.

This is in contrast with the situation that prevails in the majority of the ejidos; large numbers of exploited peasants who survive there under conditions that deteriorate year after year. This reflects the changes of the Mexican economy, that has turned from an agricultural exporter to an importer of basic foodstuffs in large quantities.7/ The crisis that develop cyclically in the Mexican economy, has a deep impact on the rural workers. Millions of them have abandoned the land, flooding the large cities (where their conditions of living are miserable) and migrate in large numbers to the U.S.; there, they are hired as hand workers, under extremely bad conditions. In general, they have engrossed the armies of "reserve workers" needed for the development of industry.

Private and official investments in the Mexican rural areas allow for the consolidation of the capitalist relationships in the field. The main effect of this is the increasing proletarization of the peasants. Government programs for rural development bring large investments to the field, in the form of credit, machinery and modern technology. Only a few peasants benefit from these investments, and then, they are normally converted into the administrators of the capitalistic interests involved; the majority of the members of the ejido, despite their formal condition

as legal possessors of the land, end up working in the conditions of proletarian.

Often, the government programs for rural modernization fail due to mismanagement and/or a misconception of the conditions that could bring their success. It is the peasants who have to pay for the high cost of these programs, since the official investments are made in the form of credits to the peasants.

In general, the rural workers have been unable to organize themselves in order to make technological modernization work for the benefit of their class interests.8/

The Project Site

In the field work the MAYA team followed a procedure different from the ones applied by the other participating teams. The Ethiopian and Philippine teams selected areas reasonably representative of the regional socio-economic conditions and developed their whole action in those areas. The Mexican team, as we have already seen, have been involved for several years in field activities connected with socio-economic problems in rural Mexico. In entering the project, they attempted to tackle the technological element of "problem situations" they had earlier identified in several localities of the country.

During the first stage of the project the MAYA team worked in the following sites:9/

The coastal region of the state of Jalisco

The coast of Jalisco is a geographical unit that includes the coastal valleys of the state of Colima to the south and a mountain complex that separates it from the coast of Nayarit to the north. The studies were carried out in terms of two subsystems within this region: the municipal districts on the coastal plains, and the Tomatlan Irrigation District.

In the plains of Puerto Vallarta Municipality, in the first subregion, the main productive activities are cattle breeding for meat, and corn and bean crops. To a lesser degree, chilli (hot peppers) and watermelon are grown, and dairy cattle and pigs are raised.

The Tomatlan subregion forms a geographic unit with the coastal plains of Puerto Vallarta, Cabo Corrientes, and La Huerta municipalities. The main local product has been "thin" cattle, which were sent to other regions for fattening. The chief crops are corn, beans, and sorghum; sesame, chilli, and tobacco are grown on a smaller scale. More recently there has been some production of coconut, watermelon, tomato, and several fruits such as mango, tamarind, and papaya.

La Frailesca

The Frailesca region is located in the state of Chiapas, close to the Guatemala frontier. It includes two municipalities: Villa Flores, with 40,868 inhabitants, and Villa Corzo, with a population of 25,580. Both municipalities are located on the slope of the Sierra Madre, at an altitude which varies between 400 and 2,400 m. Most of the region has an altitude of about 600 m. The economy of the region is based on agriculture -- beans and corn -- and cattle raising. The specific problem studied by the MAYA group was the almost total disappearance of the bean cultivation, due apparently to the loss of soil fertility.

Yucatan henequen zone

The henequen zone in north-west Yucatan has 11,800 km^2 and comprises 52 municipalities. The economy of the region is centred on henequen, a plant exploited for its fibre, which has a variety of uses. About 100,000 families depend on henequen cultivation and processing. The henequen problem was described as an example in the chapter on methodology above.

Jimenez Camargo district

The Jimenez Camargo region is located in the state of Chihuaha and comprises four municipalities: Jimenez, Valle de Allende, Parval, and Camargo. The zone is mostly a plain. The climate is dry and hot, and annual precipitation varies between 200 and 700 mm. The basic technological problem of the region -- particularly for the "ejidatarios" -- is the adequate selection and planning of crops to cope with the water scarcity. The solutions attempted up to now, however, have been ineffective, due mainly to the socio-economic elements of the problem situation.

La Mixteca

The Mixteca region is located in south-west Mexico, 300 km from Mexico City, and is composed of two zones with similar ecological and socio-economic characteristics: the Mixteca Baja and the Mixteca de la Sierra. In the former, at an altitude of between 1,000 and 1,500 m, the prairies are dominant and the climate is temperate. In the latter, the altitude is over 1,500 m, but the climate does not differ significantly from the Mixteca Baja. The basic technological problems of the region are related to irrigation.

Ejido El Xico

The Ejido El Xico is located in the municipality of Chalco, in the state of Mexico, 30 km from Mexico City. It is part of a region of high fertility, which produces foodstuff for Mexico City. The technological problem in which the MAYA team was involved was the loss of fertility of the soil, apparently due to chemical and sewage pollutants coming from the city.

NOTES

1. Ethiopian Team, "Preliminary Report on R and D Systems in Rural Settings Project in Ethiopia" (Ethiopian Science and Technology Commission, Addis Ababa, 1982).
2. The results of the socio-economic survey were summarized and distributed in five documents under the general title "Socioeconomic Baseline Survey of Welmera Wereda" (Ethiopian Science and Technology Commission, Addis Ababa, 1979). The subtitles of the individual documents are "I. Population," "II. Economy," "III. Problems of Production," "IV. Institutional, Social and Attitudinal Aspects," "V. Indicators of the Level of Living." Two documents were also prepared on the geological and biological features of the area.
3. The following information has been taken from "Development and the Peasantry" (Economic Development Foundation, Manila, 1982). This document has been submitted for publication in the UNU HSDRRD series.
4. The results are summarized in two documents: "Report on Research and Development Systems in Rural Settings -- Philippines" (Economic Development Foundation, Manila, 1978); "Report on the Pilot Project, Research and Development Systems in Rural Settings" (Economic Development Foundation, Manila, 1979).
5. The Constitution of 1917 imposed a maximum legal limit on the private ownership of rural land and decreed that areas exceeding that limit should be distributed to landless peasants living in the neighbourhood of the large landholdings. The land thus distributed, the ejido, is not given to the peasants in property; they receive the legal rights of possession of the land as a community, while the State retains the rights of ownership.
6. Up to 1910, the powerful hacienda owners were the main supporters of a military dictatorship and of a backward economic system that hindered the free circulation of land and labour; they subjected the workers to a sort of landlord/serf relationship.
7. Mexico exports oil and some high-cost foodstuffs such as vegetables, meat, and fruits.
8. "R and D Systems in Rural Settings," draft version of a project report (Instituto de Estudios para el Desarrollo Rural, MAYA, A.C., Mexico, 1982). For a more detailed description see "La Situación del Sector Agrario Mexicano" (Instituto para el Desarrollo Rural, MAYA, A.C., Mexico, 1981).
9. On the work done in Jalisco, see Miguel Szekely, "Report of the Investigation Carried Out on the Jalisco Coast in the Pilot Stage of the Research and Development Systems in Rural Settings Project" (HSDRRD-3/UNUP-389, UNU, Tokyo, 1983). The work done in the other sites is described in the following documents of the project: "Reporte sobre La Frailesca"; "Reporte sobre la Zona Henequenera, Yucatán"; "Reporte sobre el districto Jimenez Camargo"; "Reporte sobre La Mixteca"; "Reporte sobre elejido El Xico."

V. APPLICATION OF THE METHODOLOGY

As indicated earlier, it was agreed that each team was free to adapt the methodology to its own conditions, provided that its basic principles were maintained in order that the results could be reasonably compared. Besides the obvious need to allow for flexibility in the application of the methodology taking into account the wide diversity of the participants -- in terms of composition, previous experience, and institutional setting of the teams, the socio-economic features of the countries involved, type of problems confronted, cultural, educational, and organizational background of the peasantry -- there was another reason which made that flexibility not only necessary but also desirable. That was the fact that the main objective of the project is precisely to test the methodology in the field in order to perfect it. As we have already pointed out, the methodology was amply discussed before the beginning of the field exercise, but it remained nevertheless a theoretical conception, which could be validated only through its application in an actual field experience.

The problem of how the methodology could be validated arose during the pre-project discussions. Some of the members of the sponsoring institutions were in favour of testing the methodology in a single country, in what could be called a pilot experience. This proposal was opposed by other participants, included the project co-ordinator, on the ground that, given the diversity of situations in the rural areas of the Third World, it would be difficult, and above all too risky, to generalize the results obtained in a single country. This position was finally accepted on the condition that the first year of the exercise was to be considered a pilot phase; the continuation of the project was conditional on the methodology being proved viable in that initial part of the experience.

The results of the project proved that the decision to organize a multi-country exercise was a sound one. As we shall see later in this report, most of the wealth of useful information generated on how to identify problems and implement technological solutions with the participation of the peasants would have been lost in a single-country experience. In what follows we will present the experience of each of the participating teams.

ETHIOPIA

Welmera Wereda

The project area is divided into 53 local peasant associations, each with its own elected local government. The 53 associations form an association of a higher level, the wereda peasant association, again with its own elected body which governs except in certain aspects of specialized services that have to be furnished by the central Government. For ease of communication, groups of neighbouring local associations were formed into units termed substations. Each substation is headed by an elected leader. There are nine such substations in the project area (the wereda unit). These nine leaders form a committee which, together with the project leader and other experts as needed, identifies the components of the problem situation through a series of discussions.

To explain the methodology used in the interaction of peasants and scientists, given the importance of the subject, we will quote extensively from a report by the team:

> Both a series of dialogues and a questionnaire were used to collect information on problems constraining development. The overlap between the peasant's and the scientist's views of the problems became defined in the process of the dialogue. The questionnaire was not amenable to this two-way modification. The scientist's understanding of the problems was, however, explained to each respondent, and the scientist's conceptions had accommodated as much of the peasant's conceptions as were known from previous experience. In either case, therefore, the concept of an absolutely objective questionnaire or questions is inapplicable; when it comes to problems, which, by their nature, have value judgements in their definitions, objectivity has meaning only when there is a homogeneous population with only one set of values.
>
> The first contact in the project area was made with the Chairman of the Welmera Peasants' Association. After a discussion with him and his other elected colleagues, it was agreed that the nine "substation" leaders would form the Peasant's Association's subcommittee with whom the dialogue would continue. Several sessions of dialogue between them and the Project Leader were then used to define the problems constraining development as the peasant saw them in terms that the scientist understood. In other words, the problems were documented according to the scientist's comprehension of the peasant's definition of them.
>
> Using the scientist's conception of rural problems that constrain development modified to accommodate what was known of the peasant's conception of these problems, a questionnaire was prepared and

administered parallel with the dialogue and analysed with due considerations for sample size and error.

. . . . . .

The categories of important problems that were identified through the questionnaire and the dialogue were essentially the same. In administering the questionnaire, the level of detail of the intricacy of the problems was set by the scientists' preconception of the nature of them. No new and unexpected problems or relationships among problems were expected to emerge through the questionnaire. In the dialogues, identification of some unforeseen aspects of problems emerged. For example, soil erosion was shown to be a problem through both the questionnaire and the dialogue. The flexibility of interaction in the dialogue revealed that one reason that militates against the peasants constructing terraces to combat soil erosion is the lack of building materials....

Traditional solutions were identified through dialogue; the Project Leader recorded the problems constraining rural development and traditional solutions as presented by the peasants. If this were tried in the questionnaire it would have only asked for a description of traditional solutions, if any. A question of such a generalized nature is difficult to handle in a questionnaire. In any case, when such a general question is asked, the distinction between "dialogue" and "questionnaire" becomes trivial. The general question asked once in the questionnaire is ineffective compared to the set of questions in a dialogue that try to elicit the same information but can be formulated and reformulated according to their ability to exact detail.

For these reasons, the identification of problems and traditional solutions as obtained through dialogue were taken as the more satisfactory; the main aim of the questionnaire being to obtain baseline information for comparisons with future situations.

The problems constraining rural development and their traditional solutions, as seen by the nine substation leaders and as recorded by the Project Leader, were discussed informally with farmers in short conversations in villages, on footpaths, in markets, in cars, etc., and with scientists in a parallel way in offices, laboratories, coffee bars, etc.

Other more straightforward scheduled meetings between the nine substation leaders and the Project Leader were also held. No effort was made to encourage the peasant leaders to open up. The elected peasant leaders are not only social leaders, but also political and administrative. Now they even command their own armed defence squads. Therefore, they have no hang-ups that have to be handled carefully. The identification of the problems and traditional solutions was done by the

peasants themselves, the Project Leader acting entirely as a mover to start the process and to record the findings. Finally these problems were discussed and assessed and their technological alternatives reviewed over an intensive two-day meeting chaired by the Project Leader. The participants were 18 farmers, including most of the substation leaders, 1 administrator from the District Administration of the project area, and 29 scientists from the various R&D institutions in the country. It should be noted here that the R&D system is very small, and virtually all its components with a rural interest were represented.

In this context, it is interesting to note that in the joint discussion between scientists in the R&D system and the peasants, only very few problems that the peasants had not identified emerged. Even these were small details. For example it was discovered that pleuropneumonia and pasteurellosis had not been stated by the farmers as important cattle diseases, but animal disease as a problem had been amply stressed by the peasants. On the other hand, it became clear that the R&D system had virtually ignored certain important problems. For example, very little is known of the natural pastures: work on pasture and forage has concentrated almost entirely on the possibility of introducing exotic species. There has also been no study of the problems arising from, or associated with, marshes beyond pointing out the fact, obvious to the farmers, that marshes harbour the liverfluke.

At this point some comment would be in order on the two-day joint meeting between the scientists and the peasants. After a few moments at the beginning of the meeting when the scientist looked apprehensive and defensive and the peasants were subdued, a working atmosphere evolved which soon changed into candour and full enjoyment with both sides describing more or less the same phenomena using entirely different sets of mutually unusual images to conjure up, especially to the scientists, unfamiliar but clear pictures of familiar situations and events. The simple phenomenon of trapping a porcupine, which is accepted as a good solution to this vermin problem by both scientists and peasants, for example, came across full of vigour and humour when one of the peasants described the necessary night-time observations of the animal's path prior to digging a pit to entrap the animal. The details also gave insight from the peasant into the behaviour of both this nocturnal animal and man.

In the general discussion on livestock, one of the scientists gave the generally accepted scientific basis of "over-stocking" as the crucial issue in increasing meat and milk production. This provoked two well-phrased but pointed replies from the peasants which showed clearly that "stocking rate" for the peasant is related to his needs for power to plough his land; meat and milk production being secondary to this. However, both scientists and peasants agreed that the major livestock

problem is lack of adequate feed. It was also refreshing to hear the scientist trying to describe concepts without the usual scientific jargon and English words. (Conversations among Ethiopian scientists usually take the form of a mixture of English and Amharic weighted in favour of jargon.)

The tacit endorsement by the scientists in the joint discussion of the set of problems identified by the peasants as the major problems of the area indicates a leading role by the peasants in the phase of problem identification.

In retrospect, it seems that the farmers' committee of nine substation leaders could have been improved upon by the addition of some chairmen of specific peasants' associations, perhaps selected from among the 53 by a random procedure stratified to make sure that the major ecological categories of the project area were included. This may have added to the precision of the problem identification and possibly even modified some of the contexts through which the problems should be viewed. For the same reason, inclusion of some non-elected members of the community might have been beneficial.

An even greater omission is that of women. Women were not deliberately left out; it just happened that all the nine leaders in the farmers' committee were men. The elected leadership at many levels includes women, though fewer than men. There is no doubt that additional components of the problem might have been identified and certain interrelationships of the components now not obvious specified. As an example, the question of chickens and eggs may be cited. Chickens are, as a rule, the responsibility of the housewife, and the role of chickens and eggs in the situation described above is not apparent from our studies so far. Although the overall picture of the situation would have been unlikely to change, additional problems would have emerged.1/

The following points in the above deserve to be emphasized: (a) The peasants interacted with the scientists through their own organizations, which they trusted. (b) The peasants -- because of the benefits they have received from the revolution, above all a fairly large degree of autonomy and self-determination -- trusted the Government and consequently the scientists, members of governmental organizations. (c) The elected leaders of the peasant association were full members of the Project Committee. (d) In the stage of problem identification scientists belonging to most of the disciplines involved, who eventually were going to be in charge of the research, participated in the meetings and discussions. (e) The presence of peasant association leaders in the Project Committee, on the same footing as the scientists, ensured the peasants' participation throughout the development of the project. We will come back to these points when referring to the overall results of the project.

Before entering into the detail of the specific technological problems identified through the above procedure, we will go back to the "problem situation" of the area, to which most of the specific problems are directly or indirectly connected. We will quote again from the same report.

> A model for understanding the situation [the problem situation] could be constructed using the high vulnerability of the Ethiopian ecosystem to agricultural practices and population growth as interacting factors.
>
> Assume N to be the number of people who, by causing the removal of nutrients from the soil in the form of crops harvested and plants grazed and by accelerating the geological erosion to a certain speed, can equalize the soil-forming and soil-destroying processes and maintain the environment, at a fixed level of productivity, g(n) (g here and f below indicate mathematical functions). An additional number of people arising from population growth, say dN, would increase the soil-destroying process causing a net loss of fertility. The decreased soil fertility would render the environment no longer capable of supporting even the N people. The environment can now only support N-f(dN), which is smaller than N.
>
> After a critical population size of N is exceeded, therefore, the environment steadily worsens even if the original N were restored....
>
> In practice, peasant agriculture is capable of empirically discovering limited ways of reducing the fall in soil fertility and modifying what would be predicted by the above model; i.e., empirical knowledge can, to a limited extent, slowly raise the carrying capacity of an area. However, empirical knowledge is not versatile enough in the face of great challenges that multiply profusely in a short span of time, and when the increase in population (dN) exceeds a threshold, its capacity to cope with added impact is impaired, and the mechanism of environmental deterioration described above becomes approximately true. This is the frightening situation that peasant agriculture in Ethiopia in general, and in the Welmera Project area in particular, is facing. The corrective measures that empirical peasant knowledge uses are no longer robust enough to prevent environmental deterioration, and the above model would indicate that the degeneration is increasing geometrically, outstripping the rate of population growth. What is needed is a set of inputs of experimental knowledge, which can be injected at critical points in the environment to raise productivity and counter the impact of the existing population.
>
> The inputs model described above should include historical, social, and political phenomena as well as the natural phenomena that constitute the problem, since the increased productivity needed could come out of discoveries of natural phenomena, which would be used as corrective measures, or social or political changes, which would increase the

effectiveness of labour to produce. Historical phenomena -- important in determining the population size (N), which should be at equilibrium with the environmental productivity -- would also be important in determining the political and social responses to the environmental pressures resulting from increased population. Conversely, of course, this pressure could arise from natural phenomena, e.g., climatic changes causing a decrease in primary productivity.

In the identification of the problem in Welmera, detailed investigations on historical and socio-political questions were deliberately overlooked because at this time in Ethiopia's history these areas are changing so fast that phenomena are rendered out of date while studies are going on.

Suffice it to say that the history of the past centuries, in so far as it oppressed the peasant, killed his initiative, and produced large income and class differentials, has largely been rescinded by the land reform proclamation and the proclamation strengthening the peasants' associations, which have provided for the equitable redistribution of rural land, the main means of production. These proclamations and the guidelines for establishing producers' co-operatives have started the process of transforming the peasants from weak individuals who fall prey to defrauding into strong groups who, through their own organization into peasants' associations and producers' co-operatives, are now responsible for their own social, political, and administrative affairs. The vivid history of the peasant's awakening to his present position of strength stands out so strikingly that the previous centuries fade into background noise. However, the peasant still has much to achieve; and even background noises can have their effects.

Nevertheless, as a first approximation, the situation in Welmera, and in most of Ethiopia, can now be realistically defined in terms of the interaction of agricultural man with his own organizations and with natural force, historical considerations being largely inconsequential.

As we have seen in chapter II, the central principle of the methodology is that a technological problem is always a part of a "problem situation" in which socio-economic, cultural, and political components should be carefully taken into account. In many cases the solution of the technological component does not solve the problem, because the socio-economic elements are the variables that determine the system.

In the case of Ethiopia, as stated in the quotation above, the technological problems are normally the relevant ones, with relatively little interference from the socio-economic frame of reference. This does not mean, obviously, that there are not socio-economic and political elements to be taken into account. It only means that those elements are clearly defined and not conflicting: on one side the peasants, who are now largely responsible for

their own social, economic, and administrative affairs, and on the other side the government, one of whose main objectives is the improvement of the conditions of the rural areas. The main non-technological conditions are the general poverty of the country and the scarcity of scientific personnel, but those conditions are known variables that can be measured and taken openly into account in the planning process.

Through the process already described the following problems -- or areas of problems -- were identified in the Welmera site:

- -- problems of soil erosion -- erosion on steep slopes, gullying of delicate soils,
- -- problems of low soil fertility,
- -- marshes,
- -- eucalyptus plantations,
- -- problems posed by proximity to natural forests and thickets,
- -- rodents,
- -- other animals,
- -- insect crop pests,
- -- weeds,
- -- plant diseases,
- -- animal diseases,
- -- external parasites of domestic animals,
- -- shortage of salts,
- -- problems of drinking water,
- -- scarcity of clean seeds of reliable purity,
- -- weather problems.

Luma Wereda

The procedure followed in the second site -- Luma Wereda -- for the identification of problems, was slightly different from the one applied in Welmera Wereda.

Luma Wereda was divided into environmentally more or less homogeneous units, and peasant farmers were selected by the association leadership to participate in the problem identification process. The criteria used for the selection were: competence as a farmer, knowledge of the environment, and capacity of expression.

In order to avoid the mistake made in Welmera of having only men in the problem identification process, it was agreed with the wereda peasant association leadership that four men and three women would be included. Of the three women, one never attended the meetings. It was said that her husband refused to let her participate; this is probably a confirmation that regarding socio-cultural attitudes "even background noises can have their effects."

Encouraged by the very positive participation of the peasants in Welmera, it was decided to dispense with the indirect approaches to the problem identification process that had been used there. In Welmera the problems were initially identified by the peasants assisted by the project leader alone, and other scientists were involved only at a later stage in evaluating the problems. In Luma the peasants and scientists carried out a series of scheduled meetings chaired by the project leader and identified the problems through a free flow of questions, answers, and comments. The identification and evaluation of the problems were, therefore, simultaneous.

As for the effectiveness of the peasant participation in the discussions, in the words of the team report, "Within the limits of the environmental conditions in the area, the peasants turned out to be more than a match for the scientists in expounding the problems, and in presenting coherent views of the interrelations of these problems among themselves and with other phenomena."2/

The problems -- or areas of problems -- identified in the Luma site were the following:

-- problems of water -- ponds, wells, watermills, floods;
-- problems of erosion -- deforestation, overgrazing, erosion by water, erosion by wind, reduction;
-- reduction in soil fertility;
-- problems of crop production -- shortage of land, weeds, pests, insect pests, avian pests;
-- mammalian pests;
-- plant diseases;
-- climate;
-- crop shortage;
-- shortage of edible oil;
-- lighting;
-- farm implements;
-- problems of home and health;
-- personal hygiene;
-- external parasites;
-- diseases.

Analysis of the Problems

As the problems were identified -- in Welmera as well as in Luma -- the local technological solutions were analysed, and the possible contribution of the R&D system was considered. From the point of view of solutions, the problems identified can be broadly classified in the following categories: (a) problems for which the traditional solutions are adequate, (b) problems where the traditional solutions are insufficient but can be adequate with some input from the R&D system, (c) problems where the traditional

solutions are inadequate or non-existent but that can be solved with already existing technologies, (d) problems that require research which is within the present capability of the R&D system, (e) problems that require research beyond the present capability of the R&D system, (f) problems whose solution depends more on organizational factors than on the generation of new knowledge.

The above categories obviously overlap to some degree, and many of the problems can be classified under more than one heading. We will describe briefly the elements of some of the problems identified in order to illustrate the above.

Soil erosion

The solutions to the problem of soil erosion are standard and well within the economic and technical means of the peasants. They include contour farming, strip cropping, terracing, and overall protection of the soil with vegetation. The solutions are well-known to the peasants; it is only the land holding system that has made them inapplicable. The peasants, deprived of the ownership of the land, were unable -- and unwilling -- to make long-term investments in the preservation of the soil. Besides, erosion cannot be controlled at the level of small plots; it can only be controlled effectively at the zone or regional level, and that requires community action, which was not possible under the previous system.

With land reform the situation has improved, and efforts at checking erosion have become widespread. Land has to be reallocated every few years even now, however, and although the reallocation is performed by the peasant associations, the security of tenure that would enable an individual to undertake long-term investments on land amelioration does not as yet exist. The answer to this problem lies not in secure individual rights to plots of land, but in the communalization of production so that a long-term tenure compatible with equity can prevail.

Besides the available technologies, entirely new ones can be introduced. The largest group of domestic animals are cattle -- essentially oxen used for ploughing, cows being kept chiefly to produce the oxen. The introduction of cultivation without tillage could make cattle redundant, undoubtedly reducing their number. This could reduce overgrazing and soil erosion. Such techniques of cultivation are being developed in several countries, and, should it become possible for them to be introduced into Ethiopia, the effect could be dramatic.

This problem is one which the peasants have the necessary knowledge to solve; the obstacles are mainly socio-economic. The main contribution of the R&D system could be in the introduction of entirely new technologies such as those presently being developed in other countries.

Lowered soil fertility

Erosion causes loss of soil fertility long before the soil is so decreased that the bare substratum is left. Reduced fertility also results from the repeated removal of nutrients by crops and other plant products. This is referred to as soil exhaustion. Before one can think of restoring soil fertility, therefore, erosion has to be checked. Once erosion is checked, there are several technologies available for the restoration of soil fertility. Many of these, including manuring, crop rotation, the growing of legumes, and fallowing, are practised by the peasants. Improving the cycling of nutrients could be achieved by the introduction of composting and green manuring. Nutrients could also be brought in from outside the farm ecosystem in the form of chemical fertilizers. Chemical fertilizers are, in fact, well known and accepted, their use being limited only because they are not easily available, and when available are expensive. Ethiopia has a very large hydro-electric potential, and if the capital could be raised, it should be easy to make chemical fertilizers in Ethiopia so that they could be more easily available; so far, all chemical fertilizers are imported. A combination of chemical fertilizers to raise the availability of nutrients in the farm ecosystem and improvements in the existing techniques to increase the rate of cycling of the nutrients would be the ideal condition. Perhaps the most effective package of technologies to increase this rate of cycling of nutrients known to date is the Chinese biogas technology which, besides producing a very effective organic fertilizer, provides a very convenient form of energy for rural cooking and lighting, methane.

In this case, the solution is an improvement of the traditional peasants' solution in combination with the introduction of existing technologies. The real problem is not so much the technologies as their cost.

Water for home use and for domestic animals

In the areas of water shortage, water is obtained by travelling long distances to fetch it, by storing rainwater in ponds, and by digging wells if the water table is near enough to the surface. These three existing technologies can be improved upon. Most of the water is carried by women; despite the fact that most peasants have some pack animals, these are used only infrequently. It should be possible to develop water containers that can be easily loaded onto pack animals.

Improvements in the construction and hygienic maintenance of ponds and in digging wells so that water can be obtained from deeper water tables than hitherto require technological as well as organizational input. It would help if houses were built in compact villages chosen so as to enable the hygienic maintenance of ponds and easy access to wells. Because it is in accord with existing policy, relocation of villages would be easy. Virtually all the people in the Bale Region, for example, have been moved into such villages in the last few years. This has improved not only the availability of water but also other services including schools, clinics, pharmacies,

shops, etc. The making of ponds could be improved upon by building larger structures for storing more rainwater, by the inclusion of simple filters with sand and/or charcoal beds for purifying, and by maintaining clean catchments to minimize contamination. For digging wells, there is no alternative to the use of modern drilling rigs in places where the water table is deep. But this once-off exercise could be carried out by the modern sector (the government). The difficulty comes in getting the water out of the well. Pumps that are run by engines should be avoided because they cannot, at present, be maintained by the peasants. It should be possible to use simple mechanical devices that are operated by hand or by animal power. Promising simple pumps have recently been developed by the Faculty of Technology, Addis Ababa University; these are still undergoing tests. At a higher level of sophistication, windmills could be used provided they are simple enough to be maintained by the peasants themselves and robust enough to require minimal maintenance. Some watermills in Luma are deteriorating because of lack of maintenance. The technology involved is simple and, with some training, the more mechanically inclined of the peasants could maintain them and their number could even be increased, thereby saving energy.

The water problem is a typical situation where the traditional solutions are not sufficient. The solution includes action from the government at its upper levels (relocation of villages), research by the local R&D system, and introduction of existing technologies.

Among the problems with adequate traditional solutions is the control of the damage to crops produced by rodents (mainly rats) and birds. The control of plant diseases is an example of the "upgrading" of traditional technologies. The best method for combating crop diseases is through the breeding of strains resistant to the disease. This has been the traditional solution, but the introduction of modern methods for breeding can greatly improve its effectiveness.

To determine finally which problems required research from the R&D system, the elements of the problem situation were discussed one by one between the scientists and the peasants. The problems having technological solutions which have so far not been applied due only to lack of availability, were identified. The remaining problems were also discussed with the purpose of directing them to the R&D system. Those problems were further subdivided into those which would be tackled by the Institute of Agricultural Research and those for which no researchers are available in the acquired disciplines.

The problems that are being researched by the Institute of Agricultural Research are the following:

-- the conservation and effective utilization of manure,
-- the improvement of soil fertility through fallowing cultural practices and fertilizers,

-- trials with forage plants that could be grown in marshes, thus possibly enabling their utilization for improved animal production,
-- the improvement of natural pasture by seeding legumes and grasses,
-- evaluation of the production of crosses of Friesian and Zebu cows under peasant farmer conditions around Holeta,
-- trials to control the shallot white rot fungus, Sclerotium cepivorum,
-- continuation of the breeding of crop varieties resistant to smuts and rusts,
-- evaluation of the residual effects of pesticides; this is important for the acceptance of pesticides for pest control by the peasants.

The Department of Biology of the Faculty of Science of Addis Ababa University accepted the following topics for research:
-- the adaptation to soil fertility of the different cultivars of barley grown in Welmera Wereda,
-- nutrient cycling in the Menagesha Forest, Welmera Wereda (the relevance of this topic to the problems of the project area is that the area was a natural forest and, in order to understand its impoverished soil, the nutrient dynamics of a natural forest are needed for comparison).

The research still involves as much peasant participation as possible.

THE PHILIPPINES

The Philippine team in its area of work faced conditions totally different from those which confronted the Ethiopian team. To understand those conditions we will briefly describe the two main elements from the point of view of the project: the problem situation of the area, and the local representative organizations.

The Problem Situation

When land is the basic issue of consideration, the entire web of a farmer's life is virtually affected. Through the continuous progression of events from share tenancy to owner-cultivatorship, the farmers have been heir to a multitude of problems. Decades of "exploitative land ownership schemes" have led the government to institute a nation-wide land reform program that aims primarily to emancipate the farmers. Certain repercussions of the program are starting to surface.

In the project site, where quite a large number of farm families have been initially benefited by Operations Land Transfer, the abrupt shift from being share-tenants to owner-cultivators has resulted in outright

leasing of agricultural lands in case where the new owner is incapable of fulfilling his monetary obligations to institutionalized or non-institutionalized credit outlets.

Substantially interlinked with this tenancy problem is the almost total dependence of new crop varieties on chemical inputs. High-yielding varieties can insure a more than substantial yield only if the necessary chemicals are applied. Consequently, the farmer burdens himself with agricultural loans to make possible a bountiful harvest.

Due to various setbacks like plant pests, drought, etc. suffered by the farmers in their crop production, many of them failed to repay these loans on the maturity period. In fact, when farmers are faced with harsh natural conditions, they incur double losses; they have very minimal produce that could barely satisfy their essential needs and they are unable to repay their creditors. As a result, they are forced to sell or mortgage some of their property, i.e., farm animals, land, etc.

A different case occurred in Barangay Rotrotooc, in which the human factor was the primary reason behind the farmers' refusal to repay their loans. In 1973, loan officers from the Agriculture Credit Administration offered loans to farmers in the village. Loans approved were at a minimum of P3,000 per farmer. Initially, the farmers were only asking for loans within the range of P1,000-P1,800 since they believed this amount to be within their capacity to repay. But since loans below P3,000 would not reportedly be approved, they were forced to sign for P3,000 loans, upon agreement with the loan officers that they would only receive the amount they specifically needed and the balance would be given to other farmers who required an additional amount. When the cropping season was over, the farmers were surprised to learn that they were required to pay the entire P3,000 loan even when they got only a partial amount of it.

Looking back, under the prior tenancy scheme, the farmer did not encounter problems of this magnitude. Although he did not own the land he tilled neither did he encounter any problems concerning the acquisition of loans, etc. These were problems that burdened the big landowners.

The farmer's economic means of livelihood has seemingly retrogressed from a surplus economy to a subsistence economy. While this may not be the sole reason for the backward slump in the economic system, this factor nevertheless plays a major role in the determination of economic directions. In trying to assess the benefits of the land reform program, perhaps it is worthwhile to reflect on the fact that what may appear to others as exploitation might have been perceived by the poor people concerned as an essential relationship of security. This dimension appears to have been grossly overlooked by our seemingly over-eager

public administrators. In consequence, farm mismanagement has resulted to the utter detriment of the small farmer.

Another aspect of the land tenancy problem is that land below 7 hectares has not been expropriated by the government. This loophole in the land reform program engenders the problem of small absentee-landowners whose landholdings average 3-4 hectares of agricultural land. There are many small absentee-landowners in Calabtangan and this fact aggravates the plight of the farmers, as with this system, a 60-40 share-tenancy scheme is imposed.3/

Community Organizations

The research project was undertaken primarily in two villages, or barangays, of the municipality of Bani -- Rotrotooc and Calabtangan. There are five organizations in Barangay Rotrotooc, the main locality:

(1) The Barangay Council, the smallest political unit under the Philippines parliamentary government, is headed by a barangay captain and presides over at least 2,500 persons belonging to one barangay. The council co-ordinates and oversees all development activities in the barangay, e.g., cleanliness and sanitation, beautification, and peace and order.

(2) The Samahang Nayon is a co-operative association of farmers within a barangay organized for the purpose of improving the quality of life of rural farmers through the provision of liberal credit and material inputs to production. The Samahang Nayon in Rotrotooc supervises a consumers' co-operative store built in 1968 through member contributions and a cash donation from SEATO, which also donated the village rice mill.

(3) The Kabataang Barangay is a national organization of youths from 15 to 21 years of age. It is committed to the full development of Filipino youth through the provision of skills training in productive crafts and the formation of leadership qualities among them. Rotrotooc counts about 96 members, mostly high school students; Calabtangan has about 35.

(4) The Rural Improvement Club, initiated by the Bureau of Agricultural Extension in 1969, assists mothers in home management and provides them training in dressmaking, food preservation, and other home crafts through its extension workers.

(5) The Provincial Social Action Council provides manpower skills training to able residents. However, this organization has ceased to exist in Rotrotooc.

In the words of a report from the Economic Development Foundation (EDF):

> On the whole, these organizations have achieved little in terms of bringing about a better quality of life for the residents of the two villages. On the other hand, there is poor planning and general lack of direction among these organizations. On the other hand, there was the general low level of participation of the residents owing partly to their preoccupation with farm chores, and partly to a conditioned distrust of organizations and agencies such as these.4/

As a consequence of that distrust -- or, at best, indifference -- the present conditions of those organizations are the following:

The Samahang Nayon, at the time the project began, had not had a meeting for about a year. The consumers' co-operative store has hardly made any profit; residents would rather buy from other local stores.

The Kabataang Barangay, the Rural Improvement Club, and the Provincial Social Action Council are practically inactive.

The Barangay Council -- whose members have been in office for about ten years due to regulations by the government -- has initiated only a few projects, and those with little success because of the unwillingness of the residents to devote time and effort to them.

The deteriorating socio-economic situation of the area -- a consequence of the way the agrarian reform was implemented -- and the lack of local organizations trusted by the peasants posed a difficult problem for the Philippine team. They confronted a double task: firstly, to overcome the distrust of the farmers -- justified by a long history of frustrations -- to any organization pretending to solve, or help to solve, their problems; and secondly, to find a way of organizing some type of farmer's structure to participate in the project. In other words, they had to create a valid partner to the team from the peasants side. In what follows we will present a brief account of the procedure used by the team to try to reach an effective interaction with the community.

Prior to the implementation of the project in Rotrotooc and Calabtangan, the EDF had already established contact with the village people through the Help-a-Barrio team. A series of meetings with the local residents were conducted to explain to them the basic characteristics of the project. In addition, local inspection trips were made to make an initial assessment of existing material resources and to get a clearer picture of the general local conditions.

The socio-economic survey of the area was made through an interview schedule using a questionnaire. Prior to the in-depth interviews, the interview schedule was pre-tested on a 10 per cent sample of the total

household population of the villages. The pre-test was devised with the primary purpose of initially identifying and assessing which information was important for the objectives of the project. The pre-test gave the population an idea of what the rest of the data-gathering phase would be like. Also, through the pre-test, the team was able to identify important areas of future concern. In obtaining historical information, for instance, a three-member group was formed to discuss major past events. After pointing out the importance of reconstructing the history of the village in attempting to put the study in its proper perspective, a very interesting discussion ensued. Likewise, the settlement pattern in the village was mapped by another study group. The map was incorporated into the baseline study.

An interesting feature of this part of the work was the utilization of group dynamics. Before the beginning of the socio-economic survey, a group dynamic session was held in each of the two villages, with a resource person from EDF facilitating the sessions. The group dynamics session sought to familiarize each individual with the whole group. Working both ways, group dynamics served as a vehicle for informally voicing community problems and constraints to development on the part of the village residents on the one hand and clarifying role expectations on the part of the research group on the other.5/

During this first phase of the project, the following problem areas were identified in Rotrotooc:
-- water supply,
-- farm implements,
-- rice production and culture (from seed selection to harvesting),
-- rice drying and storage,
-- income;
and in Calabtangan:
-- water supply,
-- seed selection,
-- farm inputs,
-- harvest and storage.

After this broad identification of problem areas, the next stage was the identification of specific priority problems on which the research should be concentrated. This stage was conducted through the study groups already mentioned. In those groups the solutions proposed by the peasants, the solutions suggested by the scientists, and the traditional solutions were analysed and compared. The outcome of that procedure was the identification of the following priority problems:
-- low production due to lack of reliable sources of water for rice crops in the uplands,
-- the high cost of maintaining soil fertility,
-- seasonal flooding of low-lying areas,
-- problems of grain drying,

-- problems of small fish ponds,
-- firewood shortage.

In the second stage of the project (1980) the team made a critical revision of the methodology of participation. The results of that evaluation are very interesting for its implications for the methodology being tested, and deserve extensive quotation:

> The team had to devise a strategy that would maximize the involvement of Bani's rural population. At the start, getting the people to take part in the program was not considered a problem. It was assumed that once the people saw that the exercise was being conducted to benefit them, they would be more than willing to take part in solving problems.
>
> Formal meetings were scheduled in every barangay and the people were invited to attend. The response was generally positive with many residents from each barangay turning out for the meeting. Unfortunately, when the time came for the actual analysis of the problems, it was difficult to get most of those present to participate in the discussions and freely express their ideas. The more articulate members of the barangay tended to dominate the meeting while the others who were more indifferent remained in the background. Attendance in subsequent meetings waned leaving only a few who showed serious concern about the proceedings.
>
> The issue of extent of participation was therefore raised. Compared to the number of residents in the barangay and those who actually took part in the formulation of technological solutions, participation was marginal indeed. How then could the validity of the results of the formal meetings be ascertained? Would they be acceptable to the rest of the community who may have similar problems but were not party to the decision-making?
>
> Despite these questions, however, the formal meeting results were not disregarded. While they may not apply to the rest of the community members, at least they were valid for those who formulated them. Instead of ignoring the results an effort was made to substantiate them.
>
> The strategy of relying solely on formal meetings was found not to be very effective in drawing participation for two main reasons. First, the large number of people proved unwieldy and difficult to control. A few, because of their background (social standing, education, age, experience, etc.), dominated the gathering. It is possible that the less vocal segment of the groups (less vocal because they did not have the courage to assert themselves in a formal meeting, or did not speak up for fear of being ridiculed should they speak the wrong thing) felt alienated because they could not express their ideas.

Second, the deliberations consumed so much time. Some problems could not be adequately dealt with in one sitting; therefore other sessions had to be scheduled. When the schedule conflicted with farm activities, the farmers elected to stay on their farms to do their chores rather than go to the meeting.

Some other factors may explain the failure of the approach to secure cooperation of the community members:
-- The problems being discussed did not concern them.
-- Their experience with other change agents had made them skeptical. They adopted a wait-and-see attitude.
-- They were just not interested.

To get around those drawbacks, another approach which proved effective in the first phase was tried. The team now relied heavily on informal talks with people at the barangay level. In small gatherings of two to five people, the farmers were apt to speak their mind freely, volunteering their opinions with only a little encouragement from the scientists. The informal discussions did not yield much in terms of concrete solutions or specific designs of devices. Nevertheless, through this interactive process a more distinct picture of the characteristics and features that technologies should have in order to increase chances of success gradually took form. This rather tentative picture was not arrived at from just a single talk with one person; rather it evolved from numerous contacts with a variety of people. It is based on the scientists' perceptions of the ideas the farmers wished to convey during the many conversations that took place. Whether these perceptions are accurate will be known when the technologies were finally developed and disseminated.

From the talks it also became apparent that people were willing enough to contribute ideas but very few were ready to spend time or invest resources for their implementation. It became necessary to look for cooperators who would be in a position to take this step.

Farmer-cooperators from every barangay were picked by the research team before proceeding with the technology development activities. These cooperators were to work with the scientists in choosing the technological solutions to be finally adopted and in making workable designs of particular technologies.

The selection of cooperators took some time. Among others, the team looked for certain characteristics in the farmer-cooperators such as:
-- leadership qualities;
-- good communications skills;
-- manual skills and experience in various trades;
-- interest in participating in the research work.

The researchers felt that these qualities were important because the cooperators would be involved not only in the generation, but also in the dissemination of the technologies. Since these people were acknowledged (officially or unofficially) leaders in the barangay they would have considerable influence on the people of the community. Those who seek them for advice and guidance would be more likely to follow their example rather than accept the word of the researchers. Many of the early cooperators fell within this category. Other cooperators who were craftsmen, though not recognized as community leaders, would be valuable for their contribution in terms of skills and know-how that would be necessary in designing and implementing technologies.

The fourth requirement is as important as the preceding ones. Some potential cooperators who fulfilled the first three requirements were not interested or just could not spare the time to get involved in the project. On the other hand, men who at first seemed to lack the first three qualifications but were really concerned about the progress of the technology generation process because they were directly affected by the problems being discussed, made valuable contributions later on. They volunteered their help, even the use of their land for field-testing of some technologies. This provided the needed motivation for additional effort from community members and scientists alike. Although the research team used criteria for recruiting cooperators, other interested members of the community were also encouraged to participate in the research activities.

About this time, the Ministry of Local Government and Community Development (MLGCD) had begun organizing the people of the barangay into brigades. Seventeen brigades were organized in every barangay. One of these is the Education and Technology Brigade. The research team decided that working with these groups could be a very effective means of securing participation in the barangays. After obtaining permission from the Municipal Development Officer who oversees the activities of the various brigades, the team initiated contacts with the executive officers (some of whom were already cooperators) and through them with the rest of the members. In this way the researchers were able to set a broader base for their activities in the municipality.

The methodology was again revised the next year on the basis of the accumulated experience of the approach using individual co-operators. Assessing its past experience, the team found that people's participation was effective only during the problem-identification phase and could not be effectively sustained through the implementation phase. As the team proceeded with its work in Bani's villages, it became increasingly obvious that lessened participation was an inherent limitation of the individual co-operator approach. To solve the problem, the team evolved a modified co-operator approach: Philippine villages, or barangays, are subdivided

into smaller geographical areas -- sitios, or zones -- each of which consists of a cluster of houses and is under the jurisdiction of a barangay councilman or zone leader. Under the modified strategy, the team held several meetings per zone to identify and discuss technological problems. Each zone was then asked to elect from among its residents a project co-operator, who would be directly responsible for conducting experiments on the chosen technological alternative. Making the zone the active component in the decision-making process, rather than the Council or the captain, puts the responsibilities on a larger base. Several research projects are being implemented using this zone-based co-operator strategy with the assistance of scientific personnel from EDF.

The identified technological problems are experienced by all the farmers, but they occur in varying degrees throughout the municipality. A major problem in one area might only be a minor one in another. For instance, grain drying was a major problem in lowland barangays that had adopted the new high-yielding rice varieties, whereas some barangays that had adopted the new high-yielding rice varieties, whereas some barangays in the upland areas that still plant the traditional rice varieties do not consider it much of a problem. In implementing the technologies, the scientists and farmers have to consider such situations. Thus, instead of implementing all the formulated technological solutions in every barangay, the co-operators chose to test the technologies corresponding to major problems in their respective areas.

In addition to the lowlands, the municipality of Bani has two distinct upland areas -- one located to the west and the other situated at the south-eastern side. While both are considered upland and possess similar climatic conditions as well as soil types, certain factors have made their agricultural development differ. Thus, the technological needs that were identified for them were distinct.

The ongoing projects in the various areas are testing the following solutions for the problems identified -- in the western upland:
-- drought-tolerant rice,
-- improvement of soil fertility;
in the south-eastern upland:
-- vegetable variety trials,
-- livestock forage;
in the lowlands:
-- a grain dryer,
-- deep-water rice,
-- aquaculture,
-- saline-tolerant rice,
-- rice hull fuelled store.

It should be pointed out that the solutions being worked on were selected from among several alternatives through discussions between the farmers

and the scientists. The ones finally selected were those best fitting the "technological space" as defined in the methodology.

To give just one illustrative example, for the problem of the seasonal flooding of low-lying areas causing soil salinity, a variety of possible solutions were considered. Traditional solutions were
-- the use of tall varieties of rice,
-- adjusting planting dates to avoid the period when water level is deepest.
Solutions proposed by the farmers included
-- rice plants adapted to deep-water conditions,
-- rice plants adapted to salty soil conditions,
-- conversion of low-lying areas to fish ponds.
Solutions proposed by the scientists included
-- reforestation,
-- removal of illegal dikes,
-- a search for salt-tolerant rice varieties.

As can be seen, some solutions were aimed at eliminating flooding (reforestation, removal of illegal dikes), others proposed to devote the lowland to uses other than rice cultivation, and still others proposed a solution through the use of special rice varieties. The one finally selected belonged to the last type (saline-tolerant rice).

MEXICO

As we have already seen, the Mexican team followed a different procedure in the field work from the one applied by the other participating teams. Instead of concentrating their work in special areas selected for the project, they attempted to tackle the technological component of "problem situations" they identified in several localities of the country. In the previous section of this report we gave a brief description of those localities, and of the problem situations confronted.

The team has summarized its experiences in applying the methodology, and the concepts it arrived at as to "what to do," "how to do it," and "when and where to do it" -- particularly in reference to securing community participation, which it sees as the key to the project -- as follows:

> The various elements that will be presented in no way pretend to be a pre-established manual for "programming" the activity of the researchers in the community; they are only intended to reflect the attempts that the MAYA team has made in order to systematize its approach to the community groups with whom it has tried to establish a joint learning process. These methodological elements in no way can

substitute the disposition that the researcher must have to establish a commitment with a community group. The purpose of their systematization is to make possible the discussion and transmission of the relevant experiences among the members of the MAYA team, as well as with the other groups that participate in the project.

The direct involvement of the researchers in the day-to-day activities of the members of the chosen community group, as well as in those activities of the group as a whole, is not only the fundamental linking element on the basis of which the researcher establishes the desired commitment between himself and the community; it is also the supporting element for his efforts for gathering the direct information that is needed in order to detect and analyse the problem situation that is faced by the group: it also provides the basis for a future joint effort to promote the group's position within that problem situation, which is more likely to occur inasmuch as the analysis of that situation is carried out jointly too.

a) Regarding the question of "what to do" in order to get the participation that is desired, we will single out the elements that are involved in the action of a community group in the face of a specific problem on which they decide to act upon.

i) Identification of a specific problem that is important for the community group given the common interests of its members.

ii) Problem definition: the detection of each one of the different relevant factors which have an incidence on the problem at hand.

iii) Problem conceptualization, that is, the establishment of the way in which the detected "relevant factors" are mutually dependant on each other, and of the positive or negative way in which they affect (individually or jointly) the possibilities of improvement of the group.

iv) Formulation of alternatives: establishment of the different ways in which one or more of the relevant factors can be manipulated in order to improve the situation of the group.

v) Decision making: selection of the "best among the existing alternatives, as they are evaluated in relation to their potential contribution to the betterment of the group, as well as on the group's ability to carry them on successfully.

vi) Organization of the group, in order to implement the course of action chosen. This implies the establishment of a specific scheme of division of work to be done among the members of the group, as well as for the delegation of the group's authority, through the designation of those who will be responsible or supervising the aspects that may require special attention.

vii) Establishment of the communication mechanisms that are necessary to create among the members of the group, in order to make possible the implementation of the selected alternative of action.

viii) Establishment of the control mechanisms that are needed in order to evaluate the results of the individual actions to be taken, and for their reorientation.

In the experience of the MAYA team, the question regarding the "what to do" for the researcher who wants to get the desired joint participation with a community group, is answered by orienting his actions in the direction of supporting the efforts of the community group in the establishment of the elements above mentioned, and in particular, in the systematization of those efforts.

The order in which the elements above have been presented follows the logic of the sequence with which they are established when the group initiates its actions on a specific problem. However, as this action moves on, the experience that the group accumulates, as well as the changes which occur in the conditions that surround the problem (be they the result of the actions of the group of not), motivate a constant critical review of the elements that have been mentioned, as well as of the actions that have been derived from them. It is for this reason that, when we talk about the procedures followed by the researcher in the field, we cannot establish a programmed sequence of his actions around the elements listed, since it will be the process followed by each group what will dictate the order in which these actions will be undertaken.

b) As far as the question of "how-to-do-it" in regards to what is indicated in the paragraphs above, there are three elements that must be singled out, in the experience of the MAYA team during the project.

i) The individual discussions, in which an attempt is made in order to obtain the rational judgements as well as the value judgements of the members of the community group over the elements mentioned in the previous section, on the basis of unstructured individual discussions carried out in "appropriate" situations as described in the following paragraphs.

ii) The confrontation of different opinions: with this, an attempt is made in order to single out the fundamental disagreements on the rational judgements, as well as on the value judgements that have been mentioned before; also, an attempt is made to motivate the discussion around these disagreements, seeking with this to identify those opinions which better correspond to the conditions of the group's reality. These confrontations are carried out in small-group discussions, in "appropriate" situations.

iii) The collective discussion: with this, an attempt is made to articulate the rational and the value judgements mentioned above, in such a way that they not only express the group's thinking and feeling, but also, that they materialize the pact (commitment) subscribed among the members of the group, and with the researchers, as they confront a given aspect of the group's reality, with the aim of acting upon it.

With respect to the location of these three latter elements in time and space, so far we have only mentioned for (i) and (ii) that they must be carried out in "appropriate situations". The experiences of the MAYA team in this regard during the project, indicate in an emphatic manner that these situations came up fundamentally in the context of the day-to-day activities of the members of the community group. This includes those activities that are undertaken individually around the immediate family needs of subsistence, as well as those which are carried out collectively around the productive process (when this happens in the group at hand).

This enhances the importance of the integration of the researcher to the day-to-day life of the community group.

The collective discussions (iii) are also frequently located in the situations described above. However, this particular aspect of the "how-to-do-it" often requires of formal situations (meetings, assemblies, etc.) that are specifically set-up for the purpose of collective discussion. It must be pointed out that the setting-up of these situations ought to be the culmination of the realization of many individual discussions (i) and of confrontation of opinions (ii). Otherwise, the collective discussion turns out to be a useless formality.6/

The attitude of the peasant communities toward the project was very interesting and exhibits a remarkable difference from those in Ethiopia and the Philippines. The peasants became actively involved in the activities needed for carrying out the analysis of the problem situation and its technological components. They also involved themselves in those stages of the methodology oriented towards the analysis of solutions given to the technological problems that they confront. However, they showed a limited willingness to collaborate in the design of new technologies. On the contrary, they insisted that it was enough for them to make an adequate selection of the technologies already available. That does not mean that they always use the technology in the same way a modern agri-business entrepreneur would. They frequently make modifications: typically, the proportions in which the productive inputs are combined are modified or their intensity is reduced. The most important observation of the MAYA team, however, was that the frame of reference used for the selection is the technologies developed by modern capitalist enterprises.

The unwillingness of the peasants to commit their efforts to the design of new technologies has been explained in each case in the reports referred to in the previous section. However, the MAYA team considered that a case-by-case explanation was not enough and that a deeper analysis from an approach appropriate for generalization was necessary. As a consequence, the team proposed, as its contribution to the second-year

stage of the project, an in-depth analysis of the underlying causes of the attitude of the peasants in relation to the adoption of technologies.

The study was initiated on the basis of the following considerations:

When a community group succeeds in improving its situation, it gets involved in two general processes: (1) a process of increase in its self-reliance and in its capacity to make autonomous decisions, and (2) a process of negotiated change of its insertion in the overall system. MAYA's research efforts had to center on the analysis of these two simultaneous processes, and of the requirements that they impose on a community group, in the area of "know-how"; the comparison between the "required" know-how and the one that is generally available to a community group, would be the basis for answering the question presented at the beginning.

The basic supposition was that, on the one hand, the efforts that a community group makes in order to autonomize its decision making may require -- as a tendency -- a type of know-how that the overall system has not created, and on the other hand, that the change of the community group's insertion in the overall system (which results from the group's increased capacity to negotiate its relationships with external forces), may put the group in a position -- as a tendency, also -- in which the type of technological know-how that it may require to operate, is the one that the overall system has developed already. While the first tendency may lead to the need to develop new technologies, the second one may call for the use of the technology that is already available.

What MAYA decided to investigate was the dominance of one tendency over the other, under the present conditions of rural Mexico. To do this, it was necessary, first, to develop a general conceptualization of the two simultaneous processes involved.

The starting assumption was that the autonomous decisions that a community group may want to make by itself and the decisions that the external system may want to impose upon the group are not only different in <u>form</u> but also different in kind. That the "rational man" in a "peasant economy" is different from the capitalistic entrepreneur. Then, when the control of the decision making process of a community group is constrained by an external agent, the issue at hand is not only the group's right to self-determination in general, but more specifically the conflict between <u>two different orientations</u> to be given to the process of production.

The research was centered on the in-depth study of the internal economics of the "peasants socioeconomic unit" (PSU); the mechanism of insertion of the PSU in the overall capitalist system; and the change of

the way of insertion of the PSU in the overall system as negotiated process.

The main conclusions of the study are the following:7/

[1] There is a mismatch of a varied degree between the agronomic assumptions behind the technologies developed for the agri-business entrepreneur -- who owns the best lands -- and the physical conditions of the poorest lands, that are the ones typically in the hands of the peasant population in Mexico. This mismatch calls for efforts in the area of technological research, which should result in the design of new technologies that are appropriate for the agronomic conditions of the land that peasants control.

[2] When the peasant producer has to depend on the capitalist market for buying inputs for any of his productive activities, or for acquiring consumption goods, his "economic plan" has to abide by essentially the same rules that define the economic plan of the entrepreneurial producer; otherwise, the peasant would not be able to pay for the monetary cost of reposition of those inputs or goods. As a result of this, the paradigms for the design of technology that correspond to the agri-business entrepreneur dominate over those which would be derived from the logic of the peasant subsistence producer if this logic were to be considered in isolation. In rural Mexico today, it is extremely rare to find a community group that is totally isolated from the market.

[3] This dominance of the technological paradigms 8/ of the entrepreneurial producer over the logic of the peasant subsistence producer does not eliminate the latter. This shows in the need (that we have reported during our work in the project) of the community groups to implement some modifications over the entrepreneurial technologies that they adopt.

[4] The design of the new technologies that we refer to in our first conclusion has to respond to essentially the same paradigms that are defined by the entrepreneurial economy. The modifications to be introduced to those paradigms, and that can be generalized to some extent, are the following: (a) those that result from the difference in the agronomic conditions of the land in the hands of the peasant vis-a-vis those in the hands of the entrepreneur, and (b) those that result from the fact that the peasants in Mexico, given the conditions of submission in which they live, are forced to accept operating with an economic plan which allows only for their subsistence, and which yields small monetary profits for them. In one sentence, the paradigms in question correspond to those that would be derived for a hypothetical capitalist producer working in the poorest lands and willing to operate with low profits.

[5] If -- as we have attempted to do in this project -- we were to undertake an effort to design rural technology strictly on the basis of the analysis of a given "problem situation", we would have to take into account (a) the same paradigms that are used by the designer of technology for the capitalist entrepreneur, plus (b) those considerations that derive from the modifications indicated in our fourth conclusion (above), plus (c) the specific considerations that may be derived from the peculiarities of a given problem situation.

The peasants have a perception of the high cost of every kind and risks that are involved in such a design effort; indeed, they would have to succeed in doing all of what the designer of entrepreneurial technology does -- with whom we would be then competing -- plus what is implied in (b) and (c). Then, the community groups prefer to take the technology already available -- be it designed on the basis of (a) alone, or on the basis of (a) and (b) -- and modify that technology on the basis of (c); this implies for them the facing of significantly lower costs and risks. This explains their "attachment" to the entrepreneurial technology, i.e., their taking of that technology as the point of reference for their own technological decisions.

[6] The need for designing new technologies for the peasants under the paradigms indicated in our fourth conclusion (above), is evident. However, for this purpose, the design effort is oriented to the general needs of a hypothetical capitalist producer willing to operate with low profits; the considerations that may be derived from the analysis of "problem situations", are marginal to this type of effort.

NOTES

1. T.B.G. Egziabher et al., "Participation of a Rural Community in the Identification of Technological Problems in Ethiopia: A Case Study from Welmera Wereda" (HSDRRD-2/UNUP-366, UNU, Tokyo, 1982).
2. Ethiopian Team, "Application of the General Methodology, R and D Systems in Rural Settings Project" (Ethiopia Science and Technology Commission, Addis Ababa, 1983).
3. "Report on Research and Development Systems in Rural Settings -- Philippines" (Economic Development Foundation, Manila, 1978).
4. "Report on the Pilot Project, Research and Development Systems in Rural Settings" (Economic Development Foundation, Manila, 1979).
5. For a detailed description of the methodology used and the results, see "Group Dynamics as an Approach towards Enhancing Community Participation: The Philippines Experience" (Economic Development Foundation, Manila, 1980).

6. "R and D Systems in Rural Settings," draft version of a project report (Instituto de Estudios para el Desarrollo Rural, MAYA, A.C., Mexico, 1982). For a more detailed description see "La Situación del Sector Agrario Mexicano" (Instituto para el Desarrollo Rural, MAYA, A.C., Mexico, 1981).
7. The results of the research are recorded in several documents that have been submitted to the UNU.
8. The concept of "paradigms" for technological design is understood here as the set of requirements that a technology must fulfil and the constraints that it must satisfy in order to be coherent with the economic plan of production of a given producer.

VI. EVALUATION OF THE METHODOLOGY

The main direct results of the project have been presented -- although very briefly -- in the previous sections of the report. We mean by direct results the research activities being carried out by the R&D systems of the participating countries to solve the technological problems identified in the rural communities involved. It could be said that those activities per se are enough to justify the project.

The main aim of the project, however, was to test a methodology to make possible the identification of technological problems and to devise appropriate solutions through the joint action of scientists and peasants. The central question, therefore, is how effective the methodology proved to be, and what the contribution of the project is to the much-discussed problem of the participation of the peasants in the solution of their own problems.

The general results of the use of the methodology have been presented in the sections above, but a detailed evaluation requires a much deeper analysis. That analysis is being carried out by each team, but because of the termination of the project at the end of 1982, it is very difficult to compare and integrate results, as was the original plan. Nevertheless, there is already rich material available which represents a very valuable contribution on the subject from an empirical as well as from a theoretical point of view.

In what follows we present a very brief summary of some of the findings regarding the methodology of the project, but, before discussing the subject, it is necessary to point out some of the characteristics of the problem under consideration.

As is well known, much has been and is being written about the need for participation in the identification and solution of technological problems in rural communities. The opinions about the viability and the usefulness of such participation show a wide range of positions. Advocates maintain that it offers the best solution for the problem of devising really adequate technologies for the rural areas, above all the poor ones, while a considerable part of the scientific community is rather sceptical about the capacity of the peasants to make a significant contribution to the design of technologies.

On the other hand, the empirical evidence to substantiate any of the positions is rather meagre. Most of it comes from the experience of small groups of well-meaning persons, working normally outside the "official" R&D systems, and in small peasant communities. Even when successful, those experiences are considered inconclusive, as they cannot be extrapolated to the normal working conditions of the research organization.

In relation with the above, the approach chosen by the project was the following: (a) to study the interaction between peasant communities large enough to be representative of regional problems and organizations belonging to the regular R&D system, (b) to perform the work on the basis of a methodology which could be monitored and its results properly evaluated. It was considered that both conditions were necessary to ensure that the experience gained in the exercise could be applied in the normal work of the R&D systems.

We will very briefly consider the three main elements of the methodology: interaction between peasants and scientists, effects on the R&D system, and effects on the peasant communities.

INTERACTION BETWEEN PEASANTS AND SCIENTISTS

Ethiopia

In Ethiopia, as reported in the preceding chapter, the interaction between scientists and peasants was very effective in the stage of identification of problems. The interaction allowed the identification of the most relevant problems for the community, including some that would have been overlooked by the scientists working alone. It also made it possible to identify and evaluate the local solutions and to determine when a problem was not solved locally because of lack of knowledge by the peasants or the lack of appropriate social or material conditions.

The interaction was also very effective in helping to define the "technological space," the set of requirements and constraints that should be taken into account to implement the technological solution. The final result was the definition of several lines of research to be undertaken, taking into consideration the priorities of the peasants and the possibilities of the R&D system.

It is interesting now to compare separately the attitude of peasants and scientists. We will quote the Ethiopian team's final report on the project:

> By 1975, when the popular revolution erupted in Ethiopia, the peasants had not only been fighting the feudal system, but also all other forces

had united in the slogan for the peasant, "Land to the tiller." the Ethiopian peasant was, therefore, the centre of focus of the revolution. For that reason, the first major legislation after the onset of the revolution was one for land nationalization and peasant organization. When the R&D Systems in Rural Settings Project started, therefore, the peasants were ready for participation with scientists to transform their lives. This does not, of course, mean that all peasants were for participation; it does mean, however, that the bulk of them were, and those few that were not were dominated. In the life of the R&D Systems in Rural Settings Project, there has not been one incident which indicated a substantial peasant resistance to participation with scientists.

This does not mean that peasants have accepted all that scientists have said. Peasants also have their own views, and these views often enough differ from those of scientists. In fact, if this were not so, there would have been no need for partnership, a one way information flow from the scientists to the peasants would have sufficed.

As for the peasants' participation in the stage of research, quoting the same document:

Of the three problems directed to the Biology Department, Addis Ababa University, two have been taken up for study, one being dropped because of technical difficulties. These three studies were meant to yield supportive information and not to generate technologies that the peasants could use. There has not been peasant participation in studying them.

The problems directed to the Institute of Agricultural Research were aimed at generating technologies; and peasant participation was envisaged. Peasant participation has been minimal.

Some already developed technologies had been recognized by the peasants as solving some problems of production. An effort was made to see if the peasants would not adopt these technologies. The research scientists, extension agents and peasants agreed to work on the adoption together. The technologies included improved seed, improved cultural practices, and recommended rates of fertilizer application. Most of the actual detail of application ended up being by the peasants with help from the extension agents, with not as much input in time and attention as was expected from the research scientists. The peasants and the extension agents made a very serious effort to adopt the technologies and obtained very good results.

Summing up, the peasants showed their willingness to participate in all the stages of the project. The scientists interacted very effectively with the peasants in the first stages but were very reluctant to allow peasant

participation in the stages of research. On the other hand, the extension agents collaborated very effectively with the peasants in all the stages. We will come back to this subject when treating the effects of the project on the R&D system.

The Philippines

In the Philippines, the interaction between the peasants and the scientists team was effective, as in the case of Ethiopia, in the first stages of the methodology. Consequently the most pressing problems of the community were identified, and lines of research were determined jointly by peasants and scientists.

The difference from the Ethiopian experience appears in the second stage of the process. It was difficult for the scientists to get the general collaboration of the peasants to implement the solutions. Finally, by selecting the peasants who were more inclined to participate -- "co-operators" -- and by dividing the area into zones and asking each zone to elect a co-operator, the team succeeded in implementing several research projects with the collaboration of the peasants.

Mexico

In Mexico the peasants participated in the whole process but were unwilling to collaborate in the implementation of new technologies, even when they offered the possibility of better results than the existing ones. In all cases they opted for the existing technologies being used by the more advanced agricultural enterprises in the area, although with the introduction of some modifications to adapt them to their circumstances and resources.

The Mexican team undertook research to explain that attitude, and a brief summary of their conclusions was given at the end of the previous chapter. However, the failure to involve the peasants in the generation of new technologies is not due solely to the logic of the peasants' economy. To show possible alternatives, we will quote the Mexican team report:

> The key limitation of our earlier work (both, in the field, and at the analytical level) has come from the way in which we defined a "problem situation" from the very beginning of the project. That notion was developed with the purpose of centering our attention in the project on the problems of the "poor majority" in each community. This was in agreement with the spirit of the project. Also, this was the way in which the MAYA researchers tried to express their conviction that, to understand the problems of technology, one had to recognize that we live in a society divided in social classes; a first approach towards this

recognition was, then, to identify the poor majority in each community, and work on the problems that they face, as a group.

The way in which we proceeded led us to an undue polarization of our work that, in the end, confused our view about the specificity of the struggle among the classes in rural Mexico. First, we attempted to homogenize the "poor majority" at a community as a single social group, while in reality there were many conflicting interests among the poor themselves; this made it difficult to consolidate the organizational efforts initiated with them. Indeed, once an organized action was carried out and developed to the point of a tactical success,1/ the conflicting interests inside the peasant groups started to show up with increased intensity, when internal rivalries developed around the question of who would benefit more from the initial success achieved. These divisions often weakened the peasant groups involved, and made it difficult for them to proceed to more ambitious tasks, around more complex problems like the ones that require the design of new technologies. Our analysis, that centered on the notion of a "peasant economy," only aggravated this situation; indeed, after internal divisions developed in the peasant groups, we tried to support the fractions whose behaviour responded more closely to "the production of values of use"; this only led to deepen the process toward internal division, since the majority of the peasants did not see their own interests reflected in such criterion. In our last studies we could verify that, in Mexico today, the number of peasants whose behaviour abides to what we envisioned as a "peasant economy" is diminishing at an extremely fast rate, if not disappearing.2/

The polarization in our approach -- when we put the "haves" on one side and the "have nots" on the other -- prevented also our correct understanding of the possibilities of new actions, that may be conjuncturally taken under a democratic alliance, with the participation of some segments of the bourgeois class, on the benefit of the living conditions of the rural poor. This also limited our scope of action, and prevented us from promoting more ambitious undertakings that may involve the needs of designing new technologies.

As a balance for the project, the MAYA team showed the applicability of the project methodology to the selection of technologies in the benefit of the poor majorities at different rural communities. We also learned that the methodology can be applied in more ambitious actions that may require the design of new technological solutions. This will be pursued in future projects at MAYA and other research outfits in Mexico.

The above shows what we consider one of the most positive aspects of the project and demonstrates the commitment of the teams to their task: the willingness and the capacity to critically analyse their own work. This is an attitude which clearly appears also in the reports of the Philippine and Ethiopian teams, as can be seen in several parts of this document.

EFFECTS OF THE PROJECT ON THE R&D SYSTEM

Ethiopia

The Ethiopian team has carried out an in-depth study of the results of the project from the point of view of the methodology, taking into consideration the complex social and political factors involved.3/ It is not possible to include in this report even a summary of the conclusion, so we will quote only a few paragraphs concerning the impact of the project.

After referring to the attitude of the scientists towards the project -- their involvement in the phase of identification of problems and of the definition of the lines of research to be pursued, and their reluctance to involve the peasant in the process of developing the technologies -- the report says:

> The scientists as a whole, however, have become more field oriented. Having demonstration plots in peasants fields is now the norm for research institutions. Before the R&D System in Rural Settings Project, most of demonstration plots were carried out by extension agents, with scientists having such plots only in a very small number of cases.
>
> There have also been initiated projects which seek to bring about peasant-scientist collaboration of greater magnitude than happens in carrying out demonstration plots, where the peasant is only an observer. The Legambo Project based at the Alemaya Agricultural College and funded by FAO can be mentioned as an example. This project, nevertheless, accepts the traditional model or researchers, extension agents and users. It is, therefore, not in the same spirit as the R&D Systems in Rural Settings Project. However, it recognizes the problems in the diffusion of technologies in Ethiopia using this model and tries to coordinate research, extension and teaching more effectively than hitherto.
>
> There are also some scientists who have shown themselves to be committed to the spirit of the R&D Systems in Rural Settings Project. It is expected that their numbers will grow with time; any useful new idea, and we believe that this is a useful idea, obtains more and more adherents as time goes on in spite of opposition to it.
>
> The R&D system which launched the project has not yet evaluated the experience from this project in view of what lessons it can draw. Whatever the R&D system concludes, however, it has changed since the launching of the R&D Systems in Rural Settings Project. It is now more aware that it should do something to make its research activities benefit the peasant.

The Philippines

The effect of the project on the Philippine R&D system has been summarized as follows:

> In 1979, after the site was selected, the National Science Development Board (NSDB), the Central Luzon State University (CLSU), the International Rice Research Institute (IRRI), the National Institute of Science and Technology (NIST), the National Science Research Center (NSRC), were visited by the Project Director to inform them of the UNU-sponsored project. Subsequently, collaborative arrangements were made with IRRI, NIST, and NSRC.
>
> -- From IRRI, HYV seed for deepwater rice (drought resistant) varieties were obtained. All throughout the exercise, dialogues between IRRI scientists and the field men of the research team was maintained.
>
> -- The NIST allowed its scientists to participate in the project for a period of one and one half years, phasing out after the entire team left the project site.
>
> -- NSRC scientists were used as sounding boards for problems encountered by the team.
>
> -- A CLSU aquaculture scientist worked with the team for a year. The scientist worked with the peasants from project identification to program implementation.
>
> During small scientific meetings and seminar-workshops, the status of the project was discussed with peers in the science community. As a result, a similar project was sponsored by NSDB with substantial funding support.

EFFECTS OF THE PROJECT ON THE PEASANT COMMUNITY

Ethiopia

Besides the direct results of the project, which have been summarized in the previous sections, the team conducted a survey in the project area of Welmera to assess the extent to which the peasants have had useful influence from the project. The survey indicated that 78.6 per cent of the peasants had received advice or training from the R&D system. A higher percentage of members of the producer co-operatives than of members of the peasant association indicated that they had received advice or training at one time or another in the past.

> Many respondents could not recall the years they first came across particular inputs or techniques. Those who were able to recall placed

the years mainly around 1977-1980, although inputs such as fertilizer were known to many respondents as early as the period 1969-1972. The R&D Systems in Rural Settings Project in Ethiopia started being developed jointly by IAR, Ministry of Agriculture and Addis Ababa University scientists in 1977 and it was launched in 1978. It is thus obvious that the interaction for the first time among peasants and the R&D system peaked starting with the activities of launching the project and continuing into the first 3 years of its life. The effect of the R&D system on the peasants could, therefore, be attributed to the combination of the forces that created the project and the activities that resulted from the project.

Furthermore, the extension agent was also identified as the primary source of most types of technological information for the future. IAR scientists of the area were also considered as a future source of information by a significantly greater number of the members of the producer cooperatives than the members of the peasant associations.

The peasants who are not members of producer cooperatives tended to mention more the peasant association officials and production cadres than the IAR scientists. This is quite understandable, since the IAR scientists are working closely with the producer cooperatives members through the R&D System in Rural Settings Project.

An attempt was made to find out the extent of usage of some selected agricultural technologies. The extent of usage of the selected agricultural technologies was higher among the members of the producer cooperatives than among the members of the peasant associations, 69.4 per cent as compared with 47.7 per cent respectively.

Furthermore, relatively more cases of discontinuation of usage of the selected agricultural technologies were found among the peasant association members than the producer cooperative members. One different between these two categories of peasant is that the R&D System in Rural Settings Project works primarily with producer cooperatives, though effort is made to influence the other peasants as well. The fact that the producer cooperatives work as organized bodies while the other peasants work as individuals could also contribute to this difference. When viewed against the fact that the peasants in the producer cooperatives have more contact with IAR scientists than the individual peasants, however, the first interpretation looks more plausible. After all, the selected technologies can easily be applied by individual peasants.

The Philippines and Mexico

The main effects of the project on the peasant communities involved in the

project in Mexico and the Philippines have been indicated in the previous sections. A more detailed analysis is given in the final report and special papers of the participating teams.

NOTES

1. The peasant groups with which MAYA worked in the project were ones that had developed spontaneously some sort of organization in order to confront problems that were common to all its members (frequently, land-tenure problems). The work of the researchers with those groups tended to solve some of the technological aspects of those problems: in several cases, as we reported, a successful accomplishment of a community group was facilitated by the adequate choice of a technology that resulted from the application of the methodology of the project.
2. According to statistics, about 30 per cent of rural production was commercialized in 1940, while in 1970 this percentage was on the order of 85 per cent; it is certainly higher today.
3. "Final Report on the R and D Systems in Rural Settings Project" (Economic Development Foundation, 1983).

VII. PRELIMINARY CONCLUSIONS

The main conclusion of the project is that the methodology proved viable and useful for the generation of technologies adequate for rural areas in developing countries. It allowed the identification of problems -- avoiding the errors incurred in the traditional approach when R&D systems are applied in poor rural areas -- and the establishment of lines of research on the problems considered relevant by both peasants and scientists.

In the stage of implementation of the solutions, the interaction between scientists and peasants became more difficult, but in all cases the experience gained in the project demonstrated that the obstacles to that interaction can be overcome.

The project has had an impact on the R&D systems and the peasant communities far transcending the direct results of the specific research projects undertaken under its influence.

The project also showed -- and this is perhaps its most important result -- that the interaction between scientists and peasants is a complex and difficult problem which involves historical, social, political, and cultural elements besides the specific conditions and the characteristics of the groups directly involved. This view is very different from the one prevalent in most projects concerned with peasant participation, which are planned under the assumption that the success of the peasant-scientist interaction depends on the specific conditions under which the joint activities are carried out.

Besides the empirical findings of the project, which are the result of the careful monitoring of the methodology applied, the participating teams also made extremely valuable theoretical contributions to the problem of peasant-scientist interaction. The Ethiopian paper quoted above, analyses the problem taking into consideration the social and political elements involved and the characteristics of the project in the frame of reference of the specific historical situation of the country. The richness of the study is based to a great extent on the variety of conditions of the countries involved in the experience: Ethiopia in a post-revolutionary process; Mexico with a peasantry with a recent past of bloody struggle for the right to possess their own land; and the Philippines with a recent land

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reform which failed to really liberate the peasants but which gave them many of the characteristics of the small entrepreneur.

The MAYA studies show the problems of a peasantry trying to find a place in a rural economy rapidly evolving from a subsistence basis to an advanced capitalist structure.

Those separate studies should be integrated or published separately, and their dissemination will constitute a most valuable contribution to an important and much-discussed subject.

Finally, each team is preparing several papers as a by-product of the project on subjects related to rural problems. The tentative titles of those papers have been presented to the UNU in a previous report, and some of them have already been published or submitted for publication to the project co-ordinator.

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