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Proceedings

Farming Systems Seminar - Workshop
March 16 - 18, 1981
PCARR, Los Baños, Laguna

INTEGRATED AGRICULTURAL PRODUCTION AND MARKETING PROJECT (IAPMP)

PNAAP 778

FOREWORD

Through the years, the Ministry of Agriculture has been in a constant struggle to bridge the gap between food demand and food supply and to raise the incomes of farmers through increased food production. These concerns are manifested in the various agricultural programs through which technical and credit assistance are extended to farmers. Thus, the country has become self-sufficient in rice. In the last three years, we reached the status of a rice exporter. Similar successes have been achieved in the production of other grains, vegetables, livestock, and poultry.

But because of the physical limits of the country's arable land and the reality of a burgeoning population, the Ministry of Agriculture cannot rest on these gains in food production. New technologies which, hopefully, will maximize returns from the basic units of production, especially land and farmer's labor, will have to be developed.

Attention should therefore be focused on *farming systems.* This is an approach which considers the total resources of the farm and the entire range of the farming activity -- from the production process to the marketing of produce. Under the farming system concept, the farmer does not only grow a diversity of crops, but also raises livestock, poultry and even fish in the same unit of land, to supply predetermined markets.

In the light of this necessary thrust toward farming systems, the seminar-workshop conducted by the Integrated Agricultural Production and Marketing Project from which the following papers were culled, assumes great relevance.

ARTURO R. TANCO, JR.
Minister

WORKSHOP RATIONALE

Agricultural production in the Philippines is at a stage where much can still be done to improve its efficiency. To maximize the use of resources and to increase the cash incomes of farmers, some mono-cropping areas have gone into multiple cropping and hopefully will graduate into the more advanced, integrated approach called farming systems.

Results of various farming systems models in the country indicate the profitable potentials of this innovative approach. There is, therefore, a need to bring to farmers the product of various researches on farming systems. This, however, requires the development of a methodology for disseminating farming systems information to farmers on the utilization of technology packages that have been developed by research and agricultural institutions and modified for the specific environment of the concerned farmers, with these farmers' participation. It was for this purpose that the Integrated Agricultural Production & Marketing (IAPM) Project orchestrated the conduct of this seminar-workshop. The three-day meeting brought together leading researchers and policy makers from all over the country, including visiting consultants, to review various farming systems research methodologies and to agree on a common approach for the dissemination and utilization of farming systems research as an important tool for agricultural development.

EDGARDO C. QUISUMBING
Overall Project Coordinator,
IAPM Project

1. Foreword

2. Rationale of the Seminar-Workshop

3. Program of Activities

4. Papers Presented

5. Discussion Panel on the Role of Social Scientists in the Development of Farming Systems Technology

6. Report of the Workshop Groups

   6.1 Technology Generation

   6.2 Technology Verification

   6.3 Technology Dissemination

7. List of Participants

8. Working Committees

FARMING SYSTEMS WORKSHOP

March 16-18, 1981
PCARR, Los Baños, Laguna

OBJECTIVE: To review different farming systems research methodologies for possible adoption under Philippine conditions.

SCHEDULE OF ACTIVITIES

DAY	TIME		
16	**Morning**		
	9:00-9:30	Registration	
	9:31-10:15	Welcome Address Declaration of Objectives/ Expected Output/Procedure Presentation of Speakers, Discussions and Presentation of Participants	Dr. E. C. Quisumbing
	10:16-10:30	— Coffee Break —	
	10:31-12:00	Farming Systems: CLSU Model	Dr. Filomena F. Campos
	12:01- 1:20	— Lunch Break —	
	Afternoon		
	1:30- 3:00	Farming Systems Research Reviewed	Dr. David Norman
	3:00- 3:15	— Coffee Break —	
	3:16- 4:30	Cropping System Approach in Capiz Settlement Area	Mr. Honorato Jereza, *et al*
17	**Morning**		
	8:30-10:00	UPLB Integrated Rural Area Development	Dr. Ramon Nasol
	10:10-10:15	— Coffee Break —	
	10:16-12:00	Role of Social Scientists in the Development of Farming Systems Technology	Dr. Fermina Rivera Chairman Dr. David Norman Co-Chairman Dr. Grace Goodell Mr. Glenn Denning Dr. Percy Sajise
	Afternoon		
	12:01- 1:00	— Lunch Break —	
	1:30- 3:00	Experiences of the Inter-Asia Cropping Systems Network	Dr. Johnny Pendleton
	3:00- 3:15	— Coffee Break —	
	3:16- 4:30	*Slide Presentation:* Soil Benchmark Survey as a Tool for Developing Farming Systems Technology	Dr. Martin Raymundo

	4:30- 5:30	Some Approaches in Irrigation-Based Farming Systems: The FSDC Experience	Mr. Pete Corona
18	**Morning**		**Group Leade**
	8:30-12:00	Workshop in the Development of Farming Systems Research Methodology	Dr. Arturo Gom Dr. Amado Magl Dr. David Norm
	1:00- 4:00	Group Presentations	
	4:00- 5:00	Wrap-Up Session	Dr. Arturo Gom

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PAPERS PRESENTED

Paper 1	The Technology Packaging Project of the Central Luzon State University (CLSU)	Dr. Filomena Campos *Director* *Research and Development, CLSU*
Paper 2	Farming Systems Reviewed	Dr. David Norman *Kansas State University* *Consultant on Farming Systems* *IAPM Project*
Paper 3	NFAC Agusan-Bukidnon-Capiz Model	Mr. Honorato Jereza *Director* *Agricultural Service Center* *Capiz Settlement*
Paper 4	UPLB Integrated Rural Area Development	Dr. Ramon Nasol
Paper 5	Experiences of the Inter-Asia Cropping Systems Network	Dr. Johnny W. Pendleton *Head* *Multiple Cropping Dept., IRRI*
Paper 6	Farming Systems: Farm Systems Development Corporation (FSDC)	Mr. Peter Coronado *Project Officer* *Farm Systems Development Corporation*
Discussion:	The Role of Social Scientists in the Development of Farming Systems Technology	**Panel**
	Chairman :	Dr. Fermina Rivera *TPP-IAPMP SER Senior Propart* *R & D Center, CLSU*
	Co-Chairman:	Dr. David Norman
	Members :	Dr. Grace Goodell *Anthropologist, IRRI*
		Dr. Percy Sajise *Dean, Institute of Human Ecology* *UP at Los Baños, Laguna*
		Mr. Glenn Denning *Visiting Field Specialist* *Rice Production Training and Research Division, IRRI*
		Dr. Sisira Jayasuriya *Economist* *Cropping Systems Network* *IRRI*
Slide Presentation:	Soil Benchmark Survey as a Tool for Developing Farming Systems Technology	Dr. Martin Raymundo *Project Leader* *Benchmark Soil Survey Project*

THE TECHNOLOGY PACKAGING PROJECT[1/]

Project Description

The Technology Packaging Project (TPP) is one of the four major thrusts of a national program known as the Integrated Agricultural Production and Marketing Program (IAPMP). The other thrusts are the National Policy, Academic and Extension/Outreach. All four thrusts of the IAPMP as a whole represents one of the greatest efforts of the government to cushion the repercussions brought about by the unprecedented increase in rice yields made since 1974 which proved too soon and too much. The country had inadequate drying, storage and processing facilities and the distribution channels were likewise inefficient which resulted in relatively lower returns for the farmers.

The project is jointly financed by the Government of the Philippines and the United States Agency for International Development (USAID).

Objectives

1. To develop and test technological packages (tech packs), to integrate crop and livestock enterprises, product processing and marketing;
2. To provide training in production, post-harvest technology, by-product utilization, processing/marketing and extension education; and
3. To construct and operate a food/feed grain processing center.

Project Area and Clientele

The Central Luzon State University is the project implementation venue of the Tech Pack Project. CLSU which is located in the heart of Central Luzon region.was chosen primarily because of the rural background of its students, the availability of an integrated university farm, the characteristics of the surrounding agriculture and the interest of the administration.

Initially, the TPP's target population consists of the farm families in sample barangays within the 15 km radius of CLSU. The project will likewise serve the government and private extension workers, students, as well as the faculty and staff of the university.

Organization

The TPP started in 1978 with three highly interrelated sub-thrusts, namely: Socio Economic Research (SER), Tech Pack Testing and Adoption (TPTA) and the Food and Feed/Grain Processing Center (FF/GPC).

The main concern of the TPTA is to increase the farmers' income by improving their production/processing/marketing capabilities through the development and testing of technological packages.

The SER on the other hand, provides the other TPP staff with relevant information on the target populations' social needs and resource constraints. Toward this end, the SER has conducted a baseline survey and other socio-economic researches.

The FF/GPC will provide the necessary physical link in processing between production and marketing of selected food and feed stuff. With this, a multiple food and feed grain complex has been constructed on the CLSU campus and is expected to become operational by 1982.

By the second quarter of 1980 however, the TPTA was merged with the Agricultural Commodity Research to become the Agricultural Technology Research (ATR), while the SER was fused with the Rural Development Studies, an attempt to "weld" the TPP to the existing structure of R & DC and be made a continuing project of the university.

The project is headed by a Thrust Coordinator under the direct supervision of the University President. The Coordinator is back-stopped by project proparts, researchers, field and administrative staff.

1/ Prepared by Dr. Filomena F. Campos, Director, Research and Development Center, CLSU, Muñoz, Nueva Ecija, PHILIPPINES. Thrust Coordinator, Technology Packaging Thrust.

Operation

To attain its objectives, the TPP adopts the following strategies of operation:

- baseline data on the target area and population were gathered to get an idea of the attributes obtaining in the place and the people they intend to serve
- select/generate/develop tech pack components/mixes/system in-campus
- identify and select potential farmer cooperators who will be willing and capable of conducting verification trials in their fields
- train the recruited farmer cooperators on the different aspects of the tech packs
- closely supervise the implementation of the off-campus verification trials at the same time monitoring their activities as well as problems encountered in the field
- prepare the final report on the results of the verification trials and present it in appropriate forums for discussions
- conduct socio-economic studies
- diffuse the tech packs proven to be economically feasible, biologically adaptable and socially acceptable.

Monitoring and Evaluation

Regular monitoring of project activities is being undertaken to provide the management with the progress of the project as compared to what were planned.

Linkages

The TPP has established strong linkages with both government and private agencies concerned with agricultural and rural development, notably the Ministry of Agriculture's line agencies like the Bureau of Agricultural Extension, Bureau of Agricultural Economics and the Bureau of Animal Industry, to mention a few.

Impact

The TPP after barely four years of operation has contributed to the attainment of the following:

- introduction of the concept of total food systems approach in the improvement of the production, income and standard of living of the farmers
- development of the packages of technology for sorghum, onion, sunflower, cotton, rice-fish-gabi, broiler, swine and brick-making
- development/enchancement of manpower capability
- conceptualization of related projects like the Trading, Training and Marketing Assistance Center; National Post-Harvest Institute for Research and Extension, etc.
- infrastructure development of the University
- training of government and private extension workers, students and farmers on various fields, particularly on the CLSU Tech Packs

FIGURE 1

ORGANIZATIONAL CHART A

INTEGRATED AGRICULTURAL PRODUCTION AND MARKETING PROJECT
ORGANIZATION FOR PROJECT ACTIVITIES IN THE PHILIPPINES

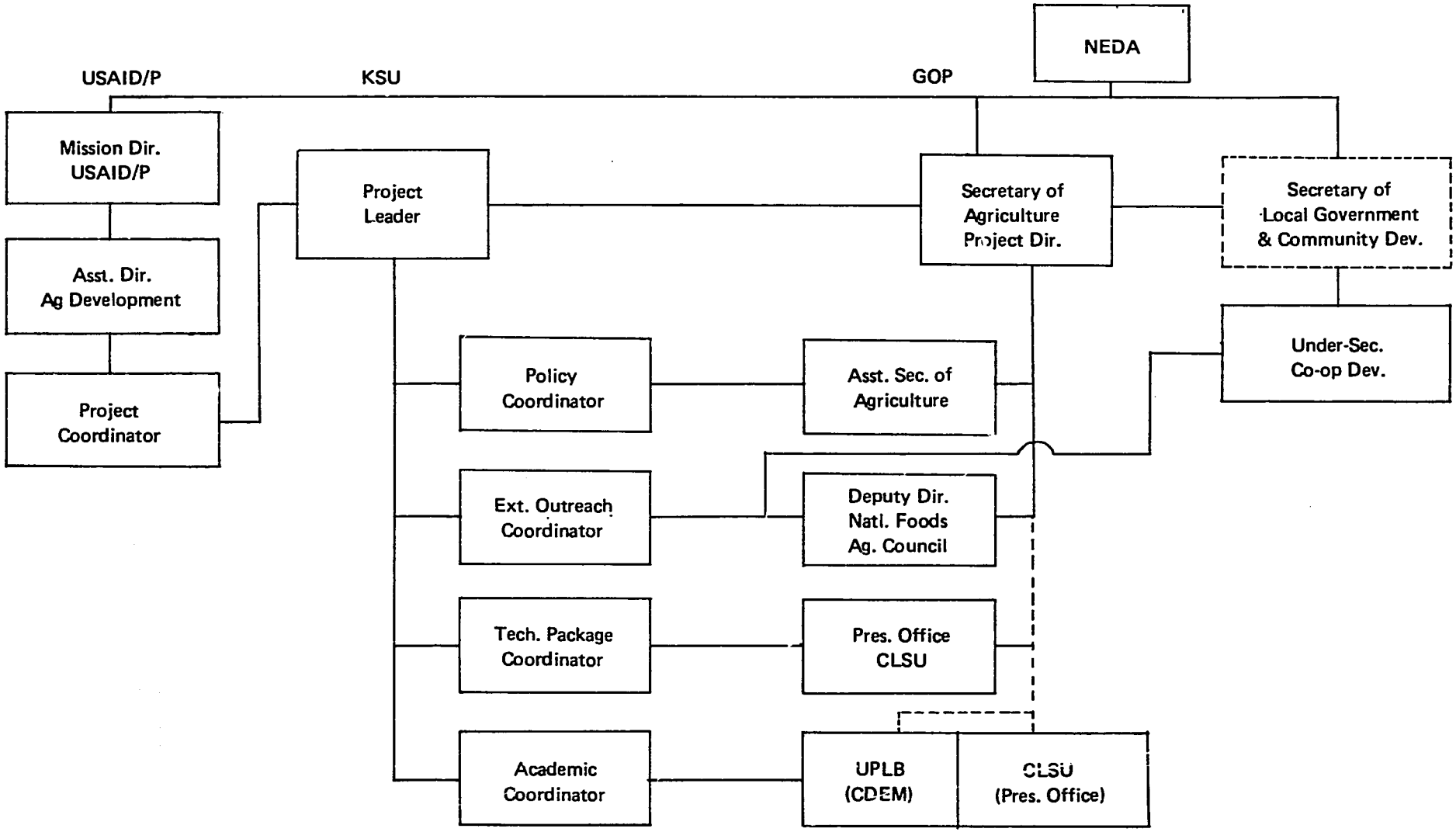


FIGURE 2

TECH PACK ORGANIZATION AND MANAGEMENT STRUCTURE

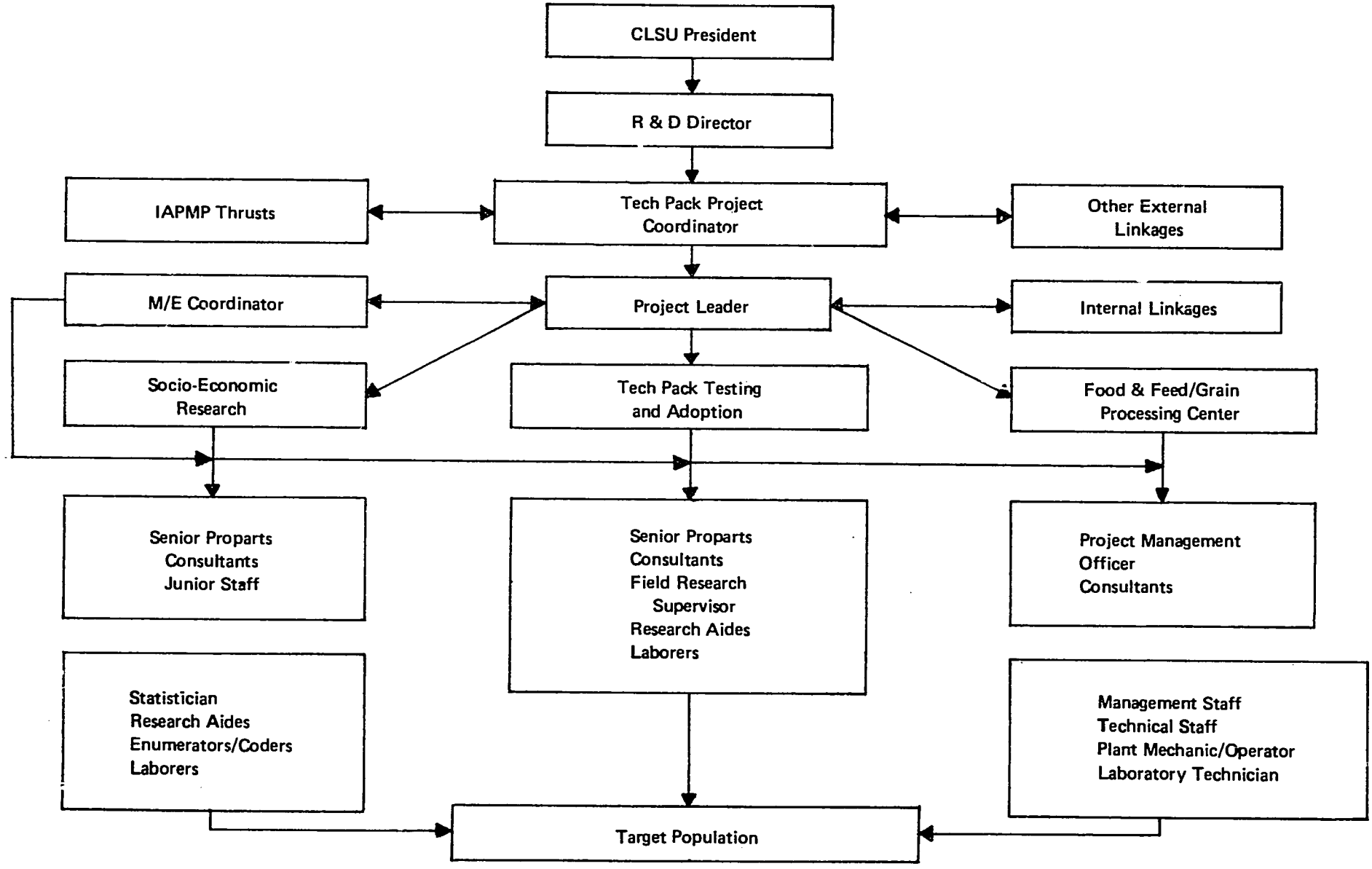
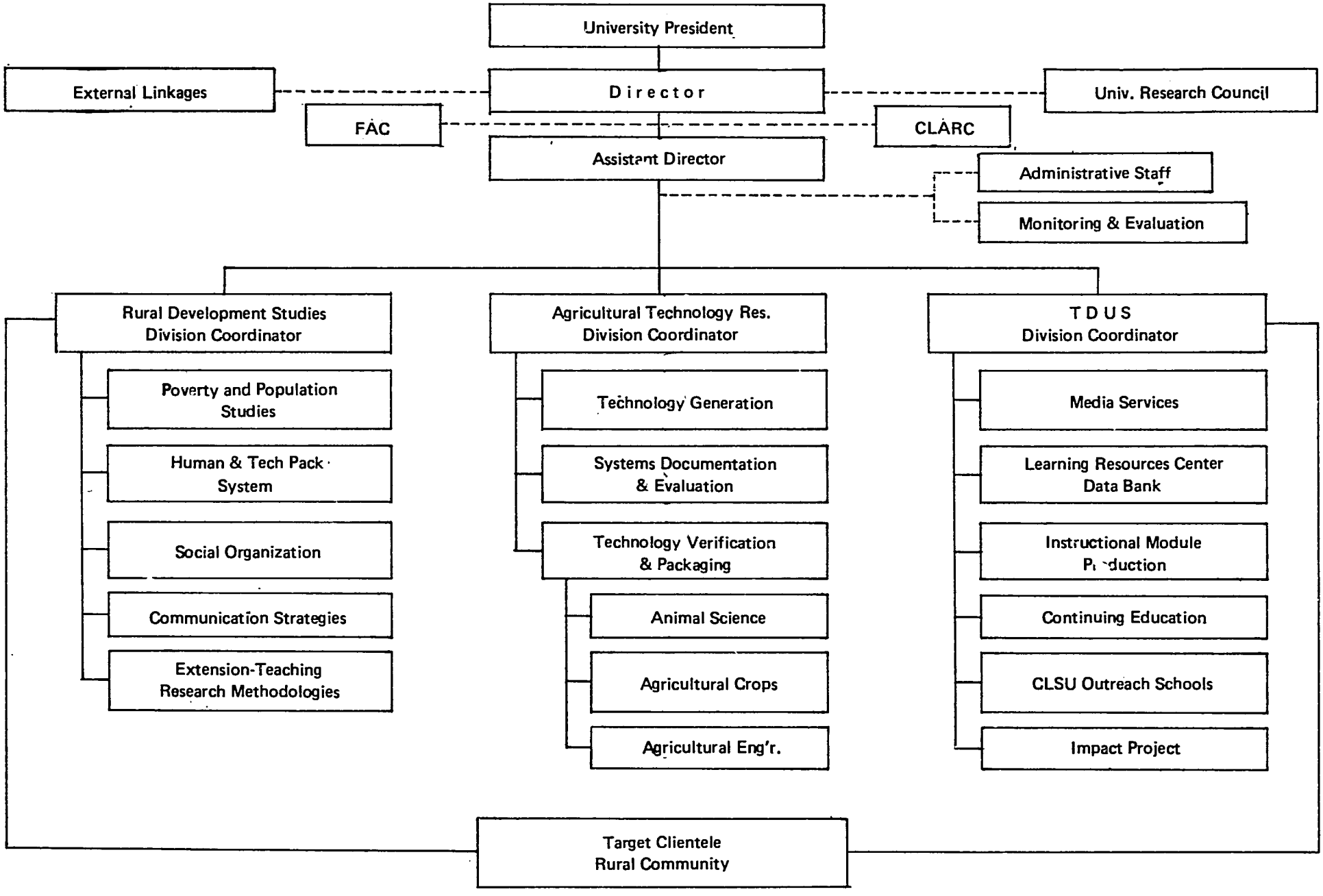


FIGURE 3

RESEARCH AND DEVELOPMENT ORGANIZATIONAL STRUCTURE



A REPORT OF THE OPERATION OF THE CLSU INTEGRATED MODEL FARM FOR THE FARM YEAR 1980-1981 1/

I. BACKGROUND:

The CLSU Integrated farm, initially known as CLSU Model Farm was designed under the supervision of Mr. Francisco Carbonel in 1977. His one-hectare farm in Muñoz was used as the pattern for the development of this frequently dubbed "Farm of the Future". It started as a pure crop and fish farm listed under leasehold system in 1978. CLSU has managed it since 1979 with the integration of livestock and poultry to the initial intensive cropping system.

This report covers the third year of operation from June 16, 1980 to June 15, 1981 with the farm operated and managed under paid labor.

II. FARM DEVELOPMENT AND DESCRIPTION

The farm is a one-hectare area developed to include a farm house and stockroom made of bricks, a shallow-well pump system with water storage tank, two fish nursery ponds, two fish breeding ponds, four rice-fish/taro paddies and several elevated beds. The rice-fish paddies with peripheral trenches to serve as refuge for fish *(Tilapia nilotica,* as a replacement from the former Zilli variety) are about one meter wide and one-half meter deep. The elevated dikes or beds surrounding the ponds and the paddies are about 3 to 4 meters wide. The main dikes serve as underground channel for distributing the pumped irrigation water from a shallow well, and convenient outlets and control structure were provided at strategic locations so that irrigation water can be conveyed to the whole farm units as well as to the raised beds without difficulty. Adequate drainage outlets were also installed.

One swine house and two poultry houses covering an area of 4.21 sq m and 7.14 sq m respectively made of bamboo and lumber, and galvanized iron were constructed over the fish pond and were not competitive to the use of the land.

The total cost for the initial development of the farm was P57,479.21 or 5.75 per square meter and P45,764.81 or 4 58 per square meter with and without the farm house, respectively. Table 1 shows the breakdown of development *cost.*

Table 1. BREAKDOWN OF DEVELOPMENT COST OF THE FARM

ITEM	WITH FARM HOUSE		WITHOUT FARM HOUSE	
	Amount	Percent of Total Cost	Amount	Percent of Total Cost
1. Land Forming and Development				
Direct materials	P21,445.46	37.3	P21,445.46	37.3
Direct labor	13,912.00	24.2	13,912.00	30.4
Sub-total	35,357.46	61.5	35,357.46	77.3
2. Pumping Plant and Water Tanks				
Direct materials	9,687.35	16.9	9,687.35	21.2
Direct labor	720.00	1.2	720.06	1.5
Sub-total	10,407.35	18.1	10,407.35	22.7
3. Farm House				
Sub-total	11,714.40	20.4	–	–
Total Development Cost	57,479.21	100.0	45,764.81	–

1/ Based on the monitoring of the farm operation by the Agricultural Technology Research group composed of E. G. Ignacio (Project In-Charge) E. R. Velacruz under the leadership of Dr. Filomena F. Campos, Director, Research and Development Center, CLSU, Muñoz, Nueva Ecija.

Initial calculation (Tabago) indicated that the Model Farm operation can be made feasible with a minimum net annual income of P7,550.00 and P6,100.00 with and without the farm house respectively.

III. LAND UTILIZATION AND CROPPING PATTERN

Multiple cropping and intercropping are being practiced in the farm. A total of 38 commodities were grown with rice, fish, gabi, broilers, ducks and swine as the main produce. Cabbage, cadios, condol, gourd, patani, patola, peanut, radish, garlic, bushbeans, mustard, watermelon, Baguio beans and jute are the crops added to the previous year cropping pattern. A maximum of 35 commodities were grown simultaneously in November while a minimum of 18 commodities were cultivated in May. Amargoso, batao, banana, camote, cadios, eggplant, malunggay, pechay, rice, squash, taro/gabi, tomato, calamansi and papaya are year-round crops. Areas near the pump, around the fish pond and trench are also utilized. The fences were used as trellis for vine crops like squash and amargoso.

Swine, broilers and ducks are maintained throughout the year and replacement stocks are made available after every disposal.

IV. SEASONAL DISTRIBUTION OF COMMODITY SALES

Farm diversification provides a steady flow of income for the family and helps meet the day to day living requirements that will not be hampered by the seasonal nature of the crop.

The average monthly sales for the whole farm was P2,715.13. The average monthly sales for poultry/swine and fish was P1,562.21 and for various crops was P1,152.92. The gross income of the farm was relatively variable in the 12-month period ranging from P498.70 in September to P6,693.65 in December.

Broiler contributed 34.49 percent of the total gross sales, rice 18.82 percent, swine 16.56 percent, taro/gabi 9.87 percent and tilapia 6.20 percent. Other commodities contributed two percent to less than one percent of the total crop sales.

V. FARM AND ENTERPRISES INCOME

The individual sales of the different commodities in the CLSU Integrated Farm have increased over previous levels. The total sales of the farm produce amounted to P32,581.55 registering an increase of P12,767 over the previous year P19,814.30.

Of the total sales, livestock, poultry and fish contributed the greatest amount of P18,746 followed by crops P13,817.75 and mushroom P17.25.

There was P9,241.15 increase in the sales of crops and P3,516.10 increase in the sales of livestock, poultry and fish as compared to last year's annual sales.

VI. FARM AND ENTERPRISE EXPENSES

Cash Expenses. The labor expenses, including paid and family labor amounted to P9,645.00 with an increase of P1,166.50 as of last year's labor expenses. This was incurred as a result of increased wage rate of the laborers. The restoration of the farm to its normal operation after the destruction of typhoon "Aring" caused a considerable increase in the total crop production cost to P14,153.12, an increase of P2,465.35 as of last year expenses. Other expenses were incurred as payment for animal and machine fees, crop supplies and materials which included seeds, fertilizers, and insecticides.

The total production cost for livestock and poultry was P10,827.84. Of this amount, P4,006.40 was paid for replacement stocks for broilers, ducks and weanlings, P6,634.44 for feeds, P52.00 for veterinary expenses and P35.00 for light and electricity.

Non-Cash Expenses. The non-cash costs include payment for unpaid family labor, depreciation expenses and interest on capital. Allocation made on these accounts were P8,540.00, P2,440.24 and P6,095.66 respectively.

Total Farm Expenditures. The total farm expenditure was P33,516.86.

VII. SUMMARY OF NET INCOME

The total farm income was P36,744.25 for the total farm sales of P32,581.55 and change in inventory value of P4,162.70 as shown in Table 1.

The total farm expenses amounted to P33,516.86 divided into cash cost of P16,440.96 and non-cash cost of P17,075.90.

The net profit over cash expenses of the farm was P16,140.59, but if expenses on family labor will be excluded (usually in actual farm condition, the farmer's labor was considered as unpaid labor) the net profit over cash expenses was P24,680.59. The net profit over total farm expenses was P3,227.39.

The return to labor and management means that for every one unit of labor placed in the farm, the return will be P1.89 and P0.10 for every P1.00 investment. The greater percentage for the farm expenses goes to payment of family labor (if payment will be given), cost of feed-stuffs and interest on capital, 25.48 percent, 19.79 percent and 18.19 percent, respectively. Greater percentage of income comes from poultry, livestock and fish sales wherein 51.02% of the total income is accounted for, followed by crops sales of 37.60%.

VIII. DEPRECIATION, INTEREST ON CAPITAL AND INVENTORY CHANGE

The depreciation expenses of P2,440.24 and 12% interest on capital of P6,095.66 are taken into account first on this report as compared to the previous report undertaken on the operation of the farm to give a realistic view on the investments placed on the farm amounting to P57,479.21.

Farm inventory change amounted to P4,162.70 an increase of P16,778.50 over the last year's P12,815.80 worth of crops and livestock. Though there is a reduction in the value of standing crops due to the typhoon and livestock because some were already disposed, the planting of early maturing crops like gourd, amargoso and okra increased the value of standing crops by P4,903.00.

The reduction on the value of stored crops especially seeds by P1,800.50 is because most seeds are disposed and what remains are meant for planting materials for the next cropping season.

The increase in the number of broilers and ducks in the CLSU integrated farm increased the inventory change for livestock and poultry by P1,060.20 as compared to last year stocks.

Table 2. INCOME AND EXPENSES SUMMARY OF THE CLSU INTEGRATED FARM

I.	Farm Income		
	A. Cash Income		%
	Crops sales	P13,817.75	37.60
	Poultry, livestock and fish sales	18,746.55	51.02
	Others (Mushroom)	17.25	.05
	Sub-total	P32,581.55	
	B. Non-Cash Income		
	Inventory change		
	Standing crops	4,903.00	13.34
	Crops on hand		
	Crops	– 1,800.50	– 4.90
	Livestock	1,060.20	2.89
	Sub-total	4,162.70	
	TOTAL	36,744.25	
II.	Farm Expenses		
	A. Cash Cost		
	Paid Labor	1,105.00	3.30
	Farm Inputs		
	Animal/Machine fees	2,064.97	6.16
	Seeds	570.85	1.70
	Fertilizers	1,108.50	3.31
	Insecticides	763.80	2.28
	Replacement Stock	4,006.40	11.95
	Feed stuff	6,634.44	19.79
	Veterinary Expenses	52.00	.16
	Light and heat	135.00	.40
	Sub-total	P16,440.96	
	B. Non-Cash		
	Family labor	8,540.00	25.48
	Depreciation	2,440.24	7.28
	Interest on capital	6,095.66	18.19
	Sub-total	P17,075.90	
	TOTAL	33,516.86	100%

III.	Net Profit		
	A. Net cash profit (over cash costs)	P 16,140.59	
	B. Net cash profit (excluding family labor)	24,680.59	
	C. Net profit (over total cost)	3,227.39	
IV.	Return to Labor and Management =	1.89	
	Net return over cash cost	P 16,140.59	= 1.89
	Unpaid family labor cost	8,540.00	
V.	Return to Investment =	0.10	
	Net revenue	3,227.39	= .10
	Investment cost	33,516.86	

CROPPING SYSTEM APPROACH IN CAPIZ SETTLEMENT AREA

H.C. Jereza, E.G. Paraico and S.P. Aquino[1/]

1. Introduction

The concept of integrated approach for area development especially on agricultural productivity has been the focus of attention by national and local planners. In recent years, several integrated agricultural programs were given emphasis and carried out in the different regions of the country. This aims to increase total production and improve farmers' economic condition by (a) multiple cropping and (b) increasing the yield of each crop.

The Agricultural Service Center of the Capiz Settlement Project adopted some basic operational steps in achieving its goal. These steps are so designed in order to derive a certain output that is used as input to the subsequent steps. These include (1) formulation of objectives for agricultural development, (2) establishment of agricultural crop production targets, (3) identification of development strategies, and (4) assessment of area-wise agricultural development potentials.

One of the main development strategies of this approach is to rationalize spatial cropping pattern in the light of physical and economic conditions of the area so as to maximize total agricultural production, thereby raising the income level of farmers. To strengthen its effectiveness, it includes: (a) provision of basic infrastructure such as irrigation, farm to market roads, power, etc. (b) strengthening of institutional arrangement for credit, marketing, supply of farm inputs, and (c) improvement of research, extension and training services.

2. The Project Area

The Capiz Settlement Project is a project component of the Second Rural Development – Land Settlement Project launched under the bilateral agreement of the Philippine Government and the International Bank for Reconstruction and Development (IBRD) in 1977. It is one of the three sites included in the project to give primary emphasis to the development of rainfed agriculture in a mixed upland-lowland terrain. The Capiz Settlement Project covers a total land area of 25,000 hectares of which 10,000 ha are cultivated. The total population is 4,600 families, roughly 25,000 people. The topography of the area is generally upland ranging from mountainous and rolling to relatively flat land.

The vegetation comprises some forest on the upper slopes, grasses and cultivated crops while cogon grass is extensive and predominantly growing in the area. Rainfall received is heavy (2,400 mm per annum) with a three-month relatively dry period in February-April, only 10% of the rainfall in this period of the year. Soil survey conducted in the area shows that only 11,000 ha are classified as suited for crop development and the rest of the land requires good soil conservation practices.

Benchmark information also shows that the average farm size is 2.8 ha while the dominant cropping pattern is rice followed by rice, corn-fallow and sugarcane. Area planted to upland and lowland rice is 7,000 ha while sugarcane and corn total 1,200 and 1,000 ha respectively.

3. Agricultural Development Targets of the ASC

The ASC aims to:

1. increase production of rainfed lowland rice from an average of 1.5 to 3.5 tons per hectare;
2. increase the present average yield of upland rice from 0.75 to 2.5 tons per hectare;
3. convert from subsistence crops to cash crop farming by expansion of land devoted to cash crop, specifically sugarcane, and by improving production from 32 to 60 tons per hectare;
4. increase areas planted to plantation crops and forest trees; and
5. improve the production of secondary food crops such as corn, peanuts, root crops, perennial crops like citrus, coconut, coffee and other fruit trees.

1/ ASC Director, Agricultural Economist, and Research Coordinator, respectively, Agricultural Service Center, Astorga, Dumarao, Capiz 1981.

4. Organizational Framework

The Center, headed by the Director, is divided into three major components, namely: the Research, Extension and Training Units. The ASC serves as headquarters where field staff are technically and materially supported. The Ministry of Agriculture, through the National Food and Agriculture Council (NFAC), takes overall responsibility for the staffing and technical competence of the ASC.

4.1. Research Unit

The Research Unit adopts a multidisciplinary approach to its development research program. This approach is significantly applicable in cropping systems research where the Center hopes to develop an acceptable and profitable farm package of technology. The multidisciplinary team of workers are composed of a research coordinator, an economist, an agronomist and a crop protection specialist.

4.2. Extension Unit

The Agricultural Extension Unit is headed by a Senior Agricultural Extension Officer who has overall responsibility for the extension system at the settlement. His technical staff is composed of one plantation crop specialist and one extension supervisor for each 7-8 Farm Management Technicians (FMTs). To significantly increase the effectiveness and multiplier effect of the FMTs, a network of barrio-level farmer-counselors are continually developed and utilized.

4.3. Training Unit

Recognizing the fact that the farmers have little or no exposure to new and improved agricultural technology, farmer training in the project site is institutionalized, closely integrated with, and complimentary to the agricultural extension efforts of the ASC. Headed by a Senior Training Officer with experience in agricultural training and administration, the Training Unit is composed of a core of training staff to include (1) Agricultural Training Specialist, on general training, field training support and training in health, nutrition, home economics and related subjects; and (2) Training Assistants.

5. Approaches in the Development of Cropping Systems Methodology

5.1. Site Selection

The selection of the Capiz Settlement as a primary area for development is in line with the program of the national government through the Ministry of Agrarian Reform to extend basic agrarian reform services. These services include infrastructure development, social services and, agricultural development that considers the potential for increased production, cropping intensity, adequate marketing system and extension service available to the area.

5.2. Identification of Development Priorities

Aside from the assessment of agricultural development potentials made by the World Bank team during the early project preparation of the settlement, NFAC, through the assistance of the International Rice Research Institute (IRRI), conducted an agro-economic survey with the purpose of documenting on-farm resource availability to include information on farm resource levels, present cropping patterns, profitability of enterprises, and benchmark welfare variables (Price, 1977).

An inventory of relevant bio-physical profile was also gathered to form the basis for the Center's cropping systems development. And periodically, the ASC, through its multidisciplinary workers, conducts economic and sociological research with respect to production, utilization and marketing of all crops considered for development.

6. Technology Generation Approach

Initially, the ASC conducts research managed trials at its experiment farm and on farmers' field. Trials are conducted in order to provide answers for variety needs, pest management, tillage practices, fertilizer requirements, spacing, planting methods, etcetera. Although information on these could be obtained from various sources or through the general recommendations issued by the Ministry of Agriculture or any other related agencies, these tests in the project site are necessary to further verify if new technologies are area-responsive. IRRI and UPLB are also involved in some adaptive trials in the settlement.

The multidisciplinary team of the ASC is headed by the Research Coordinator whose function is to coordinate the activities of the various research components and is responsible for the effective implementation of researches.

7. Technology Verification Approach

After identifying the technology in the experimental farm, the ASC proceeds to conduct adaptive or verification trials in the farmers field to further streamline the component technology or the cropping systems technology. This is also done to test if it suits the farm environment of the farming locality. In these trials, the center gives the necessary material inputs while the farmer provides the labor.

To ensure that the various cultural operations are carried out, participating farmers are closely supervised by researchers. As part of the activity, agro-economic data are gathered and evaluated in order to be able to determine whether or not the technologies tested could be transferred to our extension personnel and eventually to our farmers.

Component technologies in this phase of the work is continually fitted against the existing farmers' systems. This is done to produce results which are not only technically feasible and profitable but also socially acceptable to the farmers. This means that one factor to consider in order to motivate the farmers to shift to new and unfamiliar farming technology is the highly significant productive advantage of the new technology over the others.

The Extension Unit of the ASC is also involved in verification trials. Trials are established in 27 barangays of the settlement project and problems observed in the area are echoed back to the researchers for serious consideration. Establishing demonstration trials in the different parts of the settlement is one of the effective ways of disseminating new technology.

8. Cropping Pattern Testing

In the initial phase of the project, the existing predominant cropping pattern in the settlement area were identified as well as the 20 years average rainfall data. These existing conditions were the basis in the design of cropping patterns tested and evaluated in farmer's fields during the crop year 1979-80. However, only eight of the ten originally tested cropping patterns were selected for further testing in the crop year 1980-81. The selection of these eight cropping patterns were based on their favorable performance. These practices were derived from the results of the applied research trials conducted in crop year 1979-80. Of the eight cropping patterns tested and evaluated for crop year 1980-81, only three were identified for adoption. These cropping patterns will be used in the pilot production which will start in crop year 1981-82. The component technology and methods will be essentially those used in the crop year 1980-81 cropping pattern testing.

9. Technology Extension Approaches

The last phase to consider in the development of a package of technology is the dissemination of the results to the farmers. An improved technology is relayed by the ASC extension workers through farmers classes, farm and home visits and the demonstration farms established by them in every barangay of the settlement. The demonstration farm of the extension personnel follow the on-farm package of technology designed by the research unit. Considering the fact that the new technology is not simple, the Training Unit of the ASC conducts training for the farmer-settlers in coordination with the research unit. Farmers are trained on all aspects of the package of technology from land preparation to harvest and processing.

Furthermore, recognizing the fact that introducing a new farming system requires additional inputs, money and improved market structure, strong linkages are adopted with some participating agencies like the Rural Bank of Capiz Settlement, Bureau of Cooperatives Development, Ministry of Agrarian Reform and Ministry of Public Highways. This is where the essence of a total integrated approach for rural and agricultural development comes in.

As part of the strategy for effective dissemination of improved technology to the farmers, the ASC utilizes the existing farmers association as channel of information to its members. The Cooperative Development Unit of the project develops the Samahang Nayon's capability to channel credit, utilize modern technology, provide marketing outlets and farm capital. Also, in support to the program, the Capiz Settlers Cooperative Rural Bank helps to finance the additional expenses brought about by the new technology. Farmers who are eligible for the loan prepare a farm plan and budget with the aid of the technician. The farmers are encouraged to agree to follow the recommended practices and to pay the loan from proceeds from his crop.

It is also a basic concern of the ASC to come up into an integrated system conducive to effective participation of individual farmers into the process of development. For example, to effectively facilitate mutual communication among project personnel, extension workers and individual farmers, ASC has recognized the following (1) the need for standardization of farming technology in accordance with local conditions; (2) the need for preparation of a manual to be used as work guidelines for personnel concerned with the program; and (3) the need for preparation of a practical farming manual that can be understood even by illiterate farmers.

Through the general training program of the Training Unit, selected farmers with leadership potentials have been trained on new technologies to serve as agricultural counselors, complementing and reinforcing the technical inputs provided by the FMTs by furnishing local knowledge, experience and acceptance.

To date, the ASC is still in the process of finalizing plans for input distribution and marketing arrangements. The ASC recognizes the seriousness of lack of farm input in the area. The Center hopes to utilize the existing Samahang Nayon in performing some of these functions. Furthermore, the presence of a National Food Authority buying station in the project site has partly solved the problem.

10. Pilot Barangay Production Program

After two years of implementation, the ASC has come out with a production-oriented program for pilot barangays. This involves the testing of recommended cropping systems on a larger scale by the extension unit with the full support of the research and training units. Initially, the ASC has identified four pilot barangays in which the plan will be implemented before going full scale to the rest of the settlement in the late part of this year.

As a starting point, the identified major crop in the barangay will be planted by ten selected cooperators provided with credit with the close supervision of the FMT assigned in the pilot barangay.

11. Accomplishment of the ASC

It can not be overlooked that the establishment of the Agricultural Service Center in the Settlement area has indeed brought changes to the economic condition of the settlers. Comparing production of rice before the project started, there was a registered increase in yield of 53.3 percent from 1977 to 1980 or an improvement in production of lowland rice from 1.5 to 2.3 tons per hectare. Although no significant increase in yield for corn was registered, continuous extension efforts have led to the motivation of the farmers to plant corn twice a year. Also, the area planted to corn has increased.

As of now, the Settlement has an estimated marketable surplus of 95,000 and 13,000 cavans of palay and corn, respectively per year. Of the total volume, the bulk of palay and corn is sold to Iloilo City and a significant volume also reach Negros Occidental. Although agricultural trading is still largely controlled by middlemen, the National Food Authority's total procurement made during the first season was 3,200 cavans, roughly valued at P204,800.00.

Some factors credited for this success were the introduction of improved varieties in the settlers' farm as well as the availability of farm inputs to the remote barangays brought about by the continuous building of barangay roads. We recall that in the early period of the project, most of the settlers were still planting one crop of rice a year and using local varieties of rice.

Through the efforts of the extension unit, farmers associations were organized for every barangay in the settlement. These serve as an effective training ground in formal organization and self-government. Also, the periodic farmer's class has increased the farmer's awareness about his environment and full understanding of the crop.

12. Constraints of Implementation

Although the Capiz Settlement Project has achieved some significant contributions to self-sufficiency of the area especially in rice production, some drawbacks still threaten the accomplishments made. Some of the important problems encountered were: mobility of extension workers, low repayment of loans, weak marketing of farm input.

12.1. Mobility of extension workers. Due to inadequate public transport plying the route inside the settlement, extension workers sometimes have difficulty in supervising some of the settlers. Not all production technicians were able to avail themselves of the motorcycles provided by the project.

12.2. Low repayment of loans. Many of the farmers who have agricultural production loans were not able to repay. The primary reason cited by farmers was the low buying price of palay after harvest especially during the first crop. This forced them to divert the money intended for repayment to family needs. The farmers are still frequently forced to sell their product at prices significantly below the support price because of previous debt obligations, their inaccessibility to NFA procurement teams or below standard quality of the crops to NFA specifications.

Difficulty in obtaining and late releases of loans discouraged many of the farmers and rendered the recommendations useless due to late application of inputs.

12.3. Weak marketing of farm inputs. Farm inputs are not adequately extended to the farmers by the dealer operating inside the settlement area. As a result, most of the farmers have to buy their inputs in Iloilo and Roxas cities with an average distance of 85 kilometers. This difficulty has significantly reduced the effectiveness of production technicians to convince farmers to follow the new technology.

SOME APPROACHES IN IRRIGATION-BASED FARMING SYSTEMS: THE FSDC EXPERIENCE[1/]

It is both an honor and a privilege to be a participant to this mutual sharing of experiences and ideas along the area of farming systems development.

We emphasize the word "mutual" because we are here as much to learn from the expected fruitful discussion as we are happy to share our own modest contribution to the continuing effort to develop optimum impact farming systems.

A review of FSDC's programs and strategies will serve to provide an idea on why, how we operate and what we have and hope to achieve.

The Farm Systems Development Corporation and the BISA Program

The FSDC was organized by virtue of PD 681 on April 4, 1975 with the Barangay Irrigators' Service Association or BISA Program as its major springboard towards the establishment and development of efficient farming systems.

Under its farm systems concept framework, the program seeks to develop optimum sets of farm enterprises whereby limited land and water resources are tapped and organized by the farmer to give the highest possible output.

Two essential strategies are implemented in pursuit of the above objectives namely:

A. **Irrigation Development** — where farmers are organized into irrigation based groupings called Irrigators' Service Associations or ISAs. With this, we provide the "mutual responsibility" element essential to cohesiveness and cooperation since irrigation systems are built, owned, managed and operated by the farmers themselves. This component covers the construction of small-scale irrigation systems consisting of Pump Irrigation Projects (PIPs), Communal Gravity Irrigation Projects (CIPs) which include those jointly established with NIA, and Water Impounding Projects (WIPs).

   To date, 586 pumpsets have been installed and are serving some 60,298 hectares in 68 provinces.

   With irrigation already established and providing the essential requirement upon which production activities depend, we have implemented a production tools and equipment scheme which has brought to the farmers the technology needed for increased farm production. This is carried out thru our *Adaptive Farm Technology Development Strategy.*

   Presently, this component provides for the farm tools and equipment needs of 152 ISAs and through which, again, mutual ownership through pooling has ensured the equitable use and distribution of these needed farm implements.

   Also part of this scheme is the introduction of innovative farm practices which are either developed by farmers themselves or borrowed and modified to suit existing farm conditions. Extensively, we have used this strategy as a venue for technology generation/modification, verification and dissemination.

B. **Institutional Development** — This is basic to FSDC's development approach and aims for the rural clientele to have direct and conscious involvement in project identification, planning, implementation and evaluation. It is premised on the fact that people and not programs or organizations are the main agents of development.

   Continuing education through training and skills development are carried out by our front line personnel. The Institutional Officers to ensure that specific projects respond to felt needs and that farmer beneficiaries' sense of involvement is sustained. This component virtually serves as the program's backbone considering that it caters to behavior and attitudinal needs of the program. To date, 1449 ISAs representing 73,826 farmers have been organized on 195,589 hectares nationwide.

Reduced Productivity Gap

Integrating all the activities and schemes under each component to arrive at the right balance is no easy task as other agencies will tell you. Indeed, we have had our share of problems but generally, our efforts to date have served to reduce the gap between low and desirable productivity to the extent that it has provided some degree of uniformity and stability to these associations' limited resource base besides opening a wider range of cropping/farm enterprise possibilities. As a result:

1/ Presented by Pedro Coronado, Project Officer, Farm Systems Developing Corporation (FSDC).

- 69.5% and 78.4% of the ISA farmers are now adequately and timely served with irrigation water during the dry and wet season, respectively. This is higher, at 84.2% and 80.95%, dry and wet season, respectively where innovation packages exist.
- Cropping intensity has improved at an average of 1.51 for ISAs with "irrigation" and 1.7 for ISAs with innovation packages projects.
- Average palay production has increased from a per hectare yield prior to irrigation of 1.87 m.t. and 2.15 m.t. dry and wet season, respectively, to 2.64 m.t. and 3.0 m.t. during the dry and wet season, respectively.
- Farmers are now more willing to try our recommended practices.
- Farm profitability has improved gross farm income. At an average of P2,625.13 (P3,263.60 where innovation packages exist) or an average net income of P646.52 per hectare (P964.19 with innovation packages projects).

FSDC's Expanded Thrusts

Full, even part attainment of each set objective oftentimes presents new areas and problems requiring renewed efforts and/or added resource inputs.

Recognizing this, PD 681 was amended by PD 1595 on June 11, 1978 expanding its program coverage to other rural based associations and commodities and setting as its urgent concern for the decade the establishment of irrigation-based farming systems, especially in the more technically, financially viable ISAs.

Whereas in the past, plans were of necessity built around rice-based irrigation projects, the expanded scope signals a shift to diversified crop-livestock-other farm enterprises programs which include among others, Mountainside Development, Tree Farming Project (Agro-forest development), Cotton-rice Systems and the Farm Systems Optimization Model Project which is envisioned to eventually serve future planning needs of our farming systems development objectives.

Current Projects

- Mountainside Development

  This farming system project is currently being piloted in Arayat, Pampanga and comprises hectares and involving some farmers. Others are being planned for Tarlac, Bicol and eventually in other regions. The Pampanga Model is an integration of cropping, fisheries and agroforest projects which incorporate a range of production, water impounding, institutional, technical, ecological and conservation management modules aimed at developing farm systems in otherwise unused or unproductive hilly or mountainous areas.

  Various crops as vegetables, peanuts, corn, etc. have been tried and initial harvests have been reported encouraging both in terms of income and general improvement in the production area. The project system as a whole is presently being evaluated as to productivity, socio-economic impact and potential model for systems of its kind.

- Tree Project

  Conceived early this year, this program is an ipil-ipil tree based system which will be implemented this quarter in coordination with BFD.

  While essentially established for dendrothermal purposes, agro-forestry systems which will see the interplanting of agricultural crops in between trees will be developed to provide income for cooperators during the trees' growing period.

  The project will be implemented over a 3-year period on a 100-hectare site.. At the first year, 33 hectares will be planted, followed by another 33 hectares in the second quarter and finally the remaining 34 hectares in the 3rd year. This is to ensure continuous harvest of ipil-ipil. It will be implemented in 7 regions for a total of 700 hectares. Already funds amounting to P1.6 M have been approved for the project's 1st year operation.

  FSDC will fund 90% of the initial 3-year project cost with 10% as the farmer cooperators equity to consist of cash, labor or materials. Eventually, it is envisioned that sub-products as feeds, charcoal making, lumber, etc. will evolve and contribute to the enhancement of the socio-economic potential of the system.

  Provision for market is assured with expected yield to be absorbed by the requirements of gas producer plant projects which will be set up in the regions in addition to potential market outlets.

In both farming system projects, the usual strategies of organization, adaptive technology and water resource development will be carried out. In sites where there exist communities, cooperators will be chosen to manage and undertake the various activities required. In the absence of communities, cooperators will be taken from ISAs nearest the project site to oversee the project. TREE Project supervisors have been hired and are now being trained prior to assignment to regions where identified sites are to be developed.

- Rice-Cotton-Other Crops Farming

This is a project being undertaken in Iloilo under a production tie-up venture with Shell Chemicals Corporation. It is a joint undertaking with Shell providing production financing for cotton culture along with rice areas.

This involves a total of 32.50 hectares representing four ISAs and 69 farmer members. Its 1979-1980 output had been profitable giving an average per farmer net income of P1,594.06.

- More than any other farm systems development project which FSDC launched, none is perhaps more awaited and given much attention as its:

Farm Systems Optimization Model (FSOM)

FSOM was conceived for want of efficient and reliable tools that would enable planners to study the interdependence of the elements of a given farm system.

FSDC's approach to hasten rural development as embodied in the farm systems concept aims to attain the level of production that can remedy existing deficiencies and ensure sufficient food supply and higher income for the rural population through the development of irrigation-based farming systems. Planners, however, are wanting in tools that would enable them to study the interdependence of the components of a farm system.

The Farming Systems Optimization Model was envisioned to develop a computer programming model which shall respond to the need of Irrigators Service Associations (ISAs) for a planning tool in determining the optimum mix of farm-based enterprises which could yield for them the maximum income. The operating model identifies and quantifies the linkages among crops, livestock, poultry, fishery and other possible enterprises in irrigation-based farming systems. Being applied to suit particular site conditions, the model determines the allocation of resources to such enterprises and develop optimum farm plans for irrigated croplands under varying constraints. As a planning tool, the model provides necessary inputs for the recommended farming systems such as the total area devoted to crops per cropping season, the number of heads of livestock and poultry, the volume of fish production and the marketing system for a particular ISA in a given set of conditions.

A. **Model Development**

The model was developed by modules. Each module has undergone the process of conceptualization, formulation, testing and reformulation until finalized. These modules are:

1. *Biological Feasibility Analysis Module* which determines the list of feasible crops which can grow in a planning area given certain agro-climatic conditions.
2. *Water Management Module* which determines the water requirement of each of the crops in a given area. The water requirement of each crop/crop combination for each month of the year are then compared with available water, based on rainfall, pump capacity and water-source discharge.
3. *Crop-Livestock-Poultry-Fish Production Module.* This integrating module utilizes a linear programming model that determines the optimal mix of enterprises given resource constraints and variability of yields and prices. This module is composed of the following sub-modules:
   a. *Cropping Systems Sub-Module* determines the optimum combination of crops to be planted in succession or simultaneously and which yields the maximum income.
   b. *Livestock/Poultry Production Module* determines the optimum combination of crops to be planted in succession or simultaneously and which yields the maximum income.
   c. *Fish-Production Module* determines the feasible level of fish production that will assure availability of a more balanced food resource for farming systems and nearby communities as well.
4. *Market Feasibility Analysis Module* determines the market potentials of the commodities which compose the optimum mix of enterprise for the farm system.

The input-output data collected/generated for the different production sub-modules, the water requirements and available resources are then integrated into a linear programming tableau. The tableau is in effect the ISA model since it incorporates the production matrix for crops, livestock, poultry and fish; the cost of buying input matrix; the revenue or selling output matrix and the resource constraints. A computer program is then utilized in obtaining the OPTIMUM FARM PLAN.

B. **Piloting the Model** — Implementation of the model will involve two phases. Phase I will underscore the testing of the recommended technologies for three cropping seasons during one crop year among selected farmer-cooperators. Phase II implementation will entail the piloting of the Optimum Farm Plan at the ISA level, also for one crop year.

The recommended technologies under the various Optimum Farm Plan are now being tested in several pilot ISAs. Included in the testing are cropping patterns and systems developed to suit the existing ISA conditions. These patterns are rice-rice-rice, rice-rice-upland crops, rice-upland crop-upland crop, and rice-fish-rice-fish-upland crop.

In conclusion, the optimal utilization of resources in a farm system can cause a significant improvement in the lives of farmers concerned, as the FSDC experience and those of other agencies have shown. If we are to achieve significant strides in our national development efforts, clearly the task ahead is the integrated development of a significant number of farm systems.

Setting the direction and priorities in determining approaches to the development of the farm systems needs careful study and analysis. Some development policies which researches might respond to or which can provide a guide for subsequent activities are:

1.0 Developing cropping systems that are within the capacities of soil to nourish and sustain; cropping patterns like crop rotation, multiple cropping, relay-cropping, and other patterns and schemes designed to maximize economic return per unit area;

2.0 Developing a scheme for vertical and horizontal integration of farm production. This involves raw product utilization either as raw materials or semi-processed products for industrial use or finished consumer products; and

3.0 Developing a strategy that will develop further or enhance the productive skills of the farmers such as their managerial and entrepreneurial capabilities.

INTEGRATED RURAL AND AGRICULTURAL DEVELOPMENT (IRAD) PROGRAM[1/]
College, Laguna

Summary Of Findings

A partial analysis of the 1979 conditions compared with the past (1975) shows the extent to which the program's objectives were met. A comparison between those who did not participate in the program and those who had a high degree of involvement (cooperators) was made. This analysis by quantitative measures even if very rough, include some socioeconomic returns from the development efforts.

Program Impact

1. **Income**

Income as used in this sense, means the disposal of the total net income from salaries, wages, self-employment or from production either in crops, livestock, fishing or related activities.

The results indicated that rural families derived their income mostly from agriculture, particularly by the farm-cum-farm labor families.

An analysis of income distribution among households in 1975 revealed the level of income to be very low (P3,166). Of the 50 non-cooperator-respondents, 26% belong to the 1,500-1,999 income level. However, there was a 156% increase in income within the four-year period, with an average income of P7,943 in 1979.

Among the cooperators, the average annual income was P4,098 in 1975 but a very big increase was noted in 1979. The average annual income of P14,010 is about 243% increase from the 1975 data.

2. **Employment**

Another significant finding which emerged was that there were more jobs held by cooperator-family members than the non-cooperators. A significantly higher percentage of the cooperator-household members was employed in white collar jobs than in 1975.

3. **Household Possession**

Cooperator-families were able to acquire more consumer durables than non-cooperators. Many acquired additional electrical appliances such as electric iron, electric stove, etc.

4. **Education and Learning**

Comparative analysis of the number of years of schooling among cooperator and non-cooperator-family members shows that the average number of schooling of cooperator family members was 7.74 (equivalent to first year high school) but was increased slightly to 8.07 (second year high school equivalent) in 1979. Moreover, the number of family members who were enrolled in college had increased over that of the figure in 1975.

Among the non-cooperators, the average number of years in schooling for both 1975 and 1979 was 6.6 (Grade VI equivalent). An average of 3.85 percent went to college in 1975 but this was increased to 7.77 in 1979. This indicates therefore that not much change occured among this group.

5. **Nutritional status**

Results of the height/weight measure in 1975 revealed that 78.82% of the 8,215 preschool children weighed were suffering from malnutrition. However, there was a slight decrease in the levels of nutrition in 1979, from 3.62% to 2.96% of severely malnourished, from 25.02 to 21.26 in the 2nd degree and from 50.18% to 46.78% in the first degree.

The changes may be attributed to the changes in the consumption pattern of families. More families included in their meals more nutritious and calorie-giving foods. There were more vegetables, vitamin C-rich foods, eggs, meat and poultry.

6. **Housing**

Not much changes in home ownership as well as type of housing have been significantly noted among the cooperators and non-cooperators. Housing is one indicator which has long term realization and may not be noted greatly within a program's gestation period of five years.

1/ Presented by Dr. Ramon L. Nasol, Executive Director, Center for Policy and Development Studies, UPLB.

7. **Community participation**

The terminal survey revealed that the cooperators were more concerned with economic endeavors than the non-cooperators. There were shifts in the type of organizational membership for the cooperators. A majority of them have joined economic organizations rather than social organizations and more family members have joined certain organizations.

Program Effects

Crop Production

1. **Coconut production**

Production data on this crop revealed slight increases in yield. Compared with the 1975 data there was an increase of 63 percent in average yield, from 33 nuts per tree per year to 48 nuts per tree per year (see Table 1).

Table 1. AVERAGE ANNUAL COCONUT PRODUCTION PER TREE, PER YEAR BY MUNICIPALITIES, 1979

Municipality	Annual Production			
	1975		1979	
	No. of trees	Nut harvest per tree	No. of trees	Nut harvest per tree
Pagbilao	6,400	40	6,064	38
Padre Burgos	4,340	31	8,134	58
Unisan	4,123	31	6,624	50
Agdangan	3,600	30	5,672	47
Average	4,616	33	6,623	48

2. **Rice production**

Similarly, there was a moderate increase of rice harvest in the program area. The benchmark data indicated an average yield of 35.4 cavans per hectare per season. However, this was increased to 47.3 cavans or 34% increase in 1979. Seventy-seven percent of all rice farmer-respondents had an average rice yield below fifty cavans. Ten percent of the respondents harvested more than 100 cavans in one season.

There could have been a greater increase had all the farmers been motivated to adopt new rice farming technology but many factors contributed to non-adoption particularly the tenure status, topography of the place, absence of irrigation water, credit, etc.

3. **Other crops**

Vegetables, rootcrops and feedgrains were the minor crops planted in the area. The accumulated area devoted to this crop was 8.9 hectares with an equivalent value of P8,946 for the produce. However, vegetables such as eggplant, ginger, beans cover 69% of the area devoted to these crops giving an extra annual income of P3,709.

Program Output

The terminal survey figures also indicated some technological improvements which show the adoption by farmers of new practices and inputs to raise yields of crops such as coconut, rice and vegetables. The 1979 survey revealed adoption by farmers of some practices such as fertilization and improved means of copra drying. On vegetable farming, the survey revealed that greater awareness on vegetable production was created. More areas have been planted to those crops.

Requisites of IRAD Implementation

1. The success of a program rests on the political will – the support and commitment of the local leaders in the area. This requirement can be a valuable asset in making IRD programs more effective since development needs an influential person to mobilize resources.

2. People participation is an important ingredient of the development process. This is a process whereby community members come together in identifying problems, mobilize resources and seek solutions among themselves. This also ensures acceptance of the program and encourage group action and efforts towards self-improvement.

3. The many critical observations on the IRAD's administrative and management machinery reveal that the administrative deficiencies are many and varied. Structural and organizational management manifested numerous forms of difficulties during program execution. Such problems of supervision, coordination and linkages implied the need for a well-defined organizational arrangements to ensure efficient program implementation. This arrangement allow central direction and control and decentralized execution of activities.

4. Planning is generally accepted as an essential process for developing programs and activities for social and economic development of the area. This process should be done with all agencies concerned as well as with the intended beneficiaries.

5. Policy support to development is a must. Experiences in IRAD indicated some problems in pricing and marketing of produce. Pricing and marketing policies have a substantial bearing on the performance of agricultural projects. These are indicative of a need for policies in support of development goals.

6. The IRAD experience implied a need for significant changes in institutions serving production and consumption. It was found in the project implementation that the structural set-up was a constraint. This refers particularly to the landlord-tenant relationship, sharing arrangements and land-use rights. Therefore, some social and institutional reforms have to be instituted in order to implement an IRAD program.

FARMING SYSTEMS RESEARCH REVIEWED[1/]

A. Some Determinants of the Farming System

1. Congruence of production and consumption units

In most types of agriculture in the developing countries, there is considerable overlap between the unit of production and the unit of consumption. Therefore the means of livelihood and the household are intimately linked and therefore cannot be separated.

The specific farming system adopted by a given farming household results from its members, with their managerial know-how, allocating the three factors of production (i.e., land, labor and capital) to which they have access, to three processes (crops, livestock and off-farm enterprises) in a manner which, within the knowledge they possess, will maximize the attainment of the goal they are striving for.

2. Determinants of farming system

A farming system is determined by the environment in which the farming family operates. The "total" environment in which it operates can be divided into the technical and human elements.

The technical element reflects what the potential farming system can be and therefore provides the necessary condition for its presence. The technical element can be divided into:

a. Physical factors — water, soil, solar radiation, temperature, etc.
b. Biological factors — crop and animal physiology, disease, insect attack, etc.

The human element has often been neglected in traditional research approaches to development of improved technologies, which accounts for their often being rejected or at least being differentially adopted, thereby resulting in an inequitable distribution of benefits. The human element, providing the sufficient condition for the presence of a farming system, determines what the actual farming system will be.

The human element can be divided into two components or groups of factors: endogenous and exogenous factors.

The exogenous factors are the social milieu in which farming household operates. These are largely out of the control of the individual farming household but will influence what its members are able to do. They can be divided into three broad groups:

a. Community structure, norms and beliefs.
b. External institutions or support systems. This is often provided by government, both on the input (extension, input distribution) and product (direct and indirect intervention) sides.
c. Miscellaneous influences - - location, population density, etc.

On the other hand, endogenous factors - - land, labor and capital, along with management - - which are under the control of the individual farming household, can be used by them to derive a farming system consistent with their goal and subject to the boundary conditions laid down by the technical element and exogenous factors. The endogenous factors can under certain circumstances be complemented and supplemented in quantitative and qualitative terms through the influence of exogenous factors such as capital through a credit program, and management via extension.

B. Objective of, and Development Strategies Used in the Farming Systems Research (FSR) Approach

1. Objective of FSR

The primary aim of the FSR approach is to increase the overall productivity of the farming system and therefore hopefully the welfare of individual farming families - - in the context of the entire range of private and societal goals, given the constraints and potentials imposed by the determinants of the existing farming systems.

2. Developmental strategies

Increased productivity is achieved through two developmental strategies: through the development and dissemination of relevant improved technologies and through influencing the exogenous factors either to create op-

1/ Excerpts from Dr. David Norman's paper on Farming Systems Research Reviewed.

portunities for certain types of improved production systems to be adopted by individual farming families, or to provide conditions conducive to the adoption of technologies already available.

Examples would be:

a. Encouragement of group action on the part of farmers.
b. Influencing necessary adjustments in agricultural policies and actions of farmers contact agencies.

3. Relative emphasis in FSR

To date, work in FSR has been largely confined to developing improved crop technologies while the type of strategy envisioned under the second developmental strategy has as yet not in general been linked to FSR. Therefore, this potential role of FSR still has to be demonstrated to be of practical value, due in part to bureaucratic inflexibility toward the "bottom-up" characteristic of FSR.

C. Defining and Operationalizing FSR

1. Definition of FSR

Research can be considered farming systems research if it has the following characteristics:

a. The farm as a whole is viewed in a comprehensive manner with a recognition of the interdependencies and the interrelationships within the natural and human environment in which the farming system is operated. As such, it is more holistic in orientation than the reductionist approach traditionally used by technical agricultural scientists. The latter approach has involved studying one or two factors at a time while attempting to control all others. The inclusion of the perspective of the whole farm in the research process means that explicit attention is focused on such characteristics as goals, components and constraints of the farming systems that are present.

b. The choice of priorities for research reflects the initial study of the whole farm.

c. The farming system can be broken down into a number of sub-systems which may overlap and interact with one another. It is legitimate to consider research on a subsystem as being FSR provided the connections with other subsystems are recognized and taken into account in the research on the subsystem under consideration.

d. The evaluation of the results and their implementation take the linkages between the subsystem explicitly into account.

2. Operationalizing FSR

The methodological complexities of undertaking FSR can be great because of its systems focus and its "holistic" characteristic. Therefore in practice, in order to operationalize it, advantage is taken of the definitional characteristics of FSR mentioned above. In other words, the concept of the "total" environment is preserved but instead of assuming that all factors determining the actual farming system can be potential variables subject to manipulation, some are treated as parameters. In addition to methodological considerations, the mixture of variables to parameters is determined by the scope of the FSR program and effectiveness of linkages, resources available, etc. Therefore, FSR may be called FSR in the small (i.e., small number of variables to parameters) or FSR in the large (i.e., high ratio of variables to parameters).

3. Types of FSR programs

As well as FSR programs being differentiated on the basis of the ratio of variables to parameters, they can be classified as follows:

a. "Upstraam" types

These are FSR programs which have a developmental orientation and usually do not provide results for immediate adoption by farming families. Perhaps more aptly called resource management research, upstream FSR programs involve using a systems approach to provide prototype solutions on experiment stations to major contraints to crop or agricultural improvement (e.g., watershed management, intercropping, etc.).

b. "Downstream" types

These are FSR programs which have an applied orientation and aim at developing and introducing strategies that will improve the productivity of farming systems for target groups of farming families now and in the short-run. This requires selectively drawing upon available information in the process of designing practices or recommendations for a particular farming system on the basis of an analysis of the constraints of that system. Therefore, recommendations are produced which are suited to a specific local situation. This involves working directly with farmers and as a result reducing to a minimum work in the experiment station.

Both type of FSR programs are important. The relative degree of emphasis on one or the other will depend on the nature of the problem and the research resources available. Upstream type FSR programs are necessary when traditional reductionist research approaches leave a gap in the body of knowledge, and inhibits the ability of downstream FSR to produce appropriate or relevant practical strategies for farming families in the short run. However, the research resources required to undertake upstream FSR programs, with their focus firmly on the needs of specific groups of farming families, have a comparative advantage in being located in national institutions. Therefore, in order to reap a payoff from upstream FSR, the effectiveness of the link between it and downstream FSR programs becomes a critical issue.

D. Characteristics of Downstream FSR

1. Stages of FSR

There are four successive stages in the research process: descriptive, design, testing and extension. The descriptive (diagnostic) stage is undertaken to determine constraints (needs) and flexibility in the current farming system. This provides an input into designing, testing and extending improved strategies, whose potential suitability will be determined by the application of appropriate evaluation criteria ascertained during the descriptive stage.

2. Characteristics of FSR

a. Participation of farmers

The objectives of the farmer are directly incorporated into the research process. The farmer is the central unit in the research process, being directly involved in the description, testing and extension stages. Testing consists of trials at the farm level (i.e., with farmer providing labor) and farmer testing (i.e., with farmer providing both labor and management). Involvement of farmers give them a "voice" in the research process and ensures the use of evaluation criteria relevant to them. For the farming family, evaluation criteria can be divided into the following groups although it should be emphasized that they are not entirely mutually exclusive:

i. Necessary conditions determine whether the farmer would *be able to* adopt the improved practices. Such conditions would include technical feasibility, social acceptability and compatibility with external institutions - - that is, support systems.

ii. Sufficient conditions determine whether the farmer would *be willing to* adopt the improved practices. Obviously, the necessary conditions will be influential in determining this willingness. Sufficient conditions will include compatibility of the improved practices with the goal(s) - - self-sufficiency, profit maximization, etc. - - of the farming family and the farming system they currently practice.

b. Incorporation of community and societal goals.

Efforts are made to incorporate community and societal needs into the FSR process by trying to ensure a convergence between private and societal interests. Examples of possible conflicts would be where satisfying short-run needs of individual farming families would result in long-run societal costs in terms of degradation of the natural resource base, increased inequalities in welfare distribution, etc. It is necessary to develop improved strategies that will avoid such conflicts.

c. Tapping the pool of knowledge of the society.

The FSR approach by including farmers taps the pool of knowledge in the society and enables research and hence developmental strategies to build upon the good points of the present farming systems, while at the same time minimizing the time spent in "rediscovering the wheel", e.g., the value of intercropping.

d. Recognition of the locational specificity of the technical, exogenous and endogenous factors.

This requires disaggregating farming families into homogeneous subgroups and developing strategies appropriate to each. Farming families in a particular subgroup will tend to have similar farming activities and to include similar social customs, similar access to support systems, comparable marketing opportunities and similar present technology and resource endowment.

e. Dynamic and iterative nature.

The process of FSR is recognized as being dynamic and iterative with linkages in both directions between farmers, research workers and funding agencies rather than simply the presence of forward linkages characteristic of the "top-down" approach.

f. Integrative and interdisciplinary nature.

The whole farm perspective of FSR compels the adoption of an integrative function which increases the potential for exploiting complementary and supplementary relationships between resources and enterprises, and the derivation of solutions compatible with the needs and capacities of farming families. The farming systems farmers practice traditionally recognized such relationships - - for example crops and livestock, staggered planting dates, etc. To ensure that the integrative and beneficial relationships are adequately considered and exploited, requires a multi-disciplinary team - - both technical and social scientists - - working together at all four stages of the research process.

g. Flexibility in accommodating both technical and non-technical improvements in farming systems.

FSR, unlike the more traditional agricultural research approaches, has a wider perspective and is concerned with the productivity of the entire farming system. Therefore, rather than just being concerned with technical issues, it can also encompass non-technical or institutional issues, e.g., Caqueza project in Colombia and Technology Packaging Project at the Central Luzon State University in the Philippines. The latter is addressing not only issues with respect to increasing production but also the related issues of marketing and processing.

h. FSR complements traditional research approaches.

FSR complements and does not compete with other research approaches. Reductionist and commodity based research programs provide essential inputs into the body of knowledge which downstream FSR relies on for facilitating quick results at specific locations. Also, the application of downstream FSR can help redefine or refine research priorities in other types of research programs.

E. Some Methodological Issues of "Downstream" FSR

1. Methodology still evolving and a number of issues still need resolving.

Due to the fact that the methodology for undertaking downstream FSR is still going through a period of evolution, a large variety of methodological issues require resolution. Not surprisingly perhaps, there are often considerable differences in opinion as to how severe they are and how they should be dealt with.

2. Some of the major issues

a. How holistic should FSR be?

The methodological problems increase as the FSR program become more holistic (i.e., the ratio of variables to parameters become higher). Also stressed earlier was the fact that the present state of the arts of undertaking FSR means that most current work is on the crop process and is largely confined to development of improved technologies. Practical problems also restricting the scope of downstream FSR are the mandates of institutions in which they are located and poor or weak linkages with other research institu-

tions, policy making and farmer contact agencies. Related to the question of how holistic downstream FSR should be is the issue of whether the policy-institutional environments should be treated as parameters or fixed. Increasingly, it is being suggested that these might be treated as variables subject to manipulation. This micro-macro link is important in maintaining the viability of downstream FSR in the long-run through the added dimension it gives to creating conditions conducive to improving the productivity of farming systems and therefore hopefully the welfare of farming families.

b. Whose constraints to concentrate on and how to deal with them?

What needs or constraints are to receive focus in the research process? Should they be those articulated by farming families, those scientifically ascertained by research workers, or those reflecting the needs of society?

The criteria used in developing improved strategies should reflect the felt needs of farming families provided they are not incompatible with the needs of society. Strategies developed need to ensure convergence between short-run private interests and those of the society in the long-run. Although there is in principle agreement with the above, there is often disagreement as to how societal interests can be incorporated practically into downstream FSR. The problem of doing this relates to the methodological complexity of their incorporation and the time that would be required in deriving societal impact evaluations.

The needs or constraints that are identified may be technical, economic or socio-cultural in nature. What approach should be used in dealing with them? The two approaches generally used are:

i. Accepting the constraint and developing strategies that exploit the flexibility that exists in the current farming system while at the same time not further exacerbating the constraint. Socio-cultural constraints should not generally be broken.

ii. Developing strategies that will overcome the constraint.

The decision as to which approach to use usually depends on the constraint severity, flexibility that exists in the current farming system, availability of potential improved strategies either to break the constraint or to exploit the flexibility, compatibility with societal goals, etc.

c. Cost efficiency in the FSR process

Is it necessary for downstream FSR to be expensive? It is viewed by some to be expensive because of its locational specificity and therefore the need to focus on limited number of farmers. The expensive nature is emphasized because of the opportunity costs of neglecting other farmers. Therefore the quest for minimizing costs in the research process is a major issue. Considerable controversy exists concerning the degree to which costs can and should be reduced, and the ways in which they should be reduced. In general, three approaches are being used to try to minimize costs:

i. Seeking ways to reduce time and resources required for moving through the four research stages -- methods used should be based on the criterion of the lowest possible cost commensurate with the degree of understanding that is necessary. Can this be done with base data analysis plus an informal exploratory survey and a one-shot formal survey? Or is a detailed twice weekly formal survey required for a period of one year? Can modelling techniques help improve understanding or does this come at too high a cost? In the testing stage, should farmers be selected that are the better farmers, most cooperative farmers or simply representative farmers? Representative farmers may not for example be so cooperative thereby reducing the efficiency and effectiveness of dialogue and the timely conclusion of the testing stage. Considerable controversy still exists concerning the way in which these and other questions should be resolved in the interest of minimizing costs and time.

ii. Finding ways to maximize the return from the location specific nature of downstream FSR by determining the transferability of the results to other similar "total" environments. Introducing some flexibility into the improved practices increases the potential of transferability but this may come at some cost in terms of the potential level of return. Is this or is this not desirable? Controversy exists with respect to this.

iii. Seeking best of readily available solutions that is better but not necessarily best. How much fine tuning should there be thereby extending the testing stage?

d. **Single trait versus packages of innovations**

In terms of developing improved practices, should emphasis be placed on single trait innovations which may preclude the exploitation of possible complementary or synergistic effects between the various components in packages of improved practices. In theory, the farmer would be desirable but in practice the latter are much more common. A possible compromise is to design and develop packages of improved practices that permit, in an explicit manner, a stepwise approach to the adoption of the various components of the package.

F. Methodology at each Stage of Downstream FSR

1. Descriptive and diagnostic stage

a. Objective

The objective of this stage is to pick target areas, describe the present farming systems, ascertain major constraints on farming in the area and discover the degree of flexibility in modifying the farming systems.

b. Selection of the target area

The following points should be considered in selecting the target area:

i. An FSR program should be compatible with government needs and priorities.

ii. The problem of obtaining credibility in reasonable time, especially when research resources are scarce, means a bias towards selecting an area not only consistent with national development priorities but also one where tangible results are potentially possible in a short time (Navarro, 1979).

iii. The broader the target area, the greater is the potential to spread costs. Concentrating on small, unrepresentative areas is likely to reduce the potential multiplier effect of FSR.

The criteria for delineating boundaries of the target area also may be affected by political issues. The target area, for example, may be demarcated by an administrative or political boundary and may embrace a wide variety of farming systems.

c. Base Data Analysis

Baseline data analysis involved using available information. In view of the time and cost of collecting primary data, available secondary information should be exploited. Secondary data can be useful in delineating the target area and in obtaining a preliminary understanding of existing farming systems.

The criteria for data to be used in baseline data analysis and in the collection of data from on-farm studies should be the relevance of the data in understanding existing farming systems, particularly their constraints and flexibility and how to modify present systems (Technical Advisory Committee, 1978). Good data on the technical element, particularly on such physical factors as land resource classification and weather and climatic characteristics, can be particularly valuable.

d. On-farm studies

On-farm studies are important in disaggregating the target area's environmental heterogeneity. Such studies should classify farming families into homogenous sub-groups or "recommendation domains" (CIMMYT Economics Program, 1980). The sub-groups provide a focus for developing relevant strategies to improve their welfare. Effectively delineating such sub-groups depends on being able to isolate the factors and adopting a classification method that effectively weights the influence of the factors. CIMMYT (1979) has suggested two types of divisions: "a locational division by area and a hierarchial division between farmers in the same area." Three sets of factors are identified as contributing to the divisions:

i. Natural factors: climate, soil, topography.

ii. Historical factors: food preferences, social customs, present technology, and tenurial arrangements.

iii. Institutional and economic factors: access to markets and to inputs.

While historical, institutional and economic factors are relevant to both locational and hierarchial divisions, natural factors are relevant only to locational divisions.

The two major methods generally used in obtaining the necessary data from on-farm studies to finish classifying farming families into homogeneous sub-groups are the reconnaissance or exploratory survey and formal surveys. These two types of surveys are complementary rather than competitive. The former should nearly always precede the latter.

The reconnaissance surveys are informal, consisting of field tours or *sondeo.*

Multidisciplinary teams working in an interdisciplinary framework travel throughout the target area talking with representatives of policy-making, farmer-contact agencies and with community leaders and farm families. Such discussions are to delineate sub-groups of farming families and to analyze current farming systems and possible types of developmental strategies potentially useful to farming families and consistent with their goals. The exploratory surveys require interaction with people in the target area and also among members of the FSR team. They can be carried out in six to ten days and are largely a function of the experience of the team in FSR and their familiarity with the target area.

On the other hand, formal structured farm surveys often are carried out among the target population to verify the tentative insights from the exploratory survey. The surveys involve trade-offs between cost and time efficiency on one hand, and accuracy on the other.

2. Design Stage

a. Objective

It is in the design stage where improved practices based on the needs of farming families and constraints they face are developed for testing at the farm level.

b. The design process

Collinson (1979a) suggests the following procedures for designing improved practices:

i. The experimental variables should consist of practices in which farmers' management is flexible and those where *ex ante* evaluation suggests room for increased productivity. Flexibility in management is enhanced when there are underutilized resources, while increasing productivity of variables is particularly important for those resources that are most limiting.

ii. The feasible range of treatments for such variables is set by the flexibility that exists. Some flexibility could be introduced, for example, by assuming the institutional support could change. It could, for example, be assumed that an institutional source of credit could be made available to supplement the cash flow of the farm business.

iii. The parameters in the experimental process should be those not potentially subject to manipulation and as representative as possible of practical farming conditions.

The design stage is primarily implemented under station conditions. Experimentation, according to the above specifications, is essentially downstream FSR. Where the "body of knowledge" is not sufficiently developed to provide adequate material for the design stage of the "downstream" FSR program, relaxing the above experimental constraints may be justified so an upstream FSR program may be initiated.

In the design stage of downstream FSR programs, two issues have important methodological connotations:

i. The problem of minimizing costs of research.

ii. Developing improved practices may involve incremental or "single trait" changes instead of packages of practices.

3. Testing stage

a. Objective

The objective of this stage is to evaluate the improved practices flowing from the design stage to the farm.

b. Phases of the testing stage

i. Trials at farmers' level

This makes use of farmer's land and maybe labor but with the managerial input still provided by the research workers. Also known as research-managed testing, trials at the farmers' level can cover more treatments than those at the farmers' testing stage.

The aim of such trials is to screen the improved technologies arising from the design stage, to fine-tune them to the local situation, and to evaluate their potential both locally and for broader regional coverage. Researcher-managed trials can consist of either replications within fields or between fields to check site variability. The varied types of farm level trials can use experimental designs similar to designs on experiment stations.

ii. Farmer's testing

This makes use of farm families providing their own land, labor, capital, and management. In essence the improved technology is tested for compatibility with the technical, exogenous, and endogenous factors.

Three points should be considered to derive valid, useful data for evaluating the improved practices at this stage:

* Plots are large enough that labor inputs can be accurately measured.
* Both the technical and human environments vary widely over time. Testing for more than one year gives a better idea of the level and stability of improved practices, particularly where there are substantial inter-annual variations in the "total" environment.
* It is important to obtain data that will assess compatibility of the practices with other parts of the farming system. This can be done by collecting data on all other parts of the farming system to assess potential conflicts and compatibility or by collecting data on only the parts of the farming system that the improved practices are likely to directly affect or replace.

c. Intermediate types of trials

These are trials which combine some of the characteristics of farm level trials and farmer testing to encourage more farmer-research worker interaction and lower costs.

i. Trials superimposed at the farmer testing level; e.g. IRRI's Cropping System Program specifies that superimposed trials must include four levels: a simulation of farmers' management with no purchased material inputs, the level of component technology assigned to the cropping pattern, and a level of component technology that will produce high yields in the cropping pattern, or will produce similar yields with substantially lower input.

ii. Use of unit farms to more realistically include the human element with perhaps much more control than possible under farming conditions at the village level.

4. Extension stage

a. Monitoring and evaluation

Monitoring and evaluating activities serve as a management tool to improve the effectiveness of ongoing projects and provide important input for the design of upcoming projects; check the validity of the description, design and testing activities of FSR so lessons from the project can be systematically incorporated into the design of future projects in that area or similar areas.

Monitoring and evaluating the introduction of improved strategies need to be looked at from the perspective of research workers, farming families, and society as a whole. The research perspective is reflected in the degree to which the needs of the individual farming family and society are met.

The point to consider in monitoring are:

i. the importance of determining the number of individual farming families that have adopted the improved technology, the degree to which they have adopted it, including the different components of a package, and the reasons for divergence from what was recommended; and

ii. evaluating the impact of improved technology such that the point of view of society involves answering such questions as the distribution of benefits from the adoption, stability of the ecological base and the general nutritional level.

b. Integrating FSR into projects

Increasingly, projects also include an adaptive research component linked to monitoring and evaluation activities. Adaptive research can upgrade recommended practices being extended by the project and help anticipate and solve problems, particularly technical ones. Monitoring activities can serve as an early warning system, identifying problems when they first appear so they can be dealt with through adaptive research. Adaptive research personnel on a project, in turn, need to have close links with research institutions where they can draw materials and expertise on short notice as required.

Monitoring, evaluation and adaptive research activities in a project collectively provide an in-house capability of carrying out the full range of FSR-type activities. Ideally, some of the same research personnel who would participate in the initial stages of the FSR before a formal project is initiated should be available throughout the life of the project. These activities, collectively in effect, become the FSR component of the project. Analysis, design, and testing activities can improve the performance of extension activities and lay the basis for future extension efforts in the same area.

G. Some Implementation Problems of Downstream FSR

1. Credibility problems in terms of both practical results and professional respect can result in difficulty of attracting adequate resources.
2. Intra-institutional adjustments to accommodate downstream FSR programs can be difficult.
3. Linkages between FSR programs in national, regional and international research institutions need rationalization to exploit the advantages of each.
4. Problem exists in identifying suitable individuals to participate in FSR programs.

H. National FSR Programs in Latin America

1. Guatemala: Institutc de Ciencia y Technologia Agricolas (ICTA)

ICTA was created as an autonomous agency in Guatemala in 1973 for the purpose of providing sufficient, appropriate technology to increase production of basic grains. Its specific target are small farmers who form the majority of the population. ICTA uses the *sondeo* approach or sounding out method to carry out the initial survey work.

Sondeo is an intensive team effort, usually involving five social scientists and five technicians of various disciplines over a six to ten day period. It seeks to:

i. Identify the major farming system in an area and its geographic distribution.

ii. Discover common agro-socio-economic conditions facing farmers in the system.

iii. Provide an orientation for the initial work on designing an appropriate technology for this system through farm trials.

iv. To acquaint members of the team with farmers in the area, and with each other.

The specific activities in the *sondeo* are:

i. Unstructured interview of farmers and leaders by pairs of team members, one social scientist and one agricultural technician.

ii. Discussions involving the entire ten person team between each set of interviews.

iii. Preparation of a single team report.

Technology development and testing at ICTA include trial work at four levels:

i. Controlled trials on the research station and a few farms.

ii. Replicated technical trials on many more farms.

iii. Non-replicated, agro-economic trials, on large plots, of the most promising technologies developed from the preceding trials.

iv. Farmer's tests wherein farmers become the primary evaluators.

2. Colombia: Instituto Colombiano Agropecuario (ICA) - - The Caqueza Rural Development Program

Program Components

i. Mobilization of farmers, conduct of extension demonstrations, and collection of baseline studies to determine the technical, social, and economic features of the existing farming system.

ii. Use of agronomic trials with the objective of modifying recommendations for local conditions.

iii. Improvement of credit availability and marketing arrangements.

iv. Intensive research in adaptive behavior of farmers.

I. National FSR Programs in Africa

1. Senegal: Institut Senegalais dela Recherche Agricole (ISRA)

The design of improved technologies is basically a downstream FSR, taking into account technically sound and acceptable recommended technologies but also the existing systems of production and the constraints facing farmers.

Location of new technologies involves three stages:

i. Analytical studies including traditional studies of plants, soils, and the various technical factors of production, along with socio-economic studies of existing farming and marketing system.

ii. Experimentation with simple combinations of factors and establishing reference norms for fertilizer, equipment, etc., that could be used in defining simple combinations of crops, equipment, and factor combinations for each zone and ecological sub-region.

iii. Synthesis of research on existing and possible improved systems and elaboration of proposed farming systems specifically designed for each ecological zone.

Stages (i) and (ii) are generally carried out by researchers of different disciplines working separately while stage (iii) involves interdisciplinary teams.

2. Other countries having FSR programs

FSR programs also exist in Mali (Institut D' Economic Rurale) and in Upper Volta (SAFGRAD and ICRISAT). Many African countries are still in the planning or very early implementation stage, usually having downstream orientation. These countries are Botswana, Burundi, Cameroon, Gambia, Lesotho, Malawi, Nigeria, Swaziland, Tanzania and Zambia.

J. Personal Concerns about FSR

1. Possible incompatibility of private and societal interests.

2. Credibility

a. Evolutionary not revolutionary impact.

b. Gestation period for FSR to prove itself is not short.

3. FSR is still evolving and is not a panacea.

EXPERIENCES OF THE INTER-ASIA CROPPING SYSTEMS NETWORK[1/]

This is my first opportunity to meet the leaders of the farming systems research program of the Philippines. You are probably hearing from the least experienced fellow in cropping systems. I have only been here since November so I should be listening to you.

I have four objectives in this paper: firstly, to give a history of the Asian Cropping Systems Network; secondly, to describe the methodology that has been developed cooperatively between IRRI scientists and national program scientists who make up the Asian Cropping Systems Working Group; thirdly, to define or describe cropping systems research and how it differs from research in so-called developed countries; and fourthly, to briefly touch on some of the challenges to research and extension workers in cropping systems. I shall do this in a simple straightforward manner and I will use a liberal sprinkling of personal philosophy.

I think you will agree that this slide symbolizes the small Asian rice farmer that we are all trying to help. Don't you wonder sometime when he began to plow like this? How many thousands of years ago? And where did he get this idea, because up to that time this was probably the greatest technology innovation for this man's farm in the history of his agriculture? Perhaps next to the wheel, anyway. Don't you wonder where he got this idea? Was it brought by a stranger or did he go somewhere else to see it? Is he still happy with this technology? And who are we to judge whether this man is happy? He consumes about 125 to 200 kg of rice a year and there are thousands of other farmers like him in the tropics. He has a loving wife and a friendly dog so why should we worry about him if he walks in rice paddies each day?

What is happiness? Are his children happy riding on a bullock sled? Are they not as happy as our children who ride tricycles that cost $20 or $30? Who are we to judge? This picture of a basketball playing teenager in a Sumatran jungle I took last summer – he is perhaps just as happy with the game as he would be in a $200 M gymnasium. He lives in a virtual paradise. Life is easy and we really did not worry much about his happiness or his farm activity until 1960. Because of medical science and people living much longer, world leaders suddenly realized that population was going to surpass food production. These concerns culminated in the world food conference of 1974 in Rome.

Suddenly, countries began to realize that unless we do something for these farmers, he might not remain so happy because when a fellow or his children are hungry, he does not remain happy very long. When this man's children go to a distant schoolhouse on top of the hill in the Sumatran jungle and read about and see how other people live, how happy will they remain after growing up?

So this is a BIG challenge that is facing the world. We must help these people help themselves. Now my story started many years ago in the early mid-1960's when Dr. Richard Bradfield came to IRRI. He was originally head of cropping systems in IRRI. He had been an active participant in the success of American agriculture in its exploding yields during the 50's and 60's. He had spent time in Mexico and Taiwan in developing agricultural research programs. He saw no reason that the Taiwan system could not be used here and in other tropical areas. And so he set about at IRRI to run many intercrop and relay type experiments. His objective simply was to keep a layer of leaves between the soil and the sun or to keep some plant in its maximum growth period everyday of the year. He had hundreds of experiments. The production of these experiments was very high and their nutritional value was very high. From that he moved to intercropping. He grew two to three crops at the same time, and again showed yield gains over conventional practices. Different cultural practices – row spacing, fertility, etc., and various intercropping were tried. Generally, these intercropping experiments included a grain crop and a seed legume crop; one crop to provide calories, and the other to provide protein.

Dr. Bradfield had several articles on cropping systems published in Reader's Digest and in other publications over the world. And in these articles, multi-cropping was the way the on-rushing population of Asia was going to be fed.

What happens when a methodology that works so well in transfering the improved agricultural methodology in temperate agricultural areas of the world is used in the tropics? The past 20 years were glorious years in the temperate zones. Yields were doubling and even tripling in some crops. Agricultural production scientists felt confident that the same miracles could be accomplished by small farmers in the tropics. They reluctantly granted that more time would be involved because of needed development of the infrastructure and inputs and outputs, but they were very confident.

When I went to India in the mid-60's, I was confident that we could do exactly the same things with small farmers in India as had been done with large farmers in the Central U.S. We knew how to increase yields of single crops, or multiple

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1/ Presented by Dr. J.W. Pendleton, Head, Cropping Systems Program, International Rice Research Institute, Los Baños, Laguna, Philippines.

crops. And given our recent performance records, only a few social scientists dared to question our methods, determination or enthusiasm.

It became apparent in the mid-70's that this was not going to work at IRRI or in other experiment stations in the tropics that were trying to move the technology from the experiment stations to the small farmers.

About six years ago IRRI took a new look at this challenge. How to intensify cropping systems within the constraints which the small Asian farmer operates? Other Asian national governments were also having similar thoughts on how to improve the lot of small farmers. So an Asian Cropping Systems Network was organized. The following research strategy was developed cooperatively between IRRI scientists and national scientists.

The Cropping Systems Agricultural Research Methodology differs in several ways from the Agricultural Research Methodology generally practiced in the temperate zones or advanced farming areas of the world.

First, cropping systems research is primarily farm-based rather than research station based. The research is conducted on farms and only the difficult questions or problems are brought back to the national experimental station or international center. These serve as "back-up" resources. Sometimes this is referred to as "bottoms up research". All research is designed by recognizing the farmer's physical, biological and socio-economic environment. Perhaps a better way to state the objective of this approach — "to marry or integrate the Science of the Researcher with the Art of the Farmer". Why did IRRI choose this "bottoms up" approach?

- Failure of other strategies to reach the small farmer.
- Renewed appreciation and awareness of certain small farm practices and recognition of their benefits and built-in risk protection.
- The increasing energy costs that are becoming a greater production factor both in small and large farm agriculture. The input costs of crop production are steadily rising and alternatives must be sought.

The second biggest difference is that cropping systems research involves a multidisciplinary team of researchers to design, implement and interpret the farm research. This is in contrast to the single scientist working in their narrow discipline area. Six agricultural disciplines are represented among this group: Agronomy, Agricultural Economics, Entomology, Plant Pathology, Soil Science, Weed Science.

In advanced agriculture the research generally centers around one crop or commodity, whereas in cropping systems several crops are involved. Generally advanced research is concerned with the grain yield of a single crop per hectare whereas cropping systems research concentrates on yield per hectare per day or per year. Advanced agriculture concentrates on high value crops while cropping systems must concentrate on the subsistence grain crop. For this is the farm family's livelihood. The farmer must produce sufficient quantities of this grain, and in most of Asia, it is rice that feeds the family.

Farmer interviews are also made to secure additional information on the physical, biological and socio-economic environmental factors. These interviews are made by persons familiar with the customs and language. They go to the farmer and find out:

- What are his farming practices and more importantly, Why?
- What are his resources-
  Land, Labor, Capital, Power
- Where are his markets
- How is the community organized

The scientist must visit the research sites to carefully map topography, soil characteristics and present cropping patterns on the various land types.

Armed with this information the national interdisciplinary team designs new cropping patterns for the most common landtypes in the selected sites. These recognize environmental constraints and use previous research in the area or from similar areas. They must also identify the community and area linkages needed to effectively do research in the region. All disciplines are involved at the design stage, and sometimes the meetings are long and the discussion lively between biological scientists and social scientists. A cropping system comprises all the components required for the production of a set of crops on one plot during a year. These components include all necessary physical and biological factors as well as technology, labor, and management. To design, monitor and capture farmer feedback on new systems is not simple. Only new patterns that are to be both biologically and economically feasible are suggested.

Step IV is the testing of the new cropping patterns. These are compared to the farmers' cropping patterns in the same field or in an adjacent field. The farmer actually manages the new pattern with his labor and power. As many as 10 or 12 cropping patterns may be tried in the first year. The poorer ones as judged by low economic returns or poor farmer acceptance are quickly discarded and only the more promising ones are tested further. Each field represent one replication but with a minimum of five replications per land type. In many areas, this refers to different topography: top, side slope, or plain area.

How are these trials supervised? A site team made up of a site coordinator who is responsible for the overall supervision and three agriculturists. Their training is in agriculture generally through the B.S. or M.S. level with the ability to carefully carry out field trials. They are also carefully selected for personal characteristics and it is helpful to hire natives at the area. The site personnel are provided transportation to monitor the sites.

There are component technology questions that always arise in cropping systems research, i.e., what is the best variety, tillage system, fertility, and pest management. These answers are obtained from simple superimposed trials across the new cropping pattern or in research managed trials. Both are conducted in farmers' fields. The "backup" or basic research is conducted at national, regional or international research centers. An example of a superimposed trial in a farmer's field would be a strip planting of a new variety to compare with his, or an area where a new herbicide is compared with the farmer's method of weed control. These trials are visited often and close observations made. The views of the farmer are sought. Field days are held for farmers and extension staff of the area. The results of the farmer trials are evaluated agronomically and economically and discussed with the farmer.

Step V of the Cropping Systems Methodology is Preproduction Testing. This involves extension and supporting institutions and services. For insurance of success preproduction testing should involve two steps between site generated technology and a final regional or national production program. The first step in preproduction testing is multilocation. This simply attempts to verify the promising site technology over a larger area and to delineate the extensiveness of adaptability. All secondary climate, soil and irrigation data sources are used. A pilot production program further evaluates the education (extension) and support institutions. This is the final stage of testing and determines:

- Do farmers accept the new technology and if not - why not?
- Is the educational delivery system personnel well trained and adequate to handle the new technology?
- Is the support system adequate - credit, inputs, and markets?

Extension meetings are held for farmers included in the multilocation and pilot production programs. Farmers may need assistance in locating and establishing credit.

The final and last step is a regional or national production program. For a new program to be successful many farmers will require all, or many of the following –

- Credit for many of the inputs such as seeds, fertilizers, and pesticides.
- Commodity price or market support.

Successful production programs will generally require institutional support:

- Government
- Banks or credit agencies
- Agricultural suppliers
- Marketing structures

In summary, success will depend on the farmers' convictions that the new system is physically and economically possible, socially and politically acceptable with accessible inputs and markets. Cropping systems methodology simply seeks to integrate the small farmers practical knowledge and constraints with our scientific knowledge. Agricultural scientists have come to realize that technology cannot be forced on the small farmer. But rather that this individual must be carefully listened to.

An important objective of the IRRI Cropping Systems Training course is to give the trainees practical experience: in laying out and conducting field trials, in making field observations for insect and disease pests, in being able to identify these pests and the recommendations for control; to become familiar with various kinds of small sprayers and to be able to calibrate these, to recognize soil characteristics and landforms and how they affect cropping pattern, and to become familiar with new areas of research such as the use of *Azolla* to provide nitrogen to rice.

A word about the Asian Cropping Systems Network — The network started in 1974 and included only the Philippines and Indonesia. The network now has 10 country members, and China, Pakistan and Vietnam have recently expressed interest in joining. The policy body consists of the Cropping Systems leader from each country, the IRRI program leader and IRRI network coordinator. As mentioned previously much of the methodology reported herein came from a series of Working Group Meetings of scientists from the network countries. The objective of this Group as stated in the first meeting in 1974 was "to formulate methodologies and directions for cropping systems improvements and to design collaborative studies." Annual monitoring tours are taken to different member countries where research is viewed and experiences exchanged. Additional objectives of the Asian Cropping Systems Network are:

- to develop cropping systems technology for the major rice growing region in Asia.
- to enable IRRI to extend relevant technology and methodology into national programs.
- to establish and develop strong national cropping systems program.
- to generate and provide data on performance of crop and cropping technology in a wide range of environmental complexes.

We believe the major accomplishments of the Cropping Systems Program over the past 5 years has been:

- Methodology development for transfering improved technology to the small Asian rice farmer.
- Establishment of national cropping systems programs.
- Identification of important research areas needing attention.
- Increasing quantity and quality of training programs.
- Information and material exchanges
- Obtainment of crop performance data from a wide range of environments.

However, there is much left to accomplish. These are some of our future challenges:

- Extrapolation techniques to identify similar agroclimatic areas.
- Methodologies for multi-location testing and pilot production programs.
- Training facilities and logistical assistance.
- Technology environmental relations
- Improved upland crop varieties and technologies.

In the final analysis, our success depends on:

- Adoption of new cropping patterns by farmers
- Increased food production in a region or country
- Increased welfare of the farmers' family

The question is — will this farmer continue this way for another 1000 years? Unless an outside force: education, technology — call it what you wish enters in, he will continue at his present production level and this will not feed his family plus the rapidly increasing population in this part of the world. Therefore we have chosen and developed this unique methodological approach of conducting research on his farm and recognizing his many constraints.

IRRI's cropping systems program will continue to seek to understand and respond to the needs of the national programs. This will involve the design of collaborative research, and the use of facilities and equipment of IRRI to provide basic information on problems arising in the network countries.

Agro-meteorological studies will receive more attention as a means of identifying areas where present cropping systems might be intensified, or lead to better understanding soil-water-plant relationships.

THE BENCHMARK SOILS PROJECT
An Overview[1/]

INTRODUCTION

The Benchmark Soils Project is a research on the transfer of agrotechnology aimed at assisting in the international or worldwide effort to provide the basic needs of man both in the near and in the distant future. The lowlands and agriculturally productive areas are shrinking as agriculture loses in the competition for these areas to human settlement and urban expansion. The uplands and marginal areas are the places which will shoulder the burden of food production for the increasing population.

A project entitled "Crop Production and Land Capabilities of a Network of Tropical Soil Families" which in short is known as *The Benchmark Soils Project* was conceived by the University of Hawaii and the University of Puerto Rico fund under the contract AID/to C-1108 and AID/ta C-1158.

PROJECT OBJECTIVES

These are the three main objectives of the project:

1. To determine agrotechnology transferability on the basis of soil classification;
2. To assess cropping and management potentials of some soils; and
3. To demonstrate the value of soil and land classification in agricultural development.

The Soil Taxonomy and Technology Transfer

The Soil Taxonomy, a basic system of soil classification for making and interpreting soil surveys was an essential tool in the project. Normal to natural classification systems the information, knowledge, and experience increase as one goes down in the categories of the system. In the Soil Taxonomy the categories defined Order, Suborder, Great Group, Subgroup, and Family. Among these categories, the Soil Family provides the linkage between soil classification and land capability. Soils in the same family formed under the same sets of environmental conditions and possessing the same textural and mineralogical properties have the same management problems. If the management problems are the same and conditions are the same, the solutions to these problems can be evolved using the same approaches and technologies. Hence, technologies developed in one area can be transferred to other areas of the same soil family without going into repetitive experimentation of generating technology which demands manpower, time and resources can be minimized without necessarily reducing the effectiveness and utility of the technology to be transferred.

In the transfer of any technology, the project considers both the horizontal transfer which involves the transfer of known technology from the place of generation over space to other areas and the vertical transfer, which involves the farm levels adjustments of the technology to suit the economic and social demands in the locality.

Although the project limits itself to agro-technology, the Soil Taxonomy also provides the operationalization of transfer of other technologies needed in engineering work and urban planning in the establishment of human settlements.

COVERAGE OF THE PROJECT

The project works on three soil families located in various areas in the tropical world. A soil family is worked on in at least three countries (or scattered locations). Within a country or locations, two or three manageable sites are identified, characterized, equipped for experimentation and provided with weather instruments.

In each country, the project works cooperatively in established national agencies. In the Philippines, the project is cooperatively undertaken by PCARR through the Bureau of Soils.

1/ Paper presented by Dr. M. E. Raymundo, Project Leader, Benchmark Soils Project, PCARR.

The soil families:

1. The Hydric Dystrandepts of the thixotropic isothermic family is a soil at a rapid stage of development, on volcanic ash deposits, low in base saturation, and has a high water retention. These are found at higher elevation with uniformly cool temperature throughout the year (between 15°C - 22°C mean temperature). They are associated with udic moisture regimes, a condition where rainfall is uniformly distributed throughout the year or there exists a very short dry period.

   This soil is experimented on in Hawaii, USA; in Java, Indonesia; and in Naga, Philippines. In Naga, the sites are at Panicuason, Naga City; Paustina, Pili; and Burabod, Calabangan, all in Camarines Sur at the upper slopes of Mt. Isarog, a volcanic cone. In all other places, the soils are found associated with volcanic ash cones which are predominantly wet.

2. The *Tropeptic Eutrustox* of the clayey kaolinitic, isohyperthermic soil family. These soils are found at low elevation of the tropics, warm (more than 22°C mean temperature) with distinct dry season (ustic moisture regime). They are high in base saturation (eutric) and are dominated kaolinite clay minerals with some degree of concentration of oxides of iron and aluminum.

   The experimental areas are in Hawaii, Puerto Rico, and in Brazil.

3. The Typic Paleudults of the clayey, kaolinitic, isohyperthermic family are found at low elevation of the tropics, warm, but has very short or no dry season at all. They are very old soils, almost depleted of primary weatherable minerals. They are dominated by kaolin clays.

   The areas for experimentation are in Davao and Sorsogon in the Philippines, in Sumatra in Indonesia and in Barombi Kang, Cameroon in Africa.

THE BSP ACTIVITIES

The activities of the Benchmark Soils Project are summarized as follows:

1. Grow the same crop (corn) using the same experimental design under similar management conditions.
2. Measure crop response in farm of yields to management practices.
3. Compare yields from similar soils from different sites and countries.

The experimental design for the transfer experiments makes use of 13 basic treatment of P by N combination. The rates based on soil analysis vary among soils. As such the computed minimum, maximum, optimum levels and other levels in between are cited as −0.85, +0.85, "0" and ±0.40, respectively. The rates of nutrients applied are dictated by the levels in the soils as affected by previous management which vary according to previous inputs afforded by the production systems which in turn is dependent on the level of technology in agricultural production in the particular country. The experiment is carried out in three replications.

Fertilizer inputs are carefully measured, applied as uniformly as possible in the plots and rotavated into the soils before planting. Only the nitrogen is applied in three equal doses. Micro-nutrients and irrigation are provided to reduce the variables to the main treatment variables.

Experimental data collected are growth and yield components, i.e., plant height at 3 stages, nutrient levels of the ear leaf samples collected at 50% tasselling, ear size and weight, number of sterile plants and grain yield. Preplant and post harvest soil samples and plant tissues collected are sent to the laboratory for analysis and correlation to crop responses.

All the experimental data and weather data from the instruments in all the sites are fed into computer for storage and analysis. Weather data from the mechanical weather stations and other instruments to serve as check to the weather stations are collected, recorded and monitored.

Preventive and control practices against pests and diseases are closely practiced. Effect of "force majeure" like typhoons, gales, windstorms and the like are also monitored.

Daily soil temperatures are taken regularly and at two-hour intervals during particular growth stages, i.e., at emergence and tasselling stage are collected at different soil depth and monitored.

RESULTS

Results obtained from 1976 to date has shown similarity in responses from similar soil families, whether in regression analysis and in terms of surface three dimensional graphs. The absolute yields vary from one location to the other which is a reflection of the soil fertility levels at different sites but the response to the treatments are similar. At low levels of past management, the optimum yields are attained at higher rates of application but at the same coded levels of treatments.

Among soil families, the yield potential was highest in the Tropeptic Eutrustox and about the same in the Hydric Dystrandepts and Typic Paleudults considering suitable varieties. Even varieties showed different potentials in different soil families. Highest yielders in Hydric Dystrandept was not the best in Tropeptic Eutrustox.

Transferability equation was developed using as input data the soil and climate as constants, applied fertilizers as controlled variables, and weather as uncontrolled variables in the experiment. The output is prediction equation.

The prediction equation is as follows:

$$Y = bo + 150\,P + 2708\,N - 905\,P^2 - 347\,N^2 + 295\,PN$$
$$- 7.61\,PPext - 5.21\,PNext - 7.58\,NPext - 82.7\,NTmin$$

where: Y = predicted maize yield

bo = intercept (estimated yield when P and N are both zero in coded values)

P = coded value of phosphorus differential

N = coded value of nitrogen differential

P ext = Truog-extracted soil phosphorus

N ext = KC1-extracted soil nitrogen ($NH_4 + NO_3$)

T min = Minimum temperature (4 weeks before and after tasselling

It will be noted that the minimum temperature 4 weeks before and after tasselling was found to affect the predicted yields.

With the use of this prediction equation yield in one site was estimated with the use of data from the other sites. The predicted yields were within 300 kg on the average compared to the actual yields observed, and considering yield between 4 to 8 tons the prediction is relatively accurate.

When the equation was used for sites of a different soil family using the P test, the prediction was way off. Predictions that give a ratio of less than 1 with the actual shows transferability but predictions with predicted actual yield ratio is more than 1 negate transferability.

Other observations showed that diseases can be stratified according to soil classification because of its relation to specific environment. Downey mildew are found rampant in the warm humid areas of the Typic Paleudults but not in the warm dry areas of the Tropeptic Eutrustox and the cool, even if humid, areas of the isothermic family of the Hydric Dystrandepts. In the warmer regimes of the Hydric Dystrandepts the disease tend to be prevalent. It is anticipated that with more studies, dominant pests like insects and weeds can also be stratified according to soil families. The tremendous potentials in use of soil taxonomy in the transfer of experiences from one area to other areas is obviously there and discovering the relationships among this factor still has to be done with the use of the Benchmark approach in research on technology transfer.

OTHER ACTIVITIES

1. Some field experiments to fine tune technology for the vertical transfer are also being done to assist participating countries. Some of these are (a) the NPK test to determine the economic rates of nutrients verified to be needed; (b) population x fertility test; (c) nutrient sources and rates studies to explore the use of locally available materials as alternative or supplemental to synthetic inorganics the cost of which increase with the increase in price of hydro-carbon sources; (d) tests of fit of cropping systems (cropping intensities) in various soil families and tests of nitrogen fixing and fuel wood trees and their relative potentials in the different soil families.

Tests on the varieties show that with good control of downy mildew, yields of 6 to 7 tons of maize is possible with the hybrids. These could definitely support the maize or corn program of the country. Guano and phospatized rocks were found to be an alternative or supplemental to the superphosphate.

The training component in the project has also been active. A training on soil resources inventory and agrotechnology transfer experimentation was conducted at UPLB with the support of the Benchmark Soils Project, Cornell University, and SEARCA in 1977.

The training in Soil Taxonomy was conducted in 1979 supported by BSP and PCARR resulted also to the survey of 9 research stations in the country which are the sources of technology. The results of the survey were presented in a workshop on Agro-Technology transfer in 1980 under the support of BSP and PCARR.

The concept of the benchmark soils project is being adopted in the country. Physical environment characterization is considered a must and recommended as a top priority in government policy on research to facilitate the transfer of technologies which have been generated and verified.

DISCUSSIONS ON PENDLETON AND RAYMUNDO PAPERS

F. C. CAMPOS :

Has IRRI bred varieties that are suitable for this type of farming system? Meaning that if we go into intercropping, we know the specific requirements of intercropping: maturity-wise, foliage, position of foliage, number of foliage because of the shading effect of the crops, the combination whether there are enough varieties whose leaves are upright or whether there are some legumes wherein there are fewer leaves but still high-yielding — all the other agronomic characteristics that will really conform with a certain schematic arrangement of planting as so required by an intercropping system.

J. W. PENDLETON :

We are quite concerned about the lack of breeding work in upland crops for the unique conditions of rice based cropping systems. We don't blame the breeder because this person is trying to develop a new corn variety or a new soybean variety for the very best part of the year, using optimum fertilizer, and optimum everything in his nursery plots. Therefore the variety that he selects from his nurseries is not what we are looking for in cropping systems. We are looking for varieties that may not be the highest yielders but are really tough that can take drought stress, water stress, etc. So I agree with you that we have a long way to go. We hope to start the wheels rolling in this respect with a cooperative upland crop breeding project with IPB. I think we are beginning to educate the rice breeders in IRRI that the needs of cropping systems rice varieties are a little different. Dr. Khush met with us a couple of weeks ago and said they have some 75-day rice varieties now on the drawing board with good yield potential.

In speeches about 15 years ago, I was a real enthusiast on ideal plant type. I worked on corn, soybean, and other crops, with this in mind. In my first visit to IRRI in 1968, Dr. Chandler showed me the new rice variety with upright leaves and I think this characteristic has helped in getting higher yield. I know no concentrated breeding programs in this part of the world for ideal plant types for intercropping. The closest thereto would be UPLB's good work in shade tolerance.

PARTICIPANT :

In the Asian cropping systems network what do you think is the most important common denominator constraint in moving cropping systems technology to the farmer?

J. W. PENDLETON :

As the technology moves from the experimental site or first cropping pattern testing onward, there are challenges. One, in some countries anyway, is transferring new knowledge from the research to the extension person. Thus you must get the extension persons aware of what you are doing in the very early stages, then it is easier to train them. As an example, in Sri Lanka, they start with the top administrators in research and extension. They have two planning meetings a year. Now the second transfer problem is from extension to the farmer. This is where the social and economic considerations come in. We must realize it may be different between villages within a country. And again different countries do it in different ways. Burma does it easily. They prove the technology and then the farmer uses it, or they take away his land. Maybe this is the way in China, too. I have faith in our educational process but time and patience will be required. And as previously mentioned, the availability of markets and credit is extremely important.

S. K. JAYASURIYA :

Obviously, the main concern does come at the stage of technology transfer. I think in most countries participating in the network, you have the problem sorted out at the level of technology generation. I guess a few remaining problems like some of the problems you were discussing this morning are identified later. In the sites in most countries, we work with few people. Very often, we do not have the full complement of people that you really like to have. Very often, we work with an agronomist and sometimes they have very little training. So there has to be a lot of back-up support from headquarters.

I don't know if we like to change that set up. And because of that problem and because of the lack of trained personnel, it is very difficult to look at questions or indications of kinds of technology that they develop. The researchers develop technologies which they think would increase production and be acceptable to the farmers in that area. It is very rare if it

happens at all that they would look at indications of how it will affect income distribution later on, how it will affect female employment, etc. There are questions involved, but at this stage, in most research national programs in Asia, in the regions, it is very hard for these problems to be tackled at site levels. However, in many places, researchers are confident that they have got some technologies which are increasing cropping intensity production and acceptable to large groups of farmers.

Two months ago, we organized a study tour of extension and research people. We went to Sri Lanka and Nepal and observed how they tackle the problem of technology transfer from cropping systems sites to wider areas through pilot production programs. When extension and research get together early for the design of the experiments, including implementation and evaluation, transfer is then facilitated. But that's more the exception than the rule.

PARTICIPANT :

The Philippines has been doing this for a long time. The transfer of technology is not even a problem but our main problem is the marketing aspect. You assure the farmers of the market of their produce and they will produce it irrespective of how much his expenses will be and how much labor will be applied. Extensionists and researchers will not have problems as long as there is an assured market. The economists must help us on the market aspect of the small farmer producer.

S. K. JAYASURIYA :

Yes, this is one of the problems which arises when you have a new crop or when you have a perishable crop. But I was talking more generally of the rice-based systems and even when they are secondary crop like mungbeans, or sorghum, as in Batangas. I think in the Philippines there's a lot of sorghum but what is lacking here really is government emphasis on producing sorghum domestically. In irrigated areas, we can produce a lot of rice. Many of the other areas may be better off producing other crops.

G. L. DENNING :

I was wondering whether or not you are planning to encourage cooperators of national programs to include extension and other social sciences?

S. K. JAYASURIYA :

Very much so. The Ag. Economist should be included and because we are coming across these problems when you try to get these things across at adoption levels, at identifying constraints, very often other social sciences can help insights with ag. economists to intervene. In the extension thing we push very hard. In the last study tour, we invited extension people. We managed to get people from extension agencies in the regions and at the next working group session which will be held in Indonesia extension methodology is one of the major topics for discussion.

J. CORPUZ :

I understand that one of the participants has visited Sri Lanka and Nepal to study their cropping systems. Can you tell us more about the cropping systems in Sri Lanka, Director Almirante?

B. ALMIRANTE :

I was very fortunate to observe the cropping systems in Sri Lanka. However, I took the attitude of just listening while there because I was very new to the program. There were many terms I did not know especially regarding the water irrigation systems. One observation that I would like to say is that in Sri Lanka, as well as in Nepal, it seems that in studies on cropping systems, not much importance is placed on the credit aspect. The reason for this is they tried this in a few cases but failed, and so they no longer emphasize this aspect.

Another thing is that marketing is not involved much in the program. There is also some difficulty in training extension workers, whose acceptance of the new knowledge is half-hearted. It seems that if the farmers are confused about what the extension people are teaching, it is because the extension workers themselves are also confused about what they are supposed to teach the farmers. This is especially so in Nepal. The extension workers, who are called Junior Technical Aides, are ordinarily high school graduates. So even if you give them training, still their knowledge will be very limited. More so when they get only

one or two months of training and then they are allowed to go out to the fields and teach the farmers. I think they themselves cannot understand sometimes what the researchers would like them to understand. These are some of my observations and I hope I will be given another opportunity to be with the group and get the real feel of the program. Really that was my first exposure to the cropping systems.

F. C. CAMPOS:

Director Almirante, you made mention that, even if the training was very good, yet the target clientele of the training was not prepared. I think that should not be a constraint. It is a matter of tailoring the training program to suit the level of the capability of the trainees. Meaning, you can translate many of the research results at the level of popular parlance which would be understandable to them. A clear case in point was the one discussed by one of the panelists this morning when he said that there is a need for the establishment of economic threshold levels in order to develop a good integrated crop protection management program. Unless you translate that in terms of something, instead of farmers going out in the field counting stem borers per square meters, etc. But if you can translate these into some significance — for example you might put out the lights at night and then put a basin of water under the light and then whatever is caught there can be estimated. But is that a farmer's translation of certain economic results? So that our researchers should also be geared towards translating these very high falluting research results into something that can be comprehensible and appreciated by the farmers.

B. ALMIRANTE:

Thank you very much, Dr. Campos. Training has to go a long way. It will take a little more time. They have very good training centers but unfortunately, I think they might have some problems. They have only a month of training after graduating from high school and at once they're sent out to the field to teach.

DR. RAYMUNDO:

Regarding the practice of picking up the results of cropping systems research and testing it on the different soils, it occurred to me — why don't you join them and have only one experiment instead of picking up results and trying in different soils (Benchmark Soils Program).

F. C. CAMPOS:

In any biological taxonomy — when you classify the species you have the basic assumption that if they survive throughout the year their characteristics will remain the same. How does this follow, considering the fact that there are so many things that one puts now in the soil, different methods of land preparation, different fertilizer levels. How are you going to maintain the stability of a type of soil so that after five years they will still belong to that type?

DR. RAYMUNDO:

Soil is dynamic but it is not that dynamic. It changes but it takes a very long time to change the classification of the soil. You change the fertility but it is hard to change the texture. Dryness is hard to change even if you employ drainage, and the characteristics of a fully drained soil will stay there for quite sometime. And we do not change the classification. It is not static but it takes a long time. Classification does not change. It's management that changes. Just like Hawaii where there is a high level of technology there before so the response is going up but where we have no technology before, the response is lower.

DISCUSSIONS: THE ROLE OF SOCIAL SCIENTISTS IN THE DEVELOPMENT OF FARMING SYSTEMS TECHNOLOGY

D. NORMAN:

I consider social science as embracing agricultural economics, anthropology, sociology, and extension. In reply to Grace, I would say there are two antidotes in the social science arena at the moment: anthropology-sociology and extension in the farming systems research. So I don't think extension is getting the breaks it should.

Now, I want to speak on functions. What I see as the functions of social sciences — I think it is a whole role of implementation, how you incorporate them into systems in an operational project. I also want to point out that the methods that are used by social sciences are often not very acceptable to the technical sciences, backing up what Grace has said.

I think one of the reasons agricultural economists have been accepted by technical scientists much more than anthropologists is that, unfortunately, we emphasize numbers all the time. I agree with Grace completely but there is a qualitative analysis that is important. What we can't do is to put things down in numbers, because one of the problems with social sciences is that we have a lot of *non-ceretis paribus* conditions. Technical science is very easy. You have your experimental plot and you control everything, but in social science you've got ultimate randomness of human behavior. You try and look for patterns but there are fewer *ceretis paribus* conditions and these make analytical techniques very difficult. Before I get into the midst of what I got to say, I want to say that I want to emphasize more on the clients. I think farming systems at the moment is addressing the client but is not doing a job on interdependence. Going back to the two points that Dr. Rivera mentioned at the beginning, I think we are much better helping certain clients but we are not good at the independent clients.

Now, I see four types of role for social sciences, three of which are client or farmer-based and one which refers to the independent issue. These are not mutually exclusive, but for the sake of simplicity, I am going to try to make them mutually exclusive.

The first role I see for the social scientists is that they should be involved, all of them, in all four stages of the research process: the descriptive (diagnostic), the design, the testing and the extension. And that includes the farmer. I agree completely with Grace. I believe most of us in this room are moving around to that. So right at the beginning the social scientist should be involved in the design that he is testing and in extension. I worry about farming systems research projects where the social scientist goes out and does the descriptive/diagnostic. This is often true. They do the survey and come back to the technical scientists and tell them what they should be doing. That is not a good relationship. The technical scientist should be out there with the social scientist right at the beginning. When we design surveys we do not look at the interaction of the technical and the social economic variable. For example, why did Percy plant late? He might have planted late for a number of reasons. It might be a lack of available labor; it might be a risk aversion strategy against losses from early planting. The type of strategy that he would design will be very dependent on the relationships, whether it is a technical reason or a socio-economic reason. And if he gets the socio-scientist to do that early survey, invariably, he will come up with socio-economic reasons as to why certain things do not happen. I think it is very important to get that interaction between the technical and social scientists.

The *sondeo* method as practiced in Guatemala is a very important thing, bringing the technical and social scientists together right at the beginning of the process.

First point is that social scientists are involved in all four stages. Second point, I see the role of the social scientist as changing according to the stage of research process and according to the stage of development of the target group of farmers within that area. In the early stage when there is not much in the way of much institutional support system, you would really be trying to get an understanding of the system that the farmers are practicing which is often very self-contained. But the goals of those farmers are often self-sufficiency and not profit maximization. As development gets underway, you might see a shift. You get a mixture of self-sufficiency-profit maximization till you end up with profit maximization so that the complexity of looking at the goals is much greater in the early development stages. When farmers are fully commercialized, then the external institutions are very important. The policy institutional frame-up becomes a very important area which social scientists should be addressing. So the function changes according to where the stage of development of the farming groups are.

The next point I want to mention is that I think social scientists have a very important role in evaluating the suitability of strategies that you are introducing. Technical feasibility is only one of them. Many of the others are socio-economic in nature. Yesterday, I mentioned necessary and sufficient conditions for evaluating the suitability of an individual farmer. The ne-

cessary conditions being whether the farmer should be able to adopt the improved practices. This would consist of considerations like technical feasibility, social acceptability (very important particularly in many tradition-oriented society) and compatibility with the external institutional support system. And then the sufficient conditions would be whether the farmer would be willing to adopt it. Even if the conditions are favorable, it does not mean to say that the farmer will be willing. That depends on whether it is compatible with the goals of the farming family, whether it fits in with the farming systems that he is already practicing, and so on. So I think the evaluation is very important.

One of the things I get as I keep going on as an agricultural economist is the value of labor. I think labor is a very important component in evaluating issues in the field technology.

But so often we design technology looking at the monetary returns. Maybe, often, the return per unit labor during certain periods is the more fundamental criterion. That is what an agricultural economist is supposed to do.

The fourth point is the interdependence issue and I would admit this is where we are failing. It comes right back to one of the points that Grace was saying in a much more articulate manner. (I don't know why women are often much more articulate than men. I have to say that in Filipino society because I feel women dominate in this society.)

As we look around in many, many farming systems research projects, we have gone to the other extreme. We are now addressing the needs of the individual farming family. I think if you look around and I think with due respect, the international institutes are very bad about that.

In economics you would say that probably they have a neo-classical modernistic approach to some extent. They are addressing the needs of the individual farming family. I think we should be looking beyond that. There is a lot of evidence in Africa that when we look at the individual farming family unit, we just look at it as a unit. We do not know what is happening inside that unit over time. There are many examples in Africa where the woman is losing out in the development process and farming systems research approach may need to look at what is happening within the family unit. Now that is a more complex problem. I do not know how to handle it. But it is an interdependence issue.

And then there is the issue of what is happening between families. We agree that we should classify the farmers into groups, homogeneous groups whatever that means. Ultimately, every farming family is different but for the sake of adjusting the needs, we try to approximate farmers into similar types or groups. If you help the farmers in this group, what happens to the farmers in that group over there? The interdependence issue is important because differentiation between those groups may be based on the control of certain resources. That is, certain groups have control of certain resources that can influence what happens to that group over there. And I think if we don't take that into account we are in trouble. And I am glad we talked a lot about agrarian reform in this meeting. It was good to see this, because you are recognizing that interdependence. If you address the needs of tenant-farmers what would be the landlord's attitude? You are addressing that. But I think it is not being addressed sufficiently in many countries. I think the historic question is very important. You have got to look at the past and at what the situation is now. Who is controlling what resources and who will receive the benefits of what you are introducing?

So you are getting into the future. I am frustrated with this. I don't think they have methodology that is simply applied looking at the interdependence issue. I think this is an area where the anthropologist can play a very important role but it is a very difficult area to come to grips with, particularly as to what might happen in the future, because I think this is important in designing strategies now that are relevant for farmers. You are going to increase inequalities in the society in the long run depending on what you do now. That's the issue that you have to address. It's a major issue.

When we address this to the individual farming family we are often addressing his short-run private needs, especially, his level of survival. He is going to be interested in surviving until next year. But we also got to look at the long-run societal interest. One aspect is the point that Dr. Percy mentioned — the ecological stability in the society. If you degrade the ecological base now there is no life in the future for people to live on. That is one point. The other point is socio-economic. What is happening to the stratification in the society — the interdependence issue? And I don't think farming systems research at the moment is addressing the issue of bringing about the convergence between short-run private interests and long-run societal interests. Now, I see that you are disagreeing. You may be surprised I am coming up very supportive in terms of anthropology.

F. T. RIVERA

Let me summarize, factualize what has been discussed by the panel. It seems to me there are more discussions on the client system and the issue covering the client system but very little on the project systems. Let me say a few more words re-

garding what we said at the beginning as to the two important elements of the farming systems research: the project system and client system.

There is a lot being said and maybe there is work being done towards trying to make a more complete picture of the systems and trying to uncover rather the block box in the whole farming systems approach. Perhaps the issues should be addressed more to trying to understand the human process and this is somewhat emphasized both by Dave and Grace. I think we have a complete picture of what is happening in terms of what is being done in research in those areas that concern the farmers, but very little done on the process at the project level. So maybe this is one of the things that have to be discussed more than anything else in the open forum which I now declare open.

F. C. CAMPOS :

Thank you, Madam Chairman, for emphasizing that what is actually lacking is an in-depth analysis of the human process.

First, I would like to raise the question of why there is no farmer in this forum when he is the most concerned about this thing?

Second, I always perceive as a social scientist although I am more of the technical. However, everytime a social scientist is called for, the first thing that they have in mind is a survey but the poor farmer is so fed up with so many surveys that he tells all kinds of crazy stories so that he can get rid of that person fast so he can continue his farm work.

The second question, I would like to ask is — Is there a better instrument that the social scientist can give in place of surveys? Because surveys are already getting in the nerves of the farmers, if I may say so, here in the Philippines. I direct this to any brave ones over there. And again, I congratulate Dr. Goodell for saying that true enough we should involve the farmers but the farmers really cannot identify their own problems. You ask them what their problems are and they say all kinds. And then you look at it and then that is not the real problem. Again, what is this thing that we should do in order for us to draw out from him his real problem? This is the second question.

The third one is what particular specific indicators can you suggest in order for us to have a definite measure of the impact of specific projects? Like for example, how sure are we that the increase in income of the tech pack project was due to our tech pack rather than a contribution of the BAEx technician or the irrigation system that came in or maybe the credit facilities that were given out? So with that I look forward to answers to these three questions. Thank you.

G. GOODELL:

One alternative is survey — but not really — it depends on what stage of research you are at — it is actual observation where you actually go and spend time, hanging around, if possible living in, but that is not necessary. Hanging around the people that you study and know them possibly by participating. You harvest or transplant rice with them. I have a friend who is working with Filipino bureaucracy whom I see go out and work with them. You spend special time with them to break down their inhibitions toward you. Furthermore, it is no longer possible for people to disturb their experience, because they are seeing hundreds, millions of experiences through the day. You can readily check on their behavior rather than what they say. However, ultimately, even this would have to be checked on a wider scale on how intensively you want to take them. We feel that this observation should come before a survey. Then you will be in a better position to know what kind of things you look for. There are now being devised what you call informal or non-formal tests. You get people to play games. The most famous is Dr. Binswanger where he got people to do risk games with him. All of these games are subject to criticism but if you do them in the right way, we can often device it in such a way as to make people unaware of what really you are getting at. There are many, many very clever ones who are fun to work with. There is another one which is now standard throughout that is really a game. It is not a questionnaire.

Secondly, I agree with you that it's very hard to get farmers these days and know what they need. Partly, we need to raise the farmers' awareness of what they want and need and their priorities. Then we also have to raise their ability to analyze and to express in a group way. All of this requires time. You are right. For instance, World Bank makes a survey and asks people what they want because I think farmers are really not aware enough or able enough or conscious enough of inter-communication dynamics to sit down under a mango tree for half an hour and tell you what they want. The process of organizing is quite widespread in the Philippines though.

D. NORMAN:

The problem with this kind of observation is the time element. It is a long-term thing. But the whole objective of the farming systems research, particularly during the early descriptive/diagnostic stage is to do it very quickly so that you can go to designing and testing and you can do a lot of verification during that testing stage. I am not sure how you interpret the survey. If you have a group of people going around just talking to farmers in an informal manner, that is not a diagnostic survey. It is another type of survey.

F. C. CAMPOS:

What I have in mind in this standard procedure is that they develop a questionnaire, they pre-test that, then they train the surveyor or enumerators and down they go. How many carabaos do you have? How many children? How many wives did you have before you became . . . You know, all of those things. You look at the survey. Then these are all baseline data. Then later on, after 5 years, an accounting system. Did he increase his income by how many percent? And in many project documents they are as quantified as that and so the output is expected that you will have increased the income of the family by so much percentage, that so many farmers would have adopted his technology, etcetera.

D. NORMAN:

I think you have to separate the two types of survey. I would say that the approach you used for an input into design and testing process perhaps is very different from what you used as a survey to evaluate that project. I see no alternative if they want figures. Then at the beginning and at the end you have got to do a formal baseline. One of the arguments I would like to see for the purpose of your putting inputs into the design and testing stage is I would like to see much more time devoted to this. Not time, but I would like to see a *Sondeo* approach, the Guatemala approach, where you can go with informal unstructured interviews which interact with technical and social scientists. That is a type of survey that is informal, the type of relationship that a farmer quite enjoys when you come around doing that. It may well be that it needs to be supplemented by one short survey. The one that you are using at CLSU is a very big one. I was looking through it last night. I bet you have two purposes for that which explains the complication. You have a purpose for your input into your design and testing. You have also a purpose for evaluating at the end of the project.

The other question about the felt needs. Incidentally, one of the things I meant to say earlier, I think it is absolutely essential that the social scientists are local people. They understand their environment. They should not be people from outside the area. Maybe they have preconceived ideas, but hopefully they have an understanding of that environment before they go in.

Regarding the second question in terms of addressing the needs of farmers, I think you are absolutely right. The farmers will often articulate the needs that they think you can help them with. I think if he is the type, you have to try and address the needs he articulates, but make sure that it is not conflicting with some other things that he is not mentioning. In other words, you have to have an understanding of that environment. I think the scientists do not consult with the farmer at all. You will be going back to the old approach. You are trying to introduce a product that the farmer wants. The anthropologist cannot help very much in terms of ways of questioning farmers, but they can do something. And I think the social scientist and technical scientist go through their own evaluation as to whether these are valid or whether they compete with other problems that they see. For example, in West Africa, we have a problem of "strikers". It is semi-parasitic on sorghum and it is endemic. It is very, very common. You go to a farmer and you ask what his problems are. He won't mention the "strikers", I suspect, because he does not know anything much about it. But a technical scientist will immediately see that and see that as an issue that needs to be addressed rather urgently. So I think getting them into the field, seeing it or going around the barrio – I think there is a lot of understanding and intuition that can develop. It comes through experience. It cannot be done through a form of training. I think that's a major problem. The only way you can compare the end from the beginning is to have another area which is exactly similar where you are not undertaking anything. And then you see what has happened to the package of change that you have introduced. It would be very difficult to say which factor did not change.

We have a project in Mexico in maize. They kept introducing new strategies and in the end you have no idea of what was the thing that turned the key toward bringing about development. And of course nothing is static. Everything is dynamic. Everything is changing.

F. T. RIVERA:

Let me summarize a few things on the CLSU baseline survey and towards answering the questions of Dr. Campos. Of course she knows about this already but this is for the benefit of the group. As Dave said this is a voluminous questionnaire and contains a list of information in 14 major categories. We consider this as a block of information for the baseline study purposely for two reasons earlier stated. One is for the testing-design-descriptive stages research as described earlier, and the other is towards monitoring and evaluating the on-going and also towards the end of the project or even in the middle. At the end of the project, we have to do some evaluation whether the tech pack project as an integrated scheme has had an impact or effected changes in the barangays and target clientele.

R. RAROS:

I would like to raise two major questions to the panel as well as try to contribute, to give comments on my observations about development work. The first question is up to what extent in as far as methodologies are concerned are we not able to measure the social impact of a lot of the development work that we are tying to do?

Second, to your perception, up to what extent do you think would be the effect of historical perspective in as far as the success of the development project is concerned? I should also like to make comment on the role of women in development. In my observation working with marginalized farmers, it seems to me that in the modern technological approaches, we have development biases towards greater use of women labor. In other words, we save labor in favor of men and the other routines of farm work to women and I am so worried about the motherhood role of women getting disrupted. I think there is also a need to look at the stage of development of a barangay or a community before any development work is to start because the stage of development will dictate the sequence and the process of development.

F. T. RIVERA:

What do you mean by historical perspective?

R. RAROS:

For instance, some of our development workers do not even have a clear perception of Philippine history, the barangay leaders knowing Philippine history. Or why, for instance, a man does not like to do ceramic work? For what reason?

F. T. RIVERA:

Who would answer No. 1?

S. JAYASURIYA:

I don't know how long we can measure the impact of change probably because everybody has his own impact that he wants to measure. But we have an interesting experience in our project. We come to think that the degree to which people are learning to participate in their own development is the main criterion of development and we actually have, working with some social psychologists, developed some indicators to the point of having developed instead of two or five different measurements which one could use to go into a barangay and see whether people are actually participating in the project – the World Bank, the EDP or Tech Pack or IRRI. Now, in the Philippines, everybody claims that we are teaching farmers to participate. This is a great deal of encouragement that we can actually develop perhaps through test, but everybody has different things to measure and so put all this together. If IRRI measures production, they think that's it, so they measure that. But some of these social values are harder to measure but probably there are ways if you work at it.

D. NORMAN:

Since I am a male, I would like to comment on the role of the female. I don't think that farming systems research is addressing very well what is happening within families. And women are a very important component of these families. And I can give you examples from Africa where you have families that may be headed by men. If you introduce mechanization, for example, the Oxen Act is controlled by the head of the household, the man. If women have fields of their own, they get the last shot at the use of the oxen. So they lose out in terms of timeliness of operation because the males get the use of the animal

first. And in a credit program, who gets the credit? Once again, it is the men, not the women.

You can look at fields in Senegal. You can look at yields of peanuts and the yields of fields farmed by men are twice as high as the yields of fields farmed by women. There are other cases in Africa where the women end up working a lot harder because mechanization comes under the realm of the male and so if the women can continue farming, she ends up working hard. Or when cash crops are introduced, the woman is pushed over into food crops and the men pocket the cash from the cash crops and don't support the family. There are many instances. And I would say this is probably a built-in bias in most societies if you look at the external institutions support system. Who runs the external institutional support systems in the Philippines? Are they men or women? In Africa males dominate, so women are often left out of consideration. So I think the role of women is very important. We should be looking at the family unit to see what is happening in the family. I think the bias, is not only a predominantly male-oriented bias, there is an effective bias in many of the things. But I think the bias is also a very much production-oriented bias. Production, anyway. So people do not go into the implications of that and I guess that's part of the education of scientists whether economists or the technical scientists.

F. F. CAMPOS:

I think the role of women in the Philippines, if I may speak specifically for Central Luzon, is really significant because by the very nature of the role of women in the Filipino family, perhaps we can even say that the Filipino women are more or less trade managers because they look after so many things. They are the holders of the purse, meaning they are the managers. They look after the children, after the household. The roles are really significant not only in the home but even outside the home. Being the holder of the purse, they can spell out whether farm systems research will do or not. It is not a joke. This is a serious observation.

R. RAROS:

Actually from what I know about farming systems, not only farming systems but particularly rice technology, is that women are displaced in the production process. For example, in direct seeding, we are displacing women from transplanting. And in Indonesia, rice milling which is predominantly a major source of income for rural women is completely destroyed when the mechanical thresher was employed. But the thing is, when people sit down in a farming systems research type to design a new technology, they never ever think about the implications of their technological changes until two or three years' time. When we get into a meeting like this, lots of people will talk about things of this and things of that and so on. And when you get a team of people to sit down and decide the technology to be tested in a particular area, believe me, I have yet to see an instance when anybody talks about the implications of this on women labor.

F. F. CAMPOS:

I think Dr. Raros has a point there. Traditionally (I am talking from the Philippine scenario), there are certain activities in the farm relegated to women. Like for example, growing vegetables, poultry, hog raising, and all of these things. Now, if you go into farming systems and you have inputted these activities, then all of these become added roles of the women in the household. And the husband's role is only rice production. You were talking of women being displaced because you were talking about monoculture of rice. But in a farming systems context like our integrated model farm, I could see the woman's role as wife because it is a husband and wife team. Practically, she does the business aspect, she feeds the broilers, and takes care of livestock and vegetables. So I am in agreement with Dr. Raros that this is something we have to look into if we want to retain the responsibility of the mother in taking care of the children. The men, after they have planted their rice already, go to the cockpit, disco and others.

TECHNOLOGY GENERATION REPORT

D. NORMAN :

I appreciate being asked to lead the group this morning, although I have a cultural problem in the sense that I don't know much about the Philippines. But we had a very lively discussion group and I hope that what I will say represents the views of the group. I especially thank Rolly Labios because he sat on my right and he was very helpful and I would like to acknowledge that publicly.

The first point we brought out was that the methodology on farming systems research is still evolving. Our discussions brought out the fact that there are a number of handbooks that are at IRRI in the area of farming systems research. There are four publications from IRRI that are relevant in this area. One paper is impressive. There are also two papers from CIMMYT in Mexico on the West Coast. There is a handbook being prepared by the Consortium of Western Universities in the United States, a handbook on farming systems research which will be available later this year. And finally, from Guatemala, there are papers written on how to do farming systems research. So I think those who are wondering whether they are wasting their time in this meeting should not consider it, because it is within only a couple of years that these handbooks will be appearing and there is still no conventional general accepted way of doing farming systems research.

Now, before we talk about the specific individual stages, let's talk about four general issues.

Firstly, one of the general issues is the selection of target area. How do you select the target area when it comes to working? We discussed different ideas as to what should be the criteria. Generally, those that came out as acceptable to most of the people were accessibility and at least the promise of some adequate support services in terms of marketing, distribution system, and institutional credit.

Secondly, it was felt that because of limitation of resources, people should be working in areas that are representative of large areas. Because of the limited resources you can't work in every area, so you choose areas that are representative of large areas in order to multiply the impact of the work that you do.

Thirdly, pick an area that has reasonable homogeneity in terms of the types of farming systems that exist in the area. In general terms, "homogeneity". We would stress that the farming systems that exist in an area are the end results of the interactions of the technical elements — the soil, the climate and the socio-economic characteristics.

Finally, the fourth issue is the potential for improvement of the target areas. Most people feel you should be working in those areas in order to establish credibility. But then if you look at some hill farming work that is being encouraged at the moment, that is a reflection of these people that are being left out of the whole system and they need encouragement. But that may be more of a long term goal of farming systems project. I think what we are addressing is something from which we can get a quick pay off. So I think there is a bit of ambivalence in terms of where you go on that last one.

The second general issue is the focus. Basically, what is the focus of a farming systems research project? Should we be looking at a large number of variables in the systems in relation to parameters or a small number of variables in relation to parameters? Going back to the CIMMYT example, you are looking at how to put wheat or corn into a farming system. The cropping systems program in the Philippines is looking at all crops so you got more variables in the systems. The CLSU project is looking at a very large number of variables. It is looking at crops, livestock and the institutional marketing framework at the end, so it has a large number of variables and relatively few parameters.

The following points came out of these discussions: The first one is that if you increase the number of variables, you increase the methodological problems of doing farming systems research. I think we all accepted that. The next comment that came out was that the focus probably would depend on whether the area you are working in is a depressed area or whether it is an advanced area. If it is a depressed area, you probably have to emphasize production aspects and keep the support systems you have made to try to influence the marketing system. However, in advanced areas like Muñoz where production might be a minor problem, marketing becomes a major issue.

It was felt that in most areas where farming systems research might be carried out in the Philippines at the present time, the emphasis would be on increasing production within the constraints laid down by the support system. In other words, you have a rather submissive approach, and not a support system. However, it was brought out in the discussion that there might be value in this approach which is being done in one or two areas. The idea is to have a management action committee consisting of researchers, local political leaders, development representatives and some farmers. This committee gets together and is aware of what is going on and how the policies and institutional framework would have influence in order to make the in-

sight framework acceptable. This scheme is consistent with the regionalization of the agricultural system in the Philippines. I am not saying that this management committee should be at the regional level. It might be at a much lower level than the original committee but specifically aimed at the target area. The final point was that, at present, the interventionist or policy influencing the institutional front in an internationalist manner like the CLSU area would be very limited if that sort of thing is done in a very selected area.

The third general issue is the discipline. What discipline/disciplines should be involved in farming systems research? The general point to notice will depend on the focus and the problems that you find in the target area.

It was felt that we should think of two items. There should be a beginning team or a forward planning team, the composition of which should represent a large number of disciplines that would be involved in the early stage of just looking at the area (a reconnaissance survey) — all sorts of discipline like agronomy, crop protection, extension, soils, animal husbandry, ag engineering, anthropology, ag econ. Later, we would simply have a small team which would be doing the on-farm work when you actually get into the implementation. The composition of the smaller team will depend on the focus of the farming systems research project and the problems identified. We basically agreed that there should be this on-site team in almost every area. The farmer should be a member of such team. He is right up front, he is unpaid, he is the up-front person. Then we have the agronomist, an agricultural economist, and agricultural extensionist. So — farmer, agronomist, ag economist, extension man. As for anthropology or rural sociology, there is a lot of debate. I don't want to get into that now. Some people say they should be included, some people say they should not. It depends on the circumstances. It was felt that this small team (on-site research) might have back-up support from specialists in pathology, entomology, soil science, etcetera. They might come in and help overcome a particular problem. This process links back with the other original team that does the original survey.

The fourth general issue raised is the idea that cost minimization is involved in farming system research. You try to get results at minimum costs. This is a major issue because the Philippines has limited resources and this fact influences the design of the methodology for doing this type of farming systems research.

The three issues that help in minimizing costs are: (a) a speedy process of moving through the design, (2) descriptive diagnostic design, and (3) design, testing, and extension.

Going back to the fact that we should be working in large areas to insure the multiplier effect, the transferability and the final one is not to wait for optimum conditions. If we come up with at least something better than what is being done, get it out. Don't worry about coming up with optimum solutions. If it is better, get it out.

Then we go to specific stages that are outlined in this discussion. In this outline here, I think that earlier, we did not really address ourselves to the suggested modification in existing policy organization or research and extension. I guess we considered this issue in the general issues that we talked about. So let us go through this quickly.

In each of these stages, we try to outline the objectives of each stage and determine methodologies as well as the role of the disciplines in each of the stages. So the first one — the descriptive diagnostic stage. What was the objective? The objective we came out with was we should describe the farming systems, the productivity of those farming systems, the problem areas that these farming systems face, the constraints that exist on these farming systems, the flexibility that exists in these farming systems, and assess the potential for improvement.

This objective will involve dividing the target area into homogeneous subgroups of farmers. These groups of farmers will face the same constraints, the same resources and similar accesses to support systems. And therefore, similar strategies will be required to help the farmers in those subgroups. So we are deciding on that basis. Now there is another objective that we get mixed up with this scientific diagnostic phase. This is the idea of a benchmark survey: to provide a basis for evaluating the project at the end of a project period. That, of course, could be very important, but we felt that what you might do when you get into farming systems research process of providing an input into the next stages of the process might be very important and very different in what you might use when you evaluate the impact of a project. And so we push that benchmark study for evaluation purposes that would involve the whole work, then fulfill the needs of addressing what is important in terms of the designing and the testing phases.

Then we discuss ways on how to carry out the descriptive diagnostic phase. The first step is of course secondary data analysis — looking at what are available in the area. It was generally agreed that technical data are more readily available in many areas than socio-economic data. Agroclimatic data, soils, etc. are very important in terms of assessing the potential for improvement. The second step was to have a reconnaissance survey. What we are arguing for was the Sondeo approach that was used in Guatemala. This would be informal, unstructured interviews with farmers, extension workers, development agencies.

It would consist of that large group of disciplines that are involved in the beginning – going out talking to farmers, extension workers, people in development agencies on a man-to-man basis, in an informal manner. There are quite a few disciplines involved in this exercise. It may go on for about two weeks. At the end of it, one would like to see some sort of common report that would characterize the area. This would give some idea on what subgroup there should be, how homogeneous it is and what the constraints are in that area. The report may also come up with some priorities.

As a result of that process you go through the third step focusing on one short survey. The objective of this is to verify the preliminary grouping of farmers obtained in the Sondeo, the reconnaissance survey; to verify the constraints and put positive quantitative figures on some of those constraints; and clarify some of the issues that were unanswered in that reconnaissance survey. The design of that one short survey should be made by the team, and not designed by the social scientists alone but in collaboration with the technical scientists. This is to ensure that we get a constant linkage between the technical and the social scientists. The survey should be administered to a stratified random sample. In other words, we would try and interview representatives from each of those preliminary subgroups of farmers that we have identified in the reconnaissance survey. We emphasize that these forms should be location specific in terms of its design and it should be short and the processing should be done very quickly because the findings are needed to provide an input into the next stage of the design process. So it's got to be short, done quickly, and processed quickly.

Then we went on to the next stage which is the design stage. What are the objectives of the design stage? We thought the objectives of the design stage are to identify the priorities for research. And these priorities go in terms of the group. What groups take priority over the other groups that we should be working with? Should we be working with all those groups of farmers we've identified or just some of them? How about the topics that we should be working with? There should be some order of priority.

The second objective would be once we have identified those priorities, the same should be addressed using information from other research programs and from farming systems which are already practiced in the area. After defining the objectives, we proceed to the next stage on how we should do it. It was felt that once we have identified the priorities and we come up with some sort of order of priorities, it is important to try and discuss these with the farmers. We ask the farmers if we have come up with the right kind of priorities. We say "Do you really agree with the prioritization we have drawn up"? We got stuck with some discussions on how we talk to these farmers, because depending on who you talk to, you might come up with different lists of priorities. We should talk with representative farmers. So we thought that the management action committee that I mentioned earlier was not really the group that we should be talking to in order to verify these priorities but perhaps we should get small groups of farmers together and thresh it out with them. The next step after verifying the priorities is the selection of certain strata or certain groups of farmers that we're going to work with. We got to be realistic that we won't be able to work with all groups of farmers. Once again, as we come back to the criteria in terms of establishing credibility, we probably work with groups of farmers' strata which have the largest number of farmers and have the most potential for improvement. In terms of establishing credibility we have to make that compromise which is not a very comfortable one to work with, but I think we have to be realistic.

The next point we considered was the design process. Once we have established the priorities to work on and the strata on what groups of farmers we are going to work with, then how do we go on to the design process? Well, we draw on the component technology research that comes out of other research programs and we put that component technology into packages that are thought to answer the constraints whether through breaking those constraints or exploring the flexibility in the farming systems by avoiding the constraints, putting that together in a manner that we think will be compatible with the overall farming systems used by farmers. In other words, we start putting it into a package that we think is compatible with the overall farming systems.

When we look at this word "package", it becomes a complex issue. A package can consist of a quite complex cropping pattern. It can consist of one crop or a package of crops and livestock. It can be a very complex process. But I think one of the things we stressed with regard to the package is that we would like to see a package that would be designed for several levels. This was the general feeling because of the differences in skills among various farmers. We should design one with less skill. We might design one that involves lower input than another package. In other words, we might design levels of packages to enable more farmers to adopt the technology. This is a complex issue. I think there was a feeling that just designing one package and assume it should speak for all farmers is probably rather shooting for the moon.

Then we talked about the experimental variables. In designing your experiments, what do you consider as experimental variables and what do you regard as parameters or constants? Well, I think we felt that the experimental variables are those you would consider important in overcoming the constraints or exploiting the flexibility that exists in the farming systems. All

those things that you are not going to influence, i.e. the parameters, you should keep at a level at which the farmer is operating. In essence, you are just superimposing a few experimental variables on the farmer's level of management. That is a very complex issue but I think it is an issue that all of us in this room are having difficulty articulating at the moment.

The terms of the next step, experimental design, are suitable especially on the experiment station. We did not discuss it because that is very straightforward. The evaluation criteria in terms of the results of that experimental station work would be whether or not we think the treatments are looking at the constraints or address the needs of the farmers that have been identified in the descriptive diagnostic phase. We don't put our own evaluation criteria; we think of it in the farmers' terms.

Then there's the role of a discipline. We thought all disciplines have a role in this design stage, the basic team consisting of the agronomist, the ag economist, the extension man. Perhaps possibly an anthropologist. But then an input from the supporting cast, the others, the entomologists and such types, are necessary. Then the final stage in terms of our part not the farmer's, of the research process is the testing component. What is the objective of the testing stage? We decided that the objective of the testing stage is to evaluate the improved practices flowing from the design stage in conditions more close to the farm situation. In other words, we are not simulating, we are getting out there on the farm itself. Frequently, there are two levels of testing, there is research-managed trials and the farmer-managed trials. Then there's the superimposed trials, a little bit that is in-between research-managed and farmer-managed.

We recognized that our main task was to simply look at the research-managed trials. We did not discuss the experimental design that we would use on research-managed trials but we stress that we will still use the same experimental design used in the experimental stations. It will be much simpler, however, since we will be looking at a few number of treatments. We would have replications probably between fields, not within fields, in general. We really basically accept what you are already using in Capiz and in one or two other areas — the IRRI approach in terms and size of crops. The number of replications was not discussed because we thought this was already well threshed out in the Filipino setting. But standard experimental techniques for research-managed trials don't hold so easy when you get to the farmer-managed trials.

Then the next point on how to do it — selecting farmers. Who should be included in research - or farmer-managed trials? We did not resolve it. I don't think anyone of us expected to resolve this. I take it you want to pick representative farmers. But then there is a danger that you are going to end up with an uncooperative farmer. The other thing is to pick cooperative farmers since the cooperative farmers are often community leaders. They are often the better farmers, the bigger farmers, and so on. So there is a real problem. We never resolved this issue and I think someone very diplomatically put it this way: "Well, we could note that we should be looking at representative farmers when it comes to farming the on-farm team." What we would like to see would be say, two farmers that might be leaders, two farmers that might be the average, and two farmers that might be poor.

They would be selected randomly because you are looking at few farmers. That was the ideal. We recognized the practical realities as to whether what we are looking at overcomes the constraints that we face or avoids the constraints to be faced by exploiting the flexibility and assistance.

The last point we recognized is that all disciplines should be involved in this research process, perhaps at this time the extension man on the team is starting to get a little bit independent. He may be bringing in farmers to look at these research-managed trials, getting their reactions, discussing with them not just the farmers involved in the on-farm tests but other groups of farmers. He may be bringing farmer counsellors, and the locally trained extension people in to look at it. So he will start to spread his wings a little bit at this stage. We said that we felt that the farmers of course are involved in technology generation, verification and dissemination, right through the whole process.

The researchers are very important in the technology generation. And in the verification, they still have some role. Also, they have some role in the dissemination, monitoring and evaluation. But their role might diminish a little bit over time through that process.

The extension man starts off with not such a major input, but his role starts becoming a prima donna as he goes through the research process. He becomes very, very important at the end. We recognize that both research and extension should be involved right through the whole research process.

A. GOMEZ:

We must symphatize with Dave for not being able to give most of his knowledge and not being able to listen to many of the stories we have been getting this lunch time. But you can see that their group covered a lot of ground. And probably, we

should spend sometime to listen specially to the members of the group. Maybe there are certain issues that have not been stressed that they might point out to us. Are there any additional comments from members of the group?

PARTICIPANT:

As a follow-up regarding discipline, I think instead of specifying for example an economist or agronomist to be a member of the survey/preliminary team, it should be someone from the area of economic production and a sociologist in social science so that all the areas will be covered.

A. GOMEZ:

Any other major issue?

R. RAROS:

I notice that in the overall research design there has not been much attention as I would expect about the input of the farmer into the research design itself. In other words, in evolving the crop pattern for instance, I think that the farmer's ideas on how to do it should be involved.

D. NORMAN:

I think your points are well taken. I think we generally agreed that the farmer should be involved and I am sorry that this issue did not come through. I think you are absolutely right. I think in the spirit of the discussion this morning, we did feel that the farmers should be involved in the design process. I apologize.

F. CAMPOS:

May I comment on that. That is why during our meeting I said that let us not just presume that the farmer is included there. Let us specify and list him. As a matter of fact, I said he should be number one in the list. From the technology generation up to the full entourage of activities, but not necessarily to be the leader. We took that into consideration, Romy.

TECHNOLOGY VERIFICATION GROUP

A. MAGLINAO:

I guess we do not have a very long report as what the generators have come up with, but I hope we will generate more discussions with a shorter report.

Let me first acknowledge the participation of the members of the group. May I call the members of the verifiers to stand up (applause). I would like to acknowledge the participation of Linda Flores who took notes during the deliberation. I would like to discuss what happened in the group. Maybe the other groups overheard us laughing a lot but anyway we have been doing our responsibility. First of all, I emphasized to the group the objective of the workshop which is to evaluate and formulate a farming systems research methodology which could be adopted in the Philippines. And again this morning, there was the question of so many overlaps among generation, verification and dissemination. And so what we did was first to define what is technology verification and to do that we presented a schematic diagram. That schematic diagram was patterned after results of a seminar on technology verification and dissemination.

So from there you could see that we can answer what technologies are to be verified. It could be borrowed technology, it could be indigenous technology, and also you can see the inter-relationships among the technology generation-verification and dissemination activities.

By looking at this diagram, we were able to come up with a procedure as outlined in the framework that was given this morning. We were able to see and hear what we have already included in the issues, policies, strategies, programs, and the monitoring and evaluation as part and parcel of all the activities in the whole project. Having that as an introduction to the activity this morning, we went on discussing the verification procedures we could follow. We came up with four general steps to follow in verification:

1. Identification of training or farming systems technology packages.

It could be component technology or a mixture. It could be either borrowed or indigenous. So this answers what sort of farming systems technology packages are to be verified. We could do this by the process of inventory, documentation, analysis, and prioritization. We came up with several issues in the discussion of this activity and the first basic issue was what is farming systems? What is a farming systems technology package? Of course, we have listed down the issues and we have some deliberations, but we do not have anything to suggest to the group. As part of our recommendation, we suggest a follow-up workshop. Because of the short time that we had, we listed down the issues but we do not have anything concrete after this. So that is one and the other one is who identifies. Maybe the generators may claim that they should be the one to identify the technologies to be verified but we feel that the people in the private areas should also be considered. So it boils down to the contribution or participation of the farmers. Then who prioritizes? And what are the basis for prioritization? Maybe on the basis of prioritization, we could more or less have some concrete suggestions here. We have identified some basis for this like marketing and distribution, nutritional level, whether it will be large-or small-scale verification trials.

2. Identification of human technology packaging systems, characterization and description of bio-physical, socio-economic conditions of target area, end-users, extension methodologies of tech packages, farming systems dissemination, considering also the institutional and cultural constraints of the given target area.

To do this we have to know the regional profile as to the physical human resources constraints and community dynamics. Well, as far as some of the terms here are concerned, the group feels that there are some new terms but we have Dr. Rivera who can explain to you the meaning of this.

Also as part of the methodology in support of Step No. 2, we can hold field workshops, small area development, social action and each field workshop should be a multi-disciplinary consultation dialogue. Again, we cannot do away with the generators and the disseminators. As far as regional profile description is concerned, we asked ourselves these issues: What baseline information are needed? What is the minimum essential? For what purpose do we have access to computerization and of course the analysis?

So for the baseline information, maybe it is a relative thing. Other regions may need more information than others.

3. The development and implementation of technology verification including farming systems verification design.

Verification development program comes in after identification of what technologies are to be verified. What are the target areas considering not only the bio-physical but the socio-economic cultural and institutional factors as well? And for the methodology we have to identify and select farming systems technology package concepts and for this we should develop criteria of barangay entry. And for this, issues that come up again is the problem of selection of barangays. Who are the cooperators? These are the farmer-cooperators now. Because in this particular aspect, we are concerned with the farmers' participation here. So we are also concerned with who the farmer-cooperators will be in the farmer-managed verification trials. Then No. 2 is the development and implementation of farmer verification design.

4. Documentation and analysis

As you will see the issues and policies are more or less related. For example, in Step No. 1, we have also to consider large scale or small scale. Again, we have here indicated the inter-relationship among technology generation, verification, documentation and analysis. Documentation and analysis refer you to the existing farmers' practices. The lower portion of the pyramid shows the participation of extension people and we say that from the beginning the extension people are involved but his participation intensifies towards farmer-managed verification trials.

So again, this could be a subject of our discussion later on. We are now in the last step in the verification portion and this is regarding monitoring and evaluation. For the methodology we have identified phases and types and stages of evaluation and monitoring:

(1) Operational or baseline study
(2) Pre-operational
(3) Operational
(4) Post-operational

These refer to the stages of the project. We have also identified the levels of management under monitoring and evaluation which starts from field level, mid-level and top level. The goal of the system is the socio-economic well being of the

area. And again, I am not very familiar with most of the terms here. T_0, is when do we start evaluating? The T_1 during the middle of the operation, and T_2 after the project is finished. Now, in this portion of the activity, we cannot always say that the system or the technology after verification is ready for dissemination because it is most likely that we will encounter some problems which we will throw back to the generators. So in this case, we should have back-and-forth communication between the generators. That is why we have also included in one of the issues here the reporting system and the bio-feedback. So it is a question of whether the verified technology is really ready for dissemination toward the dissemination aspect of the activity.

Fo. the recommendations, we have four:

1. Refinement of farming systems research terminology in order to avoid confusion. Again, we discussed this in the past two days whether it should be farming systems or farmer systems.
2. Use of end-users' prioritization criteria. This now reflects the needs of local farmers because we may have a very good technology generated but if they are not acceptable then we may have placed it under a top priority in terms of let us say feasibility, but acceptability could be at a lower level.
3. A follow-up workshop.
4. Improvement of human private management including monitoring/evaluation.

A. GOMEZ:

Thank you Mading. I think the planners of this conference were very wise in having only three hours for the workshop session. Imagine if we had a whole day, our reports would have been two or three times longer. But again, let me give a chance to the members of the group since they have additional information or comments.

F. F. CAMPOS:

One important item in verification is Monitoring & Evaluation (M/E). I was expecting only the general framework of M/E to be included here. First, I would like to congratulate the group. But I don't know if this is implementable.

F. T. RIVERA:

The M/E has a time cycle. This corresponds to the time cycle of a certain project. If the project is five years, then the time cycle is five years. Like in the Tech Pack, since we have the time frame from 1978 to 1982, so therefore at the purpose levels we like to achieve a certain goal we call "Cloud 9". The welfare-social equity goal is really something new and you cannot attain that in a short while, but somehow you could approach it. So then, I integrated three schemes: monitoring scheme as well as the management levels that will participate in the monitoring; and the hierarchy of objectives that will be attached at each stage of development and implementation of the project. So then starting from the bottom, we have the farmers, the field technicians, and those belonging to the small team. Like a railroad, we have a time frame for each of the stages. You cannot accomplish all the things that you want to do in so short a time. Therefore, you now assign targets and specify these targets in terms of complete or maybe behavior components. So in a sub-project level in the case of Tech Pack we have at the sub-project level the socio-economic research, Tech Pack testing and adoption and the food and grain processing center.

Somehow there should be a consistency, a unification to achieve a perfect communication and this happens in the earlier stages of the Tech Pack. The animal science group was doing one thing, the socio-economic group was doing another, and the agronomy group was also doing another. In fact, in the selection of the barangay and in the selection of the farmer-cooperators, we did not have common criteria. Of course, the administrator concerned is success-oriented. So usually, he is biased towards good farmers. But then there is the social equity goal or the achievement of a certain level of development in the barangay target areas. So then should it be the depressed farmers? That's why we line up also the issues in consonance with this.

Therefore, when designing the monitoring and evaluation scheme, we decide on what should be monitored, what should be evaluated and why. In the Tech Pack project we also have Americans coming in, Filipinos coming in, and all kinds of evaluators and we call these the external evaluators and we do also have the internal evaluation like we have in annual program reviews of what we are doing. Many times we feel that what external evaluators are saying and trying to look at our project are not the same as the internal level evaluation. Many times, priorities at Ministry level trickle down into the project level and we are also confused as to which farming system tech packages are to be prioritized. In research, we have our own orientation and biases that cannot be avoided. For example, there is the conflict between the interest of CLSU and the interest of the Ministry. So the university President has one kind of pet project, I have my own, and the others may have their own too. That's why in research we have our own orientation and biases that cannot be avoided. But then it has to be some leverage

against some objective criteria. So now, the phases would be — I used the word pre-operational referring to prior implementation of project. Then we have the baseline study. (If you want to know more about it, you have to go to CLSU and we might conduct a workshop there.) Right now we are in the process of analyzing and looking at 3,000 variables. The earlier comments of Dr. Norman are very well taken. If you have a project that lasts for five years and it's now on its third year but the baseline study has not been analyzed and written, then it may not serve its purpose anymore.

So we have the operational aspect of the M/E. This will be conducted from the beginning up to the end of the project and this will report what is on-going not only on the formative but also on the other aspects of the study. In the end we would be able to measure the project.

Now in issues and policies, T_0 there means time zero. Like in the setting off to the moon you really have a countdown. Then Time-one would mean between the third and fourth year and Time-two may be between the fifth and the sixth year. And here I am recommending already a kind of human process management because the M/E tools we are using at the Ministry do not reflect that. So what happens is that it is reported. But how it happened is not well documented. And so somehow we have to make a decision. Not all can be documented though. But there are many significant aspects of the process of management which can be documented. For example, why is it that there is a fast turn-over of people in the project? Maybe the social organization is not working efficiently so we have to look at the system and sub-systems. But which system? Yesterday we were articulating our ideas on the project system. This is the least monitored. What I mean is we may have our own faults in the implementation of the project. We did not fully understand the project goals and how to carry the project as well. So we would like to have a reporting system to be used by the management as a tool in making the project flow and move.

DR. PANTASTICO:

I have been hearing quite a number of good reports and recommended resolutions. The more I hear the more I am getting confused. I have a feeling also that we have an attitude of getting materials for expert writing, something like that. This is not addressed to anyone, but this is a general comment. What I think should happen at this stage of the game on the multiple cropping and farming systems is to see in the models a report from the beginning. What are some of the models that can work on specific areas and if that model is good except that we have to add this a little more. That model may not be in the right direction. The more we get this, we go on specific area and specific frame. So we do not like to make it appear that we are back to zero and then we come up with recommendations. So we would like to see if we can cite which of those presented recommendations may be pursued so that we can start this discussion.

S. ABIT:

I understand that the verification aspect will come after a technology has been generated, and dissemination comes in after the technology has been verified. Now I would like to suggest that the mechanics of each — like generation, verification, and dissemination should be placed together. From this intersystem we can talk on the evaluation report. I think there is no problem in the evaluation aspect. I should say evaluation is necessary on the three aspects but I think each evaluation will be limited to the particular subject matter. For example, in the generation aspect, the evaluation will be limited to the generation of a certain technology, And in the verification-evaluation, it will be limited to whatever technology is identified after verification that could possibly be adopted into different places. And in the evaluation and dissemination, how much of that technology has been adopted and is there any impact of that technology which has been disseminated? I think what is necessary here now is to put this into one system so that at least we can bring something into our respective stations. Regarding the suggestion of Dr. Pantastico, I think there is no one model there that could possibly be adopted in all the regions. It is now up to the particular agency who will handle the program to adopt a certain model to a certain region at provincial or municipal level.

A. GOMEZ:

Thank you. Any other comments? It seems to be a fair suggestion that since we are really talking of generation and verification as related activities, we can probably put the two together. That type of suggestion I think coincides with the paper presented by Dr. Norman during the first day where he dealt primarily with the combination of generation and verification. Maybe this is indicative of the hazy boundary between these two activities, one of the reasons of some of our difficulties in terminology beforehand. But essentially, then, the task is to develop new technologies that are better than what is now being practiced and this covers both the technology generation and verification parts. Any other issues that should be raised?

H. CUSTODIO:

Please allow me to underscore the importance of this workshop in terms of a program to be undertaken by the Ministry very soon. It is the plan to integrate all these work on packaging and verification of technology at our regional stations. This will be the major function of most of our regional stations as proposed. This goes to show the importance of this workshop. Now, because of the disparity and conditions obtaining in the regional stations, there is no one model that is applicable for all. But at least we should have a working knowledge of the various types which we could later modify. That should then be the answer to our problems in these specific areas. From the models presented in the primary stations, a model can be chosen which could approximate the specific needs of the respective regions. And I think this is a case-to-case decision but at least on the overall, there should be an overriding principle that will govern the process, the system, and the sub-systems. There should only be one monitoring system for the entire system. So I think when we have already the sub-systems presentation I think it is high time that we wrap up our discussions on a system, the entire system. We should look at it as a continuing system.

A. GOMEZ:

Thank you, Pol. Any other comments? Let me then bring one other issue that has been harped at several times during the presentation. In essence, if we are looking at this activity which is the technology generation-verification part as defined, I think one of the worries that had been voiced during this report is the cost of the technology generation-verification activity, this cost being both in time, in number of people involved, and the area that is covered. I think most importantly the expensive part is really the time. As you know, in the developing countries, we are always on a crash program. We are always on the run just to keep pace with the developments of the time and probably there might be some general discussions here on the length of time to be spent on technology generation-verification. How long should it take and what might be the steps that could be taken to shorten it and make it less expensive in terms of time, money and people? Any comments here? Shall I call on Dave?

D. NORMAN:

I really do not have anything to add. I think the efficiency of the research process is not just money. It is also time. This is a major issue. And I think we are looking for short cuts. I think what our group did this morning was to bear that in mind. I would like to support previous comments and I think we should try to integrate things now. I can see where the verification people are coming from but I think some of the things they are saying are things that come in the early stages of the whole process. It is the same people who are involved in the descriptive, diagnostic, generation, verification, and to a lesser extent, in the dissemination. It is the same thing. I think the verification people have done a good job in giving us this realistic spectrum.

A. GOMEZ:

I wonder what the experience of KABSAKA has been. Glenn, would you like to say something about this time issue?

G. DENNING:

What we did there was basically to take much of the technology and methodology information gained from the Iloilo KABSAKA Project and then tested it elsewhere in the country. Instead of starting from scratch, we already had a technology which was worthwhile testing in the field and immediately we managed to get adoption by farmers. But that is not the end point. At the same time in South Cotabato, while this research program is going on, we are also refining the technology.

A. GOMEZ:

I am not an employee of the M. A., but hopefully, I will accurately present the rationale for this workshop symposium.

I think there are several activities that are simultaneously occurring in the M.A. By the way Pol Custodio is here, I am sure he will add to some of the things that I will have to say and I will have to tie this up with some of the findings that we have this afternoon. What are these activities that are on-going in the Ministry?

You are aware, of course, that the regional directors are the primary central actors of the reorganization of the Ministry. You know that and we take that as given. Together with this are several proposed programs for World Bank loans that should be of interest to many of the regions. The underlying principle is that from now on the regional directors will essentially bear much of the burden of what used to be activities of the national offices. The general principle of many of the activities is to

pass down to the regions the planning, implementation of research and development. I think if we take Masagana 99, most of it was coordinated by NFAC.

With that as the underlying principle, what happens is that you have many aspects of research and development now put under the regional directors. The regional directors now, for example, manage the research work in the region. It is not only the dissemination part that is now under the authority of the regional directors, but also research. So both technology generation and verification would then be under the authority of the regional directors. Coupled with this, I think, is a loan from the World Bank with funds that will establish a network of farmer trials all over the country. These are designed to test whether or not certain technologies are applicable to the different regions. This is the loan that Ed (Quisumbing) is going to negotiate in Washington sometime towards the end of this month. The rationale behind this is that the technologies that you will use in your region are the same technologies that have been verified to be suited to your region. This is why in this conference, we are talking not only of a new technology but also of how you will develop your own technology. You will not for example go back to your region and say "this is the new magic miracle fish." What we are essentially saying now is the procedure you may adopt to develop your own technology. This is like the story of giving fish to an individual or teaching that individual the skill to catch his own fish. I think that at this time you are now in the stage where what we are talking about is the skill and ability in catching fish, not just being doled out the fish. When you get to that stage, it becomes more difficult. As we progress things will be more difficult, there will be more responsibilities.

Second, look at the rainfed area in all of Mindanao. It is very similar to that in Iloilo. This means that these areas will probably require the same types of development projects adaptable to Iloilo. This is what we are now talking about here: How to disseminate the technology, not what technology to disseminate but how this technology can be disseminated. These are what we might call the seedlings of major activities that will come in the near future. I am voicing some of these things that Ed Quisumbing has been talking about. I think he probably has been talking to you about it anyway.

If we talk about a general framework of developing your own technologies in your own respective regions, that is what we term as technology generation/verification which is, in essence, an activity that is mainly done in farmer's field. This is an activity that is done jointly by research and extension workers both of whom are under your direct hand. This is an activity that is supposedly one that integrates very closely and naturally to a dissemination part. We are talking of a continuum activity, mainly out of station. We have only spent very little time on what is done in experiment stations. We are talking about what is done outside of the experiment station, primarily an activity that is done both by your researchers and extension men. We are talking of an activity that is done by almost the same people from beginning to end. For example, when we say the Subject Matter Specialist (SMS) should participate with the research group in developing and designing the technology, these are your people that participate in an activity from start to end. In essence, it is a process of weaning the region away from the national office to be self-supporting and self-sustaining on its own. I think this has been the cry of almost everyone of us from the very start and I hope that it will be realized soon and then many of the planning and implementation will be realized.

In short then, we have tried during the last two days and today to bring to your attention a procedure for doing something, a procedure that hopefully you will be using and will continue to use later on doing the kind of work that you would like to do in the region. None of this is perfect. I am sure you are aware of its defects. What has been tried is to bring people who have had experience in this activity here this afternoon for them to share with you their experiences and for you to learn from their experiences and then for you to synthesize your own experience or your own activities later on. There are various alternatives that are before you; while not very specific, and while there are many alternatives, we hope that you will consider these alternatives and arrive at one that you will find most useful in the region. As for the regional directors whom I think are the intended beneficiaries of this conference, I hope then that you will find some use of what has been discussed in this conference and probably we won't think of these three days as a waste of your time.

J. LAPITAN:

Any other comments?

H. JEREZA:

As I have mentioned earlier, we have three programs — 1) the on-going program on cropping patterns, or the ABC's. 2) the program of Regional Integrated Agricultural Research Stations (RIARS) which shall be essential for verifying packages of technology for the respective region, and 3) the loans that we will be getting to finance some of these crop-

ping pattern programs in Mindanao and the Cebu development program and several of these. Now these will be the beneficiaries of this workshop and the regional directors will have their arms full in implementing these programs. There is no one model for each region. You have got to evolve your own model with the guidelines presented by the various speakers. I think we are now in a better position to evolve our model for our respective regions. I think that is the end product.

A. GOMEZ:

We will not come up with some production technology after this meeting but we hope that there will be some procedures that can be brought back to your respective areas on the basis of which you can develop the technology that you can use.

TECHNOLOGY DISSEMINATION

A. GOMEZ:

I know the issues are quite complicated and I think it will take an hour or so to merge the various reports. We are really going to that — on how one report would merge with the other. I suggest that we keep that at the back of our mind and very quickly finish with the third part of the report so that we can look at some general guidelines on integration. Since I am moderating I will see to it that we are on time for our report. I think there is also the least problem of overlap, primarily because I think the group assumes that when technology dissemination starts, the technology is already available.

The first two groups talked about how the technology should be developed and verified. We assume that this technology is already there and we spent no time discussing about the technology developed and verified. We just talked about how such a technology can be spread very quickly.

Fortunately, we have several regional directors who were able to give us some fairly good guides on what is now happening and how certain activity should be merged into existing activities. I think you have a one-page paper that has been distributed to you. Essentially, we felt that for the first part, the technology dissemination activity really looks at the institutional and social structures existing in the communities that could then be held more in the dissemination of technology. In this area, we are not looking at communities and before I came here, I thought the generation and verification aspects would look at farmers as a unit and that here in this area of technology dissemination we would probably be looking at communities. But apparently that is not the case with the previous reports because even the verification report was already concerned with community structures. Anyway, we thought then that the task of technology dissemination is to provide the institutional and social structures that can support the accelerated dissemination of a technology that is available and has already been designed.

We were told that in all regions of the country, because of the new reorganization of the Ministry, there are now areas in each region which are pilot testing a new extension delivery system, this system being one where the extension technician is a generalist. This technician deals with his farmers on more crops than what his farmer cooperators grow and on all animals. So those of you who are familiar with the Philippine extension system may notice that this is a major modification of our previous extension system where our extension people were assigned to individual crops. I am told then that there are in each region one or two municipalities that are pilot testing this new system. Having been informed about this, the group felt that it might be wise for the pilot municipalities to include other aspects in these tests, to look at it as a community and consider things that can be provided in order that a technology can be disseminated more rapidly. And so in that report, we are saying that we should use the new production technology which is farming systems-based as a component of that area. We look at credit and see to it that some of its aspects are incorporated. The same is true with marketing systems that are now being developed in the country, farmer organizations which are under the Ministry rather than where it was before under the other Ministry and the seed production aspect.

In essence, what the group was recommending is to convert this fairly limited pilot area center on extension delivery system to embrace the other aspects of these pilot areas so that we can see to it that the new technologies on farming systems can be introduced to the community in an accelerated manner. We hope that probably some of the regions would adopt this and that we would be able to find out whether or not technology that has been developed in the first two groups are in essence worthwhile extending. Now, together with this modification of the process, there should be a fairly simple and easy

way to implement a monitoring system so that we will be able to find in one or two years whether or not the things that we are doing are successful. After all this is a trial. And the group has suggested that in terms of M/E, there are major indices or indicators of success or failure of this pilot program. One of these is the adoption of the new technology on the basis that the farmer will no doubt accept those technology that are different. And so if there are many farmers who will adopt it, this means that this technology is promising. Second, for those who have adopted a particular technology, we should probably look at their net farm income and the nutrition of their children as they contrast with those farmers who did not adopt.

Some people have indicated that in terms of nutrition, you can just look at the height and weight of the young children and that really go very far from there because what we need is an evaluation process, an M/E process that is simple and can be done quickly. Otherwise, it would not be done at all. And the third one is to look at the farmers who did not adopt the technology and ask them for the reason why they did not adopt. These are the three indicators that were recommended by the group, essentially, to be measured in the pilot municipalities of the different regions, so that after one, two or three years there will be a fair indicator as to whether in fact what we thought would work did work.

Finally, we tackled these other issues on the role of researchers in this activity. By the way the first and second is really the activity to be done — the activity of technology dissemination in pilot areas. What is the role of the researcher here? The possible alternative roles are listed there — four of them. SMS is the term used to designate the subject matter specialist who is now in the present organization at the provincial and regional levels. The SMS that we are talking about here are in the provincial level, and we think they should be included in the research team that has been described in the first two groups. Second, the production technicians participate in selecting the test farms. We have been told that by and large when the researchers go out and select their farms, it is primarily selected by the research group. The suggestion is that these farms must be selected upon recommendation of the production technician so that their location is known and the SMS could be updated on what is happening and he can use it as best as he could in his task of dissemination. Third, is the researcher a participant in evaluation? Well, the researcher participates in the evaluation of the production program. In other words, when we do this M/E part, the suggestion is that the researcher should participate in the recording of production, benefit of production, and so on. And finally, extensionists and farmers should consult with the researchers in planning. These are the three major issues that have been discussed by the group. They are specific, primarily because I think the task at hand is more specific than the two other groups.

Because of the wide dimensions of things that we could be discussing and may be hopping from one issue to another, may I take the liberty of directing the discussion. Try to see to it that the discussions will look at specific issues first. The thing that strikes me is that the verification report sort of really overlaps and straddles, so to say, the generation and dissemination. I think this is when my friend Dr. Pantastico was making his comments. I think this is probably what he was alluding to as well. And so could I then request that maybe this would be the first part where we can direct our comments and concentrate on first. That seems to be a very important issue, right?

F. F. CAMPOS :

Regarding that, this is precisely the very reason why I commented this morning that it would be very difficult for us in our discussions not to involve or tread into technology generation, into the other groups. I really appreciate Group 2 because they looked at the whole picture *en toto,* looking at the integration of technology generation and the involvement of technology generation with that of dissemination because we really need to have a look at it at this point. As to whether or not we liked the way they presented it is something else but the process is okay with me the way I see it. It shows to us very clearly how the technology dissemination dovetails or cuts across or connects the other aspects and similarly how dissemination relates to verification.

Dr. GOMEZ :

Any other comments? I think the issue probably is a definitional issue. The task obviously of farming systems research and development covers all the three groups up to dissemination. We have used certain words that I thought were quite acceptable but probably not so. I think the verification group had interpreted the verification stage to cover from start to end, thereby encroaching on the other aspects of farming systems research.

F. T. RIVERA :

The presentation was like that but we did not intend to really cover generation and dissemination-utilization. We just presented it that way because we are looking at both ways. While we consider the generation and utilization systems, we did

zero-in on farm management trials. Let me demonstrate this by looking at that pyramid. In the agenda for today, we did not even consider documentation as an important input into technology. Documentation somehow should be in generation. And so in the end there are supposed to be some arrows here, reiterative arrows which were not drawn and so we are zeroing in only on farmer-managed trials but we did not indicate the extension program as contained in the agenda. Each component has extension in it and therefore we would like to look at it that way, too, so that technology dissemination utilization is there, supportive of all the processes.

A. GOMEZ :

As I understand your report, it covers from T_o to T_v. What is verification here is only the last four blocks.

F. T. RIVERA :

Yes, you have there T_v and T_g. T_g or technology generation is the research-managed thing while T_v is farmer-managed and that is the technology verification stage.

A. GOMEZ :

No, I don't think it should really be that way. It is like this. We are looking at it as a whole system and therefore all of the three (T_o T_g T_v) belong to one system. And you have sub-systems and other sub-sub-systems. Now whether you are in generation, in verification or documentation, you are doing essentially several common activities and there are common denominators to them. Therefore, as we specify verification we have to go back to what generation and documentation people are doing, so that we are jibing activities on certain points in time. So that the definition of the simultaneity and the necessity for doing these kinds of jobs are specified at once. Otherwise, this will look as if the generation people are identifying their own barangays and the verification people are doing another thing. So we look at it from that vantage point.

I understand they are part of one system. But you are really defining these - T_o T_g and T_v as sub-systems of a system. Definitions are in essence like that, right? You define the sub-systems and in essence we have tried to define the sub-systems of T_o T_g and T_v. But obviously, when you do this, you are able to define the boundaries of sub-systems. Otherwise, you have a very poor sub-system.

What I am in a way trying to elucidate are the boundaries of the sub-systems that we are talking about. As I understand the sub-systems are very difficult to define. Can I call on Glenn?

G. DENNING :

I am having some trouble really understanding the mechanics of this technology verification. What specifically is going to be done? Could I ask the people who provide this information to tell us. Given an example, the technology of the rice-fish culture. How do we verify the usefulness and credibility of that technology across your target area? Specifically, what would you do if you have an improved technology, say, rice-fish culture? How do you verify across your target area?

A. MAGLINAO :

In step 3.1, we identified which technology could already be verified. So the next step we go down to 3.2 which is identification of the target areas where this technology of rice-fish culture could be acceptable in terms of biophysical, socio-economic, institutional, and other cultural practices or factors in the area. So that is how you go from identification of which technology could already be verified to the areas where they should be verified.

G. DENNING :

You do it in the office. You don't actually . .

A. MAGLINAO :

No, that is why we have some issues here in the identification of which technology could already be verified. We have here who should identify. I already mentioned that the research generators could claim that they should identify but we claim that we should consider the target areas, the people in the target areas.

A. GOMEZ :

Suppose you have already identified the target areas. Then what do you do in the farmer-managed trials?

F. F. CAMPOS :

We are talking very specifically of rice-fish culture. That is our forte and this is part of one of our technology packages or tech packs. This gives me a chance to explain this. Actually what we did is that we have the Freshwater Aquaculture Center which develops the technology for the fish alone. The selection of the rice variety that is needed as a pre-requisite for this kind of system is done at IRRI. Meaning, that the variety must be relatively resistant to pests and diseases considering the fact that if you put insecticides then the fish will suffer. All of these have been worked out as component technology.

For example, rice. How does rice respond to this particular insecticides whether or not it is resistant to specific pests and diseases? Together with the identification of rice varieties and with the identification of the species there should be a study of particular pesticides that would affect the fish at minimum adversity. So there has been a testing on different pesticides, how to incorporate it, and what particular insecticides. So here you have different components. Then we all got them in three mixes. The problem came up. What kind of trench design? Is it going to be center trench or peripheral? Now we have already mixed two commodities. We are mixing the rice and the fish. But here comes the problem now of how to make that particular mix viable. Will a center trench be more favorable to the fish or to the rice? So research is again conducted on that. We found out that in center trench, water gets very hot. At certain times of the day the fish don't have enough place to go around so we added another component in the system. We studied it with the use of taro *(Colocasia esculentum).* Will this solve the problem of shading, giving shade to the fish, lowering the temperature? Will this be workable under a center-trench if added? Also, what particular species of gabi will be able to enter in that system? We have now all of these in-campus testing. And then once we have verified that and we have packaged the technology, we are now ready for off-campus verification. What do we do? We get farmer cooperators. First we look at the target areas. Which among these target areas will have the physical resources to support this kind of package of technology? What are the pre-requisites? Basically water is a pre-requisite because you have fish. If an area is not assured of a steady supply of water nothing can be done because the fish will not survive.

Granting that water is available but pollution in terms of pesticides from adjoining areas is a constraint. Look again, how many of these farmers are using this particular insecticide? There is the sociological problem of poaching. If, for example, an area that has been selected is far from the household, problems of poaching comes in. It is very sociological but realistic. All of these. Now, what do we do with the farmers? Shall we teach him the technical aspects? What do we do off-campus? We train first. We get all of these farmers, bring them to CLSU, train them, teach them the basic pre-requisites, we explain to him why we have to do these. We give him alternatives. If water is limited, and you want to produce more rice and less fish, use center trench. We give him sets of alternatives from which we can choose from, depending upon the physical and biological conditions and resources that he has. Then we help him in the technical aspects but the day-to-day activity is managed by the farmer himself. He is the manager and what do we do? We just monitor his activities. He consults with us if he has any technical problems and we try to help and to evaluate. That is how we do it. That is why Dr. Rivera and I are sure that these things are a replica of what we are doing. We have been integrating all of these because we do not see just one sub-system but several which should be integrated.

DIRECTOR SERRANO :

I do not know whether it is fortunate or unfortunate that our group (technology verification) is in the middle. We have to first locate ourselves. . .who is on the right and who is on the left? You are fortunate perhaps because your neighbor is maybe only one. In our case there are two. So we see the two sides of the coin. In other words, we want to look at the two aspects of the truth. All these two days we have been saying we have to link these three. In fact we are saying that there should be a continuity. I don't know whether you are accusing us of having done too much in our output but I think this is the minimum thing that we will be able to visualize for the team particularly at the regional level. And I think that the way we did this, I think it is the briefest we can do, as a matter of fact. And as far as whether it is specific or non-specific, I think taking the country with its varied agro-climatic conditions, we cannot really do it as specific as some people would like it to be. And I think our group has the most number of regional directors and we feel that in order that we will be able to see things the way perhaps you would like to see it right in our different regions, we see that this kind of presentation will be more understable by us and by our people. So perhaps we have located ourselves in such a way as to see the left and the right sides so we will have a total vision of what farm systems research would be for us — the people at the regional level.

J. LAPITAN :

I think what we can do when we leave the meeting is choose from those models presented the one you will adopt in your locality. You have discussed the merits of these models. You can do one more thing in the region. Get hold of your captains and generals there and discuss which of these can be adopted as an introduction. We have agreed we will try on the national level but in the regional level why don't you simply do that? Discuss the merits and advantages of all these packages presented to you and determine which packages to work on. Beyond that, let them use borrowed money from different projects. So we will do this for this year up to the second year. And maybe when we come back here to compare notes, you tell us which model you will adopt. The more we get such feedback at the national level, the more positively we can identify the program that can be adopted in a majority of places in the country.

A. GOMEZ :

One more comment. Relative to what was mentioned, there is a letter of Ed Quisumbing to the regional directors and it is precisely what was suggested and that is what we will do. Among the questions in this letter pertaining to extension workers are the following: What do they perceive to be the priority, is it light or basic research problems confronting the farmers in their areas of operation? How, according to extension workers, can a stronger linkage between extension and research be forged? This is in connection with the meeting of our own people from the provinces outside the influence of researchers. That is what precisely was suggested. What is requested here is to meet and include this as an input in our consultation and this should be done on or before the end of March.

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