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ANNEX

PROJECT EVALUATION

INTEGRATED ROOT CROP PROGRAM

VISAYAS STATE COLLEGE OF AGRICULTURE

TEAM CONSULTANTS

March 30, 1992

Marcel W. Zollinger

TEAM

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Research Program Outline

IDRC Funded Integrated Root Crops Program

VISCA, Baybay, Leyte

Overall Program Coordinator	-	DR. JOSE L. BACUSMO, OIC, IRCP Director, Philippine Root Crops Research and Training Center (PRCRTC)
Technical Program Coordinator	-	DR. MANUEL K. PALOMAR Director, Office of the Graduate School

PROGRAM 1 - **Varietal Improvement of Sweet Potato and Minor Root Crops**

Program Leader: Dr. Jose L. Bacusmo

Project 1 - **Hybridization (Wide Crosses and Varietal Crosses) and Observational Trials for Several Uses**

Project Leader: Prof. Rodrigo F. Sebidos
Professor, Plant Breeding

Study 1 - Generating Sweet Potato Plant Variabilities Observational Trials and Wide Crosses

Study Leader: Prof. Rodrigo F. Sebidos

Study 2 - Yield Trials (Preliminary and Advanced) for High Elevation Conditions and for Any Subsistence Farming Situations

Study Leader: Prof. Rodrigo F. Sebidos

Study 3 - Yield Trials (Preliminary and Advanced) for Optimum Conditions and Inheritance Studies

Study Leader: Mr. Dilberto O. Ferraren
Instructor, PRCRTC

Study 4 - Cytogenetic Studies in Wide Crosses of Sweet Potato and Wild Relatives

Study Leader: Ms. Marilyn Z. Oracion
Instructor, Plant Breeding

Study 5 - Tissue and Embryo Culture in Sweet Potato and Wild Relatives

Study Leader: Ms. Celsa A. Quimio
Instructor, Plant Breeding

Project 2 - **Evaluation of Sweet Potato Genotypes for Various Characters with Emphasis on Marginal Environment**

Project Leader: Dr. Ruben M. Gapasin
Department Head, Plant Protection

Study 1 - Adaptability and Stability of Selected Sweet Potato Genotypes on Problem Soils

Study Leader: Dr. Jose L. Bacusmo

Study 2A - Resistance of Sweet Potato to Scab and Root-Knot Diseases

Study leader: Dr. Ruben M. Gapasin

Study 2B - Sweet Potato Plant Resistance to Weevil

Study Leader: Ms. Reny G. Gerona
Instructor, Plant Protection

Study 3A - Screening of Sweet Potato Genotypes for Storability Parameters

Study Leader: Dr. Antonio L. Acedo, Jr
Assistant Professor, Horticulture

Study 3B - Screening of Sweet Potato Genotypes for Organoleptic Quality and Chemical Composition

Study Leader: Prof. Marcelo A. Quevedo
Assistant Professor, PRCRTC

Project 3 - **Varietal and Cultural Management Improvement of Minor Root Crops with Emphasis on Aroids and Yam**

Project Leader: Dr. Jose L. Bacusmo

Study 1 - Development and Selection of Improved Taro, Yautia and Arrowroot Genotypes

Study Leaders: Dr. Jose L. Bacusmo and Mr. Dilberto O. Ferraren

Study 2 - Performance and Acceptability of Selected Genotypes of *Dioscorea alata* and *D. rotundata*

Study Leader: Prof. Nestor L. Pido
Assistant Professor, PRCRTC

Study 3 - Somaclonal Variation in Yam

Study Leader: Prof. Villaluz Z. Acedo
Assistant Professor, PRCRTC

Study 4A - Improvement of Cultural Management for Minor Root Crops

Study Leader: Mr. Alfredo G. Dingal
Instructor, Regional Coconut Research Ctr
(RCRC)

Study 4B - Biological Control of Major Taro Pests

Study Leader: Prof. Erlinda A. Vasquez
Assistant Professor, PRCRTC

PROGRAM 2 - **Processing and Utilization**

Program Leader: Dr. Manuel K. Palomar

Project 1 - **Development of Sweet Potato and Cassava Food Products and Processes for Subsistence Households**

Project Leader: Dr. Truong Van Den
Associate Professor, Food Science

Study 1 - Assessment of Eating and Processing Characteristics of Sweet Potato Varieties and Hybrids Processing Technology

Study Leader: Dr. Truong Van Den

Study 2 - Improvement and Evaluation of Selected Sweet Potato and Cassava Processing Technologies

Study Leaders: Engr. Felix J. Amestos
Assistant Professor, Food Science
Dr. Lemuel M. Diamante Assistant
Professor, Food Science

Project 3 - **Processing and Utilization of Food Products from Minor Root Crops**

Project Leader: Dr. Lutgarda S. Palomar
Associate Professor, Food Science

Study 1 - Development and Evaluation of Food Products from Arrowroot

Study Leader: Dr. Lutgarda S. Palomar

Study 2 - Improvement and Pilot Testing of Food Products from Aroids and Yam

Study Leaders: Engr. Felix J. Amestoso and Dr. Lemuel M. Diamante

Project 4 - **Livestock Feeding Strategies in a Sustainable Root Crops Production System**

Project Leaders: Dr. Oscar B. Posas, Head, Animal Science, and Mr. Lolito C. Bestil, Instructor, Animal Science

Study 1 - The Potential of Silage from Root Crops for Sustainable Animal Feeding

Study Leaders: Dr. Oscar B. Posas, and Mr. Lolito C. Bestil

Study 2 - Economical Swine Production in Root Crops-Based Farming Systems

Study Leader: Dr. Sulpecio C. Bantugan
Assistant Professor, Animal Science

PROGRAM 3 - **Information, Communication and Extension**

Program Leader: Dr. Eliseo R. Ponce
Director, Research and Extension

Project 1 - **The Philippine Root Crops Information Service (PRIS)**

Project Leader: Ms. Rebecca B. Napiere
Senior Librarian, College Library

Study 1 - Information Delivery/Distribution Systems

Study Leaders: Ms. Rebecca B. Napiere
Ms. Epifania G. Tudtud, Instructor
Center for Social Research

Study 2 - Root Crop Data Base

Study Leader: Ms. Julieta R. Roa
Instructor, PRCRTC

Project 2 - **Development, Production and Evaluation of Communication Materials on Root Crop Technologies**

Project Leader: Dr. Monina M. Escalada
Professor, Development Communication

Study 1 - Development, Production and Evaluation of Print Materials on Root Crop Technologies

Study Leaders: Dr. Monina M. Escalada
Ms. Edith A. Gundaya, Head
Training and Extension, PRCRTC

Study 2 - Development, Production and Evaluation of Audio-Visual Materials on Root Crop Technologies

Study Leader: Dr. Monina M. Escalada

Study 3 - Development, Production and Evaluation of Broadcast Materials on Root Crop Technologies

Study Leaders: Dr. Monina M. Escalada and Ms. Edith A. Gundaya

Project 3 - **Development of an Effective Technology Transfer Scheme for Appropriate Mature Root Crop Technologies on Production, Processing, Utilization and Marketing at the Community Level**

Project Leader: Dr. Salvador C. Dagoy
Acting Director, CSR

Study 1 - Development of an Effective Mechanism for Farmers' Participation in On-Farm Research in Selected Areas of the Philippines

Study Leader: Prof. Rodrigo F. Sebidos

Study 2 - Community Organizing for Accelerated Root Crop Technology Transfers Among Subsistence Households

Study 3 - Strengthening the Regional Capability of the Department of Agriculture on Root Crop Technology Transfer

Study Leader: Ms. Maria Cristina U. Ramirez
Administrative Assistant, PRCRTC

Project 4 - **Integrated Socio-economic Studies on Root Crops**

Project Leaders: Dr. Nerelito P. Pascual
Director, RCRC and Professor
Agricultural Economics & Agribusiness

Dr. Jose M. Alkuino Jr.
Department Head
Agricultural Economics & Agribusiness

Study 1 - Profitability of High Yielding Sweet Potato Genotypes

Study Leader: Dr. Nerelito P. Pascual

Study 2 - Marketability and Acceptability of VSP's, Minor Root Crops and Processed Products in Selected Areas of Leyte and Samar

Study Leader: Ms. Norma B. Mesorado
Instructor, Agricultural Economics & Agribusiness

Study 3 - Economic Analysis of Improved Technologies on Root Crop Processing

Study Leaders: Prof. Camilo D. Villanueva
Director, Office of Business Affairs and Assistant Professor, Agricultural Economics and Agribusiness

Dr. Jose M. Alkuino, Jr.

Study 4 - Feasibility Studies of Root Crops for Food, Feeds and Other Uses

Study Leader: Ms. Analita A. Salabao
Instructor, Agricultural Economics and Agribusiness

Project 5 - **Monitoring of Impact Variables of the Integrated Root Crop Development Project (IRCDP) in Pinabacdao, Samar**

Project Leader: Dr. Ramon S. Laguna
Associate Professor, Agricultural Economics and Agribusiness

FIELD OPERATION Leader: Dr. Salvador C. Dagoy

Annex 2:

Methodology for the Self-Evaluation Exercises

by

Marcel W. Zollinger - Consultant

Annex 2: Methodology for the Self-Evaluation Exercises

1. Seminar for all Study Leaders held Monday February 15 at VISCA

The IRCP Program leader Dr. Bacusmo, Acting Director of PRCRTC, VISCA, called a meeting of all the project leaders and study leaders to introduce Mr. Zollinger, and to allow him to outline the approach to his work.

2. Briefing on the Project Cycle

A short outline of the project cycle was given, beginning with design to implementation and evaluation. This aspect was especially stressed, with particular emphasis on the constructive paradigm, i.e. presenting an evaluation, not as an audit, but as a learning process. Here it was particularly important to indicate that, in the IRCP, this was an opportune moment to look back and to clearly focus on the work accomplished, on the successes and the failures. It was especially these failures which should lead to an analysis of what could have been done better. Based on this, the project cycle can then be closed, using the lessons learned as the starting point for the design of a new and better project.

3. Background Situation of the IRCP

The participants were briefed on the situation at IDRC, with its new president and the possible shift in emphasis of project funding priorities. At the same, time the financial situation was outlined, with the potential cutback of up to 20% of staff and possible future spending restrictions. The implications for the IRCP would thus be that a continuation of IDRC funding beyond the present project was not assured. However, one of the aims of the resource person was to help VISCA to evaluate its IRCP in order to assess if a continuation could be argued for, independent of the outlined IDRC situation. It was made clear that the better a new proposal was, the more likely it would be considered. And, in turn, the quality of a new proposal would hinge on the lessons learned in the present project, and thus directly on the evaluation and analysis of these activities during the present assessment process.

4. Goals of the Visit by the Resource Person

His goal was to achieve the following tasks by the end of his two week stay:

- instill in the study leaders an understanding of constructive evaluation within the project cycle, and guide them through an effective and objective process of self-evaluation
- form a management team and guide it through a process of assessment of important project management issues

- have the project leaders write 33 short but concise and accurate reports on all the studies, including an evaluation of the study, work to be done until the end of the project and potential future work

- identify a number of management issues and have a detailed report on each by a member of the management team, including the design of a better project model based on the lessons learned

- generate from these two types of reports a detailed work plan for the extension period from July 1982 to June 1983

- prepare a general outline of a potential new project, incorporating the built-in improvements generated by the analysis of the two types of evaluation reports submitted

5. Study Team Tasks

Each study team (or individual) is to undertake its own assessment, with the support of the Project Leader, but without his influence on the analysis. The basic task is to carry out a self-evaluation of each study under the IDRC Project. The study leaders (and their teams) are expected to be critical, objective and constructive, and in particular use the identified shortcomings as a learning experience. Each study leader is then expected to write a report of five to eight pages, with the following general headings:

- Clearly define the goals, targets and measurable indicators which were set out for the study, either in the project document, or as they were understood by staff.

- Write a brief report on the work carried out, as a type of methodology, but with emphasis on the practical, as it actually happened.

- Outline the work achieved to date with a special focus on the practical results.

- Evaluate the results achieved, especially as set against the goals and targets initially set, as outlined in the first point.

- Discuss the successes, problems and shortcomings of this process, with an analysis of why this happened and how these problems could be overcome.

- Outline the work remaining:

    - between the time of assessment and June 1992 and
    - during an extension from July 1992 to June 1993.

- Prepare some conclusions and recommendations including proposals at to what type of work could be of importance in a new project, should this be considered.

6. The Management Team and its Tasks

Initially it was envisaged that the leadership within the IRCP would assess management issues, but in practice there were only two persons present. It was therefore decided to form an enlarged management team and it was left up to Dr. Bacusmo to form this team. In an initial meeting with the Resource Person, he outlined the task of this team, which is to address a number of relevant project management topics. This process was to be parallel to the individual study reports, as it should also be an assessment exercise analyzing these topics, indicating shortcomings and success, and recommending better approaches as a result of the lessons learned. Each member was to be assigned one topic, according to Dr. Bacusmo's judgement, however it was left up to each individual as to how the information should be gathered.

The following topics of particular interest to the Resource Person were proposed but, at the same time, suggestions were welcomed:

- The relationship between IDRC and VISCA in general, and the IRCP in particular.

- The role of VISCA as a research establishment, its other mandates, and the ability of the institution to carry out research.

- The present system(s) of dissemination of the research results generated by VISCA and IRCP, the adoption rates of the new technologies and the hindrances to a more rapid and comprehensive adoption rate.

- The relationship between VISCA and the IRCP with the Department of Agriculture and other government bodies, in particular regarding the dissemination of research results.

- The performance of an integrated research program containing a multi-disciplinary team and the usefulness of this model for the future of VISCA and for IDRC.

- The IRCP management system, its organizational structure, its efficiency and effectiveness, especially the degree of cooperation between the Academic Departments and the PRCRTC with clear indications for potential improvements.

- The existence and comprehensiveness of internal evaluation systems both short term, for ongoing management purposes, and long term, for the program as a whole, with special emphasis on the generation of a quantitative database to facilitate evaluation.

- Budget and financial aspects of the project in relation both to the overall management and its effect on the execution of the individual study.

Annex 3:

Management Team Reports

Annex 3: Management Team Reports

1. THE IRCP MODEL

Background

The Integrated Root Crop Project (or IRCP) is a VISCA project funded by IDRC that seeks to apply an integrated approach to the development of root crop technology. The mission of the IRCP is to test developed root crop technology and to design new technology that will improve the socio-economic status of subsistence root crop growers/ processors.

Secondary goals of this project are:

- to use the project as a unit of experimentation and learning on the effectiveness and efficiency of integrated projects

- to strengthen VISCA/PRCRTC as a national research institution for root crops through capability building, funding for research and by evolving research and extension models which can be applied in future works of PRCRTC/VISCA.

The origin of the IRCP can be traced back to the submission made by VISCA to IDRC of numerous individual proposals and requests for extension of ongoing IDRC funded projects in Singapore in 1989.

At that time, there were two existing IDRC funded projects at VISCA, specifically the Varietal Improvement and PRIS projects. Towards the end of these projects, the researchers felt that a need existed to continue the work. They initiated a new project proposal based on new ideas/developments generated from the previous work and submitted a proposal to IDRC for funding.

In early 1989, a meeting was called at IDRC Singapore with some VISCA administrators and researchers. In that meeting, problems related to the IRCP research proposal were discussed. An integrated approach was suggested. IDRC staff then recommended the pooling of resources from different IDRC programs to fund an integrated project at VISCA.

However, the concept of integration was not clear to most leaders and researchers. Attempts to resolve this led to several meetings conducted at VISCA and visits of IDRC officers which did not help to resolve the issue.

To design a proposal for an integrated project required that the project accommodate the previous projects and that it address production, processing and marketing/extension. Other components deemed necessary such as the minor root crop were also added.

When the rough draft of the integrated proposal was completed and the management structure was worked

out, certain problems arose. Specifically, some of the research staff were reluctant to reduce the proposed budget of their proposals to the level suggested by Dr. McKay. As well, research staff of some projects were hesitant to assume a role in the integrated project because it called for a lower management responsibility and reduced flexibility in using funds.

The final proposal was presented by selected VISCA staff to IDRC in Singapore. Further refinements of the management structure and research components were completed. In the end, the IRCP was approved for implementation.

Design and Implementation

A pre-implementation workshop was held to finalize components and budget allocations. In this workshop, more components were added which later jeopardized the impact of some studies. Unfortunately, IDRC representatives were not able to attend this workshop. By this point, each party had chosen respective roles in the integrated project regardless of the needs and opportunities of the clients at the site.

A unified survey and rapid rural appraisal (RRA) were conducted to select the pilot site investigate the farmer's circumstances in the pilot site and to establish bench mark information. Results of these studies were intended to provide the basis for improving the design, and for the phasing of the other studies. However, the unified survey ended up addressing too many issues. Therefore, data gathering and analysis were difficult to manage.

While the RRA report was released early in the implementation phase, the results of the unified survey came much later. The problems expressed by farmers in the selected pilot site highlight the possible intervention points. These problems were:

- a lack of planting materials of improved varieties
- a lack of technical knowledge on cultural management
- declining soil fertility
- the low price of root crops.

Of these, only two were included in the original proposal although the need to address the other two was emphasized and included in the later refinement of the IRCP.

The IRCP project is subdivided into 3 programs (production, processing and extension communication and socio-economics). Of these, Programs I and II are on technology generation and program III on technology transfer.

Vertical integration is strongest in Program I (Projects 1 and 2) where a single study addresses the generation of sweet potato genetic variabilities and the other studies handle the screening/evaluation of new genetic variabilities. Project 3 of Program I, on the other hand deals with minor root crops (aroids, yams and arrowroot) hence integration within the project is somewhat loose. A looser vertical integration can be observed in Programs II and III. For Program II, the components were dealing with different species of root crops and one project was on utilization.

Horizontal integration between programs is somewhat minimal. Integration between Program I and II exists in terms of supply of raw materials and exchange of data on characteristics and acceptability of F1's. With Program III, only some of the output of Programs I and II are included in the portfolio of technologies which are being tested in the pilot site. The technology generation components are under extreme pressure to come up with results which can be integrated into the program but some studies are still a long way from yielding information on useful technology. Program III on technology transfer is therefore strongly linked to past projects for technology that the project can promote or test.

Benefits of IRCP

Many of the studies such as the non-conventional breeding, variety development, introduction of new yam species, new products, training modules, printed matters, mass media materials and extension models developed will have significant impact on VISCA's capability as a research institution and on the national root crop program. Further, the equipment, staff development and training derived by VISCA through this project strengthened VISCA as a research institution.

Most, if not all of the researchers in IRCP, will acquire from this project some degree of appreciation of the advantages of working as a team of careful and holistic planning and of proper timing of interventions. In a way, the project was a significant learning experience for a number of root crop researchers.

They began to appreciate the need for participatory planning, administration and execution of activities. It is important to note that, to achieve full participation, an attitude conducive to voicing concerns must be cultivated among research staff. The importance of constant communication with other researchers in the project is also recognized. Programs which did not achieve strong integration are those projects whose members seldom meet as a group.

The importance of holistic planning and appropriate timing of intervention is also acknowledged. Research and researchers should not be compartmentalized into projects and studies.

Finally, the importance of sound management structure in the implementation of the project is highlighted. Clearly, the management has done its best to have this model work. If there were some shortcomings in managing this project, the whole group and to some extent IDRC, should feel responsible.

Weaknesses of the Model

A close examination will show a number of problems and weaknesses in the design and implementation of the model. First, the project did not start with a clean slate. Because of the notion that it was a phase II of the IDRC funded projects (PRIS, etc.) the new program leaders were unable to exclude or reduce emphasis on past projects.

Phasing is also important to an integrated project. The chronological implementation of different components would have led to fewer studies operating and fewer personalities to handle simultaneously. A project's integration depends on the ability to carry out activities in a timely manner. A plan that clearly

defines the sequence in which activities will be carried out is needed.

For IRCP, the project components were established even before the needs assessment of the pilot site began. Starting the different studies before the results of the unified survey and RRA were obtained and analyzed gave some studies an advantage.

Conclusions

A number of weaknesses have been inherent in the model from the design phase. These could be due to lack of experience of researchers with integrated projects and circumstances that had to be dealt with at that time. Problems in terms of personalities of researchers and management weaknesses in the project also exacerbated the difficulties of operationalizing the model. In spite of the weaknesses and constraints, however, the model achieved significant results and promoted a certain degree of integration. The model could be strengthened if lessons learned from this project are used to design a more effective and efficient model.

2. INTERACTION BETWEEN VISCA AND IDRC

As noted in section 1, the program was initiated in response to a IDRC recommendation that new projects for funding be integrated with existing projects. However, the definition of integration was not clearly spelled out. As a result the components of an integrated model were not consistently incorporated into the project.

Integration

There was a dilemma with both IDRC and VISCA on the concept of "integrated project". It was not clear whether integration means: (1) inter-disciplinarity in each program which would mean common goals, division of research responsibilities, complementarity and use of common facilities; (2) sectoral integration or simultaneous treatment of production, processing and commercialization processes; (3) functional integration - linking the technical, financial and entrepreneurial assistance system of the project and (4) working together in a common pilot site.

The lack of integration affected the manner in which research was carried out. It is important to note that except for the Unified Survey and RRA, IRCP implemented at the same time all projects/studies with a different focus. In simultaneous operations of projects with a different focus, the difficulty of integration was noticed. It is possible that the concept of integration is also not clear to IDRC PO's and, as a result, expectations were not clearly defined.

Program Officer Support

Interaction between VISCA and IDRC occurred only during reviews. As well, Project Officer (PO) feedback was received a few weeks after reviews. Suggestions from IDRC Project Officers to improve

implementation reports were not immediately incorporated because researchers were already following PCARRD Format. In some studies, IDRC and VISCA researchers still have some disagreement even after implementation (e.g. objectives and methodologies of studies).

Problems were brought out and discussed between POs and study leaders during consultation time but these were second generation problems or immediate problems that affect the researchers during the course of implementation.

The projects were also affected by PO turnover. When a change of PO was first announced to us during the consultation meeting last December 5-7, 1991, most of us were bothered by the news. We felt that IDRC support to IRCP would be reduced or terminated because a different set of POs not having been directly involved in the conceptualization and implementation process of IRCP would not support its continuation. The effect of turn-over is hard to measure but change of IDRC thrust has significant impact.

Suggestions for Improvement

For future projects, there should be a clear goal setting between IDRC and VISCA researchers/administrators especially on the subject of integration. To achieve better communication, frequent visits/consultations (e.g. 2 visits/year) of IDRC POs is important.

In relation to project/study objectives, methodology and expected output including schedule of activities, should be agreeable to both IDRC and VISCA Officers. IDRC should define its role as a funding agency in relation to the "needs" of recipient institutions.

Finally, administrative officials should not be given the responsibility of running such a big project.

IRCP is now on its last stage of implementation. IDRC, for whatever success/failures generated by IRCP, is a part of the whole process. We expect that IDRC should be understanding and proud of what this project achieved.

3. VISCA AS A RESEARCH ESTABLISHMENT

Visayas State College of Agriculture (VISCA) is an educational institution that is mandated to perform instruction, research and extension functions. Since it plays a lead role in agricultural development, VISYA has a regional mandate.

The Philippine Root Crop Research and Training Center is a research establishment of VISCA created by a Presidential Decree (No. 1107) to formulate and implement the national research program on root crops. By decree, PRCRTC's mandate is national in scope. While PRCRTC is under the administrative supervision of the VISCA President, it has its own advisory board (see Appendix 1) which reviews the plans and programs of the Center.

To identify the significant role of the Philippine Root Crop Training Center, it is important to understand

the role of both VISCA and PRCRTC.

The Linkage of the Center to VISCA's Academic Departments

The Center maintains a core staff with various levels of educational training and fields of specialization. In addition, it draws on the expertise of the staff in the academic departments of VISCA who could be tapped in the implementation of research projects. Academic staff may also submit their research proposals for funding and conduct the research in their own departments in collaboration with the Center.

The following policies have contributed to the strengthening of the linkage between PRCRTC and the other academic departments of VISCA:

- formulation of a college (VISCA) policy that called for the integration of the department research project with those of the research centers whenever feasible

- creation of the office of the Director of Research and Extension which assumes overall responsibility for planning, funding, coordination, monitoring and evaluation of research and extension projects and activities

- creation of an interdisciplinary groups called "national commodity teams" which conduct reviews of on-going studies to pinpoint aspects in research that needs reorientation or modification and to recommend new research for funding based on the priority areas set by the centers

- issuance of a college memorandum urging academic staff to conduct research

- formulation of a college guideline setting load points for research equivalent to teaching load points.

Academic or teaching staff generally conduct research in addition to their teaching assignments. Generally, the balance between teaching and research is left to the individual. However, staff who carry a maximum teaching load also conduct one or two research projects.

The teaching staff generally feel that conducting research is helpful to them in the following ways:

- their research results update their knowledge on a particular subject matter and strengthen their teaching competence

- research enables them to attend scientific conferences and to publish in scientific journals

- research strengthens their laboratories through acquisition of laboratory equipment

- it enables them to hire research assistants who can also help in their teaching responsibilities.

The situation in VISCA with academic staff conducting research is not without problems. From the

department chairman's point of view, the main problem is that, more often than not, the teaching staff tend to give more priority to their research than their teaching. Examples of this are the unprogrammed trips of the teaching staff to experimental sites or to procure highly needed supplies. These trips may result in the neglect of their classes.

The teachers, however, feel that this is not a problem because they hold remedial classes to compensate for any absence they incur. Teaching staff feel that the biggest problem is financial in nature, especially in the light of commodity and labour cost increases.

PRCRTC has also formed a research network for root crops throughout the country. This network includes major regional stations located in strategic areas to represent distinct agro-climatic and ethnic groups in the Philippines. PRCRTC's linkage with the cooperating stations/ institution has been going on for over a decade now without major problems.

Research Accomplishments

Some of the tangible accomplishments of PRCRTC that have a national significance are as follows:

- release of 13 sweet potato, 5 cassava, 1 taro and 4 yam varieties through the Philippine Seedboard;
- establishment of linkage with various academic and research/extension institutions around the country and with private organizations which include entrepreneurs, NGO's and financial institutions;
- conduct of more than 150 training courses on root crop production, processing and utilization in cooperation with Departments of Trade and Industry, Agriculture and Science and Technology;
- establishment of action/pilot projects to showcase root crop technologies in the provinces of Negros, Leyte, Samar, Bicol and Surigao, Benguet, North Cotabato;
- coordination of root crop research with the help of PCARRD.

Constraints

A number of problems affect the ability of PRCRTC to play a full role as a national center. The lack of fiscal autonomy from VISCA limits the flexibility of the Center to address urgent research and extension needs. Decision making by the Center is also impeded especially if it involves matters of external concern. Because of this, the national focus of the Center is diffused.

The budget is insufficient to enable Center staff to readily travel and conduct relevant research and extension activities in some locations in the country.

The extension works of the Center continue to be focused more on the small farmers rather than giving equal, if not more attention to the large or commercial planters. The Department of Agriculture is unable to extend full support in the dissemination of root crop technologies due to its various responsibilities

covering different crops and technologies coming from various sources.

Finally, the Center has insufficient involvement in national policy-formulating activities.

Conclusion

PRCRTC has proven itself as a research establishment. It has good and strong linkage with the different technical and academic departments of VISCA in the implementation of root crop research and extension projects. This complimentary relationship between the Center and the academic departments of VISCA has only a few very minor problems which can be readily solved. The Center is also able to maintain strong linkage with different agricultural colleges/universities and agencies around the country which cooperate in the national testing program of root crop varieties and other technologies that need verification.

As a Center having a national mandate, PRCRTC has been able to come up with relevant results and activities that may have national significance. Some problems exist that need to be addressed before PRCRTC can play its full role.

Recommendations

A system should be worked out with the VISCA administration in order for PRCRTC to have some kind of fiscal autonomy. The Center should work aggressively to obtain more funds from various sources.

The extension work of the Center should be realigned to give more attention to commercial growers or processors of root crops.

Further, the present linkage with the Department of Agriculture should be strengthened to encourage them to facilitate active dissemination of root crop technologies. Linkage should also be sought with other technical departments of the government, e.g. Department of Science and Technology, etc.

Finally, the Center should be in contact with the policy-making bodies of the country.

4. THE MANAGEMENT SYSTEM IN THE INTEGRATED ROOT CROPS PROGRAM

The Over-all Program Coordinator

The Over-all Program Coordinator is responsible and generally involved in all aspects of the administration of the IDRC-IRCP specifically on the over-all research management.

Among his duties and responsibilities are the following:

- supervises/coordinates the renewal of project-based personnel and study leaders;
- supervises/facilitates the processing of vouchers;

- monitors the progress of different studies;
- manages meeting with project leaders;
- attends to problems/requests of different study leaders regarding implementation of the project;
- meets with all project/study leaders;
- evaluates/reviews all programs, projects and studies;
- prepares and submits program/project reports.

The Technical Program Coordinator

The role of technical program coordinator is second to the over-all program coordinator. His role is to take over some of the functions of the over-all coordinator. However, his primary function is to help when problems of a technical nature arise. Originally, this role would have been filled by a research associate who would be responsible for coordinative and integrative functions of the program.

In hindsight, it is felt that a technical coordinator is not needed in the program since these areas are not new and many of the researchers are already familiar with the kind of directions they are taking. Many of them have already the necessary technical background.

Assistants for Coordination and Integration

Some staff members assist the over-all program coordinator. The process documenters, administrative and financial assistants are directly in charge of technical, administrative and financial functions respectively. (These staff are directly under the over-all coordinator and assist him in aspects related to these matters). A research associate was supposed to be hired but despite several advertisements no one has applied. Since the project was already underway, qualified staff of ODREX were tapped to assist with program coordination.

The Project Management Committee

This committee is composed of the over-all program coordinator, the technical program coordinator and program leaders.

It makes decisions about scholarships, training and procurement. This committee could decide among themselves before they are brought out to the general public. Some policies, requests or changes are discussed by this committee. Theoretically, major program decisions should be discussed by the committee. However, sometimes it is overruled and the decisions of the committee are not followed.

Personnel Management

The study leaders are responsible for hiring and managing their own staff. Project leaders do not have control over staff unless they have their own study to manage. The over-all program coordinator only has control only of the staff who work directly for him. He is advised when new staff are hired.

An exception to this is the Field Team deployed in the Extension Pilot Site in Pinabacdao, Samar. Other project leaders had a say here since the money came from different projects. A committee was created to select the staff for this particular purpose.

Project Resource Management

Each project leader was allocated funds according to the request they made earlier during the pre-implementation workshop meeting. The project leaders have full control over the use of these funds.

However, the purchase of supplies (without the approval of the Over-all Programme Coordinator) is limited. This was a policy approved by the Management Committee to serve as a check and balance.

A problem arose with respect to project savings. The group decided that a certain amount should be used (from the savings) for the Pilot Site Field Team in Pinabacdao, Samar. Other project leaders complained that they had accrued those net savings because they had started late. Also some leaders said that they had already requested that part of the savings be used to purchase equipment. Adjustments were made in response to these concerns.

Program Coordination and Integration

IDRC funded this program because they wanted this to be the model - a project operated on a large scale fully coordinated and integrated. This is the responsibility of the over-all program coordinator.

Integration was an objective from the beginning of the project. This was a long process. A large budget was allocated for coordination and integration. These issues were given priority in the program. However, as noted under Section 2 of the Management Report, problems with respect to integration have had a direct impact on the project. A lesson that could be learned from this is that the project should not have been scaled down to a manageable level.

Management Issues and Problems

Because VISCA wanted to implement cost savings measures, the research assistants were made casual employees. The IDRC-IRCP research assistants protested that they were not supposed to be made casuals because they are with the IDRC-IRCP projects. But when VISCA employees received their PERA (Personnel Emergency Relief Allowance) from the government, the IDRC-IRCP research assistants wanted to be treated as VISCA employees so that they will receive the PERA. So, the IDRC-IRCP management requested IDRC Singapore to give them the PERA from the net project savings.

In Staff Development, there was a long delay in the selection and processing of the next Ph.D. scholars after one was sent to University Pertanian Malaysia in 1989. It was in the third year of implementation of the program when the next Ph.D. trainees were selected. However, this arose not because of a decision of the management but because of the delay of applicants in applying for admission to universities where they planned to pursue their degree training. It should also be emphasized that the selection of candidates was college wide and followed the normal procedure of the college in planning/granting advance studies.

Financial Management Report

VIFARD managed the financial aspects instead of VISCA, which was an improvement because there is less red tape. A number of procedures were established that proved to be advantageous. Fund allocation/budget was decided after the pre-implementation workshop. This allowed research leaders to justify their budget proposals. Fund allocation was generally lower than the proposed budget.

Fund allocation, by study level, was known in the initial year. This gave study leaders the opportunity to manage and control their financial resources. It also provided an opportunity to be more independent and flexible.

Also, budget balances were known by research leaders in the initial year. This helped regulate research activities and bolstered research leaders confidence. This practice however has not been continued recently.

A periodic financial report was made. This allowed each leader to be aware of how the program budget was being spent.

Modifications of some projects/studies occurred after the initial planning workshop in Ormoc. This move helped to spread funds and resources. However, the reallocation of funds (Pinabacdao Experience) to other projects created problems leading to the conclusion that a mandatory budget cut from each study is unhealthy.

6. DISSEMINATION AND ADOPTION OF TECHNOLOGY

The Dissemination Process

The transfer or dissemination of rootcrop technologies in IRCP is taken as a research process with extension. Thus, the focus is on the development of a replicable extension model on production, processing and utilization of appropriate technologies. Dissemination of technologies, both production and processing, is largely through on-farm trials, demo farms, village-based nurseries and through training on processing. In the implementation, a few issues may be pointed out.

First, the system of distribution of planting materials of HYV's through farmer cooperators of the on-farm trials (i.e. with technical staff), the cluster model farmers (i.e. extension staff) or requests from the demo farm was problematic. The problem seems to be an unclear understanding of the extension model for the technical and extension activities. The project should be worked out should go back to the drawing board and an effective way of working together should be worked out.

Also, insufficient planting materials was stressed as a constraint in the distribution-adoption process. This limiting factor can be addressed by putting more concerted effort on a village- or farmer-based seed propagation-distribution system considering the particular nature of an HYV and the environmental conditions of the area. Efforts along this line have already begun in the Sibagat site, and then in Pinabacdao. These initial moves, however, seem to be more of an ad hoc response. A more systematically designed village-based seed distribution scheme that makes use of the existing informal system and ensures a built-in material quality control can be detailed in collaboration with Department of Agriculture. The need becomes even more pressing when processing technologies are under way. Soliciting the contribution of a social scientist enriches the technical-extension team. Management flexibility may be necessary for some resource commitment.

The IRCP extension component is conceived as a vehicle to build the capability of the DA for the dissemination of root crop technologies. Legitimization of the collaboration, commitment of DA staff and some resources and stability of the AT's job tenure affect the over-all effectiveness of the process. These factors became drawbacks in implementing the farmer managed farm trials at the Pinabacdao site and in securing cooperation from the AT's. These conditions caused a two-year delay. If these issues can be resolved, the DA capability can be strengthened and the technology dissemination function fulfilled. The situation, however, varies from area to area since DA strength is not only a function of technical capacities but also of local leadership and staff attitude/orientation (e.g. Sibagat site does not have the above-mentioned problems with DA). The differing situational relationships and experiences with DA at the two sites point the need to continue the dialogue started last year to ensure effective collaboration. The various implications of the local government code are of particular significance in this dialogue.

In addition to monitoring over-all program management, it may be relevant to review whether a systematic feedback mechanism should be operationalized in the extension model (i.e. technology dissemination). It is one thing to train technicians in monitoring and another to operationalize the results at the pilot site. The informal farmer feedback to the project staff may be a starting point to actively involve the AT's in the process.

Finally, a detailed operational guideline for an integrated dissemination of processing technology still has to be drawn up in the IRCP extension model. This could involve integrating specialists, economists, market analysts and extensionists in working out the backward and forward linkages of a root crop-based enterprise. However, this phase can not be fully addressed as part of the one year extension. A decision with respect to the type and level of activity that can be implemented must be made with provision for phase-out or continuity.

In conclusion, these issues are linked to the operationalization of the extension model. There is a need to review the modified extension blueprint as a team to plan the interphases, streamline organization for effective integration, resolve gaps/constraints and improve the feedback system.

7. INTERNAL EVALUATION SYSTEM OF IRCP

Internal evaluation in IRCP has been conducted through meetings and reviews. From 1989 to the present,

IRCP conducted a total of five annual and semi-annual reviews and 89 meetings. The meetings could be broken down as follows:

- 44 management meetings;
- 20 program/project/study leaders' meetings;
- 11 project leaders' meetings;
- 8 project and study leaders' meetings;
- 3 science research assistants' meetings;
- 2 program/project/study leaders/SRA's meetings; and
- 1 program and project leaders' meetings.

During the semi-annual and annual reviews, the IRCP staff are required to submit/present reports of their accomplishments, problems met in their respective programs/projects/studies and solutions undertaken during the period under review. IDRC staff from Singapore and Canada usually come to assist the IRCP management in evaluating the staff's outputs.

During the meetings themselves, issues related to the planning of IRCP major activities, procurement of materials, fund allocation, salary adjustments, travel plans, procedures in reporting outputs during reviews and other matters are discussed.

Some issues/problems related to the IRCP's internal evaluation system have been identified. Concern has been expressed that many meetings have been called on an emergency basis. As a result, the IDRC staff who have previous commitments could not attend the meeting. Many of the IRCP staff are handling other research projects or had teaching assignments and other related activities which demand much of their time. This creates a problem in gathering all participants together for one meeting.

A number of management - related issues have been discussed during meetings. However, many of the IRCP Staff interviewed said that there is a need to include the following issues in the meetings:

- activities planning
- mechanics of integration and coordination
- budget management, transfer of funds
- program focus/priorities
- prerogatives of top management.

Some of the staff complained that they could not fully participate in the deliberations on issues due to the following reasons:

- they did not have full understanding of the problems discussed
- environment is not conducive/they feel that the chairman did not give them the chance to participate
- they feel that the issues can be resolved by the top management
- they are too shy to participate.

Some people have complained that changing report formats causes confusion and consumes too much of their time to revise reports. Notice of change of format is sometimes given late.

Recommendations:

Meetings should be properly scheduled. Scheduling regular meetings may enable the staff to effectively allocate their time. RCP staff should be given an opportunity to voice their ideas and opinions during meetings.

Top management should properly brief other staff about their specific roles in IRCP and staff should clearly understand the concept of integration and how to operationalize it to avoid confusion.

If possible, IRCP staff should be informed well in advance about upcoming activities and about any changes in IRCP activities.

ANNEX 4

INDIVIDUAL STUDY LEADER REPORTS

Integrated Root Crop Program

Visayas State College of Agriculture

Baybay, Leyte

PROGRAM 1 - **VARIETAL IMPROVEMENT OF SWEET POTATO AND MINOR ROOT CROPS**

Program Leader: Dr. Jose L. Bacusmo

Project 1 - **Hybridization (Wide Crosses and Varietal Crosses) and Observational Trials for Several Uses**

Project Leader: Prof. Rodrigo F. Sebidos
Professor, Plant Breeding

Study 1 - **Generating Sweet Potato Plant Variabilities Observational Trials and Wide Crosses**

Study Leader: Prof. Rodrigo F. Sebidos

I. OBJECTIVES

The objectives of this project are:

- to set-up polycross nurseries, general polycross nurseries and specific polycross nurseries for concentrating desirable genes for yield and other desirable traits (e.g. weevil resistance, scab resistance)

- to produce at least 20,000 variabilities for subsistence conditions and 10,000 variabilities for optimum conditions

- to conduct observational/preliminary trials with the following expectations: 20,000 variabilities for subsistence conditions, 4,000 breeding lines (20% selection) for succeeding polycross and advanced yield trials in subsistence conditions, 800-2,000 breeding lines (20% selection) for advanced trials in optimum conditions and inheritance studies.

II. METHODOLOGY

To generate sweet potato variabilities, polycross nurseries were established. These polycross nurseries aimed at:

- concentrating desirable genes for subsistence/marginal conditions
- improving the dry matter of orange flesh and/or commercial varieties (e.g VSP-1)
- improving the yield of the purple flesh varieties.

Under the polycross system, the selected parents were planted in ridges supported by hog wires strung in bamboo poles at 4 meters apart. In between the poles, the parents are planted. Row and plant spacing is 4 meters. The number of parents per polycross nursery varies (12-24) with 4-8 replicates.

For the observational trials, seed generated from polycross nurseries were collected, scarified and then sown in seed boxes. After one month, the seedlings were planted in the field by cuttings. Single plant selections were conducted based on dry matter (specific gravity technique), vining characteristics, pest and disease reaction and yield. Selected entries were then forwarded to Study 3 of Project 1 for further evaluation (replicated trial) in the preliminary and advanced trials.

For the wide crosses, promising parents possessing the desired traits were crossed with diploid (2x) and hexaploid (6x) *Ipomoea trifida* to generate variabilities aimed at concentrating the desired genes from the cultivated sweet potato plus the adaptability to marginal conditions and resistance to pest and disease.

III. RESULTS

Generating Sweet Potato Variabilities

Variabilities were aimed at improving dry matter of orange flesh (74,337), improving yield of purple flesh (156,066), and improving traits suitable for subsistence/ marginal farming conditions (52,732), for a total of 283,125 (Average = 94,333 F1 seeds/year 1989-1990-1991).

Observational Trials

Screened 23,526 genotypes (as of April 1991), where 2,229 genotypes were selected. Samples of the selected F2s were forwarded to Studies 2 and 3 (P1,P1); Studies 1, 2, and 3 (P1,P2), and the processing group.

Broadening Genetic Base

Wide Crosses of cultivated sweet potato x *I. trifida* (6x) were done and a total of 1,119 F_1's were produced.

On the average, 373 genotypes were produced/year. These are presently at various stages of improvement and evaluation.

Approximately 151,875 (60%) genotypes are now in seed boxes. These will soon be planted in the field for observational trials. The back crossing program was started last December 1991 for selected F_1's from wide crosses. Backcross seeds have been collected.

IV. DISCUSSION

a) Evaluation

Variabilities generated far exceeded the target set in the objective. Approximately 40% of the total variabilities generated had been screened; 60% are still in the pipe line. The project produced outstanding genotypes namely: V37-151 and V37-26, suited for marginal and optimum conditions.

Superior volume of variabilities were generated and two outstanding entries identified.

The project was a bit slow in evaluation which could be attributed to limited resources (i.e. work force not sufficient to handle the activities).

b) Conclusion and Recommendation

As far as generating sweet potato variabilities is concerned, Study 1 (P1,P1) is successful. However, evaluation of remaining variabilities should be a priority at this stage. Promising entries should be maintained/propagated for other Studies/Projects.

New Project:

Farmer x	Environment x	Sweet Potato
Farming systems	Upland/Hilly land	New Genotypes
Indigenous Tech.	Acidic (low pH)	VSP's
Fallow Rotation	Rainfall Pattern	Promising lines
SALT		Other varieties

Study 2 Yield Trials (Preliminary and Advanced) for High Elevation Conditions and for Any Subsistence Farming Situations

Study Leader: Prof. Rodrigo F. Sebidos

I. OBJECTIVES

The objectives of this project are:

- to develop/identify sweet potato lines/varieties that possess the following attributes: long vines, fleshy roots along nodes of vines, adaptability to mid to high elevation, good eating quality (high dry matter), good storage quality, resistance to pests and diseases and high yielding.

- to increase farmer adopters of promising sweet potato varieties (VSP's, lines and other recommended varieties).

II. METHODOLOGY

For the preliminary yield trial, breeding materials were tested in a single row and replicated twice. The number of entries ranged from 18-24 per trial. One set was conducted at VISCA and another set at Pinabacdao. After 2 cropping seasons, the best materials were identified based on agronomic and other desirable traits. Selected entries were then forwarded to the next stage of evaluation.

For the advanced yield trial only the elite lines are included, usually 4-6 entries including the local checks. Bigger plot size and more replications (3-4) are used. Selected entries are tested for 2 cropping seasons. At harvest, farmers are invited to participate in the trial under the coordination of the extension group of IRCP in order to select and provide feedback on the variety/lines.

III. RESULTS

Two breeding lines, namely V37-26 and V37-151, were selected by farmers. These materials are now entries for the Wet Season 1991 National Cooperative Testing (NCT) of sweet potato.

IV. DISCUSSION

a) Evaluation

The selection of V37-26 and V37-151 is a significant contribution to the overall program, where the farmers

were directly involved in the selection process. There is a need for continued evaluation of the elite line already on the pipeline.

b) Problems and Recommendations

Assistance is needed from the extension group in order to accelerate adoptions by farmers.

A new project that should be considered is technology transfer piloting. This project would allow for the commercialization of identified/preferred varieties in the pilot barangays.

For farmers that opt for home consumption with enough extra tubers under mixed cropping schemes, fitness of their selected varieties/lines to their farming systems should be vigorously explored. As well, an adaptability trial of elite lines under acid upland/hilly land conditions should be conducted.

Study 3 - Yield Trials (Preliminary and Advanced) for Optimum Conditions and Inheritance Studies

Study Leader: Mr. Dilberto O. Ferraren,
Instructor, PRCRTC

I. OBJECTIVES

The objectives of this project are:

- to identify new genotypes for growing under optimum conditions,
- to understand some important characteristics of the mechanism of inheritance.

II. METHODOLOGY

Four sets of trials to evaluate 1690 genotypes under preliminary trials were set up.

Replicated advanced trials were conducted for 212 genotypes over several locations and season. Only six genotypes were forwarded for testing in the NCT program.

Bi-parental crossing was done on 40 genotypes to study the inheritance mechanism. The seedlings are now planted in the field.

III. RESULTS

Success in items of evaluation of SP lines up to the NCT-trials was high.

Failure in the inheritance studies could be attributed to the budget allocation and mismatching of studies

at the merging stage to accommodate new components. At this stage, inheritance studies should have been eliminated. Therefore, with this project, inheritance study was given low priority over the evaluation work. As a result, only the observation of materials in the field has been accomplished.

IV. DISCUSSION

a) Evaluation

Evaluation of breeding lines at the preliminary and advanced stages should have been separated from inheritance studies. Evaluation focused at these stages precludes the use of more appropriate samples for understanding the mechanism of inheritance. Selections have already been made at these stages.
Inheritance studies in sweet potato are quite difficult to do except by simply trying to do correlation and regression analysis of parental materials against progenies. The anova may be quite deceptive as the number of sample progenies to be obtained would be unequal. Secondly, the sweet potato is a polyploid and seemingly an allohexaploid. This broadens the gap between theories of genetic analysis and the existing crop under study and increases the problem of self and cross incompatibility.

Evaluation of sweet potato for optimum conditions should have been done in several sites. But because of budget allotment, it was carried at VISCA only which is not necessarily representative of the optimum conditions considered originally.

b) Conclusions and Recommendations

Evaluation of sweet potato could be done at least two sites. Thus, a merger of Study 2 and Study 3 has been planned. One evaluation should be done at VISCA and the other in Pinabacdao.

Study 4 - Cytogenetic Studies in Wide Crosses of Sweet Potato and Wild Relatives

Study Leader: Ms. Marilyn Z. Oracion
Instructor, Plant Breeding

I. OBJECTIVES

The objectives of this project are:

- to widen the genetic base of sweet potato
- to produce outstanding interspecific hybrids for use in conventional breeding
- to undertake cytological and cytogenetic studies basic to the breeding work

II. METHODOLOGY

Wild germ plasm collection and crossability test were conducted. Out of 65 sweet potato relatives collected, 9 relatives were tested for cross compatibility with sweet potato.

In an effort to produce outstanding interspecific hybrids for use in conventional breeding work (Objective 2), massive controlled crossing at the hexaploid level of crossable strains was done guided by the results of the cross-compatibility test. Crossable species/forms/hybrids were hybridized.

Field and laboratory evaluation of selected parents and progenies in crosses was completed.

Two species successfully produced seeds when crossed with sweet potato. This result led to the initiation of the effort towards widening the sweet potato genetic base (Objective 1).

Four hundred and four interspecific F_1 hybrid seeds using only hexaploid *I. trifida* strains as males and sweet potato as females were generated while 27,052 seeds (as of December 1991) were collected in open and controlled crosses using other wild relatives. About 30% of the 6x x 6x F_1 hybrid seeds were viable and reached single row field evaluation for good agronomic characters. Twenty eight genotypes were selected for further back crossing to sweet potato.

Fertility measurements through cytological study (Objective 3) were conducted in all the entries in the cross-compatibility test and controlled crosses while cytology of all hybrids and parents in the backcross breeding nursery is ongoing.

III. RESULTS

Only about 60% of objectives 1 and 2 in this study have been met. The remaining work could generate some backcross one progenies but their usefulness for the applied breeding work can not be evaluated. The study has originally programmed the generation of at least up to BC_2 progenies. Only F_1 progenies have been evaluated. Another important point to consider is that only one wild relative has been fully utilized in the pre-breeding work; this is the hexaploid strain of *I. trifida*. The results of this study point to the fact that there is still tetraploid and diploid potential and perhaps, more useful gene sources for widening the sweet potato genetic base. In fact, the local species that can also cross with sweet potato and which has been identified to be the source of genes for drought tolerance has not yet been utilized yet in this study because of time and budgetary constraints.

Only 70% of the cytology work of the materials used in the study is completed. Cytogenetic analysis has not started as this depends upon the completion of the cytological data needed. Cytological data gathering set by this study was up to BC_2 generation of hybrids. Up to now, the cytology monitors the increase on the number of cooperators and non-cooperators on swine management practices and community organization with the coordination of the community organizer, process documenter and livestock group in the pilot sites.

IV. DISCUSSION

a) Evaluation

The change of leadership within the project caused some delay in the implementation of specific activities in the study. Five months after the study was implemented, Dr. Florencio Saladaga (the original project leader) decided that Study 1 under his leadership would do wide crosses for applied breeding while Study 4 would just concentrate on cytogenetic studies in wide crosses. This move, in effect, would remove objectives 1 and 2 under Study 4 and transfer these objectives to Study 1. However, Dr. Saladaga had to leave soon after and there was no proper turn-over of responsibilities. I later learned that the decision about research implementation was left to the research assistant and labourer of Study 1. When I talked to the Study 1 leader, he said that he also believed that the research assistant and labourer assigned for the purpose acted upon my instructions as Study 4 leader. This miscommunication caused a few months delay in the directed crossing experiments for production of F1 hybrids. At this point I had to decide in favour of the original objectives of the study and to declare null and void the verbal agreement between myself and the original project leader.

b) Conclusion and Recommendations

It is recommended that the implementation of this study be extended in order to meet objectives 1 and 2 of the study.

The remaining cytological work must be conducted in order to obtain the required data for cytogenetic analysis. The results of the cytogenetic study would be the deciding factor whether to pursue or stop the breeding work using wild relatives.

Study 5 - Tissue and Embryo Culture in Sweet Potato and Wild Relatives

Study Leader: Ms. Celsa A. Quimio
Instructor, Plant Breeding

I. OBJECTIVES

The objectives of this project are:

- to undertake tissue culture studies on sweet potato and its wild relatives for the germ plasm exchange component of the program (germ plasm exchange of about 50-100 accessions yearly)

- to culture embryos from the wide crosses of Study 4 which show symptoms of abortion at various stages of embryogenesis (approximately 200-500 embryos of 1,000 expected interspecific hybrids per year may need embryo rescue)

- to handle and maintain variabilities produced *in vitro* for possible utilization by studies 1, 2, and 3

- to maintain selected accessions *in vitro* (germ plasm maintenance of about 50-100 accessions out of over 1,000 accessions in the germ plasm pool).

II. METHODOLOGY

Eight combinations of varying levels of the hormones IAA, KI and GA using MS formulation as the basal medium were tested on about 39 sweet potato accessions to identify appropriate media for micro-propagation, germplasm maintenance and for generation of variabilities where cultures should pass through a callus phase. Responses *in vitro* were monitored.

Six medium variations involving various levels of hormones and additives like yeast extract, benzyladenine and coconut water utilizing three medium formulations, namely 1) Knudon's, 2) Gamborg's and 3) Murashige-Skoog's, were tested on wide cross hybrids between 16 accessions of *I. batatas* with *I. trifida* 2x, 4x and 6x. Hence, a hybridization nursery was setup for this purpose and the study performed wide crossing activities utilizing various accessions to identify a culture medium that would be appropriate to a wide range of crosses. Data on percent abscission from the first day of pollination to maturity of the fruit, fruit set and seed set were also taken to determine the approximate age of capsules when abortions most likely occur. GA applications on stigma were also tried to improve seed set or otherwise delay abscission so capsules would reach the stage when embryos were big enough for excision and culture in the laboratory. From these, immature hybrid embryos were collected for *in vitro* culture. The study also handled aseptic germination of mature hybrid embryos (seed) of Study 4 collected from their polycrosses and wide cross activities. Since the medium for immature embryos doesn't work as well with mature embryos, an appropriate medium for the latter was also identified from among six medium variations tested.

When survival rate of plantlets in the screen house were observed to be low, several approaches were tried one of which was rearing the plantlets in liquid culture solution prior to transfer to soil.

Thirty eight putative variants from tissue culture of VSP varieties were handed over to Study 1 for field evaluation to select for some desirable agronomic characters that have potentials for use in their breeding work. The preliminary tests also gave us the idea of variabilities were really generated *in vitro*. Thirty eight wide cross hybrids grown through embryo culture were handed over to Study 4 for field evaluation. Once appropriate media were identified, maintenance of accessions *in vitro* was immediately started.

III. RESULTS

The study identified or developed appropriate media for:

- micro-propagation
- germplasm maintenance *in vitro*
- generation of variabilities
- culture of immature hybrid embryos
- culture of mature hybrid embryos
- liquid culture medium to increase survival rate of plantlets in screen house.

For the germplasm exchange component, the study received 31 sweet potato accessions from CIP and the Department of Horticulture, VISCA. A total of 187 genotypes were generated through culture of immature wide cross hybrid embryos. Thirty eight of these hybrids were preliminarily screened for storage root-forming ability by Study 4. Out of these, 5 produced tuberous roots. In addition, about 1,820 mature embryos from Study 4 had been cultured for aseptic germination.

There are 207 sweet potato cultures *in vitro* from which thirty eight putative variants were selected for preliminary screening by Study 1. From these, 8 were selected for possessing desirable vine characteristics and relatively good root production ability. At present, 458 cultures are now maintained *in vitro* including 29 varieties, 5 wild species, 251 wide cross hybrids and 38 promising hybrids from open-pollination.

IV. DISCUSSION

a) Evaluation

In spite of problems with equipment, the study has accomplished fairly well the objectives with respect to tissue and embryo culture concerns. Since the study utilized only an enclosure for excision of small embryos, a lot of embryos were wasted just to become familiar with excision techniques without the use of a stereoscope. It was only recently that a unit for instruction was lent for our use.

The budget for the study was only about 25% compared to another tissue culture study under IRCP and only about 18.7% compared to another related study in the project. Even with these budgetary constraints already existing, the budget for the second year was further reduced (about 15%) for some important projects.

b) Conclusions and Recommendations

The study tried its best to achieve its goals in spite of the above mentioned constraints. The opportunity to work in an academic department was a definite advantage. This study in particular was very dependent on instruction facilities and equipment in the laboratory (distilling apparatus, autoclave, hood, oven, refrigerators, etc.) and screen house.

Problems related to financial constraints could easily be straightened out if thorough planning was done before research implementation. Further, projects should be given a certain degree of flexibility so resources can be allocated according to priorities which surface during the course of the research.

Project 2 - Evaluation of Sweet Potato Genotypes for Various Characters with Emphasis on Marginal Environment

Project Leader: Dr. Ruben M. Gapasin
Department Head, Plant Protection

Study 1 - Adaptability and Stability of Selected Sweet Potato Genotypes on Problem Soils

Study Leader: Dr. Jose L. Bacusmo

I. OBJECTIVES

The objectives of this project are:

- to assess the adaptability and stability of selected sweet potato genotypes on problem soils;
- to select sweet potato genotypes that are tolerant to problem soils
- to test the mineral efficiency of selected sweet potato genotypes.

II. METHODOLOGY

Two sites were identified as experimental areas: Matalom, Leyte and Pinabadao, Samar. Both sites have low pH levels and problems of soil fertility. Soil samples were collected at random in the experimental areas. The experimental areas were ploughed, harrowed and furrowed with the use of a carabao-drawn moldboard plough. Furrows were formed at a distance of 75 cm.

For 1989, 39 genotypes were tested in replicated trials and 138 were tested on single row (non replicated) trials. For 1990, the experiments were laid-out in RCBD factorial with 4 replications. Eighteen varieties of sweet potato were the first factor and the two levels of fertilizer application (no fertilizer and with fertilizer 45-45-45-NKP) were the second factor.

For 1991, four trials were set up but with reduced entries as decided by the farmer cooperator. Experiments on different rates of lime application on selected varieties were also done.

Data gathered included:

- the weight of tuber roots
- the herbage weight
- the percent stand of plant survival.

At harvest the extension program of IRCP invited farmers in the village to observe and help in harvesting and to participate in simplified acceptability tests of the boiled roots of varieties in the trial.

III. RESULTS

a) General

The project can be credited for the collection of information on the adaptability of the recommended varieties and subsequent selection of VSP6 Red Wonder and BPI Sp2 by the farmers in Pinabacdao, Samar. The project also identified (with some funding from IFS) high yielding variety OPS # 88 which was later released and recommended by the Philippine Seedboard and was given the popular name "Red Wonder". Finally, a demonstration to Matalom and Pinabacdao farmers on the performance of recommended varieties under the local condition where soil pH and/or fertility are low was conducted.

b) Specific

Of the 138 accessions tested under single-row trials at Matalom, Leyte only 70 accessions survived due to drought during the third and fourth months of growth. In the replicated trials at Matalom, Leyte, 13 sweet potato genotypes did not survive but 8 genotypes showed some degree of tolerance to stress environment (problem soil and drought).

Profuse flowering of sweet potato genotypes planted on acid soil and in drought conditions at Matalom was observed during the second month of growth. Also, yellowing and stunting were noted in 5 genotypes (VSP1, VSP3, VSP5, UPL-SP5 and V15-70).

Data on replicated trials at Matalom, Leyte showed that, of the entries, only VSP-3 had less than 50% survival and only two entries (VSP-7 and OPS # 88) in fertilized plots yielded over 5 ton/ha; none yielded over 5 ton/ha in unfertilized plots.

For the trials conducted in two locations (Brgy. Nabong and Pahug, Pinabacdao, Samar), Red Wonder and BPI-SP2 were the top yielders in both locations among the 8 entries. These entries outyielded both standard check (VSP5) and local check (Kapilis and Ka-angi). On the other hand, application of different levels of fertilizer did not have a significant effect on the yield of all entries evaluated. VSP6 was also selected by farmers for further testing.

IV. DISCUSSION

a) Evaluation

The project allowed the farmers and researchers to evaluate the adaptability of the recommended varieties. However, stability analysis has not yet been done. This project has allowed farmers to narrow their selection to 4-5 varieties. Final selection may come after 1 or 2 years of growing the new varieties. The researcher feels that objective 3 will not help the farmers. Only 10% of this objective was accomplished.

b) Conclusions and Recommendations

Initially, the researcher envisaged making this project an opportunity for systematic evaluation of the PRCRTC germplasm collection and F1s Protest from the farmer program leader. However, the agreement reached to test only the adaptability/stability of recommended varieties in the trials, relegated the study to an on-farm trial of recommended varieties which duplicates an approved on-farm component of the extension program. Reallocation of funds during the first year for "field operation" handicapped the study in the succeeding months and years. Although the yield trials resulted in satisfactory outcomes, the researcher feels that the study should be discontinued.

Resources left from this study should be used for cropping system studies for two reasons. First, these studies are weak in the total program. Secondly, these studies have a good chance of creating an impact on the farmers and productivity.

Study 2A - Resistance of Sweet Potato to Scab and Root-Knot Diseases

Study leader: Dr. Ruben M. Gapasin

I. OBJECTIVES

The objectives of this project are:

- to screen newly developed sweet potato hybrids for resistance to the weevil, scab and root-knot nematode
- to evaluate resistant genotypes as to stability of their reaction to the said pests under field condition
- to develop a rapid, practical and economical method of assessing resistance to the said pests
- to determine the basis for resistance of sweet potato to the weevil, scab and root-knot nematode.

II. METHODOLOGY

Sweet potato hybrids/lines in advanced yield trials and in single row non-replicated trials planted in the field were rated for their resistance/susceptibility to the scab using the 1-9 disease severity ratings. Resistance ratings were based on disease severity as follows:

- 1.00-2.50 = HR (Highly Resistant)
- 2.51-4.50 = R (Resistant)
- 4.51-6.50 = MR (Moderately Resistant)
- 6.51-7.50 = S (Susceptible)
- 7.51-9.00 = HS (Highly Susceptible)

Sweet potato hybrids/lines found resistant and moderately resistant under field conditions were collected and planted in micro-plots together with the infector plants which were planted 2 weeks ahead. Plants were rated following the resistance ratings mentioned above. For root-knot resistance, two week old plants were inoculated with 10,000 eggs of M. incognita. Each hybrid line was replicated five times and, after fifty days, plants were rated for egg mass index based on the following:

- 1 = 1-2 egg masses
- 2 = 3-10 egg masses
- 3 = 11-30 egg masses
- 4 = 31-100 egg masses
- 5 = more than 100 egg masses

Based on the egg mass index, resistance ratings were as follows: 0-1.9 = HR (Highly resistant); 2.0-2.9 = R (Resistant); 3.0-3.9 = MR (Moderately Resistant); and 4.0-5.0 = S (Susceptible).

III. RESULTS

Using the 1-9 rating scale, sweet potato hybrids/lines were rated for scab disease under field conditions. In 1990, a total of 149 entries were screened for resistance to scab disease. There was only 1 entry rated highly resistant; 67 entries were rated resistant; and 53, 10, and 18 entries were rated moderately resistant, susceptible and highly susceptible, respectively.

In 1991, of the 206 entries, 156 were rated highly resistant, 26 resistant and 9 were rated susceptible and highly susceptible. Sweet potatoes planted in a single row non-replicated trial show that, out of 315 sweet potato lines screened, 19 entries were found to be highly susceptible, 9 susceptible, 16 moderately resistant, and 271 were resistant. Of the 55 sweet potato hybrids/lines screened using infector plants in micro-plots only 2 entries were found moderately resistant, two were susceptible and the rest were highly susceptible.

In 1990, a total of 388 hybrid/lines/varieties were screened for resistance to M. incognita. Two hundred and fifteen entries were rated highly resistant, 50, 59 and 64 entries were rated resistant, moderately resistant and susceptible, respectively.

In 1991, out of 633 sweet potato hybrids/lines screened for resistance to root-knot disease, there were 397 sweet potato entries found highly resistant, 281 were resistant, 94 were moderately resistant and 90 were found susceptible.

IV. DISCUSSION

a) Evaluation

To date, the four objectives of the study have not been fully met. The first objectives will be a continuing activity as long as breeders develop new hybrids/lines or varieties of sweet potato. This study has

developed a rapid, practical and economical method of screening sweet potato for resistance to the scab disease. Root-knot disease has recently been found to be an important disease of sweet potato, therefore screening for resistance to this disease was initiated. Determining the basis for resistance of sweet potato to the scab has been partly accomplished. Morphological characters of sweet potato that are responsible for resistance to scab have been examined.

Biochemical basis of resistance to diseases was originally planned to be carried out in this study. However, the acquisition of equipment was limited by a shortage of funds. Despite this limitation, collaboration is being pursued with a UPLB scientist.

b) Conclusions and Recommendations

Breeding for resistance to diseases is a continuing activity. Therefore, if sweet potato plants will continue to be improved, the pest problem should be addressed.

One major task that we think is worth undertaking is to determine the biochemical basis of resistance to scab and root-knot diseases. If a chemical is identified that would confer resistance, selection of hybrids/lines would be more rapid.

Study 2B - Sweet Potato Plant Resistance to Weevil

Study Leader: Ms. Reny G. Gerona
Instructor, Plant Protection

I. OBJECTIVES

(not included)

II. METHODOLOGY

Field evaluation of sweet potato lines/hybrids/accessions from the advanced yield trial were planted using three replications per entry. Proper cultural practices for sweet potato were followed with the exception of insect control. Data collections were done at harvest which included damage ratings (both external and internal), percent weevil infestation and weevil counts on both fleshy roots and main stems. Damage ratings were done using the following rating scale: 1 = no damage: resistant (R); 5 = 1 - 4 puncture(s) or larval tunnel(s) per root/mainstem: moderately resistant (MR); 9 = 5 or more punctures or larval tunnels per root/mainstem: susceptible (S).

Screenhouse evaluation of promising sweet potato hybrids/lines rated MR to R under field condition were re-evaluated by planting them in clay pots whose brims were covered with nylon sheer (muslim cloth). Plants were allowed to climb on wire trellises to enhance fleshy root formation in pots. Proper cultural practices were provided again with the exception of pest control. Three months after planting, artificial infestation was employed on partially exposed roots using 10 adult weevils (2 males and 8 females) per pot.

Similar data were gathered at harvest using the same rating scale as in field evaluation.

III. RESULTS

Field evaluation results from the three wet-season plantings showed that majority of the entries were rated moderately resistant (MR) to resistant (R). In general, main stem reaction seemed to be parallel with fleshy root reaction although in few entries the latter showed a higher level of resistance. This observation indicated limited accessibility of fleshy roots to adult weevils which might have been due to deep rooting and/or very minimal soil cracking during this season. VSP-2, a shallow-rooted variety, was rated susceptible. In addition, higher levels of percentage infestation and weevil count in the main stems were recorded which further supported the above claim.

In the two dry-season plantings, out of the 77 entries evaluated, only 8 were rated MR based on both main stem and root reaction and 5 based on main stem reaction alone. A lower level of resistance was generally observed in the dry-season plantings than in the wet-season plantings which could be indirectly due to maximum soil cracking brought about by the long drought experienced during the growing period which enhanced accessibility of roots to weevil. This can be further supported by high percentage infestation and weevil counts recorded during this period in both main stems and fleshy roots.

Overall, field evaluations gave a total of 85 entries or 48.3% rated MR to R in both main stem and root reaction.

In the screenhouse evaluation, of the 138 entries evaluated, 18 entries or 13.04% remained MR to R based on both main stem and fleshy root reaction. This result suggested that, even at optimum weevil infestation, these 18 entries could perform better than other entries. On the other hand, the entries rated MR in the field but S under the controlled experiment may suggest that, although they could perform better under field conditions they may succumb to weevil attacks at times of the year when natural field population of the insect is high.

In addition, 12 *trifida* crosses were rated MR under screenhouse evaluation (OA5.41, OA5.46, OA2.27, OA4.10, OA5.104, OA2.13, OA6.21, OA7.1, OA5.5 and 2 X *I. trifida* seed 1; A 22 and A25).

IV. DISCUSSION

a) Evaluation

Extreme environmental conditions delayed field operations. Non-fleshy root formation of some entries occurred. The project provided limited time for a thorough investigation of the correlation of specific morphological characteristics to weevil resistance.

b) Conclusions and Recommendations

For sweet potato weevil, screening is best done during the dry months when sufficient insect population is available. If field testing is done during the wet months, artificial infestation has to be employed for more reliable results. Screening for weevil resistance under controlled conditions may be ideal but possibilities of forced feeding may alter the validity of results. A combination of field evaluation at optimum insect population and screenhouse evaluation will give a better picture of the plants reaction to the insect.

Although the level of resistance identified was less than satisfactory, varieties with that level of resistance could still be used without additional control applications if planted during the wet months. However, when planted during dry months, application of additional controls such as biological measures, use of natural pesticides or adaption of cultural practices that would minimize infestation may be employed.

For a rapid and economical screening, results suggested the possibility of screening based on main stem reaction alone. This particularity holds true for entries which do not develop fleshy roots or whose fleshy root formation is adversely affected in potted experiments. However, this aspect needs further investigation.

Study 3A - Screening of Sweet Potato Genotypes for Storability Parameters

Study Leader: Dr. Antonio L. Acedo Jr.
Assistant Professor, Horticulture

I. OBJECTIVES

The objective of this project is:

- to select sweet potato genotypes with long shelf life under ambient conditions.

II. METHODOLOGY

The study evaluated the storability characteristics of sweet potato genotypes under ambient conditions screened under the preliminary, advanced and seedboard trials as well as those screened under marginal areas (Study 2 and 3 of Project 1, Program 1). Verification trials on the storability of some promising genotypes were also conducted. As an additional activity of the study, the shelf life of recommended sweet potato varieties (VSPs 4-7) was determined under hut storage conditions. Storability parameters such as weight loss , decay, shrivelling and sprouting were monitored each month for 3 months. Temperature and RH conditions during storage were also determined.

III. RESULTS

The project evaluated the storability traits of a total of 171 genotypes (first to fifth storage set-up) from the preliminary trial, 181 genotypes (first to sixth storage set-up) from the advanced trial, 33 genotypes from the seedboard trial, 14 genotypes grown under marginal areas and recommended varieties VSP 4-7 (3 storage trials).

In addition, the project identified genotypes with roots showing only slight or no shrivelling, decay and sprouting during a 3-month storage at ambient temperatures, namely; 49-59, 42-46, 52-32 and 52-140 from the preliminary trial; 38-1, 38-15, 38-20, 29-111, 29-1149, 42-337 and 42-343 from the advanced trial, V30-127 and G105R-12C from the seedboard trial, and 42-335 from the marginal area varietal screening. Weight loss was consistently less than 30% after 3 months of storage. VSP 4 and VSP 7 were identified as having long storage life among the recommended varieties. The storability characteristics of some promising genotypes were verified but only 38-15 showed consistently better traits.

IV. DISCUSSION

a) Evaluation

Some promising sweet potato genotypes with long post-harvest life were identified. However, the storability traits of these genotypes were not verified to confirm the findings. Some sweet potato genotypes from the preliminary and advanced trials remain to be evaluated for root storability.

As mentioned, the study was able to identify some genotypes with excellent storability characteristics. Unfortunately information comes too late to be used as one of the criteria in the selection of varieties for further yield trials. It takes 3 months for results from storability evaluation to be obtained and be available to plant breeders. By that time, the breeder has moved to another selection place. Also, because of the limited number of tubers harvested, some field-screened genotypes were not included as entries in the evaluation of root shelf life.

b) Conclusions and Recommendations

From the results of the study, it can be concluded that the shelf life of sweet potato roots is primarily dependent on the rate of shrivelling and sprouting which vary with genotype. Several genotypes exhibited minimal or no symptoms of shrivelling and sprouting during a 3-month storage period at ambient temperatures. However, these results were obtained from a one-trial undertaking. It is therefore recommended that the study be extended to institute the following activities:

- verification of storability characteristics of promising genotypes to substantiate the present results
- evaluation of root storability of genotypes being screened by the plant breeder (Study 2 and 3 of Project 1, Program 1) in the preliminary, advanced and seedboard trials as well as those grown in marginal areas.

Study 3B - Screening of Sweet Potato Genotypes for Organoleptic Quality and Chemical Composition

Study Leader: Prof. Marcelo A. Quevedo
Assistant Professor, PRCRTC

I. OBJECTIVES:

The objectives of this project are:

- to identify sweet potato genotypes with good organoleptic quality and high nutritional value
- to evaluate the chemical composition of sweet potato genotypes at harvest and after storage.

II. METHODOLOGY

All sweet potato genotypes of studies 2 and 3 of Project 1 under Program 1 that passed the preliminary and advanced trials and seedboard entries were further screened for their organoleptic quality, dry matter and chemical changes at harvest and after 3 months of storage.

Verification trials (genotypes identified with good storability), recommended varieties and those genotypes grown in marginal areas were also evaluated for organoleptic quality and chemical composition at harvest and after storage.

Chemical composition, such as starch and sugar contents, were analyzed using the modified anthrone method. Protein content was determined using the micro-kjeldahl method.

III. RESULTS

In the preliminary trials, there were 5 configurations - a total of 171 genotypes screened for storability, organoleptic and chemical composition. Only 18.13% of the entries reached 3 months of storage. Genotypes 50-55 and 42-46 showed the highest rate of increase in sugar and protein contents after the storage period. Genotype 52-186 had the least dry matter content at harvest and after 3 months of storage. There was an increase in dry matter content during storage as a result of water loss with genotype 42-332 showing the highest increase.

There were 181 genotypes evaluated in advanced trial in 6 configurations. Of these, only 20.44% lasted for 3 months. Genotypes 30-655, 29-789 and 30-786 showed the highest starch content among the genotypes left after 3 months of storage. Genotype 31-786 had the lowest sugar content. There was a decrease in starch content in all genotypes except genotype 42-1149. The sensory qualities of all genotypes that reached 3 months of storage were acceptable based on the Hedonic rating scale.

Thirty-three genotypes under seedboard trial were evaluated during both the wet and dry seasons. Of the entries, 36.36% reached 3 months of storage during the dry season and only 21.21% reached 3 months during the wet season. V15-70 and OPS-44 incurred the highest dry matter, starch and protein contents. Sugar content increased with time of storage except in genotypes V35-46, OPS-56 and 65IR-42. Sensory qualities of stored sweet potato genotypes under seedboard trial were acceptable.

Four recommended varieties (VSP4,5,6 and 7) were evaluated. Of these, VSP5 did not last for 3 months of storage because of severe decay. Dry matter, sugar and protein contents increased with time of storage while starch content decreased after 3 months of storage.

In the verification trial, out of the 14 genotypes, only 35.7% lasted for 3 months. Genotype 38-1 had the highest dry matter among the genotypes left after 3 months. OPS-37 and 42-36 incurred the highest sugar content.

Of the 14 genotypes grown in marginal areas, only 35.7% lasted for 3 months of storage. Genotype 37-151 incurred the highest rate of increase on the dry matter, sugar and protein contents.

IV. DISCUSSION

a) Evaluation

The identification of genotypes possessing good storability and maintaining high levels of dry matter, starch and protein during storage was successful.

Not all genotypes with potentially high yield were screened for the storability, organoleptic qualities and chemical composition during storage because of limited sample roots. There is a need to verify the results.

As well, not all of the genotypes identified with good storability, organoleptic and chemical composition

were used in the breeding work because of a delay in the release of results. This delay was attributed to the long period of evaluation. Some genotypes were already discarded.

b) Conclusions and Recommendations

In support of the breeding work, there should be a continuous evaluation of genotypes for their organoleptic and chemical changes at harvest and during storage so that varieties developed have the desirable characteristics including high yield and better post-harvest characteristics. A close coordination of the research activity with the processing group should be done, especially in the conduct of organoleptic quality immediately after harvest.

As well, it is recommended that the screening of genotypes to determine good post-harvest characteristics be continued.

Preliminary trials can be deleted from the screening process due to very limited sample roots.

Project 3 - **Varietal and Cultural Management Improvement of Minor Root Crops with Emphasis on Aroids and Yam**

Project Leader: Dr. Jose L. Bacusmo

Study 1 - **Development and Selection of Improved Taro, Yautia and Arrowroot Genotypes**

Study Leaders: Dr. Jose L. Bacusmo, and
Mr. Dilberto O. Ferraren

I. OBJECTIVES

The objectives of this project are:

- to select genotypes of taro, yautia and arrowroot for adaptability under subsistence agriculture,
- to develop new genotypes from selected taro cultivars that are adaptable to traditional and modified cropping systems, specifically multiple/polycultural cropping systems.

The target areas are:

Lowland with waterlog conditions;
Upland acidic;
Drought-prone;
Under shade.

II. METHODOLOGY

Four different sites were selected for the establishment of the first set of trials to select varieties adaptable to the four specific target areas mentioned. After the first trial, the sites for evaluation were reduced into three: upland acidic, lowland and under shade areas. These sites were used for the second evaluation phase.

During the second year of trial, four selected varieties underwent further testing for their ability to yield under an inter-cropping scheme (modified cropping system). The taro were planted in double rows at .5m x .5m apart per double row, the distance between double rows was 1.5m. In between the double rows, either peanuts or corn were planted.

III. RESULTS

Ten cultivars with high yield potential were evaluated in upland acidic and drought prone areas, together

with eight hybrids from the breeding work. However, none of the evaluated materials showed sufficient tolerance to drought. From this, no further evaluation was done.

In the upland acidic area, thirty-one hybrids were evaluated and only six were found to yield equally with the control variety. Six taro cultivars were evaluated in the upland acidic area with two found to perform reasonably well.

Under lowland conditions, only two out of the six cultivars were found to yield over 10 tons/ha. Of thev seven new hybrids evaluated under lowland conditions, the yield ranged from 10 to 21 tons/ha. However, the general acceptability was below 6.0 on the Hedonic rating scale.

Out of the eight, two taro cultivars were found to yield above 8 tons/ha selected from the first evaluation of 35 accessions and 30 hybrids in an evaluation under shade. The Yautia evaluation was done under shade alone. There were only three varieties used. The red white variety had high yield but lower dry matter content. Arrowroot evaluation was done in one site only. Out of the 20 accessions evaluated, none gave a yield over 1.5 tons/ha.

For the inter-cropping study between taro-peanut is taro corn, the taro-corn combinations gave much higher LER compared to taro-peanut combination. It was found that Iniito (PRG 734) gave much higher yield in inter-cropping both combinations.

IV. DISCUSSION

a) Evaluation

The implementation of the study was partly successful. For taro, we have identified varieties suitable for upland acidic conditions such as PRG 734, PRG 068, PRG 066 and PRG 062. For lowland areas, PRG 068 and PRG 694 seem promising. For under shade, PRG 062 and PRG 068 are good. For yautia, the white variety is more acceptable due to its high yield. For arrowroot, no recommendation can be made due to insufficient data.

Therefore, the first goal has only partly been achieved. These materials should be further evaluated to verify the results.

As the project evolved into a research-cum-extension project, we felt that the issue should be attacked in several directions. First, we should identify the varieties suitable for a site. Then we should plant the varieties the way farmers do, as part of a localized cropping system. Modified systems should also be developed to encourage systematic management of a farm lot/area.

The second goal was not fully realized because, in the looking at the term subsistence agriculture, one has to consider multiple/polycultural cropping management.

Thus, a change in procedure was adopted in the second year of evaluation. The goal originally set could

be expanded to include legumes and cereals and vegetable crops. But the limited budget restricted the trials to be conducted. Secondly, the farmer cooperators were limited as the farmers at the site identified for the project were involved in so many activities. Lack of coordination in the farm site thus limited the achievement of the goal.

In over-all evaluation, the study partly fulfilled the goal of identifying cultivars for specific site planting but under a monocultural system. Yet the evaluation phase has some obstacles that led to some failures.

Since the project focused only on Pinabacdao, Samar during the second year the previous year's evaluation in other sites became irrelevant. This then called for a new intensive work schedule to be developed in the second year which was not fully followed due to budget and time constraints.

The replication of trials based on a single year evaluation was not sufficient to make a firm conclusion/recommendation.

Soil characterization is an important aspect which was left out. This was due to the non-inclusion of soil science specialist at the outset of the study.

b) Conclusions and Recommendations

If this study has to be re-designed, it should tackle the following questions:

1. What is the best intercrop/production mix that will include taro, legumes, cereals and vegetables?

2. How will each intercrop be allocated, in double rows or in single rows?

3. What is the best production mix under coconut or shaded areas?

4. How much of the nutrient is being depleted and how much could be retained if residues of each crop species were returned to the soil?

5. How does this compare to the cropping system of farmers with their random assignment of crops species in a farm lot and their practice of fallowing after two or three years of planting in the same area.

An ecologically sound farming practice is an important solution to the present needs of crop yield productivity. Thus, for the next phase, the project should focus on increasing farmers' awareness of environmental conservation vis-a-vis full utilization of renewable resources.

The project component may include:

- soil fertility enhancement and conservation through biomass management

- soil fertility enhancement through understanding mycorrhizal action and rhizobial utilization
- systematic mix cropping with interphase of relay crop in an inter-cropping production mix
- study of the pest and disease dynamics given a specific mix.

Increased farmer income depends largely on systematic crop production techniques. First, a less demanding input plus a chance to lessen the flood of commodities thereby lowering market price. At the same time, sustaining availability of products in the market could be done by appropriately scheduling harvest which would then lead to optimum market supply. The next phase of study should focus, not only on taro, but also on other crops in association with taro that can give greater LER, ATER and higher return over cost of production.

Study 2 - Performance and Acceptability of Selected Genotypes *Dioscorea alata* and *D. rotundata*

Study Leader: Prof. Nestor L. Pido
Assistant Professor, PRCRTC

I. OBJECTIVES

The objectives of this project are:

- to evaluate the agronomic performance of selected *Diocorea alata* and *Dioscorea rotundata* genotypes
- to compare the productivity of the *alata* and *rotundata* species of yam
- to evaluate the acceptability of *Dioscorea alata* and *Dioscorea rotundata* farmers and consumers
- to select yam cultivars with high yield and acceptability.

II. METHODOLOGY

Twenty genotypes of *Dioscorea alata* and *Dioscorea rotundata* were selected from the PRCRTC yam germplasm collection on the basis of yield.

These genotypes were evaluated in 2 on-station variety trials (1 with *alata* and 1 with *rotundata*) set up at the PRCRTC experimental field. Randomized complete block design with 3 replications was employed in both trials. The on-station variety trials were carried out in the field between July 1, 1989 and February 28, 1990. Data included genotype stand, yield and reaction to anthracnose and leaf blight diseases.

On the basis of yield performance, 6 genotypes of *D. alata* and 6 genotypes of *D. rotundata* were selected

from the 2 on-station trials. The selected genotypes were evaluated further in on-farm trials.

The first on-farm trial was conducted at Pinabacdao, Samar between May 9, 1990 and March 30, 1991. The second and third on-farm trials were set up in Calbiga, Samar and Dawis, Bohol from May 22 to June 6, 1992 and are expected to last until March 30, 1992. The on-farm trials were set up in farmers' fields using randomized complete block design with 3 replications. Farmers were involved in the evaluation of the genotypes at harvest and in the organoleptic tests (sensory evaluation) conducted at the farm. Organoleptic tests that did not involve farmers were also conducted at VISCA.

III. RESULTS

In the on-station variety trials, 12 genotypes were found to have superior yields. In addition, 6 genotypes with relatively short maturity periods and 9 genotypes with resistance to anthracnose were found in *D. alata*.

In the first on-farm trial, yields of all *D. alata* and *D. rotundata* genotypes tested were found to be more or less comparable, but *rotundata* genotypes were more resistant to anthracnose than the *alata* genotypes. In terms of acceptability of eating quality, one *alata* genotype (VU-2) had a high rating; the rest of the *alata* and *rotundata* genotypes had comparable ratings.

As to the second and third on-farm trials, data obtained so far indicated genotype differences. The trials in Dawis, Bohol, however, appears to be a failure because of severe drought. Final results will be available once sensory evaluation and data analysis are completed.

IV. DISCUSSION

a) Evaluation

With the data available so far, the first 3 objectives and part of objective 4 have been achieved. Objective 4 will be fully achieved once sensory tests and data analysis are completed. The more relevant question perhaps would be whether the findings, especially as regards the on-farm trials, will be valid. Again, this will be determined only after all data are available.

One of the most serious problems faced was financial. The overall program coordinator allotted a fixed amount to each study in the program. No one except the study leader was to touch the amount allotted for each study. With budgets tight, many study leaders tried hard to save for possible future difficulties. However, contrary to his earlier pronouncement, the overall program coordinator reallocated project savings from the first year of implementation. With those savings gone, some study leaders had a very hard time making ends meet when difficult times came.

Related to this problem, the program vehicle had high flat rate charges in addition to charges for drivers' per diem and fuel. (budgets were initially prepared on the assumption that the cost of program coordination would be substantially less).

A number of other problems while minor in nature, should be considered. Firstly too many meetings on integration were held. In early 1990 how each study would relate to other studies was clearly spelled out. However, so many more meetings were conducted that other staff activities were sometimes affected.

Secondly, with the extraordinary number of meetings on integration, some members of the program wondered whether the program coordinator had a clear idea of how to get the program integrated. Junior members of the program thought they had a clear understandings as it was already spelled out well in an earlier meeting. In time, it became evident that the program management wished, not just integration of the study and project components of the program, but also the expertise and outside resources (i.e. outside of IRCP) of those involved in the program. As well, the focus of integration for the extension component was on Pinabacdao. This focus was supported by the program co-ordinator.

In retrospect, personalities aside, the impression remains that the main reason for the rough sailing of the program was simply poor planning and poor co-ordination.

b) Conclusions and Recommendations

As determined in some meetings, the program requires studies on production practices especially cropping systems. This study is therefore to be merged with another to form a new study on taro- and yam-based cropping system as soon as the last sensory evaluation in this study is completed.

Study 3 - Somaclonal Variation in Yam

Study Leader: Prof. Villaluz Z. Acedo
Assistant Professor, PRCRTC

I. OBJECTIVES

The ultimate aim of this study is to develop genetic variants by somacloning for varietal improvement in yam. This non-conventional breeding system can serve as a very useful alternative to the traditional breeding approaches which have been constrained by the aberrant flowering behaviour of yam.

In the pursuit of this goal, this study was guided by the following research objectives:

- to induce formation of callus (somatic cells) from vegetative explants of *in vitro*-derived plants
- to generate plants (somaclones) from either callus or suspension cultures
- to observe phenotypic variations among somaclones.

II. METHODOLOGY

In the production of somaclones and their subsequent evaluation for variabilities, the following activities were undertaken:

- stock plants were raised *in vitro* of different yam genotypes using the protocol pre-established for VU-2 variety.
- callus induction experiments using leaf, node, ternode and root sections of stock plants and cultured on MS and White's media with different hormonal supplements were conducted.
- plantlets from callus using hormone-free medium were regenerated.
- the phenotypic characteristics of regenerated plantlets under screenhouse and field conditions were evaluated.

III. RESULTS

VU-2 stock plants were successfully cultured *in vitro* using nodal segments and MS medium. VU-1, VU-3, PRA-5, PRA-10 and BES-1 genotypes also responded positively when cultured using the protocol identified for VU-2. However, plantlet production from nodal segments varied from 4.1% in BES-1 to 65.5% in PRA-5. No plantlets were produced from PRA-35 cultures.

A callus induction experiment has been conducted for VU-2. Moderate to profuse callusing was observed in MS medium supplemented with 8 mg NAA/L or with a combinations of 3 mg BAP/L and 2-6 mg NAA/L.

Ten plantlets (designated as somaclones 1 to 10) were generated so far from VU-2 callus cultures. These were micro-propagated for phenotypic evaluation. Preliminary visual evaluation of phenotypic characteristics of the somaclones under screenhouse conditions has been carried out.

IV. DISCUSSION

a) Evaluation

The achievements have only partly met the objectives of the study. In the induction of callusing (Objective 1), only one genotype (VU-2) has been used. Callus induction experiments for the other varieties are still on-going. A rapid callus induction technique is also being developed. The same is true in the regeneration of plantlets from callus (Objective 2). However, only one plantlet was produced per culture vessel. The callus being composed of several cells is expected to produce several plantlets. It is then possible that the plantlets (somaclones) produced were derived from the buds of the nodal segments rather than from the

callus. This can be the reason why the phenotypic characteristics of these plantlets were visually observed to be similar to the parent VU-2 plants when evaluated under screenhouse conditions. Other techniques are now being tried to induce callus differentiation into plantlets.

To date the study has succeeded in the establishment of stock plants *in vitro* of the genotypes used except PRA-35, and the induction of callus and its differentiation into plantlets in VU-2 genotype. Other techniques will be explored to regenerate plantlets from PRA-35 explants.

The problems met include:

- frequent power failure which affects the performance of cultures
- browning of explants especially PRA-35
- lack of equipment, especially for suspension culture experiment.

b) Conclusions and Recommendations

The results obtained so far have not adequately attained the aims of the study. It is therefore strongly recommended that the study be extended.

Study 4A - Improvement of Cultural Management for Minor Root Crops

Study Leader: Mr. Alfredo G. Dingal
Instructor, Regional Coconut Research Center (RCRC)

I. OBJECTIVES

The objective of this project is:

- to develop cultural management practices for yautia in marginal areas and under low external inputs.

II. METHODOLOGY

During the early stage of the study, the experiments were conducted on the production of good quality planting materials using mother corm. Experiments were conducted to determine:

- the effect of different sett sizes on the production of planting materials
- the effect of different sett preparations
- the effect of sett type and seed bed cover on the production of planting materials.

III. RESULTS

The mother corm cut into 100 g sett produced better planting materials than the smaller sett. The number of suckers produced is greater when mother corm is cut into pieces. The head portion or the youngest part of the mother corm is the best source of planting material.

Cultural experiments conducted were:

- the effect of shading, mulching and fertilizer on yautia
- the effect of the degree of shading on yautia
- the effect of the degree of cultivation on yautia
- the effect of depth of planting
- the effect of soil bulk density.

Plants provided with shade and mulch performed well while fertilizer application did not show favourable effects.

Plants performed well when provided with two layers of GG-Net (fishing net) to provide shade.

Spot cultivation performed much better. Performance of yautia was favourable at 20 cm planting depth than those at shallow depths. Finally, soil with lower bulk density was found to be favourable for yautia.

IV. DISCUSSION

a) Evaluation

Only a portion of the goal has been reached for a number of reasons. First the goal is very broad. As well the crop has a long growing period. The crop is very difficult to handle because it performs very well at the early stage of growth. However, during the latter part, some may turn yellow and eventually die. Finally, limited manpower was available for the project.

b) Conclusions and Recommendations

Based on the problems observed in growing yautia, it is recommended that further studies be done to solve the early dying of plants. As well, because of the remaining financial resources, the project leader planned to merge this study with that of Study 1 and will focus on taro or yam-based cropping systems.

Study 4B - Biological Control of Major Taro Pests

Study Leader: Prof. Erlinda A. Vasquez
Assistant Professor, PRCRTC

I. OBJECTIVES

The objectives of this project are:

- to develop mass production techniques of the biological control agents of major taro pests
- to test the efficiency of biological control agents in the screenhouse and in the field.

II. METHODOLOGY

A survey was conducted in selected taro growing areas in Leyte and Samar to determine the major pests of taro in each area and to collect parasites, predators and entomopathogens associated with each pest. The collected samples were placed in polyethylene bags, rearing bottles or in glass vials and were brought to the laboratory for examination, identification and mass culture. Unidentified species were sent to taxonomic museums for proper identification.

Kalpao, a widely grown taro cultivar and Iniito and Hinagnaya, two commonly grown local varieties in Samar, were planted in the field and in pots to serve as host/ feeding substrate for the mass rearing of the insect pests of taro. Some of the potted plants were used in the laboratory and screenhouse evaluation of the different biological control agents.

The major taro pests were reared either on potted taro plants or on excised taro leaves. The melon aphid, taro plant hopper and taro grasshopper were reared on potted taro plants in the laboratory and screenhouse while the taro hornworm was reared in used plastic ice cream containers filled regularly with fresh excised taro leaves.

Only the potential biological control agents of each pest were mass produced. Trichogramma chilones, the egg parasite of taro hornworm, was mass reared on both the natural and alternate hosts, i.e. hornworm egg and rice moth (Corcyra cephalonica) eggs, respectively. The procedure used by Cadapan was adapted with slight modifications. On the other hand, the virus infecting the hornworm larvae was initially cultured on laboratory-reared hornworm larvae by introducing field collected diseased larvae and virus-sprayed taro leaves into the rearing container. Dead larvae were harvested, mashed and liquified to produce viral suspension.

For melon aphid, a predatory species of coccinellid beetle (Coelophora inaequalis) and the syrphid fly (Ischiodon scutellaris) were mass reared. The latter aphid species was used in the subsequent mass production of the two predators because of its high reproductive capacity. Bean plants were used because

they are easier and more convenient to handle than taro plants.

For biocontrol of grasshopper and taro plant hoppers, only the most prevalent species i.e., Scelio fascialis and Cyrthorhinus fulvus, were mass reared on their natural hosts. Since the eggs of taro grasshopper are deposited and inserted in the petiole of the plant and the life cycle of the parasite takes one month, it was too bulky and laborious to mass rear the parasite on potted live plants. Instead, the parasites were allowed to parasitize on newly-harvested laboratory-produced eggs in petioles, first in large jars, then incubated until adult emergence. To prevent desiccation of the eggs, moist tissue paper was placed on the bottom of the containers.

For predators of taro plant hopper eggs, rearing of C. fulvus was done on live potted plants heavily infested with taro plant hoppers inside wire-screened cages. Gravid females were introduced and allowed to oviposit and feed on plant hopper eggs. The nymphs were transferred regularly to another infested plant once the prey became depleted.

The efficiency of T. chilones was evaluated both in the screenhouse and in the field. In the screenhouse evaluation, the taro plants were artificially infested with adults of taro hornworm. The female adults were allowed to oviposit before parasites were released. The parasite was artificially introduced in the screenhouse by randomly placing the paper strips containing the parasitized eggs which were about to emerge. Egg parasitism was recorded one week after release of the parasite.

In the field evaluation, initial population counts of the existing eggs and larvae of taro hornworm and initial reading of egg parasitism were made before releasing the parasite. The same number of parasites were released in terms of parasite population to area planted. Egg parasitism was recorded two weeks after the release of parasite and every other week thereafter. Establishment and population build up of the parasites were noted in two set-ups.

Bioassay of the virus infecting larvae of taro hornworm was conducted in the laboratory to determine the optimum concentration to effectively kill the larvae and the stage of larval development most susceptible to viral infection. Leaf dipping and spraying in viral suspension with and without sticker were employed. First and second instar larvae, the most susceptible stages, were used as test materials. Larval behaviour and mortality counts after treatment were recorded.

As it was observed that C. inequalis and I. scutellaris could be easily established in the screenhouse as long as the prey was available, screenhouse evaluation of the effectiveness of these two predators was no longer conducted. Field evaluation was directly carried out instead. Adults of C. inaequalis and about-to-emerge adults in pupal cases were released in the field. Initial aphid infestation ratings and predator population counts were done before and after release of the predators.

III. RESULTS

Based on the survey conducted, taro hornworm, melon aphid, taro plant hopper and taro grasshopper were identified as major pests of taro in Leyte while hornworm, melon aphid, taro grasshopper and unidentified corm beetle in Samar. Corm beetle has not been reported nor included in the list of taro pests by Gabriel. It was only after a survey was conducted and farmers reported on the extent of damage to the corm that the beetle was considered a serious pest. However, incidence of corm beetle was last recorded in 1990 and since then no corm beetle infestation has been found.

The natural enemies associated with the major pests of taro include: T. chilones, egg parasite of taro hornworm, and unidentified virus infecting hornworm larvae, three species of coccinellid beetle, two species of syrphid fly and a species of lacewing - all of which prey on melon aphid; C. fulvus and unidentified mirid bug - egg predator of taro plant hopper; and Scelio fascialis and unidentified hymenopteran - egg parasites of taro grasshopper.

The egg parasite T. chilones was successfully mass-reared on taro hornworm eggs and Corcyra eggs without any difference in the biological parameters. Five-day old parasitized eggs can also be stored in a refrigerator for one week (for taro hornworm) to three weeks (for Corcyra) without significant difference in the percentage adult emergence. The eggs could be stored until the sixth week, however, only 50% parasite emergence can be obtained. The result suggests that Corcyra eggs offer better substrate for mass production of T. chilones in terms of biology and ability to withstand low temperatures during storage.

The virus infecting the hornworm larvae was successfully mass-produced on hornworm larvae in the laboratory. Infected larvae can be harvested one week after inoculation.

Among the predators of melon aphid, only C. inaequalis and I. scutellaris were considered potential predators based on their developmental period and feeding efficiency. Mass production for these two predators using black bean aphid was more efficient than using melon aphid.

Of the two egg parasites attacking taro grasshopper, only the predominant species , S. fascialis, was mass reared. The rearing technique used can only culture fewer parasites. Thus, limited numbers could be released for field evaluation. The rearing technique being adopted still needs improvement for more efficient mass production of the parasite.

In unsprayed taro fields, the natural field population of T. chilones is relatively high, ranging from 16-54% which varied from month to month. However, the existing population cannot effectively reduce the population far below the economic threshold level. Artificially inundating the field with laboratory-reared parasites of this kind can help the existing population by checking the recurrence of high hornworm incidence.

Results of the screenhouse and field evaluation showed a high potential of T. chilones for hornworm control. The parasite was able to get established after few artificial releases and the rate of parasitism efficiency was relatively high. Egg parasitization can reach 100% in the screenhouse and 84% in the field after just four parasite releases.

The results of laboratory bioassay of the virus infecting the hornworm larvae showed that its not a good candidate for a biocontrol program. The virus caused low mortality even under controlled conditions. Thus, screenhouse and field evaluations were terminated.

Field evaluation of the predators of melon aphid, egg parasite of the taro grasshopper and egg predators of the taro plant hoppers is continuing.

IV. DISCUSSION

b) Evaluation

The potential biological control agents of the major pests of taro had been mass reared in the laboratory and screenhouse for inundative release in the field.

Mass production of *Trichogramma chilones*, the egg parasitized of taro hornworm was successfully carried out in the laboratory using a low-input technique which can easily be acquired and adopted. On the other hand, the mass rearing technique of the coccinellid predators of the melon aphid, egg predators of the taro plant hopper and the egg parasite of the taro grasshopper required the use of living plants which is laborious and uneconomical. Modifications continue to be made to the mass rearing technique.

Based on the monthly monitoring of the population of taro pests and their natural enemies, the existing population density of the latter in the field can hardly control the population of the former far below the economic threshold level. Thus, inundative release of natural enemies is necessary to augment the existing population.

Screenhouse and field evaluation of natural enemies with emphasis on *T. chilones* showed positive results. This egg parasitoid can easily get established in the field and increase the rate of parasitoid remarkably while decreasing the existing taro population far below the control threshold level.

However, it is difficult to mass rear and maintain the different biocontrol agents in bulk at the same time due to limited resources in terms of manpower and laboratory facilities. An air conditioner unit is needed for longer storage of *Trichogramma* - parasitized eggs and to arrest the development of coccinellids and other predators for melon aphids and planthoppers, in order to reach the optimum number for field release and evaluation.

As well, field evaluation of the effectiveness of the egg parasitoid of grasshoppers in the demo-field cannot be done because destructive sampling of plant parts (petioles in particular) will be done regularly. Those responsible for the demonstration area won't allow the destructive sampling since it would affect their experimental set-up.

The plants in the demo plot were sometimes sprayed with broad spectrum pesticide and we were not informed.

b) Conclusions and Recommendations

With the results gathered, biological control showed some promise for taro pest management. It is therefore important to educate the farmers that biocontrol works, not only in rice which already has an established pest control tactic, but also in taro.

PROGRAM 2 - **Processing and Utilization**

Program Leader: Dr. Manuel K. Palomar

Project 1 - **Development of Sweet Potato and Cassava Food Products and Processes for Subsistence Households**

Project Leader: Dr. Truong Van Den
Associate Professor, Food Science

Study 1 - **Assessment of Eating and Processing Characteristics of Sweet Potato Varieties and Hybrids Processing Technology**

Study Leader: Dr. Truong Van Den

I. OBJECTIVES

The objectives of this project are:

- to assess the organoleptic properties and nutrient content of sweet potato varieties/hybrids
- to screen the accessions/varieties from VISCA sweet potato germplasm for non-sweet type sweet potato
- to evaluate the hybrids developed in the program for their suitability for food processing and utilization
- to determine the correlation between the chemical constituents in roots of sweet potato varieties/hybrids and their eating/processing characteristics.

The data generated from this study would be useful to the plant breeders and food technologists in their work on breeding and food product development, respectively.

II. METHODOLOGY

Sweet potato varieties, accessions and advanced lines developed by breeding group were collected and subjected to sensory evaluation and chemical analyses. Sensory attributes such as sweetness, dryness/moistness and general acceptability and its physical characteristics before and after cooking were evaluated by laboratory taste panellists and by consumers in urban centers and rural areas. Chemical analyses of dry matter, sugar, starch and protein content were made following standard procedures.

Eating quality on the eating quality of sweet potato tops as vegetables was also assessed. Sweet potato tops

were blanched, made into "camote top salad", a traditional dish and subjected to a taste panel for evaluation of colour, hairiness, tenderness, flavour, aftertaste/bitterness and general acceptability. Varieties/hybrids included were VSP's, advanced lines and the controls, namely Kinangkong and Kangkote, which are native cultivars being commonly grown by farmers for sweet potato tops.

Sweet potato accessions collected from VISCA germplasm were screened for sweetness, dryness/moistness and general acceptability. Descriptive scales of 1-5 (1 - not sweet and 5 - very sweet) and 1-7 (1 - very moist/watery and 7 - very dry) were used respectively for the sweetness and dryness/moistness of the cooked sweet potato.

Fresh roots of various sweet potato varieties/hybrids obtained from Program 1 were processed into sweet potato (SP) chips, SP fries/strips and "camote cue", a popular traditional snack item. Orange fleshed sweet potato hybrids were processed into fruity-food products namely SP catsup, SP jam, SP beverage and Delicious SP. Samples of the processed products were subjected to taste panellists for sensory evaluation.

Starch of sweet potato roots was extracted following the standard procedure. Sweet potato varieties representing the very moist type (VSP-1); moderately moist type (VSP-4), and dry type (VSP-6, VSP-3) and native varieties with good eating quality (Karingkit, Siete Flores, Miracle...) were included in the experiment. Starch samples were subjected to characterization in collaboration with Dr. Tomonori Nagahama of Kagoshima University, Japan.

III. RESULTS

One hundred and forty-one sweet potato varieties/advanced lines were analyzed for the contents of dry matter, sugar, starch and crude protein. Results showed wide variations among hybrids/varieties. Dry matter content ranged from 23.0-45.0%. Sugar and starch content ranged from 2.0-21.2% and 52.5-86.6%, respectively. Crude protein ranged from 1.2-4.9%.

For sweet potato tops as vegetables, 49 advanced lines of sweet potato varieties were prepared into "camote top salad" and subjected to sensory evaluation in the laboratory, there was no significant difference in sensory scores among the hybrids as compared with the native cultivars even though the morphological characters of the sweet potato tops vary widely.

Two hundred and forty-one sweet potato varieties, accessions and, advanced lines developed by the breeding group were evaluated for their organoleptic characteristics. About 25% of the accessions evaluated had a general acceptability score of 8.0 (like very much category) and were found comparable to the native varieties. The two accessions, V37-26 and V37-151, which were included in field evaluation in Pinabacdao had high scores on eating characteristics.

Four VISCA sweet potato varieties namely, VSP-3, VSP-4, VSP-5 and VSP-6, were compared with the most popular native varieties in the locality selected for the consumer acceptability tests. The results showed that acceptability scores of VSP's except VSP-6 were very much comparable with the native varieties in farmer communities (Pinabacdao, Baybay) and urban centers (Tacloban, Cebu City).

Two advanced lines of sweet potato, V37-26 and V37-151 were also tested for consumer's evaluation as compared with the popular native varieties, Miracle and Kaangi in Tacloban City and Pinabacdao, Samar respectively. Preliminary results showed that the eating characteristics of V37-26 and V37-151 were very comparable with those of the native varieties. Further tests will be conducted in other urban and rural places.

Fifty-seven sweet potato varieties/advances lines were processed into food products namely, sweet potato (SP) chips, SP sticks/fries, "camote" cue and fruity products such as SP jam, SP catsup, SP beverage and Delicious SP. The sweet potato varieties/hybrids which are suitable in processing into these products were identified.

One hundred sweet potato accessions were screened for non-sweet type sweet potato. Thirteen and thirty-five accessions were rated under non-sweet and slightly sweet category, respectively.

Extraction and characterization of starch from selected VSP's and native sweet potato varieties were done. Preliminary results indicated that there was no significant difference in the physical properties of the starches.

IV. DISCUSSION

a) Evaluation

When consumer acceptability tests of the selected VSP's lines were conducted in farmer communities and urban centers, we were able to assess the sweetness of only 100 sweet potato accessions out of over 1,000 accessions in the germplasm.

As well, we evaluated only 49 sweet potato varieties/advanced lines for their characteristics in processing into SP chips, SP fries/sticks and camote cue. Seven orange fleshed sweet potato varieties were evaluated for their suitability in processing into fruity food products: SP jam, SP catsup, SP beverage and Delicious SP.

Physico-chemical properties of the starches from different types of sweet potato (moist, mealy...) were determined. However, the results are not conclusive.

b) Conclusions and Recommendations

Out of the varieties/accessions evaluated, two accessions, V37-26 and V37-151, had good eating characteristics. Fortunately, these accessions also performed very well in the pilot sites at Pinabacdao and Samar.

Contrary to public opinion, the results of the consumer testing of VSP's in the surveyed areas indicated that VSP-3 and VSP-4 are comparable with the native varieties which were preferred by farmers and consumers.

Based on the results, sweet potato tops from all of the varieties/advanced lines evaluated and developed by the breeders can be utilized for salad making which is one of the favourite filipino dishes. This can broaden the food uses of sweet potato.

Some varieties showed very good performance in processing into SP chips, SP fries/sticks and camote cue. The orange fleshed sweet potato roots also showed very promising performance in processing into fruity food products.

We failed to evaluate consumers acceptability tests of V37-26 and V37-151 in Baybay and Cebu City and of VSP's and V37-26 and V37-151 in other sweet potato producing areas such as Bicol, Northern Mindanao, etc. due to time constraints.

We were also not unable to either evaluate the processing characteristics of other promising sweet potato accessions/hybrids and to screen the sweet potato accessions from VISCA germplasm for their non-sweet type sweet potato due to unavailability of roots.

Finally, we failed to determine the correlation between the chemical constituents in roots of sweet potato varieties/hybrids and their eating/processing characteristics due to the complicated nature of the matter and lack of facilities.

Study 2 - Improvement and Evaluation of Selected Sweet Potato and Cassava Processing Technologies

Study Leaders: Engr. Felix J.Amestos
Assistant Professor, Food Science
Dr.Lemuel M. Diamante
Assistant Professor, Food Science

I. OBJECTIVES

Earlier studies recommended that selected cassava and sweet potato processing techniques be improved. The recommendation was based on the prevalent consumption of the product in the locality, the necessity to improve the nutritional quality to alleviate malnutrition in the rural areas and the commercial potential of the product if proper machines/devices and standardized processing can be adopted.

To answer this need, the study was conducted with the following objectives:

- to identify and describe the indigenous technologies in processing of cassava and sweet potato
- to improve the nutritional and sensory qualities of selected cassava and sweet potato products
- to modify existing equipment/tools used in processing the traditional products to improve the

technical efficiency and sanitary conditions

- to generate data for cost and return analysis.

II. METHODOLOGY

Previous reports were studied to identify potential technologies which needed to be improved or developed. Necessary mechanization of the operations of identified technologies was determined by studying the time-and-motion requirements of each operation. Machines and equipment were developed or adapted for the operations. The design of the machines was based on functionality/workability, simplicity of design, ease of operation and hygienic considerations.

To strengthen and standardize the processing parameters of selected traditional cassava and sweet potato products, several formulations were made to improve the products. The improved/developed products were subjected to sensory evaluation and the best treatments were recorded and recommended for adoption. Final product prototypes were subjected to storage studies to determine the shelf life of the product using the use of different packaging materials.

III. RESULTS

A reconnaissance survey was conducted by the socio-economics group in collaboration with the Department of Agriculture (DA) to identify cooperators who are processors of food products. Our group, in collaboration with the economics group, had monitored the selected processors in Samar, Bicol, Iloilo, Aklan and Bohol to assess the potential processing technology through a diagnostic cost and return analysis. Most of the products which showed economic potential utilized grated cassava as the primary ingredient. Hence, the dehydrated cassava grates, an intermediate product, was identified for development into a convenient product for traditional cassava food preparation.

For dried cassava grates, the focus of the study was primarily on the development of equipment suitable for scaling up the processing at village level conditions. The basic equipment developed for processing of dried grates were:

- Root crop grater/pulverizer - basically a rotating drum covered with punctured G.I. sheet serving as the cutting surface. It has a capacity of 50 and 150 kg/hr when pedal and motored-operated, respectively.

- Juice extractor - this resembled a platen press with a capacity of 30 kg/hr.

- Sifter - an aluminum mesh rotary drum sifter with a capacity of 120 kg/hr.

- Dryer - a natural convection cabinet dryer fuelled by agro-waste can dry 100 kg. of materials per batch with different drying time for different loads or products.

When rehydrated, the final product can be used as ingredient in food preparation as a substitute for fresh cassava grates. Sensory evaluation revealed that cassava cake, "puto" and rolls prepared from fresh cassava grates can be made. Dried cassava grates were also utilized in other food products such as cassava pudding, cassava "ibus" and cassava "suman" with general acceptability ratings of 7.3 - 8.0 in a 9 point Hedonic scale. The product may have a market in urban centers where fresh cassava is not always available and consumers utilize readily available materials to save time in preparing food products.

To increase the protein content of the products especially "puto", a certain percentage of mung bean flour was added to the dried cassava grates. The product was acceptable with the addition of 20% mung bean flour without significantly affecting the product's sensory attributes.

Fried strips/chips from cassava and sweet potato were developed by standardizing its processing parameters such as the size, length and thickness and the product formulation such as the sweetness, saltiness, etc. The cassava/sweet potato fried strips have a 5 minimum square cross-section with a length of 7 cm. A sweet-salty taste of the product was most preferred compared to either salty or sweet. For cassava chips, the final product has a thickness of 1 mm which could either be flavoured or sweetened.

A strip cutter which cuts sweet potato/cassava roots into strips in one operation was developed. At normal pedalling speed of 60 rpm, its average capacity is 86 kg/hr at about 50 per cent recovery of intact strips. Existing devices such as the slicer, steamer and fryer were adapted.

The storage studies have been established to determine the shelf life of the product using different packaging materials such as plastic and aluminum foil and with/without anti-oxidant. Results revealed that fried cassava strips could be stored in plastic without anti-oxidant for at most three months without significantly affecting product quality.

The developed/improved machines were assembled in a processing line and pilot production trials were conducted in collaboration with the Economics group. Data on product recovery, man-power requirements, cost of ingredients, fuel, depreciation, etc... were provided to the Economics group for economic feasibility studies.

IV. DISCUSSION

a) Evaluation

We were successful in:

- working closely with the Economics group in the process and in monitoring the existing technologies of different products at various locations in the country

- improving the product quality and the processing efficiency of traditional technology through product formulation and the development of the processing equipment and devices

- assembling processing lines at the laboratory level to generate data for cost and return analysis of the products. Pilot processing had been done in collaboration with the Economics group.

The following activities were unsuccessful:

- We were unable to complete storage studies of the product especially the sweet potato strips, because of the time constraints

- We did not conduct consumer acceptability tests of the products because of a lack of raw materials and time constraints

- We did not do field tests of the improved technologies. Although the technologies had been introduced to households in the pilot site (Pinabacdao) through an awareness drive, the clientele have not shown interest in adopting the technology.

b) Conclusion and Recommendation

The study was able to identify the potential indigenous technologies, has made improvements to them, and has pilot tested the improved technologies at the laboratory level. A need to transfer the technology to the target clientele, farmers and small-scale food processors has been identified.

Project 3 - **Processing and Utilization of Food Products from Minor Root Crops**

Project Leader: Dr. Lutgarda S. Palomar
Associate Professor, Food Science

Study 1 - **Development and Evaluation of Food Products from Arrowroot**

Study Leader: Dr. Lutgarda S. Palomar

(to be produced later)

Study 2 - **Improvement and Pilot Testing of Food Products from Aroids and Yam**

Study Leaders: Engr. Felix J. Amestoso
Dr. Lemuel M. Diamante

(to be produced later)

Project 4 - **Livestock Feeding Strategies in a Sustainable Root Crops Production System**

Project Leaders: Dr. Oscar B. Posas, Head, Animal Science,
Mr. Lolito C. Bestil, Instructor, Animal Science

Study 1 - **The Potential of Silage from Root Crops for Sustainable Animal Feeding**

Study Leaders: Dr. Oscar B. Posas
Mr. Lolito C. Bestil

(to be produced later)

Study 2 - **Economical Swine Production in Root Crops-Based Farming Systems**

Study Leader: Dr. Sulpecio C. Bantugan
Assistant Professor, Animal Science

I. OBJECTIVES

The objectives of this project are:

- to develop sustainable feeding systems based on rootcrops and their by-products
- to determine economical feeding schemes at the farm level for optimum performance
- to assess the extent of adoption of introduced feeding innovations.

II. METHODOLOGY

A diagnostic survey was conducted to determine existing animal production systems in the area. The site for the on-farm trial was selected. Appropriate strategies were designed for flexibility in three areas:

1. continuous monitoring of existing feeding systems of farmer cooperators as the basis for deciding on the feeding innovations;
2. we viewed the feeding innovations as a "supplement" that will blend rather than replace what exists
3. we exercised "dynamism" in suggesting and/or deciding on the feeding innovations based on feeding gaps and available feed resources.

Farmer cooperators were selected in Parasanon, Pahug, Lale, and Nabong barangays of Pinabacdao, Samar. Implementation of the on farm trial involved:

- 6 cooperators using traditional feeding methods (control)
- 6 cooperators using traditional + innovative methods.

Two farmers having similar cropping patterns/systems were paired and each randomly assigned to any of the two treatments. They were given two upgraded female piglets each.

III. RESULTS

A diagnostic survey conducted in ten selected municipalities of Eastern Visayas had already been completed. It was done primarily to assess the existing animal production system in the upland, to include the extent of utilizing rootcrops as animal feed. Results obtained were useful in planning and designing the on-farm trial.

Based on the data gathered so far gathered, rootcrops particularly cassava and sweet potato are available

during the months of January, February and March. Availability declines starting in April. Availability of other feedstuffs is highly variable. With barely 10% data remaining to be gathered to establish a complete feed profile in the area, our goal of developing a sustainable feeding scheme based on rootcrops and their by-products is far from being attained. This is due to the fact that rootcrops production is still minimal. The introduced feeding innovations are highly dependent on the supply of rootcrops on-farm. However, if processing of rootcrops into food products is to be fully established, farmers may be encouraged to produce more and to consequently produce rootcrops by-products for feed.

Although not directly a part of our objective, the training of one farmer to undertake artificial insemination in the area is highly significant, considering that maintaining good quality breeding boars is expensive. The services of this one farmer is therefore important in facilitating increased production of improved swine at lower cost.

After seeing the piglets that we dispersed to our cooperators many farmers have expressed an interest in acquiring upgraded piglets. Even farmers from non-pilot barangays are now aware of the benefits.

IV. DISCUSSION

a) Evaluation

The study has been successful in the creation of awareness among farmers of the importance of raising improved pigs at the village level. Because many farmers (both within and outside the pilot barangays) are now interested in raising improved piglets, they are expected to produce more rootcrops for feed as well as for home consumption and market. Eventually, more feeding innovations can be devised for the development of a sustainable feeding system based on rootcrops. The skills acquired by the cooperators in the preparation of rootcrops for feed is another important accomplishment.

Technically, however, the study has failed to develop an economically sustainable feeding system for rootcrops and their by-products. This failure is due to insufficient supply of rootcrops for animal feed which resulted in the on-and-off feeding of pigs with the introduced feeding innovations.

As well, money allotted for travel was limited and made the field visits of the irregular. This is extremely necessary for livestock on-farm research in order to establish closer relationships with the farmers and to enable farmers to participate in the research team.

b) Conclusions and Recommendations

Under the present circumstances, it is expected that the objectives/goals of the study will not be fully attained. It is therefore recommended that farmers be encouraged to first produce more rootcrops first before designing a feeding system based on rootcrops. The present enthusiasm shown by the farmers to acquire improved piglets is a good start.

PROGRAM 3 - **Information, Communication and Extension**

Program Leader: Dr. Eliseo R. Ponce
Director, Research and Extension

Project 1 - **The Philippine Root Crops Information Service (PRIS)**

Project Leader: Ms. Rebecca B. Napiere
Senior Librarian, College Library

Study 1 - **Information Delivery/Distribution Systems**

Study Leaders: Ms. Rebecca B. Napiere
Ms. Epifania G. Tudtud
Instructor, Center for Social Research (CSR)

I. OBJECTIVES

The objectives of this project are:

- to strengthen the PRIS network in collaboration with the Department of Agriculture and other agencies
- to enhance the delivery of root crop information services
- to mass produce and distribute the various extension and training materials developed by the Extension and Communication Components.

II. METHODOLOGY

To achieve the above goals, a number of activities were undertaken. The study strengthened linkages with other information centers like AGRIS, CIAT and CIP and exchanged bibliographies and materials on root crops to keep the PRIS bibliographic collection updated. We included extension workers of the Department of Agriculture in the PRIS network to assist PRIS in the dissemination of root crop information using materials produced by PRIS. Two regional sub-centers for the bibliographic database in Luzon (Benguet State University) and in Mindanao (Central Mindanao University) were established to increase access to root crop information at the regional level. The collection of root crop literature throughout the country was continued in collaboration with the liaison officers. The collected documents on root crops were analyzed and stored in the database. The delivery of information services such as on-line searching services, reprographic services and the inquiry-and-answer service were improved. Finally, communication materials were reproduced and circulated to the target clientele.

III. RESULTS

The PRIS mailing list was expanded to include 163 Provincial Agricultural Officers, Municipal Agricultural Officers and Provincial Information Officers. At PRIS headquarters requests and inquiries from root crops users were answered. At present, the bibliographic database contains 2,240 documents and 1101 users have availed themselves of the information services.

We disseminated 8,995 copies of communication materials all over the country to target clientele. These target clientele included:

- farmer trainees and cooperators in the pilot sites of Pinabacdao, Samar and Sibagat, Agusan del Sur
- farmer trainees and cooperators of the Root Crop Livelihood Projects of the Philippine Root Crop Research and Training Center in Capoocan, Leyte; Padre Burgos; Silago, Southern Leyte; Hindang and Dulag
- farmer trainees of the Agricultural Training Institute, research centers, state colleges and universities and other government and non-government agencies.

Publication materials were reproduced and disseminated. The VSP calendars and brochures were reproduced in English, Cebuano and Waray editions. Two thousand copies of the VSP calendars were reproduced and distributed, while 3,000 copies of the VSP brochures were reproduced. Of these brochures, 2,100 copies had already been sent to the target clientele. Likewise, 500 copies each of the ISPN vol. 3(2), 4(1) and 4(2) were reproduced and distributed to sweet potato researchers throughout the Philippines and abroad.

IV. DISCUSSION

a) Evaluation

The goals of the study have been achieved in that collaboration with the Department of Agriculture in the dissemination of root crop information has been established and two regional sub-centers for the databases have been created. However, an evaluation of the effectiveness and the degree of the collaboration between PRIS and the Department of Agriculture on the dissemination of information is required. As well, the database sub-centers should be evaluated to determine whether they are effective in making root crop information more accessible to researchers.

In addition, the distribution system and evaluation of PRIS publications should be streamlined to gather better feedback on the usefulness and relevance of these publications.

The coordination among PRIS staff, the technical staff and the communication staff in setting up targets

and activities should be improved. Because of this lack of coordination, the ability of PRIS to disseminate root crop publications is largely dependent on the input of the technical and communication components.

Finally, unfortunately PRIS does not always receive copies of papers and reports on root crops presented or published by root crop researchers. The provision of these documents is very important for updating the bibliographic database.

b) Conclusion and Recommendations

Before the project is completed, a number of activities must be undertaken.

The following communication materials should be reproduced:

- training modules
- SOTA/abstract bibliographies on yam and taro
- abstract bibliographies supplied on sweet potato and cassava
- root crops fact sheet
- PRIS notes.

PRIS services should be marketed in the form of a brochure or flyer and an information campaign should be undertaken in collaboration with the Department of Agriculture. Collaboration with cooperating institutions should be strengthened with a view to improving the collection of updated root crop information. This study should be extended at least until the end of the extension and communication components because other information needs may be identified towards the end of the project.

Study 2 - Root Crop Data Base

Study Leader: Ms. Julieta R. Roa
Instructor, PRCRTC

I. OBJECTIVES

The objectives of this project are:

- to gather and review existing root crop data and other related relevant data from secondary sources and results of studies
- to improve access to rootcrop data

- to provide updated information to help improve policy making and project planning for rootcrops.

II. METHODOLOGY

Exploratory research on existing factual/statistical data bases was conducted.

The study sought opinions of experts in this field including CIP, CIAT, SEARCA, PCARRD, BGPRT and M. Bourke.

Secondary data was collected from PCARRD, Bureau of Agricultural Statistics (BAS), provincial and municipal planning offices, Bureau of Soils and Water Management, Department of Agriculture, Center for Research and Communication, VISCA.

A simplified data base combining some features of the reference file method and a simplified geographic information system was piloted. A sample simplified matrix for cassava using the micro-regions concept was generated.

Socio-economic papers and reports on rootcrops were collected.

III. RESULTS

Thirteen computer files of Philippine statistical data for rootcrops and related agricultural data, reports and papers with indexes were prepared.

A data base using the simple features of the reference file and simplified geographic information which includes geographic and physical information, agro-climatic conditions, land use and vegetation, markets/trading system, cropping patterns, etc. was piloted. This data is available for 45 provinces and 12 regions. Complete LREP data was completed for 2 regions.

A collection of 14 papers, 17 articles and newsletters, 23 reports, and 17 publications/proceedings was created.

However, the review and analyses of rootcrop data to provide updated information to policy makers and project planners was not achieved because of budget cuts. As well, the verification surveys were impossible and the linkages of limited effectiveness.

IV. DISCUSSION

a) Evaluation

Root crop data has been gathered and data bases have been created. Access to the data base has improved.

However, the drawbacks stem from delay in full implementation. Staff time for the first year was spent mostly on the bench mark survey. Delays in submission of requested reports, and substantial budget cuts (about 50%) have limited travel needed for data/information collection and verification. The quantity of data collected is relatively more than could have been warranted by the released budget. This was mainly due to the involvement of the study leader with other data networking and collaborative projects with scientists/ researchers based in Los Baños which saved on trips and gave PRCRTC access to primary data gathered by other network members.

b) Conclusions and Recommendations

While the project has been very successful, to achieve the desired output for the remaining tasks and those recommended for extension, it is necessary to increase the maintenance and operating expenses (MOE) budget from CAD $670 to CAD$ 2000. Further, it would be important to strengthen the knowledge of the systems analyst in the refinement of the database and to work out a system for the timely submission of needed results and/or data.

To strengthen the integration of components and to make the project more cost effective, it is important that management style be improved.

Project 2 - **Development, Production and Evaluation of Communication Materials on Root Crop Technologies**

Project Leader: Dr. Monina M. Escalada
Professor, Development Communication

Study 1 - **Development, Production and Evaluation of Print Materials on Root Crop Technologies**

Study Leaders: Dr. Monina M. Escalada
Ms. Edith A. Gundaya Head,
Training and Extension, PRCRTC

Study 2 - **Development, Production and Evaluation of Audio-Visual Materials on Root Crop Technologies**
Study Leader: Dr. Monina M. Escalada

Study 3 - **Development, Production and Evaluation of Broadcast Materials on Root Crop Technologies**

Study Leaders: Dr. Monina M. Escalada
Ms. Edith A. Gundaya

I. OBJECTIVES

The objectives of this project are:

- to prepare an inventory of appropriate technologies ready for piloting, promotion and extension to farming households, processors and extension personnel dealing with root crops
- to develop a plan for communicating the technologies to the target audience using an appropriate combination of media
- to design, prototype, pretest and produce training and extension support materials for farming households and extension workers
- to evaluate the effectiveness of strategic communication campaigns in creating a demand for information among farming households in the pilot areas.

II. METHODOLOGY

To meet the objectives, a handful of activities were undertaken

First, individual consultations with subject matter specialists were conducted. A baseline survey of pilot sites was completed. A rapid rural appraisal of pilot sites was undertaken. Pilot sites were selected and demonstration farms were established. A field day was conducted in collaboration with the Department of Agriculture. A preference evaluation of sweet potato varieties was completed in order to help farmers decide which VSP's to plant.

III. RESULTS

After consultation with specialists, VSP varieties and their cultural management practices were identified as ready-to-promote root crop technologies.

Baseline surveys were conducted in the primary (Samar) and secondary (Agusan) pilot sites. The report highlights findings related to farmers' knowledge, attitudes and practices.

Dialogue with farmers revealed production related problems such as lack of information on the new sweet potato varieties and their cultural management practices, pest control and soil fertility restoration and conservation. However, the RRA team reported problems such as a lack of working animals, declining soil fertility, a lack of planting materials of recommended root crop varieties, a lack of technical know-how, a low income derived from root crop farming, frequent typhoons and tenurial insecurity. Pilot sites were selected in collaboration with other IRCP projects and the audience for pilot sites was defined using the RRA and unified survey results. Focus group discussions, field visits and the RRA confirmed the selection of Pinabacdao, Samar as the primary pilot site, and Sibagat, Agusan del Sur as the secondary pilot site. Selection of a secondary pilot site was done to enable the program staff to try an integrated approach under different conditions from the primary pilot site.

The project staff also insisted on the selection of a secondary pilot site to allow them more flexibility in trying a strategic approach of communicating the technologies to the target users. They could not fully implement such an approach in the primary pilot site because of the large number of program staff working there (the site has a field team actually living there). In Pinabacdao, the target technology users are small farmers who grow root crops mainly for food and animal feed.

The role of the project is less directive and more reactive to complement and integrate with the other IRCP projects. The extension support materials are developed in response to the needs perceived by the field team. In Sibagat, on the other hand, the target technology users are small farmers who grow root crops, particularly sweet potato, for food and for sale (they are the suppliers of sweet potato in Cebu).

The role of the project is more of an information broker. The staff work through the Department of Agriculture (DA) and they facilitate the acquisition of information needed by the DA technicians and

farmers. They also facilitate linkage among the technical people in VISCA, DA technicians and Sibagat farmers. As part of the communication strategy to increase Sibagat farmers' awareness of the VSPs, the project staff facilitated the establishment of sweet potato demo farms in three barangays in Sibagat. The demo farm enabled the farmers to actually observe the performance of the VSPs on site.

To provide farmers with an avenue to discuss the results of VSP trials and analyze the acceptability of the varieties in the area, the project staff and the DA technician organized a field day. This event succeeded in generating more interest in the VSPs among farmers and consumers.

Results of a preference evaluation revealed that among the 7 VSPs tried, VSP-1 ranked first in terms of colour, flavour and general acceptability. VSP-2 was preferred for its form, VSP-3 for dryness, and VSP-6 for the size of tubers.

Based on unified survey results, a strategic communication plan for primary pilot site was developed. This plan included the following components:

- Problem identification
- Audience analysis and segmentation
- Campaign objectives
- Problem-solving strategy
- Message design and media selection
- Distribution and use of communication materials
- Simplified technology
- Needs assessments
- Prototype development
- Pretesting
- Production of final prototype
- Reproduction
- Distribution
- Field evaluation
- Campaign implementation
- Process documentation
- Summative evaluation.

Participated in revising the integrated development plan for the primary pilot site.

The following communication materials were developed for distribution to pilot and non-pilot sites:

- VSP calendar (English, Cebuano and Waray versions)
- VSP brochure (English, Cebuano and Waray versions)
- VSP radio promotions (Cebuano)
- VSP radio promotions (Tagalog, negotiations for reproduction still going on)
- VSP radio dramas (Cebuano)
- VSP radio dramas (Tagalog, negotiations for reproduction still going on)

- Script handbook (Cebuano)
- SALT poster (English, Cebuano and Waray versions)
- Flip chart on sweet potato production (English and Waray versions)
- Flip chart on sweet potato production (Cebuano, still in press)
- Brochure on sweet potato production (English, Cebuano and Waray versions; all still in press);
- Overhead projector picture set on sweet potato production (English, Cebuano and Waray versions)
- Chipper/grater construction manual (English).

The following communication support materials were produced for the demonstration farms, staff house, DA office, field days and other pilot site activities:

- billboard
- demo farm placards
- posters
- streamer
- exhibits
- brochure
- flip chart.

As well the project guided the conceptualization of the methodology for a training module provided expertise for training module development on root crop-based technologies.

A number of workshops to enhance skills of IRCP staff were conducted. These workshops included:

- communication skills enhancement for IRCP research leaders
- communication skills enhancement for IRCP research assistants and aides
- video production for IRCP staff
- training module development for subject matter specialists.

The project provided miscellaneous communication support services to the other IRCP projects including:

- laser printing
- computer graphics
- art work
- copy editing
- securing communication support materials.

Presentations were made to the Department of Agriculture (DA) officials at the national, regional, provincial and municipal levels. Favourable endorsement for collaboration with our project was given by then DA Under Secretary Apolonio V. Bautista to the regional director, the provincial agricultural officer, municipal agricultural officer and the municipal mayor in the secondary pilot site.

A key component of the project plan for the secondary pilot site is capacity building for DA field staff to ensure post-project sustainability. To achieve this, the project:

- facilitated and supported the participation of 6 DA staff from Sibagat in the "Training Course on Sweet Potato and Cassava Production, Processing and Utilization Technology"

- organized a "Workshop on Strengthening the Department of Agriculture on Root Crop Technology Transfer" for agricultural technologists in the pilot sites. Six ATs from Sibagat and 4 from Pinabacdao exchanged experiences and were updated on the production, processing, economics, marketing and extension of root crop technologies

- monitored and documented the farmer-managed VSP demo farms in the secondary pilot site

- established three farmer-managed VSP demo farms with support from the project during the set-up stage.

  The demo farms served as a valuable learning tool for both farmer-cooperator and other farmers in the area. Throughout the cropping period, the farmer-cooperators and his neighbour-farmers learned the recommended cultural management practices of VSPs. At harvest time, they discovered the yield of these recommended varieties. On the day of harvest, a localized preference evaluation was conducted by the farmer-cooperators with assistance from the Department of Agriculture technician and the project's research assistant. In each farmer-cooperator's kitchen, VSP tubers were either boiled or prepared as "camote cue" for neighbour- farmers to sample. This activity heightened the interest of neighbouring farmers in the varieties.

Possible linkages with non-government organizations operating in the area were explored. Although the anticipated collaboration with the NGOs operating in Agusan del Sur did not materialize, the initial contacts made resulted in the dissemination of VSP technology and planting materials to the farmers identified with radical groups in Tandag, Surigao del Sur.

We field-tested and refined a "preference evaluation" instrument to help farmers in decision-making on selection of VSP varieties and documented farmers' response to recommended technologies during periodic field visits.

Finally, the project encouraged wider and sustained adoption of VSPs through the establishment of village-based nurseries in Barangay, El Rio, Afga, Tabon-tabon, Mahayahay, San Vicente, Tagoyano, Ilihan and Poblacion. The nurseries are set up in farmers' fields and monitored by the DA.

IV. DISCUSSION

a) Evaluation

At least 80% of the activities required to attain the project's objectives have already been undertaken. The remaining activities include, among others, the reproduction of the other training and communication support materials identified in the overall communication plan. These materials have not yet been produced because of administrative delays in processing vouchers.

Another reason for the delay of communication materials production is that the other IRCP technical staff who served as subject matter specialists were occupied with other research projects. Their input is important to our work.

b) Conclusions and Recommendations

The study found that farmers are more receptive to VSPs when these are introduced not as a substitute for traditional varieties but to provide farmers wider selection of varieties.

Further, it is recommended that other sweet potato varieties should be introduced together with the VSPs to show that IRCP's primary concern is to meet the actual needs of farmers rather than to promote institutional interests.

Given the array of recommended technologies, farmers select the technology that best fits their needs and circumstances. Awareness of promising technologies will stimulate farmers to experiment with the technology. DA and IRCP should strongly encourage experimentation.

To ensure that the efforts of IRCP can be sustained and replicated after the termination of the program; the following points should be considered:

- a low external input strategy is ideal

- in principle and practice, IRCP communication and extension should work through DA, not just with it. DA should be seen not as a partner but as the leader in implementing the program and their role, by legitimization of the DA staff's involvement in the IRCP, is a prerequisite to whose full participation. Financial incentives should be avoided if at all possible

- integration with IRCP does not mean all project components take center stage at the same time. Proper timing and phasing of interventions enable the farmer to cope with and gradually appreciate the adoption process

- a highly specific commodity/technology-based development strategy can be misleading and unrealistic. After all, farmers approach their problems from a holistic perspective with root crop only a component of the entire farming system. There are other determinants of program success (soil, market, socio-cultural factors) besides the introduction of root crop technologies.

In closing, functional integration among projects is best achieved when there is mutual understanding, acceptance and commitment to the project strategy. It can, however, be counterproductive when different agencies have different perceptions of how IRCP goals could be achieved, after an integrated development plan has been drawn up.

Project 3 - **Development of an Effective Technology Transfer Scheme for Appropriate Mature Root Crop Technologies on Production, Processing, Utilization and Marketing at the Community Level**

Project Leader: Dr. Salvador C. Dagoy
Acting Director, CSR

Study 1 - **Development of an Effective Mechanism for Farmers' Participation in On-Farm Research in Selected Areas of the Philippines**

Study Leader: Prof. Rodrigo F. Sebidos

I. OBJECTIVES

The premise of the study is that, before a "mature" technology is disseminated for wider adoption, it should first be verified and adapted to the target clientele's conditions. The verification of technologies would be meaningful and relevant if target clientele are involved in the evaluation process.

With this in mind, the objectives of this study are:

- to develop an effective mechanism for farmers' participation in on-farm research in selected areas of the Philippines
- to develop a root crop technology verification and adaptation strategy with farmers' active participation
- to seek a mechanism for eliciting participation in the assessment of socio-economic constraints and impact of newly introduced and adapted root crop technologies among root crop farmers and processors
- to evolve a functional linkage between root crop technology generation and adaptation that actively involves farmers and processors in the context of the Department of Agriculture.

II. METHODOLOGY

A 3-hectare demonstration farm was established and maintained for the propagation of recommended root crop planting materials and as a showcase for appropriate root crop-based cropping systems.

Farmer organizations participated in the identification of farmer cooperators. Fourteen farmer co-operators were selected and five volunteer on-farm research cooperators were identified. On-farm research was conducted and farmers participated in the evaluation of technology.

Discussions were held with the farmers to improve their participation in on-farm research. Contour hedge rows in the farms of 12 cooperators were started. On-farm research on varietal trials and root crop-based cropping systems was started on the farms of 15 cooperators. Seeds and other required planting materials were distributed to farmer cooperators.

Four field days were conducted for farmers to evaluate new sweet potato varieties and improved lines. Technology assessment discussions were held during farmers' classes. Finally, linkage with DA regional, provincial and municipal offices were established for the participation of DA ATs in order to promote farmers' participation in technology adaptation.

III. RESULTS

Cooperators selected through the farmers' association are better accepted by other farmers than those identified individually by the project. Moreover, farmers in barangays where root crop research was conducted are more receptive to the idea of on-farm research and they are more willing to try out the technologies that do not require more inputs such as varietal trials.

Four field days were conducted for farmers to evaluate new sweet potato varieties and improved lines. Farmers' participation in the evaluation of the technology led them to try their preferred varieties on their farms. Farmer-preferred varieties were mostly used in the conduct of on-farm research.

Implementation of goal 3 has been hampered by the fast approaching implementation of the Local Government Code. DA ATs are in a quandary during this transition phase of the reorganization.

IV. DISCUSSION

a) Evaluation

The research assistant for the project was first assigned to develop the demonstration farm, therefore, in 1990, the on-farm research was not conducted. The on-farm research was also delayed because the study leader was a staff member of the planning section of the Department of Agriculture and his time for the study was limited. It was only after the reorganization of the field team in April 1991 that a research assistant was assigned to do on-farm research. The dry season from April to June and the standing crops of farmers from June to September caused further delays in the implementation of on-farm research. It was not until October 1991 that the study was fully implemented.

DA ATs have also showed lack of commitment in the on-farm research. The lack of commitment can be attributed to lack of job security as a result of the new Local Government Code.

b) Conclusions and Recommendations

The findings of the study need further validation. The study only began in October 1991 and it needs more time to gather reliable information on participatory on-farm research. Moreover, the extension of root crop technologies needs a component of on-farm research or verification trials to evaluate the appropriateness of technologies to the local situation.

In the extension stage, redirection of implementation strategies will be made. Specifically the aspect of institutionalizing the strategy in the DA structure under the new Local Government Code shall be emphasized. The pilot site will be used as training facility for the DA extension workers and for other farmers. Lastly, expanding the service to other root crop growing areas should also be a major concern.

Study 2 - Community Organizing for Accelerated Root Crop Technology Transfers Among Subsistence Households

Study Leader: Dr. Salvador C. Dagoy

I. OBJECTIVES

The objectives of this project are:

- to accelerate the transfer/adoption of root crop technologies through client organizations
- to evolve strategies that would elicit sustained farmers' participation for technology adaptation and dissemination
- to identify factors that impede or enhance farmers' participation in technology transfer-oriented community-based organizations
- to determine the institutional elements needed to develop viable, functional and self-reliant technology transfer-oriented community-based organizations.

II. METHODOLOGY

The identification, formation, and strengthening of farmers' organizations that would facilitate technology adaptation and dissemination were held. Farmers' classes for technology evaluation and dissemination were conducted. To strengthen farmers' organizations, leaders were trained and technical assistance was provided. Data was gathered through qualitative and survey methods. Finally, participant-observation studies were conducted to identify the facilitating and inhibiting institutional factors.

III. RESULTS

An RRA for the pilot site was conducted. The Nabong Farmers' Association was organized and farmers' associations in Lale, Pahug and Parasanon were revived. Two existing farmers' associations (Madalunot and Laygayon) are being assisted and strengthened. The following four farmers' associations have been registered: Parasanon, Pahug, Lale, and Nabong.

Four farmers' classes were held to disseminate root crop technologies and an awareness drive on new cassava products was conducted. The study assisted both the Parasanon Farmers' Association in opening a bakery and the FAs in Lale and Pahug in opening a sari-sari store.

Four farmers' associations (Nabong, Laygayon, Pahug and Madalunot) have established 9 cluster farmer leaders who adopted new technologies on their farms.

Preliminary data on farmers' perceptions of community based organizations and of technology-transfer has been gathered. Finally, a participatory review of the client organizations has been conducted.

IV. DISCUSSION

a) Evaluation

The strategies to elicit farmers' participation in technology transfer-oriented community-based organizations are two fold. First, the functions of the organizations have been expanded to include economic and income generating projects. Secondly, incentives to outstanding farmer leaders and organizations have been provided. Ultimately, the participatory approach made farmers realize that the organization is theirs, hence, members' participation was enhanced.

The critical factors affecting farmers' participation in technology transfer oriented, community based organizations are as follows:

- perceived benefits
- the management competence of the leaders
- the members' understanding of organizational objectives.

Study 2 is one of the three components of the extension strategy that is envisioned to be institutionalized in the set-up of the Department of Agriculture. This study was implemented late, that is, last March 16, 1990. As a result, very few of the objectives have been implemented. At the time of implementation, only one research assistant was in the field working as the community organizer. However, her first few months were spent supervising the construction of the staff house/training shed and establishing the demonstration farm. In February - March 1991, the field team was reorganized and the community organizer was changed. The community organizer had a heavy work load of both extension work and research, covering six pilot barangays. Nonetheless, he was able to form six farmers' associations,

five of which are still actively functioning. Some confusion exists with respect to the focus of study 2. The objectives reflect that the study is actually a research activity. However, expectations from the management, other project leaders and IDRC visitors seemed to center on its extension aspect. Looking at the objectives, the extension activities are apparently a means to attain the goals.

b) Conclusions and Recommendations

The study should be extended for another two or three years. The community based organizations established will enable the DA staff to become competent in root crop-based technology transfer. The extension of the study should be directed toward institutionalization of the strategy in the DA office under the New Local Government Code. Moreover, the study, in its extension phase, should cover other root crop producing regions of the country.

Study 3 - Strengthening the Regional Capability of the Department of Agriculture on Root Crop Technology Transfer

Study Leader: Ms. Maria Cristina U. Ramirez
Administrative Assistant, PRCRTC

I. OBJECTIVES

This study is the training component of the project. As such, the main goal of the study is to strengthen the regional capability of the Department of Agriculture for root crop technology transfer. With the above in mind, the specific goals of the study are:

- to establish a functional linkage and cooperation between PRCRTC-VISCA and the DA in root crop technology dissemination in selected areas of the country
- to assess the training needs of the DA personnel on root crop technology dissemination; and
- to determine the appropriate training modules and materials to disseminate appropriate root crop technologies.

II. METHODOLOGY

To attain the first specific goal of the study, a regional consultation/ orientation on linkage and cooperation between the DA Region VIII and PRCRTC/VISCA officials took place. A memorandum of agreement between the two agencies was drafted.

A training needs assessment survey was conducted among the ATs of the DA. Questionnaires were sent out to the ATs facilitated by the DA Human Resource Development Officer. Retrieved questionnaires were tabulated and results were analyzed. In coordination with the DA personnel, the study identified the ATs who would participate in the training program. Trainees were selected from the top five root crop producing municipalities of every province in the region (there are five provinces in Region VIII). For the pilot site, all ATs in the area were requested to attend the training program.

A workshop on training module preparation among the root crop trainers was conducted to be able to develop training modules to disseminate appropriate root crop technologies. These modules will be utilized by the ATs of the DA who will provide training on root crop technologies when the program pulls out from the project site.

III. RESULTS

The study resulted in a wide range of achievements. A regional consultation/orientation on linkage and cooperation between PRCRTC/VISCA and DA on root crop technology transfer was conducted. A memorandum of agreement was drafted between PRCRTC/VISCA and DA to assist in the dissemination of root crop technology within the DA's organization.

The training needs assessment survey among the ATs identified those who will participate in the training program on root crop technologies. Of the 45 questionnaires sent out for the survey of the ATs, only 31 were returned and 31 ATs (68%) attended the training session. The survey enabled the training group to come up with a training program designed to fit the needs of the ATs.

Eight training sessions for the root crop clientele were attended by 249 cooperators and 7 ATs from the pilot barangays. It should be noted that several cooperators and ATs attended more than one training session. Based on the Revised Integrated Root Crop Development Plan promulgated by the program in February 1991, the study has to conduct additional training sessions and an awareness drive for the clientele before the targeted completion date of the program.

The workshop on training module development for root crop technologies, conducted on November 14-15, 1991, was attended by 16 root crop trainers and 9 program staff. The resource person came from VISCA faculty where he is currently the project leader of the communication component of the program and the FAO consultant on module development. The root crop trainers identified the training modules to be developed to enable the ATs to disseminate the appropriate root crop technologies. Of the 16 modules identified, 7 modules are now on the second draft stage, 4 on the first draft stage while 4 trainers have not yet submitted their modules.

IV. DISCUSSION

a) Evaluation

The study was not without its share of problems. Like most of the projects and studies, the budget for the study was limited. It also lacked equipment (such as the overhead and slide projectors) necessary for the training. As it is, the study had to borrow one from other units in the College every time it has to conduct a training. For documentation purposes, the study had to borrow a camera from the Program Coordination and a video camera from PRCRTC.

The importance of the training modules as one of the tangible results of the study cannot be overemphasized. Unfortunately, the over-all program management was not very supportive of sending the study leader to learn training module preparation at the INNOTECH, SEAMEO organization based in Manila. The course would cost the program ₱10,000.00 for one week, which Dr. Somsak claimed to be worthwhile. The management was also not keen on supporting a workshop for root crop trainers on training module development. It was only when there was an officer-in-charge of the program late last year, when the overall program coordinator was on leave, that the long overdue workshop on training module preparation was finally realized.

At this point, it cannot be determined if the capabilities of the DA have been increased because we have not yet seen whether the ATs could be effective trainers on root crop technology transfer. As soon as the program pulls out from the site and the ATs take over the job of technology transfer, an evaluation can be conducted. In terms of the clientele, success should be measured by the number of farmers who adopt the root crop technologies.

b) Conclusions and Recommendations

The linkage established at the regional office level was not followed up at the provincial levels where the operationalization of plans is conducted. An inter-agency linkage could only function if is clearly understood and operationalized at the provincial level. It is recommended that the linkage between PRCRTC-VISCA and the DA be revised through its provincial office by following the mandate of the Local Government Code.

The preparation of training modules takes time and there is still a lot to accomplish before a final copy is produced. It is recommended that the study be extended beyond the termination date of June 1992 to complete this work.

Further, it is recommended that the training component identified to meet the needs of the clientele be extended.

Project 4 - **Integrated Socio-economic Studies on Root Crops**

Project Leaders: Dr. Nerelito P. Pascual,
Director RCRC; and Professor, Agricultural Economics & Agribusiness
Dr. Jose M. Alkuino, Jr.,
Department Head,
Agricultural Economics & Agribusiness

Study 1 - **Profitability of High Yielding Sweet Potato Genotypes**

Study Leader: Dr. Nerelito P. Pascual

I. OBJECTIVES

The objectives of this project are:

- to determine the profitability of VSP and other high yielding varieties/genotypes as intercrop with coconut and other perennials, as relay or mixed crop with annual crops, as monocrop in relatively flatland and in relatively hilly land/marginal land

- to determine the profitability of VSPs when planted at various provinces/locations, and at various fertilizer levels.

II. METHODOLOGY

The study uses sweet potato varieties developed by the plant breeders and the relevant data obtained by other project leaders and researchers.

Farmer cooperators or research sites in various field conditions and locations have been or will be identified. Each VSP will be planted for a minimum of 4 planting seasons in every field condition.
Computations of all costs and returns are based on current prices, that is, actual price and existing wage rate during a particular cropping or season.

Two kinds of net returns are presented. The first is return above material cost (RAMC) and the second is return above all variable cost (RAAVC). RAMC reflects the earnings of land, labour, capital and management, while RAAVC measures the earnings of land, capital and management. Small farmers, especially those who do not consider labour a scarce production factor, may use RAMC as a measure of profit while business-oriented farmers may adopt RAAVC as their profit measure.

III. RESULTS

Various research sites were surveyed and three sites were identified (Baybay, Matalom and Pinabacdao). Trials on the following studies and sites were conducted:

- VSPs as intercrops with coconut (Baybay), 1st, 2nd, 3rd, and 4th croppings completed, VSP-4, VSP-5, VSP-6, and VSP-7 performed better than the native (control) variety

- VSPs as intercrops with coconut (Matalom), 1st and 2nd croppings only. Observations still insufficient to determine the superior varieties

- VSPs as relay crops with corn (Baybay,) 1st, 2nd, 3rd, and 4th croppings completed. VSP-4 and VSP-7 were found superior than the native (control) variety

- VSPs as relay crops with corn (Matalom) 1st and 2nd croppings only. Observations still insufficient to determine the promising varieties

- Fertilizer trial of high yielding SP varieties. 1st cropping just planted. Data on costs and returns are not yet complete.

Land preparation, planting, field maintenance and harvesting of three research sites (Baybay, Matalom and Pinabacdao locations) were supervised and monitored.

The study coordinated with production groups an evaluation of the performance of high yielding sweet potato varieties at various locations. The costs and returns data for 3 stations (UPLB, Bohol, and Negros) were gathered but analysis has to wait until data from 5 more cooperating stations become available.

IV. DISCUSSION

a) Evaluation

The study was successful in identifying two research sites in which to conduct the studies noted above. While successes are noted, only one planting season per year is possible in the Matalom site because of the long dry season. Therefore, only three cropping seasons are feasible for a 3-year period. Further, the selection of Pinabacdao site was made by the management only in 1990. As a result, observation from the trials in this site was limited to only one cropping.

b) Recommendations

To fully achieve the objectives, the study needs to be extended until June 1993.

Study 2 - Marketability and Acceptability of VSP's, Minor Root Crops and Processed Products in Selected Areas of Leyte and Samar

Study Leader: Ms. Norma B. Mesorado
Instructor, Agricultural, Economics & Agribusiness

I. OBJECTIVES

The objectives of this project are:

- to assess the marketability and acceptability of VSP's, minor rootcrops and their co-products in various locations/markets
- to determine some characteristics of VSP's , minor rootcrops and their co-products preferred by most buyers and consumers
- to identify indigenous post harvest and pre-selling practices, problems, and constraints related to the marketing of these products
- to explore new packaging techniques for sweet potato, minor rootcrops and processed products
- to determine socio-economic factors affecting decisions made by consumers in buying these products.

II. METHODOLOGY

Sites for marketing of VSP's and minor rootcrops were selected. Market outlets in the selected sites have been identified and storekeepers hired. Sales activities will continue as long as the supply is available and the budget allows.

Production and marketing data including characteristics of sweet potato, minor root crops and processed

products preferred by consumers was collected. Data from other components of the program, especially with the unified survey group, was gathered. A survey was prepared and conducted to obtain data on indigenous post-harvests and pre-selling practices and problems and constraints related to marketing.

New packaging techniques for rootcrops and its processed products were developed and a market survey was prepared and conducted after the VSP's, minor rootcrops and processed products were marketed in different locations/markets.

Finally, the study coordinated with the activities of other projects/studies and provided them with assistance needed for their studies.

III. RESULTS

The study identified Tacloban and Catbalogan as market sites because of their proximity to the pilot site. VISCA was also selected as an initial site for marketing fresh VSP's because the supply is small.

Results of market surveys in Tacloban and Catbalogan reveal that:

- sweet potato varieties found in the survey areas were mostly the traditional ones (Binato, white in colour, Nagpitao, Kasapad, Kinarawsi and Kinampay);

- Tacloban respondents preferred the Karingkit native variety of sweet potato and the Linawaan was preferred by the Catbalogan sweet potato farmers;

- minor root crops available in the two areas are ubi, gabi, palawan, karlang, talian and gawani

- arrow roots were only found to be available in Catbalogan.

For commercial snack products, the majority of the respondents in Catbalogan bought them only in small quantity (average of 1 pack per week). The average quantity purchased by Tacloban respondents was 3 packs per week. The snacks were generally purchased at department stores because they are cheaper.
A questionnaire was designed for an acceptability test of the newly developed packaging materials for VSP's and available processed products. The white opaque polyethylene sando bags for sweet potato (VSP 1 to 7) and the plastic transparent cake trays for arrow root cookies, as well as rectangular boxes with windows for coco-yam and yam waffles were designed and developed.

A market test on the white opaque polyethylene sando bags was conducted in Baybay and VISCA. The majority of the buyer-respondents preferredi this packaging because it is easy to carry, attractive, reusable and durable. A survey schedule to determine socio-economic factors affecting consumers' decisions in buying the products was prepared.

A training module on farm record-keeping and preparation of income statements was prepared and

conducted in Pinabacdao, Samar (the pilot site) as requested by the farmers. From the training session we learned that the majority of farmers do not keep records and have no knowledge of income statement preparation.

Finally, the study provided the other projects with relevant data and assisted other research staff in conducting surveys and evaluations.

IV. DISCUSSION

a) Evaluation

Because the supply of fresh and processed rootcrop products is limited, we have only assessed a few for processed products and none for the minor crops. Collection of production and marketing data had been initially conducted but the number of respondents was limited. As suggested by IDRC, there is a need to increase the number of respondents.

A survey of indigenous post harvest and pre-selling practices, problems, and constraints related to the marketing of these products was conducted. However, data was insufficient and will have to be supplemented by data to be collected from the other components.

Few packaging materials were developed because of limited funds and limited processed products available for packaging evaluation.

The survey on the determination of socio-economic factors affecting consumers' decisions in buying the rootcrop remains to be conducted when the marketing activities are finished.

b) Conclusions and Recommendations

Accomplishment of other target activities was constrained by the requirement for output of the other study groups. As the supply of minor rootcrops and processed products is limited, it is recommended to explore other areas for VSP and minor rootcrops production.

To address the need for data on production, post harvest, pre-selling practices and marketing, another set of surveys should be conducted and expanded to other sites. As well, additional funds are needed to finance the cost of the development of the new packaging materials.

Finally, as noted, a survey schedule was initially drafted to determine the socio-economic factors affecting consumers' decisions in buying the products. However, in the remaining time and due to the irregular supply of VSPs, lack of supply of minor rootcrops and insufficient processed products, it may not be possible to produce the expected results. A one-year extension might be enough to achieve this goal and to complete the other important related activities identified by our study.

Study 3 - Economic Analysis of Improved Technologies on Root Crop Processing

Study Leaders: Prof. Camilo D. Villanueva,
Director, Office of Business Affairs; Assistant Professor, Agricultural Economics and Agribusiness
Dr. Jose M. Alkuino Jr.

I. OBJECTIVES

The objectives of this project are:

- to determine the costs and returns of indigenous technologies on root crops
- to monitor and determine the costs and returns of improved indigenous products and equipment
- to monitor the performance and acceptability of the improved processed products and equipment among rural processors.

II. METHODOLOGY

A reconnaissance survey among DA technicians, local leaders, market vendors and some farmers was conducted. Information obtained included:

- a list of locally processed food and feed products
- places of origin of products
- name of processors
- places where the products are sold.

Cooperators were selected based on the products they produced and place of origin. The selection was made with the cooperation of the food technologist.

Monitoring of the selected cooperators was arranged and conducted by a team of economists, food technologists and engineers. The cooperators were requested to process root crops as the team observed the process. The cost and return calculated to determine the profitability of the product and laboratory analysis of the samples was undertaken to determine the nutritional value.

The results of this monitoring process served as the basis for:

- the food technologist to determine the kind of improvements to be made on the indigenous food products
- the agricultural engineer to design improved indigenous tools and equipment
- the economist to have a bench mark with which to compare future results.

For improved root crop processed products and equipment, information was secured from Project 1, Study 2 and Project 2, Study 1. The cost and return of the improved root crop processed product and equipment was determined.

The developed technology was introduced to the rural processors on the pilot site to test the acceptability and performance of improved technologies.

III. RESULTS

Thirteen indigenous food products were studied. These products were by community:

Carmen and Bohol:	Cassava chips, Cassava crackers
Legaspi City:	Kalingking, Sp hopia, Molido
Balete and Aklan:	Camote chips, Cassava butse, Cassava chips, Guimaras and Iloilo: Camote piece, Camote bar
Pinabacdao:	Sagmani, Butse, Baduya

Five improved products, dehydrated cassava grates, cassava sticks, cocoyam waffle, arrowroot cookies and sweet potato sticks, were also monitored and cost and return analyzed.

Questionnaire for performance and acceptability evaluation of improved processed products at the pilot site was prepared.

IV. DISCUSSION

a) Evaluation

Goal number 1 has been fully achieved. Of the 13 indigenous food products studied, 8 have shown positive net returns and the rest incurred losses. However, the profitability of all the indigenous food products could still be improved if labour costs can be reduced through the use of proper tools and equipment for chipping, stripping and grating process. Production costs can further be reduced by eliminating the use of

unnecessary ingredients such as excess sugar and colouring.

Goal number 2 has been partially achieved as the output of the food processing and engineering group is still required. At present, only 8 improved food products have been developed and some are still in the laboratory stage.

Goal number 3 is still to be accomplished. Performance and acceptability tests are scheduled to be undertaken this month. Pilot production follows immediately in Pinabacdao, Samar. Improved tools and equipment will be introduced in the pilot production stage.

The major constraint of the study is that the accomplishment of our objectives depends on the output of other studies, especially the processing group. At present, this component must wait until other improved food products have been developed.

b) Conclusions and Recommendations

For several years now, VISCA has generated a number of innovations and yet little of this technology has been produced commercially. Potential investors are still concerned about marketability and profitability. These concerns cannot be answered merely by a cost and return analysis or by a project feasibility study. It is recommended that a test marketing of root crop based processed products be undertaken. Test marketing using this strategy could lead to automatic technology adoption by the processor once the product proved to be profitable. A brief process description is outlined below:

- VISCA should provide the fully developed technology to private processors, preferably those with existing processing plants to produce the root crop based product.

- VISCA should conduct a test marketing and economic analysis. An ideal market environment should be simulated including delivery to retail stores, advertisement and handling of the products.

- The expected output of this test marketing is a pool of information that will indicate consumer demand, consumer characteristics and the limitations of the markets.

Study 4 - Feasibility Studies of Root Crops for Food, Feeds and Other Uses

Study Leader: Ms. Analita A. Salabao
Instructor, Agricultural Economics and Agribusiness

I. OBJECTIVES

The objectives of this project are:

- to prepare project feasibility studies on root crop products developed for food, feed and other uses by the processing and animal science group
- to prepare a project feasibility study training module with the training and communication group
- to conduct training of Agricultural Production Technicians (APT's) on the preparation of project feasibility studies with the training/communication group.

II. METHODOLOGY

Technical data from the processing/utilization group, the animal science group and data from other sources relevant to the preparation of project feasibility was gathered.

Market surveys of the products developed by processing group were conducted. Related reference materials were gathered and the project feasibility training module was prepared. Training of APT's on project feasibility study preparation in coordination with training/communication group was conducted.

III. RESULTS

A feasibility study on cassava sticks, developed by the food processing group, was completed. Initial technical data on cassava grates from Program 2, Project 1 was gathered. A survey was conducted of the demand for cassava grates among bakeries, producers of native delicacies, school canteens and refreshment centers in Tacloban City.

Initial technical data on cocoyam waffle and arrowroot cookies from Program 2 Project 1 Study 1 was obtained.

The module for the project feasibility study training was prepared and revised following the common format suggested by the training group. A manual on project feasibility preparation was prepared and reproduced. A complete feasibility study on Delicious-SP as a sample for project feasibility study training was completed. The manual on project feasibility was revised to incorporate the additional sample feasibility

studies. Training of APT's on the preparation of project feasibility studies with the training group was conducted from July 19-21, 1990.

IV. DISCUSSION

a) Evaluation

Objectives 2 and 3 of the study have been accomplished although the training modules are still being revised.

Objective 1 has not been fully accomplished because completion of the feasibility studies largely depends on the technical data provided by the processing group. To date, the products that have been developed (cassava grates, cocoyam waffle and arrowroot cookies) have not been piloted.
Consequently, this study has not yet been provided with the necessary technical data for the feasibility study.

A feasibility study on the feed product (root crop silage) developed by the animal science group cannot be prepared because the study has been terminated and no data on economic returns has been gathered.

b) Conclusions and Recommendations

A complete feasibility study cannot be prepared for the products developed if the needed technical data is not available. It is therefore recommended that:

- the products to be developed should be clearly identified beforehand so that market studies could be conducted while waiting for the technical data;

- the products developed should be piloted as soon as possible so that the necessary technical data can be provided for the preparation of the feasibility studies; and

- the study should not be implemented simultaneously with the studies of the processing/animal science group to ensure that the lead time for product development is available.

Project 5 - Monitoring of Impact Variables of the Integrated Root Crop Development Project (IRCDP) in Pinabacdao, Samar

Project Leader: Dr. Ramon S. Laguna
Associate Professor, Agricultural Economics and Agribusiness

I. OBJECTIVES

The objectives of this project are:

- to monitor some of the impact variables of the Integrated Root Crop Development Project (IRCDP), in Pinabacdao, Samar
- to evaluate the farm and home productivity of the rural families and the capability of the Department of Agriculture (DA) extension personnel; and
- to provide timely and accurate data to project decision makers.

II. METHODOLOGY

The impact assessment and evaluation of the Integrated Root Crop Development Project (IRCDP) was done in the pilot barangays in Pinabacdao, Samar namely: Pahug, Lale, Nabong, Parasanon Laygayon and Madalunot. The last two were new barangays covered by the project. Respondents for this project include cooperator and non-cooperator root crop farmers and processors, and DA's extension personnel in the pilot sites. Cooperator root crop farmers and processors were those already identified by the different program, project and study leaders in the integrated root crop project. Indicators for measuring impact of the project were production, post-production, marketing and community organization.

Data gathering was done using the monitoring system, field observations, market observation/survey, formal and informal interviews. Guide questions were prepared and distributed to the identified cooperators and non-cooperators who had the same farming characteristics. The cooperators facilitated report writing. The frequency of data collection was weekly, monthly, quarterly, semi-annually and per harvest or per season depending on the type of data.

III. RESULTS

Questionnaires and farm records were prepared and translated into Waray for greater understanding among the respondents.

Farmer cooperators and non-cooperators were identified. A pre-test, including farm visits and interviews among identified cooperators and non-cooperators in the pilot sites, was conducted. A formal survey (interviews) was conducted with the cooperators and non-cooperators in the pilot sites and the prepared

questionnaire/farm record was distributed to each respondent in their respective homes.

Attendance at meetings, trainings, seminars and workshop was recorded. A monitoring board was put up in the demo-farm house and the increased number of cooperators for different projects and experiments in each pilot site was updated.

Finally, data was collected and provided to other project components.

IV. DISCUSSION

a) Evaluation

Post production practices in the pilot sites of Pinabacdao, Samar were not completely followed. Presently,low production has resulted in a small percentage of the processors producing root crop products. Adoption of new processing technologies has not yet been widely practised by the cooperators in the pilot sites.

Activities in the field like harvesting and planting are still going on. Gathering of data has to be done to monitor the yield of rootcrops from the new cooperators of the on-farm research and demo-farm.

Partial data on production, post-production, marketing, community organizations has already been collected. Since project activities are still continuing, data has to be analyzed and presented to project decision makers.

Problems existed, however. Limited information on processed products was gathered because farmer-processors are busy with their household and farming activities. As a result, some of the farmers did not update their records of on-farm activities.

b) Conclusions and Recommendations

In order to meet the supply requirements of farmer-processors in cassava - starch processing a campaign should be undertaken to increase cassava production in the pilot site.

Since not all identified cooperators and non-cooperators have attended farm record keeping and accounting seminar-workshops, additional training on this subject should be provided.

Assistance should be extended to farmer-processors in obtaining loans from government and private agencies.

FIELD
OPERATION Leader: Dr. Salvador C. Dagoy

(text missing, to be written)

ANNEX 5

WORK PLAN FOR THE EXTENSION PHASE

Integrated Root Crop Program

IDRC Funded Research

Visayas State College of Agriculture

Baybay, Leyte

Annex 5: Work Plan for the Extension Phase

A meeting of the management team composed of project leaders of IRCP was called in order to firm up an activity plan for February-June 1992, and July 1992 - June 1993. The purpose of the exercise was to determine the activities that each study will pursue in the termination phase of the IRCP. It was also emphasized that activities that overlap with other studies or are deemed irrelevant will be eliminated. Studies that have attained their objectives or whose results are not productive will be terminated.

The exercise resulted in a consolidation of 2 studies, the termination of 4 studies to free funds for more important research areas (cropping system and soil conservation), and a more clearly defined focus in some studies i.e. Breeders.

Other issues with regard to overlapping activities and the need for a clearer definition of roles were scheduled for resolution in separate meetings the following week.

In the end, it was agreed by all project leaders that if the available money for July 1992 - June 1993 is not adequate to support all the planned activities, the work plans of the different studies will be reduced further..

The following is a summary of the work plans by study for the period of February to June 1992:

PROGRAM 1 - **Varietal Improvement of Sweet Potato and Minor Root Crops**

Program Leader: Dr. Jose L. Bacusmo

Project 1 - **Hybridization (Wide Crosses and Varietal Crosses) and Observational Trials for Several Uses**

Project Leader: Prof. Rodrigo F. Sebidos,
Professor, Plant Breeding

Study 1 - **Generating Sweet Potato Plant Variabilities Observational Trials and Wide Crosses**

Study Leader: Prof. Rodrigo F. Sebidos

Work to be completed:

February - June 1992

- seedling of said materials, preparation of seed boxes, hauling of garden soils and scarifying more than 152,000 seeds ready for sowing;

- planting more than 50 entries/parents with estimated total of 151,875 seeds and care and management of the seedlings

- outplanting in the field for yield trials, land preparation of about 20,000 sq. m. (field area) to accommodate the numbers of genotypes; -- planting of first batch of seedling (15,000) in the field and their care and management, such as weeding and spraying, which requires more labour

- harvesting of the trials and selection of different genotypes for preliminary and advance trials

- gathering necessary data such as yield (t/ha), high dry matter, long vines and tubers along the vines. All data will be consolidated and fed into the computer

- analyzing data and making of reports

- for the wide crosses, continuous back crossing of selected F1's, germinating back cross seeds (263 seeds) in seed boxes, and planting of seedlings in the field for evaluation.

July 1992 - June 1993

- further observational trials of remaining F1 seeds and testing the backcross materials.

Study 2 - Yield Trials (Preliminary and Advanced) for High Elevation Conditions and Acid Upland Conditions

Study Leader: Prof. Rodrigo F. Sebidos

Work to be completed:

February - June 1992

- preparation of sweet potato materials and selection of observational yield trial genotypes (17,996) for the preliminary yield trial

- selection of preliminary lines (2 sets; 12 entries per set) to be forwarded to the advanced yield trial

- selection of advanced lines (5 superior lines) in acid upland condition to be forwarded to National Cooperative Testing Regional Yield Trials

- maintenance of untested selected lines in VISCA and Pinabacdao

- propagation of preliminary and advanced lines in VISCA and Pinabacdao

- set-up of the selected lines (preliminary and advanced lines) in barangays Nabong, Lale and Pahug

(2 sets/barangay 6-8 entries)

- harvesting of advanced yield trials (researcher managed trials) in Lale, Pinabacdao (2 sets 6 entries/set, 3 reps)

- data analysis/reporting (May - June 1992).

July 1992-June 1993

- sending cuttings of selected genotypes to NPRCRTC, La Trinidad for testing at high elevation

- yield trials of new advanced lines.

Study 3 - Yield Trials (Preliminary and Advanced) for Optimum Conditions

Study Leader: Dr. Dilberto O. Ferraren
Instructor, PRCRTC

Work to be completed:

February - June 1992

- three sets of evaluation were harvested February 1992, and one set will be by May 1992, while for the single row yield, trial planting will be conducted by March 1992 and harvested by June 1992

- for the advanced yield trials, the planting of two sets will be done by March 1992 and harvested first week of June 1992. One set will be harvested by March 1992;

- for the inheritance studies, data gathering and analysis will be conducted from February 1992-June 1992

- start data consolidation and analysis

- write the report.

Study 4 - Cytogenetic Studies in Wide Crosses of Sweet Potato and Wild Relatives

Study Leader: Ms. Marilyn Z. Oracion
Instructor, Plant Breeding

Work to be completed:

February - June 1992

- pollen viability test of entries in the backcross experiment continues pending the flowering of some hybrids
- compatibility tests between F_1 interspecific hybrids and sweet potato parents continues pending the flowering of some hybrids
- hybridization of sweet potato vs. F1 hybrids to produce BC1 seeds continues
- tetrad analysis is continuing
- somatic chromosome number counts of F_1 and parents is continuing
- meiotic behaviour study of F_1 will be conducted during April-May
- report writing and analysis in June.

Study 5 - Tissue and Embryo Culture in Sweet Potato and Wild Relatives

Study Leader: Ms. Celsa A. Quimio
Instructor, Plant Breeding

Work to be completed:

February - June 1992

- determination of pre- and post-fertilization barriers in crosses between *I. batatas* and *I. trifida*
- pollen viability test of *I. trifida* 2x, 4x, 6x and the check *I. batatas* (Miracle)
- assessment of pollen tube growth and seed set of 16 wide crosses between *I. batatas* and *I. trifida* 2x, 4x and 6x
- morpho-anatomical study of some wide cross embryos

- cytological study (mitosis) of wild *Ipomoea* species and selected F_1's

- determination of pre- and post-fertilization barriers between *I. batatas* and other wild *Ipomoea* species, namely: *I. triloba, I. cairica, I. pescaprae, I. obscura, I. pestigridis, I. aquatica* and *I. purpurea* including propagation in the breeding nursery, pollen viability tests, and assessment of pollen tube growth and seed set of all possible combinations as a result of crossing

Project 2 - Evaluation of Sweet Potato Genotypes for Various Characters with Emphasis on Marginal Environment

Project Leader: Dr. Ruben M. Gapasin
Department Head, Plant Protection

Study 1 - Adaptability and Stability of Selected Sweet Potato Genotypes on Problem Soils

Study Leader: Dr. Jose L. Bacusmo

Work to be completed:

February - June 1992

- harvesting of remaining trials during the last week of February 1992 and the second week of March 1992;

- analysis of data, March - April 1992

- writing of final report, May - June 1992.

Study 2A - Resistance of Sweet Potato to Scab and Root-Knot Diseases

Study leader: Dr. Ruben M. Gapasin

Work to be completed:

February - June 1992

- culture of scab pathogen and root-knot nematode (March-June 1992)

- disease rating for resistance of at least 50 advanced entries (March-April 1992)

- planting of 120 entries in micro-plots (infector method) and scab disease rating (April-May 1992)

- harvesting of 120 entries and root-knot disease rating (March-April 1992)

- pot experiment, planting of 100 entries, inoculation and root-knot disease rating (April-June 1992)

- planting of 2 highly resistant and susceptible cultivars to root-knot and scab diseases in pot experiments (April 1992).

JULY 1992 - JUNE 1993

- disease rating (of 350 entires) for scab resistance (single row non-replicated) (July-Sept. 1992)

- disease rating (of 200 entries) for scab resistance using infector method (Oct.-Dec. 1992);

- disease rating (of 40 entries) for scab resistance (preliminary and advanced yield trial) (Oct.-Dec.1992)

- planting of 500 entries,inoculation and disease rating for root-knot resistance (August-Dec. 1992)

- biochemical analysis of highly resistant and susceptible cultivars against scab and root-knot disease at VISCA and UPLB (July 1992-June 1993 and subject to availability of funds)

- planting of 4 highly resistant and 4 susceptible entries against scab and root-knot disease (July 1992)

- inoculation of sweet potato tops, freeze drying and grinding of samples in Laboratory and greenhouse (August-Dec. 1992)

- inoculation of root-knot nematode, harvest of roots, freeze drying and grinding of samples (August-Dec. 1992)

- extraction of chemicals from samples and thin layer chromatography (January-April 1993)

- writing of final report (May-June 1993).

Note: Some activities will be done if production of hybrids by breeders continues. The exact number of entries will depend on the breeder.

Study 2B - Sweet Potato Plant Resistance to Weevil

Study Leader: Ms. Reny G. Gerona
Instructor, Plant Protection

Work to be completed:

February - June 1992

- field evaluation of sweet potato hybrids/lines for resistance to the weevil (July 1992 - May 1993)
- land preparation, lay outing, preparation of cuttings and planting (March 1992)
- maintenance of the area (March - June 1992)
- harvesting and sweet potato weevil rating (June 1992)
- consolidation of data (June 1992)
- screenhouse evaluation of sweet potato hybrids/lines for resistance to sweet potato weevil (March - June 1992)
- preparation of pots, planting materials and planting (March 1992)
- maintenance of the set-up (March - June 1992)
- preparation of weevil for introduction to potted plants (April 1992).

JULY 1992 - JUNE 1993

- field evaluation of sweet potato hybrids/lines for resistance to the weevil (July 1992 - May 1993)
- screenhouse evaluation of sweet potato hybrids/lines for resistance to the weevil (July 1992 - May 1993)
- writing of terminal report (June 1993).

Study 3A - Screening of Sweet Potato Genotypes for Storability Parameters

Study Leader: Dr. Antonio L. Acedo Jr.
Assistant Professor, Horticulture

Work to be completed:

February - June 1992

- continue storability evaluation of 2 on-going storage set-ups (72 entries)
- storability evaluation of 8 seedboard trial entries (to be harvested in May 1992)
- storability evaluation of 24 entries screened in marginal areas.

July 1992 -June 1993

- continue storability evaluation of storage set-ups for no. 2 & 3
- storability evaluation of about 2,000 entries from advanced trials
- storability evaluation of entries selected for the seedboard trial
- storability evaluation of entries screened in marginal areas
- verification of storability of promising genotypes
- writing of research progress and final reports.

Study 3B - Screening of Sweet Potato Genotypes for Organoleptic Quality and Chemical Composition

Study Leader: Prof. Marcelo A. Quevedo
Assistant Professor, PRCRTC

Work to be completed:

February - June 1992

- continue the chemical analyses of the remaining storage set ups
- monitor the organoleptic and chemical compositions of the different genotypes

- maintain close coordination with the processing group especially in advance trial.

July 1992 - June 1993

- another storage set-up in the advanced trial will be done
- genotypes grown in marginal areas and those in the seedboard trials will be screened further
- screening of sweet potato varieties for high dry matter, high starch content and non-sweet type sweet potato.

Project 3 - Varietal and Cultural Management Improvement of Minor Root Crops with Emphasis on Aroids and Yam

Project Leader: Dr. Jose L. Bacusmo

Study 1 - Development and Selection of Improved Taro, Yautia and Arrowroot Genotypes

Study Leaders: Dr. Jose L. Bacusmo
Mr. Dilberto O. Ferraren

Work to be completed:

February - June 1992

- report writing
- collection of data from an evaluation under shade (coconut)
- preparation for the next evaluation set under an intercropping scheme.

June 1992 to July 1993

- conduct a modified cropping system that identifies the following:
- best cropping mix to conserve soil fertility thus sustaining productivity
- compatible crop species in a relay-intercropping scheme, thus including residual management strategies.

Study 2 - **Performance and Acceptability of Selected Genotypes of *Dioscorea alata* and *D. rotunda***

Study Leader: Prof. Nestor L. Pido
Assistant Professor, PRCRTC

Work to be completed:

February - June 1992

- as determined in some meetings, the program lacks studies on production practices especially cropping systems. This study is therefore being merged with another to form a new study on taro- and yam-based cropping systems as soon as the last sensory evaluation in this study is completed. Completion of the sensory evaluation is expected before March 30, 1992.

Study 3 - **Somaclonal Variation in Yam**

Study Leader: Ms. Villaluz Z. Acedo
Instructor, PRCRTC

Work to be completed:

February - June 1992

- evaluation of putative somaclones derived from VU-2 calli under screenhouse condition
- callus induction experiment of VU-1, VU-3, PRA-5, PRA-10 and BES-1
- proliferation of calli to be produced.

July 1992 - June 1993

- regenerate plantlets (somaclones) from calli of the different yam genotypes
- evaluation of VU-2 yam somaclones in field condition
- evaluation of somaclones to be derived from other genotypes under screenhouse and field conditions
- callus induction and plantlet regeneration experiments using yam genotypes other than those being used so far.

Study 4A - Improvement of Cultural Management for Minor Root Crops

Study Leader: Mr. Alfredo G. Dingal
Instructor, Regional Coconut Research Center (RCRC)

Work to be completed:

February - June 1992

- yautia is a long season crop which requires at least 10 months from planting to maturity. Therefore, if new cultural experiments are to be conducted on this crop, it could not be harvested in June 1992.

Study 4B - Biological Control of Major Taro Pests

Study Leader: Prof. Erlinda A. Vasquez
Assistant Professor, PRCRTC

Work to be completed:

February - June 1992

- continue mass rearing/production of natural enemies of major taro pests with emphasis on taro grasshopper and taro planthopper
- continue evaluating the effectiveness of *T. chilones* in the field
- perform field evaluation of the natural enemies of melon aphid, grasshopper and taro planthopper
- monthly monitoring of seasonal abundance of taro pests and natural enemies in the field
- make field release of potential biological control agents in a taro-based mixed cropping system in the demonstration farm and in a farmer cooperators' field.

July 1992 - June 1993

- continue the field evaluation of the natural enemies in a taro-based mixed cropping system
- monitor the effectiveness of the natural enemies not only on taro but also on mixed crops since most of the natural enemies studied have wide host range
- consolidate data and write report.

PROGRAM 2 - **Processing and Utilization**

Program Leader: Dr. Manuel K. Palomar

Project 1 - **Development of Sweet Potato and Cassava Food Products and Processes for Subsistence Households**

Project Leader: Dr. Truong Van Den
Associate Professor, Food Science

Study 1 - **Assessment of Eating and Processing Characteristics of Sweet Potato Varieties and Hybrids Processing Technology**

Study Leader: Dr. Truong Van Den

Work to be completed:

February - June 1992

- evaluation of new SP hybrids being planted by the breeding group for eating and processing characteristics and chemical composition
- consumer evaluation of V37-26 and V37-151 in farmer communities in Baybay and urban centers in Cebu City
- continuation of SP starch extraction for collaborative research with Kagoshima University in Japan
- preparation of the final report and a paper on consumer acceptance of new sweet potato varieties/hybrids.

July 1992 - June 1993

- evaluation of SP hybrids/varieties for their processing/eating characteristics as long as the breeding group continues its work on varietal improvement
- consumer acceptability tests of VSP's and the most promising hybrids (V37-26 and V37-151) in sweet potato production areas in Luzon (Bicol, Quezon, Tarlac, etc...) and Mindanao.

Study 2 - Improvement and Evaluation of Selected Sweet Potato and Cassava Processing Technologies

Study Leaders: Engr. Felix J. Amestos
Assistant Professor, Food Science
Dr. Lemuel M. Diamante
Assistant Professor, Food Science

Work to be completed:

February - June 1992

- varietal screening for processing sweet potato fried strips
- storage studies on sweet potato fried strips
- pilot production of cassava fried strips and chips
- consumer testing of dried cassava grates, cassava/sweet potato fried strips and cassava chips;
- design of a tumble dryer for drying cassava grates
- training, field testing of the technology and preparatory steps for technology transfer.

July 1992 - June 1993

- identification of cooperators
- market research (collaborate with economics group)
- establishment of processing facilities at the cooperator's sites
- pilot processing at cooperator's sites
- machine/process modification to suit farmers needs/conditions
- full processing operations and marketing of the product
- project monitoring, product promotion, information drive and other marketing strategies

Project 3 - **Processing and Utilization of Food Products from Minor Root Crops**

Project Leader: Dr. Lutgarda S. Palomar
Associate Professor, Food Science

Study 1 - **Development and Evaluation of Food Products from Arrowroot**

Study Leader: Dr. Lutgarda S. Palomar

Work to be completed:

February - June 1992

- continue the storage study of arrowroot cookies
- conduct consumer testing and a storage study on arrowroot flakes
- undertake initial improvement activities on the product, process and equipment
- undertake identification and initial evaluation of packaging in collaboration with the marketing group of IRCP.

July 1992 - June 1993

- improvement of products, process and equipment
- product modelling and formulation optimization with due consideration to increasing operations and cooperators' input
- evaluation of packaging/labelling in collaboration with the marketing group
- identification and monitoring of cooperators in collaboration with economics and marketing group.

Study 2 - Improvement and Pilot Testing of Food Products from Aroids and Yam

Study Leaders: Engr. Felix J. Amestoso, and
Dr. Lemuel M. Diamante

Work to be completed:

February - June 1992

- storage studies for cocoyam waffles to be completed
- pilot production and economic analysis of cocoyam waffles to be conducted
- process/equipment improved to suit processor's needs/conditions
- a pilot production of yam chips/fries to be conducted.

July 1992 - June 1993

- cooperators will be identified in collaboration with the other cooperators
- complete processing lines for production of yam chips/fries, cocoyam waffles at cooperators' sites will be established
- pilot processing operation at cooperators sites will be conducted
- products will be marketed
- project monitoring, product promotion, information drive and other marketing strategies will be completed

Project 4 - Livestock Feeding Strategies in a Sustainable Root Crops Production System

Project Leaders: Dr. Oscar B. Posas,
Head, Animal Science
Mr. Lolito C. Bestil,
Instructor, Animal Science

Study 1 - **The Potential of Silage from Root Crops for Sustainable Animal Feeding**

Study Leaders: Dr. Oscar B. Posas and
Mr. Lolito C. Bestil

(to be written)

Study 2 - **Economical Swine Production in Root Crops-Based Farming Systems**

Study Leader: Dr. Sulpecio C. Bantugan
Assistant Professor, Animal Science

Work to be completed:

March - June 1992

- continue monitoring availability of feedstuffs for the preparation of a feed profile
- continue assessing the introduced feeding innovations
- continue monitoring the reproductive performance of experimental pigs
- continue gathering data for economic assessme
- redispersel of the project's share from the original experimental pigs to selected farmers
- establish backyard piggery (in cooperation with the extension group) as a component of the demo-farm (April)
- determine year round supply of feed at demo farm
- prepare/submit reports (June).

July 1992 - June 1993

- improve feeding interventions; continue monitoring the performance of original experimental pigs;
- follow-up the performance of the offspring;
- manage backyard piggery in the demo-farm including its economic assessment;

- determine the year round supply of feed based on rootcrops at the demo-farm
- make regular visit to cooperators (monthly)
- prepare periodic reports and final report (May to June).

PROGRAM 3 - **Information, Communication and Extension**

Program Leader: Dr. Eliseo R. Ponce
Director, Research and Extension

Project 1 - **The Philippine Root Crops Information Service (PRIS)**

Project Leader: Ms. Rebecca B. Napiere
Senior Librarian, College Library

(to be written)

Study 1 - **Information Delivery/Distribution Systems**

Study Leaders: Ms. Rebecca B. Napiere
Ms. Epifania G. Tudtud
Instructor, Center for Social Research (CSR)

Work to be completed:

February - June 1992

- reproduce the training modules, SOTA/abstract bibliographies on yam and taro, abstract bibliographies (suppl.) on sweet potato and cassava, root crops fact sheet, and PRIS notes
- reproduce additional communication materials needed by the clientele
- market PRIS services in the form of brochures, flyers on PRIS activities and undertake information campaign in collaboration with the Department of Agriculture
- strengthen collaboration with cooperating institutions to improve collection of updated root crop information.

Study 2 - **Root Crop Data Base**

Study Leader: Ms. Julieta R. Roa
Instructor, PRCRTC

Work to be completed:

February - June 1992

- mapping of sweet potato concentrations, cropping systems, cultivars and yields (March - May)
- GIS appreciation seminar/workshop; output processing (first week, April)
- finalizing rootcrop fact sheet (May - June)
- preparing report of the sweet potato food system (May - June).

July 1992 - June 1993

- data/information collection/verification/inquiry response for 2 pilot regions (continuous, July - September)
- formal linkage with BSWM, BAR, PCARRD, BAS (January)
- data base refinement (October - January 1993)
- preparation of manual/workshop (February - March)
- preparation of second fact sheet and report (April - June).

Project 2 - **Development, Production and Evaluation of Communication Materials on Root Crop Technologies**

Project Leader: Dr. Monina M. Escalada
Professor, Development Communication

Study 1 - Development, Production and Evaluation of Print Materials on Root Crop Technologies

Study Leaders: Dr. Monina M. Escalada
Ms. Edith A. Gundaya
Head, Training and Extension, PRCRTC

Work to be completed:

February - June 1992

- produce 11 training modules and their corresponding support materials on (a) production technology of sweet potato; (b) production technology of cassava; (c) production technology of yam; (d) production yechnology of taro; (e) postharvest handling and storage of root crops; (f) bakery and other products from root crops; (g) utilization of root crops for animal feed; (h) root soy sauce production; (i) root crop flour processing; (j) swine production and management; and (k) co-operatives (February - May 1992)

- continue providing the DA technicians in Pinabacdao and Sibagat with print materials they can use to correct misperceptions about root crop technology (February - May 1992)

- continue conducting field evaluations of print materials already distributed in Pinabacdao and Sibagat (until May 1992)

- consult with subject matter specialists to identify root crop processing technologies appropriate for the pilot sites - develop prototype of appropriate print materials that will contain information about the processing technologies identified; (March - May 1992

- write report (June 1992).

July 1992 - June 1993

- produce 4 training modules with their corresponding support materials about (a) leadership and organization development; (b) farm record keeping; (c) entrepreneurship; and (d) project feasibility study preparation (July - September 1992)

- develop prototype, pretest, produce and distribute the following communication materials on root crop processing (a) 3 calendar posters (b) 9 recipe booklets in English (3) in Cebuano (3) and Waray (3) (July - December 1992)

- revise/update, reproduce and distribute the following technologies: (a) root soy sauce production and (b) root crop flour processing (July - December 1992)

- conduct field evaluation of the print materials produced and distributed (January - May 1993)

- document farmers'/processors' response to processing technologies introduced in the pilot sites (October - May 1993)

- continue backstopping ATs in Sibagat to bring about wider and sustained adoption of root crop technologies (July - May 1993)

- write report (June 1993).

Study 2 - Development, Production and Evaluation of Audio-Visual Materials on Root Crop Technologies

Study Leader: Dr. Monina M. Escalada

Work to be completed:

February - June 1992

- produce the following training module support materials: (a) 11 slides sets and (b) 11 sets of overhead transparencies (February - May 1992)

- conduct evaluation of the audio-visual materials produced and distributed earlier (until May 1992)

- write report (June 1992).

July 1992 - June 1993

- produce 4 slide sets and 4 sets of overhead transparencies which will for the training modules to be produced by Study 1 (July - September 1992)

- develop, pretest, produce and distribute 1-2 video tapes on root crop technologies (October 1992 - March 1993)

- document on video tape the important activities undertaken by IRCP (July 1992 - May 1993)

- conduct evaluation of the audio-visual materials produced and distributed (January - May 1993)

- report writing (June 1993).

Study 3 - **Development, Production and Evaluation of Broadcast Materials on Root Crop Technologies**

Study Leaders: Dr. Monina M. Escalada
Ms. Edith A. Gundaya

Work to be completed:

February to June 1992

- facilitate production of 9 VSP radio plugs and 3 VSP radio dramas (all in Tagalog versions) in Manila (February - May 1992)
- conduct field evaluation of the Cebuano broadcast materials produced and aired (until May 1992)
- continue documenting farmers' response to information/technologies introduced through the broadcast materials (until May 1992)
- write report (June 1992).

July 1992 - June 1993

- develop, prototype, pretest, produce and distribute the following communication materials on root crop processing: (a) 9 radio plugs 3 in Cebuano, 3 in Tagalog and 3 in Waray and (b) 6 radio dramas 2 in Cebuano, 2 in Tagalog and 2 in Waray (July - December 1992)
- conduct field evaluation of the broadcast materials produced and distributed (January - May 1993)
- document farmers'/processors' response to the information/technology introduced using the broadcast materials (January - May 1993)
- write report (June 1993).

Project 3 - **Development of Effective Technology Transfer Scheme for Appropriate Mature Root Crop Technologies on Production, Processing, Utilization and Marketing at the Community Level**

Project Leader: Dr. Salvador C. Dagoy
Acting Director, CSR

Study 1 - Development of an Effective Mechanism for Farmers' Participation in On-Farm Research in Selected Areas of the Philippines

Study Leader: Prof. Fernando A. Evangelio
Assistant Professor, PRCRTC

Work to be completed:

February - June 1992

- develop root crop technology verification and adaptation strategies with active farmers' participation, intensify conduct of on-farm research on root crop-based technologies, and review of farmers' participation in technology assessment

- seek mechanism to elicit farmers' participation in assessment of technologies, by means of field days to evaluate new technologies, through technology assessment discussions, and through farmers' evaluation of technologies

- collect data and report results.

July 1992 - June 1993

- create wider and sustainable impact of root crop-based participatory OFR in the pilot and selected non-pilot sites

- document the processes and experiences

- strengthen the capability of DA in the pilot site on participatory OFR on root crop-based technologies

- institutionalize participatory OFR in the DA in selected non-pilot sites

- develop OFR in the pilot site as a training facility for non-pilot site clientele

- propagate recommended root crop varieties for distribution to clientele

- maintain demonstration farm for appropriate root crop-based cropping system

- collect data and report.

Study 2 - Community Organizing for Accelerated Root Crop Technology Transfers Among Subsistence Households

Study Leader: Dr. Salvador C. Dagoy
Director, Center for Social Research

Work to be completed:

March - June 1992

- strengthen farmers' organizations, and conduct educational activities, such as farmers' classes and field trips and institutionalize program planning, monitoring and evaluation
- identify factors that impede or enhance farmers' participation in technology transfer-oriented community-based organizations and carry out a participatory review of farmers' participation in associations
- determine the institutional elements necessary to develop functional organizations, through participatory review and informal discussions on farmers' participation in associations
- establish root-crop based economic activities with organizations in the pilot site
- collect data and report.

July 1992 - June 1993

- strengthen DA's capability in organizing root crop farmers for technology dissemination both in the pilot and non-pilot sites
- document process and experiences
- facilitate educational activities for the farmers' organizations in the pilot site such as farmers' classes, field trips and meetings
- strengthen the farmers' organization in the pilot site to serve as training facility for selected non-pilot site clientele
- institutionalize program planning, monitoring and evaluation for sustainable farmers' organizations in the pilot site
- conduct participatory review and articulation of root crop-based technology transfer functions of farmers' organizations
- document and report.

Study 3 - Strengthening the Regional Capability of the Department of Agriculture on Root Crop Technology Transfer

Study Leader: Ms. Maria Cristina U. Ramirez
Administrative Assistant, PRCRTC

Work to be completed:

February - June 1992

- conduct training sessions for the clientele on organizational development and management, program planning, monitoring and evaluation and improved traditional cassava products and introduction of new products
- conduct training sessions identified by farmer associations;
- facilitate the production of training modules
- refine and pre-test training modules
- reproduce training modules
- review linkage with DA and other agencies on root crop technology transfer.

July - June 1993

- conduct training sessions identified jointly by the FAs and the LGUs
- facilitate the production of training modules on leadership and organizational development, farm record keeping, entrepreneurship project feasibility study preparation
- refine and pre-test training modules
- reprode training modules
- train DA ATs on the use of modules
- establish linkage with DA and other agencies on root crop technology transfer
- conduct training sessions for DA ATs on root crop-based extension strategies and approaches.

Project 4 - **Integrated Socio-economic Studies on Root Crops**

Project Leaders: Dr. Nerelito P. Pascual
Director, RCRC; and Professor, Agricultural Economics & Agribusiness
Dr. Jose M. Alkuino, Jr.
Department Head, Agricultural Economics & Agribusiness

Study 1 - **Profitability of High Yielding Sweet Potato Genotypes**

Study Leader: Dr. Nerelito P. Pascual

Work to be completed:

February - June 1992

- continue the field experiments and data-gathering on: VSP as intercrops with coconut (Baybay), last cropping, VSP as intercrops with coconut (Matalom), 3rd cropping, VSP as mixed crops with corn (Baybay), last cropping, VSP as mixed crop with corn (Matalom), 3rd cropping

- continue coordination with production group and data gathering on: fertilizer trials of high yielding SPs (Pinabacdao), 1st cropping, performance of high yielding SPs in 2 additional cooperating stations/locations (Quezon and Albay)

July 1992 - June 1993

- continue the field experiments and data-gathering on: VSP as intercrops with coconut (Matalom), last 2 croppings and VSP as mixed crops with corn (Matalom), last 2 croppings

- continue coordination with production group and data gathering on: fertilizer trials of high yielding SP (Pinabacdao and Matalom) for at least 2 more croppings and performance of high yielding VSPs in 3 additional cooperating stations (Leyte, Bukidnon, and Benguet).

Study 2 - **Marketability and Acceptability of VSP's, Minor Root Crops and Processed Products in Selected Areas of Leyte and Samar**

Study Leader: Ms. Norma B. Mesorado
Instructor, Agricultural Economics & Agribusiness

Work to be completed:

February - June 1992

- conduct marketability and acceptability evaluation of the different varieties of VSP's, minor rootcrops grown and commercial snack products in Baybay, Leyte
- provide additional and regular supply of sweet potato for marketing and testing, by continuously planting existing fields with VSP's from March to June
- develop and pre-test a package design for cassava grates, cassava strips together with arrowroot cookies, yam and cocoyam waffles with the assistance of the Communication group
- after the pre-test, provide results to other projects/studies in June
- provide marketing assistance on available fresh and processed products produced from February to June by the Pinabacdao farmers and processors.

July 1992 - June 1993

- explore the possibility of including nearby towns of Pinabacdao as additional sites or outlets for marketing fresh and processed rootcrops
- survey the variables needed in these sites
- increase the number of respondents in the formal survey to be conducted as suggested in the previous review
- set another time to observe and record the farmers' post harvest and pre-selling activities to obtain feedback for a better marketing analysis and to provide farmers the appropriate form of assistance
- identify other possible packaging materials for processed products and conduct evaluation of the package used
- conduct a survey to determine socio-economic factors that affect consumers' decisions in buying fresh and processed root crops

- conduct marketability and acceptability evaluation of minor root crops, cassava grates, cassava strips, camote strips and arrowroot flakes

- provide a regular supply of fresh and processed root crops to laboratories for testing and to consumers

- conduct a training session on packaging and product promotion to assist farmers in marketing their produce.

Study 3 - Economic Analysis of Improved Technologies on Root Crop Processing

Study Leaders: Prof. Camilo D. Villanueva,
Director, Office of Business Affairs
Assistant Professor, Agricultural Economics and Agribusiness
Dr. Jose M. Alkuino, Jr.

Work to be completed:

February - June 1992

- conduct performance and acceptability tests of various food products and improved equipment among processors in Tacloban City and Pinabacdao, Samar. (March - April 1992)

- continue pilot production at the farm level in Pinabacdao, Samar. (April - June 1992)

- determine costs and returns of various food products and improved equipment at farm level (Pinabacdao, Samar). (April - June 1992)

- write report (June 1992).

There is a chance that the last three items above can be undertaken before the end of June as there are still preliminary activities to be undertaken in performance and acceptability tests such as pre testing of the instruments and production of the food products.

Study 4 - Feasibility Studies of Root Crops for Food, Feeds and Other Uses

Study Leader: Ms. Analita A. Salabao
Instructor, Agricultural Economics and Agribusiness

Work to be completed:

February - June 1992:

- gather technical data from processing group on cassava grates, cocoyam waffle and arrow root cookies needed for project feasibility study preparation (February - May 1992)
- prepare a complete feasibility study on cassava grates (March - June 1992)
- prepare a feasibility study on arrowroot cookies (March - June 1992)
- prepare a feasibility study on cocoyam waffle (March - June 1992)
- revise training module on project feasibility preparation after editing by the training/communication group (March - April 1992)
- extend assistance on project feasibility study preparation to interested entrepreneurs and farmer groups in Pinabacdao, Samar (February - June 1992)
- extend assistance training on accounting and financial management to interested entrepreneurs and farmer groups in Pinabacdao, Samar (February - June 1992)
- complete the feasibility studies, if the processing groups can provide this study with the complete technical data before the targeted dates.

The following extension of activities is foreseen:

- feasibility study on arrowroot cookies (July 1992 - September 1992)
- feasibility study on cocoyam waffle (October 1992 - December 1992
- report writing and reproduction (June 1992).

Project 5 - Monitoring of Impact Variables of the Integrated Root Crop Development Project (IRCDP) in Pinabacdao, Samar

Project Leader: Dr. Ramon S. Laguna
Associate Professor, Agricultural Economics and Agribusiness

Work to be completed:

February - May 1992

- follow-up activities of the new cooperators for on-farm research
- gather more data and information from the DA technicians, their plans and projects for each pilot site
- continue the market and price survey in Tacloban and Pinabacdao, Samar (March - May)
- monitor the number of farmers-processors, the kind, volume and type of root crop processed products and their market outlets (March - May 31, 1992)
- follow-up activities in the pilot barangays with the coordination of the field operation team and the production group (March - May 31, 1992)
- monitor the increase in the number of cooperators and non-cooperators on swine management practices and community organizations with the coordination of the community organizer, process documenter and livestock group in the pilot sites (March - May 31, 1992)
- submit monthly reports (March - May 1992)
- consolidate all the data gathered (April 31, 1992)
- encode all the data gathered for data analysis (April 31, 1992)
- prepare the final report (May 31, 1992).

July 1992 - June 1993

- continue the market and price survey in Tacloban and Pinabacdao, Samar to calculate the percentage share of farm gate from wholesale price
- follow-up farmer-processors in the pilot sites who adopted the new processing technologies

- follow-up monthly the activities of DA extension personnel and the cooperators and non-cooperators in the pilot sites

- gather additional data on production, post-production and marketing for cassava, gabi and yam in areas where root crop farmers are harvesting once a year.

FIELD OPERATION Leader: Dr. Salvador C. Dagoy

(to be written)