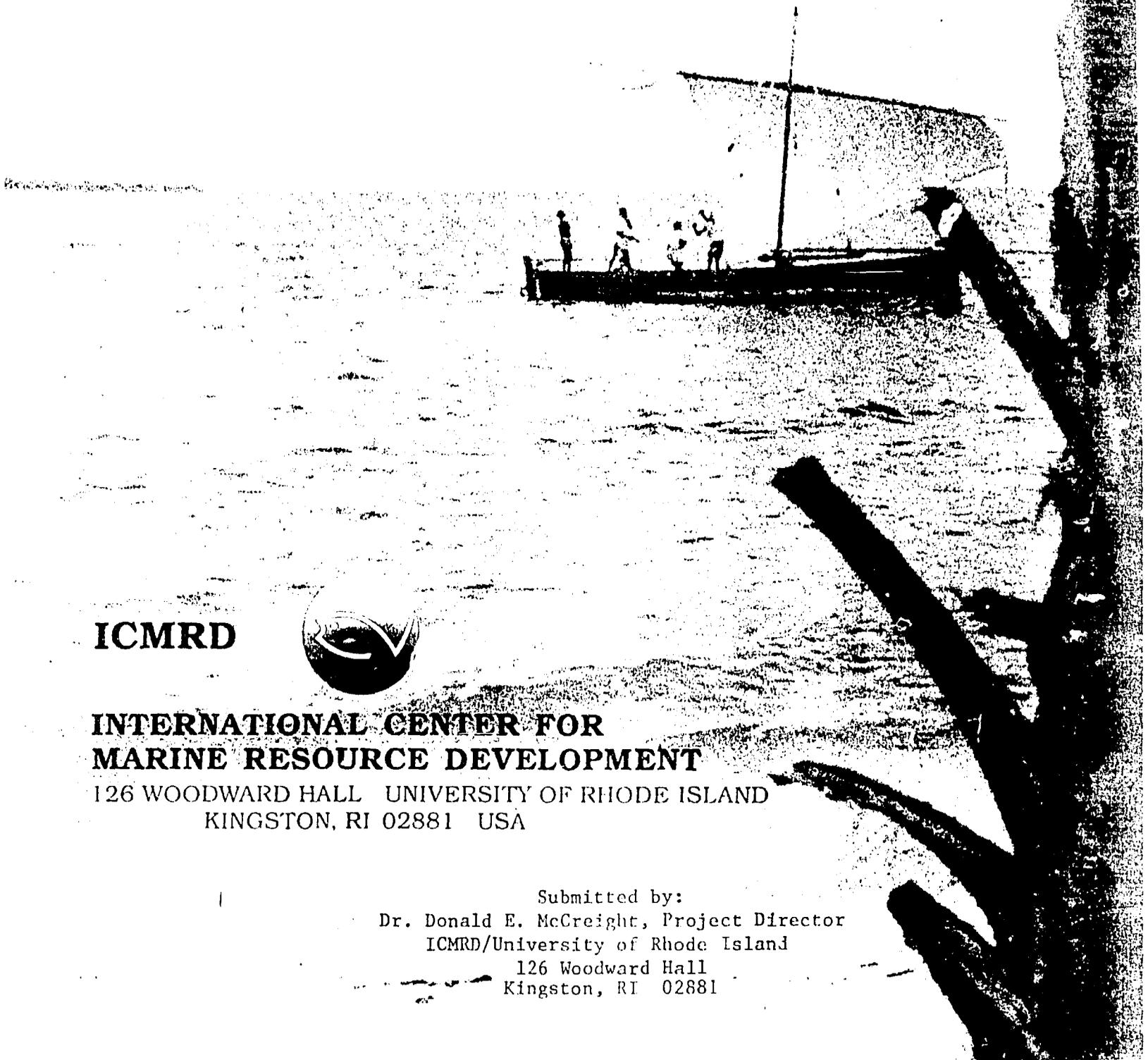


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XD-RAU-23 A-C  
1/78-6/30/83

FINAL REPORT  
UNIVERSITY OF AZORES  
INSTITUTIONAL BUILDING PROJECT  
AGRICULTURAL SCIENCE, FISHERIES,  
and OCEANOGRAPHY - RURAL EXTENSION  
1/78 - 6/30/83  
Contract AID/NE-C-1477



**ICMRD**



**INTERNATIONAL CENTER FOR  
MARINE RESOURCE DEVELOPMENT**

126 WOODWARD HALL UNIVERSITY OF RHODE ISLAND  
KINGSTON, RI 02881 USA

Submitted by:  
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## EXECUTIVE SUMMARY

This report provides a final report of project activities for the entire institutional building project and a report of activities for FY 83.

## SUMMARY OF ACCOMPLISHMENTS 1977 - 1983

The University of the Azores was established in 1976 as an Institute University. The facilities and staff at the beginning were minimal in scope and numbers. The Institution building project faced many difficulties during its five-year duration, namely a major earthquake in 1980 and numerous staff changes. Through technical assistance and participant training, many outputs can be identified to measure the development of a viable University program. Primary thrusts of this institution building project were to provide inputs to the following programs: Agricultural Science/Terceira; Fisheries and Oceanography/Fayal; and Rural Extension/RGA.

Agricultural Science/Terceira

	<u>1977</u>	<u>1983</u>
Enrollment	10	120
Laboratories	0	Soils Teaching, Research and Testing Animal Nutrition Microbiology Chemistry Biology Dairy Products
Greenhouses	0	3 (plastic, glass and fiberglass)
Staff	6	20
University Farm	0	53 Hectare Dairy Farm University of Azores (UA)
	Institute/Univ. of Azores (IUA)	

Fisheries and Oceanography/Fayal

	<u>1977</u>	<u>1983</u>
Research Vessel	0	1 ("Giralda")
Laboratories	0	Chemical Biological Data Analysis (Stock Assessment)
Staff	3	10

Rural Extension/RGA

	<u>1977</u>	<u>1983</u>
Extensionists		
Agricultural	0	15
Home Economics	1	20

The rural extension personnel are integrated within the Agricultural Services throughout the eight Islands. Specific outputs are:

- increased demonstrations
- increased farm and home meetings
- publication of 50 issues of a newsletter
- increased technical assistance to farmers and homemakers

### Socio Cultural Aspects

An additional input developed the social impact research capability within the sociology department of UA/San Miguel. This capability can provide very useful data for the operation of extension activities.

### Women in Development

During the project UA/Terceira, staff consisted of 25-35% women faculty members and 40-50% female students were enrolled in programs. Of the total 35 extension staff, 65% are women working in grass-roots development activities.

The preceding general summary highlights the changes that have occurred during the five-year institutional building project. The \$571,570 USAID grant and the additional USAID equipment loan, technical assistance and participants training have contributed much to the development of a viable University program. More details of specific accomplishments appear in the remainder of this report and in the forty reports developed during the project. Through various identified modes, URI will continue assistance through an institution to institution arrangement.

### SUMMARY OF PROJECT INPUTS 1977 - 1983

Technical Assistance: During the project the following Technical Assistance inputs were provided.

Agricultural Science	
Soils/University Farm/Animal Science	11.25 person months
Fisheries	33.00 person months
Food Technology	2.00 person months
Socio-Cultural Aspects	4.75 person months
Project Administration	14.00 person months
Rural Extension	<u>5.75 person months</u>
	70.75 person months

In total, six person years of technical assistance were provided in country to the Azores.

Participant Training: The project provided degree training or assisted with faculty development as follows:

<u>Degree</u>	<u>Academic Area</u>	<u>University</u>
PhD.	Food Technology	URI
MS	Soils	URI
MS	Animal Reproduction	U. of Minnesota
MS	Forage Crops	U. of Wisconsin
PhD.	Sociology	Rome

Non-degree Training: A total of fourteen person-months of training was provided to twelve (12) individuals at UA and RGA in the areas of Rural Extension, Food Science and Dairy Management.

Other: Other inputs included assistance with greenhouses, laboratories and the UA/Terciera library.

### FY83

Five University of Rhode Island consultants provided a total of three person-months of technical assistance in the areas of Fisheries Stock Assessment, Food Technology, Soils, and Project Review and Projection of Future Activities.

FINANCIAL REPORT  
UNIVERSITY OF AZORES  
INSTITUTION BUILDING PROJECT  
01/78 - 6/30/83

<u>CATEGORY</u>	<u>BUDGETED AMOUNT</u>	<u>CUMULATIVE EXPENDITURES</u>
SALARIES	172,451.00	154,872.00
INDIRECT COSTS	85,979.00	78,483.78
CONSULTANT FEES	33,989.00	37,556.61
ALLOWANCES	16,883.00	17,468.11
TRAVEL & TRANSP.	80,979.00	88,274.06
EQUIP. & MATERIALS	37,205.00	38,669.45
PARTICIPANT COSTS	183,355.00	130,876.58
<u>OTHER DIRECT COSTS</u>	<u>20,905.00</u>	<u>25,369.38</u>
GRANT TOTAL	631,746.00	571,569.97

## OVERVIEW

This report is prepared to serve two objectives: 1) provide a final project report of accomplishments for the entire institutional building project January 1, 1978 to June 30, 1983; and 2) provide a project report for technical assistance activities and participant training for the FY 83 (July 1, 1982 to June 30, 1983).

Since reports have been prepared on at least an annual basis, this report will merely summarize the reports and include discussions conducted in the Azores during June of 1983. A list of reports for the entire project is included at the end of the report.

## ACKNOWLEDGEMENTS

As Project Director, I want to thank all the various agencies and individual staff members who have assisted the project over the past six years.

## University of Azores

Department of Agricultural Sciences (Terceira)  
 University Administration (San Miguel)  
 Department of Fisheries and Oceanography (Fayal)  
 USAID Liaison Officer (Ponta Delgada)  
 US Consulate Office (Ponta Delgada)  
 Secretary of Agriculture and Fisheries and his staff in other islands (Horta)

## USAID Mission (Lisbon, Portugal)

Director, Program Officers, Training Officers, Contract Officers

## Near East Bureau USAID/Washington, D.C.

Technical Support Office  
 Desk Officer  
 Contract Officers  
 Training Program Office

Since we are thanking 200+ people in the above named groups, it is impossible to name each and every individual. However, it would have been impossible to implement the project without the cooperation each and every individual extended to us throughout the entire project.

## FY83 ACTIVITIES

During the Spring of 1983, URI provided the following consultants to UA to provide a technical review, provide ongoing assistance with immediate problems and identify possible areas for continued assistance after June 30, 1983.

<u>CONSULTANTS</u>	<u>1983 DATES</u>	<u>DESCRIPTION OF CONSULTANCY</u>
Dr. Saul Salla	5/23-6/7	Fisheries Stock Assessment and Management
Dr. Garth Rand	5/31-6/13	Food Technology
Dr. William Wright	6/7-6/30	Soil Survey Activities
Dr. Donald E. McCreight Dr. Gerald A. Donovan	6/13-6/30	Project Review and Identification of Continued Assistance

Each of the above reports are included in the appendix.

During the week of June 19 at University of Azores meetings, Donovan and McCreight set forth to accomplish the following objectives:

- Purpose: 1) To monitor progress of areas at University of Azores Technical Assistance and Training provided under the URI/UA/AID Institutional Building Project
- 2) Identify possible joint projects -
- |                  |                   |
|------------------|-------------------|
| Food Science     | Dr. Ponte Tavares |
| Nutrition/Forage | Anabela Gomes     |
| Soils            | Jorge Pinheiro    |
| Fisheries        | Dr. Avila Martins |
- 3) Develop joint memorandum of understanding establishing formal institutional linkages
- 4) Identify URI and UA inputs to joint projects and identify possible sources for seeking joint funding.

## MODES OF POSSIBLE COOPERATIVE EFFORTS IDENTIFIED

USDA RESEARCH - of benefit to both Azores and RI and USA competitive grants

INSTITUTIONAL LINKAGE - letter of intention for cooperation

TITLE XII STRENGTHENING GRANT/USAID

COOPERATIVE AGREEMENT FISHERIES USAID/URI

SABBATICAL LEAVES - housing provided by UA

USAID OFFICE OF SCIENCE ADVISOR - biotechnology, etc.

FOUNDATIONS

NSF INTERNATIONAL COOPERATIVE PROGRAM - requires application to national agency in Portugal simultaneous with submission to NSF

STUDENT EXCHANGE

Beginning dates University of Azores October - February - June 30

Beginning dates University of Rhode Island - September and mid-January

## PROJECT SUMMARY OF TECHNICAL ASSISTANCE

The following section of the report outlines and details the six person-years of technical assistance provided under the project.

AGRICULTURAL SCIENCE

<u>Soils</u>	<u>Consultant</u>	<u>Date</u>	<u>Person Months</u>
Preparation of Soils Laboratory	Salomon	Nov. 1977	1.5
Soils Teaching	Salomon	Jan. 1979	.5
Soils Teaching and Laboratory	Salomon	Feb. 1980	1.0
Soils Testing and Applied Research	Salomon	Mar. 1981	.75
Soils Survey	Wright	June 1983	1.0
 <u>University Farm</u>			
Dairy Plans	Roberts	Aug. 1977	1.0
Swine Plans	Gerstner	Aug. 1977	1.0
Agricultural Engineering	Bundy	Aug. 1977	1.0
Farm Management	Erven	Apr. 1979	.75
Forage Crops	Wakefield	May 1979	.5
 <u>Animal Science</u>			
Animal Nutrition	Olentine	May 1978	1.0
Animal Reproduction	Bartlett	Apr./May 1979	<u>1.25</u>
Total Agricultural Science Technical Assistance			11.25 person months

Soils

Nearly half of the technical assistance efforts in Agricultural Science were provided to the Soils program at U.A. Through Salomon's continued efforts of short-term assistance (four trips varying in length of two to six weeks), he was able to assist the teaching program, establish the soils laboratory, make recommendations for applied research in soils and advise staff member Pinheiro regarding his MS degree in Soil Science at URI. During June 1983, Dr. Wright provided technical assistance in Soil Surveying. A complete report and recommendations for possible applied and collaborative research appear in the appendix of the report.

University Farm

Prior to the beginning of the project, we arranged for a team to design the University Farm. The plans were developed and accepted under the first director of Agricultural Sciences. Through staff changes, plans were altered for the next five years until an agreement finally has led to construction of a dairy unit quite different from the original plan. An Agricultural Economist provided stimulus for a farm management survey of the various islands. Various staff have followed up and initiated the farm management survey.

An Agronomist also provided short-term assistance to advise on applied research for forage crops and provided guidance for the MS degree training for Anabel Gomes at the University of Wisconsin.

### Animal Science

Short-term efforts provided assistance to curriculum development and laboratory efforts currently provided by UA in Animal Nutrition and Animal Reproduction.

<u>FISHERIES</u>	<u>CONSULTANT</u>	<u>DATE</u>	<u>PERSON MONTHS</u>
Departamento de Oceanografia e Pescas	Sainsbury	July 1977	.5
Cooperative Fisheries Pgm.	Johnson	Sept. 1977	1.5
Fisheries Curriculum	Sainsbury	May 1977	.5
Fisheries Extension Pgm.	Webster	July 1978	1.0
Fisheries Educational Pgm.	Maine	July/Aug. 1978	1.5
Fisheries Extension and Education	Lusardi	Oct./Dec. 1978	3.0
Stock Assessment	Johnson	Summer 1977	2.0
Stock Assessment	Johnson	Nov. 1977	.5
Stock Assessment	Stevenson	Nov. 1978	.5
Fisheries Education	Maine	1979	12.0
Fisheries Applied Research	Lusardi	Jan.-June 1979	6.0
Fisheries Electronics	Merriam	April 1980	.5
Stock Assessment	Stevenson	June 1980	.5
Stock Assessment	Martins	June-Aug. 1980	2.0
Department of Oceanography and Fisheries	Marshall	Oct. 1980	.5
Stock Assessment	Saila	May/June 1983	.5
Total Fisheries Technical Assistance			33.0

person months

## Fisheries

Technical assistance efforts centered around three aspects of fisheries, namely: Fisheries Education, Applied Research including stock assessment, and program facilities and equipment including the "Giralda" (department research vessel).

### Fisheries Education

Fisheries Education was an original thrust of the institution building project. After about 15 months of time was committed to development of the program, a University decision was made to not offer fisherman training as part of the UA program.

### Applied Research

The development of research capabilities for the department centered around the component of Fisheries Stock Assessment. Through the efforts of Johnson, Stevenson and Salla, this component is established within the UA program of Oceanography and Fisheries in Horta. The most recent assistance provided by Salla in May 1983 can be continued under the URI/USAID Cooperative Agreement. A copy of Dr. Salla's report appears in the appendix of this report.

### Program Facilities and Equipment

Various consultants provided advice and assistance on ordering, equipping and installing items for the Department of Fisheries and Oceanography. Supervision of reconstructing and equipping the research vessel took considerable time and effort under Dr. Sainsbury's leadership. The research vessel is currently operating and available to the Department of Oceanography and Fisheries in Horta.

<u>FOOD TECHNOLOGY</u>	<u>CONSULTANT</u>	<u>DATE</u>	<u>PERSON MONTHS</u>
Canning Fishery Products Observations & Recommendations	Doyle	April 1978	.5
Food Technology in Azores	Rand	June 1979	.5
	Barnett	June 1979	.5
Directions for Food Technology at University of Azores	Rand	June 1983	<u>.5</u>
Total Food Technology Technical Assistance			2.0
			person months

Early in the project, a training course was conducted with twenty food industry personnel from the various islands. Since this was less than University level of instruction, the University didn't pursue offering the course on a continuing basis.

Dr.'s Rand and Barnett of URI reviewed the food industry in the Azores and made recommendations for University involvement. Currently, one staff member is pursuing degree work in Holland. With the nucleus of trained staff and current facilities, UA and URI will be able to move forward with some collaborative research projects of value to both institutions. Specific plans are outlined in the Rand report that appears in the appendix of this report.

<u>SOCIO-CULTURAL ASPECTS</u>	<u>CONSULTANT</u>	<u>DATE</u>	<u>PERSON MONTHS</u>
Development of Research Plan for Social Soundness Analysis	Pollnac	Nov./Dec.1977	2.0
Pretesting and Modifying of Guides	Pollnac	July/Aug.1978	1.25
Extension Training/Socio- Cultural Impact	Pollnac	June 1979	.5
Research on Social Impact on Extension Programs	Pollnac	August 1980	<u>.5</u>
Total Socio-Cultural Aspects Technical Assistance			4.75
			person months

Through Dr. Pollnac's efforts and counterpart Dr. Francisco Carmo, URI and UA have developed a capability within the Sociology Department of UA in Ponta Delgada. This capability provides the mechanism for conducting useful research on socio-cultural impact. Guides for conducting research were developed, pretested and utilized in rural extension training sessions. Dr. Pollnac also served as one of Dr. Carmo's advisors for the collection of data for his recently obtained PhD. in Rome. The development of this component certainly is a highlight of the project with minimal continued effort from faculty member (Pollnac) working to develop a counterpart and continuing capability.

<u>PROJECT ADMINISTRATION</u>	<u>CONSULTANT</u>	<u>DATE</u>	<u>PERSON MONTHS</u>
Project Leader in Residence Annual Administrative Report	McCreight	July 1978- Aug. 1979	12.5
Project Administrative Activities	McCreight	April 1981	.5
Project Administrative Activities	McCreight	August 1982	.25
Proposed Future Activities	Donovan	June 1983	.25
	McCreight	June 1983	<u>.25</u>
Total Project Administration Technical Assistance			14.00 person months

Co-leaders Dr.'s Sainsbury and McCreight developed and implemented the first half of the project in accordance with USAID assistance and guidance. With assistance from Joao Tavares, AID liaison officer, logistics were made much easier. During the second half of the project 81-83, Dr. McCreight served as project leader. Fifty percent of the technical assistance was provided during the years of 1978-1979 while the project leader resided in the Azores.

During the final meetings in June of 1983, Dean Donovan and Dr. McCreight outlined the procedures for continued assistance and proposed a memorandum of agreement to establish a formal linkage between URI and UA.

<u>RURAL EXTENSION</u>	<u>CONSULTANT</u>	<u>DATE</u>	<u>PERSON MONTHS</u>
Extension Workshop AV, Methods & Materials	Jones	July 1978	.75
Extension Programs	Rego	Oct./Nov. 1978	1.5
Extension Education	Herr	Oct./Nov. 1978	2.0
Extension Programs	Nelson	June 1979	.5
Extension Participant Training	McCreight	July 1980	<u>1.0</u>
Total Rural Extension Technical Assistance			5.75 person months

In addition to Dr. McCreight's administrative efforts, he contributed to the rural extension training component by assisting and presenting training sessions, organizing observation visits of the agricultural and veterinary offices on each of the eight islands, and organizing an awareness meeting on rural extension education. The awareness meeting involved Regional Government officials, University officials, University staff and Agricultural and Veterinarian services staff.

Eight individuals from the agricultural services (one from each island) were selected for extension training. In addition, one chief of agricultural services and one home economist also participated in the training program. The training program extended over a two to three year period, beginning and ending with the same individuals. Two to four week training sessions were scheduled at ~~UA~~ in Terceira. The selection of government employees for extension training was contrary to the original plan established at the beginning of the project. The training program included short-term training in the Azores and the US. The primary thrust of the US training was for each individual to intern with US extension personnel.

After the training program, a separate extension service was formed rather than have the trained individuals work in their respective agricultural services and draw on personnel for their program resources. In 1982, the trained extension personnel were assigned to the Agricultural services to carry out extension activities.

Outputs of the trained extension personnel includes:

- increased applied research or field trials
- information publication (50 issues since 1978)
- increased number of instructional meetings and demonstrations

## OTHER ASSISTANCE

During the project, various individuals have provided assistance to the UA units in Horta and Terceira. Some of the major efforts involved:

Greenhouses: Ordering and shipping of the three large greenhouses utilized considerable time. Currently, UA/Terceira has in operation three of the best greenhouses in Portugal for conducting applied research. These include a glass house, a fiberglass house and a plastic house.

Library: Numerous volumes of books and journals were donated and shipped to the Azores to assist UA/Terceira build it's library for the Agricultural Science Department. Many journal collections of fifteen to twenty years were donated to the department.

Other Equipment: During the project we responded to numerous requests to assist with the purchase of equipment and supplies necessary to the function of laboratories in Fayal and Terceira.

## PARTICIPANT TRAINING

Staff Training/Degree

Food Technology: Dr. Ponte Tavares received his PhD. at the University of Rhode Island in 1982. He returned to the University as a faculty member to head up the Food Science and Technology section of UA/Terceira. Currently he is co-director of the Agricultural Science program at UA/Terceira. Future collaborative research efforts are planned with Dr. Rand of URI to conduct research of production of cheese enzymes. Dr. Tavares also has assumed major responsibility for implementing an applied research program utilizing the newly established greenhouses.

Soils: Jorge Pinheiro received his MS degree at URI in June of 1983. He has returned to UA/Terceira to head up the Soils teaching, applied research and soil testing laboratory efforts of the Aquacultural Science Department.

Animal Reproduction: Carlos Gradil received his MS degree at the University of Minnesota in April of 1982. He returned briefly to UA/Terceira, but recently left the staff and assumed an assistant professor position at the Veterinary Science School in Lisbon. Although he won't continue to utilize his training in the Azores, he is still contributing to the Government of Portugal Veterinarian School in Lisbon, Portugal.

Forage Crops: Anabel Gomes completed her MS degree at the University of Wisconsin in June of 1983. She has returned to her teaching and applied research duties in the department of Agricultural Science at UA/Terceira.

Sociology: Dr. Francisco Carmo received his PhD. recently in Rome. Although he wasn't funded directly under the project, Dr. Pollnac served as a major advisor in the pursuit of his degree. Dr. Carmo has returned to UA/Ponta Delgada and will continue to conduct social impact research.

### Staff Training/Non-Degree

Duarte Ponte, Food Science Faculty member, completed a two-month short-term training program at URI during the project. He returned to utilize his training in extension training sessions conducted at UA. He also assisted the staff with audio-visual problems and assisted them to use the purchased audio-visual equipment in their teaching. Currently, he is studying in Holland for his PhD. in Food Science and will return to UA as a faculty member.

Caldas Duque, Animal Science faculty member, completed a two-month short-term training program at URI during the project. The training was to assist him with his dairy herd management duties at the UA University Farm. After the training, he returned to his duties and utilized his training for several years, but has since departed to a position in Macau.

Ten participants received one month of training in the US as a part of their total extension training program. All ten individuals are still employed by the regional government and are utilizing their skills in extension training. Further details of this training can be found in the Rural Extension summary of this report.

SUMMARY OF REPORTS PREPARED IN CONNECTION  
WITH CONTRACT NO. AID/NE-C-1477

Agricultural Science

Soils, Farm, Management, Animal Nutrition, Animal Reproduction

1. Plans for University Farm  
Paul Gerstner, Herbert Roberts and Dwaine Bundy  
Sept. 1977
2. Report of Dr. Milton Salomon (Soils Consultant)  
Nov. 4, 1977
3. Report of Dr. Charles Olentine (Animal Nutrition Consultant)  
May 23, 1978
4. Report of Reproductive Physiology and Artificial Insemination  
Consultant  
Dr. David E. Bartlett  
April 5 to May 9, 1979
5. Farm Management Recommendations for the University of the Azores  
Dr. Bernard L. Erven  
April 6 to April 26, 1979
6. Recommendations for Applied Research in Foliage Crops  
Dr. Robert Wakefield  
May 1979
7. Soils Teaching and Laboratory  
Dr. Milton Salomon  
March 7, 1980
8. Soils Testing and Applied Research  
Dr. Milton Salomon  
March 10 to 31, 1981
9. Soils Survey  
Dr. William Wright  
June 1983

Fisheries

1. Departamento de Oceanografia e Pescas, Horta, Faial  
J. C. Sainsbury  
July 1977
2. Notes Regarding the Introduction of a Fisheries Option within  
the Animal Production Curriculum at Terra Cha Division of IUA  
J. C. Sainsbury  
May 1977
3. Report of Seminar/Workshop on Azorean Fisheries, held at IUA  
July 24 to 28, 1978

4. Report on Organization of Fisheries Extension Program for IUA  
Donald Webster  
July 1978
5. Report on Azores Consultancy - July 14 to August 4, 1978  
Ronald A. Maine  
August 1978
6. Work Procedure for Fisheries School Facility at Mt. Brazil,  
Terceira, Azores  
Ronald A. Maine  
October 1978
7. Equipment List for School of Commercial Fisheries, Terceira,  
Azores  
J. C. Sainsbury & R. A. Maine  
October 1978
8. Extensao Para O Sector das Pescas. Prepared for the Extension  
Planning Workshop, Terceira  
P. Lusardi & J. Sanches  
November 1978
9. Report on the Cooperative Fisheries Program IUA/URI, Summer 1977  
Jan P. Johnson  
September 1977
10. Report on Azores Work November 17 to December 2, 1977  
Jan P. Johnson  
December 1978
11. Report on Stock Assessment Consultancy in the Azores, Nov. 10-24,  
1978  
David K. Stevenson  
December 1978
12. Earnings in the Artisanal Fisheries of the Azores: A Preliminary  
Report  
J. G. Sutinen  
January 1979
13. Report on Assignment in Azores, Jan. 1979 to Jan. 1980  
Ronald A. Maine  
March 1980
14. Report on Work at Depto. Oceanografia e Pescas, Horta, Azores  
March 24 to April 1, 1980  
Robert W. Merriam  
April 14, 1980
15. Report on Visit to Instituto Universitario dos Acores  
David K. Stevenson  
June 13 - 27, 1980

16. Report on Stock Assessment Consultancy in the Azores  
Antonio M. Frias Martins  
June 13 to August 14, 1980
17. Report of the University of Rhode Island Mission to the  
Departamento de Oceanografic e Pescas, Universidade dos Acores  
October 18 through 31, 1980  
Nelson Marshall  
November 20, 1980

#### Food Technology

1. Report of Observations and Recommendations, Terceira, Azores  
Dr. Edwin S. Doyle  
March 30 to April 15, 1978
2. Industrial Extension in Seafood Processing Industry in Azores  
Duarte Ponce and C. Donmoye-  
July 1978
3. Food Technology in the Azores: Observations and Recommendations  
Dr.'s Barnett, Rand and Tavares  
June 27, 1979
4. Future Directions for Food Technology at University of Azores  
Dr. Arthur G. Rand, Jr.  
June 1983

#### Project Administration

1. Annual Administrative Report  
Dr. Donald E. McCreight  
July 12, 1978 to August 1, 1979
2. Report of Project Activities in Azores and Lisbon  
Dr. Donald E. McCreight  
March 28 to April 10, 1981
3. Project Administrative Report  
Dr. Donald E. McCreight  
August 1982
4. Future Activities and Proposed M.O.V.  
Dr. Gerald A. Donovan  
June 1983

#### Rural Extension

1. Extension Programs  
Dr. John Rego  
October 4 to November 14, 1978
2. Extension Education  
Dr. Robert Herr  
October 3 to December 1, 1978

3. Extension Programs  
Dr. Clifford Nelson  
June 1979
4. Rural Extension Education Technical Assistance  
Participant and Training Program Report for 1980  
Dr. Donald E. McCreight  
November 17, 1980
5. Relatorios de Estagiao de Tecnicos Extensionistas da  
Direccao Regional de Extensao Rural - Secretaria Regional de  
Agricultura e Pescas, da Regiao Autonoma dos Acores, nos Estados  
Unidos da America do Norte, ao Abrigo do Acordo AID/URI/Governo  
Regional dos Acores  
Jose Silva Duarte  
July/August 1980



August 8, 1983

Dr. Machado Pires , Rector  
Instituto Universitario dos Azores  
Rau da Mae de Deus  
Ponta Delgada  
San Miguel  
The Azores

Dear Dr. Pires:

I appreciated the opportunity for Dr. McCreight and I to visit the Azores and your university recently. I wish to again thank you, your faculty and your staff for the kind and gracious hospitality extended to us.

The visit has given me a first hand review of our URI faculty members' activities and accomplishments in conjunction with your faculty. I now better understand the relationships that have evolved and more about the situation, as it is now, that the USAID grant, which made it all possible, has come to an end.

It is apparent, from our discussions, that both institutions are anxious to continue the close relationships that have evolved over the past six years. Such relationships, as we both know, will have to be supported by other means now that the AID institution-building grant has terminated.

I will summarize the statements I made to you and your staff on June 23, 1983, as I indicated I would.

Means of Supporting and Nurturing the UA/URI Relationship

I. Possible sources of financial support

A. United States Department of Agriculture

1. Portugal Treaty

I will contact the Office of International Cooperation and Development (OICD) as to possible support.

2. University Linkage Program

I will write the Executive Director of the International Science and Education Council (ISEC) as to the possibilities of joining that program.

B. USAID/Washington

1. Science Advisor Program

Dr. McCreight will screen projects developed jointly by UA/URI faculty for submission to the Science Advisor.

2. The URI will consider possible means of utilizing part of its USAID supported Title XII Strengthening Grant to work with UA.

3. The URI will consider possible means of utilizing part of its USAID supported Cooperative Agreement to work with UA.

C. U. S. National Science Foundation (NSF) International Cooperation Program.

Dr. McCreight will encourage joint faculty project development that might qualify under this program.

## II. Other Means of Nurturing the UA/URI Relationships

### A. Sabbatical Leaves

1. My office will encourage URI faculty to consider sabbatical leaves at UA. Most feasible will be six month leaves where the faculty receives full pay and fringe benefits from URI during the period.

UA would provide housing and a small stipend (on a task performed basis) to help offset food costs.

2. Full agreement would have to be reached by both institutions in every case before approval would be final. In other words, each sabbatical must be negotiated separately.

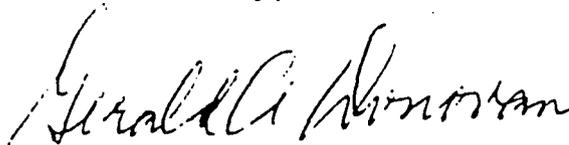
I am sure we will find means of continuing our mutually beneficial cooperative efforts.

Enclosed, please find a draft Memorandum of Understanding for your consideration. We believe it will meet both of our needs. Please review it and suggest any changes, you feel would strengthen it, for our further review.

If you have an opportunity to visit the United States in the near future, please plan to visit our university.

Warm personal regards.

Sincerely,



Gerald A. Donovan  
Dean and Director

GAD:nl

cc: Dr. William R. Ferrante  
Dr. Donald E. McCreight

MEMORANDUM OF UNDERSTANDING

BETWEEN THE

UNIVERSITY OF RHODE ISLAND

AND THE

UNIVERSITY OF THE AZORES

WHEREAS, the University of the Azores and the University of Rhode Island have participated in a cooperative venture since 1976, which has been supported primarily by a United States Agency for International Development grant; and

WHEREAS, the University of the Azores and the University of Rhode Island are mutually interested in collaboration in research, undergraduate and graduate education plus related activities; and

WHEREAS, the parties wish to embark on collaborative research, development, and education programs in various disciplines relevant to agriculture, fisheries and related areas; and

WHEREAS, the two institutions have already cooperated to further these interests and now desire to record here their mutual understandings in this regard;

NOW, THEREFORE, the parties hereto do hereby record their understanding as follows:

ARTICLE I

The purpose of this Memorandum of Understanding is to further the following objectives:

1. To develop cooperative and collaborative activities in furtherance of the mutually reinforcing interests of the two institutions;

2. To develop research, development, and education programs and related activities as may be of mutual interest to both institutions;
3. To encourage and nurture faculty and student exchanges.
4. To facilitate the following:
  - a. Promote beneficial staff exchange between the University of the Azores and the University of Rhode Island
  - b. Promote beneficial graduate student exchange between the University of the Azores and the University of Rhode Island.
  - c. Promote, where appropriate, the conduct of the University of Rhode Island graduate students' theses research at the University of the Azores.
5. To enlarge and strengthen the capacities and capabilities of each institution through the cooperative use of materials and facilities which are supportive of the mutually agreed programs.

## ARTICLE II

To implement the aims and purposes expressed in Article I, it is mutually understood and agreed:

1. Proposals for cooperative and collaborative work under this Memorandum will be submitted through liaison officers designated by each of the institutions to assure conformity with the aims and purposes described as set forth in Article I;
2. Individual programs of work under this Memorandum will be jointly planned and implemented, and program results and other benefits will be shared and mutually interchanged by the two institutions. Programs of work and budgets will be reviewed and approved by designated representatives of the institutions.

3. (a) In recognition of the mutual interests and benefits to be gained by the University of Rhode Island and the University of the Azores, costs of implementing the graduate education program and other activities will be shared in conformity with these interests and as specifically understood and agreed to.

3. (b) In recognition of local constraints on such funding as identified above, both institutions will collaborate on the solicitation of funding from international agencies for the purpose of implementing cooperative projects.

ARTICLE III

1. This Memorandum of Understanding is effective as of October 1, 1983 upon its execution by the appropriate officer of each of the signatory institutions.

2. This Memorandum may be amended at any time by mutual consent and shall continue to be in force and effect indefinitely unless terminated by either party by giving written notice of intent to terminate. In so far as possible such notice will be given one year in advance of the termination date.

Executed for the University of  
Rhode Island

Executed for the University  
of the Azores

\_\_\_\_\_  
W. R. Ferrante, Acting President

\_\_\_\_\_  
Rector, Machado Pires

\_\_\_\_\_  
G. A. Donovan, Director/ICMRD

\_\_\_\_\_  
Date

\_\_\_\_\_  
Date

22

XO 887-235-13  
1911 2255

Trip Report

- S.B. Saila -

May 23, 1983 - June 7, 1983 - The Azores

Arrived in Terceira, Azores, at approximately 7:00 am May 24.

Airplane reservations to Fayal, Hurta, were not confirmed. I was told to take 8:30 am flight to Pico Island, and to take ferry to Fayal. Arrived in Pico at 9:00 am, but had to wait until 13:30 to take ferry to Fayal.

Arrived at Department of Oceanography and Fisheries, 2:30 pm to find all doors locked and no one present. Registered at Hotel Fayal, and found reservations had been made for me. It was later explained that May 22-24 were three days of Pentecostal holidays. However, I had dinner with Dr. and Mrs. Martins on the night of May 24, and we discussed plans for the duration of my stay. In general, it was planned that I was to meet the laboratory staff, see the facilities and try to make recommendations and suggestions as the opportunities permitted.

Arrived at Department of Oceanography and Fisheries Laboratory. Facilities were examined and staff were interviewed.

Dr. Helen Martins--discussed her work on the squid Laligo forbesi in the Azores, and considered possibilities. Although squid fishing has been traditional in the Azores, the catches are relatively small and fishing (jigs and handlines) apparently takes place only during the day. It was suggested that the squid fishery is presently underexploited, with some opportunities for expansion. The local fishermen catch squid seasonally and incidental to other fishing activities. The prospects for bringing in new technology (night fishing with lights, for example) were considered by her to be limited due to resistance of local fishermen to change.

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A visit was made of the facilities of the Department. A new Digital Equipment Corporation computer (V-100) had just arrived and was still not fully operational. It has 256K of random access memory, 8½ inch double density floppy disk storage of 1 megabyte and a printer. It is capable of real time analysis of data with a complete interfacing setup (A to D connector), as well as a voltage stabilizer. This computer has FORTRAN IV and BASIC capabilities at present. It is considered to be more than adequate for the perceived needs of the Department of Oceanography and Fisheries. There exists a real need at present to develop suitable software programs in fisheries and oceanography, and a need to encourage some use for the system by the staff. URI could help in this respect, if desired.

It is believed that URI could substantially assist in the acquisition of computer programs useful to the Department. Perhaps some formal arrangement at this end could be put in place.

The chemistry laboratory seems to be very well equipped with analytical instruments for many types of chemistry. However, there seemed to very little activity of any sort taking place in the chemistry laboratory.

There were some interesting projects in Fisheries taking place by some of the Department staff. Among these was an outstanding project on age, growth and mortality of the blackspot seabream, Pagellus bagaraveo. This fish is of considerable economic importance, but little is known of its biology - especially in Azorean waters. This project seems to have a high potential for success.

Another excellent study has to do with the kite-fin shark, Dalatius licha, a species which is caught locally by hook and line. It is a source of valuable oil from its large liver, and its white flesh is dried and exported. The biological study deals with age and growth (analysis of vertebrae), length-weight relationships by sex, and planned tagging studies. More size frequency data gathered regularly is needed.

No specific recommendations - other than minor improvements in data gathering and analysis - were offered to the leaders of the seabream and shark projects.

Other fish species considered to be of interest to the Azoreans include the following:

Albacore	<u>Thunnus alalunga</u>
Atlantic bonito	<u>Sarda sarda</u>
Bluefin tuna	<u>Thunnus thynnus</u>
Bigeye tuna	<u>Thunnus obesus</u>
Horse mackerel	<u>Trachurus picturatus</u>
Forkbeards	<u>Uycais</u> spp.
Barracuda	<u>Sphyraena sphyraena</u>
Chub mackerel	<u>Scember japonicus</u>
Conger	<u>Conger conger</u>
Squid	
Spiny lobsters and shovel nose lobster	

The tuna fishery is presently the most valuable fishery (about 45 percent by value) of all existing fisheries. It is almost exclusively a pole fishery - the boats are 60-75 feet in length and operate as day boats almost exclusively. The fishery is seasonal. Bait acquisition may be a problem.

The University's research vessel (GERALDA) is a former tuna bait boat at approximately 17.5 meters in length. She is currently on the ways for hull repairs. The vessel is well equipped with electronics and navigational gear including an Omega navigational system. The vessel is considered adequate for the needs of the Department - at least for some time. However, she presently has no mechanical winch.

Systematic programs for the acquisition of basic oceanographic and meteorological data are not in place at present. That is, no tide data, no meteorological data, no temperature records or other oceanographic data are being routinely collected and/or analyzed. This is considered to be a serious shortcoming of the present Department, and some suggestions were made.

There are local problems, such as the construction of a boat marina in the harbor at Fayal. Circulation in part of harbor will be altered, but no measurements of flushing or circulation of water in the harbor have apparently been made by anyone.

Discussions were held among a NORRAD scientist, Dr. Are Dommasnes and Professor Armando Fuesa of the University of Lisbon, a physical oceanographer, the director and myself. A cruise with the Norwegian donated vessel NORVEGIA (150+ feet in length) is planned for September - October 1983. This will involve physical oceanography primarily. The NORVEGIA is owned by the National Department of Fisheries and has been used for cooperative cruises previously. The Norwegian scientist plans to stay six months. He is a fishery biologist and his task is to extend the Johnson-Stevenson data on catch statistics and to bring them up to date. His later goal is to develop a flow diagram for computerized data management for the available catch statistics, and to implement this data management system on the recently acquired computer.

Some discussions were held with the Director, Dr. Martins, regarding the kinds of projects the Department of Oceanography and Fisheries, should undertake. The following points were made:

- 1) Although tuna are an important fishery resource, the Department should not expend too much money and effort on this program for the following reasons: ICCAT (The International Council for the Conservation of

Atlantic Tuna) has a membership of several countries including the United States, France, Spain, Japan, who are expending considerable resources on tuna. The tuna are highly migratory and the Azores do not control the stocks which pass through their EEZ.

- 2) The possibility of a squid resource development project - exploratory fishing and new methodology was discussed and considered reasonable.
- 3) Aquaculture-mariculture was discussed and the possibility for raising blackspot seabream in cage culture. The spiny lobster and shovel nose lobster were considered, but their long larval life stage precludes this possibility at this time. Artificial habitats and shelters were considered. The illegal taking of lobster by divers is considered to be a serious problem.
- 4) Other considerations included the gathering of routine oceanographic data by the Department in order to be able to respond to potential local problems - such as dredging, coastal engineering structures, pollution, and development projects. It was thought that some routine time series of temperature, salinity, tides, and wave heights would be useful.

The bulk of the period of time spent at the laboratory was devoted to the analysis of squid and tuna data.

The analysis of the squid data consisted primarily in attempting to fit growth curves from the recorded statolith zones. The statolith zones, although easily countable under magnification were not well correlated with size. A non-iterative derivative based ordinary least squares regression was fitted to the increments from birth to capture - assuming the zones were laid down daily. Only a few data points were acceptable and the fit for the females was found to be better than for the males. The equations were left with the staff of the Department.

The major portion of the tuna data analysis consisted of examining a 12-year record of catch and effort data for the Azorean tun fishery. No direct evidence of overfishing or of a reduction in the catch per unit of effort was found. A parabolic regression was fit to the overall Azorean tuna catch and effort data for all species. The fit was very good, and about 90 percent of the observed variation could be accounted for. It was suggested from this analysis that some increase to the tuna catch and effort was possible - with a sustained maximum of more than 6,000 metric tons per year. It was suggested that this fishery could not be expanded significantly, because tuna were highly exploited, and their availability in Azorean waters was seasonal.

Prediction equations for the albacore and bigeye tuna catches were attempted using the available data base and certain meteorological variables. There was not enough time to pursue these prediction equations to a great extent, but some indications of temperature effects on the albacore fishery were demonstrated.

A lecture was also given to the staff of the Department of Oceanography and Fisheries, as well as informal talks with all of the staff.

The arrival of a 1200 ton purse seiner (TUNAMAR) to undertake purse seining out of the port of Fayal was considered to be a potentially serious problem for the local bait-boat fishery. The TUNAMAR is Portugese owned and is licensed to fish out of Fayal until September. A detailed analysis of the possible effects of the seiner on the bait-boat fishery is strongly recommended.

XO-APV-23-C  
1983-09-25-6

REPORT TO ICMRD

TITLE: Food Technology at the University of the Azores

DATE: June 13, 1983

PREPARED BY: Dr. Arthur G. Rand, Jr.  
Professor and Chairman  
Department of Food Science & Technology,  
Nutrition and Dietetics  
University of Rhode Island  
Kingston, RI 02881

## 1. Scope of Work

In May of 1979, food technologists from the University of Rhode Island, Dr. S.M. Barnett and Dr. A.G. Rand, Jr., visited the Azores with J.F. Ponte Tavares, who was on leave from the University of the Azores while completing a Ph.D. in Food Science at URI. This group prepared a report surveying the Azorean food industry and recommending development of a food technology program at U.A. Dr. Tavares completed his Ph.D. in 1981 under Dr. Rand's direction and returned to the Azores to initiate food technology as a scientific discipline at UA.

The plans for development of a food technology program at UA have now been initiated and some of the basic equipment required has been purchased, ordered, or identified. Thus, Dr. Rand was requested to spend two weeks in the Azores to help finalize program development, assist in preparation and setup of new equipment, and to develop some long range plans for UA/URI cooperative research in Food Science and Nutrition.

## II. Daily Activities

### A. May 31 - arrived in Terceira at 11 a.m.

1. Met by Dr. Ponte Tavares and Dr. Young Amaral.
2. Check into Hotel Angra, lunch, rest.
3. Visit UA-Terra Cha for tour and review.

### B. June 1 - UA Food Technology Laboratories

1. Assist in plans to develop the food science research laboratory.
2. Setup IEC refrigerated centrifuge.
3. Put the LABCONCO Freeze Dryer into operation.

### C. June 2 (holiday) - UA Food Technology Laboratories

1. Continue work on the freeze dryer.
2. Setup Ainsworth analytical balance.

- C. 3. Setup the YSI sugar analyzer for lactose analysis and establish the application for milk, whey, and wine measurements.
- 4. Put the Corning Model 12 Research pH meter into use.
- 5. Discussed possible sabbatical plans in the Azores with Dr. Tavares.
- D. June 3 - UA Food Technology Laboratories
  - 1. Utilized the freeze dryer to process some milk.
  - 2. Assembled the Dixie Blancher.
  - 3. Reviewed how the Dixie Exhauster works.
  - 4. Discussed how the Dixie equipment could be used in the pilot plant for canning and freezing.
  - 5. Put the fibrometer unit into operation to measure enzymatic coagulation of whole, raw milk. Mixed results, so prepared a skim milk substrate.
  - 6. Put the Ohaus balance into operation.
- E. June 4 - UA Food Technology Laboratories
  - 1. Worked on the fibrometer and improved the process. Needed further development.
  - 2. Discussed layout of the pilot plant area. Determined basic functions and needs.
  - 3. Reviewed instrumentation available for greenhouse/hydroponics research as cooperative effort.
  - 4. Reviewed the number of changes at UA-Terra Cha since 1979.
- F. June 5 (Sunday) - Met with Dr. Tavares at the Hotel Angra.
  - 1. Discussed some of the equipment needs at UA for future research and teaching.
  - 2. Discussed the problem of lactose intolerance.

- F. 3. Reviewed the equipment which would be needed in the pilot plant to focus initial efforts on cheese processing.
  - 4. Discussed Dr. Tavares' plans to conduct research on plant and animal enzymes which can be produced in the Azores.
  - 5. Considered the need for chromatography equipment to isolate and study plant and animal enzymes.
  - 6. Traveled into the mountains to review the natural sources of unique gravel and peat which are available as valuable support material for hydroponics.
- G. June 6 - Met with Dr. Tavares at UA.
- 1. Power out. Worked on developing equipment needs for the food technology pilot plant and research lab - including types of chromatography equipment and refrigerated cold rooms.
  - 2. Discussed a plan on how to utilize the fibrometer instrument for testing milk coagulation.
    - a. formulated possible substrate and enzyme ratios.
    - b. checked substrate concentrations.
  - 3. Evaluated UA yoghurt production. Suggested some adjustments in the formulation.
  - 4. Toured new greenhouses, now being wired to operate automatically.
  - 5. Reviewed storage facilities for chemicals, acids and solvents.
    - a. Reviewed supplies available for food technology research.
    - b. Considered adequacy of current procedures.

H. June 7 - UA Food Technology Laboratories.

1. Worked again on fibrometer for enzymatic coagulation of milk.
  - a. used new substrate.
  - b. did not work well.
  - c. recommended contacting A.J. Foss to obtain information on their unit.
  - d. made suggestions which would have to be tried in an effort to utilize fibrometer.
2. Discussed the possibility of a loan from the Dutch to provide UA with equipment for milk/cheese processing.
  - a. UA must submit proposal.
  - b. UA must set up a pilot plant to receive equipment.
3. Discussed the possibility that Dr. Tavares may have to assume complete administrative responsibility for UA-Terra Cha.

I. June 8

1. Travel from Terceira to Sao Miguel.
2. Settled into hotel.
3. Toured the Pontu Delgada Agricultural Station and UA-Ponta Delgada.
4. Reviewed changes at UA since 1979.

J. June 9 - Dr. Tavares' office at UA.

1. Discussed UA current programs of study and plans for a new option in food technology.
2. Discussed "Irish Report on the Development of the Grassland and Livestock Industry in the Azores", particularly recommendations that UA train quality control technicians and conduct research on S. Jorge cheese.
3. Discussed methods for cheese research on S. Jorge products.
4. Discussed possible research project on cold sterilization/preservation of cheese milk.

- J. 5. Reviewed Dr. Tavares' paper on tuna enzymes from his dissertation.  
Has a good draft, will submit through URI to Journal of Food Science.
6. Toured Salsame Meat Processing Co. and a pineapple plantation.
- K. June 10 (holiday) - Dr. Tavares' home in S. Vincente.
1. Discussed Salsame Co. - have interest in:
    - a. production of enzymes from hog & beef stomachs.
    - b. sausages from fish.
  2. Discussed preparation and manufacture of milk coagulating enzymes from hog & beef stomachs for queigo branco and pasta mole soft/short hold cheese. Could try on S. Jorge cheese, but will need development research when new facilities in pilot plant are available.
  3. Toured several agriculture stations to review facilities for milk production and milking parlors.
- L. June 11 - went to Dr. Tavares office at UA.
1. Roughed out a draft for a second paper from Dr. Tavares' dissertation on bovine pepsin research which will be for Journal of Food Science.
  2. Discussed equipment development for enzyme extraction from meat processing by-products in the Azores.
  3. Developed a rough outline for a joint research proposal on obtaining milk coagulating enzymes from fish waste.
  4. Developed an outline for a second joint research project on enzyme preservation and cold sterilization of milk for S. Jorge cheese manufacture.
  5. Discussed additional research projects which could involve Dr. Barnett:

5. a. Hydroponics - an important area which can be significant to both Rhode Island and the Azores.
  - b. Biomass conversion of animal and green manures to energy to make the UA research farm self-sufficient for heat and electricity.
  6. Discussed nutritional problems in the Azores. Urgent need for information on the nutritional status and food habits.
- M. June 12 (Sunday) - met with Dr. Tavares at his apartment in Ponta Delgada.
1. Drafted a report to ICMRD.
  2. Discussed the report and recommendations.
  3. Considered a report from the National Laboratory of Engineering and Industry/Dept. of Food Technology in Lisbon:
    - a. provided suggestions to improve S. Jorge cheese.
    - b. determined there were 3 basic needs - Hygiene/Quality, Technology, and Commercial support.
    - c. UA could help with all of these.
  4. Reviewed Dr. Tavares' trip to Budapest last year where he presented a paper on his research at URI concerning tuna enzymes for cheese manufacture.

### III. Identification of Potential Areas for UA/URI Cooperation.

- A. Nutrition - badly need a nutritional assessment of the Azorean population & study of their food habits.
- B. Agriculture - hydroponics
  - biomass conversion for waste utilization & energy production.

III. (cont.)

C. Food Science - cheese manufacture

- identification of microorganisms involved in cheese manufacture.
- cold sterilization of cheese milk.
- enzymes for milk coagulation.
- antibiotic detection in milk.
- training and education of plant and quality control personnel.

IV. Suggestions for possible funding modes.

A. AID Program in Science & Technology Cooperation (PSTC).

1. UA submissions w/URI consult. & collab.
2. URI submissions w/UA linkage.

B. NSF International Cooperative Programs.

C. Sea Grant International Program.

D. Fundação Gulbenkian

E. Instituto Nacional de Investigação Científica

F. RIAES/UA - institutional support.

V. Summary of Status

A. UA - Terra Cha has made good progress since 1979 toward developing food technology under the direction of Dr. Ponte Tavares. Changes which have occurred in the last 4 years include:

1. Dr. Tavares is now the administrator in charge of Plant Technology and Food Technology programs, and shares overall responsibility with Dr. Young Amaral.
2. Most of the faculty is young, Azorean, and slowly upgrading in degrees to M.S. toward Ph.D.
3. IUA has become UA.

V. (cont.)

4. Greenhouses have been established and are being utilized for studies, as well as producing food, such as tomatoes and peppers.
  5. Animal herd facilities are being upgraded with new barns, milking parlor and research facilities.
  6. The land around UA has been cleared and developed for food production.
  7. There is a planned program of beautification underway with plantings of trees, shrubs, and flowers.
  8. A cafeteria and lounge is now in operation for students and faculty, utilizing food produced on the UA grounds as much as possible.
  9. UA cows are producing quality raw milk for faculty and students.
  10. UA milk is currently being processed into yoghurt and queigo branco cheese for use in the cafeteria.
  11. Vasco Mendez and Ester Gradil have been head of the Microbiology lab and left.
    - a. Raquel Costa e Silva, working in plant tissue culture, will now head up the Micro Lab. She has industrial experience in milk microbiology.
    - b. Mrs. Gradil's position will be filled by a UA graduate.
  12. Duarte Ponte is on leave in Holland studying for a Ph.D. with an emphasis on fish processing. He will be gone at least another 2 years.
- B. Food Technology has been established at UA-Terra Cha.
1. Space has been identified for this program which includes:
    - a. Microbiology Lab
    - b. Dairy Quality Lab
    - c. A lab which can be converted for research.
    - d. A large room and 3 adjoining small rooms to be developed as a

pilot plant complex.

- e. office space.
- 2. Consideration is being given to developing a curriculum.
- 3. Some staff is already available with support technicians.
- 4. A good start has been made in obtaining the basic equipment needed for research and food processing.
- 5. There is initial development of some support programs:
  - a. for industry
  - b. food service in the UA cafeteria.
  - c. food processing for the UA cafeteria.
- 6. Recently, UA received word of approval for a loan from the Dutch Government to purchase processing equipment for a milk/cheese pilot plant. UA administration must now submit a proposal through the Regional Government and National Government to the Dutch Embassy.

#### VI. Recommendations

##### A. University of the Azores

- 1. UA should continue the development of a research laboratory for Food Technology.
  - a. Some of the essential large equipment has been received or is coming.
  - b. The designated room must be developed to house the equipment.
  - c. This laboratory will need sufficient electricity and power points to handle the heavy demand for equipment.
  - d. The laboratory must be equipped with benches, cabinets, shelves, drawers for working and storage space.
  - e. Sinks, drains, and hot and cold water should also be provided for this laboratory and the adjacent dairy quality lab.

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- VI. 2. UA should provide funds for the purchase of chromatography equipment in support of food technology research.
  - a. This essential equipment should include a continuous flow absorbance monitor, fraction collector, pump, columns, recorder and the necessary accessories.
  - b. The equipment will be vital to support the plans for an extensive research program which will study the utilization of enzymes for cheese processing. These enzymes will be obtained from sources which can be produced in the Azores; such as pineapple, papaya, figs, horse radish, fish waste, bovine waste and porcine waste.
3. UA must provide funds to renovate the designated room complex into a food technology pilot plant.
  - a. This facility should have mobility and versatility for at least 3 planned functions:
    1. Research utilization - initially this will be directed at cheese.
    2. Teaching - for food technology classes.
    3. Processing - preservation of UA food production.
  - b. Needs for this facility include:
    1. floor drains
    2. service units, either around the walls or down the center, which contain - water proof power points
      - hot & cold water outlets
      - steam outlets
    3. large capacity hot water heater
    4. steam generator

VI. 3.b. (cont.)

5. walk-in refrigerator
  6. walk-in freezer
  7. cheese aging room with temperature control
  8. small quality control/sensory evaluation laboratory
  9. stainless steel tables
- c. Some future needs for this facility should include:
1. pilot scale plate freezer
  2. pilot scale ultrafiltration unit for cheese manufacture and whey processing.
4. UA should process the proposal to obtain a loan from the Dutch Government. These funds would be for the purchase of milk and cheese processing equipment to initially outfit the pilot plant.
5. UA should consider establishing facilities for Controlled Atmosphere storage of fresh fruits and vegetables.
- a. This research capability would permit studies on the development of better systems to preserve fresh produce.
  - b. UA could then determine what conditions work best for Azorean products.
6. UA must improve the storage facilities for chemicals, acids and solvents.
- a. A separate building should be constructed at Terra Cha, with ventilation, to hold solvents and acids.
  - b. Chemicals stored on shelves in the present store room should be restrained in the event of another earthquake.

7. UA should provide additional staff support for Food Technology, since it appears Dr. Tavares may have to assume additional administrative responsibilities.
    - a. Additional administrative responsibilities for Dr. Tavares could slow the development of food technology, with Duarte Ponte away for at least two years.
    - b. The University should move quickly to fill all vacant staff positions in Food Technology.
    - c. At least 2 additional technician positions should be created in support of the food technology research lab and the food technology pilot plant.
  8. UA should plan to hire at least 2 new food technology staff in the near future, with one position in human nutrition.
- B. University of Rhode Island
1. URI should establish research linkages with UA in several project areas involved with food technology.
    - a. Hydroponics - research project on large scale food production employing new facilities being developed at URI and the new greenhouses at UA. URI Faculty - Barnett/Hull.
    - b. Milk coagulants - joint project on identification and extraction of enzymes from fish waste for utilization in cheese manufacture. URI Faculty - Rand.
    - c. Cold Sterilization of Milk - joint project on the enzyme/hydrogen peroxide treatment of milk for S. Jorge cheese. URI Faculty - Rand.
    - d. Nutritional Assessment - develop a research project to determine the nutritional status and food habits of Azoreans. This could be a potential sabbatical leave possibility in 1984-85. URI Faculty - Caldwell.

2. Establish consultancies and collaboration in the following areas:
  - a. Biomass conversion - utilization of animal and plant manures for energy production on the UA research farm. URI faculty-Barnett.
  - b. Animal rennets - develop the processing and utilization of porcine and bovine stomach tissue for industrial production of enzymes for the manufacture of queigo branco and pasta mole (short hold) cheeses. URI faculty - Rand.
  - c. Training Programs - development of short courses and slide/tape presentations for the training dairy industry technicians in quality control and food plant personnel in sanitation and hygiene. URI Faculty - Cosgrove.
  - d. Antibiotic Detection Program - development of methods and procedures for detecting the presence of antibiotics in the Azorean milk supply. URI Faculty - Cosgrove.

XO-17AV-235-0  
CSN = 49257

Report to

ICMRD

on

Soil Survey Activities

University of Azores

from

William R. Wright  
Associate Professor of Soil Science  
Department of Natural Resources Science  
University of Rhode Island  
Kingston, RI 02881

July, 1983

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Soil Survey and Support Activities  
University of Azores

OBSERVATIONS AND RECOMMENDATIONS

Soil survey involves not only the field mapping of soils, but includes such support activities as the characterization of the soils in each mapping unit to determine their physical, chemical, mineralogical, and morphological properties. In addition, research activities related to map unit composition and variation, and plant adaptability and response to various management techniques on different mapping units are an important aspect of the interpretation component of a soil survey program.

Field Soil Survey

A good soil mapping program is the first step in developing a strong soils program in the Azores and will prove to be a valuable asset in improving agricultural production and in making other land use decisions. The soil scientists that have been assigned to the mapping program appear to be quite capable in carrying out the task. Edwardo Camara and Manuel Ferreira have considerable years of experience in mapping soils and Joao Madruga, although young and inexperienced, appears to be extremely bright and capable of doing an excellent job. Many of the soil survey techniques which they have utilized, such as digging a large number of pits, making descriptions

of the soils, and trying to draw lines around similar soils, is extremely cost inefficient and does not always result in an accurate soils map. However, Paulo Guerra, who has mapped soils throughout the world for FAO, has considerable knowledge and experience in the application of air photo interpretation in mapping soils and will lend a great deal of expertise in developing an excellent mapping program as soil survey leader. Jorge Pinheiro and Jaoa Sampaio both have considerable knowledge about the soils and landscapes in the Azores and will be a valuable component of a good soil survey program.

#### Soil Characterization

Laboratory support is a necessary component of a good soil survey program. Without it, the maps developed are an academic exercise and do not lend much support for interpretive purposes. One of the first tasks of the soil characterization laboratory is to determine what analyses are important for characterization, classification, and interpretive purposes. Many analyses are routine for all soil characterization laboratories, however, additional analyses may be required for volcanic soils and for the specific problems associated with Azorian agriculture.

As a first approximation, it is recommended that the following analyses be run on a routine basis: particle size distribution, organic matter content, cation exchange capacity, exchangeable cations (Ca, Mg, K, Na), exchangeable acidity,

free iron oxides, pH ( $H_2O$ , KCl, NaF), extractable P and K, and 1/3 and 15 bar water. It may not be necessary to run these analyses on all horizons, but they should be run on the major horizons (A, B, and C). Other analyses which may prove valuable on a selected number of samples include: clay mineralogy, extractable or amorphous aluminum, total nitrogen, extractable Ca and Mg, bulk density, available micro elements, and phosphorous adsorption isotherms.

One of the major problems that will have to be resolved is concerned with laboratory procedures. Many of the methods that have been developed in soil science and which are standard in most laboratories frequently are not suitable or applicable for soils of volcanic origin. In particular, textural analysis and cation exchange capacity methods give erroneous results on volcanic soils. It is recommended that a review of the methods utilized in other volcanic areas of the world be evaluated and that appropriate procedures be developed. The R.I.A.E.S. could perhaps lend some support in this area of research.

Following the identification and development of appropriate methods, personnel in the laboratory should be trained and well versed in the procedures utilized. They should analyze the same soil samples numerous times until their increased familiarity with methods and procedures has resulted in the desired level of precision and accuracy. This training will increase the credibility of the data obtained from the laboratory.

Initially, two or three representative soil profiles from each mapping unit should be described and sampled for laboratory characterization analyses. Soil samples should be obtained from every horizon to a depth of about one meter or bedrock if shallower. If the data obtained indicate a great deal of variability within a mapping unit, additional pedons should be sampled. Selected profiles from similar mapping units on other islands should also be sampled and analyzed for correlation purposes. The number of profiles sampled will depend upon variability of data and the degree of similarity to similar mapping units on other islands. This process insures similar soil properties and thus similar interpretations for the same mapping units on different islands. In addition, soils that present a problem to the surveyor should be analyzed by the characterization laboratory during the mapping process to insure correct map unit designation and classification.

#### Research and Interpretation

The ultimate goals of any soil survey or research programs should be the interpretation of the data for the user. Therefore, the types of information gathered should be directed towards the needs of the users and the interpretations must possess a high degree of reliability. One method of measuring soil variability will be to evaluate the laboratory data obtained from representative soil profiles within

each mapping unit. In addition, map unit composition and variability can be estimated from observations conducted on soil-landscape transects.

It is strongly recommended that any research conducted on the soils be associated with the mapping units identified in the soil survey program. In addition, to further strengthen the extension component of the soil survey program, studies should be initiated to evaluate plant response to different soils and management practices. Both greenhouse and field correlation trials should be directed at assessing the major soils on the islands as determined by soil survey mapping units. Plant tissue analyses should also be correlated with soil test data. The soils laboratory at the University of Azores, Terceira has the capability of carrying on these types of research projects.

#### Cooperative Studies with the R.I.A.E.S.

Cooperative research between the University of Azores, Terceira and the R.I.A.E.S. should be developed as the soil survey program progresses and as needs are identified. Immediate studies could be initiated in the development of appropriate laboratory methods suitable for soils of volcanic origin. In addition, research associated with the correlation of routine characterization analyses to mapping units and to various soil properties which are more difficult to determine would be extremely valuable. For example, pH (1N NaF),

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15 bar water, Fe, Al, or perhaps other analyses may be good indicators of the presence of allophatic minerals which have numerous land management implications. In particular, these types of minerals fix phosphorus in an unavailable form and if simple, routine procedures could be developed to predict this phenomenon a major contribution would be made in the management of volcanic soils.