

UNITED STATES GOVERNMENT

Memorandum

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TO : Research and Development Committee

DATE: July 15, 1975

FROM : TA/AGR, Leon F. Hesser *LH*

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SUBJECT:

Attached is a proposal for a two-year 211(d) utilization grant in small scale fisheries for the University of Rhode Island.

AID conducted major reviews of its grants to University of Rhode Island and Auburn University in 1974. The review teams, while strongly recommending continued involvement in fisheries and aquaculture, urged AID to clarify its goals and develop programs tailored to these goals.

The goals of AID's program have been defined as follows: AID policy is (1) to assist LDCs develop intensive, science based aquaculture in fresh-water and marine environments; and (2) to assist LDCs in the assessment and management of coastal fishing stocks and in the development of coastal capture fishing, particularly by small scale artisanal fishermen.

The emphasis is on the development of fisheries and aquaculture as a potential source of protein for poor consumers and as a source of employment and income for small producers and laborers. This potential has been outlined on pages 1-5 of the University of Rhode Island grant proposal. Beyond this, the U.S. has particular high quality skills to contribute to development of both fisheries and aquaculture. Demand for these skills for AID grantees is good. The Administrator and both Congressional committee's have strongly endorsed AID programs in fisheries and aquaculture.

Fisheries or aquaculture ventures of a capital-intensive nature fall outside of AID's purview. Development of high-seas or distant-water fleets is excluded.

Fisheries or aquaculture ventures aimed at the production of high-value products for export or for domestic markets, particularly the tourist trade, may be appropriate especially if they have substantial employment-generating effects. The priority is on production of fish as a source of relatively low-cost protein and as a source of employment.



AID has arranged with NOAA for the six to nine months detail of Mr. Philip Roedel as Fisheries Advisor. It is his job to continue to evaluate the existing AID fisheries program and to recommend policy positions for fisheries development. This will take into account small scale fisheries, aquaculture, and the conservation and management needs of IDCs, especially those likely to be brought about by increased coastal state control over coastal resources.

The attached grant proposal outlined the revised program we have developed with the University of Rhode Island.

Attachment: a/s

Proposal for Continuing Support under
the Agency for International Development
Institutional Grants Program

Applicant: University of Rhode Island
Date: July 1975
Grant Title: Small Scale Fisheries
Amount and Term of Original
Grant plus Amendments: May 1969 to August 6, 1975, \$925,000
Amount and Terms of Proposal: \$400,000 extended to June 30, 1977
AID Sponsoring Technical Office: Technical Assistance Bureau,
Office of Agriculture

Grant Project Statement
(Utilization Phase)
211(d) Institutional Grant
University of Rhode Island

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I. Relevance of Problem Area and Need for Expertise

The world's food supply must be doubled by the year 2000, it was indicated at the recent World Food Conference in Rome. This is the challenge upon which the Agency is focusing.

More specifically and more immediately, the world's caloric and protein production must be increased by 1985 by approximately 50 percent of 1965's production. This 50 percent "average" figure means, of course, that for some people the increased needs will be much greater. For example, Table which indicates the increased need for the world and three selected LDCs, shows that India, Pakistan and Brazil will need approximately to double their food production by 1985. They, among others, do not have the extra 15 years that some others do.

Future world food needs are great and include the necessity to increase food on a per-capita basis as well as to provide for an expanding population. At current levels of production and distribution, approximately 20 percent of the populations of LDCs are undernourished in caloric terms, and approximately 60 percent are receiving diets that are nutritionally deficient, particularly in protein content.

Table 1. Needs for calories and proteins in 1985 expressed as percent increase over needs estimated for 1965.

<u>Needs</u>	<u>Population Estimate</u>	<u>World</u>	<u>India</u>	<u>Pakistan</u>	<u>Brazil</u>
Calories	high	52	108	146	104
	low	43	88	118	92
Protein	high	52	110	145	109
	low	45	93	121	98

The World Food Problem, 1967. President's Science Advisory Committee. ✓
Vol. 1, p. 49.

Various tactics and strategies are being employed by governments, private industries and individual farmers to increase levels of food production. As the availability of land resources decreases, the yield of a unit of land must be intensified through improved farm management in the use of water resources, new seed varieties, fertilizers and pesticides. Multiple cropping practices, using the same soil and water resources, and enhanced by the faster maturing high yielding seed varieties, is becoming more commonplace. The diversification of crop and animal production can more efficiently utilize existing resources. In addition to increasing the quantity of food produced, e.g., genetic manipulation to increase lysine levels in grain. The Agency has been fully supportive of efforts to improve food production in LDCs on a quantitative and qualitative basis.

One food crop receiving Agency emphasis is fish. The high protein content of fish gives it importance as one of several possible protein sources that can contribute to an improvement of dietary levels in LDCs. The protein content of fish, as compared to red meats and rice, is shown in Table 2.

Table 2. Protein in fish, red meats, and rice

Item	Percent of Moisture-Free Flesh
Shrimp	88
Flounder	80
Channel catfish	79
Red meats	40-50
Rice	7

R.T. Lovell, "Benefits of Fish Culture of Developing Countries", c. 1973, Table 8.

In addition to having a high protein content, fish are also efficient feed utilizers in comparison to domesticated livestock species (see Table 3). Fish are not necessarily in competition with land animals or humans for their feed especially since they are able to utilize aquatic plants.

Table 3. Efficiency of feed utilization per 1000 grams of feed intake for various animal species.

<u>Species</u>	<u>Liveweight gain (grams)</u>	<u>Protein gain (grams)</u>
Catfish	715	118
Chickens	356	101
Pigs	292	30
Sheep	185	22
Steers	163	26

The World Food Problem, 1967. President's Science Advisory Committee, Vol. II, p. 352.

In 1973, total fish production was 66 million metric tons (MMT) including the yield from aquaculture of about 5 MMT. 1,2/ The maximum potential yield from existing "conventional" fisheries is estimated in the 100 MMT plus range. 3/ Currently aquaculture production for direct human consumption

1/ Aquaculture is defined as the growing, or culture, of aquatic organisms under controlled conditions in either fresh, brackish, or sea water.

2/ Consultative Group on International Agricultural Research, Report of the TAC Working Group on Aquaculture, 1973, p. 1.

3/ Estimates of potential yields from the ocean usually embody two (continued)

accounts for about ten percent of the world's total and by the year 2000 this proportion can increase significantly. The potential increases are particularly important in view of the much greater needs of LDCs for protein (see Table 1).

Conventional fisheries can contribute an increasingly large absolute amount of tonnage (approximately 100 MMT) to world food requirements. Geographically, the potential of this increase in fish production exists largely in the waters of, or adjacent to, the LDCs. Much of the development of small scale fisheries and aquaculture in the LDCs can be handled best as labor intensive, relatively low capital undertakings. Such an approach increases employment and upgrades the living standards of large numbers of people, with fishermen progressing from a level of merely subsistence fishing to economically more ambitious small scale fishery practices. ^{1/} Upgrading the economy and the nutrition of a nation or a region must be treated as complementary goals since increased and improved supplies of foodstuffs and other goods require enhanced demand for them through increased income levels.

Economically, the prospects for developing fisheries are favorable in that (where subject to comparison) the cost per pound of producing fish protein, both in conventional fisheries and aquaculture, is often less than the cost for other protein sources of equivalent quality. While the prospects are good for producing fish protein more cheaply than other animal protein, development plans depending on such prospects must be considered on a case-by-case basis. Some relatively costly fishery products are in demand as exports; yet from the derived income, other protein may become more easily available to people involved in production.

There are needs to obtain additional knowledge about small scale fisheries and to overcome certain constraints, before the potential yields from conventional fisheries, as they apply to the small scale fishermen, can be increased. The most critical include the following:

^{3/} (continued) - important assumptions: (1) that we can improve on present harvest production by capturing species lower on the food chain, i.e. herbivores or low level carnivores rather than high level carnivores, and (2) that we can develop the capability of harvesting and can use species now underexploited or not exploited at all." Prospects for Fisheries Development Assistance, University of Rhode Island Marine Technical Report Series No. 19, 1974, p. 5.

^{1/} The term "small scale fishermen", as used by the University of Rhode Island, refers to those persons who fish by capture methods, catching more than necessary for their subsistence needs, but are not involved in capital intensive deep-sea fishing. A small scale fisherman generally fishes along coastal areas, although it is not possible to define small scale fisheries as being geographically specific to fishing operations conducted within "x" miles of a coastline.

^{2/} International Center for Marine Resource Development, Prospects for Fisheries Development Assistance, University of Rhode Island Marine Technical Report Series No. 19, 1974, pp. v-vi.

1. If increased yields are to be maintained, there is a need for improved management practices in order to assure self-sustaining fish populations.
2. Coastal and ocean areas capable of the largest increases in sustainable catches of familiar species lie along the shoreline and offshore of the LDCs. Knowledge of the extent of these resources must be increased and boat efficiency improved in order to more fully utilize these.
3. Projections of the world's marine resources indicate that an unquantified, virtually untapped reserve exists of lesser known fishery stocks which, pending the development of efficient and economical harvesting methods, may prove to be a significant addition to the world sources of fish and protein.
4. Any production increase will require an accompanying development of the infrastructure, including a greatly expanded marketing system.
5. There is need for socio-economic studies regarding the supply and demand of fish and fish products. Further study is needed of the demand for fish in the LDCs as determined by income, the cost of alternate foods and a combination of taste preferences and dietary habits. On the supply side, the ability to produce relatively low cost fish depends upon the availability of fishery resources, the ability to harvest and culture these resources, and the cost of processing and marketing the fish.

Potentials and impediments to fisheries aside, small scale fishermen constitute a significant number of persons in many LDCs. It has been estimated by the FAO that there are 9.2 million small scale fishermen in developing countries (see Table 4). There are approximately four million persons directly employed as fish processors, vendors, boatbuilders, etc. With the inclusion of family dependents there are 60-70 million persons who rely to some extent on fishing for their livelihood. Together they form an important socio-economic group within their regions, and they provide much of the fish consumed locally. As a group, however, they generally lack education and the economic means to rise above their present difficult existence. They are trapped by a situation where low incomes, often at subsistence levels, stifle the hope of significant improvement without outside help. This group is part of the Agency's target group, the poor majority. Past efforts to assist the group have met with limited success.

A fisheries policy statement was presented to the R and D Committee in May 1975. In addition to supporting aquaculture production, Agency policy is to assist LDCs in the assessment and management of coastal fishing stocks and in the development of coastal fisheries, particularly by small scale fishermen. On an international basis, increased attention is also being given to small scale fisheries development. At the June meeting of FAO's Committee on Fisheries a Latin American Inland Fisheries Body was authorized. During that same meeting the delegates from Egypt, Kenya, and Sri Lanka indicated that their countries were planning to emphasize small scale fisheries development. As the emphasis in this field

increases it is necessary that an institutional response capability be developed so that the Agency can participate more fully in small scale fisheries development.

Table 4. Small scale fishermen in developing countries, by region.

<u>Region</u>	<u>Full-time</u>	<u>Part-time</u>	<u>Total</u>
Asia & Far East	4,087,000	1,945,000	6,032,000
Africa	821,000	1,431,000	2,252,000
South America	593,000	60,000	653,000
Near East	154,000	6,000	160,000
Central America & Caribbean	97,000	20,000	117,000
TOTAL	5,752,000	3,462,000	9,214,000

Artisanal Small Scale Fisheries in Developing Countries, FAO Committee on Fisheries, Ninth Session, Rome, October 1974, Appendix I.

The University of Rhode Island's International Center for Marine Resource Development has become an established and functioning organization with an institutional focus upon small-scale fishermen. Its particular competence is varied but interrelated. It is concerned with socio-economic issues of fisheries development and the relationship of these issues to resource management as well as the technology of exploitation and utilization. Its effort has been to integrate the socio-economic, resource management and technological issues of fisheries development.

II. Grantee Performance and Results to Date

The University of Rhode Island was awarded a 211(d) grant of \$750,000 for a five-year period on May 6, 1969. Subsequently the grant was extended with no additional funding, for three months to August 6, 1974. Then a one-year extension was made to the grant to permit a comprehensive on-site review and to develop a fisheries strategy. The funding was increased by \$175,000 for a total of \$925,000 and the grant is now scheduled to expire on August 5, 1975.

As originally defined, the grant was to enable the University of Rhode Island "to strengthen its research, teaching, consultation, and service capabilities in marine resources, especially fisheries, to expand current University marine resources capabilities to an international dimension. To accomplish this, an International Center for Development of Marine Resources...will be established." 1/

University officials felt that the establishment of an international center would allow it to place its focus upon international issues of marine resources. Specific interests that the Center planned to pursue on an international basis were: development economics, marine resource

1/ University of Rhode Island, "A Proposal for the Establishment of an International Center for the Development of Marine Resources", April 15, 1969, p. 1.

economics, marine biology, oceanography, ocean engineering, fisherman training, fishing gear research, food technology, marine resource extension, and the social aspects of the legal issues arising from the Law of the Sea negotiations. The University proposed to develop the necessary expertise in these areas of interest by: expanding the interests in international problems of the existing faculty, hiring faculty with international competencies, supporting U.S. and foreign students, providing for visiting lecturers, increasing library holdings, and providing for travel.

As a result, it was felt there would be "an integrated multi-discipline center with capabilities for identification of an consultation on the solution of economic, biological, technical, social, and institutional problems and constraints and the development and attainment of opportunities related to the role of marine resources in less developed countries. The work of the center will be coordinated and integrated with and supported by the existing and expanding University activities in these subject areas on the state and national level." ^{1/} Uncertain AID direction during the initial phase of the grant resulted in a lack of institutional focus which, in turn, inhibited the development of purposeful linkages with other institutions and agencies. Moreover, this situation was not amenable to the full utilization of the University's expertise by AID Missions. The Agency review team concluded that "it may have been necessary in the beginning...to have allowed the individual members interested in the Center to 'do their own thing.' Now, however, there is a real need to sort out priorities and concentrate on those areas of activities that will have payoffs in terms of the long-term interest of the Center." ^{2/}

Considerable progress has been made during the latter part of the grant period, while both the University of Rhode Island and the Agency were developing their priorities and strategies. For example, the Department of Resource Economics has increased the number of its faculty with international experience and commitment from three to eight during the grant period. Prior to the grant, the University had had international experience with three countries, and now they have been involved with 33 countries. The funding of these programs has expanded beyond the source base of the Agency and the State of Rhode Island and other contributors now include: the National Science Foundation; Diakonia, a German church organization; the Consortium for the Development of Technology (CODOT); Resources for the Future; the Nutrition Foundation; NOAA; Sea Grant; USDA; and certain developing countries. The Center continues to use its faculty in its international programs and to educate U.S. and foreign students.

A major accomplishment was the sponsorship of a Seminar-Workshop on Coastal Artisan Fisheries and Aquaculture in Central America and Panama.

^{1/} Ibid., p. 2.

^{2/} Kitchell, R.E. September 10, 1974. "Comprehensive Review of 211(d) to University of Rhode Island (Marine Resources)", mimeo, p. 9.

The objective of the seminar-workshop was to explore the character, status, and potential of the subsistence fishery and coastal aquaculture activities of the region and determine how these activities could increase protein supply and employment. This workshop brought together representatives from a variety of disciplines from the Central American countries, international professionals in fisheries development, and Agency participants. It provided an important forum for a regional exchange of views on small scale fisheries development and provided a basis for regional cooperation on fisheries development issues.

The University previously sponsored with the University of Dar es Salaam an International Conference on Marine Resources Development in Eastern Africa. The conference brought together the interdisciplinary marine interests of 56 people from eight nations on the task of assessing the needs and capabilities for marine resource development in Eastern Africa. The conference recommended establishment of a center in Tanzania to serve as a base of knowledge for conservation and rational uses of natural resources, both human and material, for national and regional purposes. Application to regional needs would be accomplished with strong cooperative ties in universities in Kenya and Uganda and with the East African Marine Fisheries Research Organization (EAMFRO).

Various technical assistance projects were developed, including an assessment of marine productivity in Peru and marine food technical assistance and institutional improvement efforts in Chile and Ecuador. Additionally, research into marine foods of the LDCs including studies of under-utilized species as well as new preparation and preservation techniques was conducted. A report entitled Prospects for Fisheries Development Assistance was published during the past year.

In addition, complementary research included CODOT's teaching and research in Guatemala, Brazil and Chile, as well as NSF-sponsored studies of artisan fishing and mariculture in Puerto Rico.

In assessing the performance of the University of Rhode Island, the review team concluded that "no university or other organization in the United States has the breadth of field or scope concerning marine affairs as the University of Rhode Island. In the opinion of the team, this fact gives the University academic distinction as well as a broad service role for the national and international community which is perhaps unmatched elsewhere; the ICMRD is an established and functioning organization. This is true despite the vague focus of the original grant, the vacillation of AID as to its interests in fisheries programs, and the relatively small amount of grant money involved." ^{1/} The University has recently re-organized the ICMRD to effect a sharper focus of its efforts and to provide more effective control of its activities.

^{1/} Ibid., p. 13.

III. Grantee Commitment to Long-Term Involvement

In 1960, the University of Rhode Island pioneered in establishing a broad, comprehensive and integrated approach to the study of marine resource problems. The awarding of the 211(d) grant in 1969 enabled the University to establish the International Center for Marine Resource Development. The University is increasingly committed to long-term international marine resource development activities, especially now that these endeavors are finally entering into the spotlight of international need and attention. This increased University competence in international marine activities has brought increased demands for service upon the faculty and staff.

In the past year the University has undertaken advisory work for AID Missions in Kenya, Tanzania, Zaire, and Peru in conjunction with BOA No. 1079. Additionally, 23 different faculty and staff members responded to requests from 33 developing countries in the last 18 months. These responses were solicited directly by the countries, by AID Missions by international agencies, and by other institutions. Of the countries, 22 are located in Latin America and the Caribbean, six are African, and five are Asia. The activities in these countries are summarized below:

<u>No. of Occasions</u>	<u>Activity</u>
20	Consultation and Project evaluation
14	Research
6	Project development
13	Training assistance
6	Professional meetings

In-country stays ranged from a full year to several days.

In addition to out-of-the-country work by faculty and staff, many representatives of foreign countries and international organizations have visited the University. For the most part these visits have resulted in the development of cooperative programs between foreign governments, international institutions, and the University. This trend is expected to escalate with increasing institutional involvement.

As indicated the Center has been able to attract funding from other sources in addition to the Agency and the University of Rhode Island. The source and amount of funds used to maintain the activities for fiscal year 1974 are shown in Table 5.

Table 5. Source and amount of funds for International Center for Marine Resource Development, FY 1974

<u>Source of Funds</u>	<u>Amount</u>	
<u>211(d)-related activities</u>		
AID-211(d) grant	\$249,919	
University of Rhode Island	61,030	
Diakonia (German Agency)	60,000	
Other sources	25,500	
sub-total		\$ 396,432
<u>Utilization activities a/</u>		
National Science Foundation	167,654	
Brazilian government (AID loan)	143,496	
AID (mission-funded)	133,842	
National Institutes of Health	36,853	
State governments	18,810	
Other federal agencies	12,450	
Others	6,000	
sub-total		519,105
Total		<u>\$915,537</u>

a/ These activities were not supported by 211(d) funding, but they do represent utilization of the existing marine resource development capacities of the Center. The activities were listed in the 1973-74 Annual Report with full multi-year funding amounts. For this table, the amounts were adjusted to reflect one-year funding only.

International Center for Marine Resource Development, 1973-74 Annual Report, University of Rhode Island, 1974, pp. 97-99.

IV. Rationale for Revision/Extension

During the past year considerable effort has been spent and progress made in sharpening the focus of the University's commitment under its 211(d) grant.

Consistent with the University's long-term professional interest, it has directed increased attention to small-scale fisheries and aquaculture development--that is, labor-intensive conventional and culture fisheries. The most recent expression of this effort was the Central American Seminar-Workshop on Artisanal Fisheries Development which brought together qualified professionals from the University, international agencies and the Central American countries. The emphasis of this conference was on possible improvements in research and technical assistance to assist small-scale capture and culture fisheries. During the early years of the grant, a cohesive institutional focus began to evolve. Its rather slow evolution was inherent in the University's lack of experience and the heavy burdens placed upon the experienced few to respond to immediate and pressing demands for technical assistance in project development.

However, the past few years have seen a number of changes in the ICMRD's development. A clear focus on small scale fisheries and aquaculture has evolved, much of which has received support from outside AID and the University. Extensive research in Puerto Rico was sponsored by the National Science Foundation; a major effort on lagoon aquaculture development was supported by Resources for the Future and the government of Mexico, and FAO has provided research opportunities in Burundi and Zambia.

Much of the University's ability to make the transition was fostered by the fact that it has a strong program related to domestic fisheries problems, and these interests were translatable to circumstances in developing countries. Nevertheless, the University's focus requires somewhat more unification and integration of purpose.

The University has recently provided technical assistance in fisheries projects in Zaire, Kenya, Tanzania, and Peru in addition to the Central American and East African workshops. Small scale fisheries development, however, is still a new field for professional academic involvement. There is no other U.S. institution significantly involved in this field. Internationally, FAO offers assistance in the field as well as the recently established International Center for Living Aquatic Resources Management (ICLARM) in Hawaii. Expertise in marine resource economics is available at the University of Washington, although it has not been directly involved in small scale fisheries.

The focus of this grant extension upon small scale fisheries development reflects the University's interests and the Agency's Congressional mandate. It is necessary, however, that the development of an institutional response capability in this field receive Agency support. As shown in Table 5 the university has received considerable funding from other sources for technical assistance in marine resource development.

The University is committed to its work in the international aspects of marine resource development and will remain so if the proposed grant extension is not funded. However, the University will not focus on small scale fisheries development if 211(d) or other funds are not forthcoming. Its focus will remain in the marine sciences and the Law of the Sea deliberations as these are the fields for which other-than-AID funding is currently available.

There is a need to develop the University's expertise in the field of small scale fisheries. The need for additional protein food supplies throughout the world is well-documented. The over-exploitation of some common food fishes requires improved management and technical practices. New constraints, such as the energy crisis and inflation, have caused governments to focus upon low-capital, small scale fisheries. The development of the University of Rhode Island's institutional response capability in this field will allow the Agency to participate more fully in fisheries development programs.

V. Revised Grant Project Design

A. Purpose

The purpose of this grant extension and revision is to sustain and refocus the University's institutional response capability on the economic aspects of small scale fisheries and aquaculture in the LDCs.

This is to be accomplished through the further development of an expanded knowledge base of the socio-economic aspects of small scale fisheries. The specific focus of the grant revision upon the development of small scale fisheries is in accordance with the following recommendations of the Agency team's review.

1. The need for the University of Rhode Island to develop an appropriate long-range focus for the ICMRD.

2. A need to develop, through a state-of-the-art exercise, a framework for joint decision-making and collaboration on research and training needs and operational priorities--with emphasis on the socio-economic aspects.

3. The University must determine what level of institutional response capability it is willing to provide to LDCs and international development agencies.

In the early stages of small-scale fisheries development, attention was usually directed to improving the fishing technology or developing aquaculture techniques. This rarely proved sufficient, and the difficulties encountered in technically-oriented projects resulted in a search for the reasons for failure.

Difficulties in dealing with individual, unorganized fishermen were obvious. Problems involving the middlemen and the inadequacies of marketing systems also required attention. Thus, a broadened outlook placed strong emphasis on institutional and organizational change as a requisite to small-scale fisheries and aquaculture development.

The evidence showing that attempts at technical or institutional change alone were ineffective brought about the awareness that neither small-scale fisheries nor aquacultural development could be directly achieved. The primary goals of increased protein, improved fishermen's incomes and additional employment loomed as large or larger than ever as food economies began to deteriorate while interest in small-scale fisheries remained at high levels or increased. Findings of a workshop in Central America dealing with socio-economic research issues emphasize the continuing importance of the goals and recognize the complex nature of small-scale fisheries development.

The University of Rhode Island now perceives that for small-scale fisheries (as well as other activities) to be developed, careful consideration must be given to at least three broad interrelated issues in development. These are:

1. Resource management and fishing technology (or, in aquaculture, the production and harvest technology)
2. Marketing and distribution systems
3. Interpersonal and institutional relationships, organizations (including government) and enterprise management.

B. Objectives/Outputs and relevance to Agency Priorities

The program to be funded by the grant revision and extension has been designed to fit this framework. The specific grant purpose stated above meets the generic 211(d) grant purpose to strengthen and mobilize an institutional response capability within the primary objective/output categories as follows:

1. To continue to develop and extend the knowledge base and research capability of the University of Rhode Island within the redefined focus of small scale fisheries development.
2. To develop a more effective advisory response capability.
3. To develop a specialized education and training capability.
4. To develop and maintain an information capacity.

Normally grant project statements have included a fifth objective: to develop linkages and networks. This remains an integral part of the university's programs and this proposal. Linkages with other agencies and institutions are included with the first objectives.

These program objectives are explained in detail below.

1. Extended Knowledge Base

In order to achieve the purposes of this objective three state-of-the-art efforts will be undertaken in association with other appropriate institutions. These state-of-the-art efforts will comprehensively cover the field of small scale fisheries and specifically the most significant problem areas within the field. The original grant emphasized the funding of core staff in marine resources. This extension and revision, while providing the means to assemble and maintain a specified institutional response capability, emphasizes extending the knowledge base in related problem areas.

The state-of-the-art efforts are more than a review of available literature. Rather they are an attempt to inventory and analyze what is known of principles and practices of small scale fishermen in LDCs, modern and ancient, and what needs to be known. This work will be done in cooperation with Auburn University, FAO, AID, NOAA, and other interested institutions and agencies.

Priorities for expanding the knowledge base will be partly determined through the several state-of-the-art studies. While there has not been a thorough assessment of the state of the art in small scale fisheries during the past year the University has identified major problem areas in small scale fisheries. Particular emphasis will be given to the impediments to small scale fisheries development and to the development of a set of inter-related national small scale fisheries development policies.

a. Small scale fisheries and aquaculture

This study will be undertaken in cooperation with Auburn University, AID and other interested parties. When draft statements have been developed, seminars, participated in by world authorities in these fields, will be held to review, comment on and, if appropriate, endorse the conclusions. The end result sought is a concensus on the potentials, accomplishments to date, limits, and impediments to small scale fisheries and aquaculture appropriate to developing countries plus a review of issues or problems on which there is insufficient knowledge and/or a divergence of expert opinion.

The University of Rhode Island will provide a number of specific inputs to this state-of-the-art overview of small scale fisheries development. The university will make a substantive contribution to this effort while expanding its knowledge base and developing its institutional response capability in small-scale fisheries development. The specific inputs to this state-of-the-art that the University proposes to undertake include the following

(1) Lack of knowledge of available fish stocks

Before the potential production from small scale fisheries development can be adequately evaluated there is a need to develop a method which will allow an LDC to assess its coastal and reef fish stocks and its management practices of those stocks. Small scale fisheries in tropical LDCs do provide fish for local consumption yet the exploitation of coastal fishery resources has progressed without accompanying stock assessments and appropriate management techniques. As the development of harvest techniques, marketing, and processing methods proceeds, pressure on available fish stocks will increase and the importance of effective management schemes will become critical if yields are to be maintained on a consistent, optimum level. To date, obstacles to the development of management techniques include inadequate data collection and the necessity to modify standard assessment methods used by large scale industrial fisheries to the needs of small scale fishermen in tropical waters.

Initially, a document will be assembled, on a country or sub-regional basis, describing the fish stocks available, the number of small scale fishermen, the type of gear utilized, and the type of data currently available. Once this is completed the university will develop a concise, straightforward methodology which will permit first order evaluations of the effects of present and future fishing pressure on tropical fishery resources. The approach will be designed to be used as an adjunct to existing data collection efforts by national fishery agencies. This will result in a methodology which will enable LDCs to assess its coastal fishery resources.

In addition, this state-of-the-art effort will address the limits and impediments to small scale fisheries development.

(2) Lack of innovation among small scale fishermen

Fishermen are the important element in any fisheries development project. Although efforts are being made to develop small scale fisheries through the transfer of technology, methods, and organizational structures such as fishermen's cooperatives, the attempts usually result in failure due to resistance on the part of the individual fisherman.

In many LDCs the release of funds for fisheries development often depends on the existence of fishermen's cooperative organizations. Therefore this aspect of the state-of-the-art effort will focus primarily on the correlates of success and failure of fishermen's organizations, with an emphasis on the role of the individual fisherman. The University of Rhode Island will cooperate with individuals investigating the transfer of technology at the University of Wisconsin Land Tenure Center and Auburn University's International Center for Aquaculture.

This input to the state-of-the-art overview on small scale fisheries development will describe the fishermen and the multi-variate factors related to innovative behavior, including the acceptance or rejection of fishermen's organizations. A methodology to assess the diffusion of innovations among small scale fishermen will be developed for use by LDC institutions. Moreover, it will provide a beginning of a cross-cultural comparison of behavioral similarities between small scale fishermen. These reports and methodology will provide a basis for recommendations on involving fishermen in the development of small scale fisheries.

(3) Institutional constraints to small scale fisheries development

National fisheries policies and their concomitant government agencies in developing countries are often ill-suited to assist small-scale fishermen. Furthermore, private enterprises that serve fishermen such as banks and gear suppliers are rarely provided the incentives necessary to meet small-scale fishery needs.

Problems for the fishermen arise in a variety of ways, but one of the most serious causes of difficulty has been the proliferation of government agencies, often with conflicting missions, with some interest in fisheries development. In addition to complex administrative structures, there exists a complex of laws and regulations that are often contradictory, detailed, and innumerable. Moreover, there exist private enterprises that are ill-suited to meeting small scale fishermen's needs. For example, banking practices virtually preclude lending money directly to small scale fishermen. Bankers and importers, as examples, are forced into certain behavior patterns by government regulation and customary practice. These patterns inhibit small scale fisheries development and confuse the fisherman who is urged to improve but finds obstacles in his way.

If appropriate institutional structures do not exist then other aspects of fisheries development are hindered. Laws and regulations relating to fisheries in select LDCs will be collected and examined for internal consistency and their relation to small scale fisheries. This aspect of the state-of-the-art study is not to be an examination of the internal efficiency of a particular agency. Rather, it will involve the design and development of alternative organizational and legal frameworks which will be of use to administrators, managers, and fishermen in small scale fisheries development. The identification of institutional constraints will result in the ability to analyze the implications to recommendations and alternatives in fisheries development. This will provide a basis for other LDC governments to evaluate their institutional policies as related to fisheries.

(4) Underutilization of food technology resulting in losses of available food

Most fisheries programs in LDCs have concentrated their efforts on increasing production but have not made major inroads in marketing, preserving, modifying or storing the products of agriculture and fisheries. The conversion of raw products to safe, utilizable products for human populations also has been somewhat neglected. Technology can be used to control losses in potential food products, to augment the utilization and distribution of foods and to develop materials which will better satisfy the food and nutrition requirements of individuals. In fact, food technology must serve as the link between crude agricultural (including aquatic) products and the consumable food products, i.e., it must join the efforts of agriculture and fisheries to the needs of the people.

Small scale fisheries systems have failed to fully utilize available fish. There have been high fish losses due to spoilage, waste, and within the marketing system. A reduction of losses and deterioration requires, among other things, that the following be known; where in the system they take place; what species of fish are most affected; what improvement could be made in the presently used methods of fish handling, processing and preservation; and what modification or upgrading of technology might be employed and at what cost. It is essential to determine the economic

feasibility of any proposed change. Another problem in the total utilization of fish is waste, which can approach 80 percent of production costs in many cases. Improper handling, processing, storage, and marketing can result in these high losses. Processes have been developed which help utilize waste efficiently as feed. Comminuted flesh can be produced resulting in an acceptable homogeneous product. In this way different species of fish can be mixed with different plant source proteins.

Many developed and LDC countries do not utilize trash fish or inedible species. It is a nutritional crime to have fish caught and thrown overboard because they happen to belong to the unfamiliar, non-commercial or trash fish category. Traditionally these species have been considered to be inedible. This concept is wrong. The fish are edible and various food products can be made from them. The utilization of under-exploited species will encourage conservation of the resource and will revitalize the decline and long-exploited familiar species. This problem exists all over the world. For example, in Central America, for every kilogram of shrimp caught, ten to fifteen kilograms of unwanted fish also are caught and thrown overboard to make room for the shrimp, which is mainly exported.

The work undertaken by this state-of-the art include a description of the technology and marketing practices for the utilization of fish from small scale fishermen in selected LDCs. Traditional methods of preservation will be compiled and evaluated to determine the need for technological modifications to the processes. Additionally, under-utilized fish resources will be quantified and recommendations will be made on how to best utilize this existing food resource. The result of these three investigations will allow the university to determine the opportunity for a modification of low-capital, high labor-intensive simplified methods for small scale fishermen. Investigative work will be performed with Auburn University and with selected LDC food technology institutions, such as: The Central Food Research Institute in Ghana; the Department of Food Science and Technology of the University of Khartoum in Sudan; the Institute of Food Research at Kasetsart University in Thailand; the Institute of Food Technology in Indonesia; ICAITI in Guatemala; and the Nutritional Food Technology Department in Chile.

(5) The high cost and unavailability of fishermen's supplies

The development of a small scale fisheries program implies, among other things, that fishermen become increasingly dependent upon those who sell nets, twine, hooks, engine parts, ice, and other supplies. A successful development effort requires expanding the availability of these supplies in order to avoid serious bottlenecks in the development process.

There are reasons to believe that, in some cases, the costs to fishermen of these supplies are higher than necessary. There can be several reasons for this. One frequently cited case is where the buyer of the fish also supplies the fisherman with his gear and other supplies. Such ties can result in the fisherman having to pay exorbitant prices for his supplies or being unable to find a source of supply. The work done by the university will lead to the development of techniques to determine the extent to which fishermen's supplies are overpriced or not available and to identify the causes of existing high prices and bottlenecks.

A description and assessment of the state-of-the-art of identifying the causes of and evaluating the extent of high prices and bottlenecks in the market for fishermen's supplies will be accomplished initially. A quantitative evaluation will follow to determine the extent of high prices and unavailability of these supplies. An identification of the causes will be made followed by a series of recommendations for small scale fisheries development policies.

b. Economics of small scale fisheries and aquaculture

This effort is expected to entail a series of studies designed to define the problem as well as assess the state-of-the-art. The University of Rhode Island will cooperate with Auburn and AID in the development of a set of interrelated national fisheries development policies which would lead to the adoption of country-specific policies resulting in incentives for fisherman and small farmers to increase fisheries production. Information on economics and marketing in small scale fisheries will be assembled and analyzed and attention will be directed to the role of existing and potential production on local diets and on price and income activities. The effect of production upon rural incomes and employment opportunities will also be examined. The studies will give attention to social factors which must be considered, e.g. fish products as a source of protein and also consumer acceptability. Plans will be developed for testing and dissemination of results, e.g., international workshops, special purpose training, etc. The specific inputs to this state-of-the-art effort that the University of Rhode Island proposes to undertake include the following:

(1) Lack of knowledge of demand for fish

Consumer demand for fish is a critical determinant of the success or failure of any fishery development project. Yet, very little systematic analysis has been performed on the demand for fishery products in LDCs. For the most part, what has been called "demand" has resulted from projections of population and per capita consumption. Occasionally income projections have played a role but only rarely have price responses been considered. Several reasons for this approach to these problems can be posited: lack of time, lack of data, and lack of skill or methods. Any of these reasons prove valid in various circumstances, but it is of concern that some of them have not been overcome.

In conjunction with other appropriate institutions and agencies the university will assess the state-of-the-art of demand analysis for fish products. This assessment will lead to the development of practical techniques for evaluating consumer demand for fish in existing and new markets. These techniques will be refined and a "package" will be available to perform demand analysis for fish in LDCs quickly and inexpensively. These analyses will be utilized to guide policy decisions regarding small scale fisheries development.

(2) Marketing systems as an impediment to fisheries development

In recent years a great deal has been written about the marketing of fisheries products. A large part of the writing has been polemic in nature, focusing on the power of the middleman, the failures of pricing systems, and high marketing margins among other matters. A few efforts have been made to evaluate the effectiveness of fish marketing systems, but these have rarely been complete enough to be useful. Yet attempts are and have been made to improve marketing systems without a clear view of what it is that is being changed or the functions that new systems must assume. Most present programs are based on a qualitative evaluation of the system.

To affect useful changes in the marketing, distribution, and pricing systems a careful assessment of the functions being performed; a clear relationship between these relationship and market structure; specific identification of those functions that can be altered or eliminated; and those changes in market structure that can improve its effectiveness.

Initially, the university proposes to survey existing fish marketing systems in LDCs. This will be followed by an assessment of the techniques for evaluating fish marketing systems in LDCs. This will be done in conjunction with appropriate institutions agencies, such as FAO, University of Washington, and donor foundations. Techniques will be developed to evaluate a fish marketing systems in LDCs. This will allow for the identification of the impediments to development in the fish market system and to suggest means for removing or circumventing them. With the knowledge gained from this work the university will be able to respond to the requests of LDCs and/or missions for assistance.

(3) Lack of information on costs and returns to small scale fishermen

Few small scale fishermen maintain financial records of there activities. Only the crudest information exists on their gross incomes and essentially no information exists on operating costs. As small scale fisheries develops the need increases for better information on fishermen's economic performances. Without adequate information on fishermen's costs and returns, it is virtually impossible to assess the impact of development efforts or the influence of resource management schemes. Information on costs and returns can be analyzed to prescribe beneficial changes in the types of vessels, gear, or techniques to be used and used to develop measures to serve as benchmarks for gauging the relative success of alternative development and management programs.

Available information about small scale fishermen's costs and returns will be collected, assessed, and analyzed. Following an approach derived from the assessment, information on costs and returns will be applied to various kinds of small scale fishing operations. A system will be developed for the routine collection of costs and returns information in order to allow for the ability to make better management decisions in small scale fisheries.

c. Knowledge transfer methodology for small scale fishermen

An effective means of achieving transfer of technology is basic to success in small-scale fisheries development. Difficulties have been experienced which are peculiar to fishermen regarding the determination of knowledge level for transfer, the training of fishermen to receive the transfer, and sustaining the use of the transferred technology. Education and training methodology for industrialized fisheries has been given considerable study, very little attention has been focussed on small scale fisheries aspects of training and transfer techniques. Various techniques have been tried in association with different investment programs. Although little recorded evidence of results is available, various reports indicate a low level of success.

The experience of multinational and bi-lateral agencies will be assessed and analyzed in order to document their experience in technology transfer. These will include FAO, and the development banks, in addition to such agencies as CIDA and NORAD. Close liaison will be maintained with Auburn University and their work on technology transfer with aquaculture, and with other U.S. institutions having experience in parallel cases.

In establishing the state-of-the-art regarding technology transfer to small scale fishermen the contact with other institutions and agencies will be focussed on the methods and mediums used and the level of success achieved. An effort will be made to develop a success factor to compare methodologies. Potential methods and mediums for higher success factors will be identified and tested as appropriate. A report will be prepared and distributed to agencies and institutions having an interest in small scale fisheries development. The report will emphasize those techniques and mediums leading to higher success factors in the transfer of technology to small scale fishermen. Additionally, a methodology will be developed that could be utilized by LDC governments and the missions.

2. Response capability

The component state-of-the-art studies will enable the University of Rhode Island to develop its knowledge and understanding of small scale fishermen. Additionally it will be cognizant of the potentials, impediments and possible solutions to these problems in small scale fisheries development. This will enable the university to respond to requests for technical assistance to LDCs. The university will continue to make available faculty

members from the full spectrum of applicable disciplines under separate contractual arrangements. The grant will, however, fund a small amount (\$20,000) of consulting time to be provided in situations where individuals are needed on very short notice and when other instruments cannot be used without causing unacceptable delay. The university will also compile a talent bank of professionals who will be able to fulfill requirements the university is unable to meet.

Release time provided by faculty members supported by the grant allows personnel substitution for classroom and laboratory duties for faculty members on off-campus LDC assignment. This will amount to approximately 14 man-months during the grant. This provision affords users of faculty resources a wide range of talent not otherwise available.

3. Information Capacity

Within the past year, the ICMRD library service was initiated. Its service to the ICMRD associates has been invaluable. Much of the literature of consequence in fisheries development is not produced and disseminated through normal publications channels. In consequence, few non-specialized libraries receive it; and if they do, they have no mechanism for cataloging, evaluating and retrieving it. The ICMRD library has established relations with more than 600 fisheries-related offices throughout the world in the interest of developing a broad information base. Several thousand documents have been analyzed and cataloged. Further, the library service has been filling requests from throughout the world. The University is providing separate space in a new addition to the library which will improve the ability of the ICMRD library to serve the student and faculty. However, the transition to new systems will require continuing support. The library has also been invaluable in the preparation of faculty prior to country visits, in undertaking research and in meeting the increasing number of requests from developing countries, international agencies and other American universities. The library's continued support is imperative to research and maintain the university's response capability.

4. Education and Training Capability

Limited funds have been included to define a package training exercise for application overseas in an LDC region different from the area where the innovative technique was developed. The source material will be an outgrowth of the work described under the extended knowledge base state-of-the-art studies, such as: assessing the demand for fish or assessing the supply of fish.

C. Budget

The budget for the grant extension includes annual expenditure estimates for the two-year period by inputs and outputs.

GRANT EXTENSION BUDGET

<u>Inputs</u>	<u>1st Grant Year</u>		<u>2nd Grant Year</u>		<u>Total</u>	
Salaries and wages	\$120,455		\$111,721		\$232,176	
Travel	24,000		30,000		54,000	
Graduate research assistants	33,545		32,279		65,824	
Equipment and supplies	5,000		8,000		13,000	
Library and publications	<u>17,000</u>		<u>18,000</u>		<u>35,000</u>	
Total Inputs	\$200,000		\$200,000		\$400,000	
<u>Outputs</u>	<u>(\$)</u> <u>(MM)</u>		<u>(\$)</u> <u>(MM)</u>		<u>(\$)</u> <u>(MM)</u>	
Expanded knowledge base	\$173,000	131	\$173,000	131	\$346,000	262
Response capability	10,000	7	10,000	7	20,000	14
Specialized training	2,000	1	2,000	1	4,000	2
Information capacity	<u>15,000</u>	<u>12</u>	<u>15,000</u>	<u>12</u>	<u>30,000</u>	<u>24</u>
Total outputs	\$200,000	151	\$200,000	151	\$400,000	302

VI. Complementary Actions and Management Considerations

The University of Rhode Island provided technical services to Zaire, Kenya, Tanzania, and Peru this year through its Basic Ordering Agreement No. 1079. The University expects that one or two long-term projects may result from this initial work. The Central American seminar that the university sponsored resulted in several requests from fisheries officials in that area. For example, one university staff member spent three months in Panama in an effort to determine the impediments to improving Panama's small scale fisheries. As noted in Section III, above, officials from Sri Lanka, Egypt, and Kenya have all indicated an interest in the further development of small scale fisheries. New emphasis will be given to small scale fisheries in L.A. with the creation of FAO's Inland Fisheries Body this year. In the Philippines, the AID mission is assisting with plans for the development of a College of Fisheries at Iloilo. The University may be involved with the development of a fisheries economic component to the curriculum.

The state-of-the-art efforts described in this grant project statement could not be conducted without the prior establishment of firm inter-institutional, international linkages. These linkages have been established by the University over a number of years through prior technical assistance efforts within the field and in various geographical regions. Particular attention will go to establishing and strengthening the links between the University of Rhode Island and Auburn University through specific collaborative work on issues and topics of mutual interest.

A major evaluation of the University's progress on its various state-of-the-art efforts will be conducted after one year. This will enable the Agency and the University to re-assess priorities in the field of small scale fisheries. The review will enable the Agency to evaluate the University's progress toward its objective of an expanded knowledge base in this field. Once the University has accomplished this objective, the utilization of this knowledge will be of primary importance. Small scale fisheries development projects are location specific and it will be appropriate for AID missions and other donor nations to utilize this expertise on a contractual basis. The review will also determine whether or not any further extension of 211(d) grant support will be needed after the second year of this proposed extension.

In AID's negotiations, the grantee will be apprised of the intent and importance of the Percy Amendment and urged to consider arranging, whenever feasible, for participation of women in substantive capacities in grant activities, e.g., in the technical staff resources to be utilized in the institution's several areas of response capability. These actions would serve to demonstrate the role of women to the LDCs.

The need to increase the world protein supply is most acute in LDCs. As a partial solution to this challenge there is a need to utilize existing resources more efficiently. Additionally, there is a need to assess potential resources from technical, social, and economic perspectives. The University of Rhode Island is prepared, with Agency involvement, to make informed assessments of potential and significant contributions to world protein supplies through small scale fisheries development.