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**OPTIMUM UTILIZATION OF WATER RESOURCES
FOR AGRICULTURE WITH SPECIAL EMPHASIS ON
"ON-FARM WATER MANAGEMENT"**

**Annual Technical Report
Utah State University--USAID
Contract AID/csd-2459**

**Logan, Utah
June 30, 1970**

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FOREWORD

This is the first annual technical report to be submitted under the Contract AID/csd-2459. A letter of May 23, 1969, signed by Dr. John A. Hannah of the United States Agency for International Development and countersigned by President Taggart of Utah State University on June 3, 1969, constitutes the Contract (see Appendix A).

USAID has been cooperating with several universities on research and training in the areas of water management for agricultural production. This cooperation has been implemented through a Consortium formalized May 12, 1967 (The Council of United States Universities for Soil and Water Development in Arid and Sub-Humid Areas). The University of Arizona, University of California, Colorado State University, and Utah State University are members. Although the several universities have separate contracts, the Council acts in an advisory capacity to each university.

Periodic meetings of the Council have been held where progress reports have been given and discussions held on problems encountered in initiating and conducting the Grant programs. Through discussions with USAID and members of the Council, it has been generally agreed that the major emphasis by Utah State University under the 211(d) Grant will be focused on "On-Farm Water Management for Increased Agricultural Production." This Grant is being administered by the Department of Agricultural and Irrigation Engineering at Utah State University as a complement to the AID/csd-2167 research contract.

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SUMMARY OF CONTRIBUTIONS TO THE UNIVERSITY CAPABILITY

General

In assessing the contributions from the Grant 211(d), it is evident after one year that many of the benefits are relatively intangible and some of the accomplishments are of a subtle nature. The program has increased the overall competence of the University far beyond that indicated by dollar input from the Grant. In giving support to the program, it was necessary for the University to invest some of its thinking, attention, and resources that would not otherwise have been directed to the water management program. These benefits are reflected in the new course offerings, library holdings, and services available to all students, the favorable influence on the professional attitude of the staff and an increase in their confidence and competence. The program has had a striking influence in establishing a close cooperation among staff members from different disciplines and departments as well as among their administrators. The net effect is that Utah State University is becoming a more attractive place for foreign and national students to come for this specialized training.

The plan envisioned for the year under review anticipated a major effort toward increased competence in teaching, research, and services rendered by the University and its staff. It was realized that some of the programs such as teaching and research would develop slowly whereas others including consulting, library, and services would be implemented rather quickly. The following is a brief summary of the progress made in the past year toward increased competence in "On-Farm Water Management for Increased Agricultural Production" at Utah State University in the Teaching, Research, and Consulting and Services programs initiated under the 211(d) Grant.

Teaching

As a direct result of the Grant, the course offerings in irrigation and soils were evaluated and are in the process of being revised. Evaluations of staff needs for teaching were made and a search begun for competent persons to fill these needs. As a result, Drs. David James and Eddie J. Middlebrooks were employed. To date, Dr. James has revised two courses, rewritten laboratory manuals, and begun the development of a text book. Dr. Middlebrooks will arrive early next fiscal year. Mr. Carlos Grassi, an irrigation engineer from South America, is expected to be involved in the program next year. He is trained in the United States and has had six years experience in Latin America as a principal in the Utah State CIDIAT program. He will be especially prepared to instruct the many students from Latin America that come to Utah State to study irrigation and soils.

Negotiations are under way for additional staff of recognized teaching ability and experience.

Research

Increased competence in research accompanies improvement in teaching. The new staff members employed will teach, conduct research, and direct the research of graduate students. Two new staff members, Dr. James and Dr. Middlebrooks, are excellent examples of good teachers and impressive researchers. Three graduate students are conducting their research under the direction of Dr. James. One is Adel Gonzalez, Dean, Faculty Agronomia, Palmira, Colombia. Dr. James is also instructing in a seminar for staff members being assigned to research projects in Latin America.

Two graduate students supported by the Grant are now prepared to go to Colombia and Bolivia to conduct their own research.

Consulting and Services

The Grant has contributed directly to increased competence in consulting, library, and services rendered by Utah State University as follows:

Consulting

Consulting has been encouraged, especially those consulting assignments concerned with land and water resource utilization in the developing countries. The number of competent staff who are negotiating for and preparing graduate students for research experience in Latin America has increased under the sponsorship of the Grant.

Library

Library activities and acquisitions have been greatly stimulated. Improved library holdings and services are acknowledged as direct benefits to the teaching, research, and consulting capabilities of the University. It was planned that the library holdings in irrigation, drainage, and related fields would be increased. Accordingly, the library staff first made a detailed inventory of the holdings in books, journals, and reference materials. It developed criteria for selecting new acquisitions, and began to procure these and the missing issues of the current holdings. In April, when William I. Palmer joined the program, he began working with the library staff and the research and teaching faculty in determining the acquisitions that are to be made. As of June 1, about \$4,000 of Grant funds had been expended on the library program. The Library Director has reported the University spent approximately \$10,000 in support of the program.

Language

Language competence of the staff is a direct benefit to the research and consulting services rendered by the University in Latin America. The Grant provided partial support to an intensive Spanish

training program. Daily instruction was given, four hours per day, five days per week for staff and graduate students with little or no knowledge of the language. The course was repeated three quarters during the regular school year. During the winter and spring quarter, a less intensive course of five hours per week was given at an intermediate level for those that had completed the elementary course. A total of 17 different persons participated in the program, with eleven completing the second level course. Included were several wives of staff members accepting foreign assignments.

All of the improvements in teaching, course revisions, consulting, library holdings and services, staff additions, etc., increase the capabilities of the University to render services to individuals, government agencies, private companies and students from foreign countries.

OBJECTIVES AND SCOPE

A listing of the objectives as contained in the Grant proposal are as follows:

The major objective of the Grant program is to increase and expand the existing competence of Utah State University in the science and technology concerned with "on-farm water management" with emphasis on the moisture environment on the farm, as related to the special characteristics and problems of the less developed countries. Increased competence will be developed in the teaching and research activities as follows:

1. Expand its full-time professional core staff which will focus its teaching and research activities on the technical disciplines which relate to maintenance of a proper moisture environment on the farm under less developed country conditions. These include irrigation and surface and subsurface drainage. Irrigation and drainage are complex arts requiring the application of the best knowledge of water, soil, climate, and crop sciences and engineering. Existing courses in this area will be reevaluated and restructured as appropriate. New graduate courses, special short courses, and seminars will be developed as required.
2. Expand its research in less developed countries to increase the knowledge and understanding of subjects such as water requirements of crops, moisture-fertilizer-crop response, management of irrigated soils, drainage requirements, salinity, water quality, movement of water in soils, methods of water application, management of irrigation water, and water-crop-soil system analysis.

3. Expand its total library holdings in irrigation and drainage and related disciplines, especially, foreign and international publications, so as to become a center of information on world irrigation and drainage practices.

While Utah State University has considerable ongoing competence in these areas at the present time, the expanded full-time professional staff, courses of study, library information, and research will enable the University to respond much more adequately than heretofore to requests concerning agricultural related water management problems from such entities as: USAID/Washington, USAID Missions, other state and federal agencies, other universities, educational groups, foreign governmental agencies, foreign water management institutions, local irrigation and drainage institutions, various business groups, various farm groups, and interested private citizens.

The increased interrelated teaching and research competence will include, but not be limited to, the following subjects as they relate to problems of the less developed countries:

1. Irrigation Practices. The theory and practice of maintaining the optimum moisture environment for plant growth by irrigation and drainage within the complex physical and institutional systems involved.
2. Drainage Theory and Practices. The investigation, design, and operation of drainage systems to assure the optimum soil-moisture environment and avoid or reduce flooding.
3. Water Resources Systems Simulation Engineering. Simulation of multi-purpose projects to provide adequate service for irrigation, drainage, flood prevention, and other purposes as related to on-farm water management.
4. Irrigation Science Research. The basics of consumptive use, infiltration, water physics, water quality, water-salt-soil interactions, within the framework of "on-farm water management" for maximum efficiency and economic returns.

5. Irrigation Economics. The economics of changing water management practices, costs, and economic efficiency of water utilization including the incremental value of water application and water application systems.

MAJOR ACCOMPLISHMENTS

Immediately after receiving word that a grant had been made to increase the competence of Utah State University in the area of "On-Farm Water Management." Members of the Department of Agricultural and Irrigation Engineering began an inventory of manpower needs and program innovations required within the department to accomplish the objectives of the program. The negotiations for the Grant were carried out under the leadership of the Department of Agricultural and Irrigation Engineering at Utah State University and the responsibility for directing the program was naturally delegated to this department. Interdepartmental meetings were held with related departments on campus to develop the interdisciplinary aspects of the program. Several meetings were held with the Departments of Soils and Meteorology, Civil Engineering, Agricultural Economics, Plant Science, Division of International Programs, and members of the Utah Water Research Laboratory. Each of these units gave consideration to all phases of the program including the training of graduate students so as to focus on the problems of on-farm water management. Active programs are under way and will be discussed in other sections of the report.

In the initial phases of implementing the 211(d) program, it was thought that the appointment of an advisory committee consisting of knowledgeable and informed people would help to implement the program by establishing campus policies and procedures and to serve as a review committee to look at accomplishments and to recommend realignments for continuing aims and objectives. This advisory committee was appointed and the following people agreed to serve: A. Alvin Bishop, Chairman; H. B. Peterson, Project Leader; Jay Bagley, Clark Ballard,

Allen LeBaron, R. L. Smith, Members; Bruce H. Anderson, Dean F. Peterson, and D. Wynne Thorne, Ex Officio Members.

A major objective for the first year was to increase the service and holdings of the library in the area of water management. Meetings were held with the university librarian and his staff, and plans were immediately put into operation for a strong program to build the competence of the library. The library program initiated has a double objective: (1) to increase the library holdings, and (2) to build the competence of the staff.

Consideration was given to the appropriate programs to be developed within the framework of the project and the following activities were given high priority. Identify, recruit, and employ new staff having outstanding knowledge, reputation, and prestige. Improve course offerings and teaching in all departments, strengthen research, organize and conduct seminars, develop publications and text books, make site visits to facilities of related institutions, confer with the faculty of other universities, improve the library, conduct language training, and introduce special services including T. V. programs, tapes, micro-filming, microfiche, computer, and related service.

The major accomplishments during the year have been subdivided into four groupings as suggested by Dr. Erven J. Long as follows: (a) Development of Teaching Competence, (b) Development of Research Competence, (c) Development of Competence for Consultations and Services, and (d) Involvement of Other University Resources. A discussion of each category is contained in the following report.

Development of Teaching Competence

A major effort was made to identify and obtain those capable and qualified individuals who would complement the existing staff members and increase the overall competence of the University in the area of on-farm water management for increased agricultural production. Leaders

in the field were identified and contacts were made with a number of these people to determine their interest in becoming a part of the Utah State University program. Those identified and contacted include Dr. Marvin E. Jensen, Dr. Warren A. Hall, Dr. Wayne D. Criddle, Dr. Lyman S. Willardson, Mr. William I. Palmer, Dr. Eddie J. Middlebrooks, and Dr. David W. James. Dr. James and Mr. Palmer have joined the staff and Dr. Middlebrooks will arrive in August. The curriculum vitae for Dr. James, Dr. Middlebrooks, and Mr. Palmer are included as Appendix B. Negotiations are still pending concerning others mentioned. Other individuals have been identified as having outstanding competence in this general area and will be approached. It is hoped to obtain the services of Mr. Carlos Grassi from South America some time near the end of 1970.

The orientation of new and existing staff concerning the aims and objectives of the Grant has progressed so as to concentrate their efforts on a comprehensive review of the existing courses being offered and emphasize other aspects of the program. New staff have provided needed supervision for graduate students including those already on campus and those being added as trainees. Some release time for existing staff members has been provided so that they can concentrate on the areas of curriculum improvement and to give thought to developing publications and text books. Under this program a slide service on sprinkler irrigation has been prepared. Dr. Keller is preparing circulars for use in seminars and training courses. One completed is, "Determining When to Irrigate Wheat." He has also started preparation of a text on methods of water application. This part of the program has progressed on a limited basis during the year, but is expected to be increased manifold during the next year or two.

Some travel has also been accomplished under the program. The Director made a trip to the universities of the California system for the express purpose of talking with staff members and inspecting laboratories and facilities in order to determine the strength and weaknesses of the

program at Utah State University. Contacts were made at the University of California at Los Angeles, the University of California at Riverside, the University of California at Davis, and Stanford University. The project Director also made a recruiting trip to Austin, Texas, to confer with people attending the Irrigation and Drainage Specialty Conference to determine their interest in being identified with the Utah State University program. Mr. Lloyd Myers, Chairman of the Executive Committee of the Irrigation and Drainage Division of the American Society of Civil Engineers, was contacted along with a number of members of the American Society of Civil Engineers in attendance at the Conference. The Dean of Engineering, Dr. Dean F. Peterson, and the Vice President for Research, Dr. D. Wynne Thorne, each made separate foreign trips, in connection with other international travel, to develop background information for various phases of the program (Appendix C).

During the year, particular emphasis has been given to the problems of increasing the effectiveness of the library to better serve the general area of on-farm water management, both in the teaching and the research field. A very vigorous program was initiated in the library by appointing Sally Lawler as a graduate assistant in the library staff to concentrate in this specific area of on-farm water management. Under the guidance of the university librarian and Carlo Mustonen of the library staff, a comprehensive inventory and listing of all library holdings in the area of on-farm water management and related fields was made. With a comprehensive bibliography of the existing library holdings as a beginning point, plans were made to identify and acquire those additional, vital publications in the field. Policies of acquisitions were established, and a vigorous program of acquisitions was under way by the close of the year. The recent addition of Mr. William I. Palmer to the staff of the Department of Agricultural and Irrigation Engineering gave considerable strength to the library program by bringing his knowledge and ability to aid in the identification, selection, and acquisition of library materials.

In connection with the library program, the University pledged to budget a substantial amount to give the program increased flexibility and allow the acquisitions of those additional materials that may be more remotely connected to the general area, but of significant importance to the departments cooperating in the program. Cooperation by the library staff has been excellent and it is expected that this program will be an important part of the total emphasis in the next year (see library report Appendix D).

Research Competence

Increasing the research competence of the University in the area of on-farm water management has been integrated with the program to increase teaching competence in this same general area. Utah State University has a large program in research in the area of on-farm management, including a sizeable contract with USAID, Contract Number AID/csd-2167. Significant programs are also progressing under the general sponsorship of the Utah Agricultural Experiment Station and with Federal Water Quality Administration contracts concerned with water quality and irrigation return flow. These existing programs provide a substantial base for the training of graduate students who are being sponsored under the 211(d) Grant in research methods and ideas, especially, the Contract AID/csd-2167 where the graduate students may actually become involved in work in the foreign countries concerned with water management research to increase agricultural production.

A major effort in the research area has been directed toward the selection of a competent staff to direct and train graduate students and to actively engage in the work of the research under way. Dr. David James has been added to the staff and Dr. Middlebrooks will be joining the staff under the program later this year.

The selection, advising, and training of graduate students in the problems of water management has received increasing emphasis. Three graduate students have joined the program during the past year,

James Hardee, Thomas White, and Mike Moynahan. Additional graduate students have been identified and are expected to bring the program to full strength by next year.

In order to increase the competence of both staff and graduate student trainees for research in foreign countries, especially South America, an intensive language training program was initiated early in the year. The staff receiving intensive language training include the following: Dr. E. C. Olsen, III, Dr. Bruce H. Anderson, Dr. David R. Daines, Dr. Bert Embry, Professor Richard E. Griffin (Portuguese), Dr. James H. Milligan, Dr. Earl Israelsen, and Professor Spencer H. Daines. Graduate students participating in the intensive language training program include: Kern Stutler, James Hardee, Darrell Watts, and Lloyd Austin. A more detailed account of the intensive language training program is contained in the Department Head's report (see Appendix E).

A major effort has been made to coordinate the work of the 211(d) program with that of the research contract in order to provide an opportunity for graduate students to work overseas. This has been accomplished in the past year with Mr. Kern Stutler working on the evapotranspiration and water requirement for crops phase of the research contract in Venezuela and Colombia culminating in his Master's degree work which is now completed. Mr. Darrel Watts is working on another phase of the research contract concerned with the drainage and salinity problems of the Atlantico 3 project in Colombia and it is expected from his work he will develop an area for his Ph. D. dissertation. The research competence of the staff has also been increased by participating in seminars in Latin America presented by staff members as consultants to the AID research contract. Particular mention should be made of the research training seminar conducted in Brazil by Dr. H. B. Peterson, Professor Richard E. Griffin, and Professor Rex Nielson. Other members of the staff have been engaged in research consulting including Professor J. E. Christiansen, Dr. E. C. Olsen, Dr. David W. James, Dr. Allen LeBaron, etc.

Consulting

During the year the University has been able to give increased emphasis and encouragement to staff members to offer consulting advice and services in the field of on-farm water management and closely related areas. Although a major part of the consulting work has been in relationship to the AID Research Contract (AID/csd-2167), a considerable amount of consulting time has been spent in relationship to other work not related to the research contract. The following staff members have provided consulting services in the area of on-farm water management to foreign organizations, foreign countries, and the USAID research contract (AID/csd-2167). A brief listing of the staff and their consulting assignments follow.

Anderson, Bruce H. August 26 to October 5, 1969 (39 days) to Venezuela, Colombia, and Brazil. November 16 to December 2, 1969 (16 days), travel for OAS to Venezuela. April 5 to May 1, 1970 (26 days) travel for OAS to Venezuela, Colombia, Ecuador, Canal Zone, and El Salvador.

Bishop, A. Alvin. February, March, and April, 1970 (65 days) personal contract/AID on NESA Irrigation Practices Seminar. Visited Ceylon, India, Nepal, Pakistan, Afghanistan, Iran, Saudi Arabia, Jordan, Lebanon, Turkey, and Cyprus.

Christiansen, Jerald E. June 16 to July 30, 1969 (44 days) to Guatemala, San Salvador, Panama, Venezuela, Peru, and Chile. November 4 to December 12, 1969 (38 days) travel for OAS to Venezuela and Argentina. March 21 to April 2, 1970 (14 days) travel for OAS to Venezuela.

Daines, David R. May 4 to May 19, 1970 (15 days) to Bolivia.

Griffin, Richard E. February 24 to March 13, 1970 (17 days) to Venezuela, Colombia, and Brazil.

Israelsen, Earl. April 5 to 16, 1970 (11 days) travel for OAS to Venezuela and Brazil.

Keller, Jack. June 28 to July 4, 1969 (6 days) private consulting to Honduras. July 23 to August 21, 1969 (30 days) private consulting to Iran and Libya. February 25 to 28, 1970 (3 days) private consulting to Canada. May 15 to 28, 1970 (18 days) private consulting to Paraguay.

LeBaron, Allen. October 9 to 23, 1969 (14 days) travel for OAS to Venezuela. May 30 to July 2, 1970 (34 days) to Bolivia, Ecuador, Colombia, and Venezuela.

Nielson, Rex. August 26 to October 5, 1969 (40 days) to Colombia, Venezuela, and Brazil. February 24 to March 13, 1970 (41 days) to Venezuela, Colombia, and Brazil.

Olsen, Edwin C., III. June 17 to September 15, 1969 (90 days) to Chile. March 17 to 28, 1970 (11 days) to Colombia.

Peterson, Dean F., Jr. June 30 to July 1, October 27 to 28, 1969 (4 days) to Paris as U. S. Delegate to UNESCO, International Hydrological Decade, and December 8 to 19 (11 days) to Paris Seventh Meeting of the Bureau of Coordinating Council (IHD). April 1970 (30 days) to Iran as Team Leader of U. S. State Department Team to report on Water Resources Planning for Government of Iran.

Peterson, Howard B. August 26 to October 5, 1969 (40 days) to Colombia, Venezuela, and Brazil. February 24 to March 21, 1970 (25 days) to Brazil, Chile, and Venezuela.

Thorne, D. Wynne. September and October, 1969 (30 days) private consulting for Parsons in India. For 211(d) travel, see Appendix C.

Wennergren, E. Boyd. May 16 to July 2, 1970 (48 days) to Bolivia, Ecuador, Colombia, and Venezuela.

The increased effectiveness of the Utah State University consultants in the field of on-farm water management has been augmented by the language training program initiated as part of the Grant to offer intensive language training for staff members who intend to serve overseas on short or long term programs.

University's Contribution

During the first year of the Grant, the University has placed considerable emphasis on increasing its competence in the area of on-farm water management. A few of the University's contributions include:

1. Plans for modernizing the irrigation laboratory in the Department of Agricultural and Irrigation Engineering at a cost of some \$40,000. The laboratory requirements and needs have changed considerably in the last ten years, and the existing laboratories are too small and incomplete for the modern program now being offered. A new and larger room in the Engineering Building has been assigned for the development of a modern irrigation laboratory. The plans for the proposed remodeling work are nearly completed and work is expected to be finished for classes during the 1970-71 school year.

2. The University provided a special laboratory and work room in the Agricultural Science Building for the staff and graduate students in Agricultural Economics. This area is for those directly related to the research and teaching program in water management.

3. The University realizes that a modern and complete library is essential to any program of competence, and the staff of the library and the resources of the institution have been pledged towards identifying and acquiring those essential writings, bulletins, texts, and other materials in the field of on-farm water management essential to a viable program. The library has budgeted matching funds for acquisition of library materials and has assigned staff to this particular program, and a vigorous program is under way as discussed above under "Development of Teaching Competence." The Director of the Library estimated a University contribution of \$10,267 (see Appendix D).

4. Staff time has also been assigned to aid in the initiation of the Grant. The time of the Project Director and closely associated project leaders has been paid from University funds. In addition, office space, equipment, materials, etc., have been provided for the use of staff being employed or assigned to the project. The advisory committee, consisting of the University staff, has served without additional compensation to recommend plans and objectives for the project and to establish policies and procedures for augmenting the program to maximize the facilities of the University and the capability of the staff.

Associated departments have also contributed greatly, especially the Departments of Soils and Meteorology, Agricultural Economics, Civil Engineering, and Language. Personnel of the Utah Water Research Laboratory, and the Office of International Programs have devoted their time to assist in solving problems and given added support. In order to build a lasting competence, the University has provided budgetary support to pay part of the salaries of the new staff added under the Grant. The two men now employed on the project have half of their salary being paid from University funds or other sources. Additional financial support is provided to the trainees who have had their out-of-state tuition fees waived in order to reduce the cost of the program.

EXPENDITURES

The approximate expenditures during the year are indicated, for the various categories, in Table 1. The exact amounts will not be available until the Controller's books are closed about July 1, 1970. Expenditures in each category were less than indicated in the original budget. Extreme caution was exercised during the first year to insure that proper policies and procedures were established and understood before obligations were made.

Expenses for professional services were far below estimates. This resulted for several reasons. In one instance a senior professional was selected, recruited, and all negotiations apparently completed when he accepted a special assignment for the U. S. Government. In another instance the man was employed, but his arrival date was delayed. In all instances, new positions have been supported only partially from the Grant with a maximum of one-half.

A minimum amount was expended for international travel. Most travel expenses were charged to other programs or shared in two instances. Dean F. Peterson spent \$47.65 on December 20, 1969, for a visit to The Netherlands University Foundation for international cooperation in order to establish cooperative relations and obtain ideas for the improvement of the Utah State University program (see Appendix C). During September and October, 1969, while on an extended assignment, Dr. D. W. Thorne made a visit to Rome and Tokyo in order to collect information related to farm planning management of small farms and equipment for use on small irrigated farms. He spent \$120.64. (See Appendix C for his report.)

There were no expenditures for capital items during the first year of the program. There will be a modest expenditure as soon as students are approved for specific research in Latin American countries.

Table 1. Expended and anticipated expenditures, Utah State University Institutional Grant.

Item	1st Year	2nd Year	3rd Year	4th Year	5th Year	TOTALS
Salaries and Wages						
Professional Staff	15,000	75,000	100,000	90,000	90,000	370,000
Sub-Professional	1,500	8,500	8,000	8,000	9,000	35,000
Stipends	3,550	28,000	32,000	32,700	33,350	129,600
Tuition and Fees	825	5,900	6,500	7,675	8,250	29,150
Travel						
Foreign	168	20,000	24,900	22,932	17,000	85,000
Domestic	463	1,900	1,837	2,400	1,600	8,200
Equipment	--	6,500	2,000	--	--	8,500
Supplies and Computer Use	350	11,000	12,500	13,500	10,650	48,000
Library and Publications						
Acquisitions	4,000	7,750	4,000	2,000	1,000	18,750
Publications	--	2,600	4,200	5,000	6,000	17,800
TOTALS	25,856	167,150	195,937	184,207	176,850	750,000

WORK PLAN AND BUDGET FORECAST

There has been no major change in the work plan presented in the original proposal. Expenditures the first year were less than anticipated primarily because we were overly optimistic about the rate at which the program could be implemented. It is expected that the rate of implementation of the overall program will be much faster the second year than during the initial period of the Grant.

The anticipated expenditures during Fiscal Year 1969 are itemized in Table 1 along with the expected expenditures during the remaining years.

Professional Staff

It is planned that additional staff members will be employed and the number of full time equivalents of four will be on duty. Selections have been made and negotiations are in progress. The new members are anticipated for the Departments of Agricultural Economics and Agricultural and Irrigation Engineering.

Graduate Students

Three new graduate students will begin training. The University has increased the amount of its stipends which will make the program much more attractive to graduate students with dependents. Stipends of \$2400 per year were not sufficient to attract qualified married students.

Plans have been completed for two of the present graduate students to conduct their research in Latin American countries during the first six months of the coming fiscal year. Arrangements will be made for the others in the program to conduct their research in foreign countries. (We have found by experience it is not possible to get approvals for

students to study in foreign countries as readily as desirable for the student's schedule. This is one reason for our rather low expenditures and implementation of the student portion of the program.)

Language

The intensive language course will be continued about at the same level of expenditure as during the first year. Arrangements have been made with the Language Department for the continuation of the service for staff and students. This portion of our program was very successful during the first year. It certainly helped to prepare students and staff for research and consulting in Latin America.

Library

The original plan was to greatly increase the library acquisitions during the first and second years. This the library is prepared to do and so plans as indicated in the detailed report prepared for the Program Director. Professor Palmer of the Department of Agricultural and Irrigation Engineering will work closely with the library and research and teaching staff of the University in the selection of new library holdings. The report from the Library Director (Appendix D), indicates the plans for the next year's program.

Seminars

A "Water Resources Planning Seminar with Emphasis on Developing Countries" was planned for June 8-20, 1970. The principal participant, Dr. Wiener, was not able to meet the schedule so this has been postponed for one year. The program as advertised is:

The seminar is built around a forthcoming book by Dr. Wiener entitled, "The Role of Water in Development." Dr. Wiener, a widely sought consultant in the field of water resources, will present a series of lectures during the seminar. These will

be interspersed with presentations by the other principals as indicated below, although not necessarily in the order shown. A complete curriculum will be furnished separately upon request.

- A. A. Bishop, Ph. D., "Water Planning and Management for Agricultural Systems"
- D. G. Chadwick, "Hydrologic Monitoring Systems--an Aid to Water Planning and Management"
- C. G. Clyde, Ph. D., "Optimum Operation of Desalting Plants as a Supplemental Source of Firm Yield"
- D. R. Daines, "Formulation and Administration of Water Codes in Developing Countries"
- E. C. Olsen, III, and J. Keller, "Sprinkler Irrigation for New Agricultural Projects in Developing Countries"
- W. Palmer, "Planning of Small Projects and Small Farm Units" and "Economic Standards in Project Planning"
- D. F. Peterson, Jr., Ph. D., "Broad Goals of Water Resource Development"
- J. P. Riley, Ph. D., "Hybrid Computer Simulation of Water Resource Systems"

In addition to the above seminar, there will be several short seminars for local staff and graduates as was the case during the past year. They deal with such topics as "Research Methods," "Social Problems," etc., for those working in developing countries.

APPENDICES

Appendix A.

Contract

DEPARTMENT OF STATE
 AGENCY FOR INTERNATIONAL DEVELOPMENT
 WASHINGTON, D. C. 20523

OFFICE OF
 THE ADMINISTRATOR

Mr. Glen L. Taggart
 President
 Utah State University
 Logan, Utah 84321

MAY 23 1969

Dear Mr. Taggart:

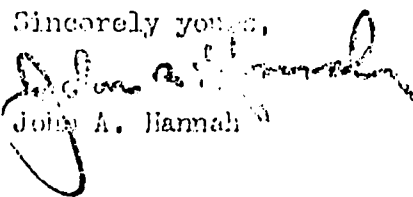
I am pleased to inform you that pursuant to the authority contained in Section 201(i) of the Foreign Assistance Act of 1961, as amended, Grant No. AID/csd-2459 in the amount of \$750,000 is made hereby to Utah State University. This grant is for the purpose of implementing the project "Optimum Utilization of Water for Agriculture with Emphasis on 'On-Farm Water Management'", as set forth in the final proposal, dated April 23, 1969, and agreed to by A.I.D. and the Utah State University.

The grant funds are obligated as of the date of this letter, and shall apply to costs incurred in furtherance of the project for five years.

This grant is made by A.I.D. to the Utah State University on condition that the Grantee shall administer the funds provided under this grant in accordance with the terms and conditions set forth in the final proposal, Special Provisions and Administration of A.I.D. Grants attached hereto and made a part hereof.

Please acknowledge this grant by signing the original and six (6) copies of this letter and one copy of the Assurance of Compliance. Please return all documents to the Grant Officer.

Sincerely yours,


 John A. Hannah

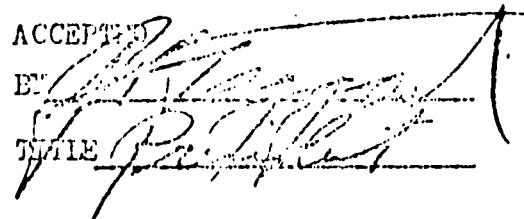
Attachments:

1. Final Proposal
2. Assurance of Compliance
3. Special Provisions
4. Administration of A.I.D. Grants
5. Budget

ACCEPTED

BY

TITLE



Appendix B.

New Staff

DAVID WINSTON JAMES
Associate Professor

Date and Place of Birth

Marital Status

Married, six children

Degrees

B. S.	Utah State University, June 1956
M. S.	Utah State University, June 1957
Ph. D.	Oregon State University, June 1962

Scholastic and Scientific Honor Societies

Alpha Zeta
Sigma Xi
Phi Kappa Phi

Other Recognition

Listed in: American Men of Science
Who's Who in the West

Professional Society Affiliations

Western Society of Soil Science
Soil Science Society of America
American Society of Agronomy
American Society of Sugar Beet Technologists

Research Fellowships

1956-57	Utah State University
1957-61	Oregon State University

Teaching Experience

1961-62	Teaching assistant, Oregon State University
1969-present	Associate Professor, Utah State University

Research Experience

1956-57 Research Assistant, Utah State University
 1957-62 Research Assistant, Oregon State University
 1962-67 Assistant Soil Scientist, Washington State University
 1967-69 Associate Soil Scientist, Washington State University
 Stationed at the Irrigated Agriculture Research and
 Extension Center, Prosser, Washington

Publications

- Mechanism of NH_3 adsorption by montmorillonite and kaolinite.
 D. W. James and M. E. Harward. *Clays and Clay Minerals*
 11:301-320. 1963.
- Competition of NH_3 and H_2O for adsorption sites on clay minerals.
 D. W. James and M. E. Harward. *Proc. Soil Sci. Am.*
 28:636-640. 1964.
- The place for boron fertilizer in central Washington field crop
 production. D. W. James and W. H. Weaver. *Wash. State*
Un. Ext. Mimeo #2518. 1964.
- Assessing the potassium fertilizer requirements of sugar beets.
 D. W. James. *Proc. 15th An. Fert. Conf. Pac. Northwest.*
 1964.
- Fertilization of sugar beets: Optimum fertility levels for maximum
 sugar yield. D. W. James. *Proc. 17th An. Fert. Conf.*
Pac. Northwest. 1966.
- Growing sugar beets for maximum sugar production. D. W. James.
Wash. Ag. Exp. Sta. Circ. 464. 1966.
- Sulfur deficiency of sugar beets. G. E. Leggett, B. A. Stewart,
 and D. W. James. *Proc. 17th An. Fert. Con. Pac. Northwest.*
 1966.
- Nitrogen rate crucial in beet sugar content. D. W. James. *Crops*
and Soils Magazine 19:24. 1967.
- Studies on potassium in central Washington soils. D. W. James.
Proc. 18th An. Fert. Conf. Pac. Northwest. 1967.
- Phosphorus fertility relationships of central Washington irrigated soils
 with special emphasis on exposed calcareous subsoils. D. W.
 James, G. E. Leggett, and A. I. Dow. *Wash. Ag. Exp. Sta.*
Bul. 688. 1967.

- Effect of molybdenum and lime on the growth and molybdenum content of alfalfa grown on acid soils. D. W. James, T. L. Jackson, and M. E. Harward. *Soil Science* 105:397-402. 1967.
- Soil testing for residual nitrates as a guide for nitrogen fertilization of sugar beets. D. W. James, C. E. Nelson, and A. R. Halvorsen. *Wash. Ag. Exp. Sta. Circ.* 480. 1967.
- Predicting the nitrogen fertilizer requirements of sugar beets grown in central Washington: 1967 research results. D. W. James, D. C. Kidman, et al. *Wash. Ag. Exp. Sta. Circ.* 488. 1968.
- Potassium fertilization of sugar beets in central Washington. D. W. James and D. C. Kidman. *Jour. Am. Soc. Sugar Beet Tech.* 14:682-694. 1968.
- Soil test index of plant available potassium and the effects of cropping and fertilization in central Washington irrigated soils. D. W. James, W. H. Weaver, and R. L. Reeder. *Wash. Ag. Exp. Sta. Bul.* 697. 1968.
- Sources of soil variation in the field. D. W. James and A. R. Halvorsen. *Proc. 19th An. Fert. Conf. Pac. Northwest.* 1968.
- Potassium in arid region soils. D. W. James. *Proc. 20th Annual Fert. Conf. Pac. Northwest, Spokane, Washington.* July 1969.
- Factors affecting chloride uptake and implications of the chloride-nitrate antagonism in sugar beet mineral nutrition. D. W. James, D. C. Kidman, et al. *Journ. Am. Soc. Sugar Beet Tech.* 15:647-656. 1970.
- Chloride uptake by potatoes and the effects of potassium chloride, nitrogen and phosphorus fertilization. D. W. James, W. H. Weaver, and R. L. Reeder. *Soil Science* 109:48-52. 1970.
- Phosphorus and potassium nutrition of sugar beets. W. R. Schmehl and D. W. James. *In Sugar Beet Production--Principles and Practices.* R. T. Johnson, G. E. Rush, and J. T. Alexander (editors). Iowa State College Press. 1970.
- Potassium in arid region soils. D. W. James. *Better Crops Magazine* 54(1):22-25. 1970.

EDDIE JOE MIDDLEBROOKS
Professor

Date and Place of Birth

Marital Status

Married 1958, one child, Tracey, age 8

Degrees

B. C. E. University of Florida, January 1956
M. S. E. University of Florida, August 1960
Ph. D. Mississippi State University, May 1966.

Scholastic Honor Societies

Tau Betta Pi
Sigma Tau

Professional Societies

American Society of Civil Engineers (Member)
Member of various section committees
American Water Works Association
Member Section Education Committee
Water Pollution Control Federation
American Association for the Advancement of Science
American Association of Professors in Sanitary Engineering
American Society of Limnology and Oceanography
International Association on Water Pollution Research

Professional Registration

Registered Professional Engineer, State of Arizona,
Certificate Number 5222
Registered Professional Engineer, State of Mississippi,
Certificate Number 2804
Registered Land Surveyor, State of Florida,
Certificate Number 1623

Awards

Harrison Prescott Eddy Medal, 1969
Special Post Doctoral Fellowship, FWPCA, 1967
INFILCO Research Scholarship, 1961
LOVETT Scholarship Award, 1955

Teaching Experience

- 1959-60 University of Florida, Graduate Teaching Assistant. Taught: Surveying (undergraduate lecture and laboratory).
- 1960-61 University of Arizona, Research Assistant. Taught. Sanitary Analysis (upper division and graduate).
- 1962-68 Mississippi State University, Assistant and Associate Professor. Taught: Public Health Engineering-- Environmental Sanitation (upper division and graduate); Sanitary Engineering Design (upper division and graduate); Sanitary Analysis (upper division and graduate); Environmental Radioactivity (graduate); Unit Operations and Processes of Wastewater Treatment (graduate); Unit Operations and Processes Laboratory (graduate); Thesis Director (10 M.S. and 1 Ph. D.); and Hydraulics (upper division).

Professional and Consulting Experience

- 1954-56 Operator-Technician. University of Florida Sewage Treatment Plant which involved operation and control of plant as well as performing chemical and biological analyses necessary to evaluate plant performance.
- 1955 (summer) Field Engineer, Ivy Brothers Construction Company. Building location and layout, supervision of foundation construction, and construction cost studies.
- 1956-58 Assistant Sanitary Engineer, U. S. Public Health Service. Water supply research and development of emergency water supply processes and procedures. Instructor in Civil Defense course on emergency procedures for water supplies.
- 1958-59 Field Engineer, T. T. Jones Construction Company. Economic evaluation of construction procedures, scheduling operations and purchasing material, hiring personnel, and renting equipment to insure that schedules were maintained. Reinforced concrete form design and cost estimating.
- 1963 (summer) Sanitary Engineer, U. S. Public Health Service, Hattiesburg, Mississippi. Performing public education services and off-site radiological safety activities for the AEC Project Dribble (part of Plowshare program).
- 1962-67 Consultant to numerous engineering firms and industries involved in the design of water and wastewater collection, distribution, and treatment facilities. Firms consultant to include:

- a. Lester Engineering Company, Jackson, Mississippi; study of wastewater treatment needs for City of Jackson; sewer corrosion in Biloxi, Mississippi wastewater collection system; and numerous sewerage designs.
 - b. Michael Baker, Jr., Inc., Jackson, Mississippi; encrustation removal in industrial water supplies and design of small sewage treatment facilities.
 - c. Water Systems Engineering, West Point, Mississippi; design of numerous rural water distribution systems including the design of the largest (1966) rural water distribution system in the USA.
 - d. Gulfport Creosoting Company, Gulfport, Mississippi; waste treatment study and design of treatment facility.
 - e. M-P Cotton Felt Company, Houston, Mississippi; development of quality control laboratory.
 - f. Springer and Associates, Starkville, Mississippi; design of water and wastewater systems and iron removal water treatment plants.
 - g. International Paper Company, Mobile, Alabama; evaluation of secondary treatment processes for wastewater stream.
- 1967-present Consultant to Engineering-Science, Inc., Oakland, California; involved in preparation of proposals to study and evaluate various new and unique wastewater treatment processes.
- 1967-present Special Consultant to Lake Tahoe Area Council Board of Consultants; involved in the review and evaluation of the most satisfactory and reproducible bioassay technique for assessment of biostimulatory properties on the stimulation of algal growth, and an attempt to evaluate these effects with reference to Lake Tahoe and the control of eutrophication.
- 1967-present Assisting Joint Industry-Government Task Force on Eutrophication; develop provisional algal assay procedures.
- 1969 Consultant to City of San Francisco Civil Service Commission in selecting managerial employees in the water department.

Research Experience

- 1956-57 Assistant Sanitary Engineer, U. S. Public Health Service. Statistical study of coliform removal by water treatment plants.

- 1959-60 Graduate Student, University of Florida. Study of emergency water treatment by chemical coagulation.
- 1960-61 Research Assistant, University of Arizona. Kinetics of the extended aeration activated sludge sewage treatment process.
- 1962-67 Assistant and Associate Professor, Mississippi State University. Directed and conducted research studies of various aspects of wastewater treatment, environmental radioactivity, biological kinetics, and industrial waste treatment.
- 1967 Special Post Doctoral Research Fellow, sponsored by FWPCA, University of California, Berkeley. Kinetics of algal growth, and assessment and control of eutrophication.
- 1968-present Associate Research Engineer III and Assistant Director, Sanitary Engineering Research Laboratory, University of California. Research activities outlined for special fellowship period have continued and have been expanded to include the role of sediment-water nutrient interchange and its role in eutrophication of lakes.
- 1969 Conference Manager for Eutrophication-Biostimulation Assessment Workshop, 19-20 June 1969 sponsored jointly by SERL and FWPCA and editor of Conference Proceedings.

Publications and Reports

- "Can Competitive Bidding Provide Professional Engineering Services," Middlebrooks, E. J., Civil Engineering, 27, 7, (1957).
- "Recording Bacteriological Data," Middlebrooks, E. J. and Walton, Graham, Journal American Water Works Association, 49, 4, 457, (1957).
- "A Study of Batch Coagulation for Emergency Water Supply," Middlebrooks, E. J., Master's Thesis, University of Florida, Gainesville, Florida, (1960).
- "Planning for Disaster," Middlebrooks, E. J., Water and Sewage Works, 111, Reference No., (1964).
- "Tables for Depth Before Hydraulic Jump," Middlebrooks, E. J. and Corey, M. W., Water and Sewage Works, 111, 10, 466, (1964).
- "Sludge Accumulation in Municipal Sewage Lagoons," Middlebrooks, E. J., Panagiotou, A. J., and Williford, H. K., Water and Sewage Works, 112, 2, 63, (1965).

- "Taste and Odor Control in Water," Middlebrooks, E. J., Public Works, 96, 4, 127, (1965).
- "A Monograph for Solution of the BOD Equation," Middlebrooks, E. J., Water and Sewage Works, 112, Reference No., (1965).
- "Taste and Odor Control," Middlebrooks, E. J., Water and Sewage Works, 112, Reference No., (1965). Reprinted in Wallerstein Lab. Notes, (1967).
- "Radioactive Equilibrium Time," Goldsmith, W. A. and Middlebrooks, E. J., Journal Sanitary Engineering Division, American Society of Civil Engineers, 92, SA6, (1966).
- "Decontamination of Radioactively Contaminated Water by Slurrying with Yazoo and Zilpha Clays," Goldsmith, W. A. and Middlebrooks, E. J., Proceedings Mississippi Water Resource Conference, pg. 59, (1966).
- "Design Parameters for Rural Water Distribution Systems," Ginn, H. W., Corey, M. W., and Middlebrooks, E. J., Journal American Water Works Association, 58, 12, 1595, (1966).
- Pipe Condition Survey, City of Biloxi Sanitary Sewage System, Lester, Horace B. and Middlebrooks, E. J., Lester Engineering Company, Jackson, Mississippi, (1966).
- "Kinetics of the Extended Aeration Activated Sludge Sewage Treatment Process," Middlebrooks, E. J., Doctoral Dissertation, Mississippi State University, State College, Mississippi, (1966).
- "Radioactive Decontamination by Slurrying with Yazoo and Silpha Clays," Goldsmith, W. A. and Middlebrooks, E. J., Journal American Water Works Association, 58, 8, (1966).
- "Upstream and Downstream Conjugate Depth Tables for Hydraulic Jump in Circular and Trapezoidal Channels," Denson, K. H., Middlebrooks, E. J., and Kuo, S. S., Water and Sewage Works, 114, Reference No., R240, (1967).
- "Performance of Field-Scale Facultative Wastewater Lagoons," Williford, H. K. and Middlebrooks, E. J., Journal Water Pollution Control Federation, 39, 12, 2008, (1967).
- "Review of Theory and Control of Corrosion," Weers, W. A. and Middlebrooks, E. J., Water and Sewage Works, 114, 156, (1967). Reprinted in Reference No., (1967).

"Kinetics of Extended Aeration Activated Sludge," Middlebrooks, E. J., Presented at Annual ACS Meeting, 1967, Chicago, Illinois, Symposium on Mixed Culture Kinetics.

Removal of Radioisotopes from Water by Slurrying with Yazoo and Silpha Clays, Sumrall, C. L. and Middlebrooks, E. J., Water Resource Research Institute, Mississippi State University, State College, Mississippi, (1967).

Effects of Concentration and Slurrying Time on the Removal of Radioisotopes from Water, Sumrall, C. L. and Middlebrooks, E. J., Water Resources Research Institute, Mississippi State University, State College, Mississippi, (1967).

Mathematical Models of the Step-Aeration Process, Lipscomb, Paul B. and Middlebrooks, E. J., Engineering and Industrial Research Station, Mississippi State University, State College, Mississippi, (1967).

Checking the Correctness of Water Analyses with Freezing Point Depressions, Hobson, J. H. and Middlebrooks, E. J., Water Resources Research Institute, Mississippi State University, State College, Mississippi, (1967).

Denitrification in Field Scale Extended Aeration Systems, Neal, R. C. and Middlebrooks, E. J., Engineering and Industrial Research Station, Mississippi State University, State College, Mississippi, (1967).

Polysaccharides in Field Scale Extended Aeration Systems, Phillips, J. L. and Middlebrooks, E. J., Engineering and Industrial Research Station, Mississippi State University, State College, Mississippi, (1967).

An Evaluation of High Temperature Waste Treatment Processes, directed by E. J. Middlebrooks, Engineering and Industrial Research Station, Mississippi State University, State College, Mississippi, (1967).

"Removal of Radioisotopes from Water by Slurrying with Yazoo and Silpha Clays," Sumrall, C. L. and Middlebrooks, E. J., Journal American Water Works Association, 60, 4, (1968).

"Wastes from the Preservation of Wood," Middlebrooks, E. J., Journal Sanitary Engineering Division, American Society of Civil Engineers, 94, SA1, (1968).

- *"Kinetics of Model and Field Extended-Aeration Units," Middlebrooks, E. J. and Garland, C. F., Journal Water Pollution Control Federation, 40, 4, 586, (1968).
- "Combined Wood Storage and Waste Treatment for the Paper Industry," Middlebrooks, E. J., Breland, E. D., Coogan, F. J., and Shell, B. J., Journal Technical Association of the Pulp and Paper Industry, 51, July (1968).
- "Wastes from the Preservation of Wood," Middlebrooks, E. J. and Pearson, E. A., Proceedings of the Twenty-Third Industrial Waste Conference, Purdue University, Lafayette, Indiana, (1968).
- "Continuous Flow Chemostat Test--Provisional Algal Assay Procedures," Pearson, E. A., Aleti, A., and Middlebrooks, E. J., for Joint Government-Industry Eutrophication Committee on Methods, June (1968).
- "Eutrophication of Surface Waters--Lake Tahoe--Bioassay of Nutrient Sources, First Progress Report, McGauhey, P. H., Rohlich, G. A., Pearson, E. A., Tunzi, M., Aleti, A., and Middlebrooks, E. J., Lake Tahoe Area Council, for Federal Water Pollution Control Administration, FWPCA Grant No. WPD 48-01-(R1), (1968).
- "Treatment of Kraft Mill Waste with a Plastic Media Trickling Filter," Middlebrooks, E. J. and Coogan, Frank J., Water Research, Pergamon Press, Volume 3, (1969).
- "Chemical Coagulation of Kraft Mill Waste Water," Middlebrooks, E. J., Phillips, W. E., Jr., and Coogan, Frank J., Water and Sewage Works, 116, 3, IW 7-9, March (1969).
- "Kinetics and Effluent Quality in Extended Aeration," Middlebrooks, E. J., Jenkins, D. I., Neal, R. C., and Phillips, J. L., Water Research, Pergamon Press, Volume 3, (1969).
- "Kinetic Assessment of Algal Growth," Pearson, E. A., Middlebrooks, E. J., Tunzi, M., Adinarayana, A., McGauhey, P. H., and Rohlich, G. A., Presented at 64th National Meeting of American Institute of Chemical Engineers, New Orleans, Louisiana, 16-20 March (1969).

*This paper nominated for 1969 Harrison Prescott Eddy Medal presented by the Water Pollution Control Federation for outstanding research contributing in an important degree to the existing knowledge of the fundamental principles or processes of wastewater treatment, as comprehensively described and published in the Federation Journal.

Eutrophication of Surface Waters--Lake Tahoe, " Middlebrooks, E. J., Pearson, E. A., Tunzi, M., Adinarayana, A., McGauhey, P. H., and Rohlich, G. A., (1969). Submitted to Journal Water Pollution Control Federation, under consideration.

City of Jackson, Sewage Transport, Treatment and Disposal Study,
Middlebrooks, E. J., Engineering Consultant, May (1965).

Eutrophication of Surface Waters--Lake Tahoe--Laboratory and Pilot Pond Studies, Second Progress Report, McGauhey, P. H., Rohlich, G. A., Pearson, E. A., Middlebrooks, E. J., Porcella, D. B., Adinarayana, A., and Tunzi, M., (1969).

"Biostimulatory Characteristics and Algal Growth Kinetics of Waste Waters," Middlebrooks, E. J., Porcella, D. B., Pearson, E. A., McGauhey, P. H., and Rohlich, G. A. Accepted for presentation at 42nd Annual Conference--Water Pollution Control Federation, Dallas, Texas, 5-10 October (1969).

"Algal Growth and Nutrient Interchange in Sediment-Water Ecosystems," Porcella, D. B., Kumagai, J. S., and Middlebrooks, E. J. Accepted for presentation at American Chemical Society Symposium on Sediment/Water Interchange, New York, New York, September (1969).

"Bibliography: Trickling Filters," Middlebrooks, E. J., Water and Sewage Works, 115, 7, 329, (1968).

"Comparisons of Algal Assay Procedures and Growth Kinetics," Middlebrooks, E. J., Oswald, W. J., Porcella, D. B., and Gaonkar, S. A. Submitted for presentation at 5th International Conference on Water Pollution Research, San Francisco, California, (1970).

"Kinetic Interpretation of Assay Data," Pearson, E. A., Middlebrooks, E. J., Tunzi, M., Adinarayana, A., McGauhey, P. H., and Rohlich, G. A. Presented at Eutrophication-Biostimulation Assessment Workshop, Berkeley, California, (1969).

"Bioassays of Productivity in Natural Waters," Middlebrooks, E. J. and Porcella, D. B. Accepted for presentation at 32nd Annual Meeting of the American Society of Limnology and Oceanography, La Jolla, California, (1969).

In addition to the above papers and reports, five papers are in various stages of preparation, all relating to the kinetics of algal growth.

WILLIAM I. PALMER
Lecturer

Date and Place of Birth

Marital Status

Married, two grown children

Degrees

B. S. Branch Agricultural College, Cedar City, Utah, 1927
 Utah State University, 1940

Professional Societies

International Commission of Irrigation and Drainage (member)
U. S. Executive Committee I. C. I. D. (member)
National Reclamation Association (member)

Special Awards

Department of the Interior Distinguished Service Award

Languages

Fluent in German

Experience

4/1/70 - Lecturer, Utah State University
present

8/15/67 - Sr. Agricultural Economist and Technical Director,
3/30/70 Agriculture Projects, The Ralph M. Parsons Company,
 Los Angeles, California. As Senior Agricultural
 Economist, have been involved in all of the Company's
 overseas operations where agriculture and agribusiness
 have been involved. Have been responsible for the
 technical adequacy of reports on agricultural studies
 and have developed procedures governing the collection,
 evaluation, and use of data assembled in the Company's
 land and water use, planning and associated studies.
 Have spent considerable time on field assignments in

Saudi Arabia, Tunisia and Zambia, and have worked also on the preparation of proposals for these countries and for the countries of Morocco, India, Argentina, Thailand, Honduras, and Australia.

- 3/65 - 8/67 Development Finance Officer for Agriculture, U. S. Agency for International Development, Washington, D. C. Provided technical guidance for the regional offices on water development and agricultural projects. Where designated, represented the Office of Development Finance and Private Enterprise in water and agricultural matters in all of the areas of the world in which the Agency for International Development is active.
- 4/64 - 3/65 Resources Development Advisor, U. S. Senate (Senator Carl Hayden), Washington, D. C. Advised Senator Hayden on all matters pertaining to resources development in the United States and at his discretion worked with the technical staffs of the Committee's of the Senate of which he was a member.
- 11/44 - 5/64 Assistant Commissioner, U. S. Department of the Interior, Bureau of Reclamation. Supervised and coordinated development and execution of all aspects of the Bureau's project investigations, irrigation and land use, and foreign activity programs. Represented the Department as a witness before the Legislative and Appropriations Committees of Congress on matters pertaining to activities under my supervision, and planned and coordinated content and presentation of testimony at hearings on project authorization, appropriations, or other legislative matters. Directly supervised three division chiefs in program responsibilities.

As Chief of the Division of Irrigation, responsible as principal Staff Officer on irrigation matters relating to land management, water operations, irrigation and water repayment contracts, and to economic analysis of existing Reclamation projects. Formulated and enforced policies, objectives, broad standards and guides governing Bureau-planned irrigation projects involving considerations of repayment, settlement, management of land and water resources, operation and maintenance of facilities, and project communities. Represented the department as witness on assigned subjects dealing with division's activities before the Bureau of Budget and the Congress.

As Principal Economist for the Division of Irrigation, developed programs and established policies, technical standards, and procedures. Conducted analysis of economic condition of settlers on projects; surveys and analysis of population trends and needs for additional settlement opportunities; established basis of calculating local, regional, and national benefits from reclamation developments.

Three years were spent as Chief Economist for the United Western Investigation Headquarters in Salt Lake City, Utah, where duties encompassed economic appraisal of a multi-billion dollar proposal to bring surplus water from the Pacific Northwest to the water-deficient Southwest, involving entirely new concepts of economic appraisal of all factors from land and water use, and requirements in both originating and receiving areas to impact of development on segments of economy. Position involved development of closest working relationships with, among others, State Colleges and Universities, State Engineers, representatives of State Departments of Agriculture, and with four regional offices of the Bureau of Reclamation.

As Agricultural Economist for the Regional Operation and Maintenance Division in Sacramento, California, responsible for development and application of procedures for use in all estimates of irrigation benefits and farmers ability to pay for irrigation water, for purposes of determining prices of project water and feasibility of constructing distribution systems. Worked as member of team to assess permissible rate of irrigation development in California.

As Agricultural Economist in Denver, Colorado, responsible for devising and installing more effective anti-speculation programs in land settlement as required by Reclamation Law and governing repayment contracts. Responsible for review of appraisal reports and processing for approval by Commissioner. Carried primary responsibility for devising methods of determining the capacity of water users to pay for water charges under various kinds of water service and repayment contracts.

8/36 - 11/44 Agricultural Economist, U. S. Department of Agriculture, Soil Conservation Service Bureau of Agriculture Economics, New Mexico and California. In charge of

land utilization program; gave technical direction to all surveys, studies, and investigations concerned with land purchase, development, and management programs; developed criteria for and supervised administration of such lands. Supervised development of land utilization project proposals and Soil Conservation District programs and work plans.

Developed proposals and plans for land utilization projects in Arizona, California, Nevada, and Utah; conducted studies for suitability of sites for Federal land acquisition and established priorities re purchase of lands; developed criteria governing use and administration of acquired lands; in charge of land acquisition work and development operations; developed criteria for administration of such lands.

Developed procedure for determining the "Conservation Needs" of the region which procedure was subsequently adapted as standard for Soil Conservation Service and applied to the entire Country.

Publications

Many articles and monographs appearing in U. S. Department of Agriculture Yearbooks, Journals of the American Association for the Advancement of Science and in papers, periodicals, and reports of the United Nations, U. S. Government and State publications.

Appendix C.

Reports of Foreign Travel



UTAH STATE UNIVERSITY · LOGAN, UTAH 84321
COLLEGE OF ENGINEERING

OFFICE OF THE DEAN
801-752-4100 EXT. 286

January 5, 1970

M E M O R A N D U M

To: Dr. A. Alvin Bishop
From: D. F. Peterson, Dean
Subject: Report on visit with Netherlands University Foundation for International Cooperation (NUFFIC)

By telephone I was able to make an appointment with Director Quik of the NUFFIC organization for Saturday morning, December 20. We met in Dr. Quik's office in The Hague and were joined by Isaac Wust.

Dr. Quik first outlined the activities of the NUFFIC program. These are two in kind:

1. Special international courses are developed to serve primarily students from developing countries. These courses are taught in Holland usually in English. They started in the Institute of Social Studies and have expanded into others like the course at Delft in hydraulic engineering with which we are familiar.
2. Try to assist universities in developing countries to build up universities of their own. The University in Africa under President Taggart, is one example. They have worked in Peru and have stimulated a number of projects in Indonesia. There is a new program now in this area which permits them to work directly university to university, where previously the activities under the program were government to government.

I described our program to Dr. Quik and Mr. Wust mentioning three aspects -- CIDIAT, AID research and institutional development. They were interested and asked me questions. One question dealt with our direct relationships with governments and I explained the necessity for this since we were re-training government people and helping to do research for which the governments had rather immediate needs. They understand also about our program of trying to develop a complementary university program in Venezuela.

Dr. Quik mentioned their "research center for business management" and indicated that their Latin American activities had involved this area of work.

Dr. A. A. Bishop

-2-

January 5, 1970

From my discussions with Dr. Quik and Mr. Wust, I obtained some ideas for improving our own program which I can present to the Advisory Council.

With regard to future cooperation, we did not identify anything specific but I suggested that we furnish Dr. Quik with information about our activities from time to time. It might be that he or one of his people would want to attend one of our seminars and I think we ought to leave an invitation open to him when appropriate.

Dr. Quik sent his regards to President Taggart and indicated that he hoped to visit with him in the United States in the future.

DFP/rs



OFFICE OF
THE VICE PRESIDENT
FOR RESEARCH

November 6, 1969

Dr. A. A. Bishop
College of Engineering
Utah State University

Dear Al:

While on my recent overseas trip, I spent two days in Rome and three days in Tokyo on matters pertaining to our AID project on on-farm use of water. At FAO I talked with a number of individuals about the general aspects of farm planning and obtained two or three publications that seem to have some value in our proposed publication. Dr. Tsuit Sui of the Land and Water Division is heading up a general program in farm planning and has tentative plans for a conference in the Philippines next year in the field of resource planning. I will attempt to keep in contact with him about this and their other programs.

Don Kimmel and Dr. Kristjansen express some interest in FAO cooperating in our program to the extent of possibly publishing a series of guide books or booklets in the general field of farm planning. They doubt, however, whether they would have any direct funds they could put into the research and writing that would be necessary for such a publication. In view of AID's announced intent of cooperating in every way possible with other International agents and in view of the profitability of such a publication to people in under developed countries, I believe that such a publication outlet should be kept in mind.

In Japan several worthwhile contacts were made. I spent the first half day with the Department of Farm Management of the University of Tokyo. The people I met were primarily in economics, but they have made some studies of mechanization and farm planning for small farms. I managed to obtain one book which was the proceedings of a symposium on the general topic held about a year ago. I spent the last half of the first day with the Ministry of Agriculture where we discussed many aspects of developing farms and equipment for small farms. They also furnished me with some significant and worthwhile published materials. The second day was a holiday and was spent at the Virus Research Institute and at some of the scientific instrument companies in Tokyo. The third day was spent at the Rice Institute about fifty miles out of Tokyo and the Farm Machinery Institute. At these two places I obtained considerable literature about organization and mechanization of small

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farms. The Farm Machine Museum was very good since the Farm Machinery Institute has developed designs for rototillers, cultivating equipment, and a large variety of harvesting equipment for rice and various upland crops, and the farm machinery companies have gone into production on these designs and have furnished models of their latest equipment for the exhibit. I brought back considerable of their commercial literature and their publications, particularly where anything was available in English. Some of the Japanese reprints may be worth translating.

I am developing an extensive file on farm planning with materials from my contacts overseas and those being put out through states and areas by the Soil Conservation Service. These materials can be available to anyone who is interested.

Very sincerely yours,

s / D. Wynne Thorne

D. Wynne Thorne
Vice President of Research

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REFERENCE MATERIALS OBTAINED FOR
RESOURCE USE AND FARM PLANNING

In Files of Wynne Thorne

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CENTO

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Appendix D.

Library Director's Report



June 15, 1970

Dr. Howard B. Peterson
Department of Agricultural
& Irrigation Engineering

Dear Dr. Peterson:

Our meeting with you this week was extremely useful. It indicated to me that I had been too pessimistic regarding our accomplishments during the first year of our program in association with the On-Farm Water Management Program. After a careful evaluation, I am impressed with the progress made during the initial year of the program. We can move into the second year of the program with much of the groundwork accomplished. We report progress in the following areas:

The completion of preliminary plans for implementation of the program including:

- 1) A survey of holdings in books, journals, and reference materials.
- 2) The development of criteria for selection in the compilation of a glossary of descriptors, a file of reference aids, together with appropriate subject descriptors for each aid.
- 3) Preparations for the development of a computer book catalog.
- 4) Preliminary work on a historical collection now housed and managed in University Archives. In particular, the O. W. Israelsen irrigation collection has been organized for cataloging.
- 5) Bibliographic work of a miscellaneous nature in support of faculty in the Department of Agricultural and Irrigation Engineering.

This work has been accomplished by the following staff personnel: Karlo K. Mustonen, Science and Engineering Librarian; Shirley Russel, Assistant Documents Librarian; Dick L. Chappell, Systems Analyst; members of the Technical Support Division in the Acquisitions and Cataloging Departments and the work of Jeff Simmonds, Special Collections Librarian. We estimate that the total cost for the employ-

ment of these staff members since January 1970 is \$3000. Other costs incurred have been in supplies and expenditures incidental to processing orders. This estimate of staff cost does not, of course, include the considerable contributions made by members of your staff, including William Palmer.

According to agreement, the Library has proceeded to purchase material in support of general water resources programs. Expenditures have been incurred in:

- 1) Maintenance of materials in areas of water resources and water law which includes some 102 abstracts, bibliographies, and book selection aids.
- 2) In the acquisition of reference works such as the Catalog of National Agricultural Library and the subscription, through private publisher, of the Bibliography of Agriculture, no longer available through the Government Depository System.
- 3) The library has acquired new books related to this project. About 88 titles have been added to the general collection.
- 4) Legal reference works regarding water law have been maintained. Additions and continuing subscriptions have been placed to the American Law Reports, Supplement Court Digest, Federal Code Annotated, and law review periodicals.
- 5) The Library has acquired new periodicals directly and indirectly related to the program. Altogether, we believe that the University has contributed about \$10,000 to the beginnings of this program.

Believing as we do that a good start has been made in the program, we would like to indicate some of the ambitions we have for the coming fiscal year. These we present now for your further consideration:

- 1) An improved liaison between the Library and the Department of Agricultural and Irrigation Engineering.
- 2) Improved communication between the program on this campus as well as related programs on other locations. In particular, we are concerned about forging a more profitable relationship with the Ecology Center.
- 3) We are looking for improved methods of working with faculty members in related fields. The faculty needs to be alerted to the project.

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Faculty order requests need to be funneled through the project when their orders relate to it. We are suggesting that some work can be done here by computerized coding.

4) We propose that a further study can be made of sister programs such as the Watershed Program in Colorado and the Arid Zone Program in Arizona. We hope that we can provide an occasion for librarians to visit both sites during the coming year.

5) We hope to expedite our acquisition for the program by improving communications with publishers, especially institutions of higher learning, research centers, and government agencies (federal, state and county).

6) We must improve communication with information centers such as the Defense Documentation Center, the Scientific Information Exchange and other similar establishments.

7) We plan to intensify our efforts to locate materials which are reported out-of-print. This should be accomplished by an improved relationship with state and federal agencies.

8) We hope to add about one full-time staff member during the coming year. This, we believe, will be necessary as the program gains impetus and visibility on campus.

As a result of our meeting with you, I am sure that you will support us in the projections we have made for the coming year. They seem altogether compatible with the objectives of the program and seem well within our reach. I am attaching to this letter one exhibit which may be required by you wherein we summarize certain of the library's financial and physical commitments to the program in its first year.

Sincerely,

s/Milton C. Abrams

Milton C. Abrams
University Librarian

MCA:dn

cc: Dr. Al Bishop
William Palmer

Enclosure

SUMMARY OF LIBRARY EXPENDITURES
In Support of the
ON-FARM WATER MANAGEMENT PROGRAM
1969-70

1)	Estimated salary expenditures for staff.	\$ 3,000.00
2)	Supplies, forms, card stocks and typing materials.	50.00
3)	Reference work in the areas of Water Resources and Water Law, together with Abstracting Services.	3,800.00
4)	Acquisition of new reference works including the Catalog of the National Agricultural Library and the Bibliography of Agriculture.	1,067.00
5)	Acquisition of new books related to the project--88 titles.	1,100.00
6)	Legal references.	900.00
7)	Cost of new periodicals.	350.00
	TOTAL	\$10,267.00

Appendix E.
Language Training Report

INTENSIVE SPANISH FOR FACULTY AND GRADUATE STUDENTS DURING 1969-1970

The Grant provided partial support of the intensive language training program. Dr. Grant Reese, Head of the Department of Languages and Philosophy has provided a description of the program and a report on the activities for the year.

A. Program Description

1. Elementary Level

The Intensive Spanish Program for Faculty has as its main objective to bring faculty members with little or no knowledge of Spanish to a level of aural comprehension and speaking proficiency adequate to satisfy routine social demands and limited work requirements in Latin America. To accomplish this goal intensive daily instruction is given for one quarter on a recommended basis of four hours a day, five days per week. During Fall Quarter there were six faculty participants in this beginning level; Winter Quarter, six; and Spring Quarter, five.

The instruction period consisted of a four-hour block during which the teaching methodology was varied (i.e., drilling, laboratory practice, word games, informal controlled conversation, etc.) and during which total immersion in the language took place. Towards the end of each quarter an effort was made to have the participants use the technical vocabulary of their field of specialization. This was in part accomplished with short oral presentations on a particular technical subject by each participant.

The instructional staff included each quarter Professor Fabian Samaniego, who supervised the program and who conducted a daily one-hour session on grammatical structures, and one native drill instructor.

2. Second Level

During Winter Quarter and Spring Quarter, a less intensive course of five hours per week on Spanish American culture was provided for those completing the elementary level to allow them additional contact with Spanish. The course was conducted on a conversation-discussion basis under the direction of a native instructor. For Winter Quarter five faculty members participated and for Spring Quarter, six.

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B. Number of Faculty Receiving Training

A total of 17 different people participated in the program throughout the 1969-70 academic year. Eleven of these completed the second level. Those who received training at the elementary level during Spring Quarter will have an opportunity to participate in the second level course next Fall Quarter.

C. Anticipated Enrollment for 1970-71

It is anticipated that between 16 and 20 faculty members will participate in the Intensive Spanish Program during 1970-71. The funding and staffing needs should closely parallel those of this past year.

D. Conclusion

Though the results of this intensive program have not been fully determined by on-duty experiences of the faculty in their foreign assignments as yet, we fully anticipate that they will function adequately enough to satisfy their basic work requirements and minimal social demands.