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 PD-441-672-E1

AID 1025-1 (7-71) (FACE SHEET)  
 NONCAPITAL PROJECT PAPER (PROP)

I. PROJECT IDENTIFICATION

PROJECT TITLE: Watershed Management: 211(d) Grant to Arizona State University

RECIPIENT (specify):  COUNTRY  REGIONAL  INTERREGIONAL TA Bureau

APPENDIX ATTACHED:  YES  NO 207

PROJECT NO. (A.O. 1025.1) 931-11-120-114

4. LIFE OF PROJECT: BEGINS FY \_\_\_\_\_ ENDS FY \_\_\_\_\_

5. SUBMISSION:  ORIGINAL  REV. NO. 4/13/75

CONTR. PASA NO. CSD-2457

II. FUNDING (SOCS) AND MAN MONTHS (MM) REQUIREMENTS

A. FUNDING BY FISCAL YEAR	B. TOTAL \$	C. PERSONNEL		D. PARTICIPANTS		E. COMMODITIES \$	F. OTHER COSTS \$	G. PASA CONTR.		H. LOCAL EXCHANGE CURRENCY RATE: 5 L'S (U.S. DOLLAR)		
		(1) \$	(2) MM	(1) \$	(2) MM			(1) \$	(2) MM	(1) U.S. GRANT LOAN	(2) COOP COUNTRY (A) JOINT (B) BUDGET	
1. PRIOR THRU ACTUAL FY	350							350				
2. OPRI FY 74	75							75				
3. BUDGET FY 75	200							200				
4. BUDGET 41 FY												
5. BUDGET 42 FY												
6. BUDGET 43 FY												
7. ALL SUBJ. FY												
8. GRAND TOTAL	625							625				

9. OTHER DONOR CONTRIBUTIONS

(A) NAME OF DONOR	(B) KIND OF GOODS/SERVICES	(C) AMOUNT

III. ORIGINATING OFFICE CLEARANCE

1. DRAFTER: D. L. Pluchnett, Title: TA/AGR, Chief, Soil & Water Mgmt. DATE: 4/5/75

2. CLEARANCE OFFICER: Leon Hesser, Title: Director, TA/AGR. DATE: 4/5/75

IV. PROJECT AUTHORIZATION

1. CONDITIONS OF APPROVAL

Grant Project Statement, dated 3/13/75 attached. This Grant Extension Proposal was reviewed by the Research and Development Committee on April 1, 1975 and unanimously endorsed.

2. CLEARANCES

DIR OFF.	SIGNATURE	DATE	DIR OFF.	SIGNATURE	DATE
JA/PM	JGunning	4/5/75			
TA/PM	REKitchell	4/3/75			
PPC/DPRE	Allandly	4/2/75			
APPROVAL AAS OR OFFICE DIRECTOR	CFarrar	4/9/75	APPROVAL AAS OR OFFICE DIRECTOR	DA/AD	4/15/75
AA/TA					

# INSTITUTIONAL GRANT PROJECT STATEMENT

Extension/Revision

University of Arizona

AID/csd-2457

Watershed Management

## I. RELEVANCE OF PROBLEM AREA AND NEED FOR EXPERTISE

The University of Arizona has been concerned with the development, processing and storage of water or, specifically the watershed management phase of the overall irrigation system. The University is primarily concerned with the source of water supply for agricultural applications and the management of small watersheds to sustain suitable quality and quantity of water for optimum agricultural production in developing nations.

The prediction and measurement of run off volumes prediction and control of damaging flood flows, prediction of minimum drought-related flows, the multiple-use management of forest and range land drainage areas in ways that protect and enhance agricultural production, techniques of controlling erosion which reduces water quality and lowers productivity of upland watershed areas, are all important factors relating to this problem area.

In almost all nations, the management of the natural resources of the areas above the agricultural valleys is given attention only after the cultivated land management has reached a degree of high sophistication. The small watersheds are usually abused by over grazing, excess harvesting of wood, and practicing cultivation on lands not suited for intensive production. The results are tremendous erosion, loss of natural nutrients, and lowering of the quality and quantity of water harvested and in general much lower production than optimal.

Water management on either, rainfed or irrigated farms cannot be done properly if the water which falls on the adjacent unclutivated lands or grazing lands is disregarded. Water harvesting, a system which could be employed to conserve water in such drought-stricken areas as the Sahel, depends on good watershed management. The tie between watershed and range land management is basic and must be linked in a total land and water management approach which recognizes the interdependence of all land resources of a region, whether cultivated or unclutivated. Watershed management is a basic ingredient which ties these land resources together.

The small farmer is very prevalent in many highly intensive cultivated areas of LDCs where irrigation is practiced. However, there are also many small farmers not so privileged as to have irrigation water and they operate the dry lands and water shed areas above. Their's is usually a subsistence agriculture involving a high dependence on livestock. Special problems are created by too many people attempting to derive their livelihood from resources which are mismanaged. Special attention needs to be given this long neglected area of proper management of rather small agricultural watersheds populated by farmers who operate at or near the subsistence level on small holdings.

## II. GRANTEE PERFORMANCE AND RESULTS TO DATE

The University of Arizona has made reasonable progress towards establishing an institutional response capability to assist developing countries in the subject matter area of the grant, watershed management. This is true despite the rather vague and general objectives -- systems analysis in watershed management stated in the original grant proposal/agreement.

Grant activities were focused on an information retrieval system in watershed management which was related to and allied with the information retrieval system of the Office of Arid Land Studies at the University. The information catalogued and indexed applies largely to arid areas, and little has been collected to date on the sub-humid or humid rainfed tropics. Grant activities emphasized systems analysis of watersheds, employing computer-assisted formats. While approach is fully consistent with the original title and objective of the grant, it is perhaps too sophisticated for most LDC needs. With good information and experience, however, it does provide information and alternatives for problem solving on large watersheds.

The University of Arizona is the first institution in the US to give watershed management sufficient emphasis as demonstrated by its recent creation of a Department of Watershed Management in its College of Agriculture. The staff is competent, well-trained, and highly motivated. However, they do not yet have an adequate appreciation of watershed problems of developing nations located in the humid and sub-humid tropics and of the small marginal farmer. Their experience has been mostly focused on arid, temperate-zone areas and large watersheds. In shifting emphasis from generalized institutional development to focused utilization, the University of Arizona and AID propose to concentrate on procedures, techniques, and policies which will optimize food production on the small watersheds in the small-operator world encountered in most LDCs. The University has not been utilized in the past as much as other consortium universities, (CSU & USU) due partially to the fact that they have no research or technical assistance contract in the subject area which provided a useful linkage with one or more LDCs. Another factor has undoubtedly been their rather sophisticated grant focus (systems analysis) which did not exploit their possible usefulness to AID and the LDCs.

Of course, the fact that AID mission activity has only recently given importance to dryland agriculture and water and soil resource management also explains their low utilization record. Recent use of Arizona in the Philippines and current requests for Panama and Kenya in the area of watershed management and erosion are examples of increasing demand. Refocusing the grant to small agricultural watersheds will substantially increase actual and potential utilization. The University of Arizona has increased involvement in its academic and research activities in erosion control and its relationship to maintaining productivity. This important aspect of watershed management is especially important to LDC situations.

The Department of Watershed Management has participated in a Ford Foundation-university of Arizona contract to provide training in water basin planning for the Philippines. The Ministry of Agriculture, Iran, has also sent 5 students to Arizona for training in watershed management. The Saudi Arabian government has utilized departmental expertise directly in a consultancy role. The Pan American Health Organization sponsored a short course held in Mexico City for planners; the Department helped plan the water quality phases and participated in the workshop. All of these contacts represent a realization by others of the expertise located at Arizona and draws on capacities created by the grant.

### III. GRANTEE COMMITMENT TO LONG-TERM INVOLVEMENT

The University of Arizona is definitely committed to long-term involvement in all aspects of water and soil management as this subject matter is of vital interest to the state of Arizona. The University as a ready and substantial commitment to assist AID in its program needs. The Administration, especially the College of Agriculture, and its Dean is deeply interested in and supportive of, the University's international programs.

The staff of the Watershed Management Department is committed to international involvement and wants to be of service, having responded readily to all of AID's requests for expert and technical advice.

Multidisciplinary land and water management programs have grown in stature at the university. Under leadership of the Department of Watershed Management, with cooperation from other College of Agriculture departments and the departments of Hydrology and Water Resources, and Systems and Industrial Engineering and Management, Arizona is in an improved position to respond to the needs of LDCs. As evidence of this increased capability in the eyes of its peers, the Department of Watershed Management has recently been accredited by the Society of American Foresters. The enrollment of high caliber graduate students from all over the world and an increase in grants and contracts also represents evidence of recognition of the University of Arizona in the subject matter area of the grant.

The University increased its efforts to obtain alternate sources of funding in the subject matter area of the 211(d) grant. At the international level, the Department of Watershed Management has recently received a Peace Corps contract to provide technical assistance in all phases of forestry and environmental programs in Latin America. In addition, they are coordinating an arid land research effort for the NSF-funded International Biological Program. The Systems and Industrial Engineering Department in cooperation with Watershed Management has entered into an NSF cooperative water research program with Hungary. Funded by the Ford Foundation, the Department of Hydrology and Water Resources has embarked on a program for the enhancement of education for students from developing countries. A 211(d) grant has also been awarded the University in the area of Natural Resources Planning which involves all natural resources

and their management on a macro scale.

Nationally, the University has received support from many cooperating agencies such as the USD Cooperative State Research Service, USDA Forest Service, USDI Bureau of Land Management, USDI Office of Water Resources Research, NASA, and others. The University of Arizona has consistently been ready to shift towards a greater emphasis on utilization of its capability in developing countries. Being a semi-arid state, a major concern is the optimal management of water and land resources. With the severity and the complexity of this particular problem becoming more acute, the University is continually expanding its activities in this subject matter area.

#### IV. RATIONALE FOR REVISION/EXTENSION

Efficient management of agricultural watershed areas is a vital part of the overall management improvement strategy necessary for increasing food production to self-sufficiency in LDCs. Resource management is important in dryland agricultural areas as well as those where irrigation is practiced. Water resources must be utilized effectively and managed for quality and quantity conservation in order to raise the quality of life for the millions of small farmers whose principal resource is this scarce water.

Increased emphasis is being placed by the Agency in programs directed toward assistance to the small farmer in managing his resources. USAID missions and LDCs themselves are involved in problem analysis and action programs directed toward efficient and effective use of water resources. There are insufficient numbers of direct-hire AID technicians to meet these requests.

The major source of expertise that can respond to AID requests, with a minimum delay, for assistance on water and soil management problems in LDCs is found primarily at south-central and western land-grant universities. Consulting firms have some talent but their capabilities are not as diversified or attuned to LDC conditions and constraints, nor are their number of available experts as great as an individual land-grant university. In fact, consultants often hire their specialized expertise from universities, thus increasing the cost of the individual consultant and since there is no institutional involvement, sometimes settling for less than the best available. Universities have the further advantage of being able to train foreign students as well as faculty members in development activities.

The new 211(d) concept of focusing on specific response capabilities and outputs creates an opportunity to emphasize specific and pre-selected problems. The University of Arizona will focus on problem identification and analysis as related to small agricultural watersheds. This specialization provides the link between irrigated agriculture, drylands, and the range lands. It incorporates animal production with crop production and identifies associated problems.

The University, although highly qualified in hydrology, resource management, and agriculture in general, needs further institutional development in the area of small watershed management as found in the usual LDC situation. Small watersheds, with many small farmers who fully utilize the land and water resources for agriculture and livestock production to the point of destruction, create problems which are not normally faced in the U.S. Even though the University wants to be involved in international programs they cannot commit more than minimal funding to creating an expertise not directly related to

Arizona or U.S. problems. While funding from sources other than AID are sometimes available to universities for development activities in LDCs, they are generally not on a continuing or sustaining basis. This on and off funding does not allow the universities to retain a critical and viable mass of experts or the flexibility necessary to have a quality response capability in readiness.

The University will continue to sustain and develop a vested competency in the subject matter area of the grant, as the management of water and land resources are of considerable importance to the state of Arizona. It will continue to be concerned with development activities of LDCs and will definitely respond, whenever professional expertise is available, to AID requests for assistance through the medium of providing funds for short-term advisory services, executing a basic ordering agreement, working thru CID or other means. Without the core support from a 211(d) grant, however, a reduced though competent faculty will not be able to always respond to AID requests because of the pressure of other duties, domestic and foreign. Activities which are outside the normal university functions, as many AID requests are, will suffer. Linkages with LDCs, international institutes, and CID itself cannot be effectively maintained with University funding only.

A minimum level of support opens the door for AID to a number of outstanding professional experts. All of these faculty will in some way or other be active in programs designed to assist LDCs through education and training, research, and information collection and dissemination in addition to performing in an advisory capacity. To have the flexibility needed for a quality response capacity, universities need additional support at a level that results in programs that have continuity, organization and relevance and can work towards long range

goals.

V. REVISED GRANT PROJECT DESIGN

The general purpose of the 211(d) grant extension and revision is to focus and sustain a response capability at the university to assist developing countries in watershed development and management with emphasis on problem analysis and small watersheds in arid and humid environments. The major changes from Arizona's initial grant will reflect the recommendations made by an Intra-agency Review Team during the on-site Comprehensive Review.

These were:

1. That University of Arizona fulfilled the objectives of the original grant, but that this focus was probably too sophisticated and general for any future grants.
2. That any new grant extension/revision be focused on small farmers and small watersheds, including the humid tropics as well as arid and semi-arid tropics.
3. That there is a real lack of understanding of the state-of-the-art of small watersheds in LDCs.
4. That University of Arizona work together with CID regarding the current division of labor and possible future focus of operations and structures.
5. That AID should assist the University in linkages with international and LDC institutions.

A large portion of the increased capability generated by the grant will be devoted to aiding the small farmer or pastoralist to improve his situation. Envisioned here are practices that will increase agricultural productivity by intensification (better watershed management practices, closer integration of crops and livestock, reforestation, etc.) and by increasing yields through conservation of available moisture, erosion control and other land improvement practices. Included also will be the investigation of procedures for developing small water supplies for aquaculture, individual irrigation systems, livestock and domestic use. The expected outputs generated by the grant extension can be grouped into the following categories:

1. Education and training: A program specifically addressed to problems of LDCs will be developed to include non-degree training for decision-makers and technicians through shortcourses, workshops, etc. An international symposium on soil and water management for erosion control will be organized, developed and presented. This symposium, proposed to be held in Haiti will highlight and dramatize the tremendous resource degradation and losses in LDCs caused by poor soil and water management practices. It will gather state-of-art information and review successful and unsuccessful programs. This symposium will be done in cooperation with CID, the Tropical Soils Consortium and an international agricultural research institute yet to be selected. This seminar will be comprehensive in subject matter and will be oriented to practical problems of small farmers in LDCs. The audience will be professional land managers in government - including agricultural forest and rangeland interests, and natural resource planners, - university faculty, and other interested parties. The seminar will be held in a developing nation probably Haiti and will include field site examinations of actual erosion

problems and control measures. Grant funds will have to meet costs for planning and organizing the symposium, including pertinent travel, correspondence, release time for staff involved in planning the conference, etc.

A one-week short course on watershed management will be presented in Latin America and will include faculty resources from other CID universities. Topics to be included will be: rainfall measurement and analysis, streamflow measurement, water quality measurement and analysis, erosion processes, control of erosion by management and engineering techniques, water harvesting and methods of water conservation. A syllabus in Spanish will be produced for the short course and its effectiveness evaluated as a teaching tool. The final objective of this short course will be the development of a set of materials which can be utilized in LDCs as teaching aids on management of small watersheds.

The University will continue to recruit students from LDCs into the academic programs in Watershed Management. A faculty member from the University of the Philippines should complete his Ph.D. within 2 years. Five students from Iran will complete M.S. degrees within the same period.

2. Expanded Knowledge Base: Research and study programs on procedures, techniques and policies for managing small watersheds to optimize food production and economic development will be continued but with emphasis on small farmers. To identify areas where new technology and principles can be brought to bear on the development and management of small watersheds, state-of-the-art studies will be initiated for both humid and arid environments. These studies involve an analytical review of the knowledge

accumulated by research and practice, setting forth the established principles, how and where they can be used, and identifying the gaps in knowledge needing research for establishment of better principles.

Specifically, and as a by-product of the erosion seminar, Arizona will develop a state-of-the-art paper on the present status of research and knowledge, a review of present management practices and a consideration of the problems associated with erosion control technology in the small watershed, small land-owner world usually found in LDCs. Another state-of-the-art study and document will be developed on the subject of efficient water harvest, use, and control in the total watershed system with emphasis on water supply for agricultural applications. The report will review presently used practices and also ancient systems of harvest with an analysis of each suitable for agricultural forest and rangeland manager use in developing nations. A state-of-the-art analysis will also be made of small watershed management problems in humid areas with emphasis on the differences encountered in management techniques between arid and humid regions.

These studies will be done by literature review, by consultations with appropriate LDCs, AID field personnel and international organizations, and in cooperating with sister universities resulting in a thorough review of all available sources of information and expertise. They will be published in a language understandable and useful to the non-technician in sufficient quantities for extensive distribution to LDCs and the world-wide network of concerned institutions. These studies will effectively and usefully involve senior faculty and graduate students in work relevant to the grant purpose and, in the process, produce products useful to them, AID, other

donors, and the LDCs.

3. Advisory Capacity: To have the required flexibility to respond quickly and adequately to requests for technical assistance to LDCs, the University of Arizona will make available faculty members from a variety of appropriate disciplines. One new staff member will be added to the present faculty to accomplish the outputs defined here and to provide release time for other faculty. The grant will also fund a small amount, not to exceed \$10,000 per year, for consultancy time to be provided in emergency situations where individuals are needed on very short notice and when other instruments cannot be used without causing unacceptable delay.

One faculty member with specialized expertise in remote sensing technology as applied to water management on forest, range and agricultural lands will be supported on about a half-time basis to evaluate applicability of easily available remote sensing technology for small watersheds. A full time faculty member with specialized expertise in water quality control on forest, range and agricultural lands, erosion control and sedimentation will be partially supported by the grant. These faculty members will teach, consult and perform application oriented research with special consideration to problems in developing nations, and will participate in the state-of-the-art study of small watershed. Faculty members from departments of Watershed Science, Agricultural and Soils Engineering, Hydrology, Forestry, Agronomy and Animal Science will also be available through release time provided by the grant. The University hopes that utilization activities will provide financial support for these staff members after this 2 year extension has ended.

4. Information Capacity: To develop an effective means for assistance in the transfer of knowledge, the University of Arizona will maintain an up-to-date information center of special competence in the broad areas containing the biologic, hydrologic, engineering and socio-economic aspects of watershed management. The Center will collect, evaluate and disseminate information useful to LDCs in their efforts to improve the quality of life of the small farmers.

An automated bibliographic information system in watershed management (WAMIS) will be expanded and maintained for international applications, with specific emphasis on documents pertaining to erosion control and problems on forest and range lands of the sub-humid and humid regions. This system will be available to land managers, students, planners and others throughout the world. The campus will be the center from which the bibliography will be published for distribution to potential users to help inform them of the system's capability. The distribution list will be international in scope and developed in cooperation with AID. Steps will be taken to integrate WAMIS into the CID information system for water management, as well as AID, FAO, and other systems in order to gain wider access of the information stored therein.

5. Linkages and Networks: Relationships with a network of domestic, multilateral and LDC organizations will be maintained for the purpose of collaborating in a joint problem-solving approach, developing cooperative research, initiating faculty exchange and becoming involved in information exchange and dissemination.

Important domestic linkages include CID and the Tropical Soils Consortium. The Arizona grant project director will become the leader within CID for small watershed management and linkages between watershed, dryland and irrigated farming. The grant will also provide funds for the maintenance of the CID office. The amount, as yet not finalized, will not be over \$10,000 and will probably be \$7,000 per year, supplemented by a \$2,000 yearly contribution from the University's Own budget.

Close linkages with the tropical soils consortium (cost estimated \$10,000) will be required to carry out the erosion seminar and to provide the state-of-the-art studies which will be produced therefrom. The University will attempt to establish a linkage with the University of the Philippines, with the help of Cornell University, in the subject area of watershed management, including faculty and student exchange with the goal of improving competence in the Philippines and at the University of Arizona. State-of-the-art studies on agricultural watershed improvement will of necessity involve a linkage with ICRISAT. Hopefully this will involve a working relationship rather than merely an exchange of information.

Linkages with LDC institutions in Latin America and Africa will be expanded as the pilot workshop program is developed and expanded. The proposed budget shown below by inputs and program categories subject to detailed negotiation with U/A, will fund the activities and outputs described above for a two-year period, i.e. until June 30, 1977. At the mid-term, the utilization rate and need for additional grant support, if any, will be reviewed.

July 1975 to June 1977

<u>INPUTS</u>		<u>OUTPUTS</u>	
Salaries & Benefits	\$140,000	Education & Training	\$ 40,000
Travel	30,000	Expanded Knowledge Base	50,000
Equipment & Supplies	5,000	Advisory Capacity	50,000
Library & Publications	10,000	Information Capacity	40,000
Other (CID)	<u>15,000</u>	Linkages	<u>20,000</u>
	\$200,000		\$200,000

The University of Arizona, committed to long-term involvement in development activities, is continually striving to obtain additional sources of funding. It has been successful in attracting additional funds in the subject matter area of the grant, water and land management for agriculture. Through CID, progress has been made in obtaining funds other than from AID for activities related to increasing food production and improving nutrition in LDCs. The potential appears to be good that the CID program will gradually increase. Even so, the University of Arizona needs this grant support to expand its knowledge base, to develop the state-of-the-art related to watershed management for small farms associated with small watersheds. They cannot do these things with state funds. This need, however, is expected to diminish significantly as utilization of its services increase and it is hoped that direct grant support can be discontinued after 2 years.

The University now provides a significant input to the program. The grant provides no overhead, therefore, such items as office space, electricity and heating, and some supplies are provided automatically by the University.

Approximately 10% of the grant is made available to CID, along with a direct university contribution, and significant portion of faculty and administration time and facilities are made available for grant or grant-related activity without charge.

#### VI. COMPLEMENTARY ACTIONS AND MANAGEMENT CONSIDERATIONS

This grant is planned as an extension and revision of the existing 211(d) grant of Arizona and is a part of a much larger package of Agency activities and relationships. There are several on-going programs which relate closely to this grant. Grant programs are active in the areas of dryland moisture control for both winter and summer rainfall areas and tropical soils management. Centrally funded research contracts include on-farm water management, fertilizer use, management of tropical soils and soils classification.

Anticipated programs to be developed within the next two year period include: the extension and revision of the existing 211(d) grants at Utah State University and Colorado State University into grants in the utilization mode, to be accomplished in the next six months; a research contract with the University of California at Riverside dealing with effective management and use of summer rainfall for crop production on small farms in Africa; and a research project with Oregon State University on effective management of rainfall for crop production on small farms in a Mediterranean climate.

A research proposal is now being developed by Arizona and Auburn University which will involve the development of guidelines and practices for planners and managers on the management of the total watershed for production of livestock, crops, timber, and fish. Alternative uses based on environmentally sound practices will be identified and quantified.

Close interaction between University officials and TA/AGR will be required on all activities of the grant. In addition to an annual report, there will be an annual review to assess progress and determine if targets established are being accomplished. TA/AGR will assist with linkages necessary to develop the state-of-the-art reviews and will give professional advice on subject matters of these papers.

The focal point within AID for technical, substantive, and managerial aspects of this grant will be the Soil and Water Management Division, Office of Agriculture, Technical Assistance Bureau (TA/AGR). Liaison with the University of Arizona will be through the Grant Project Officer, Dr. Gil Corey. Contacts with AID missions will be handled through the appropriate bureaus, and the University will initiate and sustain contacts with other research and educational institutions, both within the U.S. and abroad, on a direct basis.

Demand imposed on AID offices, other than TA/AGR, by management of the Grant should be quite limited. Regional bureau and field personnel will, however, be contacted for advice and consultation on research, state-of-the-art, and training aspects and invited to participate in grant-sponsored activities.

This grant is supportive of a large package of AID centrally and field funded activities in soil and water management Watershed management as applied to small farmers and the problems associated therewith is a phenomenon of every country in the world. There is, then, a need to have a central bank of expertise looking at the problem on a worldwide scale. Successful techniques are undoubtedly transferable along climatic lines but this transferability cannot be known unless the problem is viewed globally. The grant should continue to

be centrally funded and managed to take advantage of cooperative relationships with the related centrally funded and managed programs, to permit a global sphere of influence and study, to allow for interregional coordination and cooperation among agencies and international centers, and to facilitate management within AID.