

BIBLIOGRAPHIC DATA SHEET1. CONTROL NUMBER
PN-AAH-9302. SUBJECT CLASSIFICATION (695)
AF26-0000-GG50

3. TITLE AND SUBTITLE (240)

Microbiology and mineralogy of tropical soils; final report, July 1, 1976 to Sept. 30, 1979

4. PERSONAL AUTHORS (100)

5. CORPORATE AUTHORS (101)

Hawaii. Univ. Dept. of Agronomy and Soil Science

6. DOCUMENT DATE (110)

1979

7. NUMBER OF PAGES (120)

36p.

8. ARC NUMBER (170)

631.4.H389b

9. REFERENCE ORGANIZATION (130)

Hawaii

10. SUPPLEMENTARY NOTES (500)

11. ABSTRACT (950)

12. DESCRIPTORS (920)

Soil management
Bibliographies
Soil fertility

Soil science
Technology transferTropics
Soil erosion
Soil microbiology
Nitrogen fixation
Linkages

13. PROJECT NUMBER (150)

14. CONTRACT NO.(140)

AID/csd-2833

15. CONTRACT
TYPE (140)

211(d)

16. TYPE OF DOCUMENT (160)

68

63
H 3896

YN-AAH-930

MICROBIOLOGY AND MINERALOGY

OF

TROPICAL SOILS

Grant AID/csd-2833

FINAL REPORT

1 July 1976 to 30 September 1979

UNIVERSITY OF HAWAII

COLLEGE OF TROPICAL AGRICULTURE AND HUMAN RESOURCE

DEPARTMENT OF AGRONOMY AND SOIL SCIENCE

HONOLULU, HAWAII

C O N T E N T S

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211-d Final Report
Date Due: 31 December 1979
Date: 31 December 1979

Grant Title: Microbiology and Mineralogy of Tropical Soil

Grantee: University of Hawaii

Grant Program Director: Goro Uehara

Aid Sponsoring Technical Office: Development Support Bureau Office of Agriculture

Statistical Summary

1. Period of Grant: 1 July 1976 to 30 September 1979
2. Amount of Grant: \$500,000.00
3. Expenditure: \$500,000.00

NARRATIVE SUMMARY

The 211-d Grant in Tropical Soils awarded to the University of Hawaii in 1970, extended in 1976 and completed in 1979 has significantly contributed to the University's commitment and capability to work with the United States Agency for International Development and other development agencies to assist developing countries in the tropics conserve and utilize their soil resources. A close similarity between grant objectives and the University's priorities for research and development in tropical agriculture and human resource development has contributed to the project's success.

Under the grant, the University identified five priority areas for research and development. These include biological nitrogen fixation in grain and pasture legumes, vesicular-arbuscular mycorrhiza, allelopathy in multiple cropping systems, soil erosion and soil fertility. Thorough assessments of these priority topics were made by faculty through literature survey, consultation with invited experts and on-site verification in the developing countries. These assessments have been documented in state-of-the-art reports which will be reproduced for wider circulation.

In addition to the identification and assessment of priority areas and faculty development, the grant was designed so that the momentum generated during the grant period would continue. A current awareness service in the priority areas, a training package for use in developing countries, a soil data bank, strong linkages with a network of research and development agencies, and a cadre of scientists familiar with developing country problems and conditions ensure that the University will utilize these grant products through collaborative efforts with developing countries.

DETAILED REPORT

Introduction

This is the final report of the University of Hawaii 211-d Grant (Grant AID/csd-2833) on Tropical Soils to the United States Agency for International Development. Five U.S. Universities were awarded similar grants through the Institutional Grants Program established by Section 211(d) of the Foreign Assistance Act of 1961 as amended in 1966. The grants, which were made to develop U.S. institutional capability to respond to AID request for technical assistance in developing countries, became effective on the following dates: (a) Cornell University (Grant AID/csd-2834) on June 30, 1970; (b) The University of Hawaii (Grant AID/csd-2833) on November 2, 1970; (c) Prairie View A and M University (Grant AID/csd-2836) on June 30, 1970 (d) North Carolina State University (Grant AID/csd-2835) on November 2, 1970; and (e) The University of Puerto Rico (Grant AID/csd-2857) on March 4, 1971. These institutions organized themselves into the Consortium on Soils of the Tropics (CST). The Consortium continues to function and member institutions responds to AID requests jointly or singly depending on the nature and magnitude of the problem.

In 1976, the Grants were revised and extended to capitalize on the response capabilities developed under the previous grants, to sustain these capabilities, and to develop new competence in the field of biological nitrogen fixation.

This report summarizes the impact of the grant, since its inception in 1970, on the University of Hawaii's capability to work with AID to identify and solve soil-related problems in the developing countries of the tropics.

Grant Purposes and Objectives

The main purpose of the original grant was to enhance the competence of the University to teach, conduct research and provide service in the subject matter of Tropical soils. In the revised and extended grant the purposes were changed to read:

1. To utilize the competence in tropical soil management and to develop new competence in soil microbiology, especially biological nitrogen fixation.
2. To determine ways to overcome key soil constraints on food production.

With the help of an AID program management specialist, the revised grants were redesigned to make them more relevant to developing country needs. This was achieved by rendering the grant objectives and outputs more product-oriented. Five objectives/outputs were identified. These were:

1. Expanded knowledge base in Tropical soil science
2. Information storage, interpretation, retrieval and delivery capacity
3. Education and training capacity
4. Advisory capacity
5. Linkages and networks

Grant Impact on Institutional Response Capability

When the original grant was awarded in 1970, the University of Hawaii had a strong interest in, but little experience with problems and conditions in the developing countries of the tropics. Today the University operates, in collaboration with its sister institutions of the Consortium on Soils of the Tropics, in Asia, Africa, and Latin America to develop appropriate, cost effective, transferable farming technology. So as not to dilute its strength, the University has concentrated its efforts in the area of

biological nitrogen fixation and agroproduction technology transfer. It derives additional strength from its newly developed linkages with the International Research Centers, FAO, the International Fertilizer Development Center, research institutes and Universities in Europe, New Zealand, Australia, Japan, and the developing countries. In this way the immense storehouse of experience, knowledge, and technology available in the tropical world becomes part of the University and adds to its capacity to respond to state, national and international needs.

The University administration has been quick to see the value of investing in collaborative efforts with other agencies and nations committed to increasing agricultural productivity in the tropics. By virtue of climate, soil and geography, the University of Hawaii can contribute to and profit as much or even more from collaborative work with tropical countries than it can with similar collaborative efforts with its sister states on the continental United States. This high degree of correspondence between ongoing programs and priority needs of the developing countries in the tropics and Hawaii virtually guarantees that the University will invest a greater part of its resources in international programs.

Grant Products

The grant was designed to produce tangible products which would serve to sustain the grant-generated momentum after the grant period. A summary of the grant objective/output and their corresponding products is provided in Table 1.

Expanded knowledge base

The state-of-the-art reports (SOTA) were prepared to give the participating scientist an opportunity to extend their knowledge base beyond state and national boundaries. The reports summarize what is known about a potentially

profitable area of work in the tropics and make recommendation about future needs. Of the six SOTA reports, only one recommends curtailment of development work. This report was on the subject of "Nitrogen Fixation by Bacteria Associated with the Roots of Tropical Grasses". Although the subject of nitrogen fixation by grass-bacteria association is extremely important to developing countries of the tropics, the SOTA report concluded that earlier claims of high nitrogen fixation in grasses, based on laboratory measurements could not be duplicated in the field, and therefore does not deserve heavy investment in research and development at this time.

In all other SOTA subjects, the scientist recommend continued efforts. Two SOTA topics (allelopathy and soil erosion) are being continued under USDA support and a third (Mycorrhiza) is likely to receive support in the near future. Work on Tropical pasture legumes and Phosphorus will be continued with state support.

Information capacity

The grant objective to streamline and enlarge the University's information capacity has been achieved in two ways. The College of Tropical Agriculture and Human Resources of the University of Hawaii has just approved a new project entitled "Tropical Agriculture Bibliographic Information Research". This system links the University with all of the world's major agricultural information retrieval centers. The Soil Data Bank, a second grant product under the second objective/output has been fully incorporated into an existing project on agrotechnology transfer. Efforts are underway to make the data available to other scientist through a joint Hawaii-Puerto Rico-Cornell-FAO project.

Education and training capacity

To develop Hawaii's training capacity, the University signed an agreement with the University of Philippines (Los Baños) to prepare and test an audio-tutorial package for training undergraduate students in that country. Dr. (Mrs.) Briones was invited to develop the package in Hawaii using Philippine materials and examples, and her voice for the audio part of the package. A workshop was held in the Philippines to advise teachers from the Provincial Colleges and Universities of this instructional method. This was followed by a proposal prepared by workshop participants to seek support for expanding audio-tutorial instruction in the country. The last report from the Philippines indicates that the program is now in the implementation phase.

Advisory Capacity, Linkages and Networks

The above products have been combined because both are direct consequences of the first three outputs, namely an expanded knowledge base, information capacity and training capacity. For example, the majority of scientists who participated in the preparation of the SOTA report on "The Role of Centrosema, Desmodium and Stylosanthes in Improving Tropical Pastures", are individuals from outside the United States and principally from Australia. Many of the named Australians have extensive experience in Tropical pasture management in the developing countries. Most of the grant products were produced through collaborative efforts with developing country scientists or with scientists from developed countries with long experience in the developing countries. This linked network of scientists enlarges the University's scope and capacity to serve in an advisory role.

EXPENDITURE

The expenditure listed in Table 2 is for the extended grant period June

30, 1976 to September 30, 1979. This was a non-matching grant for which overhead cost was waived.

Table 1. Grant Objectives and Products

Objectives/Outputs	Verifiable Products	Participating Scientists
1. Expanded Knowledge Base		
A. Microbiology	<ol style="list-style-type: none"> 1. Vesicular-Arbuscular Mycorrhiza in Tropical Agriculture (SOTA Report) 2. Nitrogen Fixation by Bacteria Associated with the Roots of Tropical Grasses (SOTA Report) 3. The Role of Centrosema, Desmodium and Stylosanthes in Improving Tropical Pastures (SOTA Report) 4. The Role of Allelopathy in Determining the Productivity of Grass-Legume Mixtures (SOTA Report) 	<p>B.B. Bohlool, B. Mosse</p> <p>B.B. Bohlool, P. van Berkum</p> <p>M. Asghar, R.L. Burt, D.G. Cameron, R.J. Clements, R.A. Date, I.F. Fergus, B. Grof, J.B. Macker, E.F. Henzell, B.C. Imrie, R.M. Jones, Y. Kanehiro, P.C. Kerridge, I. Lichten, D.A. Little, C.H. Middleton, R.M. Murray, A.G. Norman, B. Standall, J.K. Teitzel, I. Vallis, J.L. Walker, R.J. Williams, W.T. Williams</p> <p>D.P. Bartholomew C.C. Young</p>
B. Mineralogy	<ol style="list-style-type: none"> 1. Soil Erosion by Water in the Tropics (SOTA Report) 	<p>C.L. Armstrong, E.W. Dangleo, S. El-Swaify</p>

Table 1 (Cont'd). Grant Objectives and Products

Objectives/Outputs	Verifiable Products	Participating Scientists
1. Expanded Knowledge Base (cont'd)		
B. Mineralogy	2. Managing Soil and Fertilizer Phosphorus for a Productive Tropical Agriculture (SOTA Report)	S. Dowdle, R.L. Fox, J.P. Jones, R.A. Lower, K.S. Memon, D.E. Peaslee, P. Searle, P. vander Zaag, R. Yost
2. Information storage, interpretation, retrieval and delivery system	1. Current Awareness Service	B. Bird, S. Harris, P.P. Rotar
	2. Soil Data Bank	H. Ikawa, J. Maka
3. Education and Training Capacity	1. Audio-Tutorial Package for Training Undergraduates in Tropical Soil Science (Tested and currently in use in the Philippines.)	A.A. Briones, A.M. Briones, R.L. Green, M. Mukhtar, S. Tilo
4. Advisory Capacity	1. Cadre of 24 men and women scientists ready and willing to participate in collaborative work with developing country institution	D. Bartholomew, B. Bird, B. Bohlool, E. Dangler, R. De La Peña, P. Ekern, S. El-Swaify, R.L. Fox, R. Green, M. Habte, J. Halliday, H. Ikawn, Y. Kanehiro, W. McCall, E. Okazaki, P. Rotar, W. Sanford, J.A. Silva, Y. Tamimi, J. Thompson, G. Uehara, J.L. Walker, ∞ R. Watanabe, R. Yost

Table 1 (Cont'd). Grant Objectives and Products

Objectives/Outputs	Verifiable Products	Participating Scientists
5. Network and Linkages	1. Mailing list. Scientists from 76 countries receive CST Newsletter and University of Hawaii publication.	519 foreign scientists receive research information in soil science and related topic from Hawaii.

Table 2. Summary Budget for Extended Grant

	1977	1978	1979	Total
Salaries/wages	44,576.73	111,214.66	152,783.42	308,574.81
Fringe benefits	6,035.96	17,568.20	21,718.93	45,323.09
Materials & Supplies	1,261.41	3,608.90	15,341.33	20,211.64
Communication	99.07	956.31	924.15	1,979.53
Travel - domestic	3,298.66	12,693.64	11,931.71	27,924.01
- international	3,202.83	27,368.67	20,825.22	51,396.72
Freight & Delivery	--	75.37	985.80	1,061.17
Printing & Publication	23.50	80.67	3,063.56	3,167.73
Computer Service	666.46	4,020.39	3,015.01	7,701.86
Other Rentals	1,129.45	1,347.10	--	2,476.55
Repairs	--	--	559.60	559.60
Equipment	1,028.85	197.60	7,349.55	8,576.00
Others	178.02	575.92	2,759.52	3,513.46
Services & Fee Basis	--	11,863.83	5,670.00	17,533.83
-0-	61,500.94	191,571.26	246,927.80	500,000.00

OTHER PUBLICATIONS

In addition to the state-of-the-art reports, the faculty published the following articles related to the grant purpose during the grant period.

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