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REPORT OF THE UNIVERSITY OF PUERTO RICO

F-1

FOR THE PERIOD

JULY 1, 1973 TO JUNE 30, 1974

A. TITLE: A Grant to Strengthen the Capabilities of the University of Puerto Rico in Special Problems of Tropical Soils (Grant AID/csd 2857)

B. GRANTEE: University of Puerto Rico

C. DIRECTOR: Professor Rafael Pietri Oms

D. STATISTICAL SUMMARY:

1. Period of Grant: March 4, 1971 to March 3, 1976

2. Amount of Grant: \$500,000

3. Expenditures:

3.1 For report period: \$129,773.71

3.2 Accumulated: \$333,650.47

3.3 Anticipated for next year: \$98,200.00

E. NARRATIVE SUMMARY:

In executing grant activities during the report period, the University of Puerto Rico followed the policy guidelines developed upon implementation of the grant. Within the framework of these guidelines and in compliance with the provisions taken previously, grant funds were expended to strengthen three major areas: teaching, research, and institution building.

The grant had a marked effect on the curriculum of the Department of Agronomy as four new soils courses were added to the teaching program. Three of these were developed and are taught by new staff members whose appointments have been made possible through the grant. Encouragement by the grant director resulted in an additional new graduate course prepared and taught by a junior staff member not supported with grant funds.

Teaching conditions improved considerably on account of better laboratory facilities, availability of audio-visual equipment and an increase in library holdings which were acquired, in part, with grant funds. The grant thus resulted in the improvement of both the quantity and the quality of the University of Puerto Rico's teaching program in soil science. This is also reflected in a significant increase in the number of graduate students majoring in soils from one in 1971 to six at present.

Research efforts under the grant continued along the lines of action taken in previous years. Under the direction of the grant director, agronomic field research was conducted on the nutritional requirements of tropical food crops in two kinds of soils which represent vast areas of the humid tropics. The crops studied include yams, taniars and pigeon peas all of which are important food crops of small farmers in LDC's. Grant funds were also used to support pedological research in the area of soil classification and soil formation.

The grant further provided the opportunity for several staff members to travel in the U.S. and abroad to attend scientific meetings, participate in field trips and to visit research institutions.

An important grant accomplishment should be seen in the development of new perspectives of tropical soils by the faculty. Prior to the grant limited financial resources did not allow extensive travel which entailed a certain degree of provincialism. The grant promoted the establishment of linkages with the member universities of the Consortium as well as the development of close contacts with individuals and research institutions abroad. The University of Puerto Rico maintains excellent working relationships with the University of Hawaii and the University of Ghent, Belgium.

F. DETAILED REPORT:

1. General Background and Purpose of the Grant.

The general background and the purpose of the five grants to Consortium members are stated in the first section of this report. Within that context, the University of Puerto Rico's grant is focused on the subject matter area of conservation and protection of soils of the tropics. The grant to strengthen the University of Puerto Rico's capabilities in this field was awarded on March 3, 1971 and has a duration of five years.

The purpose of this grant is to foster the development of the University of Puerto Rico's competence and response capability in the area of conservation and protection of tropical soils. In conjunction with the four grants to other Consortium members this will contribute to building and increasing the competence of United States universities in the area of tropical soils.

2. Objectives of the Grant

2.1 Objectives restated:

- (1) Appoint a representative in a position of administrative responsibility to a program council whose function will be to provide policy and program guidance.
- (2) Appoint a project leader who will serve on a program executive committee, which will develop detailed plans of cooperation.
- (3) Reinforce existing competencies by appointment of resident and visiting staff in areas that will complement existing strengths of the five institutions.
- (4) Provide for support of students and faculty including exchanges of students and faculty to capitalize on the respective strengths of the cooperating institutions.

- (5) Make available physical resources, including office space, laboratories, equipment and other facilities and services, as well as existing staff competencies as the institution's contributions.
- (6) Develop a viable educational and research project on tropical soils and accommodate requests for training, technical assistance and consulting services as feasible and consistent with institutional resources and commitments.

2.2 Review of objectives:

The major objective of the grant is to create comprehensive knowledge, experience and expertise in the field of conservation and protection of tropical soils at the University of Puerto Rico. This objective is to be achieved via (1) assessing the currently existing knowledge, (2) increasing researcher competence, (3) developing an information system, and (4) increasing the capacity to conduct research as related to the subject matter of the grant.

Achievement of the stated objective requires coordinating knowledge of at least four areas of soil science: (1) pedology (classification and characterization), (2) soil chemistry, (3) soil physics, and (4) soil management. In addition, it requires supporting inputs related to climatology, crop management, water management and cultural systems.

Grant activities have, in general, been consistent with the original objectives. However, it is contemplated to revise the objectives listed above to indicate more specifically which objectives will be pursued in order to achieve the grant purpose.

3. Accomplishments

3.1 Organization and personnel:

Since the initiation of the grant, Mr. Rafael Pietri, Professor of Soil Science, has been in charge of all grant activities. He was appointed grant director and represented the University of Puerto Rico in the Executive Committee of the Consortium of which he is currently Chairman.

As the grant proposal called for the addition of a junior staff member (an instrumental analysis specialist), the administration of the College of Agricultural Sciences was asked for funds to appoint this new member. Funds were made available from the Dean of Agriculture's office and matched with funds from the Dean of Studies' office and Miss Milagros Miró was appointed as of August, 1970. As the funds were made available for only one year, Miss Miró is now under 211(d) grant funding, as originally planned, and will continue to be so for the duration of the grant.

In July, 1971, Dr. F. H. Beinroth was transferred from the UPR's Agricultural Experiment Station and joined the staff of the Agronomy Department of the Mayaguez Campus of the University of Puerto Rico as Associate Professor of Soils. Since then, he was fully supported with grant funds. Both Miss Miró and Dr. Beinroth are now holding tenured positions.

As a result of the grant, the number of graduate students in soil science has increased significantly from one to six. Four of these are partially supported with grant funds.

3.2 Teaching:

The soils courses offered at the University of Puerto Rico are all geared toward tropical soils and thus indirectly support grant activities. A more direct impact of the grant on the teaching program is reflected in the development of three new courses. Miss Miró designed a new course entitled "Instrumental Analysis of Soils and Plants" (AGRO 420) and prepared a comprehensive laboratory manual for this course. Dr. Beinroth developed two new courses, "Genesis, Morphology, and Classification of Soils" (AGRO 553) and "Soils of Puerto Rico" (AGRO 554).

During the report period Miss Miró offered the course on "Instrumental Analysis of Plant and Soils" and conducted the laboratory of the graduate course "Soil Chemistry" (AGRO 607) as well as the laboratory of the course "Soil Mineralogy" (AGRO 624). Dr. Beinroth taught both of the new courses indicated above and conducted the weekly field laboratories that form part of these courses. Mr. V. Synder, a graduate student, completely revised the laboratory for the course "Introductory Soils" (AGRO 300) and taught this laboratory twice. Another graduate student, Mr. R. Caudales, taught the laboratory of the course "Soil Fertility and Fertilizers" (AGRO 308) during the first semester of the academic year 1973-1974. Both students were supported with grant funds.

From January 15 through 21, 1974, Dr. Beinroth accompanied staff and students from Cornell University on their annual Field Study Tour in Tropical Agriculture in Puerto Rico. Dr. Beinroth served as discussion leader at the soil study sites and also presented lectures on the soils of Puerto Rico.

3.3 Research:

The University of Puerto Rico's research activities carried out under the grant and supported with funds from it may be grouped as follows: (a) agronomic field research, (b) laboratory studies, (c) thesis research, and (d) pedologic research.

(a) Agronomic Field Research. During the report period the following field experiments were in progress:

1. Support systems comparisons in combination with foliar fertilizer application in yams (*D. rotundata*): Isabela Substation.
2. Support systems comparisons in combination with foliar fertilizer application in yams (*D. rotundata*): College Farm, Mayaguez.
3. Yam cultivar trial (*D. alata*): Isabela Substation.
4. Yam population trial (*D. rotundata*): Isabela Substation.
5. Yam population trial (*D. rotundata*): College Farm, Mayaguez.
6. Fertilizer experiments with cassava (*Manihot* spp): Isabela Substation.
7. Effect of harvesting date on cassava (*Manihot* spp) yields; Isabela Substation.
8. Cassava (*Manihot* spp) propagation; Isabela Substation.
9. Foliar fertilizer application in pigeon peas (*Cajon cajanus*); Isabela Substation.
10. Soil compaction experiments with taniens (*Xanthosoma* spp); Isabela Substation.

With the exception of experiment 10, all of the above experiments were conceived and designed by Professor R. Pietri. The field work was carried out by Dr. J. Badillo, Assistant Agronomist with the

University of Puerto Rico's Agricultural Substation at Isabela. Experiment 10 was designed by Dr. H. Lugo Mercado, Assistant Professor of Soils at the Agronomy Department. The field work for this experiment was also conducted by Dr. Badillo. Although assigned to dedicate fifty percent of his time to these experiments, Dr. Badillo's full salary was provided by the Agricultural Experiment Station as a contribution to the grant.

The field work at the Isabela Substation was carried out on an Oxisol (Coto series; Tropeptic Haplorthox), whereas the soils used at the College Farm in Mayaguez are Ultisols (Humatas series; Typic Tropohumult). The orders to which the Coto and the Humatas series belong represent vast areas in the tropics.

The experiments in progress during the report period constitute a continuation and complementation of the experiments previously conducted. The main purpose of these experiments is to assess the nutritional requirements of tropical food crops and to provide management information for farming system operating under financial and technological constraints.

Detailed reports on the individual field experiments have been prepared. Upon completion of the experiments currently in progress these individual reports will be consolidated into one comprehensive report covering all aspects and results of the field experiments. This report is scheduled to be completed by February, 1975.

(b) Laboratory Studies. As a follow-up of the field experiments, comprehensive analytical investigations have been initiated to allow a proper evaluation of the field results and to establish

correlations between crop yields, their nutritional quality, levels of fertilization and soil characteristics. Under the general direction and supervision of Professor R. Pietri, these studies are carried out by Miss M. Miró with the assistance of grant-supported graduate and undergraduate students.

A total of 871 soil samples and 1,788 plant tissue samples have been collected, indexed and prepared for analysis. The analyses to be performed on the soil samples include cation exchange capacity; exchangeable bases; exchangeable acidity; pH in H₂O and KCL; determination of N, P, and K; and determination of extractable Ca, Mg, Fe, Mn, Zn, Al and Si. The plant tissue samples will be analysed for N, P, K, Ca, Mg, Fe, Mn, Zn Al, Na and Cu.

(c) Thesis research. Mr. R. Barahona, a native of El Salvador, is supported with grant funds to conduct research for his M.S. thesis. He is investigating the effect of different levels of fertilization on the chemical composition and nutritional quality of yams (Dioscorea spp). The field experiments were carried out in an Oxisol (Cotoeries, Tropeptic Haplorthox) at the Isabela Substation. Mr. Barahona has accomplished most of the analytical work and expects to have his thesis completed by December, 1974.

(d) Pedologic research. During the report period, Dr. F. H. Beinroth, spent approximately 75 percent on research. His investigations were in the field of pedology and focused on (i) soil classification, (ii) soil formation, and (iii) soil geomorphology.

(i) Soil classification. Research in this area concentrated on the comparison and correlation of soil classification systems used in the tropics; namely, U. S. Soil Taxonomy, the FAO/UNESCO Legend, the French Classification of Soils and the Brazilian System.

A study with the objective to classify the soil series of Hawaii in the FAO scheme was previously initiated in cooperation with Drs. Ikawa and Uehara of the University of Hawaii. The scope of this study was widened to include the French system because of its importance in Africa. Dr. A. Van Wambeke, University of Ghent, Belgium, was consulted for this phase of the study. A 107-page manuscript including five correlation tables has been completed and was sent to TA/AGR for publication as an AID bulletin (Technical Series Bulletin).

Further research on soil classification was conducted in connection with the preparation of an invitational paper presented at the seminar on "Soil Management and the Development Process in Tropical America," held in Cali, Colombia, in February, 1974. In this paper the main soil classification systems used in Central and South America were elucidated and the correlation of their taxa discussed. Another paper on soil classification and its potential use for purposes of agrotechnology transfer was prepared for the Workshop on Experiment Design held in Hawaii in May, 1974.

(ii) Soil formation. Since about two years, Dr. R. L. Fox and R. C. Jones of the University of Hawaii and Dr. F. H. Beinroth have been engaged in a joint comprehensive study of eleven highly weathered soils of Puerto Rico. The immediate purpose of this research is to report research data on the pedology, mineralogy, and chemistry of

representative Puerto Rican Oxisols and Ultisols. The ultimate objective is to provide detailed information for comparisons of selected soils of Puerto Rico with those of Hawaii and to relate soil classification to soil management and crop production. Part I of this study deals with formation, morphology and classification of the selected soils. Part II with their mineralogy and Part III with their chemistry. During the report period, Dr. Fox completed the manuscript for Part III and Dr. Beinroth finalized a manuscript of 127 pages for Part I. Dr. R. C. Jones is in the process of completing Part II. Negotiations with Dr. R. W. Simonson, editor-in-chief of GEODERMA, led to a tentative agreement that a whole issue of the renowned journal will be dedicated to this research.

With the cooperation of the University of Ghent, preliminary studies on the micromorphology of Puerto Rican Oxisols and Ultisols were initiated by Dr. Beinroth in July, 1973. To date, this research involved the preparation and inspection of thin sections. It provided valuable information on micromorphologic aspects of Puerto Rican soils which was formerly not available.

(iii) Soil geomorphology. The final manuscript on previously conducted geomorphic field studies on the island of Kauai, Hawaii, was completed during the report period. This paper, co-authored by Dr. F. H. Beinroth and Drs. G. Uehara and H. Ikawa of the University of Hawaii, discusses landscape relationships of Oxisols and Ultisols on Kauai. It was recently published in the Soil Science Society of America Proceedings.

3.4 Educational travel

Domestic travel of grant officers to comply with administrative and executive duties within the Consortium organization are not included in this item. These trips are detailed in the fiscal report for FY 1974. The following is a chronological account of domestic and international trips of educational nature made by staff members during the report period and supported with grant funds.

In July, 1973, Dr. F. H. Beinroth travelled to Ghent, Belgium to visit the University of Ghent. The purpose of this trip was to work on the micromorphology of Puerto Rican soils and to discuss the correlation of several soil classification systems used in the tropics. Dr. Beinroth's contacts at the University of Ghent were Professor Tavernier, Dr. Van Wambeke, Dr. G. D. Smith, Professor C. Sys, and Dr. G. Stoops. While at Ghent, Dr. Beinroth also presented two seminars on the soils of Puerto Rico.

In July, 1973, Miss M. Miró and Mr. V. Snyder, a graduate student, travelled to Hawaii to participate in a Workshop on Mineralogy of Soils of the Tropics sponsored by the University of Hawaii as a Consortium activity.

In August, 1973, Professor R. Pietri and Dr. F. H. Beinroth travelled to Bogota, Colombia to attend the third Colloquium of Soils of the Colombian Soil Science Society. The general theme of this meeting was soil phosphorus; a total of 19 papers were presented on basic aspects of soil P, P-fertilization and analysis and technology of P.

In November, 1973, Dr. F. H. Beinroth travelled to Hawaii to work with staff members of the University of Hawaii on three manuscripts for publications on jointly conducted research. From Hawaii, Dr. Beinroth proceeded to Las Vegas, Nevada to attend the 65th Annual Meeting of the American Society of Agronomy. Prof. R. Pietri also attended this meeting.

In December, 1973, Dr. F. H. Beinroth travelled to Washington, D. C. to participate in a seminar on "Program Design and Management," sponsored by the U. S. Agency for International Development. The objective of this seminar was to acquaint participants with key elements of project design, the methodology of the logical framework, and the process of project evaluation. Dr. Beinroth was invited by AID to attend this workshop.

In February, 1974, Miss M. Miró, Dr. J. Badillo, Dr. F. H. Beinroth, Dr. J. Colom Aviles, and Dr. G. L. Spain travelled to Cali, Colombia to participate in the "Seminar on Soil Management and the Development Process in Tropical America," this seminar was co-sponsored by the 211(d) University Consortium on Soils of the Tropics, the Centro Internacional de Agricultura Tropical (CIAT), the U. S. Agency for International Development, the Colombian Soil Science Society, and the Latin American Society of Soil Science. Dr. Beinroth had been invited to present a paper at this seminar. All delegates of Puerto Rico participated in the post-seminar field tour in Colombia, Perú and Brazil.

In May, 1974, Miss M. Miró travelled to Athens, Georgia, Raleigh, North Carolina, and New Brunswick, New Jersey to visit the soil and plant testing laboratories of the respective universities. She also visited the laboratories of the Technicon Corporation in Terrytown, New York.

In June, 1974, Miss M. Miro and Professor Pietri travelled to Santo Domingo, Dominican Republic to attend the 22nd annual meeting of the American Society of Horticultural Sciences' Tropical Region. Professor R. Pietri presented a paper entitled, "The Influence of Different Levels of N, P, K, Mg, Ca, and Si on the Yield of Tomatoes in an Oxisols."

3.5 Publications and manuscripts:

(a) Published or in press:

- Beinroth, F. H. 1973. Oxisols-Highly Weathered, Red Soils of the Tropics. In: Soils of the Southern States and Puerto Rico. S. W. Buol, Editor. South. Coop. Ser. Bull. No. 174, North Carolina State University Press, pp. 87-91.
- Beinroth, F. H., G. Uehara, and H. Ikawa. 1974. Geomorphic relationships of Oxisols and Ultisols on Kauai, Hawaii. Soil Sci. Soc. Amer. Proc. 38:128-131.
- Beinroth, F. H., H. Ikawa, and G. Uehara. 1974. Classification of the Soil Series of Hawaii in Different Systems. USAID, Techn. Ser. Bull. (In press).
- Beinroth, F. H. 1974. Relationships between U. S. Soil Taxonomy, The Brazilian Soil Classification System and FAO/UNESCO Soil Units. Proc. Sem. Soil Management and the Development Process in Tropical America, Cali, Colombia (In press).

(b) Manuscripts prepared:

- Beinroth, F. H. A study of highly weathered soils of Puerto Rico. Part I: Formation, morphology and classification. To be submitted to Geoderma.
- Beinroth, F. H. Some considerations on soil classification and "Soil Taxonomy" in particular. Proc. Workshop on Experimental Design, Honolulu, Hawaii (In preparation).

Abrams, R., L. Cruz Pères, R. Pietri, and F. J. Julia. 1974.
The influence of different levels of N, P, K, Mg, Ca, and Si on yield of tomatoes in an Oxisol. Paper presented at 22nd annual meeting. Amer. Soc. Hort. Sci. Trop. Region.

4. Impact of Grant-Supported Activities in Developing Institutional Capabilities.

At the University of Puerto Rico, most of the grant impact has been on the teaching environment, involvement and perspective of faculty personnel, and on the institution's instrumental capability to conduct research.

The grant has strongly influenced the teaching program as it stimulated the addition of three new courses. By providing improved laboratory facilities, audio-visual equipment and increased library resources, the grant has favorably enhanced the quality of the teaching and learning environment. In direct relation to these improved conditions and as a result of grant-generated opportunities for graduate studies, the number of graduate students in soil science has increased from one to six since the initiation of the grant.

Research laboratory facilities were improved significantly through the acquisition of equipment for chemical and mineralogical soil analyses. Many aspects of soil research which could previously not be investigated can, therefore, be accomplished now.

The grant enabled the appointment of two new staff members. As both of them now have tenure with the University of Puerto Rico, the experience they gained in performing grant activities will continue to be available to the institution beyond the termination of the grant. Grant funds have been used deliberately to provide travel support for staff members. It is believed that this has substantially broadened the professional experience

and perspective of the faculty and reduced a certain provincial bias stemming from limited experience in other tropical regions. The grant has further promoted the establishment of contacts with scientists from the member universities of the Consortium and from abroad. This has resulted in functioning working relationships with several institutions, as evidenced by joint research projects, as well as in dialogue with domestic and foreign scientists.

5. Utilization of Institutional Resources in Development.

Through its Office of International Programs, the College of Agricultural Sciences shares and makes available to other institutions its staff competencies and physical resources. As part of this resource sharing, commitments have been made to provide technical assistance and training to less developed countries.

The University of Puerto Rico has a contract with the Regional Office for Central America and Panama of AID (ROCAP-83) which calls for graduate training in Puerto Rico of students from Central American universities. During the academic year, 1973-1974, six students from Nicaragua were in Puerto Rico on this program to pursue graduate studies.

Another term of this contract calls for sending Visiting Professors from the College of Agricultural Sciences to Central American institutions. During the academic year 1973-1974, the following staff members were on such assignments:

Dr. L. M. Cruz Perez at the University of El Salvador, El Salvador

Dr. A. Sotomayor Ríos at the "Universidad Nacional Autónoma," La Ceiba, Honduras

Dr. V. Garcia Villareal at the "Escuela Nacional de Agricultura y Ganadería," Managua, Nicaragua.

In addition to the activities channeled through the Office of International Programs, the College of Agricultural Sciences itself serves as a resource-sharing avenue. During the academic year 1973-1974, the College of Agriculture had a total enrollment of 457 students of which 47, or approximately 10 percent were foreign students. They came from the following countries: Bolivia, 1; Colombia, 5; Chile, 1; Cuba, 5; Curacao, 1; Haiti, 3; British Honduras, 2; Panama, 3; Dominican Republic, 23; El Salvador, 1; and Venezuela, 2.

6. Other Resources for Grant-Related Activities.

The grant contributes to the overall teaching efforts and teaching commitments of the Department of Agronomy of the University of Puerto Rico. As the chief goal of the grant is to strengthen the existing competency, funds provided by this grant are not used to replace existing funding of current projects. On the contrary, activities carried out under this grant are additives to existing programs of the University. In direct support of the grant, the University has been and will continue to provide the following inputs.

1. Administrative costs and utilities in all administrative offices and facilities. The basic salary of the project leader, Professor Rafael Pietri, comes from the university budget. No funds from the grant are used to cover salaries and costs of services of senior administrative officers in the College of Agricultural Sciences.
2. Access of all persons involved in grant activities to laboratories, field research facilities, and libraries. The facilities of the Agricultural Experiment Station and its substations are also available. The field research under the grant is using a six-acre plot

- at the Isabela substation which is provided free of charge to the grant program. The services of the Central Analytical Laboratory of the Agricultural Experiment Station are also available free of charge.
3. Office, classroom, and other space for faculty, students and special meetings related to the grant program. In addition, the University provides to all persons involved in grant activities all services and facilities that are normally provided to regular staff and students.
 4. Members of the faculty in the Agronomy Department not directly supported with grant funds, but involved in grant activities, are considered an integral part of the grant program. Their salaries constitute a university contribution to the grant.
 5. Sub-professional personnel of the department are also considered an integral part of the grant program and take part in related activities although they are state-funded.
 6. Budget appropriations for supplies and materials for the Soil Science section of the Agronomy Department provided through state funds have been placed under the direct control of the grant director. This follows the same line of thinking already stated in the above paragraphs; all available resources are pooled in order to use them more efficiently.
 7. Dr. Badillo, Assistant Agronomist with the Agricultural Experiment Station, has been assigned to devote 50 percent of his time to the field research phase of the grant program. Dr. Badillo is entirely supported with state funds.

7. Next Year's Plan of Work.

7.1 Teaching:

As the new courses generated by the grant program have been approved by the Office of the Dean of Studies, they are an integral part of the department's teaching program and will, therefore, continue to be taught during the academic year 1974-1975. These courses will be evaluated and modified if necessary and appropriate.

Negotiations have been initiated to obtain the services of Mr. S. M. Viscasillas, Director of the Soil Conservation Service's Regional Office at Mayaguez, to assume part-time teaching responsibilities in the Department of Agronomy. It is anticipated that Mr. Viscasillas will modify and teach the course "Soil Conservation" (AGRO 401) in the forthcoming academic year.

7.2 Research:

Most of the agronomic field research now in progress is expected to be completed during the next year. A comprehensive report covering all aspects and results of the field experiments will be prepared. To complement the field work, the laboratory characterization of some 2,600 soil and plant samples will continue. The analytical data and the field results will be subjected to statistical analysis to establish correlations between yield levels and nutritional quality of the crop and fertilization practices and various soil parameters.

Research in the area of pedology is contemplated to comprise the classification of all Puerto Rican soil series in different soil classification systems, investigations relating forms of soil phosphorus to weathering stages and taxonomic units, and continuing

research on the micromorphology of Puerto Rican soils. The latter will be carried out in cooperation with the University of Ghent and will include thin section, porosity and microfabric studies. This research should be useful to evaluate the structural stability of selected tropical soils and their susceptibility to erosion.

Involvement of graduate students in grant activities will be expanded during the next year. Three students will initiate research on topics directly related to the subject matter area of the grant for their respective M.S. theses. One grant-related M.S. thesis now in progress is expected to be completed by December, 1974.

7.4 Visiting professors:

The grant will continue to sponsor the invitation of visiting professors. Pending negotiations have resulted in tentative arrangements for two distinguished scientists to visit the Mayaguez Campus of the University of Puerto Rico in 1974. There are Dr. Goro Uehara, Professor of Soil Science of the University of Hawaii, and Mr. Marcelo Camargo, Chief Pedologist with the "Empresa Brasileira de Pesquisa Agropecuaria" of Brazil.

8. Other:

No additional matters to report.