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THE OHIO STATE UNIVERSITY

COLLEGE OF AGRICULTURE AND
HOME ECONOMICS

DEPARTMENT OF AGRONOMY

ANNUAL TECHNICAL REPORT OF 211(d) PROJECT

1970 - 1971

Technical Report

211(d) International Program

The Ohio State University Annual Report No. 3
1970-71

The Contribution of the 211(d) Program to the Total University Capability in the Area of Agronomy

The third year of the 211(d) program at Ohio State University reflects, principally, a continuation and development of the programs that were begun in the first and second years.

1. No new courses have been introduced but considerable effort has been expended to improve and update those courses that were introduced to extend the international aspects of the Agronomy Department's instructional program. Volume of material and student interest has made it necessary to increase the weekly contact hours, from four to five, in the course on crop production in developing countries.

2. Within the context of all courses that are being taught by internationally experienced faculty, there continues to be injected a marked international component. In fact, even some courses being taught by faculty without direct international experiences are receiving some international inputs. This is a direct result of the technological developments in the agronomic field on a world basis. Thus courses dealing with grain production would be considered incomplete without emphasis being placed on the breeding and cultural practices being performed in other countries.

In certain courses such as the Undergraduate Agronomy Seminar, a definite section has been introduced to familiarize the upper class undergraduate students with the potentials, opportunities, requirements and rewards of international agronomy.

3. Since the annual report of last year which outlined the plans for the international symposium that was partly sponsored by, and instigated as a result of, 211(d) funds; many students in Agronomy and related fields have expressed interest in similar periodic seminars.

The general consensus of opinion by students, relative to the symposium, was that the gathering of experts working in various fields throughout the world to report on recent developments added a broadening

dimension that is needed because of the increasing interaction of the agricultural sectors of the world's economies. It was also felt that such seminars, apart from permitting one to plan one's own situation with more insight, provided a sound basis for assuring the relevancy of designed international programs.

The success of the international symposium of Summer 1970 dictates that another similar seminar should be offered in Summer 1972, with the exception that more emphasis would be placed on having representatives from A.I.D. as the main speakers. Logistics would suggest that the length of the symposium be curtailed to about five days and 211(d) disciplines of all CUSURDI universities be represented.

4. Library acquisitions pertaining to international agronomy with particular emphasis on India has been continued throughout the year. Special lists of the government of India's newly released publications are received monthly and the appropriate publications are ordered. These books and scientific articles are added to the Agronomy Library India shelf.

5. During the year three internationally renowned agronomists have acted as visiting lecturers to the department. All three scientists were able to spend a good deal of time with students and faculty and emphasized the International aspects of their particular specialities.

Dr. John Coulter, Specialist in Tropical Soils from Rothamsted Experiment Station discussed the soils of the Tropics from the standpoint of their food producing potential. Dr. Dev Bhumbra, Director of the Salinity Institute at Karnal, India contributed substantially to the research ideas of the 211(d) students and lectured on soil water and salinity problems of Northern India. Dr. M. L. Jackson from the University of Wisconsin contributed much to our knowledge of the mineralogical and amorphous properties of some tropical soils.

The emphasis on international agronomy by all supported speakers to the department is most apparent, even though only Dr. Dev Bhumbra was supported by 211(d) funds.

The 211(d) students have (on their own initiative) instituted a regular monthly seminar in which some member of the faculty of Agriculture with experience in India, is invited to informally discuss his experience with them, the 211(d) professor, and other Indian graduate students. These meetings are very informal and results in some very candid exchange of views and concepts. They have served to knit the students and faculty together under an umbrella of international interest.

The Objectives of the 211(d) Grant

The objectives of the 211(d) program at Ohio State University are to develop within the university an expertise and capability in

international agriculture in the area of Agronomy, specifically soil-plant-water relationships. The educational role of the university is pursued through the continued involvement in the international sector in the areas of research and teaching in order to acquire and disseminate new knowledge while developing internationally trained personnel.

In order to fulfill the stated objectives, India is being used as the country where research experience can be gained while establishing working relationships between Indian agronomists and acquiring knowledge of the agriculture of developing countries.

Major Accomplishments During the Year in Meeting the Objectives of the Grant

A. Development of Teaching Competence.

Although there is no new concrete event to characterize the build-up of the international component in resident instruction, never-the-less the efforts that were initiated in the two previous years were continued and most courses that were being taught in the department are taught by faculty with some international experience.

Those courses specifically dealing with crops, soils and climates of the tropical and sub-tropical regions continue to grow in student enrollment as awareness of the potential and possibilities for international involvement of agricultural students increases.

The stimulus of 211(d) grant funds has resulted in an increased emphasis being placed on international application, by all visiting speakers to the faculty and students of the department.

B. Development of Research Competence.

All three graduate students supported by the program will be departing for India during the last week of June. Arrangements between the 211(d) professor and his Indian counterparts have been completed and research areas and problems have been finalized.

Micronutrient chemistry has captured the interest of one 211(d) student. His activities have been focused primarily upon zinc. Several workers in the past have reported that a significant amount (25% at least) of zinc applied to soil organic matter is not available to plants. The mechanism of this reaction has not been fully elucidated.

This research project has been based on a two-fold hypothesis. The first postulate was that cations having the same coordination geometry as zinc ions should extract a larger proportion of applied zinc than cations having different coordination geometries. To this end mercury, nickel, copper cadmium and a chelating agent were studied. The second phase involved a theory that the stereo-structures of soil organic macro-molecules are determined by the coordination geometry of

the metal ion or ions. At present this attempt is leading into the employment of electron micrographs and is not completed. The effect of drying the soil has also been previewed and it definitely was a factor in determining how much zinc a soil could retain.

While in India this student will continue to attempt to elucidate the mechanisms of zinc retention by the more inorganic soils of the state of Punjab.

Another research project is involved with an investigation of the reason why some crops fail to respond to applications of potassium to soils of the Punjab testing low in this element. X-ray diffraction studies on some of these soils have shown them to be high in micas which may be weathering out potassium during the cropping period. Chemical and X-ray analyses of soil samples from Punjab are being continued and field plot studies have been planned for execution upon arrival in India.

Both students who will be working in the state of Punjab will be supported by rupee funds that have been made available through research contracts with A.I.D./India. The other 211(d) student who will be working under the direction of Dr. N. G. Perur at Bangalore, Mysore will be supported by regular 211(d) funds.

The research contribution of the student working in Mysore will be in evaluating phosphorus extraction procedures as an index for crop yield in on-going soil-test, plant-yield correlation studies. Research to date has involved a comparison of the Mehta extraction method and the S.A.H.T. ignition method for evaluating organic phosphorus levels.

Research project proposals for all graduate students supported by the 211(d) program have been reviewed and amended by the Indian professors with whom the students will be working. A good interchange of ideas has been accomplished by direct correspondence between the students, their Indian professors and the 211(d) professor who finalized all arrangements during his last visit to India in February 1971.

The distribution of foreign students within the graduate student body of the Agronomy Department is such that a wonderful opportunity is provided for U. S. graduate students to work with students from other countries. Student's from India represent the largest group of foreign students from any single country.

C. Development of Competence for Consultations and Service.

In the preceding two years the development of competence for consultation and service was perhaps the least significant of the accomplishments in meeting the objectives of the 211(d) grant. The last year, however, has resulted in increased expertise in this area.

As a direct result of the recommendation of the International Affairs Long Range Task Force Committee of which the 211(d) professor was chairman, the College of Agriculture has formed an International Affairs Advisory Committee to work in concert with the Office of International Affairs and to provide a source of direct information between the international affairs of the college and the individuals of each department. The 211(d) professor is a member of this committee and is called upon to contribute his knowledge of the international arena.

In recent months discussions have taken place between representatives of the Peace Corps and the College of Agriculture and Home Economics with the view to starting an Intern Peace Corps program for Northern India. Apart from the normal well established function of consulting with prospective Peace Corps and other internationally involved personnel, this newly formed Peace Corps Intern Program Committee allows the 211(d) professor and other faculty members with experience in India to contribute and use their acquired knowledge. With the inception of the Intern Program the Agronomy Department will be extremely involved because of the internationally oriented courses and interest of faculty and students that has been stimulated by the 211(d) program.

The most recent visit of the 211(d) professor to India provided an opportunity for him to visit Uganda and study the soils and crops of that country. This opportunity was fruitful for many reasons and was particularly significant in view of the fact that Ohio State University is currently interested in establishing a working relationship with Makerere University through the auspices of the Agency for International Development.

This visit provided an opportunity for the 211(d) professor to consult with faculty members and administrative personnel of Makerere University while supervising and advising one of his graduate students who is doing home country research work on sulphur-nitrogen interactions on the soils of Uganda.

Bananas represent a staple food source in the diet of the Ugandan people and an extensive research program is presently underway to increase production and improve the quality of this food source. Under the auspices of the Rockefeller Foundation, Dr. D. H. Parish, who was initiating the research program, had visited the 211(d) professor for consultation purposes on the agronomic aspects of banana production. The recent visit afforded an opportunity to evaluate the status of the research and advise on methodology and biometrics of the on-going program. Consultation with faculty and graduate students working with bananas resulted in the adoption of several more efficient practices and the diagnosis and correction of a problem which inhibited the use of a multi-thousand dollar lysimeter for determining the water requirements of the banana plant under those climatic conditions.

The same visit made it possible to present a seminar to the Universities' faculty of Agriculture and scientists from the outlying experimental stations, on the mineral nutrition of the banana plant.

The 211(d) professor's visit to India in February 1971 was designed to coincide with the International Symposium on Soil Fertility Evaluation which was held in New Delhi between February 9 and 14. Apart from the technical aspects, the meetings made it possible to meet and discuss international soil problems with outstanding soil and plant scientists from several areas of the world -- truly an outstanding international experience. The symposium also made it possible to bring together in one place all the Indian professors with whom the 211(d) professor has been working.

A short visit (while returning from India) was made to the Agricultural University at Wageningen to discuss with their faculty the work they are doing in international agronomy with special emphasis on the dark clay soils of the tropics and subtropics. The tropical soils institute at Wageningen has made some outstanding contributions to our knowledge and management of these very important soils.

As a result of involvement in international programs, the 211(d) professor has been asked to serve on an external advisory panel to assist the Office of Agriculture and Fisheries in the Technical Assistance Bureau, Agency for International Development, in the key problem area of "Tropical Soils and Water Management". The panel will help to identify major problems and the related knowledge gaps while making recommendations for the activities necessary for their solution.

D. Involvement of Other University Resources.

The Ohio State University continues to expand its programs in the international field. Increasing emphasis is being given to study abroad in the entire university. This includes undergraduate academic study, special study tours, and especially graduate research study.

Effort in the College of Agriculture and Home Economics in the international field has been further intensified during the past year. Three undergraduates have been studying abroad during the past academic year; two in India and one in Brazil. An increasing number of undergraduates have indicated interest. At least three graduate students are expected to be doing their research in foreign countries in the next year. The college is finding some financial assistance to encourage study abroad. One study tour group from the College went to Europe during the past year.

An International Advisory Committee of faculty with all departments, schools and areas represented, has been formed. Two new foreign assistance programs are being considered in the college.

About one-third of the graduate students in the College are foreign students. An increasing number of postdoctorals from foreign countries are coming to study in the College. Many visiting professors are coming to the College and University.

The university has continued to provide financial and faculty support for the program. Thus classroom, office, laboratory, greenhouse and equipment facilities are always available while secretarial and administrative services are funded through the university.

The Office of International Affairs, College of Agriculture and Home Economics has continued to coordinate the 211(d) program while at the same time providing an opportunity for a logical tie-in with other on-going international programs.

Although difficult to place actual dollar values on the services and facilities provided by the university, the college and the department, it is estimated that such support amounts to about \$20,000 annually.

Expenditures

Expenditures of 211(d) funds from July 1, 1970 through June, 1971 are expected to total \$38,021.98. This figure does not include any travel expenses of students to India which are expected to be incurred in June 1971. Such expenses will be included in the 1971-72 statement. The breakdown of expenditures for the year were as follows:

Salaries and retirement	\$20,288.18
Graduate student stipends	12,600.00
Equipment	805.68
Miscellaneous	2,774.21
Travel	<u>1,535.91</u>
Total	\$38,021.98

Total expenditures since the inception of the program to date are \$89,275.52.

Salaries and retirement includes the salary of the 211(d) professor while graduate student stipends reflects the support for three students; two Ph.D. candidates receiving \$4,500.00 per year each and one M.Sc. candidate receiving \$3,600.00 annually.

Equipment expenditures are reflected in the purchase of additional attachments to the existing Perkin Elmer Atomic Absorption Analytical unit and for the manufacture and installation of a stainless steel fume hood for the same unit. These additions make it possible to analyse for silica and iron in soils, elements that are very important in tropical soils work.

Miscellaneous costs reflect the honorarium and expenses for Professor E. W. Russell's participation in the international symposium of July 1970, that was partially sponsored by the 211(d) program, and also the support of Dr. Dev Bhumbra's presentations and consultation in early 1971.

Travel expenditures for the year included one round trip to India with stops in Africa and Europe to help develop competence in the area of international consultation and service. Other travel costs were for 211(d) meetings in Washington, D. C. and for attending a meeting on "Micro-Nutrients in Agriculture" in Muscle Shoals, Alabama.

Work Plan and Budget Forecast

Expenditures in the category of salaries are expected to remain fairly constant for the next year.

A decrease in student stipends is expected in the next year when two of the students working in India will be supported by USAID/India rupee funds for one year. The other student, however, will receive additional funds for travel and living allowance.

This reduction in stipend expenditures would make it possible to support at least two more students until the termination of the program in 1973. However, this would not provide sufficient time for completion of the students programs. With a favorable indication for the continuation of the grant beyond 1973, plans could now be made for involving additional students in the program.

Plans are being made to procure soil samples and monoliths of the Great Soil Groups for the tropics and sub-tropics. These will be very useful as teaching aids while acting as physical examples to arouse and develop the interests of students and faculty. Expenditures for obtaining these soils are difficult to estimate and will depend to a large extent on personal contacts in other countries. Costs are estimated in next years budget under the category of miscellaneous.

A one week international seminar is being planned for the coming year. This will attempt to bring two or three internationally well known agriculturalists to the campus to extend the international interests of the department and college. Some funds will be used to support these speakers. Costs for sponsoring this seminar are reflected in the miscellaneous and travel categories of the next year's budget.

In the category of equipment it is anticipated that certain attachments for a high-resolution microscope will be purchased in order to investigate the thin section morphology of certain soils. Using this new tool has made it possible to determine the nature of certain minerals that contribute to the fixation and release of specific nutrients.

The projected budgetary requirements for the coming year are as follows:

Salaries and retirement	\$23,000.00
Graduate student stipends	4,500.00
Equipment	3,000.00
Travel and Living allowance	7,500.00
Miscellaneous	<u>6,000.00</u>
Total . . .	\$43,000.00

For the last year of the grant 1972-73, the total projected expenditure is expected to reflect the decision as to whether or not the grant will be extended. Should it be terminated, a certain amount of funds should be expended to evaluate the impact of the program both at home and abroad.

Should a decision be made, in the near future, to continue the 211(d) beyond its present date of termination, additional funding, to the extent of \$200,000 has been requested in a separate proposal.