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KANSAS STATE UNIVERSITY

COLLEGE OF AGRICULTURE

DEPARTMENT OF GRAIN SCIENCE AND INDUSTRY

ANNUAL TECHNICAL REPORT OF 211(d) PROJECT

1970-1971

KANSAS STATE UNIVERSITY  
DEPARTMENT OF GRAIN SCIENCE AND INDUSTRY  
Manhattan, Kansas

THIRD ANNUAL REPORT AID 211(d)  
GRANT TO DEVELOP SPECIALIZED COMPETENCIES  
ASSOCIATED WITH GRAIN UTILIZATION IN INDIA - 1970-71  
June, 1971

I. SUMMARY

The 211(d) program has progressed during 1970-71 in the manner previously planned and presented in the first and second annual technical reports. Mr. Merrick Lockwood and Mr. Patrick Finney passed their preliminary examinations and are currently conducting their Ph.D. dissertation research at the Central Food Technological Research Institute, Mysore, India. A third student, Mr. Alvin Siegel, was added to the program and is in the process of fulfilling course requirements for the Ph.D. degree.

Budget expenditures for the past year contained major expenditures for travel and equipment. Mr. Lockwood and his wife departed for Mysore in August, 1970. Mr. Finney departed for Mysore in October, 1970 and was joined by his wife in December, 1970. The 211(d) professor travelled to India in April, 1971 to consult with these two students and Indian scientists co-directing their work, to evaluate the progress of these students, to finalize their research programs, and to make initial arrangements for the third student to study at the Central Food Technological Research Institute. During the year, major items of research equipment

were purchased from U.S. manufacturers and shipped to India for use by the two students in their research projects.

Professor G. S. Bains, Chairman, Discipline of Flour Milling and Baking Technology, Central Food Technological Research Institute came to Kansas State University as a visiting professor during October, 1970 under the provisions of the 211(d) program. He is co-directing the research program of Mr. Finney. During his visit at the University, he presented seminars and consulted with staff and students.

The objectives of the 211(d) program have been adhered to and the program has developed as anticipated. The program has stimulated interest in international agriculture among both graduate and undergraduate students and among faculty members. The uniqueness of this program, particularly the flexibility with regard to selection of research problems, has generated considerable discussion among both students and staff. Experience gained through the 211(d) program has been utilized to enrich course content in several existing courses by the inclusion of material with international orientation. Personnel involved with the program have continued their interchanges and cooperation with the University's South Asia Center, the International Activities Office and programs of the International Agricultural Office.

Plans are now complete for the remaining two years of the 211(d) Grant. Emphasis will continue to be placed upon graduate student training in food grain utilization in India while simultaneously further developing the competency of Kansas State University in this area. This emphasis is considered to be of maximum importance and benefit, yielding the greatest return for the current 211(d) program.

## II. GRANT OBJECTIVES

The basic objectives, as stated in the contract, are as follows:

"The basic objectives are to train graduate students in food grain utilization in India and other developing countries and to further develop the competency of Kansas State University in these areas. The University considers international activities of this nature a legitimate concern and function. Training and research activities in this area are under way but assistance, as requested in this grant, will enable the University to engage in new endeavors and expand its research and graduate instruction program so as:

- A. To increase the capability of Kansas State University to render assistance to India and other developing nations in food grain utilization.
- B. To enlarge the pool of scientists trained in grain handling, processing, storage and marketing interested in and capable of assisting India and other developing nations.
- C. To increase professional awareness of the increasing importance of grain storage, handling, processing and marketing in developing countries.
- D. To encourage college students to seek careers in international service in the broad area of grain utilization.
- E. To provide an opportunity for graduate students to obtain research experience on problems of particular relevance to India and other developing countries by assisting with research activities carried out fully or in part in India.

- F. To stimulate and encourage faculty and other professional staff to consider careers in international service and to increase faculty interest in and university commitment to agricultural problems of India and other developing countries by drawing upon their special relevant competencies in training and research.

### III. MAJOR ACCOMPLISHMENTS

#### A. Program Development

The work plan outlined in Technical Report No. 2 was followed and realized. Mr. G. S. Bains, Chairman, Discipline of Flour Milling and Baking Technology, Central Food Technological Research Institute, came to Kansas State University as a visiting professor from October 5-30, 1970 under the provisions of the 211(d) Grant. During this period he presented two formal seminars to interested students and faculty entitled "India's Food Problem and Role of Technology" and "Grain Milling in India". In addition, Mr. Bains consulted with faculty and students from several departments in the University. He had discussions with several staff members from the Department of Grain Science and Industry concerning the 211(d) program.

The plans for the graduate students in the program progressed as expected and are summarized below.

1. Mr. L. Merrick Lockwood and his wife arrived in Mysore in September, 1970. His research work is being supervised by Dr. S. K. Majumder in the Infestation Control and Pesticide Discipline of C.F.T.R.I. Mr. Lockwood was assisted by Dr.

Majumder in finding suitable housing for his family and in getting located in the laboratory. Equipment shipped from the U.S. to India for use in Mr. Lockwood's research arrived in January. In the intervening months, familiarization and preliminary tests were run.

Mr. Lockwood plans to treat domestically-grown cereal grains (wheat, sorghum and rice) with known amounts of chemicals used commonly in India to control insect infestation [malathion, sumithion, gardona and benzene hexachloride (BHC)]. After various storage periods, samples of the cereal grains will be processed by crude grinding and sieving procedures and by refined commercial operations. Each grain will be processed using conditions and equipment normally used in India. Food products will be prepared from the processed grains and analyzed for chemical residues.

Mr. Lockwood has collected a sample of sorghum from the 1970 crop and has it stored ready for processing. Initial experiments are being run to determine the lowest effective concentration of each chemical, which will be used in later evaluations. A gas chromatograph has been installed in the laboratory and is currently being "checked out" prior to use for residue analysis.

Current plans call for Mr. Lockwood to obtain a wheat sample from the 1971 crop (May, 1971) and a rice sample from the 1971 crop (December, 1971). All samples are carefully selected for known history and are inspected for soundness.

Mr. Lockwood should complete his research in about May, 1972 and will then return to the U.S. to complete the writing of his dissertation.

2. Mr. Patrick L. Finney arrived in Mysore in October, 1970 and was joined by his wife in December, 1970. His research is being supervised by Professor G. S. Bains in the Discipline of Flour Milling and Baking Technology. Mr. Finney is investigating the quality evaluation of Indian wheats, especially the newly introduced semidwarf varieties, for the preparation of white bread. Comparison will be made with bread baked from a Regional Baking Standard flour supplied by the U.S.D.A. Hard Winter Wheat Laboratory at Kansas State University and widely used as a baking standard. Efforts will be made to evaluate wheats within the context of India's uses and needs.

Mr. Finney has cleaned, repaired, adjusted and made operational experimental milling equipment available at C.F.T.R.I. Indian wheats have been milled on the Buhler mill and conditions have been ascertained for milling soft and hard wheats to yield flour of the desired extraction. These two sets of conditions will be used to mill the wheat samples used for quality evaluation. Equipment shipped from the U.S. for use in the evaluation of dough properties and for preparing dough for baking has arrived and has been installed in the laboratory.

Fifteen wheat samples from the 1970 crop have been obtained from two different locations (Ludhiana and Poona). These are currently being milled. Approximately twenty-five samples from

the 1971 wheat crop are being collected at four locations (Delhi, Chandigarh, Ludhiana and Poona). Temperatures have been requested from each location for the fruiting period.

Upon completion of the milling for each crop year, the flours will be baked into breads using a standard baking procedure which is internationally accepted. Appropriate tests will be run on the flour, dough and bread to allow quality evaluations to be made. Approximately twenty-five samples will also be collected from the 1972 wheat crop and evaluated. Mr. Finney tentatively plans to complete his research in October, 1972 and return to the U.S. to complete the writing of his dissertation.

3. Mr. Alvin Siegel has been added to the program and is working on a Ph.D. degree. He has a B.S. in Agriculture from the University of Rhode Island (1968) and a M.S. in Food Science from Michigan State University (1970). Prior to joining the 211(d) program he was employed as a Food Technologist by Libby, McNeil and Libby, Chicago. He is currently enrolled as a full-time student and is in the process of satisfying the course requirements for a Ph.D. Current plans are for him to complete his course requirements in May, 1972 and to take his preliminary examinations in June, 1972. Upon successful completion of these he will proceed to Mysore where he has been tentatively accepted at the Central Food Technological Research Institute.

During the visit of the 211(d) professor at C.F.T.R.I. in April, 1971 initial arrangements were made for Mr. Siegel to

study at the Institute in the Discipline of Applied Nutrition and Dietetics. The Director of C.F.T.R.I., Dr. H. A. B. Parpia, indicated the Institute's pleasure with the 211(d) program and the desire to broaden the basis of cooperation. Dr. M. Swaminathan and Dr. M. Narayana Rao have indicated a willingness to supervise Mr. Siegel's research. A tentative research program related to studies concerning the preparation, acceptability and nutritional evaluation of cereal-based foods for children was formulated while Dr. Lineback was at C.F.T.R.I. and is now being further considered. The tentative project objective under consideration is: "To prepare an acceptable cereal-based food from a blend of rice, wheat and soybean flour, with or without fortification with methionine, suitable for feeding of preschool children and to evaluate its nutritive value both by growth studies on experimental animals and feeding trials on school children." The Discipline of Applied Nutrition and Dietetics has a great deal of experience in this type of work.

B. Development of Teaching Competence

Kansas State University has a long history of active international involvement. The Department of Grain Science and Industry has an excellent international reputation for its research and training functions in the field of grain science. The graduate student body of this department is often as high as 50% international students and the staff of the department is in daily contact with foreign students and visitors.

The 211(d) program has been used to enrich the teaching program of this department and the services of those involved in the 211(d) program have been made available to other departments of Kansas State University for use in their teaching programs. Such involvement has been judged of more value to the University and of wider impact on students than creation of a new course devoted to international agriculture within the Department of Grain Science. As the results of international experiences, particularly those of the 211(d) professor and students, are incorporated into existing courses and seminars, many more students gain from them than would through a single course.

C. Development of Research Competence

A viable, strong program of cooperation is developing with the Central Food Technological Research Institute under the 211(d) program. As the areas of cooperation are broadened, new areas of mutual research interests become apparent. This is currently increasing the research competency of Kansas State University by opening new or expanded areas of research in which scientists from the University may become involved. Many of these areas involve new approaches, problems not previously encountered but generated by cultural practices of India, problems involving the effects of different climatic conditions and problems of new food requirements to which Kansas State University scientists may direct themselves. Several of these may be incorporated into existing research programs at the University while others involve initiation of new research programs. The results, interpreted in terms of India, increase the research competency of the scientists involved.

D. Development of Competence for Consultation and Service

The experiences gained in India by the students participating in the 211(d) program and through the annual visits of the 211(d) professor constitute a pool of knowledge and information which can be made available to the university community. The most unique concept of the 211(d) program is the ability to formulate a research project in an area of mutual interests through direct cooperation with Indian colleagues. The experiences gained from such a venture are not available in the University other than through the 211(d) program. The experiences of those involved in the 211(d) program are daily utilized through lectures, seminars, contact with international students and discussions with other faculty members having interests in India. Participants involved in the 211(d) program cooperate with the University's International Activities Office, the South Asian Institute, and the International Agricultural Programs Office. Conferences with staff members who have returned from assignments abroad or are about to leave for foreign duty are common.

Two faculty members from the Department of Grain Science and Industry have been invited to present a short course in milling to Indian mill personnel from August 2-20, 1971 at the Central Food Technological Research Institute under the sponsorship of Western Wheat Associates and Foreign Agricultural Service. Plans are currently being completed for the presentation of this course. This course has been offered several times at Kansas State University to mill personnel, but this is the first time it has been presented in another country. Experience gained from the 211(d) program has been utilized in

planning for the course and 211(d) participants have actively cooperated in the preparations for presenting the short course.

The 211(d) professor has been interviewed concerning the 211(d) program and his visit to India. The interview was used for the "Agriculture Today" program of the University radio station (KSAC) and was distributed for use throughout the state.

Dr. Lineback made a visit to India during April 1-21, 1971 to coordinate and evaluate the research of the graduate students at C.F.T.R.I., to consult with Indian scientists and to arrange for a third student to study at C.F.T.R.I. under the 211(d) program.

His itinerary included:

April 4-13	Central Food Technological Research Institute, Mysore, India.
April 13-16	Hyderabad (KSU/AID team at Andhra Pradesh Agricultural University)
April 17	New Delhi
April 19	Food Research Institute, Kyoto University

During the visit of the 211(d) professor to the Central Food Technological Research Institute extensive discussions were held with each of the 211(d) students concerning their research projects; with Mr. G. S. Bains, Chairman, Discipline of Flour Milling and Baking Technology; with Dr. H. A. B. Parpia, Director, C.F.T.R.I.; with Dr. M. Swaminathan and Dr. M. Narayana Rao, Discipline of Applied Nutrition and Dietetics. All of these discussions involved the 211(d) program, its progress and operation at C.F.T.R.I.

Discussions were also held with personnel in the Discipline of Protein Technology and the Discipline of Microbiology concerning research currently being done in those Disciplines, particularly that research of relevance to the subject of grain utilization in

India. A particularly useful discussion was held with Dr. Narendra Singh of the Discipline of Protein Technology concerning extensive research done at C.F.T.R.I. on leaf protein concentrates. This is an area currently under investigation in the Department of Grain Science and Industry, Kansas State University.

The 211(d) professor presented a technical seminar to interested staff of C.F.T.R.I. during his visit.

During the visit of the 211(d) professor to Hyderabad discussions were held with members of the KSU/AID team at Andhra Pradesh Agricultural University concerning their work, the 211(d) program in Mysore and possible linkages between these programs in areas in which the 211(d) program could supplement experiences of the KSU/AID team. The 211(d) professor presented a formal seminar to faculty and students of the College of Veterinary Medicine and Animal Husbandry, Andhra Pradesh Agricultural University emphasizing the teaching and research functions of the Department of Grain Science and Industry and their role and interest in international agriculture.

The visit of the 211(d) professor to the Food Research Institute, Kyoto University was made without expense to the 211(d) project.

#### E. Involvement of Other University Resources

Kansas State University continues to enlarge its programs in foreign countries. Programs involving grain storage, transportation, and processing have required staff members from the department to travel to several Central and South American countries and to Africa and Asia. All of these technical assistance programs are, in one way or another, related to the aims and

objectives of the 211(d) program.

Many divisions of Kansas State University provide either direct or indirect support to the 211(d) program. Administrative services and advice are provided by the various international programs offices that have extensive overseas projects. In addition, the overall staff of the Department of Grain Science and Industry contributes in innumerable ways to the support of the 211(d) project by providing office space, secretarial services, library facilities, as well as giving advice and encouragement to the 211(d) students.

#### IV. EXPENDITURES

	Original	Actual Expenditures			Estimated	
	Budget 1968-73	1968-69	1969-70	1970-71	1971-72	1972-73
Faculty Salaries	\$ 98,000	\$16,887	\$20,277	-0-	\$17,000	\$18,500
Graduate Salaries	54,000	700	8,400	\$13,092	21,300	26,120
Exchange Professor	7,000	-0-	-0-	648	1,000	2,500
Travel	25,000	713	606	7,481 <sup>(1)</sup>	4,472	8,500
Equip., Supplies and Other	16,000	73	780	14,651 <sup>(2)</sup>	10,300	6,000
	<u>\$200,000</u>	<u>\$18,373</u>	<u>\$30,063</u>	<u>\$35,872</u>	<u>\$54,072</u>	<u>\$61,620</u>

(1) Includes travel expenses of 211(d) professor and department head to 211(d) annual review in Washington, Dr. D. R. Lineback's trip to India, airfare for two graduate students and families to India, and round trip airfare for Mr. G. S. Bains based on estimated cost of international tickets. Official cost of tickets has not been received from Grant Office.

(2) All major items were purchased from U. S. manufacturers. The items listed below (costing above \$100) were purchased for the research laboratories at Central Food Technological Research Institute, Mysore, India for use in experiments being conducted in the research programs of the 211(d) students.

<u>Item</u>	<u>Cost</u>	<u>Manufacturer</u>
Dough Mixer	\$ 323.00	National Manufacturing Co.
Mixograph	905.00	National Manufacturing Co.
Pressuremeters (12)	816.00	National Manufacturing Co.
Loaf Volume Measuring Apparatus	120.80	National Manufacturing Co.
Moulder for Pup Loaves	540.00	National Manufacturing Co.
Water Bath	330.00	Curtin Scientific Co.
Special Pipets (14)	330.00	Scientific Glass Apparatus Co.
Gas Chromatograph	3,126.25	Varian Aerograph
Tritium Electron Capture Detector	488.75	Varian Aerograph
Ionization Detector	287.50	Varian Aerograph
Flow Controller	287.50	Varian Aerograph
Hydrogen Generator	757.85	Varian Aerograph
Transformer (220V to 115V)	215.00	Varian Aerograph
Recorder	1,265.00	Varian Aerograph
Disc Integrator	787.75	Varian Aerograph
Packed Columns (4)	276.00	Varian Aerograph
Gas Sample Valve	126.50	Varian Aerograph
Ultrasonic Cleaner	138.00	Varian Aerograph
Chart Paper (1 ctn.)	143.75	Varian Aerograph

V. PLAN OF WORK FOR NEXT YEAR

Mr. Lockwood and Mr. Finney will continue their research at Central Food Technological Research Institute according to the plans already agreed upon. Mr. Siegel will complete the course requirements for the Ph.D. degree and prepare for his preliminary examinations. The 211(d) professor will travel to India to supervise and evaluate the research of the graduate students and to consult with Indian scientists.

Dr. H. A. B. Parpia, Director, Central Food Technological Research Institute, has been invited to visit Kansas State University to discuss the 211(d) program with the staff of the Department of Grain Science and with University administration. He will also present seminars on cereal-based foods and food needs of India.

Under the conditions of the present grant, the training of the three graduate students currently enrolled in the program will be completed. One additional student will probably be added during the current year.

The proposed plan for continuation, if an extension in time and funding were made, has been forwarded as a separate document.