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US/AID 211(d) Annual Report

August 15, 1974

Title: A grant agreement to increase the capability of the New York State College of Agriculture, Cornell University in agricultural economics related to the less developed countries.

Grantee: Department of Agricultural Economics, Cornell University

Director: B. F. Stanton

A. Statistical Summary:

Period of Grant: 6-24-70 to 6-23-75	Amount of Grant: \$240,000.00
Expenditures for Report Year: \$82,543.00	Accumulated: \$152,263.00
Anticipated for next year: \$87,737.00	

B. Narrative Summary:

The 211(d) grant for work in agricultural economics at Cornell University has made possible an expanded graduate teaching and research program concerned with applied economic problems in agricultural development. Primary emphasis has been placed on developing more substantial programs concerned with agricultural markets and market systems, international trade and the terms of trade between agriculture and other sectors. This supplements and complements existing strength and work in production economics, land tenure systems, price policy, evaluation of new technology and sector analysis with particular reference to employment and income distribution.

Grant funds have been used during the past fiscal year to support overseas research by faculty and graduate students in Indonesia, Nepal, Nigeria, and the Cameroons. A set of projects have been developed by Professor Sisler and his students associated with problems in developing markets and evaluating trade potential in Nepal. A cooperative research effort with Amadu Bello University and Michigan State University in Northern Nigeria has been established for one doctoral student. A special project in the Cameroons established with Southern University for field research is in the final stages of data collection and analysis.

Graduate teaching in the area of economic development has been expanded and enriched. At least one visiting faculty member has been resident at Cornell during six months or an academic year during the period of this grant. These scientists have been invited because of their direct field research and experience in LDC's. In 1973-74 Dr. Solon Barraclough developed a seminar on agrarian reform primarily based on Latin American experience. Dr. Lele will teach a graduate seminar in the fall term 1974-75 on rural development with special reference to African experience. Dr. Barker, economist at IRRI spent his sabbatic year here in 1973-74 and developed a new course in production economics for graduate students in the biological sciences.

Direct application of research and analysis occurs when students supported by 211(d) funds return to professional positions and lecture and direct studies in their own countries, serve on government commissions, work for international agencies and become part of the international network of agricultural economists working in development economics.

## C. Detailed Report

### I. General Background and Purpose of the Grant

This grant was one of six made to land grant universities with substantial interests and commitments to teaching and research related to economic problems associated with the process of agricultural development. A major thrust of the grant was to expand and strengthen the competence of resident faculty committed to work on problems of low-income countries. In particular, this grant made possible a graduate research and teaching program involving significant issues and field studies in developing countries. As a result of this program, the findings of the research can be applied directly to existing problems. It provides a mechanism for American teachers and scholars to become directly involved with the real problems and issues of development together with their students in the classroom and at specific overseas locations. This aspect of the work is deemed extremely important. It would not be possible without the 211(d) grant since traditional funding sources would be inadequate or lack sufficient flexibility to provide for overseas research.

### II. Objectives of the Grant

#### 1. Objectives Restated

(1) To create a framework within which a significant number of U.S. economists interested in agricultural development in the less developed countries can work cooperatively on certain research problems of urgent importance to these countries, thereby increasing

the effectiveness of their efforts, and making the most efficient use of scarce research resources; to provide an efficient means for applying the product of this research in a way which will be helpful to the developing countries; and to contribute to the development of professional contacts and collaboration among agricultural economists in the United States and in the developing countries.

(2) To increase the competence of the University in the area of economic development problems, particularly as they relate to the agricultural sector and the interaction between agriculture and other economic sectors, by providing a continuing arrangement for faculty members to conduct research on campus and abroad and to carry on work in developing countries.

(3) To enable the University to provide increased training in economic development and agricultural economics at the graduate level for students from the U. S. and developing countries.

(4) To provide members of the University faculty the enriching experience of dealing directly with problems of agricultural development in the less developed countries by arranging for them to serve with AID in capacities which will contribute to the development of their professional skills and to their understanding of how to accelerate agricultural growth in the less developed countries and deal with the practical problems involved in the process.

## 2. Review of Objectives

Contributions have been made to each of the four objectives since the grant was instituted. Primary emphasis has been given to the first three objectives. Central to our function and mission is

the training of graduate students from a wide range of backgrounds and different countries and the involvement of these students in significant research programs within emerging nations. This grant has broadened the horizons of a number of our faculty who had not previously been involved with overseas students and research programs. Every graduate student and faculty research project has been developed cooperatively with professionals overseas and monitored by them along with our faculty. Where appropriate, US/AID officials or national government representatives have been involved in the various stages of field research and recommendations growing out of the studies. Such interaction is particularly important if research results are to be used and students doing the work are to become an integral part of agencies charged with the development and administration of agricultural policy in their own countries.

In this manner, the competence of our faculty to work with development-oriented research has been increased both through teaching and field experience. The program has strengthened teaching at the graduate level, increased our capacity to identify meaningful problems for continuing research and improved our interaction with faculty at the other 211(d) institutions in the United States as well as faculty and research workers in the developing countries.

#### Interaction With Other Cornell AID Grants

This grant has enhanced the capacity of our faculty and Department to support and complement work associated with other US/AID funded activities at Cornell University. Four specific examples will be cited.

A) The Department of Agricultural Economics has been awarded contract c.s.d. 2805 entitled "The Impact of New Agricultural Technology on Rural Employment and Income". This research is under the direction of Professor John W. Mellor. The 211(d) grant has enabled a larger number of students to work on agricultural development problems than those who are specifically involved with Mellor's AID contract. The employment and income distribution issues which are central to the contract research program may be incorporated where appropriate in research associated with the grant. The existence of a substantial group of students together with faculty input concerned with markets, market institutions, and international trade has increased overall student and faculty awareness of this set of dimensions in considering employment and income issues associated with new agricultural technology. Field research in both instances allows testing of hypotheses and continuing improvement in underlying models proposed by Mellor and his colleagues.

B) The Division of Nutritional Science has recently received AID contract t.a.-c-1116 to examine "Cost/Effectiveness of Controlling Vitamin A Deficiency". This research is jointly directed by Dr. Michael Latham of Cornell and Dr. Florentino Solon of the University of the Philippines. The principal investigator is Mr. Barry Popkin, who recently completed the work for his Ph.D. in Agricultural Economics at Cornell. The research will be a continuation of the investigation initiated by Mr. Popkin's Ph.D. dissertation. The work involves medical and agrarian aspects of alleviating xerophthalmia. The field research will be concentrated on the Island of Cebu in the Philippines.

Mr. John Staatz, a departmental graduate student, is presently engaged in research relating to "The Economic Analysis of Alternative Nutrition Programs in the Philippines". This research examines the relative effectiveness of three alternative strategies for alleviating calorie, protein, and thiamine deficiencies. The alternatives considered are increased production of fish in fresh water ponds, increased pulse production, and the introduction of high protein rice. The indirect impact of these strategies on employment generation is analyzed, as well as the direct nutritional impact that an increase in food availability would have on these programs.

This contract marks a pioneering step in building closer research efforts in the areas of nutrition and agricultural economics. It is hoped that faculty and graduate student interests will be stimulated in this vital area. Support through the 211(d) grant will be used to partially finance anticipated collaborative research.

C) Cornell University has received support under US/AID contract c.s.d. 3158. This program, entitled "Policies for Science and Technology in Developing Nations", is jointly administered by Cornell's Science, Technology, and Society, the Center for International Studies, and the College of Engineering. A professor of Agricultural Economics, Donald K. Freebairn, and a departmental graduate student, Marco Ferroni, received funding under this grant to conduct research related to the effect of income on food consumption in Lima, Peru. During the summer of 1973, Professor Freebairn and Mr. Ferroni visited Peru and worked with the Peruvian National Food Consumption Survey to detect relationships between consumption patterns and income categories.

D) The Department of Agronomy at Cornell has received funds "To Strengthen the Capabilities of Cornell University for Special Problems of Tropical Soils" under US/AID contract c.s.d. 2834. This contract is under the leadership of Professor Matthew Drosdoff, a soils scientist. The grant covers a wide spectrum of research activities related to tropical soils. In addition, it has a strong teaching component. Each year, a group of Cornell graduate and upper-class undergraduate students travels to Puerto Rico and the Dominican Republic for first-hand study of the problems and capabilities of tropical soils. This course, International Agricultural Development 602, "Special Studies of Problems of Agriculture in the Tropics", is partially funded under contract c.s.d. 2834. Professor Howard Conklin of the Department of Agricultural Economics is an advisor concerning course content and the selection of students who receive a stipend to make the associated trip. Professor Donald K. Freebairn, also of this department, served as a faculty member in this multi-disciplinary course. Professor Freebairn accompanied the students to Puerto Rico and the Dominican Republic in January of 1974.

Cornell University has been fortunate in receiving generous support from US/AID through both contracts and grants. The 211(d) grant has allowed for a much broader scope of research activities than would have been possible if other AID funded activities at Cornell had been viewed as single-purpose efforts. A larger total effort is made possible by this exchange and interaction than would be possible if each were separate entities in terms of location and overall conception. The 211(d) grant has brought scientists from a

broad range of fields into closer contact and, we feel, strengthened our competence to train graduate students and conduct fruitful research.

Cooperation With Other Universities Which Have 211(d) Grants

It is particularly gratifying to report additional professional interactions in graduate research associated with the 211(d) program. Mr. Peter Matlon, a Cornell Ph.D. student, directed by Professor Daniel G. Sisler, is presently doing his field research in Zaria, West Nigeria. This research examines the spread of new high-yielding varieties of groundnuts and the implications of these varieties to income, employment, and the potential for multiple-cropping. This project is closely associated with the research of Professor Carl Eicher of Michigan State. Before leaving for Nigeria, Mr. Matlon spent the summer of 1973 working with the staff and students at East Lansing. This period allowed for a review of the data and considerable body of literature collected by Michigan State in connection with their work in West Africa. Mr. Matlon also benefited from valuable comments concerning his proposed research during this period. He is presently making use of Michigan State resources available in Nigeria. In a real sense, this reflects a cooperative effort by two of the grant institutions to test alternative hypotheses and develop a closer research and teaching linkage.

Mr. Richard Goldman is a Cornell M.S. candidate presently working in the Cameroons. His field work is an inquiry into the micro-economics of small holder cocoa production and the possibilities of alternative resource allocation. This research is under the direction of Professor

Thomas T. Poleman of Cornell. Dr. Donald Ferguson, who completed his Ph.D. under Professor Poleman, is now on the staff of Southern University, assigned to the Cameroons. Dr. Ferguson is providing valuable guidance on all aspects of Mr. Goldman's field work. It is felt that this is the initial step in establishing a solid working relationship between Cornell and the staff of Southern University.

### III. Accomplishments

The first three objectives of the grant are closely inter-related. As faculty competence relative to the most germane issues of economic development improves, faculty members are in turn more capable of offering meaningful courses and more sophisticated guidance to graduate students. As we review the accomplishments resulting from the first four years of the grant, it is difficult to establish a criterion or least common denominator by which progress can be measured. Accomplishments are both quantitative and qualitative. We will first quantify and describe additions and improvements in course offerings and graduate programs flowing from the grant. In a later section we will attempt to delineate quality of the work through a discussion of the application of research findings, positions of responsibility held by graduate students who have received training with the assistance of grant funds, and improvement in capacity of faculty members to address themselves to issues of economic development.

#### 1. Teaching

A graduate teaching program which clearly recognizes the needs

of students concerned with development problems associated with the agricultural sector has been developed over time. The grant has provided stimulus to our teaching program in a variety of ways. There follows a list of courses with a significant development component. Several were initiated as a direct result of grant funding. All were strengthened by the availability of funds for travel, research, and interaction with counterparts in developing nations.

(a) A seminar on Agricultural and Economic Planning Models has been developed by Professor John W. Mellor. This course has been formalized and is now a regular offering in the department. The seminar deals with planning models as applied to less developed economies and emphasizes the interaction between the agricultural and non-agricultural sectors.

(b) In connection with an existing course, Economics of Agricultural Development, Professor Mellor instituted a series of visiting lecturers, open to students registered in the course and the Cornell community at large. This has made it possible for our graduate students to interact with scholars and research workers much beyond the range of normal classroom experience. The program brought several internationally known researchers and teachers to Cornell in the spring terms of 1973 and 1974.

(c) A seminar on Research Methodology in Developing Countries was offered in the spring term of 1973 by Professor Daniel G. Sisler and visiting Professor David Penny of the Australian National University. Emphasis was placed on research methodology and design of field research programs. Each graduate student participating, presented

either a critique of his own field experience or the design and plan for his thesis problem. The large number of foreign students made possible an effective role-playing experience which emphasized difficulties associated with questionnaire formulation and accurate information gathering in the context of developing nations. Two visiting professors, Dr. Scarlet Epstein of Sussex University, England and Dr. David Norman, currently working at Ahmadu Bello University in Nigeria, provided considerable enrichment to the course.

(d) A seminar on Latin American Agricultural Policy is offered annually by Professor Donald K. Freebairn. This course has been particularly successful in helping students use economic principles and models in analyzing substantial programs for change with Latin American countries as well as the underlying shifts in resource use, markets, trade, and balance of payments.

(e) A seminar on Food, Population and Employment is offered annually by Professor Thomas T. Poleman. The seminar examines techniques of national food accounting, the projection of demand, and the disaggregation of data for analysis of particular problem groups and areas in developing countries.

(f) A seminar on Agricultural Policy is offered annually by Professor Kenneth L. Robinson. It covers agricultural trade, price, and income-support policies and techniques appropriate to the analysis of policy issues. As a result of increasing interest in development issues on the part of Professor Robinson, and the expanding enrollment of foreign graduate students in the course, new topics relating U.S. agricultural policies to the problems of low income nations have become

an integral part of this seminar.

(g) A new graduate course in production economics was developed by Dr. Randolph Barker, Economist, International Rice Research Institute, and offered for the first time in the spring term 1974. The course is intended to teach graduate students interested in agricultural development from the biological sciences essential ideas from production economics. A curriculum, class exercises, and teaching materials and examples are now available for use by others who wish to bridge the disciplinary gap between economics and the biological sciences. We plan to offer the course in alternate years.

(h) A seminar on Economics of Rural Development Policy and Institutions with Special Reference to Africa will be offered in the fall term 1974 by Dr. Uma Lele, on leave from the World Bank, Washington. The course will reflect her experiences and research as coordinator of the African Rural Development Study carried out by IBRD during 1972-74. The course is concerned with concepts and definition of the problem of rural development, factors that determine formation and implementation of rural development policies and strategies and influence choices of institutions with particular emphasis on their relationship with the distribution of benefits.

(i) A seminar on agrarian reform and issues of development policy was offered by Dr. Solon Barraclough, spring term 1974. Dr. Barraclough is an economist with the United Nations and had served as Director of ICIRA in Chile. The seminar attracted students from development sociology, anthropology, political science, government and economics. All participants prepared research papers as a central part

of their learning experience.

The grant has provided resources to bring scholars with first experience in the development process to consult on graduate research projects and teach in the classroom. Dr. Barker's salary was provided by IRRI during his year at Cornell. The 211(d) grant provided funds for computer work and research assistance as well as funds for duplication of teaching materials and publication of manuscripts. Dr. Barraclough's full salary for one academic semester was provided by the grant as well as technical support. Dr. Lele's salary for six months will be supported 50% from 211(d) funds and 50% by the Center for International Studies. Her teaching assistant and hourly research support is provided from the 211(d) grant.

Overall the grant mechanism allows the flexibility in funding so necessary to provide scholars with the resources to carry on their work while located at Cornell. Dr. Barker's interaction with faculty and students made a substantial contribution at many levels throughout the College and University. His remarkable productivity continued in part because resources to do a wide variety of work were easily accessible.

## 2. Graduate Student Interest

Over the past four years, enrollment of graduate students majoring in Agricultural Economics at Cornell has averaged approximately eighty-five. Typically, half of these graduate students have a major interest in the problems of economic development. The following list of graduate students majoring in economic development during the 1973-74 academic year is representative of the cross-

section of U.S. and foreign students attracted to these programs.

In addition, a significant number of graduate students from both Agricultural Economics and other departments at Cornell minor in economic development. These students also benefit from the enriching experience afforded by the 211(d) grant.

U. S. Students

<u>Name</u>	<u>Degree Sought</u>
Calkins, Peter H.	Ph.D.
Ender, Gary P.	M.S./Ph.D.
Eriksen, John	MPS
Galt, Daniel L.	Ph.D.
Garcia, Philip	M.S.
Goldman, Richard H.	M.S.
Kreitman, Richard C.	M.S.
Lassiter, Gregory	M.S./Ph.D.
Matlon, Peter J.	Ph.D.
Montgomery, Roger D.	Ph.D.
Orsini, Jan B.	M.S.
Popkin, Barry M.	Ph.D.
Schultheis, Michael J.	Ph.D.
Staatz, John	M.S.
Talavera-Diaz, Luis	Ph.D.

Foreign Students

<u>Name</u>	<u>Degree Sought</u>	<u>Country</u>
Akenda-Ondoga, Valentine	Ph.D.	Uganda
Belt, Juan A. B.	Ph.D.	Cuba
Burger, Veit	Ph.D.	Austria
Chanthrasothy, Sivapakiam	M.S.	Malaysia
Colmenares, Adolfo G.	M.S.	Venezuela
Desai, Bhupendra M.	Ph.D.	India
Desai, Shakuntala	M.S./Ph.D.	India
Donovan, W. Graeme	Ph.D.	New Zealand
Doraswamy, Gorantla	Ph.D.	India
Edirisinghe, Neville	MPS	Sri Lanka
Escobar, German	M.S.	Columbia
Ferroni, Marco	M.S.	Switzerland
Hart, Gillian	Ph.D.	South Africa

Foreign Students (contd.)

<u>Name</u>	<u>Degree Sought</u>	<u>Country</u>
Hirashima, Shigemochi	Ph.D.	Japan
Madjd, Mohammed	Ph.D.	Iran
McGregor, Andrew M.	M.S./Ph.D.	Australia
Mensah, Patience	M.S.	Ghana
Mikdadi, Nayer	MPS	Lebanon
Monardes, Alfonso T.	Ph.D.	Chile
Monares, Anibal	Ph.D.	Chile
Mori, Shinji	MPS	Japan
Noori-Naini, Mohammad	Ph.D.	Iran
Rahman, Radzuan A.	Ph.D.	Malaysia
Ranade, Chandrashekhar	Ph.D.	India
Rukandema, Fred	Ph.D.	Uganda
Sepulveda, Sergio	Ph.D.	Chile
Shapouri, Hosein	M.S.	Iran
Sobrinho, Antonio D.	Ph.D.	Brazil
Unsal, Fahri	Ph.D.	Turkey
Wardle, Christopher	M.S.	England
Yadav, Ram	Ph.D.	Nepal

3. Graduate Students Currently Conducting Research Overseas

It is the policy of the Department to encourage every Ph.D. student interested in problems of economic development to participate in field research overseas. This is typically a cooperative venture with an agency of the host country, a university, or international organization. Students must be actively involved in the development of the specific project on which they work, even though it is a part of a larger research enterprise formulated by Cornell faculty or research workers at the host institution. This stimulates use of, and concern for results at the location where the research is to be completed. We have found that many foreign students have little familiarity with the role of agriculture and the development process in their own country. Field research expands the horizons of students who will be the future professionals in the developing nations. It

also provides them with a set of institutional contacts and relationships which become important and useful upon completion of their degrees.

Currently five students supported by grant funds are working on research topics in developing countries.

<u>Name</u>	<u>Date Left U.S.</u>	<u>Country</u>
Belt, Juan	March, 1974	Peru-Mexico
Burger, Veit	January, 1974	Nepal
Calkins, Peter	August, 1973	Nepal
Goldman, Richard	January, 1974	Cameroons
Matlon, Peter	September, 1973	Nigeria

In addition, five students have been overseas, and have returned to prepare their dissertations.

<u>Name</u>	<u>Dates</u>	<u>Country</u>
Desai, Bhupendra	Feb. 1973 - July 1973	India
Ferroni, Marco	June 1973 - Aug. 1973	Peru
Rahman, Radzuan	Aug. 1973 - Jan. 1974	Malaysia
Schultheis, Michael	July 1971 - Aug. 1973	Uganda
Zulberti, Carlos	June 1972 - July 1973	Argentina

Funds for overseas research for these students came from a wide variety of sources including New York State, the Ford Foundation, the Rockefeller Foundation, the International Bank for Reconstruction and Development, national governments for individual students and US/AID. In a number of cases, more than one source of funds helped support these student and faculty research programs. We cannot over-emphasize the importance of the use of 211(d) grant funds to

supplement research which was partially funded through other sources. In many cases, the ability to provide grant funding made the difference between a viable project and one which would have been unsatisfactory.

#### 4. Research Completed

The previous section outlined the range of development activities within the Department of Agricultural Economics at Cornell. We should now turn to projects both of graduate students and faculty which owe their inception, progress, and completion specifically to the 211(d) grant. Since the inception of the program, twelve Ph.D. students and five M.S. students have been fully or partially funded under the AID grant. Currently, four graduate students are engaged in grant-funded research in developing countries. Five students are in residence at Cornell completing their dissertations with funding from the 211(d) grant, or developing proposals for future projects.

Funds from the 211(d) grant have made possible faculty and graduate student research which could not have been undertaken without such new resources. In principle, we have sought to build on existing interests and research programs of faculty and their overseas contacts rather than to develop completely new areas and country affiliations. Recognizing that the grant is intended to add to competence and extend opportunities, a substantial share of the resources have been used to support overseas research by graduate students in projects jointly planned by faculty at Cornell, professionals at an institution in a less developed country and the students. In this sense, the grant has strengthened institutional capability in the United States and overseas.

The projects have been net additions to research which otherwise would not have been possible.

The following pages include the abstracts of seven graduate theses which were funded primarily through the 211(d) grant.

(a) An Economic Analysis of Resource Allocation in Peasant Agriculture: A Case Study of the Finger Millet-Cotton Zone of Uganda - F. M. Rukandema.

Uganda relies predominantly on coffee and cotton for its foreign exchange earnings. The two commodities earn over 75 percent of total agricultural export revenues annually. However, the rigid international coffee market leaves virtually no room for the country to increase its export earnings by expanding coffee exports. Consequently, the greatest potential for expanded foreign exchange earning, in the short run at least, rests with increased cotton production.

Year after year, the Government, through the extension machinery, mounts campaigns for increased cotton production, but in almost every case the outcome falls short of the target. Prior to this study, no systematic quantitative analysis has been done to try to identify the possible causes of this consistent and substantial deviation of the actual from the expected.

This study was an inquiry into the likely causes. In particular, it was an inquiry into the economics of cotton production in Uganda, with special reference to the most important cotton growing zone referred to hereafter as the Finger Millet-Cotton Zone. This zone embraces the Northern and Eastern Regions of Uganda, and accounts for

over 75 percent of national cotton output.

The study explored, in the context of the small, largely subsistence farmer, the impact of both relative commodity prices and relative input demands of competing farm enterprises on the output of cotton. The following hypotheses were tested in this study:

1. The level of cotton output in any particular year is a function of the price of cotton relative to the prices of other farm products prevailing at the time of planting.

2. Since cotton is inherently a heavy consumer of labor, it cannot compete successfully with rival farm enterprises at current prices.

3. Since the farmer must produce his own food, first priority in the allocation of scarce farm resources is given to food production with the result that cotton planting, weeding and harvesting will be delayed, leading to low yields.

Through regression, it was shown that cotton supply is a function of relative commodity prices, farmers' subsistence requirements, and a trend variable. Two conclusions were drawn from this analysis. First, insofar as commodity prices are determined by the government, a price policy consistent with output targets is necessary for the achievement of these targets. Second, the formulation of aggregate cotton output targets which overlooks existing constraints to production changes at the farm level has little chance of success.

Linear programming models were developed to study the behavior of cotton production under different assumptions. It was concluded that with the present level of technology and farm prices, cotton

production actually reduces the potential income of individual farmers. This is undoubtedly due to the crop's high labor requirements which are superimposed upon its relatively low cash returns per acre. This raises the question as to why farmers continue to grow the crop. The answer may be found, at least in part, in government policy. First, the government guarantees to buy all the cotton produced at a fixed price, which renders cotton production a relatively risk-free undertaking. Thus, even though groundnuts appear to be more profitable than cotton, groundnut prices are more uncertain from season to season. Hence, a farmer who is basically risk-averse will prefer a stable, though lower, income from cotton to the higher but uncertain income from groundnuts. Second, a perhaps excessive emphasis both by the colonial and post-independence governments has been placed on cotton production.

Other things staying the same, an increase of 40 percent in cotton price still leaves the crop uneconomic to produce. Any significant increase in the incomes of the farm families will essentially depend upon increased resource productivity resulting from technological change. Better still, a combination of improved technology and remunerative cotton prices will be necessary. Technological improvement will generate employment opportunities in the rural sector, obviously a desirable thing given the slow rate of labor absorption in the urban-industrial sector in the face of a rapidly rising population.

Taken as a whole, the analysis shows that labor, which is often regarded as the most abundant resource in the rural sectors of

developing economies, is actually the most serious constraint at certain periods of the year.

(b) Nutrition, Employment, and Working Efficiency: Toward Measuring Human Activity in the Rural Tropics - Weyland M. Beeghly.

For years low income countries have relied on FAO's scale of caloric requirements to estimate food shortages and plan future needs. These standards provide useful caloric adjustments for differences in weight, age, sex, and environment. But as a result of a dearth of information, they do not indicate the impact of alternate levels of physical activity -- clearly the most crucial caloric variable.

In recent years, unemployment has replaced hunger as the chief concern of politicians and planners. Precise data linking labor requirements to land at various levels of technical input are not available for the tropics, due, in part, to problems with traditional means of measuring human energy expenditure. Were this data available, it would seem possible to work toward the creation of optimum labor-land ratios at alternate levels of technical input; and in this manner, develop elasticities of labor demand for specific types of investment in agriculture.

In order to examine some of these questions, a joint research project was undertaken in Laguna Province, the Philippines. In cooperation with the Food and Nutrition Research Center, Manila, an attempt was made to determine caloric expenditure among farm families. Specifically, the objectives of the study were:

1. To discover how season and the type of agricultural system might affect energy requirements.

2. To determine the efficiency of various techniques for performing the same task.

Both phases of the project involved the use of a new system of energy measurement which lacks the clumsiness inhibiting earlier methods. Essentially indirect, indirect calorimetry, it builds on the fact that oxygen consumption and heart rate are predictably correlated for each individual. The instrument used was the SAMI (Socially Acceptable Monitoring Instrument) which is small enough to fit into a shirt pocket and can record cardiac activity for up to 48 hours with no discomfort for the subject.

The study consisted of two parts, corresponding to the two objectives. Part I, which might be called the "macro" phase, involved the measurement of general activity levels in barrios in and around the city of Los Banos. Forty-nine villagers practicing three different patterns of agricultural activity were monitored with SAMI's. In addition, a cross-check in the form of a traditional consumption survey was undertaken. A part of this phase was the calibration of each participant's heart rate and oxygen consumption, since calibration -- the simultaneous determination of heart rate and oxygen uptake at several levels of activity -- is the cornerstone of indirect, indirect calorimetry.

The second or "micro" phase centered on measuring the efficiency of various techniques for performing specific agricultural tasks. Day laborers and permanent employees of the International Rice Research Institute were tested with SAMI's as they went about their work on the IRRI test plots. Oxygen readings were occasionally made with a

respirometer as a cross-check on the SAMI results.

Specifically, the study showed that labor investment is greatest on the lowland irrigated tracts, and least in the upland barrios. The small size of the sample precluded statistical analysis of the energy requirements of alternative technologies, but the applicability of the methodology seems clear. From extensive trials of this nature, it would be possible to construct tables linking labor utilization with a wide range of technologies and combinations of technologies, and work toward the creation of optimum labor-land ratios at different levels of technical input.

Most important, the study demonstrated the effectiveness of the methodology employed. The SAMI seems to be socially acceptable. It encourages normal behavior, does not hinder the performance of any task, is concealed from the public view, and allows the recording of activity in circumstances unaccessible to the technician. The heart rate-oxygen relationship appears to be linked to physical and occupational variables. The significance of this is that once regression coefficients are established for a particular group of tropical farmers, accurate heart rate-oxygen slopes can be generated for their neighbors without putting them through the calibration process. The SAMI is unquestionably an inadequate indicator of physical activity, overstating the energy expenditure of the males in the study. Other instruments are in the process of being developed, which would hopefully alleviate this problem.

(c) The Link Between Trade and Labor Absorption in Rural Java:  
An Input-Output Study of Jogjakarta - Roger D. Montgomery.

The problem examined is the relationship between labor absorption and external trade in a very labor abundant area of the world, the Special region of Jogjakarta, a province on the south coast of Java, Indonesia. The study concentrates on:

1. Historical aspects of population growth and trading patterns.
2. Current aspects of the use of labor in production.
3. How Jogjakarta's exports and imports reveal the pattern of labor absorption.

Descriptive information is presented concerning Jogjakarta's economy, population, peculiarly fertile soils, and how Javanese society has autonomously adjusted to population increases. There is also a general description of Indonesia's trade and specific information on Jogjakarta's trade. These descriptive sections are followed by an investigation of the merits and drawbacks in using a Leontief Input-Output analysis in studying the underlying resource endowment reasons which are thought to give rise to external trade. Leontief's own work concerning factor scarcity and the nature of trade in the United States in 1947 is reconsidered. There is a detailed presentation of a sixteen sector Input-Output model constructed for Jogjakarta, sector aggregation problems, and how original data collection was undertaken for agricultural activities.

Three major Input-Output tables are given: a flow or transactions table for 1969, a coefficients table and an inverse of coefficients table. A sector-by-sector discussion of revenues and

costs follows, as the model is constructed by column or cost estimation.

Information on exports and imports is then combined with the Input-Output model in an examination of how dependent Jogjakarta has become upon trade. Alternative trade dependence measures are discussed and appropriate ones adopted. By use of these measures it is shown that although certain sectors of Jogjakarta's economy do not engage directly in exports or imports, every producing sector is affected at least indirectly by external trade.

The use of labor as a factor of production is examined in detail for each sector of the Input-Output model. Information on labor use in agricultural activities stems from the author's direct observations; other information is derived from published sources. Two types of labor demand are examined. First, direct requirements for labor within a sector are studied in isolation. Second, total labor requirements for the production of any sector's good demonstrate how labor demand is generated throughout the Jogjakarta economy. This latter avenue of inquiry stresses the importance of labor requirements for the production of all intermediate goods and services which are, in turn, involved in the process of producing any particular good. Total labor requirements, in contrast to direct labor requirements, delve more thoroughly into the true employment effect that would be felt by Jogjakarta were the production of any particular good to be expanded by policy design.

The thread of external trade is picked up again and woven into the pattern with labor requirement estimates. The resulting fabric

is an examination of the labor content of traded goods. It is found that Jogjakarta's originated exports require less labor than its competitive imports. Although this does not constitute a full test of the Hecksher-Ohlin Theorem (in the absence of comparable information on capital or other resource requirements), it does appear that Jogjakarta has a paradoxical trading pattern. Possible reasons are active governmental involvement in support of such activities as a large sugar estate, large scale textile establishments, and other economic interventions which favor capital using and labor saving production techniques. These government policies and interventions have caused Jogjakarta to forgo labor-using alternatives which would be considerably more in tune with prevailing factor supplies.

(d) An Economic Study of Tractor Contracting Operations In Western Nigeria - Michael I. Kolawole.

The agricultural economy of Western Nigeria is characterized by an overwhelming number of poor, illiterate farmers growing small, scattered acres of crops. The native system of agriculture consists of shifting cultivation, cut and burn without clean-clearing, mixed cropping and planting on the heaps. Various sizes and types of hoe, cutlass and simple knives together make up the farming equipment. Elaborate capital inputs are conspicuously absent. Labor productivity, crop yields, and the use of modern farming practices are on the low side.

Since the 1950's attempts have been made to introduce the use of tractors. But, there are doubts about the rationale for this production method; not only because of high cost of tractor operation

and the "cheap" labor but also because of the different socio-economic environment to which it is imported. Many economists both from developed and developing countries and indeed high Government officials that set up the project doubt the effectiveness of this western sophisticated production technique in peasant agricultural economies.

These doubts and the many question marks concerning farm mechanization prompted the research on which this study was based. The objective of the study was to examine:

1. The peasant farmer economic base and ability to use hire service to any significant profit vis-a-vis non-users.
2. The utilization of available power and factors that affect usage.
3. The impact of tractor use on farm size, labor requirements and farm practices.
4. How timely farmers are serviced.

Farm mechanization was introduced in Western Nigeria as a tractor hiring service because farmers lack the financial base to own tractors. The Ministry of Agriculture is the principal agency that operates tractor hire service for farmers. The hire service prepares seed bed for farmers; which consists of plowing, harrowing and ridging/planting for a charge of 82.5 shillings per acre of completed operation. Farmers send applications for service to the Engineering branch through the Extension division of the Ministry.

Primary data were collected by personal interview method during June to October 1971; using the single visit recording approach. Three

trained undergraduates of the University of Ife assisted in the survey. Data collected were for the year 1970. Four types of farmers -- farm settlers, group farmers, individual users and non-users were interviewed. A sample of 193 farmers and nine private tractor owners were interviewed. Farmers were interviewed concerning crops for which they use hire service such as maize, cotton, tobacco and rice; of which maize is the most important. Fifteen of the sixteen tractor stations were visited.

Analysis of variance technique was used to examine whether net return per acre significantly depends on the number of operations mechanized and use vis-a-vis non-use of tractor. The analysis indicated that there is no significant difference in net return per acre between users and non-users of hire service in maize production. In respect of late maize, net return per acre does not significantly depend on the number of operations mechanized. But in case of early maize, the opposite holds.

Budgeting technique was used to examine the relative profitability of alternative operational procedures open to hirers. The analysis indicates that it is profitable to farmers to skip the harrowing operation. Also, harrowing could be traded for fertilizing with profit, but the profitability is very sensitive to fertilizer prices and/or maize response to fertilizer applications. Budgeted results also show that tractor hire use is a very expensive addition to the package of farm practices.

Queuing theory was used to analyze delays and waiting times. The analysis, which used data from Oshogbo hire unit, indicated that with

six tractors to go per day, a farmer spent an average of 32 days in the system of which 19 days were spent on the queue. Congestion is a more serious problem in the early season peak period than late crop season peak period.

Annual utilization of available power was generally low. Hours per tractor ranged from 10.8 in Akure to 838.4 in Ijebu-Ode Division. Low tractor usage was due to seasonality of work, high frequency of equipment breakdowns, shortage of tractor operators and irregular fuel supplies. Except in Ibadan/Oyo Circle, tractors are used predominantly for transporting. The ratio of hours of field work to hours of transporting averaged 0.47.

The major conclusion of this study was that overall performance and effectiveness have been below expectations; and that machine technology had been extended to peasant farmers who are not economically viable enough to absorb it. The production technique also finds itself in an environment where the socio-economic arrangement and the basic supporting facilities, both physical and human, for its successful operation are not yet well developed.

(e) An Economic Evaluation of Agricultural Package Programs in Ethiopia - Tesfai Teclé.

Ethiopia has recently adopted an integrated approach to rural development. Development efforts are to be concentrated in a few strategic areas in the form of "package programs". These programs consist of an intensive agricultural extension service reinforced by an integrated package of complementary activities such as adoptive research, supervised credit, output marketing and development of

primary cooperative societies.

The purpose of this study was to appraise the progress of the first three package projects, CADU, WADU and the MPP, on the basis of their stated aims and objectives. Specifically, an attempt was made to identify and evaluate the essential components of each package project that have had, or seem likely to have, positive and/or negative impact on the development of peasant farmers; to assess the breadth of participation of different classes of farmers in the projects' activities, the size and distribution of benefits derived from the projects and the role of institutions in the performance of the projects; to identify the factors responsible for generating the economic benefits and for the varying degrees of participation by the different classes of farmers.

Both primary and secondary data, collected from various sources, were used for the study. The main sources were reports and records of the package projects, the Ministry of Agriculture, the World Bank and other government agencies in Ethiopia. Interviews were conducted with farmers, the projects' staff and other persons involved with the implementation of the programs.

To provide the basis for an overall evaluation, as well as evaluation of the different components of each package, an analysis of the socio-economic setting of the project areas, the organizational set-up of each project, and the dissemination processes of the different components was conducted. Performance of the major components of the packages was evaluated using tabular, variance and covariance analyses. Multivariate probit analysis was used to identify socio-economic factors

that appear to influence the patterns of adoption and diffusion of innovations within the CADU project area. The economic efficiency of each project was tested using benefit-cost analysis; distribution of the projects' benefits were examined using variance and covariance analyses; and some hypotheses were derived on the projects' long-term impact on agricultural employment.

On the basis of the number of farmers that they have effectively reached, their intensive extension efforts, which center around model farmers, demonstrators and demonstration plots, are progressing satisfactorily. With respect to distribution of improved inputs on credit, the findings show that so far the relatively bigger farmers have accounted for disproportionately larger amounts of the inputs. Although credit repayments were in general very high, the bigger farmers were found to be worse defaulters than smaller farmers. The marketing component, which was designed to raise farm level prices by creating sufficient competition in local markets, has been ineffective due to the higher handling costs of the projects compared to local traders, and because they handle an insignificant proportion of the total marketed surpluses.

Development of cooperatives, the major means of eliciting participation of the target population in the projects' activities, has been very slow and participation of local governments has not been forthcoming due to a conflict between the vested interests of government officials and the projects' goals. The probit analysis indicated both institutional and economic variables to play important roles in farmers' adoption of innovations provided by the projects. The benefit-cost

analysis showed all three projects to be justifiable on grounds of their economic efficiency; but in order to attain their equity objective, the analysis indicated that their input distribution policy has to be modified and large-scale mechanization has to be discouraged.

The major conclusion of the study is that, even if successful, package projects such as CADU, WADU and the MPP will be able to reach only an insignificantly small number of Ethiopia's farming population. The key role of such projects should, therefore, be to accumulate lessons that could be useful for designing programs that could reach a relatively larger number of farmers at reasonably lower costs within a reasonably shorter time.

(f) An Econometric Analysis of the Demand for Animal Protein In Iran - Hormoz Saleh.

During the past decade the Iranian economy has been experiencing one of the highest growth rates in the world. This rapid expansion, coupled with large increases in population, has resulted in an accelerating demand for highly income elastic commodities. The present study is concerned with analyzing the existing and future demand structure for one such group of commodities, namely that of animal protein. In particular, attention is focused on the demand for mutton, beef, poultry, and fish.

The format of the study is as follows:

1. An attempt is made to highlight the role of the livestock sector in agriculture's contribution to the economic development of Iran.
2. Numerous household budgetary surveys covering both the rural and urban areas of the country are utilized to estimate appropriate

demand functions for the different meats. The semilogarithmic function proved to be the most suitable for the purposes of this study.

3. The household surveys for different years are combined in order that any systematic changes in the coefficients of the demand functions over time be quantified and accounted for.

4. It is extremely important that in any analysis of demand cognizance be taken of the effect of income distribution. Therefore, a method has been formulated which quantifies the effects of changes in the distributional structure on the demand for the commodities in question. This method involves the use of the log normal frequency distribution in conjunction with the Lorenz coefficient of inequality. Utilization of this method reveals that a more equal distribution of income will increase the demand for all meats. This is due to the fact that there is a very high income elasticity for these commodities at lower levels of income.

5. Increases in population and per capita income, along with changes in income distribution are projected for the year 1979. These projections are then used to determine the level of aggregate demand for mutton, beef, poultry, and fish in that year.

6. Projections of demand are compared with forecast supply in an effort to estimate any production -- consumption imbalances which may exist.

In Iran, the most important source of animal protein is mutton, followed by poultry, beef, and fish. The absolute demand for all these meats is increasing due to rising per capita incomes and larger populations. The data reveal, however, that at constant levels of

real income mutton consumption per capita is decreasing while that of poultry is increasing over time. This phenomenon can be explained by relatively stable poultry prices in conjunction with rapid increases in the price of mutton.

With regards to aggregate consumption, the results of this study indicate a wide gap in the demand for and supply of meat in the year 1979. Using the most optimistic estimates of future supply, this demand gap will vary between 261,000 tons and 341,000 tons. The problem is most severe in the case of mutton where excess demand will be either 153,000 tons or 232,000 tons depending on the assumptions being made. If the shortage of mutton were to be met solely by imports, it would mean a drain of either \$97,000,000 or \$147,000,000 of foreign exchange. In view of the seriousness of this growing demand gap, the study concludes with a discussion of the importance of expanding domestic meat production.

(g) An Economic Analysis of the New Agrarian Reform Programs For El Cenizo, Venezuela - Richard Kreitman.

El Cenizo is an irrigation system and Agrarian Reform project located south of Lake Maracaibo in the State of Trujillo, and built by the Venezuelan government using the nation's ample oil revenues. Since 1961 the land in the system has been parcelled out to peasant beneficiaries of the Agrarian Reform who receive free usufruct of the land and water but no clear title to their parcels. One of several such systems in Venezuela, El Cenizo has the unfortunate distinction of being considered the worst failure of all these irrigated agrarian reform projects, a distinction which in recent years has led to a

costly and radical reconstruction of the system, known as the Reparcelization Project. This study describes the dynamics of El Cenizo over the past dozen years and critically analyzes the agricultural programs planned for the project's new phases.

Field data from a survey of 70 farms in El Cenizo, conducted by the author in 1972, was compared with similar data from a study done there in 1965. The most significant statistical change revealed by these parametric comparisons was a trend towards more variation in the later period. Mean incomes per-farm and per-cultivated hectare were much higher in the 1972 sample, as was the standard deviation. Comparisons of other parameters such as land and water resource use, labor use, and average parcel sizes reveal similar changes in distribution, with wider ranges of values in the 1972 data.

This study shows that changes in the cropping patterns over the inter-survey years reflected this increasing diversity, as the system went from a virtual rice monoculture to a mixed cropping pattern including bananas, pastures, sugar cane, corn, yuca, cotton and other activities. The failure of several government-sponsored crop programs during these years is described as a major factor contributing to these changes in the system and the decision to implement the Reparcelization Project.

This Reparcelization is a complete physical and organizational reconstruction of 80 percent of the system, with new parcels, roads, irrigation canals, parceleros, credit arrangements, and crop programs. Survey data on the economics of agricultural production in El Cenizo is used to analyze the new programs for the Reparcelization Project,

testing especially for any internal inconsistencies or contradictions between the various program goals. Particular attention is given to possible conflicts between the social goals of the Agrarian Reform and the physical program objectives of efficient production and full resource use.

It is concluded that it will be impossible to achieve the goal of having the parceleros and their families provide most of the labor requirements in their parcels, within the planned structure of the new programs. The analysis shows that for most of the planned cropping pattern the parcelero families will be physically unable to provide more than a small fraction of such requirements. In addition, the high parcelero family incomes which successful programs will generate make it unlikely that parcelero families will provide much physical labor.

It is shown that a significant result of both these projections will be the presence of a large population of landless workers earning a fraction of the parcelero family incomes and working for the wealthy parcelero class. This inevitable result of efficient and profitable crop production will be judged a social failure when evaluated according to the program objectives included by planners.

This analysis clearly demonstrates that the assumptions and objectives of the new agricultural programs for El Cenizo contain serious inconsistencies and contradictions. Unless these are resolved, the project will inevitably be judged a failure.

## 5. Research in Progress

The following section provides a brief report of the research of seven graduate students in the department. In each case, a significant part of the research was funded by the 211(d) grant.

(a) A Multi-Factor Analysis of Trade Flows - Gregory Lassiter and Daniel G. Sisler.

The Heckscher-Ohlin theorem of international trade states that a country's export goods use intensively that country's relatively abundant factors of production. That is, a country's comparative advantage and hence its trade performance is determined by its domestic factor endowment.

Wassily Leontief made a very startling and controversial discovery when he demonstrated that representative bundles of exports of the United States in 1947 -- a capital rich country by anyone's measure -- had a lower capital/labor ratio than imports. He disproved a complex theory of international trade by showing that even the simplest and most widely accepted proposition in it did not hold empirically. There is a wide amount of literature devoted to the topic of reconciling Leontief's results and the Heckscher-Ohlin theorem.

The objective of this thesis will be to take up where other literature on the Leontief paradox stops short -- that is, to develop a simple model which adequately evaluates the overall structure of an individual country's trade. In the process, this may reconcile Leontief's conclusions with the expectations of the Heckscher-Ohlin theorem. More importantly, the model will be used to measure the factor content of a country's traded goods. Variables measuring

other germane factors of production, such as natural resource endowment, labor skill levels, expenditure on research and development, and market structure, will be included with the capital/labor ratio to evaluate the individual country's trade. Input-output tables will be used to measure the direct and indirect content of all these factors of production in each traded good. This will allow cross-country comparisons of the relative importance of each factor to each country's export performance. If the Heckscher-Ohlin theorem is assumed correct, then this technique will roughly measure the source of various countries' comparative advantage. Hopefully, it will be possible to analyze the impact of trade related policy decisions on exports, imports, and the balance of payments.

Several countries will be analyzed: the United States (1947, 1958, 1968); Japan (1950, 1960); Taiwan (1970); and the Philippines (1961). Ideally, selecting an array of countries with different capital/labor ratios will give insight into the structure of international trade and the viability of classic comparative advantage analysis.

(b) Population Growth, Labor Utilization, and Regional Development in Uganda - Michael J. Schultheis and T. T. Poleman.

The field studies involved in this research project were carried out in Uganda over a 20 month period during 1971 and 1972, while the researcher was associated with the Makerere Institute of Social Research and the Department of Rural Economy at Makerere University, Kampala, Uganda. The research study is financed by US/AID and Cornell University, the Rockefeller Foundation and Makerere University,

and the Government of Uganda through its National Research Council.

I. Statement of Purpose:

A. The Problem. In Uganda, as in most low income countries, the problems of rapid population growth and of increasing numbers of young people who are unable to find employment and income opportunities in the "formal" sector, have combined to focus attention on the integrated physical and economic development of the rural areas. Development of the rural areas, however, requires a much better understanding of the dynamics of rural and regional economies than is generally available, especially as they relate to the patterns of labor utilization, including migration, and to the response of individuals and communities to various incentives.

B. The Purpose of the Present Study. This study was designed to provide basic information on the inter-relationships between population growth and labor utilization in a national and regional or sub-national economy, and to evaluate some of the alternatives available for creating employment and income opportunities and new possibilities of participation in the local economy. The research study addressed itself to providing information and answers to questions on:

1. The population distribution and settlement patterns and their relationship to land use and agricultural systems in Uganda.
2. The general patterns of labor utilization and employment in the "formal" and other sectors of the economy.
3. The effect of population growth upon land and labor utilization.

A regional study was undertaken to consider in detail the relationship between these factors and to evaluate alternative development strategies at the level of the local communities. Kigezi District, an area which is densely populated and which lags behind the other districts relative to the monetization of the economy, was designated for this case study. Because it is an area of high out-migration, an analysis of migration factors was included as an important element in the study.

## II. Methodology:

A. Survey Methodology. Aggregate data sources were consulted for the general features of the national and district economy, and three separate but complementary surveys were designed to fill in the "micro" features. The first of these consisted of a double-run migration survey, which sought to identify all the young people in the age cohorts 15 to 36, who were present or past members of households in ten percent of the census enumeration areas across the district. Specific information on such characteristics as age, education, marital status, occupation, and domicile were obtained on all these young people, whether they were still in the villages or whether they had migrated to other areas. A dynamic element was introduced into the survey by means of a follow-up enumeration which was undertaken approximately 12 months later.

A second questionnaire was administered to approximately 10 percent of the households enumerated in the migration survey. This focused on the farm household unit, the migration and employment history of the household head, the composition of the family, and

the nature of the household farming unit. A third survey asked the local chiefs for the history and development of their areas, the introduction of new crops and services, and their perception of the problems facing the local people.

The selection of the sample followed basic random sampling procedures. The survey areas were chosen to coincide with the 10 percent sub-sample of rural enumeration areas selected by the 1969 Population Census for a supplemental questionnaire. Because of difficulties of random selection of individual households within these areas, an effort was made to obtain complete coverage of all the households for information on the young people. With the assistance of a research team composed of ten young men from the district, 11,098 households were enumerated and information obtained on 27,576 young persons. A random sample was selected from among these households, and approximately ten percent of the household heads (1,133) were interviewed for specific and detailed information relating to their households.

The actual supervision and administration of the field surveys has been described in a paper presented to the East African Agricultural Economics Conference held at Makerere University, Kampala, Uganda, June, 1972.

B. Methods of Analysis. Because of the nature of the study, the analysis has taken longer than was anticipated. The regional aspects of the study have been placed within an analysis of the structure of the economy, with some emphasis on historical and institutional factors which have contributed to the dislocations within the economy. International dependency relationships as they

existed and developed in the pre-Amin period have been evaluated, and a case is made for a policy of self-reliance and inward looking growth as an essential ingredient for a fuller utilization of the available labor supply.

The empirical section of the field surveys is being analyzed at the level of the individual decision to migrate or not to migrate and how this fits into the utilization of labor at the level of the household and community. A probability function of migration is estimated using maximum likelihood probit and least squares regression, with probit analysis a preferred technique in the instance of a dichotomous decision (to migrate or not to migrate). The effects of several factors hypothesized to be determinants in the migration decision are evaluated by this method. The decision to migrate, however, is itself viewed within the context of the utilization of labor at the household level and the trade off between the effort price of cash income obtainable either from the sale of farm produce or of labor time. The inability of the formal sector to provide income and employment alternatives for the growing numbers who seek such opportunities affects this trade-off at the household level, and it is in this light that alternative development strategies must be considered. Migration as a means of alleviating land pressure, whether by resettlement or by labor migration to areas of employment, is approaching its limits. Land augmenting inputs for the increased production of food crops is essential if the deterioration of nutritional standards is to be stopped. From the analysis of the district economy and of present patterns of labor utilization,

alternatives are proposed for a fuller productive utilization of the human resources in rural development.

### III. Progress of the Study.

The institutional and historical aspects of the study have been written. The analysis of the empirical data is proceeding and it is anticipated that it will be completed by September 1, 1974. The final version of the study will be submitted shortly thereafter.

(c) An Econometric Model for the Foreign Trade Sector of India: 1960-1971 - Ram Yadav and Daniel G. Sisler.

The objectives of this study are:

1. To analyze India's pattern of trade from 1960 to 1971 both commodity-wise and country-wise.
2. To construct a simple trade model which consists of equations for imports and exports at a disaggregated commodity group level.
3. To examine the effects of various trade policies such as devaluation, tariffs, and multiple exchange rates on the trade balance.

A model composed of distributed lag single equations for the import demand of 13 commodity groups and the export demand for 15 commodity groups was estimated by ordinary least square methods.

The analysis indicates that most commodity groups are characterized by inelastic import and export demands. Since the criteria for using several trade policy instruments solely depends on the price elasticity of imports and exports, devaluation further increases the balance of trade deficit due to the inelastic characteristics of both imports and exports in the Indian case. Among other policies, the

subsidization of exports is also ruled out because of the inelastic demand for Indian exports in the world market. Finally, the implications of different tariff rates and multiple exchange rates on the Indian balance of payments have been examined. In this analysis, differential tariffs and exchange rates are considered depending on how essential the involved commodity is deemed to be.

Since this is a partial equilibrium model, it is impossible to measure the impact of these policies on the gross national production, employment, and the price level in the economy. This study definitely gives some guidelines regarding the effect of different trade policies.

The analysis has been completed and the thesis is currently in the "write-up" phase. A first draft has been submitted and it is anticipated that Mr. Yadav will complete the dissertation by December, 1974.

(d) An Examination of the Distribution of Policy-Induced Income and Labor Effects Among Producers of Groundnuts in Nigeria - Peter Matlon and Daniel G. Sisler.

This research project will examine existing patterns of employment and income distribution and the micro-level impact of agricultural policies on these two variables among producers of groundnuts in Kano State, Nigeria.

Observed patterns of income distribution and labor allocation will be described and explained as a function of institutional, locational, structural, and ecological factors. Linear programming models will be constructed for a set of representative farms reflecting

a range in the structural and ecological characteristics of the farm sample. Subsequent analysis will attempt to identify the potential production, income, and labor effects of price, and credit policies and of new technologies among farm types. Particular emphasis will be focused upon the relationship of these policies to changes in the allocation of labor to agricultural and non-agricultural activities.

The objectives of the research can be arranged into three separable but highly interdependent components:

1. Income distribution issues.
2. Rural labor allocation.
3. Traditional farm management problems.

1. Income distribution.

(a) Description of the existing patterns of income distribution among producers of groundnuts and determination of the most important factors contributing thereto. The independent variables examined will be subdivided into these three groups:

1. Institutional - political and institutional affiliation biasing access to credit, inputs, and extension services.
2. Locational - access to marketing networks.
3. Structural/Ecological - land type, farm scale, size of the family labor force, techniques of production, etc.

(b) Determination of the differential impact of alternative pricing policies for agricultural inputs and products, credit policies, and new cash crop technologies on farm incomes among distinct farm types.

## 2. Labor Allocation.

(a) Construction of seasonal labor profiles describing allocation of labor time to on-farm agricultural and non-agricultural and off-farm activities as they relate to farm unit and labor characteristics; stratified three ways as follows:

1. Locational.
2. Structure/Ecology.
3. Income.

(b) Determination of the differential impact on demand for labor and labor allocation associated with government pricing and credit policies and technology promotion among various farm types.

## 3. Farm Management.

(a) Description of existing farming systems and testing of current patterns of resource allocation against the standard of economic efficiency.

(b) Identification of major structural constraints to increased output by farm type as a function of policy alternatives.

(c) Generation of farm plans for a set of representative farms which will maximize farm incomes within a set of objective and subjective constraints.

Correlation and multiple regression techniques will be used to assess the relative importance of the institutional, locational, and structural factors affecting income distribution and of the locational, structural, and income determinants of labor allocation patterns. Linear programming methods will be used as the basic tools with which to consider the structural and farm management questions of the

study. Modified simplex and variable coefficient and resource programming procedures will be followed.

This project was developed cooperatively with staff at Michigan State University and the support of Professor David Norman at Ahmadu Bello University, Zaria, Nigeria. Field enumerators and support work are being coordinated with research efforts of the agricultural economics staff at Zaria.

Mr. Matlon arrived in Zaria, Nigeria on September 26, 1973. Four months were devoted to obtaining the consent and assistance of state and village leaders before field work could be undertaken. The first two weeks of February, 1974 were devoted to the selection of four representative villages. The criteria for village selection included:

- (1) proportion of acreage devoted to new varieties of groundnuts
- (2) proportion of land which was river-bottom or upland
- (3) proximity to groundnut marketing stations
- (4) the availability of non-farm employment opportunities
- (5) the extent of contact between farmers and agricultural technicians.

One enumerator was situated in each village and is responsible for conducting a weekly survey of 26 farmers. Mr. Matlon and the enumerators pre-tested the questionnaire during the latter part of February and the first week of March. Several adjustments in the initial questionnaire were made and field work began during the first week of April, 1974. To date, cooperation has been excellent although drought conditions in Northern Nigeria pose an important measurement problem particularly relative to yield differentials between upland

and river basin soils. The impact of drought is not uniform between various soil types and it is difficult to discern what normal yield differentials would be. The staff of Ahmadu Bello University has been particularly helpful and after permission of village headmen was obtained, there have been no difficulties associated with compliance. A project of this sort has one inherent difficulty; that of maintaining interest through a full sequence of crops. While farmers may be eager to provide information on a weekly basis for the initial months, their enthusiasm wanes as the year progresses and particularly as the pressures of peak labor periods mount.

Professor Kenneth L. Robinson of the Department of Agricultural Economics was a visiting economist at the International Institute of Tropical Agriculture in Ibadan, Nigeria. Professor Robinson visited Mr. Matlon and his study area, providing valuable guidance and suggestions.

(e) The Impact of Tourism on the Balance of Payments, National Income, Agricultural Production and Employment of Low Income Countries: A Case Study in Nepal - Veit Burger and Daniel G. Sisler.

The objectives of the project fall into three distinct, but clearly interrelated categories:

1. To develop and evaluate a methodological framework to assess tourism's contribution to the achievement of economic objectives of developing countries.

2. To carry out a case study in Nepal, using this methodology, to provide Nepal's development planners with information concerning the impact of tourism on the following variables:

- (a) The balance of payments and trade position.
- (b) National income.
- (c) Personal income distribution.
- (d) Regional income distribution.
- (e) The level of employment.

3. To analyze tourism's impact on the agricultural sector and to delineate the areas where there is potential to increase agricultural production.

Given the determination of the Nepalese government to develop tourism, it is desirable to go beyond merely assessing tourism's impact as a whole and to provide policy planners with information as to implications of alternative tourism development strategies. Hence emphasis is placed on delineating distinct categories of tourism, and tracing through the different impacts they will have on these macro-economic variables. Generally speaking, the ideal classification would include categories which are as homogeneous as possible with respect to class-characteristics and as diversified as possible with respect to their impact on national economic objectives. A more detailed classification of tourists will increase the flexibility of the study but will also increase costs of surveys and the sample size. We propose the following classification with respect to purpose of visit:

- (a) Cultural tourists
- (b) Trekking tourists

A cultural tourist is defined as a visitor who stays in Nepal for an average of three to four days, mainly to visit the historical,

cultural and religious places in Kathmandu Valley. The second category of tourist, the trekking tourist, includes visitors who stay an average of one week or longer, and who seek to discover and explore places outside Kathmandu Valley. A third type of tourist, the business visitor, will not be analyzed due to the relative unimportance of this category (in 1969 only 2% of the total) and because this type of tourism responds mainly to the overall development of the economy rather than to tourism policies.

The main hypotheses to be tested are:

Per one million rupees of national income generated, trekking tourism:

- (a) Earns more foreign exchange.
- (b) Results in a more equal income distribution.
- (c) Generates less direct, but more indirect and induced employment.
- (d) Stimulates more equal regional development.
- (e) Generates less demand for high income-elasticity agricultural products.

These hypotheses logically can be derived almost entirely from two basic propositions. First, the spending pattern of trekking tourists is believed to be less import-biased and more labor-intensive than the spending pattern of cultural tourists. Second, the income-expenditure pattern of the owners of factors of production which serve trekking tourism is assumed to be less import-biased and more labor-intensive than the income-expenditure pattern of factor owners benefiting from cultural tourism.

With respect to regional development, one is tempted to

hypothesize that almost by definition, trekking tourism will have a more widespread regional impact, since trekking tourists spend some time in regions other than Kathmandu Valley. The correct criterion, however, is not where goods and services are finally consumed by the tourist but rather in what region the owners of the factors of production spend their incomes. If, for example, the Tiger Tops Hotel in Chitawan "imported" all its capital, food, labor, etc. from Kathmandu, its regional impact would be zero. On the other hand, expenditures in Kathmandu need not necessarily be restricted in impact to that region. If, for example, agricultural products were imported from other regions, they would create additional income there. The impact on that region could be ignored only if the income earner's marginal propensity to import from other regions plus his marginal propensity to save and pay taxes are equal to one.

Tourism's impact on the agricultural sector will receive special consideration and scrutiny, simply because of the special importance of the agricultural sector in the economy of Nepal. As mentioned earlier, agriculture alone constitutes 70 percent of national income and employs roughly 90 percent of the total population. Many development economists now believe, that alleviation of the present unemployment and underemployment situation presents one of the most pressing problems in many LDCs and should be dealt with through the creation of job opportunities in the agricultural sector.

The United States Agency for International Development and the

International Bank for Reconstruction and Development will be consulted for assistance in making the research relevant and in obtaining the most recent and reliable data. In Nepal, both Tribhuvan University and the Department of Tourism in the Ministry of Industry and Commerce will provide logistic support. This has included mainly help in finding and getting access to data sources and in hiring capable field workers. Furthermore, the facilities of these institutions are being used to allow tabulation and a first analysis of the data.

Mr. Burger arrived in Nepal on January 4, 1974 to begin the field work for this research. It is anticipated that he will spend one calendar year collecting data. The start-up time for the project took three months while the compliance of His Majesty's Government of Nepal was obtained. The two agencies primarily concerned were the Planning Commission and the Ministry of Tourism. The study is divided into two distinct phases. A sample of each type of tourist will be provided with a diary in which they will record their expenditures while visiting Nepal. Enumerators will meet incoming aircraft and buses to solicit the assistance of tourists in keeping the diary and return it to Mr. Burger at the time of their departure. Industries such as hotels, handicraft shops, suppliers of trekking equipment, and those engaged in providing packaged tours or treks in Nepal will be interviewed. These latter interviews will allow a determination of the secondary and tertiary impact of tourism with particular emphasis on employment, and the balance of payments.

The diary surveys were started on June 1, 1974 and at this point,

compliance is a problem, although useful expenditure data was collected for approximately 120 tourists during the first full month of the survey. This is approximately five percent of the incoming tourists during the month. It is hoped to secure a ten percent sample when better techniques of obtaining compliance have been developed.

The surveys of industries related directly to tourism will start on August 1 with the first target 35 hotels ranging from the two 4-star hotels to those which are unrated and cater to the economy-minded tourist. A questionnaire relating to this industry sector has been developed and pre-tested. The initial response was excellent and the hotel operators appeared anxious to cooperate and provide accurate data.

Professor Daniel Sisler worked with Mr. Burger in Kathmandu, Nepal during the period March 24 - April 9, 1974. During this period, enumerators were selected and trained. In addition, the questionnaires were revised and pre-tested. Related governmental agencies seemed interested in the project and are anxious to examine preliminary results in the hope that they may initiate promotional and policy adjustments designed to enhance tourism as an important growth sector of the Nepalese economy.

(f) An Analysis of Price Policy and Interregional Competition in Turkish Wheat Production - Fahri Unsal and Olan Forker.

Justification. Turkey is primarily an agricultural country. This sector provides employment for a large proportion of the population, food for the urban people, raw materials for other

industries and foreign exchange that is needed for the capital imports of the country.

Wheat is the most important food crop in the country when one considers the land and people involved, and its significance in the population's diet. This commodity supplies a major part of the calory requirements of the people. In fact, Turkey's per capita wheat consumption is one of the highest in the world.

Since wheat is so important for Turkey, self-sufficiency in this crop is one of the major goals of the planners. To achieve this, a price policy which enables the government to fix the farm and retail prices as well as to control all the imports and exports is followed. The aim of this proposed research is to study problems of the Turkish Price Policy in detail and provide the policy-makers with more powerful decision tools than they have at present.

The Price Policy on wheat has three main objectives, namely, achieving self-sufficiency in production, protecting farmers against very low farm prices and protecting the consumers against very high retail prices. Three important problem areas are identified in the price policy that is followed in Turkey:

1. The announcement of the support price at the harvest time does not affect the current production.
2. At present, rather crude methods are used in deciding the support price.
3. The support price does not take into account the differences between regions, the transportation cost that is involved and the cost of storage. Hence a single price level is used all around the

country during a given year.

The increasing food requirements of the Turkish population have been met in the past by increasing the area cultivated. However, it is believed that a limit will be reached where no more land can be brought into cultivation. In fact, it is argued that some of the marginal land should be returned to less intensive uses in order to reduce the erosion losses and to encourage livestock production. Therefore, a reorganization of Turkish agriculture is desirable if the country is to feed her growing population. Since wheat production and consumption play such an important role, it is believed that the proposed study which will help to improve the resource allocation and pricing efficiency will be of considerable use.

**Objectives.** The general purpose of this study will be to formulate mathematical equations that can be used for determining government support prices at different parts of the country. The specific objectives are as follows:

1. To determine the optimum level of production in each region and optimal shipments such that total storage and transportation cost is minimized while satisfying the demand conditions.

2. To determine the optimum purchase and sale prices at different parts of the country during different months of the year.

3. To determine the production of the regions and optimum commodity flows if technology, costs or demand structure is changed.

**Methodology.** For the purposes of this study, the country will be divided into a number of homogenous producing areas. At present,

it is planned to have nine of these to coincide with the classification of agricultural regions of Turkey. However, it is expected that more regions will be identified after consultation with the officials in Turkey who are more knowledgeable, to differentiate between the irrigated and dry lands. Meetings with farmers in each region will be required to learn their problems, their production methods and their objectives more thoroughly.

The following will be estimated for each region using appropriate econometric techniques:

1. Supply Response - The total production in a given year is a function of yield and area sown. The area to be sown can usually be estimated accurately. The area under wheat and the wheat prices during the previous year are the two most important variables that determine the area during the current year. The main problem will be the estimation of the yield since so many uncertainties due to drought, floods, diseases and insects are involved. Hence a yield equation has to consider the weather factors, irrigation water availability, mechanization and the level of fertilizer application as well as other variables that cause uncertainty. Multiplying the yield and area estimates and adding the stocks from the previous year and imports should give the current total supply.

2. Demand - In Turkey, most of the wheat is used for human consumption and seed. The amount used for animal feed and industrial purposes is rather small. The country's need for seed is easy to calculate since it is directly related to area sown. The human consumption is influenced by many factors, the most important of

which are the current wheat price, the prices of other competing products (other food), the per capita disposable income and the age structure of the population. Using these variables a demand function can be estimated.

3. Optimal level of production in each region and the least cost distribution pattern - One could say that demand and supply are the determinants of the economics of interregional competition. However, much more detail about the multiple components of these two forces would be required before an operationally usable structure could be developed. The space and time component are the most relevant ones in this proposed study. For simplicity, we shall only discuss the problem of equilibrium among spatially separated markets. Once this is understood, the time component can easily be introduced into the model.

Time Schedule. We plan to start the research October 1, 1974. The duration of stay in Turkey will be eight months. The formulation of the model and other relevant theoretical issues will be solved in Ithaca before going to Turkey so that data collection in the country can be started immediately.

Most of the analysis will be done back at Cornell starting July 1, 1975. There will be a need for computer use to run some of the regressions and summarizing data. It is believed that a computer program for interregional equilibrium analysis is not available in Turkey, so that part of the analysis will be done entirely in Ithaca.

(g) An Inquiry Into the Micro-Economics of Smallholder Cocoa Production and the Possibilities of Alternative Resource Allocation -  
Richard Goldman and Thomas T. Poleman.

This study is concerned with the Cameroun cocoa farmer and specifically with those farmers near Yaounde. In recent years there has been growth of cocoa as an export crop. At the same time there has been rapid growth of the city of Yaounde, a growth which is expected to continue in the future. The fact that food prices are rising, the possibilities for more intensive production, the proximity of a growing urban area, and the lack of surplus land, all suggest the possibility of a shift in resource allocation. Cocoa farmers may find factor prices and product revenues signaling a transfer of land out of tree crop production. This would have ramifications both for the area and for the nation. Since market prices need not always dictate proper resource allocation, there may be a need for governmental intervention. Unfortunately, the basic farm data to assess these changes are lacking.

The study will focus on the micro-economic behavior of smallholder cocoa production. To this end, primary data will be collected through a farm survey and be supplemented by a commodity movement study of the road block type, should this be condoned by the local authorities. Secondary sources and interviews will be exploited where practicable in an attempt to rationalize the research process. The specifics of the project are for the present intentionally left flexible: (a) data on the subject are not abundant; (b) there is the possibility of locking into an unfavorable research design; and

(c) there is a wide divergence of opinion on the part of researchers as to approaches to collection of micro data and its subsequent analysis. Finally, special attention needs to be given to the suggestions and desires of the host institution, government, and the participating farmers.

Methods and Procedures. The literature provides numerous examples of micro studies and their various approaches and more detailed sector analysis is coming into vogue among our lending and aid agencies. Dunstan Spencer delineates four traditional methods for collecting micro-level data.

1. Model or case farm study.
2. Farm account books.
3. Farm business survey.
4. The cost route method.

Some are clearly not applicable for our purposes, though others may be adaptable under Cameroun conditions. The special consideration of dealing with a perennial cash crop and the fact that work has been done on the food crop, nutritive, and budgetary aspects will be of considerable help in designing a survey which will meet our needs and prove to be statistically valid.

On the subject of samples, Zarkovich reckons that a sample of fifty units will usually give a 'reasonable' picture of the variation in a homogeneous population with attributes which are normally distributed. Whether such conditions can be met with ease among Lekie cocoa farmers is not now discernible. Collinson is more inclined than others toward a one visit approach or at least something

less than the cost route method as advocated by Spencer. Collinson attempts to balance financial expense and accuracy of data in his methodology.

Despite the disagreement on specifics, all authorities suggest a presurvey and the development of an adequate frame from which to designate one's sample. All also stress an appreciation for the environment which one is about to study. We will adhere to these recommendations and seek a reasonable compromise between cost and accuracy.

Farm Management Survey. Data of the farm management type and the specifics of costs and benefits as regards cocoa production will be our foremost goal. A sample of at least 50 will yield specific information on inputs and cost along with revenues received subsequent to such efforts. The aim will be to make generalizations applicable to a reasonably large area if not to the whole of the cocoa growing population. The proposed methodology is to visit the farms after specific operations have taken place, and at that time record the specifics of that operation. For example, farms will be visited after spraying, after harvesting, after marketing, etc. Subsequent to one or two visits and at a lull in the production cycle, a visit whose objective is the collection of sociological and subjective data will be made. Information collected will be cross checked with local experts. Factors relating to what are traditionally male occupations vis-a-vis what females and children are customarily occupied with, are naturally significant variables affecting conclusions drawn or recommendations made from this study. Therefore the inquiry will be

interdisciplinary.

The sample population will incorporate different soil types, distances to the urban center, income groups, and the like. These factors will be carefully noted so that causal relationships may be explained.

Produce Movement Survey. An additional data collection device previously used in the Africa context is the road check survey. As the name implies, it involves the stopping of traffic and the determination of certain basic data: what is being transported from where, to whom, for what purpose. Such an approach can serve to verify data collected at the farm level, point out the timing of specific commodity flows and additionally reveal what transfers are taking place between the urban center and the rural areas.

Road check surveys have been shown to yield greater returns for the time and cost than most other survey types. They also lend themselves to the African environment. There, one usually finds most goods being transported by road. Entrance and exits to urban centers are not usually numerous. And police or military check points are often already in place.

Timing. Project timing ultimately involves a trade-off between degrees of accuracy and available resources and their use. With this in mind, it is proposed that the field work be carried out from January to September, 1974. This should be an adequate time frame in which to become acquainted with the prevailing conditions and collect the necessary data. But flexibility will be the watchword.

1. September - December 1973 (Cornell)
  - a. Collection of Supplemental Data
  - b. Survey Technique Refinement and Preparation of Preliminary Questionnaires
  - c. Academic Work to Complement Research
2. January and February 1974 (Yaounde)
  - a. Pre-survey - Identification of Populations to be Studied
  - b. Area Familiarization
  - c. General (Macro) Data Collection
  - d. Survey of Secondary Sources Not Available in the U.S.
  - e. Interviews at the Ministry of Agriculture, University, Planning Department and the Like
  - f. Enumerator Training and Cooperator Selection
3. March - September 1974 (Yaounde)
  - a. Data Collection. Our greatest uncertainty regards the cropping cycle. It is thought that most of the crop is harvested from November to January, and that none is consumed on the farm. We are assuming that reliable income figures can be available by March and that these can be verified by cocoa buyers. Planting and weeding operations from March to June will be checked periodically as will the production of drying mats. Should these assumptions prove invalid, the possibility exists that the survey timing will have to be extended.

- b. Preliminary Analysis. Throughout the survey period the data will be compared with that collected in other studies, with intuitive knowledge and with the parameters of the real world so as to permit whatever procedural adjustments seem called for.

4. September - December 1974 (Cornell)

- a. Compilation of Data.
- b. Analyses and Presentation of Findings.
- c. Final Write-up, Editing and Report Submission.

Mr. Goldman arrived in the Camerouns in mid-January, 1974. The time table presented above is being closely approximated, although as always, start-up time, selection of enumerators, and their training took longer than anticipated. Professor Donald Ferguson of Southern University is in the Camerouns and providing valuable assistance in establishing sample size, developing the questionnaire, and arranging contacts with governmental personnel.

6. The previous two sections, 4 and 5, provide a summary of graduate student research completed under the auspices of the 211(d) grant, and research in progress which is heavily dependent upon grant funding. In total, this represents fourteen individual research efforts most of which, in all probability, would not have been undertaken if it were not for grant assistance. It is difficult to provide any qualitative measure of the results flowing from this research. We view the department's major role as that of education. In each case it is felt that the student received an outstanding educational experience. In all but two cases, the students have had field

experience in a developing country. In the case of students who have completed their research, all worked in a less developed country, gathering data, relating to governmental agencies, and experiencing first-hand the frustrations and rewards of collecting, analyzing, and drawing conclusions from primary data. Two research projects, those of Mr. Yadav and Mr. Lassiter, deal with the theoretical aspects of international trade. They do not involve overseas experience, but instead provide a strong theoretical and empirical basis for future work in the vital area of LDC trade.

Of the seven graduate students who have completed their work, five are currently working in developing countries. Three men, Drs. Kolawole, Tecle, and Saleh are working in responsible professional positions within their home countries. Dr. Montgomery is employed by the University of Michigan working on development related research in West Africa based in Abidjan, Ivory Coast. Mr. Kreitman is presently working in Latin America. Of the seven graduate students conducting research under the 211(d) grant, it is anticipated that five will continue their work in developing countries. The future of the other men is less certain. However, they will clearly continue to work in the area of economic development. In our judgment, the 211(d) grant has made an enormous contribution to the training of these men who will contribute greatly to our understanding of development issues and provide guidelines in the emerging nations in the future. This is a contribution to the basic pool of well trained economists who will provide the leadership for teaching, research, and administration so critical to the development process.

IV. Impact of Grant Supported Activities in Developing Institutional Capabilities

Much of the impact of the use of 211(d) grant funds in the development of institutional capabilities has been discussed in Section III, Accomplishments. This set of paragraphs will attempt to summarize and evaluate the materials and statements provided in earlier reports and this document.

1. Departmental Faculty

The existence of funds to support graduate study and research by American students interested in economic problems of developing countries and native students from these countries has provided a basis of involving a substantial number of our faculty as teachers, graduate committee members, and directors of student projects. The small core staff with central responsibility for teaching and research in this area have been augmented and complemented by an increasingly knowledgeable faculty in marketing, farm management, finance, resource economics and public policy. They serve as major and minor advisers to graduate students. They provide critical review of research methodology, project statements and written summaries of research. They are a substantial part of the basic resources for the graduate program in international agricultural development.

2. College Faculty

The existence of research at a number of overseas locations has drawn on the resources and academic capability of scientists in other disciplines within the College as well as the permanent staff at the International Institutes, Universities and Research Centers.

Joint planning of student research has influenced faculty activities. Teaching programs and seminars have helped to provide important interdisciplinary activity. The Barker visit in 1973-74 was an excellent example of how the disciplines and selected faculty in agricultural engineering, agronomy, plant breeding and economics contribute to each other in teaching and research. The central emphasis and thrust of the efforts here using 211(d) funds have been on graduate teaching and research in the LDC's.

### 3. Publications and Accumulated Research Information

Any research effort in an overseas location provides both student and supervising faculty substantial insight and information about particular problems. Confidential survey data must be treated with circumspection. But contacts, basic country data, sources of factual information, evaluations of institutions and national organizations are cumulative and important. The existence of the 211(d) grant has made important contributions to this basic College and University fund of knowledge. In many respects it is hard to assess in direct quantitative terms. But it is important and real. The College's office of the Director of International Agricultural Development provides the coordinating mechanisms for the College as a whole. It is an effective and creative administrative office. We as a department use its resources and contribute to many other students and faculty in return. Centers of excellence concerned with problems of agricultural development in the less developed countries must rely on a slow but consistent process by which this accumulated knowledge is gained and then made available to students, faculty and

other scientists.

One use of 211(d) grant funds has been to finance publication of research reports based on M.S. or Ph.D. theses which would not have been published otherwise. In a number of cases these reflect studies financed in part by national governments where fellowships or grants provide no money for this final step in the research process. The interchange of publications between 211(d) recipient universities has provided valuable and timely additions to faculty and student libraries as well as University libraries. Important acquisitions and contributions to library collections have resulted from faculty and student initiatives both overseas and on return to the United States.

#### 4. Graduate Research Overseas

The grant has made it possible during the past five years to make certain that every Ph.D. student with a major interest in LDC problems could be financed from a wide variety of sources for overseas research on worthy projects. This is an institutional capability which has been critical to both students and faculty. It has provided a mechanism to assure a displaced Ugandan student a means to complete his graduate studies with a return to professional work in East Africa even though he cannot return now to his own country. This is in the long run one of the true tests of our nation's commitment to improving the research and technical capacity of LDC nationals who are committed to work on LDC problems in their own environment.

V. Utilization of Institutional Resources in Development

In section III, Accomplishments, a listing of current graduate students with primary interest in economic development is provided. This group of students receives assistantship or fellowship support from many sources. Some assistantship funds from the State of New York is used regularly for these students particularly when they are assigned to teaching or the development of research proposals. Fellowships from Ford Foundation, Rockefeller Foundation and the Agricultural Development Council are important sources. National governments provide a few students with support for graduate study. Almost never do they provide funding for Ph.D. thesis work in their respective countries. A listing of students with formal research projects together with primary sources of funding for their research during 1973-74 follows:

<u>Graduate Students</u>	<u>Project Title</u>	<u>Primary Sources of Funds</u>
Badillo, Arnaldo	Farm Resource Utilization in Central Venezuela	Venezuelan Govern.
Belt, Juan	An Analysis of Agricultural Project Evaluation	NYS Coll. of Agric. & Life Sci., Office of International Agric. Development
Burger, Veit	An Economic Appraisal of Tourism as a Contributor to the Economic Development of Nepal	US/AID 211(d)
Calkins, Peter	Nutrition and Employment Implications of Increased Horticultural Production in Nepal	Ford Foundation grant, International Agric. Development

<u>Graduate Students</u>	<u>Project Title</u>	<u>Primary Sources of Funds</u>
Colmenares, Adolfo	Economics of Agricultural Drainage South of Lake Maracaibo, Venezuela	Venezuelan Govern.
Ferroni, Marco	Income and Food in Latin American Urban Centers	US/AID 211(d) via Program on Policies for Science & Technology in Developing Nations.
Goldman, Richard	Small-Holder Cocoa Production in the Cameroons	US/AID 211(d), Southern Univ.
Kreitman, Richard	An Economic Analysis of the New Agrarian Reform Program for El Cenizo, Venezuela	US/AID 211(d)
Matlon, Peter	The Micro-Level Income and Labor Effects of New Technology in Ground-Nut Production in Kwara State, Nigeria	US/AID 211(d)
McGregor, Andrew	Capital Rent Extraction and the Survival of the Producer Cooperative	Cornell Univ. Fellowship
Montgomery, Roger	The Link Between Trade & Labor Absorption in Rural Java: An Input-Output Study of Jogjakarta	US/AID 211(d)
Popkin, Barry	An Evaluation of Alternate Vitamin A Intervention in the Philippines	Babcock Chair Endowment, World Health Organization, Philippine Govern.
Rahman, Radzuan	An Exploration of the Janka Timber Project of Malaysia with Particular Emphasis on Trade and Rural Employment	Agric. Development Council
Schultheis, Michael	Population Growth, Labor Utilization and Regional Development in Uganda	US/AID 211(d)

<u>Graduate Students</u>	<u>Project Title</u>	<u>Primary Sources of Funds</u>
Shillingford, John	Financial Potential and Welfare Implications of Sugar Cane Harvest Mechanization on Jamaican Plantations	New York State, Babcock Chair Endowment
Staatz, John	Economic Analysis of Alternative Nutrition Programs in the Philippines	Babcock Chair Endowment, Div. of Nutritional Science
Yadav, Ram	An Econometric Analysis of International Trade on the Economy and Employment of Rural India	US/AID 211(d)
Zulberti, Carlos	The Feasibility of Beef Cattle Feed Lots in Argentina: Methodology of Economic Evaluation	IIE (Ford), Univ. of Minnesota

In addition to this list are the group of graduate students working with Dr. John W. Mellor in his contract research funded by US/AID, c.s.d.-2805, The Impact of New Agricultural Technology on Employment and Income Distribution. During 1973-74 this group included B. M. Desai, S. S. Desai, W. G. Donovan, Gorantla Doraswamy, Shigemochi Hirashima, C. G. Ranade, and R. L. Shortlidge. In addition Dr. Mohinder S. Mudahar worked full time as a research associate on this project. Dr. Winifried Manig, a visiting research fellow from Germany made important contributions through a research study published in Dr. Mellor's occasional paper series. This paper summarized a substantial amount of Dr. Manig's work in the Baco Area of Ethiopia concerning the marketing and distribution of agricultural commodities.

Dr. Askok Chaudhari from India has been a visiting research scholar at Cornell located in agricultural economics since November

1973. He received support for his research and study from the Government of India and plans to return to his research institute in October 1974.

A list of completed graduate theses during the academic year 1973-74 in the areas associated with economic problems in the less developed countries indicates some of the range of work described earlier relative to this grant and other faculty and student activities. The list of countries involved is quite diverse: Uganda, Venezuela, Leeward and Windward Islands of the Caribbean, Samoa and Fiji, Malaysia, India, Nigeria, Indonesia, Philippines, Jamaica, Colombia, Ethiopia and Argentina.

Graduate theses with international emphasis - completed between July 1, 1973 and June 30, 1974.

<u>Author</u>	<u>Degree</u>	<u>Thesis Title</u>
Akenda-Ondoga, Valentine	M.S.	An Analysis of Resource Availability, Utilization, and Productivity in the Agriculture of Uganda
Kreitman, Richard	M.S.	An Economic Analysis of the New Agrarian Reform Programs for El Cenizo, Venezuela
McEachern, John	M.S.	Management and Tourism in Island Systems of the Caribbean
McGregor, Andrew	M.S.	Capital Rent Extraction and the Survival of the Producer Cooperative
Doering, Otto	Ph.D.	Malaysian Rice Policy and the Muda River Irrigation Project
Donovan, W. Graeme	Ph.D.	Employment Generation in Agriculture: A Study in Mandya District, South India

<u>Author</u>	<u>Degree</u>	<u>Thesis Title</u>
Falusi, Abiodun	Ph.D.	Economics of Fertilizer Distribution and Use in Nigeria
Montgomery, Roger	Ph.D.	The Link Between Trade and Labor Absorption in Rural Java: An Input-Output Study of Jogjakarta
Popkin, Barry	Ph.D.	An Evaluation of Alternate Vitamin A Intervention in the Philippines
Schluter, Michael	Ph.D.	The Interaction of Credit and Uncertainty in Determining Resource Allocation and Incomes on Small Farms, Surat District, India
Shillingford, John	Ph.D.	Financial Potential and Welfare Implications of Sugar Cane Harvest Mechanization on Jamaican Plantations
Swanberg, Kenneth	Ph.D.	The Potential Impact on Nutritional Status of Reducing Marketing Costs through Marketing System Manipulation in Low Income Countries
Tecle, Tesfai	Ph.D.	An Economic Evaluation of Agricultural Package Programs in Ethiopia
Zulberti, Carlos	Ph.D.	The Feasibility of Beef Cattle Feed Lots in Argentina: Methodology of Economic Evaluation

The current location and employment of the graduate students completing theses indicates how this professional group of economists continues to contribute to the solution of development problems in their own governments, universities, international agencies and businesses. The ways in which these individuals respond to needs in many respects is one of the most important aspects of the outreach

associated with this grant and the many other sources of funding used in graduate education in agricultural economics.

International graduate student alumni. Students who have completed degrees since July 1, 1973.

<u>Name</u>	<u>Nationality</u>	<u>Degree</u>	<u>Position</u>	<u>Address</u>
Akenda-Ondoga, Valentine	Uganda	M.S.	Ph.D. Candidate	Cornell Univ.
Doering, Otto	U.S.A.	Ph.D.	Assistant Professor	Dept. of Agri- cultural Economics, Purdue University W. Lafayette, Ind.
Donovan, W. Graeme	New Zealand	Ph.D.	Staff Economist	International Bank for Recon- struction & Dev., Washington, D. C.
Falusi, Abiodun	Nigeria	Ph.D.	Lecturer	Dept. of Agri- cultural Economics Univ. of Ibadan Ibadan, Nigeri
McEachern, John	Canada	M.S.	Economist- Environ. Specialist	Island Res. Found. P.O. Box 4187 St. Thomas, U.S. Virgin Islands
McGregor, Andrew	Australia	M.S.	Lecturer	Dept. of Economics Wollongong Univ. Wollongong, New S. Wales, 2500 Australia
Montgomery, Roger	U.S.A.	Ph.D.	Lecturer	Univ. of Michigan African Dev. Prog. Abidjan, Ivory Coast
Popkin, Barry	U.S.A.	Ph.D.	Staff Economist	Rockefeller Found. Univ. of the Philippines P.O. Box 740, Makati, Rizal, Philippines

<u>Name</u>	<u>Nationality</u>	<u>Degree</u>	<u>Position</u>	<u>Address</u>
Schluter, Michael	England	Ph.D.	Private Businessman	P.O.Box 43387 Nairobi, Kenya
Shillingford, John	West Indies	Ph.D.	Economist	Econ. Community for Caribbean, Bank of Guyana Bldg., Georgetown, Guyana
Swanberg, Kenneth	U.S.A.	Ph.D.	Economist	International Dev. Research Cntr. ICA, Bogota, Colombia
Tecle, Tesfai	Ethiopia	Ph.D.	Professor	Haile Selassie Univ. Addis Ababa, Ethiopia
Zulberti, Carlos	Argentina	Ph.D.	Agric. Economist	IDRC, Ministry of Agriculture Bogota, Colombia

One important and continuing component of Cornell resources in the development process relates to the 20 year interaction between the College of Agriculture at Ithaca, New York and Los Banos, Philippines. The formal program in graduate teaching and research funded by the Ford Foundation was completed June 30, 1972. Because of the location of the International Rice Research Institute, joint faculty interests at both institutions and the catalytic leadership of Dr. Barker, student-staff contacts will continue. It is the intent of the administrators at IRRI and the two Colleges that informal research cooperation be fostered and continued.

Dr. L. B. Darrah from our faculty was one of the last Cornell faculty resident at Los Banos. He has just completed two years in Manila in the Philippine Department of Agriculture and Natural

Resources. He has been working with a group of young Filipinos to develop a permanent research unit concerned with marketing and prices within DANR. Funding for this position and program has been provided jointly by the Ford Foundation and the Philippine government. In the appended list of publications a number of practical field studies are reported jointly authored by Darrah and his Filipino colleagues. Dr. Darrah has transferred to a position with the Ford Foundation in Manila effective July 1, 1974. He will continue in his capacity of the past two years. The linkage with our faculty and students will also continue.

Dr. K. L. Robinson spent his sabbatic leave during 1973-74 as economist at the International Institute of Tropical Agriculture in Ibadan, Nigeria. Besides assisting in a wide range of research activities with the biological scientists on the permanent staff at IITA, Dr. Robinson taught a graduate seminar at the University of Ibadan. This location also allowed him to consult with two former students, Drs. Falusi and Kolawale who held faculty positions at the University of Ibadan and Ife respectively.

Dr. J. W. Mellor consulted and lectured at a substantial number of locations during the academic year both in response to his role as director of the US/AID contract and his other teaching and research responsibilities at Cornell. He was a lecturer at the Foreign Service Institute, participated in SEADAG and ADC seminar programs, lectured at the USDA Graduate School, the World Food Institute at Iowa State University and a wide variety of programs within and outside the United States.

Dr. T. T. Poleman accepted two assignments in West Africa sponsored by FAO and US/AID concerned with economic programs in response to the drought in Sahel Region. He also continued his work with FAO and the Government of Sri Lanka on food policy planning.

Dr. D. K. Freebairn assisted faculty in Cornell's College of Engineering with respect to their 211(d) grant concerned with programs on science and technology. He worked in Mexico and Peru and worked in Ithaca as necessary in reviewing programs and plans as they developed. During June 1974 Dr. Freebairn taught a special graduate course in resource economics in Spanish at the University of Puerto Rico. He was also part of the faculty group teaching IAD 602, a graduate course in tropical agriculture involving three weeks of study in the Dominican Republic and Puerto Rico in January 1974.

The preceding paragraphs provides an incomplete but suggestive indication of faculty and graduate student involvement in development activity related to LDC problems and institutions. There is both commitment and concern by the Department as a whole to teaching, research, and outreach.

#### VI-VII. Next Year's Plan of Work and Anticipated Expenditures

This will be the fifth year of the five year grant program. Planned expenditures are presented in tables I and II immediately following this section. As in all previous years primary expenditures will be for graduate student assistantships and graduate fees, travel and research costs associated with Ph.D. dissertation projects in overseas locations and partial support for one visiting

faculty member during the fall semester 1974-75. Funds for the publication of reports and bulletins based on student and faculty research supported by funds from this grant are another important component of expenditure.

At the end of fiscal 1974-75 a number of doctoral candidates will be left without assistantship support and reduced mechanisms to support overseas research if this grant is not renewed. Graduate admissions were made in 1973-74 on the expectation that at least modest support for the graduate research and teaching components of this grant would be continued for another five year period. Admissions for candidates interested in development during 1974-75 will necessarily be reduced pending on decisions on grant renewal.

Specific projects now underway and to be supported using 211(d) grant funds are listed in detail in Section III - Accomplishments. Detailed budgets for each overseas research programs are reviewed and filed before students leave Cornell.

Table I

Distribution of 211(d) Grant Funds and Contributions From Other Sources of Funding

Review Period 7/1/73 to 6/30/74

Grant Related Activities	211(d) Expenditures			Projected to End of Grant	Non 211(d) Funding Amount (1972-7 )
	Period Under Review	Cumulative Total	Projected Next Year		
Research	\$70,543	\$127,636	\$62,364	\$190,000	\$250,000
Teaching	12,000	18,133	11,867	30,000	150,000
Libraries	-----	-----	-----	-----	20,000
Mission Payments (Research)	-----	4,087	3,913	8,000	
Consultation	-----	1,632	2,368	4,000	
Other	-----	<u>775</u>	<u>7,225</u>	<u>8,000</u>	<u>30,000</u>
<b>Total</b>	<b>\$82,543</b>	<b>\$152,263</b>	<b>\$87,737</b>	<b>\$240,000</b>	<b>\$450,000</b>

**Table II**  
**Expenditure Report**  
**(Actual and Projected)**  
**Under Institutional Grant #AID/csd - 2823**  
**Review Period 7/1/73 to 6/30/74**

Line Items (to conform to budget in Grant document)	Expenditures to Date		Projected Expenditures				Total
	Period Under Review	Cumulative Total	Year				
			2	3	4	5	
Salaries	\$51,955.98	\$85,958.69					\$124,000
Travel	1,795.21	16,076.00					25,000
Equipment (Leases & Rentals)	145.48	1,079.94					2,000
Other	3,848.96	5,862.07					8,000
Overseas Research Expenses	14,719.37	22,507.66					40,000
Mission Payments	-----	4,087.49					8,000
Computers	3,951.51	4,456.41					10,000
Printing	917.16	3,929.08					8,000
Tuition & Fees	<u>5,209.47</u>	<u>8,305.67</u>					<u>15,000</u>
Total	\$82,543.14	\$152,263.01					\$240,000

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