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**Sixth Progress Report**  
**on**  
**Participating Agency Agreement**  
**between**  
**The Agency for International Development**  
**and**  
**The Economic Research Service**  
**for analysis of**

**FACTORS ASSOCIATED WITH DIFFERENCES AND CHANGES IN**  
**AGRICULTURAL PRODUCTION IN UNDERDEVELOPED COUNTRIES**

**BY**

**Foreign Development and Trade Division**  
**Economic Research Service**  
**United States Department Of Agriculture**

**July 1966**

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This sixth semi-annual report describes progress on the productivity project during the first six months of 1966. Phase A of the project was terminated during the preceding period and attention was devoted largely to Phase B during this period. The first progress report, dated November 1963, and the Participating Agency Agreement No. 12-17-0017-132 should be referred to for background information. The second to the fifth semi-annual progress reports list accomplishments through the end of 1965.

I. Distribution of Phase A report:

Major results and findings of Phase A activities were published as "Changes in Agriculture in 26 Developing Nations, 1948 to 1963," Foreign Agriculture Economics Report No. 27, Economic Research Service, USDA, November 1965. This report has had an excellent reception as evidenced by the fact that it is now in its third printing. Practically all comments received have been favorable. The few critical comments largely called attention to elements considered beyond the scope of this initial report, such as the desirability for fuller analysis of a few topics.

The original printing of 6,000 copies was quickly exhausted. The second printing of 2,500 copies in January 1966 was exhausted by May and a third printing of 3,000 copies was made in June.

The report has been distributed in many countries through USAID Missions in those countries and also by many interested foreigners writing to request copies. In India the study received quite wide attention in the daily press. At least nine universities informed us that they are using the report as basic source material for undergraduate, graduate, and seminar courses in

economic development. This widespread publicity may be due in part to the fact that Secretary Freeman released the publication in an Address at the Biennial Conference of the Food and Agriculture Organization in Rome, Italy, November 23, 1963. Copies of the Report were also sent to members of the President's General Advisory Committee on Foreign Assistance Programs.

## II. Construction of Crop and Livestock Production Indices:

As indicated in the Fifth Progress Report, the decision was made at the February 4, 1965 meeting of the AID/W Advisory Committee to construct livestock production indices for 15 of the 26 countries included in Phase A and to construct crop production indices for 20 more countries. This work was to be done during FY 1966.

The quality of basic data available for the construction of indices and the press of other work have combined to delay the work and prevent its completion by June 30, 1966.

Livestock production indices have been completed for Argentina, Brazil and Poland; draft reports are being reviewed for nine countries (Greece, Spain, Chile, Colombia, Israel, Turkey, United Arab Republic, Japan and Taiwan); two countries, Mexico and Yugoslavia are about completed; and statistical tables have been prepared for the Philippines, but the data are so deficient that it is unlikely that little more can be done.

Crop production indices for 13 countries in Latin America are quite far along with data collection virtually completed and computations nearly finished. These 13 reports should be completed by mid-September. For the other seven countries, collection of the data is nearly finished but computations have not yet been started.

**III. Supplemental Country Analysis: Replies to Airgram AIDTO A-124:**

An airgram was sent to all Phase "A" USAIDS and to selected other countries requesting that they prepare an analysis for their country similar to that done for the Philippines in Appendix I of FAER 27. In the process missions in Phase A countries were asked to update the data for their country beyond 1963. The limited data received to date were summarized and used as background material for the Taiwan Seminar in June, (See V below for report of Taiwan Seminar).

**IV. Phase B Progress and Plans:**

By the end of June 1966, Phase B country studies were underway in Taiwan, Greece, Mexico, Nigeria, Brazil and India. A summary of the status of each country project follows:

<u>Country</u>	<u>Leader</u>	<u>Status to June 30, 1966</u>
Taiwan	David Spaeth	Draft report completed; further work planned when staff available.
Greece	Lawrence H. Shaw	Returned to U.S. April 1, 1966. Draft report to be completed August 1.
Mexico	Reed Hertford	Study began February 1965; expected to return to U.S. about April 1967.
Nigeria	William Huth	In Nigeria from October, 1965. Village survey underway June, 1966.
Brazil	Louis F. Herrmann	Started study March, 1966. Assembly of data and detailed planning of study underway.

<u>Country</u>	<u>Leader</u>	<u>Status to June 30, 1966</u>
India	William E. Hendrix	In India from January, 1966. Assembly of data and detailed planning of study, and other early stages of work underway.
Colombia	Recruiting	Memorandum of Understanding signed.
Tunisia		Memorandum of Understanding prepared; project will begin after memorandum signed by Government of Tunisia.

#### A. Taiwan

A report, "Agricultural Development and Its Contribution to Economic Growth in Taiwan," by S. C. Hsieh and T. H. Lee, was published by the Chinese-American Joint Commission on Rural Reconstruction (JCRR) as Economic Digest Series No. 17, April 1966. This publication is a report on those aspects of the Phase B study in Taiwan for which the Chinese co-sponsors of the project were responsible. The companion ERS report prepared by David Spaeth is still in the process of being revised.

A meeting was held with Dr. Spaeth and Mr. T. H. Lee, now studying at Cornell University on leave from JCRR where he worked with Spaeth on the publication. It was decided to substantially revise the draft and to enlarge upon some parts which the analysis indicated were more important than was originally thought at the time the study was planned. These changes will require spending three to four months in Taiwan to collect the needed data.

Since the final report could not be completed in time for the Taiwan Seminar in June, a 50-page condensation of Spaeth's material was prepared

for the Taiwan Seminar. This condensation was also sent to the Technical Advisory Committee for their review and comments.

Comments by the Technical Advisory Committee and the reaction of Seminar participants to this report indicate considerable interest in the analysis made by Dr. Spaeth. However, there was agreement that the analysis should be expanded to include more empirical data and a fuller description and analysis of specific organizations and their operational procedures. It was agreed that the report in its present form is not ready for publication.

#### B. Greece

Dr. Lawrence H. Shaw completed his field investigations in Greece and returned to Washington April, 1966, almost exactly two years from the date of his arrival in Athens in April, 1964. The draft report of the Greek study will be ready for review by the end of July. An outline of the purpose and major procedures used in the study, and an outline of the draft report are included as Appendix I.

R. P. Christensen consulted with Mr. Shaw in Athens in January, 1966, on a routine supervisory visit planned for Greece and Nigeria. As indicated below, the Nigeria portion of the Trip had to be postponed, however, because of political disturbances in Nigeria.

#### C. Mexico

The content and direction of the Mexico study have about been determined. These are shown in Appendix II. To aid Hertford and the co-sponsoring Mexican institution, Instituto Nacional de Investigaciones Agrícolas (INIA) in meeting these objectives, three contracts were let by ERS as follows:

(1) to conduct a detailed study of the formation of capital in Mexican agriculture by tenancy type and for each of five Census Regions for the period 1940-62.

Contractor: Mr. Eduardo L. Suarez, former Rector of the University of Nuevo Leon and former Director of the Center of Economic Research of the same university.

(2) To develop basic data for the construction of indices of livestock numbers, slaughter, productivity, consumption and imports for beef cattle, pigs, goats, and sheep for the period 1940-62.

Contractor: Mr. Finis Welch, Associate Professor of Economics, S.M.U.

(3) To conduct a detailed study of the effects of government price regulations of basic subsistence commodities (corn, beans, rice, and wheat) upon Mexican agricultural production and productivity for the period 1935-1962.

Contractor: Iowa State University

Investigators: L. B. Fletcher and Berni Saunders

The contract with Mr. Juvencio Wing S. to conduct a study of fertilizer consumption and prices by states was extended to December 1, 1966, because of unexpected difficulties Mr. Wing encountered in finding data which he originally thought to be readily available.

Reed Hertford discussed his work underway in Mexico at a seminar on Mexican Agricultural Development at the University of Chicago, April 14, 1966.

#### D. Nigeria

Work in Nigeria was devoted to further planning of the project and getting underway a village survey to collect data for a detailed analysis of farming and household practices in about 25 villages. The survey will provide data

for analysis of the productivity of major types of inputs. In addition to the uniform set of data to be compiled in all villages, it is planned to study in depth a few selected factors in four or five additional villages. This in depth study will include such factors as credit, land tenure, economic motivations and price incentives, availability and impact of extension information, etc.

Specific objectives of the village survey are:

1. To depict statistically the internal structure of Nigerian farms and the extent to which they vary both within villages and among localities.
2. To estimate present productivity levels for important agricultural inputs.
3. To evaluate farmers' economic efficiency in the use of available resources, given the techniques actually employed by them.
4. To identify reasons for observed differences in productivity of inputs, particularly labor, and the manner in which agricultural research, extension, formal education, and possibly credit, transportation and health facilities affect and determine levels and changes in labor productivity.
5. To describe the frame of reference in which Nigerian farmers make economic decisions. Attention will be given to farmers' motivations, the factors influencing them, and the responsiveness of farmers to price and other incentives.
6. To gather basic economic data on income and expenditures by household-farm decision making units in order to describe and understand savings functions and investment patterns, including investment in education as well as non-monetary kinds of investments. These data should also provide additional insights concerning the contributions to overall economic growth of subsistence (low income) sectors within the country.

A routine supervisory visit to Nigeria to consult with Mr. William P. Huth had been scheduled for early December 1965 and again for late January 1966. However, the status of work was such that a visit in December would have been inappropriate. The January visit was also postponed because of political difficulties within the country. This visit was finally made by R. P. Christensen at the end of March 1966. During his visit Christensen helped to define broad objectives and procedures for the project in Nigeria. Out of these deliberations came the conclusion to concentrate on the village survey as the chief source of data. It was also felt that the Washington office should provide some assistance in the development of specific aspects of the survey. Therefore, Stanley F. Krause spent from May 10 to June 2 in Nigeria helping to complete final plans for the survey. As indicated earlier, the survey was off to a good start in June 1966. Whether or not political disturbances permit the survey to be started and carried to completeness in all selected villages remains to be seen.

#### E. Brazil

The first three months spent on the project by Louis Herrmann have been quite productive. Upon his arrival in Rio and prior to his starting work on the project, several months were devoted to full time intensive language training.

The Getulio Vargas Foundation is the co-sponsor of the project in Brazil and is providing active support in planning and executing the study.

Dr. Herrmann reported that one of his immediate tasks upon completion of language instruction was to acquire an intimate knowledge of Brazilian agricultural output---to become acquainted with the available published and

unpublished information on agricultural output as well as to learn first hand, through travel, the realities of Brazilian agriculture and the institutions serving it. In the process, he visited several universities and similar research groups to discuss his work and to explore their interest in carrying out special studies as a part of the overall project.

One of the early tasks undertaken by Dr. Herrmann was to list the items in FAER 27 for which there was a numerical value and to obtain the Brazilian value for as many of these items as possible. The list was expanded to include basic statistics not published. In all, 267 items were identified.

This list was sent to all Phase B country project leaders following the practice of circulating to all countries procedures, methods and results from other countries that may be of interest to them.

The regional distribution of agricultural output in Brazil is very important for this project. Mr. Herrmann reports that one of the principal hypothesis for the study is that regional differences in rates of increase in output may help in identifying and evaluating the importance of factors affecting output.

#### F. India

Research into factors associated with differences in levels and rates of change in agricultural output in India was initiated in January, 1966, with the arrival in New Delhi of Dr. William E. Hendrix. This work enjoys the active interest and good cooperation from the AID/India Mission, the Ministry of Food Agriculture, and other agencies. The Directorate of Economic and Statistics, Ministry of Food and Agriculture, is the Indian agency co-sponsoring the study.

Factors associated with differences among States of India in their levels and recent rates of increase in agricultural output are to be analyzed. However, heavy emphasis will be given to Punjab and Uttar Pradesh in North India and perhaps Madras and Orissa in rice growing states (the selection of these latter two states has not yet been definitely decided). An effort will be made to ascertain the resource and technological basis of observed input and output changes.

Within each of the selected states for intensive study, plans are to identify one or more "centers" of rapid increase in agricultural output and, if possible, to find somewhat similarly endowed localities where little progress has been made. Within these "rapid growth centers", it is proposed to examine in some detail the growth processes with a view (1) to identifying the initiating agency; (2) to ascertaining this agency's or innovator's mode of operations; (3) to tracing changes over time in cultivator demands for superior inputs and factors entering into these changes; (4) to examining and evaluating the technical foundations of the changes; (5) to discovering how key impediments to increasing outputs in India (such as capital and knowledge and lack of incentives) have been overcome in these localities; (6) to ascertaining the resource and "institutional" requirements of the changes; and (7) to examining interactions over time among the factors influencing growth.

Areas of slow growth will be checked for the presence or absence of the "causal" factors identified in the rapid growth areas and for the possible presence of other factors that condition growth potentials and processes, but which were not present in rapid growth areas.

V. Taiwan Seminar on Agricultural Development:

This conference under the sponsorship of AID and JCRR was held to provide an opportunity for representatives from other Asian countries to study the methods employed in the agricultural development of Taiwan and to observe the results realized. Countries represented were Korea, Malaysia, Philippines, Thailand, Turkey, Vietnam, and the host country, The Republic of China. A total of 53 persons attended, including officials from the above countries, ECAFE-FAO, Agriculture Development Council, and AID staff members from each of the above named countries as well as from Afghanistan and India. Horace Holmes and Robert Fowler, AID regional representatives from Washington were also in attendance. Wade F. Gregory, Stanley F. Krause and William E. Hendrix (in charge of Phase B study in India) all from ERS-USDA attended the Seminar and served as resource persons in the planning and execution of the meeting.

The Seminar centered around the subject matter of the productivity project and the reports on Taiwan agricultural development growing out of the Taiwan study. William E. Hendrix presented highlights of the Phase A report, "Changes in Agriculture in 26 Developing Nations, 1948-1963," as background material for the seminar. S. H. Hsieh of China presented the changes that occurred in output, inputs, and productivity in Taiwan agriculture based on the study, "Agricultural Development and Its Contributions to Economic Growth in Taiwan," authored by himself and T. H. Lee. Wade F. Gregory summarized the paper "Economic Development of Agriculture in Taiwan," based on the analysis made by David Spaeth. Seminar participants spent considerable time in sub-groups and general meetings discussing the subject matter of these reports.

A 4-day field trip was included as part of the program. Following the field trip, the last 1½ days of the Seminar were devoted to discussing the transferrability of the Taiwan experience to other countries.

The Seminar provided the opportunity for those attending to gain significant new insights into the process of agricultural development and to observe the operation of specific programs used in Taiwan. The talks and discussion placed much emphasis on the need to identify the obstacles and opportunities that exist in each situation and the need to tailor development programs to actual situations.

VI. Technical Advisory Committee Meeting:

The fourth Technical Advisory Committee Meeting on the AID Agricultural Productivity Project was held in Washington, D.C., on June 3, 1966. The committee had not met since December 18, 1964, at which time major attention was devoted to the termination of Phase A. This fourth meeting was called primarily for the purpose of discussing progress and future plans for Phase B. Agenda items included (1) The Phase A report, "Changes in Agriculture in 26 Developing Nations, 1948-1963", and plans for preparing a comparable report at a later date, (2) the draft report of the Taiwan Study, (3) progress and plans for Phase B studies in other countries, and (4) plans for an overall final report based on Phase B work. Notes on this meeting appear as Appendix III.

## APPENDIX I

Objectives and Procedures for Agricultural Productivity  
Research in Greece

Purpose of the study.-- The major objectives of the Greece study is to provide an explanation of the growth in agricultural production in Greece during the post-World War II period.

Procedures used.-- The study has been carried out in three stages.

Stage I

It was necessary to measure growth in agricultural production at greater detail than provided in Phase A.

Data on crop production were disaggregated into 14 product groupings. Data on livestock production, using 15 product groupings, were added. All production data were disaggregated to 11 geographical regions.

Index numbers of the physical volume of production were computed. Change in the index of gross agricultural output is used as the measure of growth in agricultural production.

Stage II

The measures of crop and livestock production were separated into input and productivity components. Composition of production was also isolated as a component.

Indexes of components of production were constructed, and change in production was disaggregated to input, productivity and composition sources.

Data insufficiency required the use of partial measures of productivity (crop production per unit of land and livestock production per animal). Such partial productivities are a function of the other inputs used, and these functional relationships were investigated subject to lack of data. Fertilizer and irrigation were considered extensively in the case of cropland productivity. Feed crop production was considered in the case of livestock productivity.

Stage III

The motivations for change in input use, productivity and the composition of production were investigated.

Motivating factors were considered both as they affect changes in the components of production through the price mechanism and as they result in changed production independent of changes in prices.

Specifically the roles of credit, transportation facilities, education (both specific and general), research, income, population and preferences were investigated. Major emphasis was placed on the investigation of the role of credit.

**Outline of Draft Report  
GROWTH IN AGRICULTURAL OUTPUT  
A Case Study of the Greek Postwar Experience**

**Part I. Introduction**

- Chapter 1. Background of study
- Chapter 2. Role of the agricultural section in the Greek economy
- Chapter 3. Framework for analysis

**Part II. Change in Output**

- Chapter 4. Pattern of change in agricultural output
- Chapter 5. Product and regional sources of growth in production

**Part III. Components of Change in Output**

- Chapter 6. Specific framework
- Chapter 7. Aggregated pattern of input use and productivity
- Chapter 8. Components of change in gross agricultural output
- Chapter 9. Component sources of growth in gross agricultural output
- Chapter 10. Summary of Part III.

**Part IV. Motivation for Output Change**

- Chapter 11. Response to price
- Chapter 12. Demand originating motivation
- Chapter 13. Supply originating motivation

**Part V. Conclusions**

- Chapter 14. Summary of study and conclusions regarding the pattern of input and productivity sources of and motivations for growth in Greece agricultural output

## APPENDIX II

Objectives and Procedures  
for Agricultural Productivity Research  
in MexicoI. OBJECTIVES:

The Plan of Work for the Mexican Project identified two principal objectives: (A) The measurement of the sources of growth of Mexican agricultural production and (B) the explanation of the course by which new, more productive inputs substituted for the old, "traditional" ones in the process of that growth. The roots of the Mexican Study were set in these two objectives because it was felt at the outset that they were the highest yielding varieties.

The first objective implies either a thorough-going supply analysis or the identification of appropriately specified production functions. The latter alternative has been taken, though the data which to date have been developed will permit ultimately some reduced form estimation of supply relations.

The second objective implies what the first does not: the dynamics of change; the process by which the production function itself has taken on new character. It is acknowledged that this is the theoretically weak root in the Mexican Project. Samuelson, one famous for counting "meaningful theorems" in economics, states only that "...for any input, potentially usable but not actually used, the marginal productivity of the last dollar spent on it must not be greater than the marginal productivity of the last dollar spent on factors which are used..." and that "...it may still remain unused until some critical level at which it will begin to be used..." (Page 70, Foundations) What defines that "critical level?" When and why does the new input enter the old production function?

These are the two general objectives underlying the Mexican Project; it is upon these roots that the Mexican Project has grown.

Emanating from this growth, from work on these principal objectives, from readings, discussions and travel in Mexican Agriculture, have come a number of so-called "special issues" meriting direct attack. These issues are "Mexican-specific:" they not only are necessary to a deeper interpretation of the Project's principal objectives, but have demonstrated themselves to be singular features of Mexican agricultural development which may aid ultimately to distinguish the growth performance of that country from others under study. Five such special issues have been identified.

1. The Ejido. This is a distinctively-Mexican institution dating back to the early 1900's. For one half century the ejido has been the hub of Mexican government policy in agriculture: the Agrarian Reform has created 1.6 million ejido farmers, provided them with over forty-five million hectares of farm land, and doled out water, credit, machinery, and fertilizer to complement the gift of land. In every sense, the ejido has been the favored child born of the Mexican Revolution.

The rewards to this treatment have not apparently been great. Over the most recent two decades the ejido sector has grown at a compound rate of 3.3 percent per year in production as compared with 8.2 percent in the private sector. What source or sources of growth account for this difference between the growth of the two sectors? And if similar land redistribution schemes were undertaken in another Latin American country, would the results be similar?

2. Agricultural Labor. Given the evidenced increase in Mexican agricultural productivity over the past two decades, one would suspect that agricultural labor would have benefitted directly with higher wages. Yet this has not been true: real wages have been constant, money wages increasing about 5.4 percent per year over the past decade. The living evidence of this fact has even led some Mexicans to raise questions about the benefits of "productivity" per se. Is it possible that technological change cheated the agricultural labor force in Mexico? Or is it possible that wages have been simply mis-measured? Or is it that there were, in fact, real benefits made available to labor from Mexico's productivity increases, but that these were dissipated? And should an affirmative answer be found to the latter question, what might be said from the Mexican experience about the possibility of the dissipation of productivity increases in other countries?

3. Agricultural Research. Contrary to Professor Schultz's apparent conviction expressed in recent Congressional testimony, there does exist a first-rate research establishment in Latin America: the Mexican National Institute of Agricultural Research (INIA), formerly the Office of Special Studies, Rockefeller Mexican Program. This institution has provided Mexico with regionally adapted, improved seed varieties of wheat, corn, sugar can, cotton, rice, sorghum, beans, etc. It has also made Mexico an exporter today of these new inputs held in bank at Chapingo: several countries have been recent recipients both of the seeds and Mexican technical assistance.

The Mexican experience in agricultural research is sufficiently distinctive as to merit consideration as a "special issue" on this one count alone. Much could be learned (and ultimately will be reported on)--of INIA, its professional staff, the applicability of foreign training, associated extension techniques, the historical development of a "variety," the gestation period of agricultural research investments,

etc. Yet it is related to the Project's two primary objectives in a natural way. For one of the sources of growth identified by the data developed on the Mexican Project is the seed input. From these data an answer can be derived to the question of whether agricultural research in Mexico has been a profitable social undertaking. And the answer to this question foreshadows the next: why were these seeds adopted? What were the determinants of their entry into the production function?

4. The Price Umbrella. There is nothing in economic theory which would lead to the hypothesis that technological change arises from changes in product price relatives per se. Price changes are only responsible for "ordinary growth." Accordingly, the Mexican Project does not emphasize "price" except in the case of two commodities and these are treated as "special issues:" cotton and basic subsistence crops (corn, beans, wheat, and rice as a group).

In addition to its relation to the project's primary objectives, cotton was selected for three reasons: it accounts for roughly twenty-five percent of total Mexican crop production, it represents a good case of "ordinary growth," and the changes in price which have induced production growth have been greatly affected by US domestic cotton policy -- the CCC "price umbrella." On this last point, FAS/Mexico does not bother to report a Mexican cotton price because "...it is always twenty-five points below the CCC announced price."

Mexican subsistence commodities have likewise enjoyed the benefits of a price umbrella--this one being held by a domestic policy of price supports. But the umbrella effect in this instance has had its primary impact, not on price levels, but upon price stability. Correspondingly, in the case of these crops, price has had other than its "ordinary" effects: in fact, rapid innovation and adoption of new inputs has attended production growth. Price in this sense may have been a source of "productivity growth."

5. External Financing. The Mexicans have a most revealing aphorism of a prevailing attitude in their country: "Poor people of Mexico--so far from God and so close to the United States."

This "special issue" is motivated by the patent obverse of this statement: namely, that Mexico's proximity to the United States, and the resulting Mexican-US working relations evolved, has afforded it growth which otherwise would not have been forthcoming from domestic resources at hand. The focus here is upon the horticultural and cotton crops of the Valleys of Culiacán, Fuerte, and Yaqui located in the Pacific Coast states of Sonora and Sinaloa. These crops and regions have essentially held up the growth averages for Mexico over the past twenty-five

years: crop production increased at 9.2 percent per year for the whole of the Pacific Northwest and the particular crops to which reference is made have demonstrated in the same Region a rate of annual growth in excess of twelve percent per year. These rates are without peer elsewhere in Mexico.

Mill's well-known Method of Differences states that if there exists a single factor which is such that in its presence a certain event has taken place and in its absence it has not, that factor is the cause of the event. In the case of Sinaloa-Sonora the consensus opinion would point to external financing as "that factor." For the distinctive feature of this region of Mexico is its close financial ties to the United States-- in particular, to US vegetable distributors, though contract buying by U.S. firms of cotton is a similar arrangement which has served to finance this crop in the Pacific Northwest.

Therefore, the analysis of the spectacular growth performance of Mexico's Pacific Coast cannot avoid a thorough examination of US financial influence and of the possibility that in its absence that performance would have been much less spectacular.

The objectives of the Mexican Project are thus two. In the course of developing these, five special, distinctively Mexican issues have broken through, the investigation of which is necessary both to a rounder interpretation and understanding of the results of the Project's objectives and to Mexican Agricultural Development more generally.

## II. PROCEDURES:

(A) The measurement of the sources of growth of Mexican Agricultural Production is focused upon five regions encompassing each state of the Republic and upon the time period 1940-62. Additionally, within each region, the data are disaggregated in suchwise as to identify the ejido and non-ejido components separately.

The data employed are of four distinct types: two sets, each derived from the 1960 Agricultural Census, have respectively the state (32) and the country (2100) as their unit of observation; a third related to farms by crop over time (1937 observations from 1943-62); and the fourth set of data was generated from experimental field trials (13,000) of INIA and were obtained with the purpose of providing extraneous estimates of three variables with demonstrated hopeless collinearity (fertilizer, seeds, and water).

The basic "sources" of growth identified by these data are land, labor, machinery, livestock investment and feed, work animals, seeds, water, fertilizer, tools and implements, pesticides, insecticides, and herbicides, "other" farm real estate, and "miscellaneous other" (cottage-type inputs). In the Census data unitary prices are generally not available; in the cross-sectional data on time all inputs excepting the last six mentioned above carry a unitary price estimate. Regional prices of fertilizer (N, P, K) are being developed from an independent data source.

In all work to date these inputs have been used to generate statistical estimates of partial production elasticities from regressions linear in the logs of the "standard" Cobb-Douglas form. Factor share estimates on fertilizer are being obtained as a by-product of other research of the Mexican Project involving farm questionnaires.

These data and procedures, in addition to satisfying the first objectives of the Project; provide complementary information which is invaluable in the analysis of the ejido and agricultural labor force "special issues."

(B) The second objective of the Mexican Project is being attacked upon the hypothesis that an appropriate measure of the profitability of a new input will explain its entry into the production function provided that the degree of "awareness" on the part of farmers of its commercial availability is taken explicitly into account. "Awareness" in its turn is represented by a number of "auxiliary inputs"--sources of growth which conventionally are not treated as physical factors of production. Specifically, these have been taken to include agricultural extension, education, age, geographical dispersion of farms, supervised credit, the rate of obsolescence of information (experimental yield changes), and the costs foregone by a farmer in searching for information. These "auxiliary inputs," embodied in "awareness," are conceived as operating either to alter the date of an input's adoption or its subjective profitability of use. Thus to each can be attributed an explicit net rate of return, though this return is not gained in the classical sense from their operation the production function itself.

This model or procedure briefly outlined was motivated by two precedents: Griliches' work on U.S. hybrid corn seed and an exploratory field study done earlier in the Mexican Project, the results of which demonstrated spectacularly that "awareness" by farmers living in an underdeveloped setting hardly extends beyond the backdoor of their adobe huts.

The data for this model are being obtained through field surveys in four localized regions of Mexican Agriculture.

**(C) SPECIAL ISSUES:**

1. The Ejido. The basic procedure outlined earlier in section (A) above.
2. Agricultural Labor. The basic procedural supposition made about the Mexican real wage "puzzle" posited earlier is that it involves mis-measurement of money wages: That, if adjustments are made for the increase in females, the decrease in ages, the decrease in time spent working on the farm, and other labor quality components, real wages have in fact risen in Mexican Agriculture over the past two decades.

The quality adjustments will be made on the basis of coefficients obtained on these labor quality components from cross-sectional sample data from the 1960 Census of Population.

3. Agricultural Research. The basic data for this study are also an input for each of the two primary objectives of the Project. These involve trial results over time obtained regionally by INIA from variations in seed, water, fertilizer, and insecticide applications (primarily), the resulting published recommendations made, and data relating to the type of farmer expressing interest in these results and recommendations as evidenced in attendance at INIA's so-called "Farmers' Day."

The motivations for obtaining these data have been mentioned earlier: they are both analytical and descriptive in nature. The data obtained from the "Farmers' Day" will be used principally for descriptive purposes to complement the overall study of the agricultural research activity in Mexico and only conventional, empirical procedures are implied.

4. The Price Umbrella. Procedures for this study may be distinguished by commodity groups.

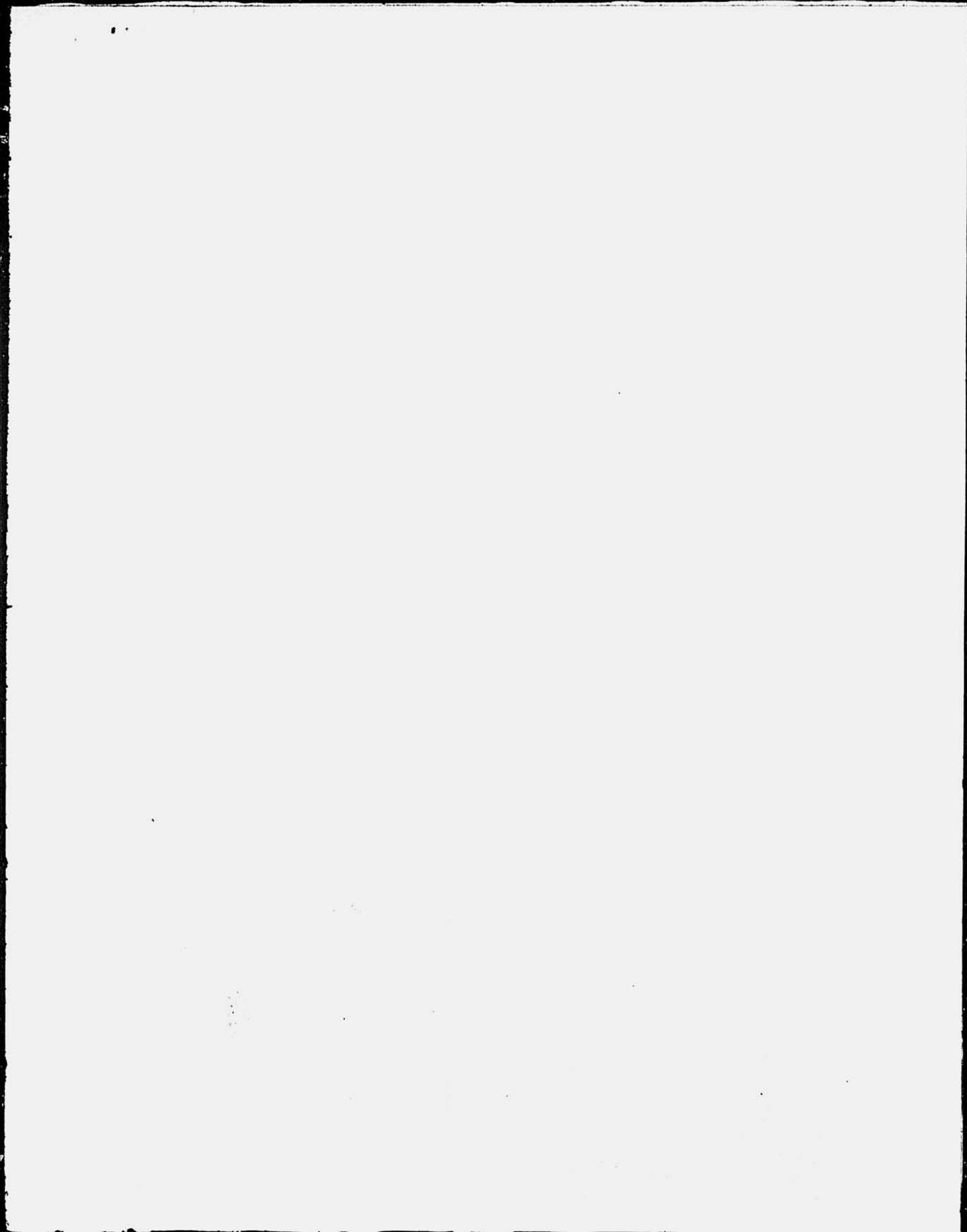
(a) Cotton. The study of cotton deepens data developed for the overall project both in the time and cross-sectional dimension: time-wise most data extend back to 1935; localized producing areas within each of the five standard regions used in the Project are identified.

Data sources employed have been numerous: predominately U.S. and U.N. for export and commercial data needs and Mexican for local production, consumption, stock, and price data requirements. Casual field interviews have been used extensively. These data serve to highlight the principal parameters of the analysis, which is at once broad, descriptive, and historical and yet analytically specific. The analytical model attempts principally to quantify the effects on cotton production and exports of US price supports operations, the four changes in the value of the Mexican peso between 1940 and 1950, a variable export tax, and a Mexican government policy toward irrigation investment which in early years was pointed at the cotton enterprise.

(b) Basic Subsistence Commodities. This part of the study of the "Umbrella Effect" is being carried forward by an Iowa group attached to "Plan Chapingo" in Mexico. The procedure for this study calls for complete specification of demand-supply relations of these commodities which will permit distinguishing the production and/or productivity effects from the differences between the equilibrium price and the subsidized farm price, the price responsiveness of farmers of subsistence commodities, the certainty of price, and the other government programs initiated as complements to the price policy (e.g., storage facilities, credit operations, irrigation, etc.).

5. External Financing. This study is forced to use the crudest procedures of guess-estimating. External U.S. credits of the type described earlier are not recorded in Mexico's income accounts or any "official sources" for that matter; Mexican producers refer to such credits as "counterband." CAADES, the national producers union most active in Sonora-Sinaloa, has consented to consult its records over time and provide an estimate of the proportion of the total crop of the region financed with credit. On the assumption (apparently valid) that producers receive credits only from wholesale distributors, one estimate of the magnitude of external credits can be thus derived with knowledge of the proportion of the total crop handled in the U.S. by U.S.-based firms. Additional descriptive information on the degree to which production so financed is actually managed (directly or indirectly) by U.S.-based enterprise can only be obtained through personal conversations with key individuals of the Pacific Coast industry.

The contents of this report by no means have intended to give a complete description of the Mexican Project's objectives and procedures: rather only to hit its high spots. Between these and the completed Final Report lies a myriad of data and additional "issues" which often--and individually--require more "procedures" and "purpose" than have been implied by any single part of the contents of this summary statement. Yet they are also the "trees" of the Project. An outline of its forest has been the purpose of this brief report.



## APPENDIX III

Minutes of The Fourth Meeting  
of The Technical Advisory Committee  
of The AID Productivity Study  
June 3, 1966

The fourth meeting of the Technical Advisory Committee for the AID Productivity Project was held on June 3, 1966. Administrator Louis Upchurch served as Chairman and opened the session at 9:45 a.m.

Committee members present were:

- Dr. M. L. Upchurch, Administrator, Economic Research Service, USDA--  
Chairman.
- Dr. Willard W. Cochrane, Dean of International Affairs, University of  
Minnesota, St. Paul, Minnesota.
- Dr. M. B. Russell, Director of Agricultural Experiment Station, College  
of Agriculture, University of Illinois, Urbana, Illinois.
- Dr. Max Millikan, Director of Center for International Studies, Massachusetts  
Institute of Technology, Cambridge, Massachusetts.
- Dr. Charles Hardin, Director of International Agricultural Center, University  
of California, Davis, California.
- Dr. E. T. York, Jr., Provost for Agriculture, University of Florida,  
Gainesville, Florida.
- Dr. Irvin T. Sanders, Ford Foundation, New York City, New York.
- Dr. Douglas Caton, Director of Agriculture and Rural Development Service,  
Technical Cooperation and Research Office, Agency for International  
Development.
- Dr. Kenneth L. Bachman, Director of Foreign Development and Trade Division,  
Economic Research Service, USDA -- Alternate Chairman.

Other Participants were:

- Mr. James Gill, Technical Cooperation and Research Office, AID.
- Mr. Wade F. Gregory, Chief, Economic Development Branch, FDT, ERS, USDA.
- Dr. Raymond P. Christensen, Deputy Director, FDT, ERS, USDA.

Dr. Matthew Drosdoff, Administrator, IADS, USDA.

Dr. Martin Abel, Assistant to the Administrator, ERS, USDA.

Dr. Lawrence Shaw, Agricultural Economist, FDT, ERS, USDA.

Dr. Stanley F. Krause, Agricultural Economist, FDT, ERS, USDA.

The project has moved from Phase A -- a study of the factors associated with agricultural development in 26 countries -- to Phase B. In this phase, several countries are studied in depth to identify and measure changes in output, input and productivity for each individual country and for significant intra-country breakdowns, e.g., regions, tenure categories, subsistence and export sectors, and to analyze the factors that impede or facilitate adoption of improved practices.

#### Taiwan Report:

The present draft of the Taiwan study tells a valuable story. The subjects emphasized are important and justify further effort. It was suggested that parts of the report need to be supported with additional data. This work probably requires several months stay in Taiwan and a redrafting of the report. More emphasis should be placed on the presence in Taiwan of a large number of well-trained agricultural technicians, including many who moved from the Mainland.

#### Number of Country Studies:

There is little reason to include additional countries in Phase B than those presently under consideration. Adequacy of each study is more important than a large number of countries. The prospect of getting a study underway in Tunisia was discussed. Committee members felt that the Phase B study in Tunisia and work contemplated by the University of Minnesota in Tunisia should complement each other very well. Final decisions by Minnesota about undertaking work in Tunisia should help to get a decision about a Phase B study there.

#### Plans for General Reports on Phase B:

Planning needs to get underway concerning the purpose and coverage of the overall final report for the project. Steps also need to be taken for project personnel to familiarize themselves with related research in other countries so as to be able to incorporate relevant findings from other research into the overall analysis. Since there are several different audiences for the Phase B study, separate reports may be needed for groups such as: (1) laymen and top administrators, (2) scientific and professional community, and (3) internal use in AID and ERS.

### Need for Washington - based coordination:

The need for central coordination of country studies was emphasized. However, relative independence of country studies should be maintained so that each study can be adapted to emphasize the more fruitful areas of investigation in each country. General hypotheses, however, might be presented to country leaders for consideration and inclusion in their particular country analysis.

### Comparability of Findings of Country Studies:

In view of the likely diversity of country studies, concern was expressed about the comparability of findings. The discussion appeared to move toward a consensus that major lessons can be learned without insisting on identical analytical procedures for all countries. It was felt that it would be wrong to put country studies into a conceptual strait jacket. Ultimate synthesis needs to come after the separate country studies are pretty well along. This synthesis should not attempt to average out the findings of the separate intensive country studies, but rather should build a generalized theory or model of development by drawing on the findings from the several studies.

Researchers are to submit a detailed plan of work within six months after their arrival in their study country. This plan of work will serve as a guide to check comparability among country work plans. As studies reach the six-month mark, checks will be made to determine whether minimum data needs stipulated by the plan of work have been secured.

Washington-based staff should make a comparison and restudy of the analytical models as soon as possible to appraise the probable comparability of findings and their application and use for the overall final report. Also, as each country report reaches the draft stage, workers in other countries should purposely look at the findings and explanations to determine the applicability of findings in other countries to the situation in their study country. For example, are the findings in Taiwan and Greece applicable to Nigeria and Brazil?

### Institutional Factors:

Committee members emphasized that country studies need to include systematic attention to institutional factors. Attention needs to be given to cultural values, type of government, political stability, etc. Likewise, it can be learned about the process of speeding up agricultural development through a better understanding of agricultural marketing procedures and systems.

There should be some attention to comparability of approaches to study of institutional factors. However, in this regard the committee did not recommend a lessening of emphasis on the input-output analysis; rather, they suggested

that the final analysis be complete enough to include both. It was mentioned that the Plan of Work for Phase B includes a listing of many institutional factors to be considered for study in each country. This list should be used by country leaders and Washington staff to check on coverage of institutional factors.

#### Areas of Rapid Growth Within Countries:

There is need to develop criteria for identifying growth centers within countries. This would aid in making both cross-country and intra-country comparisons and would be particularly useful in analysing the role of institutional factors.

Some comments indicated concern about making a general country analysis in such a diverse country as Brazil. How can such diversity be handled? There appeared to develop a concensus that problems of heterogeneity might be moderated by identifying and studying areas of rapid growth within countries and comparing them with areas of moderate or slow growth.

#### Importance of Productivity Research:

Several comments pointed toward the relevance of this type of research in view of the world food situation and the priority it should receive. Relationship to proposed Food for Freedom legislation was noted.