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Fifth 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

January, 1966

FEB 3 1966

This fifth semi-annual report describes progress on the productivity project during the last six months of 1965. During this period, Phase A was terminated and primary attention was devoted to Phase B. 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, third and fourth semi-annual progress reports list accomplishments through the first half of 1965.

I. Termination of Phase A:

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. Secretary Freeman announced the release of the report in an address at the Biennial Conference of the Food and Agriculture Organization, Rome, Italy, November 23, 1965. The press release stated that while the study confirms the serious nature of the world food crises, it uncovers a trend in some countries that indicates higher levels of food productivity can be achieved in the newly developing nations. The Secretary commented that, "The study reveals no easy road to victory, but it does indicate that freedom from hunger can be won."

The study shows that most of the 26 countries need larger increases in agricultural production to achieve their national objectives. In 17 of the 26 countries increases in crop output were slower than the rate of increase in domestic food demands, created by substantial increases in population and per capita income.

Increases in agricultural output were made under a wide variety of conditions: tropical and temperate climates, abundance and scarcity of land, high and low literacy rates, and widely differing cultural patterns and systems of government. Countries that have increased their output are characterized by aggressive group action to improve the bases of agricultural production and to obtain favorable incentives for farmers.

Appendix I, "An Illustration of Uses of This Publication In Agricultural Development Planning," was included as an example of how policymaking and administrative personnel concerned with the role and performance of agriculture can use the major findings of the study to evaluate their own agriculture. In the example, the Philippines is compared with other countries in the study on 26 selected items to illustrate the uses to which information in the report could be put, and the analysis suggests directions that can be taken to improve agriculture in the Philippines.

The first printing of FAER No. 27 was exhausted by early January 1966 and a second printing authorized. Plans are underway for the report to be translated and published in both Spanish and French.

An AIRGRAM AIDTO A-124 was sent to all Phase "A" USAIDs requesting that an analysis similar to that done for the Philippines be made for their countries in cooperation with host country officials. These analyses will be summarized and consideration will be given to publishing them. However, prior to making this decision, all country analyses will be put together and sent to USAIDs for review and comment.

Messrs. Bachman, Christensen, Hendrix and Gregory met with the AID Advisory Committee on Research, October 6, 1965, to present a progress report and findings of Phase A.

II. Phase B Progress and Plans:

At the end of 1965, Phase B country studies had been begun in Taiwan, Greece, Nigeria, Mexico and Brazil with all arrangements completed for Dr. W. E. Hendrix to begin the study in India around the end of January 1966. Before describing the status of work in individual countries, a few comments should be made relative to the overall project.

Work Seminar: Structuring Phase B Country Studies:

The period September 7-10, 1965 was used as a work session by all those engaged in the project to discuss project execution and formulation of a minimum set of data to be collected and questions to be answered and analyzed in Phase B study countries. The session drew heavily upon the experiences of David Spaeth who had finished the field work in Taiwan, of Lawrence Shaw and Reed Hertford who interrupted their field studies and returned from Greece and Mexico respectively, and of William Huth, Louis Herrmann and William E. Hendrix, who were preparing preliminary work plans prior to their departures to begin studies in Nigeria, Brazil and India. Others participating in the work seminar were Wade F. Gregory and Clarence A. Moore of the project staff in Washington; Kenneth L. Bachman, Raymond P. Christensen, Arthur Mackie and Harold Yee from the Foreign Development and Trade Division; and Douglas Caton, Frank Parker and Louis J. Gill from AID.

One result of these work sessions was the preparation of a draft outline which listed a minimum set of data and information each of the Phase B country investigators were to send to Washington for use in making cross-country comparative analyses. (This draft was incorporated into the PLAN OF WORK for Phase B included as Appendix I.) It was emphasized that the collection of

these data should not interfere with the development and orientation of individual Phase B country studies nor should the existence of a general outline lessen the need for initiative and imagination on the part of investigators when developing their respective projects to account for differences among study countries.

Compilation of Crop and Livestock Indices for Additional Countries:

As approved at the February 4, 1965 meeting of the AID/W Advisory Committee, work is underway to compute livestock production indices for the following 15 countries:

Latin America:	Argentina	Europe:	Greece
	Brazil		Poland
	Chile		Spain
	Colombia		Yugoslavia
	Mexico		
Near East:	Israel	Far East:	Japan
	Turkey		Philippines
	U.A.R.		Taiwan

Work is also underway to compute crop production indices for an additional 20 countries. The tentative selection of these countries (pending final approval by AID) is as follows:

Latin America:	Bolivia	Africa and	
	British Guiana	Middle East:	Angola
	Dominican Republic		Madagasy Republic
	Ecuador		Mauritius
	El Salvador		Morocco
	Guatemala		Senegal
	Honduras		Syria
	Jamaica		
	Nicaragua	Far East:	Ceylon
	Paraguay		
	Peru		
	Puerto Rico		
	Uruguay		

The preparation of these crop and livestock indices is to be completed by the end of Fiscal 1966.

Status of Country Studies:

Taiwan - As indicated in the Fourth Progress Report, Dr. David Spaeth completed the field work for the Taiwan Study and returned to Washington June 20, 1965 to revise and prepare a final report on agricultural development in Taiwan. Dr. Spaeth completed a draft report and returned to his former employment with Spindletop Research Inc. in October 1965 with the understanding that he would be available to make revisions as needed in the preparation of a final report for publication.

Greece - A third progress report covering the period April 1 to October 1, 1965 was received from Lawrence H. Shaw. Activities during this period were largely devoted to completing the description of the pattern of agricultural production in the post-war period and to identifying sources of growth in output. Preliminary drafts of three chapters were also received: Chapter II, Role of the Agricultural Sector in the Greek Economy; Chapter III, Aggregate Pattern of Agricultural Production; and Chapter IV, Growth in Agricultural Production. To assist in speeding up his work, Shaw sent data to Washington for processing by high speed electronic computers. Shaw's plans are to have a completed first draft by early spring, at which time he will return to Washington to prepare a final draft of the report.

Mexico - A draft chapter of the Mexican Study was prepared by Reed Hertford. This chapter presents preliminary estimates of production series and aggregate sources of growth. It also contains preliminary data on land distribution and changes in farm size with some comments on their possible effects upon changes in production. Accompanying this material was a preliminary table of contents of the final report.

A contract was signed with Juvencio Wing S. to conduct a detailed study of fertilizer consumption and fertilizer prices by states for the period 1939-63 and construct an index of the price of fertilizer at the farm level in each of the five Mexican Census Regions for the period 1939-63.

En route to El Salvador for a six-week assignment, Wade F. Gregory stopped in Mexico in July for two days to discuss work progress with Hertford and in August, Hertford traveled to El Salvador to discuss with Gregory plans for the September Work Seminar. Mr. Nathan M. Koffsky, Director, Agricultural Economics, also spent several days in Mexico discussing work plans and progress with Hertford.

Nigeria - Mr. William P. Huth arrived in Nigeria on October 6, 1965. In place of a Memorandum of Understanding, the Government of Nigeria preferred that a letter be sent to the Administrator, Economic Research Service setting forth the terms of the study and the contributions that each party to the study would make. A letter dated July 15, 1965 was received by the Administrator, ERS from the Federal Ministry of Economic Development, Government of Nigeria; the Nigerian Institute of Social and Economic Research, University of Ibadan; Economic Development Institute (EDI), University of Nigeria; and United States Agency for International Development, Nigeria. The content of the letter indicated that EDI would provide office space and related facilities for Mr. Huth as well as the services of one or more agricultural economists to work on the project. The other Nigerian agencies agreed to support the project by providing advice and counsel on planning and execution and by making available background material, both published and unpublished. The Administrator

accepted the mutual understanding and agreement expressed in this letter in a reply to Mr. A. A. Ayida, Acting Permanent Secretary, Federal Ministry of Economic Development, dated September 22, 1965 and confirmed the proposed ERS contributions to the study.

A second contract was signed with the Economic Development Institute (EDI), University of Nigeria, Enugu, Nigeria (See Second Progress Report, June 1964 for reference to first contract). This latter contract will determine more precisely the components and makeup of agricultural output and characteristics of certain input items as a basis for more intense study of the technological, economic and institutional factors associated with changing Nigerian agricultural productivity. To achieve these ends, EDI will conduct a detailed survey among families in a sample of rural villages to provide more precise data than are presently available for use in determining the level and recent changes in inputs and outputs of the agriculture of Nigeria. Because of unforeseen staffing difficulties, work on these contracts has not progressed as fast as had been expected. Dr. Raymond P. Christensen planned to travel to Nigeria to confer with Mr. Huth the early part of December but at the request of EDI this trip was postponed until early 1966.

Brazil - Dr. Louis Herrmann departed for Brazil December 11, 1965 to begin the study in cooperation with the Getulio Vargas Foundation. A Memorandum of Understanding was signed between The Ministry of Agriculture, Government of Brazil; The Getulio Vargas Foundation; The United States Agency for International Development (USAID/Brazil); and The United States Department of Agriculture in which The Ministry of Agriculture of Brazil agreed to assist in making data available and in providing consultation from knowledgeable persons in the

Ministry and its dependency agencies; The Getulio Vargas Foundation agreed to provide office space and related facilities and the services of a full-time senior agricultural economist.

India - A Memorandum of Understanding between the Government of India, The Ministry of Food and Agriculture; The United States Agency for International Development (USAID/India); and The United States Department of Agriculture was signed in which The Ministry of Food and Agriculture, Government of India through the Directorate of Economics and Statistics agreed to provide office space and supporting facilities, the services of one senior agricultural economist, and to make available background material developed by its staff on agricultural development in India. Plans were completed for Dr. W. E. Hendrix to leave for India the end of January 1966.

Colombia, Tunisia, Turkey - Clarence Moore spent ten days in Colombia in July discussing arrangements for including Colombia as a Phase B study country. Memorandums of Understanding have been prepared for and sent to Colombia, Tunisia, and Turkey for signing. Studies will be started in these three countries as soon as Memorandums of Understanding are signed and staff recruited.

Technical Advisory Committee Meeting - The last meeting of the Technical Advisory Committee was held December 1964. Primary attention at this meeting was devoted to a discussion of a preliminary draft of the Phase A report, with only minor attention given to Phase B of the project. Now that country studies are getting underway in most Phase B countries, another meeting of the Technical Advisory Committee is planned for about April 1966.

Addition to Staff - Dr. Stanley F. Krause joined the Foreign Development and Trade Division to work as field coordinator of Phase B country studies. Dr. Krause received his Ph.D. in agricultural economics from Minnesota in 1952 and has worked with the Farmer Cooperative Service, USDA since that time with the exception of a two-year tour in Ghana as a cooperative specialist with AID from 19~~6~~⁶2 to 19~~6~~⁶4. Dr. Krause completed short-term studies in Senegal and Liberia, and travelled briefly in Nigeria. He drafted material for AID/Ghana for the Phase A study in its early phases.

APPENDIX I

PLAN OF WORK

Phase B

Factors Associated With Differences and Changes in Agricultural
Production in Underdeveloped Countries

Phase B activities will be concerned with identifying and analyzing the processes by which underdeveloped countries make the transition from low to higher levels of agricultural output and productivity. This will primarily be achieved through intensive study of the development process in nine or ten countries supplemented with a limited amount of research done by the Washington-based staff and with data from other AID-sponsored research, results from research carried out with P.L. 480-104 (a) & (k) grants and other relevant information.

The main focus of Phase B will be directed toward the following four objectives:

1. To describe, compare and contrast differences and changes in agricultural output and inputs and the productivity of important input factors in the agricultural sector of the nine or ten intensive study countries.
2. To identify the major inputs and institutional conditions accounting for changes and differences in relative levels and rates of change in output and productivity in the intensive study countries and to determine the share that each of these contributed to increased output and productivity. This will establish the causes of "how" output increased, i.e. the changes in the level and combination of factors used that account for output changes.
3. To determine "why" changes occurred in the level and combination of inputs used, i.e. to identify the forces that caused producers to change their production processes and to determine the relative importance of these forces as change agents for the different conditions existing within and among the intensive study countries.
4. To analyze the potentials existing for improved institutional arrangements and resource use so that development plans and programs can be designed to include those aspects that lead to increased agricultural output and productivity.

To achieve these objectives, ERS will locate an agricultural economist in each study country for a two to three-year period to work with a host country research organization and the country USAID Mission in carrying out these objectives. Simultaneous with these country studies, a small group in Washington will conduct research on the role of technology and the institutional aspects of development on a broader geographical basis than the nine or ten

selected countries. The Washington staff will coordinate these sub-projects and the country studies to insure comparability of findings so that a comparative analysis of the developmental process in the intensive countries can be made. The analysis will be sufficiently comprehensive to permit the construction of general models of agricultural development that can serve as the basis for guiding countries in formulating programs and policies to speed up the rate of agricultural output and productivity.

Within the first six months of their arrival, investigators in each of the study countries will prepare a plan of work setting forth the objectives and hypotheses to be tested in their study country. The hypotheses will vary from country to country for at least two reasons: (1) to better explain the particular situation of each study country by concentrating on those aspects which appear to be most significant explainers of agricultural development in that country, and (2) to insure that a broader range of hypotheses will be tested in at least one or several countries than could otherwise be tested if a common set of hypotheses were established for all countries.

There will be two somewhat distinct but closely related parts to Phase B: (1) individual country analyses for each of the nine or ten study countries and (2) an overall analysis of the potentials for agricultural development of underdeveloped countries. A comparative analysis of levels and changes in agricultural output and productivity in nine or ten intensive study countries will form the basis for the major part of the overall analysis. It, however, will not be restricted to these intensive study countries. Rather, the procedure will be to incorporate findings from other AID-sponsored research, results from studies financed under P.L. 480-104 (a) & (k) grants, and other relevant sources into the comparative analysis of the intensive study countries. The main focus of the individual country studies will center on the particular factors in each country accounting for and explaining why development occurred in the way it did. The overall analysis will look at the broader picture of development in order to evaluate the potential for increased agricultural output and productivity and the kind of programs and policies that will facilitate the achievement of this potential by countries at different stages of development.

The following are indicative of questions or hypotheses which may warrant special investigations in one or several of the countries studied:

- A. What are the relative costs of expanding output via increased yields vs. increased land area? Are some governments, institutions, countries (geographic areas) better suited to increase production through expanded land area than through increased yields? Why? What is the causal relationship, if any, between these factors and increased output?
- B. The size of the technological gap as measured by the difference between average and experimental yields needs to be determined along with the dispersion in actual yields (among farmers, regions, etc.). Specifically, does a country have a technological foundation for setting off yield increases? If so, why has the gap not been closed?

- C. What are the components and magnitude of changes in domestic demand for agricultural products as per capita incomes increase and rural to urban population shifts occur? Does the percentage of agricultural output going through marketing channels change with development; if so, what is the magnitude of the change and how do marketing systems adapt to these changes? As incomes increase, what part of increased earnings do low income farmers allocate to increased consumption of farm products? How much of the increased consumption is obtained through the market system (either through purchase or barter); how much comes directly from home farm production? To what extent does a backward bending supply curve exist for farm products?
- D. How do changes in product prices compare with changes in input prices as effective policy alternatives in affecting changes in agricultural output? Are low income farmers price conscious and price responsive in terms of the kind and amount of inputs used, choice of enterprise, and amount of product sold? What measures or practices do farmers use to insure against price fluctuations? Do these vary between traditional and market-oriented producers?
- E. To what extent do inadequate quantities of improved inputs and poorly functioning factor markets and inadequate credit programs go together? Does a greatly enlarged credit program in the face of inadequate factor markets tend to greatly speed up the availability of critical inputs or does it rather tend to bid up the price of existing supplies?
- F. Is it generally true that small farms have more labor intensive and higher valued crops per land area than large farms? For the same crops and areas, are yields higher on small than large farms? If economies of scale exist what are they?
- G. Abstracting from the size of farm question (F above), what role does tenure play in affecting rates of output and productivity?
- H. What is the relationship between the manner in which agricultural output is allocated between decision makers, workers, and landowners and the way in which costs of improved inputs are paid by each of these groups. Are failures and increases in output shared in the same manner?
- I. What are the techniques, operations, and successes (failures) of the various schemes used in the production and distribution of improved seeds?
- J. To what extent can the use of fertilizer be explained via its profitability?
- K. Has cooperative action to provide marketing, purchasing, credit, and other services proved superior to other forms of organization in providing these services? Has cooperative farming been effective?
- L. Can definite relationships (perhaps cause and effect) be identified between group action and increased output?

While separate distinct plans of work will be prepared for each of the intensive study countries, there will be a minimum amount of structuring common to all studies. This will be done to insure that changes in output, input and productivity can be compared and contrasted among the study countries. Establishing these common procedures will not lessen the need for much initiative and imagination on the part of country project leaders, for it will be their responsibility to develop the investigation so that an understanding can be gained on the what, how, and why of agricultural development in each country as well as how and why differential rates of growth occurred among countries.

Investigators in each of the study countries will send to Washington, within the first year of their arrival, the data needed to achieve objective 1. Data available in the country and in the Phase A report will be reviewed, appraised and adapted to meet this objective. The data should, where possible, include the following items for a prewar date (to serve as a point of comparison) and annual data from around 1948 to the present. Index numbers will be calculated, as in Phase A, using price weights from around 1956-1960 with 1957-59 as the reference date.

- A. Output (Data will be gathered on a national basis and broken down by geographic areas where desirable)
 - 1. Index of gross agricultural output (total farm production)
 - a. Index of crop production
 - (i) Indices of major crops: wheat, rice, corn, cotton, etc.
 - b. Index of livestock production
 - (i) Indices of major livestock and livestock products
 - c. Estimate of domestic and export use
 - (i) Index of production for domestic consumption
 - (ii) Index of production for export
 - 2. Index of net agricultural output (gross output minus intermediate production consumed in agriculture--specific emphasis to be given to netting out crop production used for livestock)
- B. Input (Data will be gathered on a national basis and broken down by geographic areas to conform with the output series)
 - 1. Land
 - a. Hectares in farms for an early and recent date (total area in farms, i.e. cropland, improved pasture and forage cropland, unimproved pasture, idle land such as fallow and unplanted, and wasteland).

- b. Hectares of cropland (exclude double counting of land area).
- c. Annual data on crop area (sum of areas of individual crops planted in a 12-month period).

2. Labor

- a. Economically active population in agriculture (specify definition of economically active population used). Data should be gathered for as many years as practicable, but at a minimum for an early and recent period. Labor input should be classified where possible by sex, age, hired and family workers.
- b. Percent agricultural labor force is of total labor force for early and recent date.

3. Capital

- a. Fertilizer -- Quantities of nutrients used, disaggregated by N, P, and K components; a value series for total nutrients (quantities multiplied by constant base period prices).
- b. Seeds -- Percentage of area of selected crops planted with improved seeds. Selected crops would be those for which improved varieties are being used in the country. Comment on the quality of improved seeds.
- c. Irrigation -- Percentage of crop areas irrigated for at least early and recent period (use definition of crop area in 1-c above). Amplify with a measure of water used where feasible (type of measure will be left to the discretion of the individual investigator).
- d. Power -- Number of work animals; number of tractors. Data for several points in time.
- e. Research -- Number and quality of professional research workers (quality determined by advanced education); current expenditures on research, separating out expenditures on salaries for (i) all workers and (ii) professional workers.

Where practicable, data will also be collected for the following:

f. Pesticides

- (i) A value series for all pesticides (quantities multiplied by constant base period prices)
 - (ii) Quantities of material used for several of the more important pesticides, where possible.
 - (iii) Percentage of area of selected individual crops treated.
- g. Extension -- same as for research; in addition break out extension activities sponsored by national extension service, commodity groups, supervised credit programs, etc.

C. Prices

1. Price data for major agricultural products for whatever levels available.
2. Price data for major agricultural inputs; specifically fertilizer prices for N, P, and K nutrients.
3. Relationship of agricultural product prices to the general price level as represented by prices for major crops. (General price level indicator should not include agricultural product prices.) Specify the level at which farm prices are measured.

By early 1967, most of the data specifically requested from each of the study countries should have been received by the Washington staff. These data, plus early findings included in periodic progress reports from study countries, should permit the development of a preliminary comparative report on changes in output, input, and productivity in the intensive study countries. While somewhat a repetition of material presented in the Phase A report, this preliminary report should present a greater breakdown of aggregate data than was possible in Phase A.

Individual country reports will be prepared for each country. In addition, a final overall report will be written which will bring together findings from the study countries and supplemented with other available evidence. This report will identify the factors that impede and those that encourage rapid agricultural development along with an analysis of how these factors operate in the development process.

A tentative time schedule for execution of Phase B

Country	: Begin assignment	: Begin study : in country	: Return : Washington	: Finish draft : report
Taiwan	May 1964	June 1964	July 1965	March 1966
Greece	February 1964	April 1964	April 1966	July 1966
Mexico	November 1964	January 1965	March 1967	June 1967
Nigeria	March 1965	October 1965	December 1967	March 1968
Brazil	October 1965	December 1965	March 1968	June 1968
Colombia ...	March 1966	July 1966	September 1968	January 1969
Tunisia	March 1966	July 1966	September 1968	January 1969
Turkey	March 1966	May 1966	July 1968	November 1968
India	October 1965	January 1966	December 1969	April 1970
Philippines :	(May be added later)			