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**Third 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**

**Development and Trade Analysis Division
Economic Research Service
United States Department of Agriculture**

January 1965

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This report describes progress on the Productivity Project made during the past six months and the plans that have been developed for its continuation. Background information which describes the origin and previous accomplishments of the project is contained in the first and second semi-annual progress reports of November 1963 and June 1964 and in the Participating Agency Agreement No. 12-17-0017-132.

I. Progress and Plans: Phase A

The main emphasis shifted from individual country studies to comparative cross-country analysis during mid-1964. The previously conducted individual country studies provided a basis, as originally planned, for organizing this phase of the work as well as supplying some of the data and information needed.

Draft chapters for the final coordinated comparative report were prepared and three of these are included in the Appendix. These reports were reviewed by members of the Development and Trade Analysis Division, the Agency for International Development and the Technical Advisory Committee. Comments and suggestions from these various sources provide the basis for materially improving the final revision now underway.

In order to coordinate the analyses and findings from Phase A studies, Dr. Eibert Hendrix will assume the responsibility for organizing, editing and rewriting the final draft of the report. He will draw on the comments and suggestions made by the Technical Advisory Committee, AID personnel, and others. Members of the professional staff who have had primary responsibility for different facets of the study will assist him as needed in fulfilling this task. The final report is scheduled for completion during the first half of 1965. A revised outline of the report is given in Appendix II.

Staffing problems hindered FAO from meeting original contract time schedules in supplying data and information for the project. A request was made and granted for a second extension of the contract to January 31, 1965 at which time a final report is due. Additional data for areas such as tenure, product and factor prices, population growth and composition of the labor force, fixed capital formation, agricultural investments, credit and agricultural policies, have been received from FAO during the last half of 1964.

A proposal has been made to compute agricultural production indices for an additional 20 countries similar to those already done for 26 countries (see Table 3 in Appendix III). In addition, livestock production indices would be computed for Poland, Yugoslavia, Greece, Spain, Argentina, Brazil, Chile, Colombia, Mexico, Egypt, Israel, Turkey, Japan, Taiwan, and Philippines and added to the crop indices already computed for these countries to obtain indices of aggregate agricultural output. This work is budgeted for completion by the end of F.Y. 1966.

II. Project Contributions

Data and findings from the Phase A analyses have been used in the preparation of material for various conferences, reports and speeches.

An AID-supported conference on Problems of Improving Productivity in Less Developed Countries was sponsored by MIT from June 27 to August 8, 1964. Country reports for Greece, Argentina, Egypt, and Nigeria as well as a tentative draft of the Overview Chapter and other studies and data were supplied as basic resource material for the conference. Dr. Kenneth L. Bachman served on the six-man steering committee, and other members of the productivity staff delivered papers and participated in seminars of the conference.

Christensen and Hendrix drew on the productivity study findings in preparing papers that were presented at a conference on the Economic Development of Agriculture, sponsored by the Center for Agricultural and Economic Development at Iowa State University, November 9-12, 1964. The papers will be published by the Iowa State University Press and both speeches were duplicated and included in the ERS monthly checklist of publications as available for general distribution. 1/

A paper by Christensen and Yee, "The Role of Agricultural Productivity in Economic Development", was presented by Christensen at the annual meeting of the American Farm Economics Association in August 1964. It has been published in the Journal of Farm Economics, Vol. 46, No. 5.

Individual project statements for suggested research undertakings and some marketing information developed from the comparative studies were used by Frank Barlow as a part of his contribution to a Marketing Seminar sponsored by the Agricultural Development Council at Cornell University, October 19-22, 1964. Christensen drew on the project studies as a participant in a National Planning Association Meeting held at Chicago in December 1964. Several of the productivity staff provided data and information for E. J. Long's discussion draft of a policy background statement on The Performance of the Agricultural Sector of AID Assisted Countries.

These are examples of the contributions that have grown out of the Phase A studies. More precise findings and greater concentration on important problem areas in Phase B work will enlarge substantially the usefulness of the findings.

1/ Christensen, Raymond P., "Economic Progress of Agriculture in Less Developed Countries". Hendrix, W. E., "Observations on Recent Experiences in Increasing Output in More Rapidly Developing Countries".

III. Progress and Plans: Phase B

Phase B work is now underway in Taiwan, Greece and Mexico. An initial plan of work for Taiwan was drawn up by Drs. David Spaeth and John Brewster in mid-1964, and a progress report of work accomplished in the early stages of the study was recently submitted by Dr. Spaeth, the economist in charge of the study. Dr. Brewster will return to Taiwan for six weeks in January and February to serve as consultant in the final phases of the study. A two-week seminar-workshop starting March 29, 1965 will be held in Taiwan for AID personnel interested in agricultural development from other Far Eastern countries. The seminar will focus on determining the relevance of the Taiwan experience for countries which may have different social, cultural, economic, and political backgrounds than existed in Taiwan during the period under study. Attention will focus on the transferability of the Taiwan findings to somewhat dissimilar situations, the modifications needed to apply the results to other countries, and the construction of general principles of agricultural development.

A progress report including a plan of work was recently submitted for Greece by Dr. Lawrence Shaw. Although Mr. Reed Hertford has only been working on Mexico since the latter part of November 1964, a plan of work for the Mexican study has been drawn up and submitted. Dr. Rex Daly plans to spend two months in early 1965 as consultant on this part of the project.

Christensen and Hendrix visited Turkey, Pakistan and India in January, 1965. Purpose of the trip was to negotiate plans for a cooperative agreement for Phase B work in these countries with the hope of initiating Phase B work in Pakistan and India in late 1965 and in Turkey possibly in 1966. Similar trips are contemplated to Nigeria and to a Latin American country (not yet

selected) for the purpose of negotiating agreements with the hope that work can be initiated in these countries in fiscal 1965.

There has been some difficulty incurred in recruitment of personnel for Phase B country studies. This, however, was anticipated and the Division has been fortunate so far in obtaining the services of well qualified economists.

IV. Technical Advisory Committee Meeting

The third Technical Advisory Committee Meeting on the AID Agricultural Productivity Project was held in Washington, D.C. on December 18, 1964. The agenda included discussions of (1) findings as reported in tentative drafts of chapters of the Phase A study, (2) plans for publications of the study, (3) progress and plans for Phase B studies, and (4) the general direction, scope, and implication of the overall productivity project. Notes on this meeting appear as Appendix I.

APPENDIX I

MINUTES OF THE THIRD MEETING OF THE TECHNICAL ADVISORY COMMITTEE
OF THE AID PRODUCTIVITY STUDY - DECEMBER 18, 1964

The Technical Advisory Committee for the AID Productivity Project held its third meeting on December 18, 1964. Dr. Sherman Johnson served as chairman and opened the session at 9:30 a.m.

Committee members present were:

Dr. Sherwood O. Berg, Dean
Institute of Agriculture, University of Minnesota
St. Paul, Minnesota

Dr. John H. Provinse, Executive Director
International Voluntary Services, Inc.

Professor Max Millikan, Director
Economic Development Center
Massachusetts Institute of Technology, Cambridge, Massachusetts

Dr. William Lockwood, Professor
Woodrow Wilson School of Politics and International Affairs
Princeton University, Princeton, New Jersey

Other participants were:

Sherman Johnson, Deputy Director for Foreign Economics
ERS-USDA (Chairman)

Frank Parker, Deputy Director, Agricultural Service, Technical
Cooperation and Research, AID

Nathan Koffsky, Administrator, ERS

R. F. McCullough, Special Project Officer, Corporate Planning
Development Division, International Minerals and Chemical Corporation

Matthew Drosdoff, Administrator, IADS-USDA

Quentin West, Deputy Director, Foreign Regional Analysis Division, ERS

Les Brown, Staff Economist, Office of the Secretary, USDA

Charles Gibbons, FRA-ERS

Kenneth L. Bachman, Director, Development and Trade Analysis Division, ERS

Raymond P. Christensen, Deputy Director, DTA

Wade F. Gregory, Chief, Economic Development Branch, DTA

William E. Hendrix, DTA

David Nicholls, DTA

Donald Steward, DTA

Clarence A. Moore, DTA

Harold Yee, DTA

Jiryis Oweis, DTA

Jane Turns, DTA

Chairman Johnson introduced committee members and participants. Wade Gregory briefly described the status of Phase A work, particularly the preliminary chapter drafts of the final report. Chairman Johnson immediately threw the discussion open to comments from committee members concerning Phase A draft reports.

Referring to the general nature of the overall study, committee members raised questions about (1) a more direct view of economic characteristics and gaps in balance of payments including export capabilities, agricultural production related to exports, and the dual farm economy (plantation and small subsistence farmers), (2) more specific reference to social institutions and incentives and motivations, (3) the inclusive nature of the overview chapter, i.e., it contained much included in subsequent chapters. While commending the write-up and content of the Overview Chapter, committee members expressed some concern about the relation of this chapter to other parts of the report, particularly the conclusion chapter. AID personnel felt the Overview Chapter should be given a prominent position, and possibly published separate from the full report for administrative use.

Suggestions were made that the chapter on Agriculture in the National Economy should give more attention to agriculture's role in different stages of development and to the interrelationships between agriculture and the rest of the economy. It was noted that the chapter on Marketing Facilities and Practices ignored water transportation which is of major importance in some countries. Questions of explicit definitions and possible inclusion of cost considerations were raised relative to the chapter on Land and Other Natural Features with the suggestion that information be included on topography, climate, and other aspects, or that "Other Natural Features" be eliminated from the title.

A question was raised whether research considerations should be included in the Technology chapter. The comment was made that communications and technology were two major problems of development and that some attention should be given to the problem of disseminating information, possibly in a separate chapter. It was suggested that data in the Human Factor chapter should be updated if possible. Yee explained briefly the work done for the Demand and Price chapter.

This brief summary of the discussion of the Phase A report is not intended to be inclusive of the discussion but rather representative of the points made by committee members and others attending the meeting. There seemed to be general agreement that a conclusion chapter should be written and that it should include implications for policy.

A brief outline of progress and plans for Phase B was presented to the group. Agreements have been negotiated for studies in Taiwan, Greece, and Mexico and professional personnel are now at work in these countries.

Work plans and progress reports have been submitted by personnel in Taiwan and Greece and a plan of work has recently been received from Mexico.

Trips are planned in the near future to India, Pakistan, Nigeria, Turkey, and one Latin American country (not yet selected) to negotiate agreements in these countries. Plans are that work will be started in four of these countries in fiscal 1965 and in Turkey in fiscal 1966. A two-week seminar for the Far East will be held in Taiwan starting March 29, 1965 concerning recent agricultural experience in Taiwan and its applicability to development of other countries.

This Productivity Project is viewed by AID as only the beginning of a continuing body of research on problems of agricultural economic development in the less developed countries. It is anticipated that future efforts will not only be concerned with the integration of individual country studies but also with the integration of findings from other AID supported studies as well. Some emphasis was expressed on the need to translate research findings into policy principles for development planning purposes.

APPENDIX II

Revised Outline for Final Report
of Phase A Findings

<u>Chapter</u> <u>Number</u>	<u>Title</u>
1	General Overview: Problems, Methods, Findings
2	Agriculture in the National Economy
3	Sources of Change in Agricultural Output
4	Land and Other Natural Features
5	Farm Tenure and Size
6	Human Resources
7	Capital and Credit
8	Farm Technology
9	Marketing Facilities and Practices
10	Demand and Price Factors
11	Conclusions - Policy Implications

APPENDIX III

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

A General Overview of Study

* * *

(This report has been prepared in its present form for internal review in the U. S. Department of Agriculture and the agency for International Development. It has been developed in research conducted under a Participating Agency Agreement Between the Economic Research Service, USDA and the Agency for International Development)

DEVELOPMENT AND TRADE ANALYSIS DIVISION
ECONOMIC RESEARCH SERVICE
UNITED STATES DEPARTMENT OF AGRICULTURE
JANUARY 5, 1965

GENERAL OVERVIEW OF STUDY *

Objectives, Scope and Methods of Study

This publication is based upon a comparative study of the needs, progress, problems, and requirements of increasing agricultural output and productivity in underdeveloped countries. It has been conducted under an interagency agreement between the Economic Research Service, United States Department of Agriculture and the Agency for International Development. The major objectives of this study have been (1) to measure levels and changes since 1948 in agricultural output and productivity in less developed countries representing major underdeveloped regions of the world, and (2) to identify and assess roles of the major natural, technological, economic, social and institutional factors associated with differences in these performance patterns.

The study is based mainly upon information compiled for 26 countries selected to represent major low-income regions of the world but selected with a view to the availability of relevant information. Information for the study has been developed mainly from secondary sources including published materials, unpublished reports, and working files of cooperating national and international agencies. These agencies have included the Food and Agriculture Organization of the United Nations, the Agency for International Development and the Foreign Agricultural Service of the United States Department of Agriculture. Supplementary information has been obtained through brief visits by study personnel to several of the study countries and through interviews in the United States with persons well informed on the study countries.

The 26 study countries include Argentina, Brazil, Chile, Colombia, Costa Rica, Mexico and Venezuela in Latin America; Nigeria and Tanganyika in Central Africa; the United Arab Republic (Egypt), Sudan, and Tunisia in North Africa; Jordan, Israel, Greece, Turkey, Iran, Pakistan, and India in the Near East and South Asia; Thailand, the Philippines, Taiwan, and Japan in the Far East; and Yugoslavia, Poland and Spain in Central and Western Europe. These 26 countries represent an appreciable part of the total program responsibilities of the Agency for International Development. They represent approximately 75 percent of the total population, 73 percent of the gross national product, and 73 percent of the AID budget in all AID-assisted countries.

Some General Attributes of the Study Countries

The 26 study countries exhibit large differences in their natural features, historical backgrounds, demographic and cultural features, institutions, and levels and patterns of agricultural and general economic development.

* Prepared by W. E. Hendrix drawing upon materials prepared by ER staff members working on the ERS-AID Productivity Study, including Steven A. [redacted], Helen Clifton, Dwight Gadsby, Clarence Moore, David Nicholls, Jiryis Oweis, Margarite Settle, Donald Steward, Jane Turns, and Harold Yee.

Twelve of the 26 countries lie wholly, or in larger part, between the latitudes of 30 degrees north and 30 degrees south of the equator, 12 lie beyond these tropical and semi-tropical ranges, and the land area of two is about equally divided between these major climatic zones (Figure 1). Six of the countries lie in mainly semi-arid and desert regions. Most of the others are well-watered countries, although a few have semi-arid and desert areas.

Ten of the 26 countries are European or have large populations of European descent. In their history, several date back into antiquity and some have made large contribution to the development of civilization including contributions to literature, art, mathematics, government, and religious and philosophical thought. Others have but a short history and have not yet made great contributions to art, literature, science and government. Three of the world's four major racial groups and each of several of the world's major religions are dominant in one or more of the study countries.

In their governmental systems, the countries range from democratic and semi-democratic forms to authoritarian systems. Several have long been under colonial rule and several have been independent nations for a century or more.

The study countries also differ widely in their levels and patterns of economic development as measured by per capita income levels and by the relative importance of agriculture in their economy. Six of the countries, Tanganyika, Pakistan, Sudan, India, Thailand and Taiwan, still have a per capita gross domestic value of production in U. S. dollars of less than \$100. In contrast, six of the countries now have a per capita gross domestic product of \$400 or more. These are Israel, Venezuela, Poland, Argentina, Chile and Japan. Of these six countries, Israel, Venezuela and Japan have exhibited in recent years very rapid growth in their general economy. Venezuela's growth is based largely upon exploiting its mineral resources. The economy of the other three countries, especially of Argentina and Chile has been relatively stagnant for two to three decades. Japan has become a modern industrial nation exhibiting a long sustained and a high rate of general economic growth.

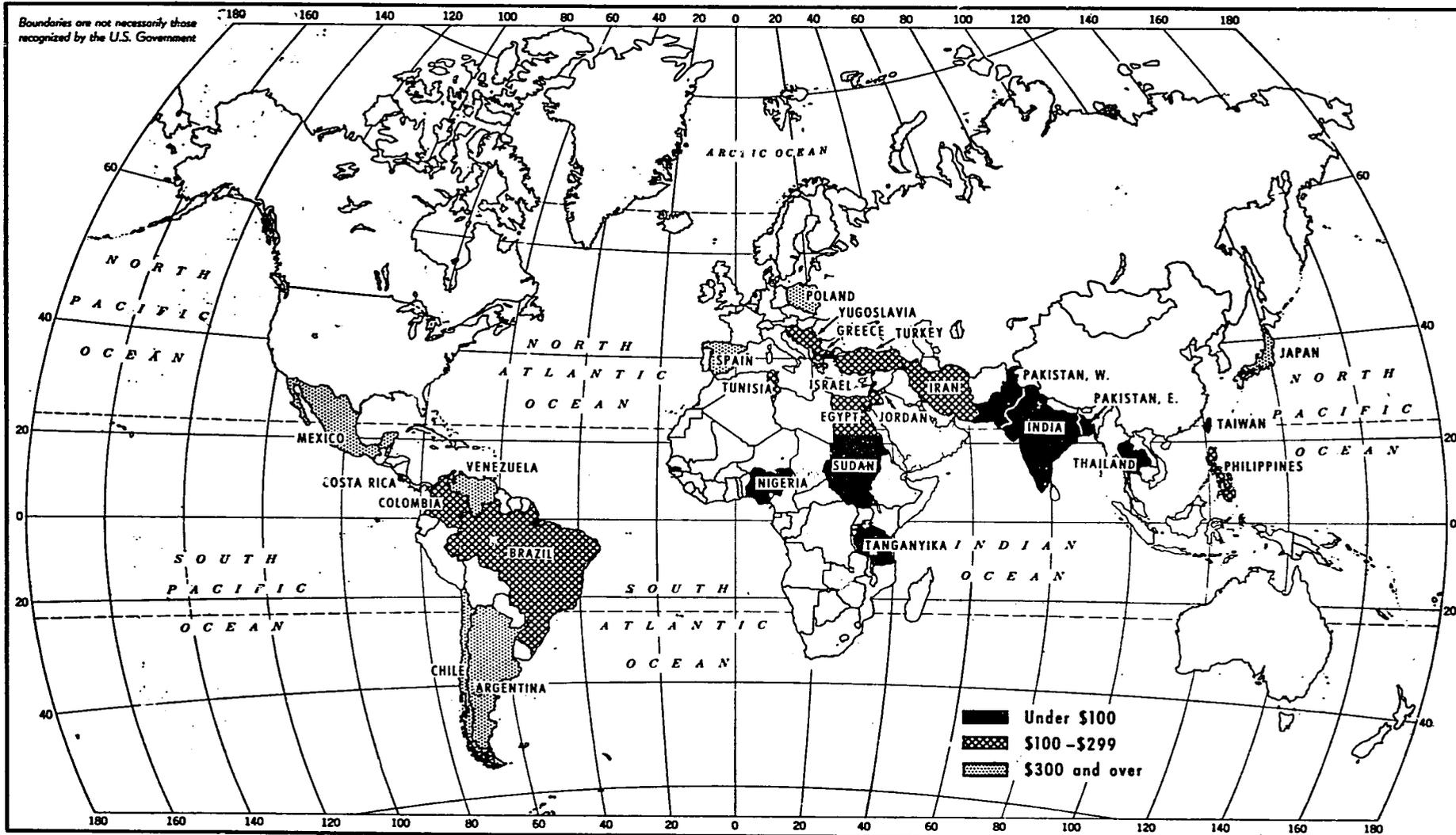
Agriculture is the major occupation of more than half of the total labor force in 16 of the 26 countries and of more than three-fourths of the labor force in 7 countries. It accounts for less than a proportionate share of the national income as a result of farm-nonfarm disparities in per capita incomes. Even so, agriculture is the most important industry in all of the study countries and accounts for more than a third of the gross national (or domestic) product in 9 of the 26 countries.

Why Improving Agriculture is Needed

The study countries, along with underdeveloped countries generally need to increase their agricultural output and productivity for one or more of the following reasons:

- (1) To correct existing food deficits;
- (2) To meet the food and fiber needs of their growing population;

PER CAPITA GNP, 26 COUNTRIES, 1958



U.S. DEPARTMENT OF AGRICULTURE

EG. ERS 3441-65(1) ECONOMIC RESEARCH SERVICE

Figure 1

- (3) To meet their own expanding per capita demand for foods and fibers resulting from rising per capita incomes associated in large part with increasing importance of their urban and industrial sectors;
- (4) To provide a source of savings out of which to finance general economic development, including improvements in agriculture; and
- (5) To provide a source of foreign exchange earning with which to finance imports of needed consumption and production goods that they have to buy in foreign markets.

Much has been done during the past decade toward closing the gap between world food needs and food consumption. Even so, food consumption levels, based upon daily per capita intake of calories without reference to qualitative considerations, are below desirable levels in 11 of the 26 study countries. These 11 countries are Colombia, Sudan, Tunisia, Egypt, Tanganyika, Iran, Jordan, India, Pakistan, the Philippines, and Thailand (Table 1). Moreover, because food supplies are unevenly distributed, most of the other countries have large population groups which suffer from both under-nutrition and malnutrition.

These food deficits are of large magnitude. For example, if present food supplies of India were distributed as far as they would go at the rate of 2,300 calories per person per day, 48 million people out of that country's population of 480 million people would be left totally without food. If these same food supplies were distributed at the U. S. consumption rate of 3,190 calories per person per day, India's food supplies would run out while yet 153 million of its people were left without food.

The food supplies required to close such food gap are increasing as a result of population growth (Table 2, Column 1). Several of the study countries will, at present growth rates, double the size of their population in less than 25 years and most of the others in less than 35 years. If they succeed merely in increasing food production at rates equal to their population growth rates, these countries will have doubled the number of their hungry people in 25 to 35 years-- i.e. assuming no change in their import-export ratios. It is unlikely, however, that the long-run reduction of world hunger can be achieved by increasing agricultural output alone. Rather, the Malthusian spectre of population growth out-running growth in the means of food production is a very real problem already facing many of the world's less developed countries at their present rates of population growth. It is inconceivable that present high rates of population growth can be continued indefinitely. Within a century, world population of 3 billion people would increase to 23 billion at an annual compound rate of growth of 2 percent a year and to 36 billion at a rate of 2.5 percent a year. Had population been multiplying at 1 percent a year for the 5000 years of human history, the world would have a population today of several billions of people for every square foot of the earth's land surface. Historically war, famine and disease have been the principal checks keeping population in balance with the earth's capacity to support it. While the problem lies outside the scope of this study, it is worth noting that development of more humane ways of maintaining a tolerable balance between population and means of livelihood is one of the most pressing needs of the human race today.

Table 1.--Food consumption per person per day and food consumption deficits, study countries 1959 - 1961 ^{1/}

Country	Food consumption per person per day	Food consumption deficit per person per day
	<u>Calories</u>	<u>Calories</u>
<u>Latin America</u>		
Argentina.....	3,220	0
Brazil.....	2,710	0
Chile.....	2,610	0
Colombia.....	2,280	220
Costa Rica.....	2,520	0
Mexico.....	2,580	0
Venezuela.....	2,330	170
<u>Africa</u>		
Nigeria.....	2,450	0
Sudan.....	2,160	186
Tanganyika.....	2,440	20
Tunisia.....	1,900	450
<u>Europe</u>		
Greece.....	2,960	0
Poland.....	3,100	0
Spain.....	2,740	0
Yugoslavia.....	2,900	0
<u>Near East & So. Asia</u>		
Egypt (UAR).....	2,300	200
India.....	2,060	240
Iran.....	2,120	330
Israel.....	2,840	0
Jordan.....	2,200	250
Pakistan.....	2,120	180
Turkey.....	2,590	0
<u>Far East</u>		
Japan.....	2,360	0
Philippines.....	2,000	350
Taiwan.....	2,440	0
Thailand.....	2,120	230
United States.....	3,190	0
Netherlands.....	3,000	0

^{1/} Source: The World Food Budget, 1970, Foreign Agricultural Economic Report No. 19, ERS, USDA, October 1964.

Table 2.--Annual rate of change in domestic food demand, 26 study countries, 1950-1960

Region and country	Annual population growth rate 1/	Annual increase in per capita income 2/	Coefficient of income elasticity of demand 3/	Annual increase in food demand per capita	Total annual demand increases	Percentage of annual demand increase accounted for by population growth
	Percent	Percent	Percent	Percent	Percent	Percent
<u>Latin America</u>						
Argentina....	1.7	-0.1	0.17	-0.02	1.68	101
Brazil.....	3.1	2.6	0.51	1.33	4.43	70
Chile.....	2.5	0.9	0.61	0.55	3.05	82
Colombia....	2.2	2.3	0.55	1.26	3.46	64
Costa Rica..	2.3	3.7	0.60	2.22	4.52	51
Mexico.....	3.1	1.9	0.58	1.10	4.20	74
Venezuela...	4.0	3.6	0.61	2.20	6.20	65
<u>Africa</u>						
Nigeria.....	3.7	1.9	0.64	1.22	4.92	75
Sudan.....	3.4	0.8	0.64	0.51	3.91	87
Tanganyika..	1.8	1.1	0.64	0.70	2.50	72
Tunisia.....	1.8	1.7	0.65	1.10	2.90	62
<u>Europe</u>						
Greece.....	1.0	4.7	0.49	2.30	3.30	30
Poland.....	1.8	6.0	0.55	3.30	5.10	35
Spain.....	0.8	3.9	0.56	2.18	2.98	27
Yugoslavia..	1.1	8.9	0.59	5.25	6.35	17
<u>Near East & South Asia</u>						
Egypt.....	2.4	2.5	0.65	1.62	4.02	60
India.....	2.0	1.7	0.80	1.36	3.36	60
Iran.....	2.2	0.05	0.79	0.04	2.24	98
Israel.....	5.2	2.5	0.55	1.38	6.58	79
Jordan.....	2.6	1.7	0.65	1.10	3.70	70
Pakistan....	2.2	0.3	0.80	0.24	2.44	90
Turkey.....	2.9	3.2	0.49	1.57	4.47	65
<u>Far East</u>						
Japan.....	1.2	7.6	0.58	4.41	5.61	21
Philippines..	3.2	1.7	0.75	1.28	4.48	71
Taiwan.....	3.4	3.7	0.63	2.33	5.73	59
Thailand....	3.2	2.4	0.72	1.73	4.93	65

1/ From U.N. Compendium of Social Statistics, 1963, Series K, No. 2, Table 1 pp. 22-30, except for Israel, which is from Y. Mundlak, Long-Term Projections of Supply and Demand for Agricultural Products in Israel, p. 203, Falk Project for Economic Research in Israel, Jerusalem, May 1964.

2/ Ibid, pp. 566-568.

3/ Agricultural Commodities Projections for 1970, FAO, Rome, Italy, 1963.

Population growth the world over is now associated with increases in percentage of total population living in urban centers. Hence with the passage of time, each agricultural worker has to produce foods and fibers for an increasing number of people. Moreover, rising per capita incomes, especially in urban areas, is increasing per capita demand for food in most of the world's less developed countries. Hence, for the first time in its history, India, as one example, is now plagued with serious food shortages rooted not in crop failures and declining per capita food output but in the increasing capacity of its people to buy the food they need.

Continuing failure in these countries to meet food needs arising from increasing incomes as well as from population growth must inevitably balance itself out in a curtailment of their rates of general economic development and in extreme cases in their economic retrogression. These results will come about (a) through curtailment of their exports, now composed mainly of agricultural products, (b) through diversion of an increasing part of their foreign exchange earnings from imports of needed capital goods to import of food more badly needed to feed their growing population, and (c) through the effects of increasing food prices upon labor costs in industry and size of income available for buying nonfarm goods and services.

For the above reasons, (which are more fully developed in other parts of this report), most of the study countries will need during the next two or three decades to increase their agricultural output at annual compound rates of 4 to 6 percent a year (Table 2). Much the larger part of these increases in needs for increased output results from population growth (Table 2, last column). Exceptions to the needs for these high rates of increase in agricultural output include countries like Japan which have reached a stage in their development where they can buy much of the food they consume with foreign exchange earned by exporting industrial products. Reliance upon food imports purchased out of earnings from the export of industrial products is an alternative open to economically advanced countries but not one open to underdeveloped, predominantly agrarian countries.

Recent Trends in Agricultural Output

To appraise agriculture's recent contributions to the above development needs, as well as to serve other purposes of this study, an attempt has been made to develop indices of agricultural production in the 26 study countries based upon a more comprehensive coverage of commodities and employing more uniform methods from country to country than has been done in previously published indices of agricultural production. Such indices based upon changes in crop production are shown in Table 3.

It would be desirable to have indices reflecting change in the production of livestock and livestock products as well as crops. Development of such indices has not been practicable within limits of the resources available for this study, however, because of (1) the poor quality of available estimates of livestock and livestock products produced in most underdeveloped countries, and, (2) the difficulties, with available statistics, of making adjustments needed to take account of feed grain imports and, within countries, of feed grain transfers from the crop to the livestock economy. In most of the study countries, however,

Table 3.--Total crop production: Index numbers for selected countries, 1948-63 (1957-59=100)^{1/}

Country and Region	1948	1949	1950	1951	1952	1953	1954	1955	1956	1957	1958	1959	1960	1961	1962	1963
Latin America																
Argentina.....	81	75	72	64	87	88	92	80	99	88	107	105	93	105	103	113
Brazil.....	68	68	74	73	73	77	81	87	82	93	96	111	107	117	114	NA
Chile 2/.....	80	77	69	73	76	83	83	90	90	87	105	99	102	103	100	109
Colombia.....	78	88	79	82	96	93	97	93	88	87	102	110	115	109	117	NA
Costa Rica.....	49	58	69	71	90	77	86	73	75	94	103	101	118	117	121	NA
Mexico.....	48	54	60	62	61	67	80	89	87	94	107	99	106	109	119	119
Venezuela.....	68	72	69	77	85	95	84	94	104	103	99	98	118	119	136	NA
Africa																
Nigeria.....	NA	NA	NA	NA	86	88	89	94	94	98	100	102	112	109	115	117
Sudan.....	42	50	58	54	62	69	75	90	105	76	105	119	104	157	130	125
Tanganyika.....	55	55	64	67	74	65	76	87	90	92	99	109	106	99	108	114
Tunisia.....	56	111	68	56	86	93	86	57	95	82	126	93	113	54	72	110
Europe																
Greece.....	54	81	60	76	65	90	81	85	88	106	93	101	86	109	96	NA
Poland.....	3/77	81	90	77	80	83	90	86	97	99	101	100	112	123	107	119
Spain.....	70	72	72	100	94	85	96	88	89	96	98	107	99	103	NA	NA
Yugoslavia.....	NA	NA	52	77	49	82	65	81	62	102	80	118	103	98	97	104
Near East & So. Asia																
Egypt.....	84	82	79	76	84	80	92	89	90	98	98	104	108	89	117	119
India.....	80	75	80	76	78	82	93	95	94	99	93	108	105	115	116	113
Iran.....	63	71	78	70	78	84	85	83	87	99	99	102	97	105	102	117
Israel.....	32	31	42	41	50	72	73	73	85	89	105	106	88	106	120	124
Pakistan.....	86	94	90	96	89	91	99	96	93	102	99	99	106	111	117	111
Turkey.....	58	53	63	77	87	99	83	88	94	95	103	102	106	104	108	119
Jordan 2/.....	NA	NA	NA	NA	137	75	146	78	160	142	63	95	75	136	114	74
Far East																
Japan.....	76	74	79	78	85	73	80	101	94	97	99	104	108	106	108	(103)
Philippines.....	55	60	63	73	75	83	90	92	94	97	99	104	108	107	120	127
Taiwan.....	56	66	72	72	77	84	85	84	91	96	102	102	103	105	NA	NA
Thailand.....	72	73	79	87	81	96	81	97	109	90	102	108	129	131	136	NA

^{1/} Estimates of crop production prepared from official country data, reports of U. S. Agricultural Attaches, and other sources by Regional Analysis Division, Economic Research Service. Includes tree crops and all other except forage crops. NA indicates data not available. ^{2/} Field crops only. ^{3/} Does not include fruit.

livestock and livestock products account for relatively small parts of total agricultural production. Exceptions include Argentina, Chile, Poland, Yugoslavia, Greece, and possibly Japan. Livestock has become increasingly important in recent years in Japan. This increase, however, is based upon large feed-grain imports, hence does not represent a net addition to Japan's agricultural production. To the extent that trends in livestock production have paralleled those in crop production, crop indices are good indicators of changes in total agricultural production.

The indices shown in Table 3 have provided the basis for computing recent rates of increase in crop production in the study countries as shown in Table 4. In this table, we have arbitrarily identified countries in the upper half of the array, based on rate of increase in crop output between 1948 and 1963, as "rapid growth countries" and those in the lower half of this array as "slow growth countries". In making this distinction, it is recognized that at higher levels of general economic development progress in agriculture may be reflected more in the release of resources from agricultural production than in increases in agricultural output. It is also true that for some countries more recent rates of increase in crop output differ markedly from those for the full period 1948-1963. These distinctions between "rapid" and "slow" growth countries however, facilitate analysis of factors associated with differences in rates of change in output, much of which is based upon the 1948-1963 period.

During the period 1948-1963, the rate of increase in crop production computed on an annual compound basis exceeded 5 percent a year in 7 of the 26 countries--Israel, Sudan, Mexico, Costa Rica, Philippines, Tanganyika, and Yugoslavia. It varied from 4 to 5 percent a year in 5 other countries--Taiwan, Turkey, Venezuela, Thailand, and Brazil. Greece and Japan are two other countries frequently cited as recent examples of rapid agricultural progress. Inclusion of Greece among truly rapid growth countries rests upon its high rate of increase in crop production per capita of total population. On other bases of delineation Japan would be included among rapid growth countries. It is not included here simply because it has now reached a stage of development where its agricultural progress is reflected more in the release of resources for industrial production than in continuing large crop output increases.

Over the 1948-63 period, output per capita of total population has been increasing in 21 of the 26 study countries, with 7 of these countries having increases on a per capita basis of 2 percent or more a year. These include Israel, Sudan, Mexico, Costa Rica, Tanganyika, Yugoslavia, and Greece. Countries in which agricultural output per capita of total population declined are Nigeria, Egypt, Pakistan, Tunisia, and Jordan.

In examining production records of the study countries since 1948, however, we find sizeable differences between the earlier part of this period extending to 1955 and later part extending from 1955. Sixteen of the 26 countries had higher rates of increase in their crop production in the earlier of these periods than in the latter. Nine had higher rates in the latter period than in the earlier one, and one had the same rate. Countries with higher rates of increase in the latter period include Costa Rica, Thailand, Brazil, Poland, Argentina, Spain, Colombia, Egypt, and Pakistan. Through increasing total output and for a decline in population growth rate, 11 of the 26 countries had a higher per capita rate of increase in their agricultural output in the 1955-63 period than in the 1948-55 period.

Table 4.--Annual percentage rates of change in crop output, 26 countries, 1948-1963 and for earlier and later part of this period: Total and per capita, 26 countries, 1948-55 period.

Country	1948-1963 Period			1948-1955 Period		1955-1963 Period		
	Annual com- pound change in total crop output	Population growth rate <u>1/</u> 1950-1960	Annual com- pound change in crop output per capita <u>2/</u>	Annual com- pound change in total crop output	Annual com- pound change in crop output per capita <u>2/</u>	Annual com- pound change in total crop output	Current population growth rate <u>3/</u>	Annual com- pound change in crop output per capita <u>4/</u>
	Percent	Percent	Percent	Percent	Percent	Percent	Percent	Percent
Rapid Growth Countries:								
Israel.....	9.7	5.2	4.3	15.9	10.7	5.7	3.5	2.1
Sudan.....	8.0	3.4	4.4	10.2	6.8	5.8	2.8	2.3
Mexico.....	6.3	3.1	3.1	8.5	5.4	4.1	3.1	1.0
Costa Rica.....	5.6	2.3	3.2	4.6	2.3	7.9	3.9	3.8
Philippines.....	5.2	3.2	1.9	8.1	4.9	3.2	3.2	0.0
Tanganyika.....	5.2	1.8	3.3	6.4	4.6	3.1	1.8	1.3
Yugoslavia.....	5.1	1.1	4.0	6.1	5.0	4.3	1.1	3.2
Taiwan.....	4.5	3.4	1.1	5.4	2.0	3.6	2.9	0.7
Turkey.....	4.5	2.9	1.6	6.0	3.1	3.1	2.9	0.2
Venezuela.....	4.5	4.0	0.5	5.0	1.0	4.4	3.4	1.0
Thailand.....	4.4	3.2	1.2	3.9	0.7	5.4	4.3	1.1
Brazil.....	4.2	3.1	1.1	3.7	0.6	5.2	3.1	2.0
Greece.....	<u>3.7</u>	<u>1.0</u>	<u>2.7</u>	<u>5.7</u>	<u>4.7</u>	<u>1.7</u>	<u>0.9</u>	<u>0.8</u>
Average.....	5.5	2.9	2.5	6.9	4.0	4.5	2.8	1.5

Continued

Table 4.--Annual percentage rates of change in crop output, 26 countries, 1948-1963 and for earlier and later part of this period: Total and per capita, 26 countries, 1948-55 period. (Con't.)

Country	1948-1963 Period			1948-1955 Period			1955-1963 Period		
	Annual com- pound change in total crop output	Population growth rate <u>1/</u> 1950-1960	Annual com- pound change in crop output per capita <u>2/</u>	Annual com- pound change in total crop output	Annual com- pound change in crop output per capita <u>2/</u>	Annual com- pound change in total crop output	Current population growth rate <u>3/</u>	Annual com- pound change in crop output per capita	
	Percent	Percent	Percent	Percent	Percent	Percent	Percent	Percent	
Slow Growth Countries :									
Iran.....	3.6	2.2	1.4	3.8	1.6	3.3	2.5	0.8	
India.....	3.1	2.0	1.1	3.2	1.2	3.0	2.4	0.6	
Poland.....	3.0	1.8	1.2	2.4	0.6	3.6	1.8	1.8	
Argentina.....	2.8	1.7	1.1	2.7	1.0	2.9	1.7	1.2	
Chile.....	2.8	2.5	0.3	3.0	0.5	2.3	2.3	0.0	
Japan.....	2.8	1.2	1.6	4.3	2.1	1.3	1.0	0.3	
Spain.....	2.7	0.8	1.9	2.5	1.7	2.9	0.8	2.1	
Colombia.....	2.6	2.2	0.4	1.5	-0.7	4.3	2.9	1.4	
Nigeria.....	2.6	3.7	-1.1	2.6	-1.1	2.6	2.0	0.6	
Egypt.....	2.0	2.0	-0.4	0.7	-1.7	2.8	2.5	0.3	
Pakistan.....	1.8	2.2	-0.4	-0.1	-2.3	2.8	2.2	0.6	
Tunisia.....	1.6	1.8	-0.2	1.8	0.0	1.4	2.1	-0.7	
Jordan.....	<u>-1.9</u>	<u>2.6</u>	<u>-4.4</u>	<u>-2.2</u>	<u>-4.5</u>	<u>-1.9</u>	<u>2.7</u>	<u>-4.3</u>	
Average.....	2.3	2.1	0.2	2.0	-0.1	2.4	2.1	0.4	

1/ From U. N. Compendium of Social Statistics, 1963, Series K, No. 2, Table 1, pp. 22-30 except for Israel which is from Y. Mundlak, Long-Term Projections of Supply and Demand for Agricultural Products in Israel, p. 203, Falk Project of Economic Research in Israel, Jerusalem, May 1964. 2/ Assumes 1950-60 population growth rate. 3/ Based on U. N. Demographic Yearbook. 4/ Assumes current population growth rates.

In general, the countries that had the highest rates of increase in the earlier period are the ones in which the rate of increase decreased in the latter period. Conversely, countries that had slow rates of growth in the earlier period have experienced more rapid rates of growth since 1955.

In part, the early higher rates reflect a return to normalcy in countries where production was disrupted during World War II by either their direct involvement in hostilities or disruption of their normal trade channels. However, two of the countries so affected, Poland and Thailand, had slower rates of increase in crop output in the 1948-55 period than in the 1955-63 period.

The earlier rapid rates of increase in output, as observed in several of the countries, probably reflect not only a return to normalcy but a "catching up" in these countries in the exploitation of simple, easily made improvements in agricultural production. Consistent with this possibility, some of the countries with much higher rates of increase in output in the latter period are perhaps examples of countries getting a later start in attempting to increase their agricultural productivity. Like those starting earlier these too may soon exhaust their simple, easily exploited opportunities for increasing output.

To the extent that this hypothesis is valid, it suggests that once countries "catch up" on simple, easily made improvement opportunities, their further progress depends upon major structural changes, such as development of improved technologies and improvements in credit, marketing, educational and research facilities. These kinds of improvements require, in addition to organizing and promotion abilities, new capital investments and a considerable amount of time for their full fruition.

Therefore, even in countries that energetically set out to increase their agricultural production, one could reasonably expect first an initial rapid start based upon simple, easily made improvements and then after these opportunities are exploited, a declining rate of increase until new more comprehensive programs contributing to increased output begin to "catch hold". Whether the initial high rate of increase is reached again, and how soon, however, will likely depend upon the capacity and will of the countries to commit themselves to basic structural improvements such as have undergirded sustained agricultural progress in every part of the world where it has ever yet been achieved. There is no inherent reason, of course, why less developed countries cannot begin building the foundations for sustained progress even while exploiting the simpler improvement opportunities that they now have, using benefits of the latter to help support needed structural changes.

For the period 1948-1963, nine of the 26 study countries had annual compound rates of increase in crop production exceeding their 1950-60 rate of growth in domestic food demand resulting from their population growth and per capita income increases (with coefficients of income elasticity of demand as shown in Table 5). These countries were Israel, Sudan, Mexico, Costa Rica, Philippines, Tanganyika, Greece, Iran, and Argentina (Table 5). Argentina falls in this group not because of the successful performance of its agricultural sector but because of its low population growth rate combined with little or no increase in per capita income.

Table 5.--Difference between rate of increase in crop output and domestic food demand growth rates, 26 study countries, 1948-1963

Country	1948-1963			1948-1955		1955-1963	
	Rate of growth in domestic food demand	Rate of change in crop output	Difference between crop output and food demand	Rate of change in crop output	Difference between crop output and food demand	Rate of change in crop output	Difference between crop output and food demand
	Percent	Percent	Percent	Percent	Percent	Percent	Percent
Rapid Growth Countries:							
Israel.....	6.6	9.7	3.1	15.9	9.3	5.7	-0.9
Sudan.....	3.9	8.0	4.1	10.2	6.3	5.8	1.9
Mexico.....	4.2	6.3	2.1	8.5	4.3	4.1	-0.1
Costa Rica.....	4.5	5.6	1.1	4.6	0.1	7.9	3.4
Philippines.....	4.5	5.2	0.7	8.1	3.6	3.2	-1.3
Tanganyika.....	2.5	5.2	2.7	6.4	3.9	3.1	0.6
Yugoslavia.....	6.4	5.1	-1.3	6.1	-0.3	4.3	-2.1
Taiwan.....	5.5	4.5	-1.0	5.4	-0.1	3.6	-1.9
Turkey.....	4.5	4.5	0.0	6.0	1.5	3.1	-1.4
Venezuela.....	6.2	4.5	-1.7	5.0	-1.2	4.4	-1.8
Thailand.....	4.9	4.4	-0.5	3.9	-1.0	5.4	0.5
Brazil.....	4.5	4.2	-0.3	3.7	-0.8	5.2	0.7
Greece.....	<u>3.3</u>	<u>3.7</u>	<u>0.4</u>	<u>5.7</u>	<u>2.4</u>	<u>1.7</u>	<u>-1.6</u>
Average.....	4.7	5.5	0.8	6.9	2.2	4.5	-0.2

Continued

Table 5.--Difference between rate of increase in crop output and domestic food demand growth rates, 26 study countries, 1948-1963 (Con't.)

Country	1948-1963			1948-1955		1955-1963	
	Rate of growth in domestic food demand	Rate of change in crop output	Difference between crop output and food demand	Rate of change in crop output	Difference between crop output and food demand	Rate of change in crop output	Difference between crop output and food demand
	Percent	Percent	Percent	Percent	Percent	Percent	Percent
Slow Growth Countries							
Iran.....	2.6	3.6	1.0	3.8	1.2	3.3	0.7
India.....	3.5	2.1	-0.4	3.2	-0.3	3.0	-0.5
Poland.....	5.1	3.0	-2.0	2.4	-2.7	3.6	-1.5
Argentina.....	1.7	2.8	1.1	2.7	1.0	2.9	1.2
Chile.....	3.0	2.8	-0.2	3.0	0.0	2.3	-0.7
Japan.....	4.4	2.8	-1.6	4.3	-0.1	1.3	-3.1
Spain.....	3.0	2.7	-0.3	2.5	-0.5	2.9	-0.1
Colombia.....	3.5	2.6	-0.9	1.5	-2.0	4.3	0.8
Nigeria.....	4.9	2.6	-2.3	2.6	-2.3	2.6	-2.3
Egypt.....	4.0	2.0	-2.0	0.7	-3.3	2.8	-1.2
Pakistan.....	2.4	1.8	-0.7	-0.1	-2.5	2.8	0.3
Tunisia.....	2.9	1.6	-1.3	1.8	-1.1	1.4	-1.5
Jordan.....	3.7	-1.9	-5.6	-2.2	-5.9	-1.9	-5.6
Average.....	3.5	2.3	-1.2	2.0	-1.5	2.4	-1.1

Source: Based upon data in Tables 2 and 4.

Since 1955, crop output relative to growth in domestic food demand has dropped in several of the study countries. Some of these, such as Japan, Israel, and Venezuela now produce enough industrial products to exchange some of them in world markets for the food they need to feed their growing population. In still predominantly agricultural countries, however, the failure of increases in agricultural output to keep up with growth in domestic demand can hardly help but slow down growth in domestic demand and dampen the rate of general economic development. The immediate consequences of such failure, except where counteracted by food aid and other assistance from developed countries or by large capital transfers by foreign investors, will normally include one or more of the following: (1) decreases in exports and foreign exchange earnings, (2) decreases in imports of capital goods, (3) increases in food imports, and (4) rising food prices. In other words, such failures intensify shortages of capital goods while increasing costs of labor and depressing domestic demand for nonfarm goods and services through the effects of rising food prices on wage rates and income available for nonfood purchases. (Information developed in Chapter , "Output, Productivity and Demand and Prices", indicates these kinds of results for countries lagging in their agricultural output relative to growth in their domestic food demand.)

The above observations indicate need by several of the study countries for greater effort directed to increasing their agricultural output, if not also the need for attention to population growth problems, as conditions for their general economic development. While the recent record of several of the study countries is disappointing, the experiences of a few have been successful enough to warrant the hope that most underdeveloped countries can with appropriate policies and programs substantially increase their agricultural output and productivity in the decade ahead. This hope is bolstered by the fact that these successes and near successes have been achieved by countries which differ widely in their soil and climatic conditions, historical backgrounds, ethnic, educational and other cultural features, man-land ratios, and proximity and accessibility to major world markets. Moreover, as more fully indicated in Chapter III, the crops about which these successes have been achieved include kind that are widely grown in both temperate and tropical climatic zones.

Elements Associated with Differences in Levels and Rates of Change in Agricultural Outputs

To make the experiences of rapid growth countries relevant to other countries, however, one needs to know what factors differentiate rapid growth from slow growth countries; through what agencies the factors contributing to growth are established strengthened and incorporated into the economy; and what things, if any, are necessary for the initiation and sustenance of conditions favorable to development. These questions are explored in the following part of this section, first, to show some of the factors associated with differences among study countries in levels of output per agricultural worker; and, second to identify some of the factors associated with differences in their rate of change in crop output since 1948.

Because of limitations in available information, it has been necessary in this analysis to rely in some cases upon rather crude indicators of the factors underlying and accounting for differences among the study countries in their level and rates of increase in crop output. For instance, population growth rates are used as a general measure of relative differences among countries in changes in number of agricultural workers. The level and changes in the amount of fertilizers per hectare of arable land are used as a measure of relative level and of changes in variable agricultural capital, also as an indicator of the relative level and changes in applied technology. Another important measure of relative changes in applied technology consists of crop yields. Illiteracy rates are used as a general measure of educational levels. Fertilizer prices are used as the best general indicator that we have on costs of production requisites.

Differences in Output Per Agricultural Worker

Because of data limitations, it has been possible in this study to ascertain the gross value of agricultural production per agricultural worker in only 19 of the 26 countries (Table 6). In U. S. dollars, the 1960 output per worker (including both crops and livestock) varied among these 19 countries from highs of \$1,825 and \$1,080 in Israel and Argentina, respectively, to a low of \$94 in Thailand. Output per worker had a value of from \$500 to around \$655 in 5 other countries-- Spain, Poland, Chile, Colombia and Venezuela. It was \$402 per agricultural worker in Japan. In Japan, agriculture is closely intertwined with small industry operations permitting much part-time farming. Hence, agricultural output of many agricultural workers is substantially augmented by their earnings from nonfarm sources. In India, the Philippines, Pakistan and Thailand, value of output per worker was less than \$200.

Data presented in Table 6 on the factors associated with these differences in output per worker yield no one simple explanation for the differences. Generally, however, the top 10 countries in value of output per worker had much more arable land per worker than did those in the lower part of this array. Using fertilizer inputs per hectare of land as a measure of variable capital inputs generally and as a rough indicator of level of applied technology, 7 of the 10 top countries were appreciably above average in their inputs of variable capital whereas among the 9 lower countries in this array, only 2 were above average in their variable capital inputs. Using literacy levels as a measure of qualitative differences in human factor inputs, in 7 of the top 10 countries 70 percent or more of the population over 15 years of age was literate whereas only 2 of the 9 countries in the lower part of the array based on output per worker had literacy rates of 70 percent or more.

Exceptions to these general relations can be accounted for by one or more other compensating factors. For example, Japan had only 0.4 hectare of arable land per worker compared with 13.1 in Argentina and 4.1 hectares per worker in Israel. But in inputs of variable capital per hectare of land, Japan ranks among the top 2 or 3 countries of the world. Its inputs of nonconventional capital (in the form of improved technologies and investments in the human factor) in agriculture are probably the highest per hectare of arable land now to be found in any country in the world. Thus in Japanese agriculture, capital invested in both conventional

Table 6.--Agricultural output per agricultural worker and associated factors, 19 study countries 1/

Country	Agricultural output per farm worker	Total land per capita of population	Arable land per agricultural worker	Illiteracy rate	Infant mortality rates per 1000	Agricultural workers per hectare of arable land	Fertilizer used per hectare of arable land	Urban population as a percentage of total population	Rank of country in miles of road per 1000 sq.mi. of land area	Agricultural output per hectare of arable land	Gross domestic product per capita
	Dollars	Hectares	Percent	Number	Kilogram	Percent	Rank	Dollars			
<u>Upper 10 countries:</u>											
Israel	1,825	0.9	4.1	6	32.0	0.31	80.5	77.3	3	557	905
Argentina	1,080	12.5	13.1	14	59.6	.07	N.A.	67.0	16	78	465
Spain	655	1.6	4.4	18	51.6	.23	31.6		7	150	372
Poland	616	1.0	2.4	5	74.7	.41	49.0	48.1	2	252	538
Chile	547	9.1	9.3	20	118.0	.11	17.0	67.2	12	59	405
Colombia	531	7.7	1.9	38	100.0	.51	N.A.		18	270	248
Venezuela	500	12.5	3.2	48	64.1	.30	3.8	66.1	17	150	650
Japan	402	0.4	0.4	2	37.7	2.39	303.7	63.5	1	961	337
Greece	391	1.6	1.9	20	41.4	.52	38.0	42.5	5	205	297
Mexico	369	5.6	4.1	35	77.7	.30	9.4	50.7	11	110	321
Average	692	5.3	4.5	21	65.7	0.52	66.6	60.3	9	279	454
<u>Lower 9 countries:</u>											
Egypt	365	3.7	0.6	80	130.1	1.76	87.0	37.7	15	643	155
Turkey	326	2.7	2.6	61	N.A.	.39	1.5	37.8	13	127	254
Yugoslavia	250	1.4	1.8	23	98.5	.57	28.0		4	141	179
Brazil	229	11.1	1.4	51	N.A.	.45	13.0	45.1	14	104	145
Taiwan	228	0.3	0.6	46	34.2	2.10	203.8	59.5	6	477	97
Pakistan	182	1.0	1.5	81	NA	.73	3.2	NA	10	133	64
Philippines	181	1.0	1.2	25	82.6	.77	12.5	42.7	9	139	113
India	144	0.7	1.2	76	145.9	.80	2.3	17.9	8	91	70
Thailand	94	1.9	0.9	32	54.8	1.13	2.3	11.8	19	106	84
Average	222	2.6	1.3	53	91.0	0.97	39.3	36.1	11	218	129

1/ Data shown in this table are for 1960 or the closest year to 1960 for which data are available.

and nonconventional inputs has become a tremendously important substitute for land, accounting for output valued in U. S. dollars at close to \$1,000 per hectare compared with only \$91 per hectare in India--this despite the fact that natural fertility of land in India is as high as in Japan. If in 1960, India had had as high a value of output per hectare of arable land as did Japan, its value of output per agricultural worker would have been about \$1,150 instead of \$144.

Generally, a high value of agricultural output per agricultural worker is associated with a relatively high level of general economic development as measured by national income per capita of total population. This is so because of the interdependence between farm and nonfarm sectors in the processes of development. Each sector in the course of its own growth contributes to development of the other making for larger rates of growth than would otherwise be possible for either the agricultural or the nonagricultural sector. Growth in the nonfarm sector leads to larger markets for agricultural commodities and generally leads to increases in the supply of manufactured production requisites, such as implements, fertilizer and pesticides, available to farmers. Hence, farmers in the more highly developed countries have important advantages in their own domestic farm product markets and domestic sources of supply of production requisites over those available to producers in less developed countries.

Countries ranking high in value of agricultural output per farm worker also stand apart from the others in their infrastructure features, including roads and other transport facilities, electric power facilities, hospitals, schools and research institutions. While such infrastructure features are essential for development, these are as fully products of as they are contributors to development. They are products that have been created over time as these countries have been increasing their agricultural output.

Differences in Rates of Increase in Crop Output

Increases in a country's agricultural output are a function of improvements in the quantity and quality of its human resources, land, capital, technical knowledge and production incentives as reflected in or influenced by price-cost relations, tenurial arrangements, tax practices and other things affecting relations between effort and its rewards. If one country increases its agricultural output at a more rapid rate than do others it does so because it excels the others in improving this complex of factors. It may so excel because of unique circumstances giving it a larger potential for progress than other countries possess. Or, it may so excel because its leaders and people are willing to make greater effort and sacrifices to increase future production.

Data on factors associated with recent increases in crop output in the study countries are shown in Table 7 where the countries are arrayed by their rates of increase in crop output for the years 1948 to 1963.

Each of the study countries has its own unique combination of human, land and capital resources and technical possibilities as well as its own unique institutional, social and political features. Hence, it would logically follow that the proportionate combination of changes in resource patterns needed to maximize rates of increase in agricultural production would differ from country

Table 7.--Annual rate of change in crop output and associated resource and market factors, study countries

Country	Annual rate of change in crop output: 1948-63: 1/	Land features			Human resource features			Capital and credit features			
	Surplus arable land: potential: 2/	Land development programs: 2/	Increase in area of crops: 3/	Population growth rate: 4/	Illiteracy rate: 4/	Health conditions: 4/	Increase in fertilizer: per hectare: 5/	Gross fixed capital formation in agriculture: per agricultural worker: 6/	Annual growth in volume of credit from institutional sources: 1953-61: 6/	Growth in cooperative credit societies membership: 1950-60: 6/	
	Percent	---Ratings 7/---		Percent	Ratings		Kg.	Dollars	-----Percent-----		
Rapid growth countries											
Israel	9.7	4	1	68.5	5.2	6	1	52.4	673	3.6	
Sudan	8.0	1	1	49.9	3.4	93	3	2.1		N.A.	
Mexico	6.3	3	1	49.7	3.1	48	2	9.0		3.3	37.
Costa Rica	5.6	3	2	N.A.	2.3	21	2			N.A.	
Philippines	5.2	4	1	66.9	3.2	25	2	9.5	4	17.2	59
Tanganyika	5.2	1	2	58.8	1.8	93	3	0.1		N.A.	
Yugoslavia	5.1	4.	2	6.8	1.1	23	1	25.7	66	N.A.	
Taiwan	4.5	4	1	11.7	3.4	46	1	140.6	30	N.A.	4
Turkey	4.5	4	2	62.0	2.9	61	2	1.2		5.6	105
Venezuela	4.5	1	2	54.0	4.0	49	2	2.7	178	0.8	
Thailand	4.4	3	1	29.5	3.2	32	2	2.1	1		4
Brazil	4.2	1	1	54.6	3.1	51	3	10.8		6.4	
Greece	3.7	4	2	22.3	1.0	20	1	21.3	29	7.1	
Average	5.5	2.85	1.46	44.6	2.9	44	1.92	23.1	140	5.5	42
Slow growth countries											
Iran	3.6	2	2	38.6	2.2	85	3			N.A.	
India	3.1	4	2	26.0	2.0	76	3	1.7	3	18.3	232
Poland	3.0	4	3	-0.9	1.8	5	1	37.4		N.A.	
Argentina	2.8	1	3	2.7	1.7	14	1			N.A.	
Chile	2.8	3	3	14.0	2.5	20	2	12.5		18.8	

Table 7.--Annual rate of change in crop output and associated resource and market factors, study countries
--Continued

Country	Annual rate of change in crop output: 1948-63	Land features			Human resource features			Capital and credit features			
	1/	Surplus arable land potential: 2/	Land development programs: 2/	Increase in area of crops: 3/	Population growth rate: 4/	Illiteracy rate: 4/	Health conditions: 4/	Increase in fertilizer per hectare: 5/	Gross fixed capital formation in agriculture: 1953-61 6/	Annual growth in volume of agricultural credit from institutional sources: 1953-61 6/	Growth in cooperative credit societies membership: 1950-60 6/
	Percent	Ratings 7/		Percent	Ratings		Kg.	Dollars	Percent		
<u>Slow growth countries</u>											
Japan	2.8	3	2	0.9	1.2	2	1	194.3	47	23.7	-1
Spain	2.7	3	1	3.1	0.8	13	1	21.2			
Colombia	2.6	1	2	11.5	2.2	38	2			0.4	
Nigeria	2.6	3	2	N.A.	3.7	89	3			N.A.	592
Egypt	2.0	3	1	6.2	2.0	80	3	43.2	19	7.5	190
Pakistan	1.8	4	2	13.9	2.2	81	3	2.0	6		
Tunisia	1.6	4	1	14.7	1.8	84	2	0.6		4.2	
Jordan	-1.9	4	3	-7.5	2.6	68	2			N.A.	
Average	2.3	3.00	2.08	10.3	2.1	50	2.08	39.1	19	9.1	253

See footnotes at end of table

Table 7.--Annual rate of change of crop output and associated resource and market factors, study countries
-Continued

Country	Technological features			Tenure features			Marketing facilities	Availability of production requisites	Fertilizer prices	Annual rate of increase of domestic food demand
	Crop yield increases 1948-63	Agricultural research programs during 1950's	Agricultural extension and education programs	Percentage and conditions of tenancy	Tenure improvement programs	9/				
	Percent	Ratings						Percent		
<u>Rapid growth countries</u>										
Israel	116.3	1	1	1	1	1	1	1	1	6.58
Sudan	74.8	2	1	3	1	2	2	2	1	3.91
Mexico	29.0	2	2	1	1	1	1	1	N.A.	4.20
Costa Rica	N.A.	2	2	2	2	1	2	2	N.A.	4.52
Philippines	-0.7	2	2	3	2	2	2	2	2	4.48
Tanganyika	16.9	3	2	3	3	3	3	3	N.A.	2.50
Yugoslavia	35.5	2	1	1	1	1	1	1	1	6.31
Taiwan	43.8	1	1	1	1	1	1	1	3	5.74
Turkey	16.4	2	2	2	2	3	2	2	N.A.	4.47
Venezuela	6.4	3	2	2	1	1	2	2	3	6.20
Thailand	31.1	2	3	2	2	3	2	2	3	4.93
Brazil	6.5	3	3	2	3	2	2	2	N.A.	4.43
Greece	43.3	2	1	1	1	2	2	2	1	3.30
Average	34.9	2.08	1.77	1.85	1.62	1.77	1.77	1.77	1.88	4.74
<u>Slow growth countries</u>										
Iran	18.8	3	3	3	2	2	3	3	3	2.59
India	14.3	2	3	2	2	3	2	2	3	3.36
Poland	41.3	2	1	1	1	2	1	1	N.A.	5.10
Argentina	23.5	2	2	3	3	1	1	1	N.A.	1.68
Chile	15.7	2	3	2	2	1	3	3	N.A.	3.05

Continued-

Table 7.--Annual rate of change of crop output and associated resource and market factors, study countries
-Continued

Country	Technological features			Tenure features			Marketing facilities	Avail- ability of Fertilizer prices	Annual rate of increase in domestic food demand
	Crop yield increases 1948-63	Agricultural research programs during 1950's	Agricultural extension and education programs	Percentage and conditions of tenancy	Tenure improve- ment programs	9/			
	Percent	Ratings						Percent	
<u>Slow growth countries</u>									
Japan	31.2	1	1	1	1	1	1	2	4.41
Spain	36.9	2	3	2	2	1	2	1	2.98
Colombia	48.3	3	3	3	2	2	3	N.A.	3.46
Nigeria	N.A.	3	2	3	3	3	3	N.A.	4.92
Egypt	22.3	2	3	1	1	3	2	3	4.02
Pakistan	11.9	2	2	2	2	3	3	1	2.44
Tunisia	-34.4	3	1	2	2	3	2	N.A.	2.90
Jordan	-2.5	3	2	1	1	2	1	N.A.	3.70
Average	18.9	2.31	2.23	2.00	1.85	2.08	2.08	2.17	3.43

1/ From table 4.

2/ From Chapter IV, "Land and Other Natural Features."

3/ From Chapter III, "Sources of Change in Crop Output."

4/ From Chapter XI, "The Human Factor..."

5/ From Chapter VIII, "Technology."

6/ From Chapter VII, "Capital and Credit."

7/ In all ratings in this table, the rating of 1 represents the most favorable situation and the ratings of 3 or 4, as the case may be, represent the least favorable situation.

8/ From Chapter V, "Land Tenure..."

9/ From Chapter XIV, "Marketing Facilities and Practices."

10/ From ratings made by country AID missions and by ERS personnel.

11/ From Chapter XII, "Demand and Prices."

to country. It is probably for this reason that we do not find among the study countries a highly consistent relationship between changes in any one factor and rates of change in crop output. What we do find is a tendency for countries having a rapid rate of increase in crop output either to excel in a fairly large number of the factors contributing to growth or to excel greatly in one or two important factors. Israel, for example, made substantial progress along each of several lines including increases in area of crops, in variable and fixed capital per hectare of arable land, in level of applied technology as indicated by increases in crop output per unit of land, and in the size of its agricultural labor force. It also ranked high in educational and health levels. Evidence that it held out reasonably good producer incentives is found in its fairly large rate of increase in domestic food demand, in its expanding volume of agricultural exports, in its satisfactory tenurial patterns, and in its relatively favorable prices of production requisites, using fertilizer prices as an indicator. In part, however, Israel's high rate of increase in crop output has to be accounted for by the fact that these increases have been computed from the very low levels of production that it had in the first two or three years of its existence as a nation.

In contrast to Israel's balanced approach the progress indicated for the Philippines and Tanganyika appears to have been achieved by heavy emphasis upon expanding their area under cultivation. During the 1950's, neither of these countries made large improvements in their level of applied technology or in use of variable capital per unit of land. Neither made substantial progress in improving the educational level of its human resources.

At the farm level, increases in crop output have been mainly a function of increases in number of agricultural workers, increases in area of crops, increases in amounts of both variable and fixed capital, and improvements in the level of applied technology. Available evidence indicates that in most of the study countries each of these four factors accounts for at least part of the increases in crop output. As indicated above, relative importance of changes in these four factors differed greatly from country to country and no one proportionate combination differentiated the rapid growth from the slow growth countries. Nevertheless, rapid growth countries generally excelled slow growth countries in the magnitude of changes made during the 1950's in most of these factors.

Over a longer period of time, improvements in the human agents through investments in education and improvements in nutrition and health would probably have been an additional factor of importance differentiating rapid growth from slow growth countries. These kinds of investments, like those in research and the building of many other kinds of institutions, however, require a considerable amount of time for their full fruition. In the short time period covered by this study, it is doubtful that differences among countries in improvements in quality of the human agent account for much of the observed differences in their rate of increase in crop output.

In less developed countries, large resource changes at farm levels are seldom made unless accompanied or preceded by large improvements in the infrastructure of roads, marketing facilities, credit agencies, research and educational institutions serving farm people. In some countries, they also require large improvements in incentives to producers, including improvements in price-cost relations, more favorable tenurial arrangements, and more favorable tax policies.

Available information on extent to which these kinds of improvements have been made in the study countries is even more limited than is that on factors entering directly into production at farm levels. Such evidence as is available, however, shows that rapid rates of increase in crop output have not just happened as a consequence of normal economic and social processes in societies organized on a laissez-faire basis. Rather, the more rapid rates of progress have been undergirded by aggressive group action, generally national in scope, directed specifically to improving agricultural service facilities as means of increasing agricultural output and productivity. These have included major land development programs, including the opening up of new lands and the development of irrigation facilities in Israel, Sudan, Mexico, the Philippines, Taiwan and Brazil (Table 7). They have included major land reform programs in Japan and Taiwan as well as land reform of considerable magnitude in earlier decades in Mexico. They have included increasing emphasis upon agricultural education in Israel, Sudan, Mexico, Taiwan and Greece, to mention a few countries on which some information is available. Expanded programs of agricultural research have been particularly important in improving the technological basis of agricultural production in Mexico, Taiwan and Japan. Significant improvements in agricultural credit facilities have been made in Mexico, the Philippines and Taiwan, as well as in some of the slower growth countries. The extension of improved roads more fully opening large new areas to a market economy has been particularly important in accounting for increasing crop output in Turkey, especially for that made between 1948 and 1955.

Determination of the full extent of these general kinds of changes and of their relations to resource and output changes at farm levels will require more intensive study including study of carefully selected areas within countries where these development foundations have been and are now being laid.

Differences in Crop Yield Increases

Estimates distinguishing between increases in area of crops and in crop yields as sources of increases in crop output have been developed for 22 of the 26 study countries. Among these 22 countries, increases in area of crops were the more important source of crop output increases in 10 and crop yield increases were the more important in 12 of the 22 countries (See Chapter 3, Sources of Change in Crop Output). Many countries particularly in Latin America and Central and South Africa still have sizeable land expansion potentials. Many other countries, however, will have to achieve their increases in output mainly through increases in yields of the crops they grow. Even in some countries with sizeable land expansion potentials increasing yields may be the better means of increasing the productivity of their labor and limited capital resources.

In terms of their physical and technical basis, recent yield increases in the study countries have been achieved mainly through increased use of plant food additives, use of improved crop varieties, more effective pest controls, improvements in planting, tillage and harvesting methods, and better use of water resources

Often, improvements of one kind have been made in conjunction with improvements of other kinds or as part of a system of improved production practices. Some of these changes have provided additional employment for labor and have required some additional capital.

Available information is too sketchy for precise measurement of the relative contribution of these several factors to the increases made in crop yields during the last decade. Under the assumption of the rather high incremental response ratio of 10 pounds of grain to 1 pound of fertilizer, however, we cannot account for more than 9 to 10 percent of the increases in grain yields made in India, to cite an example, by the increased use of fertilizers. The use of pesticides is still too limited for this to have accounted for more than 4 to 5 percent of these yield increases. Taking account of all purchased inputs, including improved seeds, it appears that the larger part of the recent yield increases in India have come about mainly through simple improvements requiring no purchased inputs, such as better spacing of plants, better weed control and better tillage practices. These are kinds of improvement that are brought about through one or the other of various kinds of technical assistance programs.

Most countries in the early stages of their agricultural development have these kinds of yield increasing opportunities. Their exploitation can have an important place in the strategy of their development.

These opportunities, by themselves, however, cannot take the less developed countries very far up the yield increasing scale. Rather, for large progress in increasing yields, reliance will have to be placed on purchased inputs and on kinds of inputs produced through investments in research and agricultural extension, such as improved crop varieties and improved knowledge of tillage and fertilizer practices.

Conclusion

Information developed in this study indicates the need to improve the performance of agriculture in most of the study countries to mitigate now existing food deficits, to feed their growing population, and to earn foreign exchange with which to buy capital goods needed for their general economic development. For periods of 5 years or more during the 1948-1963 time period, several of the study countries have experienced rapid rates of increase in their crop output with improvement made in output per capita of their total population. Not infrequently, however, these periods of rapid rates of increase in crop output have been followed by a considerable slowing down in their rates of progress. This suggests the possibility that the earlier rapid increases in output reflect a "catching up" in exploitation of simpler, more easily exploited improvement opportunities, or the cheaper sources of income increases. It suggests that long continuing progress at the rates needed in these countries will have to be undergirded by more substantial development foundations of kinds that will require considerable organizing ability, new capital investments and time to build. These include the building of roads, market facilities, credit agencies, research and education programs, and in some countries major changes in land property relations.

While in a sense these foundations are a prerequisite to continuing rapid rates of progress, the larger part of their building will have to go hand in hand with progress in increasing agricultural output and productivity with these structures at every stage of development as fully products as they are "causes" of the levels of development achieved and prerequisites to further development.

While very few of the study countries are increasing their agricultural output at the rates needed to meet their development needs, the few successes observed presage hope for the capacity of underdeveloped countries generally to make substantial progress in their agricultural sectors.

The successes observed have been achieved under a variety of conditions including in tropical as well as in temperate zones, and in countries where each of several racial groups and major world religions are dominant, reflecting major cultural differences. They have also been achieved by increases in kinds of crops that are widely grown in both temperate and tropical climatic zones. Much of the increases can be accounted for by commodities produced largely for export markets. Countries increasing their agricultural output do not appear to have done so, however, because they have possessed any inherent advantages over slow growth countries in their proximity and access to major world markets. They appear to have been merely more aggressive than have the slow growth countries in competing for a share of these markets and in improving the supply conditions under which their farm people operate.

Further details on recent changes in agricultural production and on the technical, social, economic and institutional factors associated with these changes are presented and analyzed in succeeding parts of this study.

APPENDIX IV

SOURCES OF CHANGE IN AGRICULTURAL OUTPUT *

Data on an annual basis showing the land area associated with each crop used in developing indices of crop production make it possible to indicate the following sources of change in crop production: (1) changes in land area; (2) changes in crop pattern as from high to low value crops or vice versa; and (3) changes in crop yields (Table 1). Estimates of how much of the changes in output have come from changes in land area have been based upon the assumption that new land brought into production is of the same quality as the land already being used. Hence, it is assumed that a 10 percent increase in land area used from crops increases output by 10 percent. Estimates of the effects of changes in crop patterns upon total crop production expressed in value aggregates have been computed on a crop by crop basis assuming no change in the area of all crops and no change in crop yields. The residual of the increase (or change) in value aggregates is ascribed to yield increases. Application of these procedures has been applied to the 1948-50 to 1961-63 changes in total crop production.

Change in Land Area

Increases in area of crops have been made in all of the study countries for which land area data are available except in Poland. They account for more than half of the observed increases in crop production in four of the rapid growth countries, Mexico, Venezuela, Brazil, Turkey, the Philippines and Tanganyika. Part of these increases is accounted for by increases in multiple cropping but the larger part probably reflects increases in area under cultivation. However, all of these countries except Mexico still have a large area of unused land of known potential for agricultural production (Table 1, Chapter). Argentina with only 10 percent increase from this source, however, suggests that the mere availability of such land is not by itself a sufficient condition to insure expansion of agriculture along this route.

The land resources for man to feed himself adequately exist in most of the world's underdeveloped countries. This is especially true in most of Central and South Africa, the Philippines and South America. But in the world as a whole only about 30 percent of the land with food producing possibilities is now utilized. Under present conditions, use of much of this land is not economically feasible. Technological advances, however, as well as shifts in the demand for food, may be expected to extend the economic margins of cultivation to include much land that cannot now be economically used. Both yield increasing and labor saving innovations

* Prepared by W. E. Hendrix.

Table 1. Sources of recent changes in production of field crops, 22 countries 1/

Country	Time span represented	Annual rate of increase in crop output 2/	Source of change			
			Crop acres	Crop pattern	Crop yield	Total
<u>Rapid Growth Countries</u>		<u>Percent</u>	<u>Percent</u>	<u>Percent</u>	<u>Percent</u>	<u>Percent</u>
Israel	1948-63	9.7	25.8	-2.6	76.8	100.0
Sudan	1948-62	8.0	30.8	22.2	47.0	100.0
Mexico	1948-60	6.3	53.4	-0.1	46.7	100.0
Philippines	1948-62	5.2	76.0	5.4	18.6	100.0
Tanganyika	1948-63	5.2	68.7	4.7	26.6	100.0
Yugoslavia	1948-63	5.1	15.2	15.6	79.2	100.0
Taiwan	1948-61	4.5	19.3	-3.5	84.2	100.0
Turkey	1948-63	4.5	70.0	-0.6	30.6	100.0
Venezuela	1953-62	4.5	84.6	-18.6	34.0	100.0
Thailand	1948-62	4.4	42.2	13.5	44.3	100.0
Brazil	1948-62	4.2	84.3	1.5	14.2	100.0
Greece	1948-62	3.7	29.6	6.5	63.9	100.0
<u>Slow Growth Countries</u>						
Iran	1948-63	3.6	59.7	13.4	26.9	100.0
India	1948-62	3.1	59.1	8.0	32.9	100.0
Poland	1948-63	3.0	-2.3	26.9	75.4	100.0
Argentina	1948-63	2.8	10.0	18.6	71.4	100.0
Chile	1948-63	2.8	43.7	26.4	29.9	100.0
Japan	1948-63	2.8	2.8	20.2	77.0	100.0
Spain	1948-61	2.7	7.5	14.8	77.7	100.0
Colombia	1948-62	2.6	17.6	-3.2	85.6	100.0
Egypt	1948-63	2.0	20.7	7.7	71.6	100.0
Pakistan	1948-63	1.8	50.7	14.2	35.1	100.0

1/ Data on land area in crops are not available for Costa Rica and Nigeria. Year to year variations in agricultural production in Jordan and Tunisia have been too erratic for statistically reliable results.

2/ Annual compound rates for field crops and other crops combined.

help to so extend the margins of cultivation and so will improvements in roads and transport facilities and eradication of disease and insect pests such as the tsetse fly on which research is now underway.

In contrast to these general world possibilities, however, rapid population growth in the densely populated Asian countries has become a cause for apprehension. The more densely populated countries have relied to a much smaller extent upon expanding land area to increase production than have African and Latin American countries. However, considerable expansion of land in cultivation has occurred in Taiwan, India, and even Egypt. In these and other densely populated countries, reorganization of producing units to bring additional land into use is unlikely to make a large contribution to increasing agricultural production.

The data presented in Table 1 on land area, crop patterns and crop yields as sources of increased output in the study countries do not by themselves indicate extent of the changes that have been made in land area, yields and crop patterns in these countries. This is so because of the possibility that any one of these factors can account for most or all of very small changes in output, hence changes requiring little increase in land area, yields or crop patterns. Generally, however, countries in which land area is the major source of change in output are also countries that have substantially increased area of land in agricultural production (Table 2). Brazil, for example, increased land from 1948-50 to 1961-63 by 55 percent; Mexico, by 50 percent; Venezuela by 54 percent; and Turkey by 62 percent. Taiwan, which is one of the world's most densely populated agrarian nations, increased its area in crops by 12 percent during this period. In most cases increases in land area were accompanied by increases in crop yields, with the combination of these factors making for rapid rates of increase in production.

Change in Crop Patterns

Crop pattern changes have been in the direction of shifts from low to high value crops in about three-fourths of the countries and from high to lower value crops in about one-fourth. Such shifts have not been very important in accounting for increases in crop output.

Information on the commodity composition of changes in crop production, however, helps to show whether countries where particular crops are grown have an advantage over others in the basic supply and demand conditions and have been associated with more rapid increases in production. Such data are presented in Table 3 for the 26 study countries arrayed by their annual compound rate of increase in total crop production since 1948.

Table 2.--Recent changes in area of crops and crop output per unit of land, field crops, 22 countries

Country	Time span represented	Annual rate of increase in crop output <u>1/</u>	Changes in	
			Area of crops	Crop output per unit of land
<u>Rapid Growth Countries</u>				
	<u>Years</u>	<u>Percent</u>	<u>Percent</u>	<u>Percent</u>
Israel	1948-63	9.7	68.5	116.3
Sudan	1948-62	8.0	49.9	74.8
Mexico	1948-60	6.3	49.7	29.0
Philippines	1948-62	5.2	66.9	12.6
Tanganyika	1948-63	5.2	58.8	16.9
Yugoslavia	1948-63	5.1	6.8	35.5
Taiwan	1948-61	4.5	11.7	43.8
Turkey	1948-63	4.5	62.0	16.4
Venezuela	1953-62	4.5	54.0	6.4
Thailand	1948-62	4.4	29.5	31.1
Brazil	1948-62	4.2	54.6	6.5
Greece	1948-62	3.7	22.3	43.3
<u>Slow Growth Countries</u>				
Iran	1948-63	3.6	38.6	18.8
India	1948-62	3.1	26.0	14.3
Poland	1948-63	3.0	-0.9	41.3
Argentina	1948-63	2.8	2.7	23.5
Chile	1948-63	2.8	14.0	15.7
Japan	1948-63	2.8	0.9	31.2
Spain	1948-61	2.7	3.1	36.9
Colombia	1948-62	2.6	11.5	48.3
Egypt	1948-63	2.0	6.2	22.3
Pakistan	1948-63	1.8	13.9	11.9

1/ Annual compound rates for field crops and other crops combined.

Table 3.--Distribution by Crops of Changes in Total Crop Output, 24 Countries
 Arrayed by Compound Annual Rate of Increase in Crop Production.1/

Country	Annual rate of change in all crops	Percent Distribution of Change by Crops									Annual Oilseed Crops
		Maize	Wheat	Rice	Other Cereals	Sorghum and Millets	Pulses	Potatoes and Yams	Other Root Crops	Sugar Crops	
----- Percent -----											
Rapid Growth:											
Countries:											
Israel.....	9.7	-0.1	4.2	--	1.6	2.9	-0.2	7.1	--	--	5.6
Sudan.....	8.0	0.7	0.7	--	--	21.6	7.2	--	--	--	29.1
Mexico.....	6.3	25.8	9.2	1.2	0.6	--	6.0	1.3	--	5.6	5.7
Costa Rica..	5.6	3.2	--	8.0	--	--	2.4	--	--	6.8	--
Philippines..	5.2	9.6	--	28.8	--	--	1.3	3.0	2.6	22.0	0.1
Tanganyika..	5.2	12.4	1.0	5.8	--	--	--	--	--	--	3.2
Yugoslavia..	5.1	31.8	27.0	--	2.9	--	2.2	12.0	--	3.4	1.0
Taiwan.....	4.5	0.7	2.2	47.8	--	0.2	1.2	9.5	0.8	9.0	10.2
Turkey.....	4.5	--	29.6	0.3	16.0	-0.1	1.9	7.1	--	4.5	3.2
Venezuela...	4.5	11.4	-0.2	1.4	--	--	-2.1	12.8	4.5	16.7	5.9
Slow Growth:											
Countries:											
Thailand.....	4.4	9.1	--	20.1	--	--	1.1	--	8.8	6.4	6.9
Brazil.....	4.2	13.2	-0.9	18.9	0.2	--	5.8	3.4	5.5	9.8	6.0
Greece.....	3.7	2.4	47.2	2.5	2.0	--	4.6	3.4	--	--	--
Iran.....	3.6	--	25.7	7.0	4.9	--	2.9	--	--	4.9	7.8
India.....	3.1	4.0	14.0	32.5	0.9	5.4	7.7	--	--	13.5	10.3
Poland.....	3.0	--	12.4	--	16.2	--	-0.5	38.5	--	12.7	5.9
Argentina...	2.8	17.3	6.9	0.9	1.7	0.7	-0.6	8.5	--	8.0	13.3
Chile.....	2.8	14.7	36.5	1.2	10.3	--	6.9	33.4	--	--	-3.2
Japan.....	2.8	0.3	0.7	52.5	-3.3	-0.6	3.5	4.0	--	1.2	5.0
Spain.....	2.7	0.3	0.3	0.1	--	--	0.1	0.3	--	--	--
Colombia.....	2.6	3.2	2.1	13.0	3.0	--	-1.1	6.2	--	1.6	3.6
Nigeria.....	2.6	2.4	--	2.4	--	12.7	2.5	13.7	9.4	0.2	19.5
Egypt.....	2.0	12.6	13.8	16.0	0.1	2.7	2.8	6.8	--	9.7	4.8
Pakistan....	1.8	1.3	4.7	48.5	-0.3	0.2	-0.9	--	--	21.1	9.5

Table 3.--Distribution by Crops of Changes in Total Crop Output, 24 Countries
 Arrayed by Compound Annual Rate of Increase in Crop Production. 1/ (Con't.)

Country	Annual rate of change in all crops	Percent Distribution of Change by Crops									
		Vegetables and Fruits	Olives, Palms and Copra	Nut Crops	Coffee, Tea and Cocoa	Tobacco	Rubber	Cotton	Other Fibers	Other Crops	Total
-----Percent-----											
Rapid Growth:											
Countries:											
Israel.....	9.7	62.1	0.7	--	--	--	--	16.1	--	--	100.0
Sudan.....	8.0	0.3	--	--	--	--	--	40.4	--	--	100.0
Mexico.....	6.3	7.9	3.6	--	8.7	1.5	--	22.1	0.8	--	100.0
Costa Rica..	5.6	0.5	--	--	79.1	--	--	--	--	--	100.0
Philippines.	5.2	11.3	9.7	--	5.7	5.3	--	--	0.6	--	100.0
Tanganyika..	5.2	--	--	--	14.6	0.4	--	24.8	37.8	--	100.0
Yugoslavia..	5.1	18.6	--	0.4	--	1.5	--	--	-0.8	--	100.0
Taiwan.....	4.5	10.1	--	--	2.3	3.0	--	0.5	1.3	1.2	100.0
Turkey.....	4.5	19.3	4.0	2.0	--	1.6	--	10.6	--	--	100.0
Venezuela...	4.5	14.1	-1.3	--	-7.2	4.6	--	2/8.9	30.5	--	100.0
Thailand.....	4.4	--	9.1	--	--	12.4	14.7	2/1.7	9.7	--	100.0
Brazil.....	4.2	9.9	0.9	--	18.6	0.9	--	6.3	1.4	0.1	100.0
Greece.....	3.7	11.1	5.0	--	--	13.4	--	8.4	--	--	100.0
Slow Growth:											
Countries:											
Iran.....	3.6	22.0	0.4	0.9	0.8	-0.8	--	23.5	--	--	100.0
India.....	3.1	--	0.7	--	2.1	1.2	0.2	4.8	2.7	--	100.0
Poland.....	3.0	12.1	--	--	--	2.7	--	--	--	--	100.0
Argentina...	2.8	38.3	--	--	--	2.5	--	1.6	--	0.9	100.0
Chile.....	2.8	--	--	--	--	0.2	--	--	--	--	100.0
Japan.....	2.8	28.5	--	--	3.0	5.2	--	--	--	--	100.0
Spain.....	2.7	61.0	37.3	0.3	--	--	--	0.3	--	--	100.0
Colombia.....	2.6	8.9	--	--	40.7	1.4	--	17.2	0.2	--	100.0
Nigeria.....	2.6	3.5	0.2	0.7	21.8	0.4	6.9	3.7	--	--	100.0
Egypt.....	2.0	21.2	--	--	--	--	--	9.5	--	--	100.0
Pakistan....	1.8	--	--	--	--	3.7	--	10.3	1.9	--	100.0

1/ For time period shown in Tables 1 and 2. 2/ Includes cottonseed.

Among the upper half of the countries in this array, several kinds of crops account for a fifth or more of the total increases in crop production in one or more countries. These include maize in Mexico and Yugoslavia; wheat in Yugoslavia, Turkey and Greece; rice in the Philippines and Taiwan; millet in Sudan; root crops, mainly yams and cassava in Venezuela; sugar cane in the Philippines; vegetables and fruits in Israel; coffee in Costa Rica and Brazil; and cotton and other fibers in Israel, Sudan, Tanganyika, and Mexico.

These same kinds of crops play an important role in the economy of the slow growth countries. To cite some examples, maize is extensively grown in Argentina and Chile; wheat in Iran, Poland, Argentina, Chile, Spain and Egypt; rice in India; potatoes and yams or other root crops in Poland, Chile, and Nigeria; sugar crops in Poland and India; vegetables and fruits, including citrus, in Spain, Iran, Colombia, and Egypt; coffee, tea and cocoa in Colombia and Nigeria; and cotton in Iran, Colombia and Egypt.

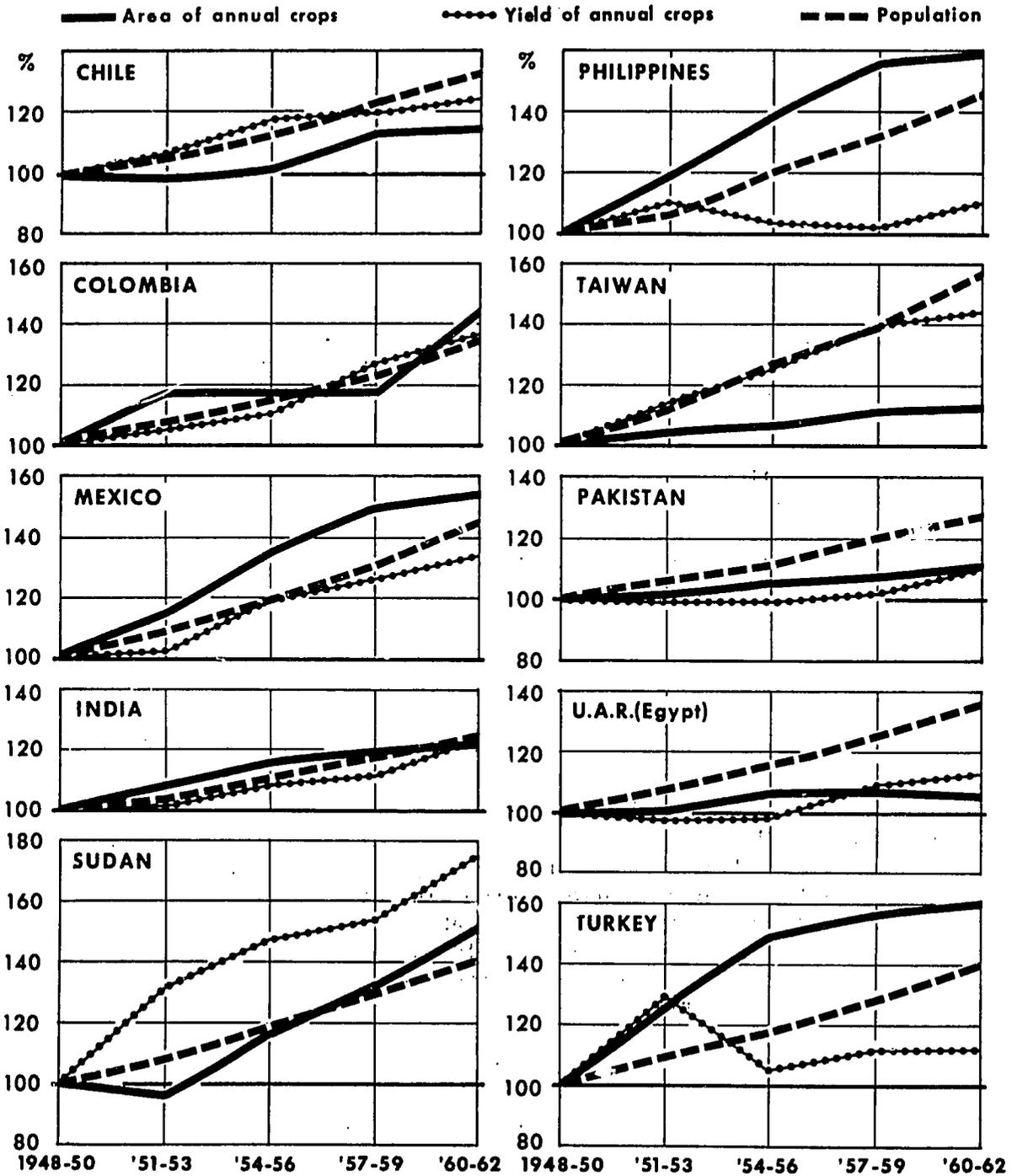
In brief, the crops which account for sizeable increases in agricultural production in rapid growth countries include kinds that are also adapted to and extensively grown in slow growth countries. They include crops grown in both tropical and temperate zones. These facts suggest the hypothesis that the differences between slow growth and rapid growth countries lie less in differences in the kind of crops they can grow than in differences in other factors. The record of substantial progress made in such countries as Sudan, the Philippines, Taiwan, Mexico, and Costa Rica, indicate that among these other factors careful consideration must be given to the role of public action at national, state and local levels in increasing farm production incentives, freeing the energies and powers of decision of farm people, and providing the infrastructure of facilities and services essential to transforming traditional agriculture. Aggressiveness and effectiveness with which countries compete for a share of world markets must also be considered in this context.

Crop Yields

There is now no better available indicator of changes in resource productivity, applicable particularly to underdeveloped countries, than changes in yields per unit of land. Crop yields have been steadily increasing since 1948 in most of the study countries (Figure 1 and Table 2). Generally, countries above average in rates of increase in their total crop production have also had higher than average rates of increase in their crop yields. Leaders in yield increases include Israel, Sudan, Mexico, Taiwan, Greece, Yugoslavia, Tanganyika and Thailand. Among the more rapid growth countries, only Brazil, Venezuela and Turkey have

Production gains result from area and yield increases

INDICES OF POPULATION, AREA, AND YIELD 1948-50 = 100



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Figure 1

failed to achieve substantial yield increases. These countries have brought considerable areas of new land into cultivation, much of which may be of below average quality.

Thus yield increases have been important as a source of the increases in agricultural output observed in most of the study countries (Table 1). Moreover, the fact that substantial yield increases have been made under a wide variety of conditions, including in tropical as well as in temperate zone area, presages hope for good yield increasing potentials in most of the world's less developed countries. They warrant further examination of the widely held belief that yield increasing technologies available today are limited mainly to temperate zone countries.

There is no a priori basis for supposing where opportunities for both exist that increasing yields are preferable to extending land area as a means of increasing agricultural output. Yet densely populated countries such as Taiwan and India have to rely upon increasing output per unit of land as the principal means of increasing their agricultural output. The most favored countries for increasing agricultural output are those which can combine large yield increases with large increases in area of crops. Study countries that have done this include Sudan, Mexico and Venezuela, all countries with rapid rates of increase in agricultural production (Table 4).

Yield Increasing Methods

It is not possible with available information to indicate quantitatively the resource basis of the observed increases in output per unit of land except in Greece. The most important methods of increasing output per unit of land have been shifts to irrigation farming and increased use of fertilizers, pesticides and improved seeds. Increases in land under irrigation have been particularly important in accounting for Mexico's gains in output per unit of land, which gains have been heavily concentrated in northwestern part of the country where production of cotton, fruits, and vegetables has become increasingly like much of the farming in Southern California. In Israel, all of the increase in area farmed consists of land brought under irrigation. Similarly, irrigation has played an important role in the gains made by Sudan. Such countries as Sudan and Israel are illustrative of parts of the world where increases in land area under cultivation and increases in yields commonly occur together. In these areas, irrigation often increases output per unit of land by making multiple cropping economically feasible. Moreover, the putting of land under irrigation is commonly associated with increased dependence upon the market economy and with increased use of purchased inputs such as fertilizers, pesticides, and improved seeds, as well as with improved tillage practices.

Table 4.--Classification of countries by rates of increase in land area and crop yields, 24 study countries, arrayed by 1948-63 rate of increase in crop production

Country	Rate of increase in crops per annum	Percentage increase in crop area			
		Upper half increase in yields		Lower half increase in yields	
		Upper half	Lower half	Upper half	Lower half
	<u>Percent</u>	<u>Percent</u>	<u>Percent</u>	<u>Percent</u>	<u>Percent</u>
Israel	9.7	X			
Sudan	8.0	X			
Mexico	6.3	X			
Philippines ...	5.2		X		
Tanganyika	5.2		X		
Yugoslavia	5.1			X	
Taiwan	4.5			X	
Turkey	4.5		X		
Venezuela	4.5		X		
Thailand	4.4	X			
Brazil	4.2		X		
Greece	3.7			X	
Iran	3.6		X		
India	3.1		X		
Poland	3.0			X	
Argentina	2.8				X
Chile	2.8				X
Japan	2.8			X	
Spain	2.7			X	
Colombia	2.6			X	
Egypt	2.0				X
Pakistan	1.8				X

Estimates made for Greece on sources of the increases in crop production between 1950 and 1960 ascribe 8 percent of the increases to increases in land area and 92 percent to changes in output per unit of land (Table 5). The bringing of land under irrigation was the one most important factor in these increases (33 percent). Increased use of fertilizer accounted for 17 percent of the increases made in the country's crop production. The remaining 42 percent of the country's increase in crop production is ascribed to a combination of technical improvements including better seed selection, crop rotation, use of insecticides and herbicides, and better tillage practices.

Table 5.--Estimates of the relative contribution of selected factors to the increase in crop production, Greece, 1950 to 1960

Factor	Contribution
	Percent
Land <u>1</u> /.....	7.6
Irrigation <u>2</u> /	33.1
Fertilizers <u>3</u> /	17.1
Other <u>4</u> /	42.2
Total	100.0

1/ Assuming the average "productivity" of land remained the same.

2/ Assuming yield of land irrigated was 3.3 times that not irrigated, based on information in C. Evelpidis, "Irrigation in Greece", International Journal of Agrarian Affairs, Oxford University Press, London, January 1963. The land factor in irrigation (as a result of increasing amounts of land under irrigation) was removed in the computation.

3/ Assuming a 33 percent increase in yields for each 60 kilograms of fertilizer used, based on 1959 FAO Mission report on Greece.

4/ Better seed selection, crop rotation, use of pesticides, etc.

Appendix Table 1.--Indexes of output per acre of annual crops, study countries, 1948-1963
(1957-1959=100)

Area and country	1948	1949	1950	1951	1952	1953	1954	1955	1956	1957	1958	1959	1960	1961	1962	1963
Latin America																
Argentina	90	92	88	95	95	97	103	95	95	95	102	103	101	107	113	111
Brazil	101	96	100	101	99	98	99	98	94	100	99	101	103	107	106	NA
Chile	91	85	74	78	84	91	93	96	95	94	107	91	92	99	96	104
Colombia <u>1/</u>	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Costa Rica <u>1/</u> ..	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Mexico	76	83	80	81	81	82	93	99	94	101	103	96	108	103	108	104
Venezuela	<u>2/</u>	<u>2/</u>	<u>2/</u>	<u>2/</u>	<u>2/</u>	88	92	98	98	100	98	103	91	100	101	NA
Africa																
Nigeria	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Sudan <u>3/</u>	58	66	71	78	98	80	97	104	116	94	103	102	96	131	112	NA
Tanganyika	62	67	70	71	81	71	74	98	97	95	102	103	104	104	106	105
Tunisia <u>3/</u>	82	169	169	95	147	133	102	108	94	94	105	102	88	62	127	125
Europe																
Greece	64	73	68	72	69	85	80	89	82	104	98	98	93	96	104	NA
Poland <u>3/</u>	80	82	92	79	84	86	92	89	99	100	99	101	110	127	111	125
Spain	76	69	74	97	93	77	97	90	91	97	98	105	94	100	NA	NA
Yugoslavia	NA	NA	56	84	52	84	69	81	68	104	80	116	109	92	97	109
Near East & S. Asia																
Egypt	94	93	88	84	97	87	91	88	88	97	99	104	108	93	111	111
India	104	91	93	88	88	89	97	99	95	99	94	106	102	114	112	109
Iran	68	89	96	79	88	92	93	90	92	99	100	102	98	103	99	107
Israel	NA	55	45	33	59	60	75	70	92	106	95	99	93	98	125	117
Jordan	144	158	116	119	152	81	158	73	139	143	43	114	81	109	76	37
Pakistan	97	100	96	99	95	96	99	96	92	102	100	98	102	108	110	108
Turkey	92	79	96	112	114	119	89	99	92	103	100	97	103	96	101	115
Far East																
Japan	88	83	84	82	88	76	82	101	92	96	99	105	109	108	114	(110)
Philippines	90	97	97	106	107	108	115	108	102	100	102	98	106	103	112	114
Taiwan	65	73	78	77	81	89	90	88	94	98	102	101	102	107	NA	NA
Thailand	91	90	88	92	93	100	84	99	108	98	103	99	118	117	116	NA

1/ Due to severe deficiencies in data on land area series on yield have not been calculated. 2/ Data incomplete or not available. 3/ Data for 6 annual crops. NA - not available.

APPENDIX V

MARKETING FACILITIES AND PRACTICES *

Agriculture's ability to grow in the less developed countries depends on available markets for its products and adequate facilities and practices for moving them to the ultimate consumer. Marketing will be used here to include all the processes and activities involved in getting agricultural products from the initial producer to the ultimate consumer in the form and at the time and place they are wanted.

Market Systems and Economic Development

Half or more of the people of the world live in urban areas away from farms and rely on markets to provide them their food and clothing. Even those that are subsistent farmers in rural areas often use some articles of clothing and food items supplied by the market system and originating in areas far removed from the locality in which they are consumed. The economic development of a country is sometimes characterized as a transformation from a subsistent and barter to a market economy, and continued economic growth is described in terms of the emergence of more sophisticated and complex market systems.

Consequently, the rapid growth and improvement of farm product market facilities and operations is considered a vital element in the development of the less developed countries. There are several ways of giving logical support to this proposition. One way is in terms of the growing demand for farm product market services.

There are at least four conditions of a developing economy that increase the demand for farm product market services. First, an increasing population will likely add one-fourth as many people to the present world population within the next decade, and half again as many in the next two decades. With other things equal this requires a rate of growth in market performance comparable with that of population. Second, economic development is generally accompanied by an increasing proportion of the total population living away from farms and relying on markets for their food and clothing needs (illustrated by the growing proportion in urban centers, Table 1). This requires growth of markets over and above the rate of population growth. Third, the people consume more and better food and clothing as their real incomes improve as a consequence of economic development, adding still greater demand for market services. One aspect of this is that fresh fruits and vegetables and livestock products usually make up an increasing proportion of their diets. These require greater care and more specialized facilities in handling, transportation and storage. Fourth, increasing specialization generally accompanies economic development and tends to enlarge the gap through which products move between the initial producer and consumer. Some operations now performed by the initial producer will likely be transferred from the farm to the market sector, other services will be added to those already performed in marketing, and two or more operations now conducted under an individual firm business may be separated into more firms as specialization increases. Too, the

* Prepared by Clarence A. Moore.

Table 1.--Urban as a proportion of total population and increases in the urban total ratio, 1950 to 1960*

Country	Urban as a proportion of total population:		
	1950	1960	Increase ^{1/}
	Percent	Percent	Percent
Israel	71.1	77.3	8.7
Mexico	42.6	50.7	19.0
Philippines	26.5	42.7	61.1
Taiwan	52.6	59.5	13.1
Turkey	21.9	37.8	72.6
Venezuela	53.8	66.1	22.9
Thailand	10.4	11.8	13.5
Brazil	36.2	45.1	24.6
Greece	36.2	42.5	17.4
Iran	20.0	41.8	109.0
India	17.3	17.9	3.5
Poland	39.0	48.1	23.3
Argentina	64.0	67.0	4.7
Chile	58.6	67.2	14.7
Japan	37.5	63.5	69.3
Egypt	31.7	37.7	18.9
Tunisia	32.1	38.2	19.0
Jordan	35.9	46.2	28.7

*Source: Constructed from basic data in the United Nation's Demographic Yearbook. Adjustments to 1950 and 1960 were made for those countries with data in other years by application of the compound rate of change in total and in urban population between the years given. Countries are arranged in descending order of their rate of change in agricultural crop output.

^{1/} The percent by which the 1960 ratio exceeded that of 1950.

widening gulf between producer and consumer requires more sophisticated and skillful organization and practices in the market system if the necessary economic incentives are to be passed back to the producer.

These four pressures aggregate the need for growth in market performance to sizeable proportions as economic development occurs in the less developed countries. Data in Table 2 is designed to illustrate market growth requirements from the combined effect of various growth rates in population, per capita real income and market dependence ^{1/} with assumed income elasticities of 0.5 and 0.75. However, it should be emphasized that study is sorely needed in the less developed countries to determine the market characteristics of different segments of the population, especially the extent of market dependence (for agricultural products) of urban, village and farm people, at different stages in development.

With a two percent growth rate in each determinant (population, per capita income and market dependence) and a .5 income elasticity the annual market requirement growth is 5 percent (Column 2, circled). This is a sizeable growth rate, being two and one-half times as large as the growth of any one of the factors affecting it singly and amounting to a 63 percent increase in a decade. If population growth in three percent, per capita income four percent, market dependence four percent and income elasticity .75 (not an unreasonable expectation for many developing countries) the market requirement annual growth rate would be 10 percent (Column 6, circled), or 160 percent within a decade.

These growth rates in market requirements, while amazingly large are probably understated for the conditions specified because they do not include the effect (1) that accrues as a consequence of simultaneous growth in the conditions, (2) from the greater requirements of facilities and care in handling for perishables toward which consumers shift as their incomes improve, (3) of increasing specialization and additional services provided by market agencies as development occurs, and (4) of factors that are implicitly more limiting in the data of the table than probably is true in the real world of a developing economy (see Table footnote).

^{1/} Defined as the increase in the proportion of the total domestic consumption of food and clothing that is obtained from markets rather than from subsistent production. The rate of growth in urbanization (the shift from rural to urban living, Table 2) is indicative of the growth in market dependence, but may not be as reliable a measure as one would want in some cases. For example, the urban population is usually defined in terms of those living in towns in excess of 2,000 or 2,500 population or some similar figure. Many of those in towns or villages with less people than used to define "urban" also rely on the market for food and clothing and probably these do not grow as rapidly as urban centers in early stages of development. Too, those people on farms may get some of their basic necessities from the market. However, in early stages of development it probably is a small percentage. Consequently, while the urbanization trend may be the most reliable empirical measure available of the growth in market dependence, it likely overstates it somewhat.

Table 2.--Annual growth rates in agricultural product market requirements associated with assumed rates of growth in per capita income, population and market dependence *

Per capita income growth and market dependence growth rate ^{1/}	Growth rates in market requirements associated with specified population growth rates					
	1%	2%	3%	1%	2%	3%
	(.5 income elasticity)			(.75 income elasticity)		
I. 2% per capita income growth market dependence growth ^{1/}						
1 percent.....	3.0	4.0	5.0	3.5	4.5	5.5
2 percent.....	4.0	5.0	6.0	4.5	5.5	6.5
4 percent.....	6.0	7.0	8.0	6.5	7.5	8.5
II. 4% per capita income growth market dependence growth ^{1/}						
1 percent.....	4.0	5.0	6.0	5.0	6.0	7.0
2 percent.....	5.0	6.0	7.0	6.0	7.0	8.0
4 percent.....	7.0	8.0	9.0	8.0	9.0	10.0
III. 6% per capita income growth market dependence growth ^{1/}						
1 percent.....	5.0	6.0	7.0	6.5	7.5	8.5
2 percent.....	6.0	7.0	8.0	7.5	8.5	9.5
4 percent.....	8.0	9.0	10.0	9.5	10.5	11.5

-4-

* The computations may tend to understate the growth in market requirements from the effect of the factors included for two reasons: (1) per capita income growth is taken to be that of the entire economy, whereas the nonagricultural incomes (market dependent sector) may grow more rapidly and (2) computations are in terms of each factor acting separately on market requirements and does not include the additional growth as an consequence of simultaneous growth in all factors together.

^{1/} The market dependence growth rates are considered feasible potentials in view of the increase in urban as a proportion of total population among less developed countries (Column 3, Table 1).

- 1 percent annual growth = 11 percent increase in 10 years
- 2 percent annual growth = 22 percent increase in 10 years
- 4 percent annual growth = 48 percent increase in 10 years.

The big question, then, is "Can the market systems of the developing countries be expanded rapidly enough to meet the development challenge?" If not, they can become a serious drag on development efforts.

The above discussion of growth in demand for market services is one view of the importance of farm product market systems in economic development. The extent to which market growth paces that demand growth, however, affects general development itself from which, in turn, demand for market services are derived. A lag in farm product market facilities and institutions can severely curtail growth in agriculture and in the general economy which, in turn, lessens the pressure for growth of the market system.

Consequently, markets viewed from another perspective are causal stimulators of production. The many small cultivators who do not have an easy market outlet for products they grow beyond their own needs have little or no incentive to produce them. The lack of economic incentives is generally considered a major barrier to increasing agricultural output in many areas in the less developed countries. The focal point of the problem is the market place, or lack of it, the institution through which economic incentives are made manifest to the cultivator.

There are several facets of markets outlets viewed as stimulators of production. The rural family's food intake and nutritional level is generally low and frequently dominated by a one-item starchy diet in the less developed countries. Markets established for grain or other products they can grow in excess of their consumption needs can provide them with the buying power needed to remedy this situation. In addition to raising their level of food consumption it may result in an improvement of the human agent as a productive factor (better health, improved response to incentives, etc.), a consideration given considerable attention in development thought.

As a production stimulator, the market system serves two general development objectives. First, it should lower the costs per unit of providing market services, a saving which may be passed forward to consumers in the form of lower prices for foods (increasing the quantity demanded) or back to producers as higher prices for their products (inducing an increase in the quantity supplied). 2/ Second, it should increase the efficiency with which consumers' wants and preferences as regards quality and kind of products are reflected back to the grower in relative prices by quality and kind. If successful this will improve the level of price incentives as well. Better attainment of both these objectives is likely to provide considerable inducement for greater output of farm products in the less developed countries.

Conceptual Considerations

The previous section dealt with the role, importance and growth needs of market systems for agricultural products in developing countries. Subsequent discussion will consider the problems associated with existing market facilities and practices in the study countries. However, a few

2/ Unique conditions may, of course, result in a backward-sloping supply curve.

conceptual matters that set the framework for the study of problems will first be outlined.

The criteria for adequacy of market performance in a non-growing economy differs considerably from those in a growing economy. For example, cases of exorbitant charges and monopoly profits do exist in the markets of the less developed countries but the wide marketing margins are more generally a mere reflection of the high costs of providing services under existing market conditions. Viewed in a static, non-growing setting the markets may be described as "traditional" and considered as adequate or even efficient, i.e. they likely are providing services at the competitive equilibrium rate in consequence of the low level of (1) market volume, (2) technology and skills, (3) communication and demand-supply knowledge, (4) facilities, and (5) the existence of many public and other restrictive measures that hamper trade within those countries.

However, this study is concerned with economic growth. Market facilities and practices that may be about the best possible under existing conditions (viewed in a static framework) are likely to be increasingly inadequate as economic development occurs which has the inevitable consequence of changing those conditions. This study considers market conditions and performance in terms of the "best" growth potentials. Consequently, certain hazards must be avoided. The general tendency is to evaluate market systems from the economic growth viewpoint in terms of those existing in modern or "developed" countries. In the longest-term context this may be justified. Markets in developed countries furnish about the only experience economists can draw on to develop goals toward which the more backward market systems can move in the long-term transformation process. However, this transformation in operations and capital accumulation took many decades for attainment in the modern economies. There is every reason to believe that it will not be accomplished "over-night", or even if it could that it would not be the most efficient means of doing so, in the less developed countries of today.

It seems more feasible to view market problems of the less developed countries in an intermediate-term context. Attention should be focused on ways the transformation process may be generated and sustained by relatively small improvements and investments initially in market facilities and operations. There is reason to believe large returns in greater efficiency, lower cost of operations, higher returns to cultivators and lower prices to consumers can be obtained in many areas of marketing by changes that add little or nothing to the overall costs but lower significantly the per unit cost of services.

In conclusion, it is likely that existing market conditions at times will be evaluated by modern, developed market criteria. However, we explicitly exhort the reader to understand that while such criteria may be considered to imply long-term goals of development they should not be considered as implying the most efficient means by which the intermediate transformation process occurs.

It is rather obvious from the literature available that market conditions in general in the less developed countries fall far short of the level considered adequate to encourage a desirable rate of growth in agriculture. Our study will focus on cases involving particular market aspects in the various countries that provide some indication both of the critical nature of the problems and the means that have proved effective or ineffective in solving them.

New Market Production

The general growth of farm product market operations involve initiating new markets as well as expanding already existing ones. Both sources of market growth involve similar problems. However, new market growth is sufficiently important to justify a brief separate treatment. The potential for increasing agricultural production by providing market facilities and outlets in areas where products are not grown for the market but are well adapted is often referred to in the literature. In some cases the demand potential is known to exist, in others it should be more adequately evaluated before development programs are initiated.

Development plans for the Papaloapan and Grijalva--Usumacinte river basins of Southeast Mexico showed in the mid 1950's that rubber, tea, vanilla, spices and fibers were suited to the areas although not previously grown there.^{3/} The development plans in general were commendable but the principal effort prior to 1957 in the Papaloapan Basin was toward increasing output of sugar and rice, both in surplus world supply. The initial plans for the basins were a package type including integrated facets. In commenting on roads already completed it was reported that "Considerable agricultural development has come about spontaneously along the roads without any encouragement except the fact of communication with other parts of Mexico". The Mexico experience is an example of both planned and unplanned (or "spontaneous") response of agriculture where basic facilities for communicating market knowledge and transporting goods are provided.

Planned inducement of sugar production to reduce imports has been successfully undertaken in many countries. Plans generally provided means of constructing and operating sugar mills coupled with some sort of market agreement or price commitments to growers. Chile developed such a plan to encourage sugar beet production in the early 1950's. Greece started production of sugar by this means in the early 1960's and production of sugar in Iran and Sudan was encouraged in like fashion.

It is reported that the rapid increase of corn production and exports in Thailand was due mainly to the opening of more roads that linked markets with producing areas.^{4/} The construction of all weather roads that connected a mountain province in the Philippines to market places in the lowlands resulted in farmers shifting from subsistence crops to cash cold-weather vegetable

^{3/} Kathryn H. Wylie, "Southeast Mexico: Promising Farm Area," Foreign Agriculture, February, 1957, p. 12.

^{4/} S. H. Work, "Thailand: Case Study of a Developing Market System," Foreign Agriculture, June 22, 1964.

crops that drew high prices in the lowland markets. 5/ Both production and market potentials had existed for many years but lack of facilities deferred their exploitation.

The Kulu Valley and Simla Hills of India are said to be particularly adaptable to fruit production for market but have not been developed due to lack of quick means of transport to consumers. 6/ Grapes, melons and many other fruits and vegetables could be produced in the Mediterranean region at a time when such produce is not available in central and west European countries but exploitation of the market primarily requires refrigeration facilities, not presently available, to put produce on the market in good condition. 7/

These are only a few examples where the establishment of existing market facilities initiated new market production and areas with such potentials. The lessons are important to those who attempt to chart the course of development in the less developed countries. First, lack of market facilities can completely nullify the efforts of planners to encourage production for market of particular commodities in particular areas. Second, the provision of basic market needs such as roads, means of transport and communication often result in spontaneous growth of new market production quite aside from, or in addition to, the anticipations of planners. Third, careful planning and the provision of proper incentives can encourage such new production to be directed toward the greatest demand potentials and away from market surpluses and depressed demand conditions. Fourth, and most important, a careful research evaluation of market potentials and of the most effective means of directing production toward the most favorable markets should precede development plans.

The fear is sometimes expressed that a majority of the less developed countries encouraging the growth of their agricultural sector to attain general economic development will very quickly span the existing food deficit and create surplus food problems that could spread chaos into general development efforts. Possibly there is a fifth lesson to learn from the cases cited above where spontaneous new growth was, apparently, so quickly absorbed in the markets. The proposition is simply that economic growth in the less developed countries initially is conducive to strong farm product demand growth and an enlarging food and fiber deficit unless growth in agricultural output can take up the slack. In other words, there are millions of hungry people with near-empty stomachs who, apparently, are anxious for the opportunity of filling them. Consequently, there likely will be sufficient markets for several decades to absorb the growth in market output of less developed countries if facilities and operations adequately provide them the kind of products at the time and place they want them.

5/ J. C. Abbott et Al, Marketing: Its Role in Increasing Productivity, F.A.O., Freedom From Hunger Campaign, Basic Study No. 4, Rome, Italy, 1962, p. 9.

6/ Ibid, p. 19.

7/ Ibid, p. 24.

Market Facilities

The availability of roads (especially all-weather roads) or other market facilities is sometimes the deciding factor between no production and some production for the market as was discussed in the previous section. In addition to the availability of such facilities their condition and the type of equipment used with them affects the cost of producing the various marketing services such as transportation, storage and processing. This section will discuss the limitations imposed on the growth of agricultural output by a dearth of physical facilities or material requisites used by individuals or firms in conducting market operations. Certain non-material organizational and operational practices also affect the performance of market operations including the conditions by which buyers and sellers conduct their bargaining transactions. These will be discussed later.

The provision of more adequate transport, processing and storage facilities has the effect of lowering the cost between farmers and consumers so that a higher price can be paid to the producer (inducing him to produce more) and a lower price charged the consumer (inducing him to consume more). There is little doubt that lack of "farm-to-market" roads, high freight charges due to inadequate roads, and other such conditions in many areas forces growers to subsistent crops and causes them to neglect the growth of crops in most favorable demand in the markets of the world at large. The perishable crops are most acutely affected.

Transportation

It is reported that crops such as rice and maize are grown in place of more suitable market crops such as manilla hemp in parts of the Philippines because of transport difficulties. 8/ And market conditions for livestock products in Greece are complicated by poor communication and excessive transport charges. 9/ Estimates of cost of operating trucks in Turkey vary from 35 cents per kilometer on unimproved roads to 22 cents on better roads. 10/ It is asserted that a truck has to be written off in one year at an average cost of \$2,000 to as high as \$10,000 for refrigerated units on the rough roads of Latin America and Africa. 11/ And it is suggested that the fitting of axles and pneumatic tires from trucks to the bullock cart, basic means of transport from farm to market in many parts of the world, results in twice the load being carried with the same tractive force and with less wear on soft country roads. 12/

8/ F.A.O., State of Food and Agriculture, 1959, p. 144.

9/ F.A.O., Mediterranean Development Project Report, 1959.

10/ J. C. Abbott et Al, op. cit., p. 21.

11/ Ibid

12/ Ibid

Past experience lends credence to the potential stimulation of output by improved transport facilities. Mexico's fresh market sales of fruits and vegetables have expanded rapidly in the last decade as highways were improved, permitting rapid truck transport to the larger markets in the country. ^{13/} A road linking La Paz in Bolivia to a nearby area in 1938 resulted in spontaneous and intensive growth of farm products to fill market needs and feeder roads built after the war in Northern Nigeria increased the movement of food, reduced local shortages, and resulted in higher prices to producers. ^{14/} It is reported that crops such as coffee, rubber and oil palms which take some years to mature were planted along the new route of a road planned in East Africa before construction began. ^{15/}

The ranking of countries in terms of their road mileage per square mile of land area in Table 3 shows a somewhat greater number of those with high agricultural growth rates also ranked higher in road mileage. The ranking has greater significance if the level of economic development as well as growth in general economic development is considered, i.e. putting in proper perspective the high road mileage ranking of countries like Japan and Greece. However, the overall quality of total road mileage differs rather widely between countries.

While the ranking of countries in terms of the number of people per bus or truck, as well as the rate of increase in this means of transport in recent years, has little significance taken separately they do provide an overall picture together with ranking by size of the commercial market and road mileage that is more meaningful. Countries that are considered more "mature" in their economic growth experience, such as Israel, Mexico, Yugoslavia, Taiwan, Greece, Japan and Spain, show the more favorable ratings in the determinant factors across the board regardless of their ranking in terms of recent agricultural output growth.

Storage

Lack of storage facilities, both quantitatively and qualitatively, is a major problem in most of the study countries. Many are tropical countries that pose serious storage problems. It has been estimated that from 5 to 10 percent of the world's food grain crop is lost annually because of faulty storage and most of this occurs in countries short of food. ^{16/} The same source has the following to say about grain storage facilities in Asia:

"In Southern Asia, grain is commonly stored in raised bins built of woven bamboo plastered with mud and cow dung; where the water table is low, concrete or brick-lined pits may be used. Measures to control pests include mixing ashes with the grain and keeping a python in the barn to eat rats, but losses are still heavy."

^{13/} Foreign Agriculture Circular, F.A.S., FDAB-1-64, April, 1964.

^{14/} J. C. Abbott et al, op. cit. p. 20.

^{15/} Ibid

^{16/} J. C. Abbott et al, op. cit., p. 25.

Table 3.--Ranking of countries by road mileage, size of urban market, and truck and bus conveyance facilities

Country*	Roads 1/	Commercial Market 2/	Trucks and buses Population 3/	Increase 4/
Israel	1	1	1	3
Sudan	3	3	3	1
Mexico	2	1	1	3
Costa Rica	1	1	1	N.A.
Philippines	2	2	2	3
Tanganyika	3	3	3	2
Yugoslavia	1	1	3	2
Taiwan	1	1	3	1
Turkey	2	3	2	1
Venezuela	3	1	2	N.A.
Thailand	3	3	2	1
Brazil	2	2	1	2
Greece	1	2	2	2
Iran	3	2	3	3
India	1	3	3	1
Poland	1	2	2	3
Argentina	3	1	1	2
Chile	2	1	1	3
Japan	1	1	1	1
Spain	1	1	2	2
Colombia	3	2	1	3
Nigeria	2	3	3	1
Egypt	3	3	3	N.A.
Pakistan	2	3	3	1
Tunisia	2	3	1	2
Jordan	3	2	2	N.A.

*Arranged in descending order of the growth rate in agricultural crop output in the 1950's.

1/ Ratings were based on miles of road per 1,000 square miles of area and over 400 miles ranked 1, 100 to 400 ranked 2, and less than 100 ranked 3.

2/ Based on proportion urban was of total population. 50 percent or more ranked 1, 40 to 49.9 ranked 2, and less than 40 ranked 3.

3/ Population per vehicle: 136 or less ranked 1, 136 to 338 ranked 2, over 338 ranked 3.

4/ Increases in number of trucks and buses 1958 through 1963 with highest increases ranked 1, medium increases 2 and lowest increases ranked 3.

A study of grain marketing in the Yaqui Valley of Mexico showed no farm storage for wheat, that all grain was transferred to government warehouses at harvest, that more than one-third of the storage capacity requires loading and unloading by hand labor and a good deal more is only semi-mechanical, that many units have relatively small capacity in terms of peak seasonal requirements, and that with only 5 readily usable scales to serve a particular area trucks loaded with wheat had to wait an average of 16 to 24 hours for weighing and a maximum of 36. 17/ Actually, the area described is one of the more developed in market facilities among the less developed countries.

Refrigerated storage, as well as refrigerated transportation, is a major problem with perishable crops. A report of cold storage development at Biher, an important potato growing area in India, furnishes an interesting picture of cost conditions. Only one cold storage was in operation in the early 1940's and the rental was \$51 per metric ton per season. The second was established in 1946 and rental dropped to \$45 per season. Continued addition of numerous cold storage units reduced charges to \$40 in 1957, \$34 in 1958, \$28.50 in 1959 and as low as \$22.70 in 1960. 18/ So important is the lack of storage facilities in many countries that there has been increasing pressures for government intervention and operation to avoid monopoly pricing.

Not all experiences with public actions have been favorable. It is reported that public grain stores in Iran have been erected at points inaccessible to producers (due to poor roads) and only a fraction of space has been occupied; that in one country a specialist spent two years carefully developing plans for building and locating storage units only to be overruled by the head of the government who selected a site 12 kilometers from a railway but belonging to a family with which he was associated; that one government continued plans to build a large cold store despite expert reports there was no economic justification for it and nearby facilities were only partly utilized; and that in several parts of Africa meat packing firms have installed plants only to find out too late the area could not supply enough livestock for their efficient operation.

In summary, the literature depicts considerable activity among the study countries toward improving their farm product storage facilities, an increasing tendency favoring publicly owned and operated facilities, widespread and acute need of more storage facilities and improved storage facilities to support agricultural growth, a noticeable lack of effective and well-intentioned planning for storage in some countries but effective and well-directed planning in others (setting up a grain storage research and training center and a storage advisory committee in India, for example). Above all, indications are that considerable economies can be attained by effectively planning, developing, and using storage in the areas of greatest need.

17/ German Rioseco and Herman M. Haag, The Marketing of Grains in the Yaqui Valley, Southern Illinois University, Unpublished Mss.

18/ J. C. Abbott et al, op. cit., p. 29.

Processing

There are several noteworthy cases where processing facilities have been instrumental in expanding market and output of products. Perhaps most general is that of the establishment of sugar mills in a number of the study countries (Greece, Iran, Sudan, Uganda, Kenya, Tanganyika, Pakistan, and Chile, for example) and the consequent increase in production of sugar. Most of these cases furnish excellent examples of the simultaneous development of market and output in the growth of their sugar industry.

Simultaneous development of market facilities along with output may be most feasible for some commodities. However, the establishment of certain market facilities may best precede, and thus lead, growth in output of some products in certain areas. But it is unlikely a marketable surplus of any significant extent will precede the establishment of necessary market facilities under any conditions.

In Mexico the construction of new strawberry freezing plants resulted in tremendous expansion of production after 1950 and today it is said that about four-fifths of the total crop is exported to the United States and Canada as frozen berries. In addition, the processing of preserves for the domestic market and export is increasing. 19/

Abbott, in the Freedom from Hunger Campaign study by F.A.O., indicates that livestock producers in Kenya and Madagascar gained access to outside markets by canning their product; that cattle raised in the dry zones of Africa lack quality but, combined with fat from other parts of the carcass, make a good canned product; and that a citrus processing plant was proposed for Libya to prepare juice and fruit extracts from fruit which, because of varying size, superficial blemishes and poor appearance, is difficult to sell on the fresh market. The F.A.O. Mediterranean Development Project report of 1959 suggests that quality of home produced cheese in Greece leaves much to be desired and that establishment of co-operative factories operating under sanitary conditions may do much toward improving the market and demand. The long established fruit and vegetable canning industry of Turkey is said to require considerable investment to improve existing facilities and set up modern export-oriented plants to reach European standards in the products and thus enlarge the market and expand growers output. Their livestock industry also is hindered by lack of a modern meat industry. Production and export of citrus fruit has increased sharply in South Africa since 1957 as a consequence of expanding processing facilities. Forty-two plants ranging in capacity from 5,000 to more than 30,000 tons now process raw citrus fruit and a large plant recently established is able to handle 150 tons of oranges every 24 hours. 20/

19/ Foreign Agriculture Circular, F.A.S., FDAP 1-64, April, 1964, p. 3.

20/ Foreign Agriculture, August 10, 1964, p. 5.

Livestock in Latin America and other countries, cashew nuts in Tanganyika and Kenya, tea in Uganda, cotton and castorbeans in Thailand, and raisins in Afghan depict a wide range of commodities with production expansion potentials that hinge on the establishment of proper processing facilities.

This discussion of market facilities separated them by types and resorted to particular cases which illustrated the problems associated with economic growth. It should be emphasized that growth of output and market of a product often depends on the installation or expansion of not one but a combination of facilities. Practices which govern their use and prove effective in moving the product through the market are also important determinants of the cost of performing a particular service and will be discussed in the following section.

Marketing Practices

The crude and grossly inefficient handling and marketing methods (by modern market standards) that prevail in many of the less developed countries may appear to the western mind almost inherent in the people, so vast is the latitude one sees for improvement. The nature of some practices are such as to display what appears to be complete obsession with the immediate transaction, disregard of long-term considerations of production, selling or buying and a lack of either knowledge or appreciation of the consumer's wants on the one hand or a "let-the-buyer-beware" attitude on the other. Thus markets bedeviled by small-lot offerings by many growers in the initial sale and small volumes and capacities in assembly, processing, wholesale, and other operations are characterized by practices deemed most likely to perpetuate their most pressing problems of development. Not only does assembly involve purchases from large numbers of growers with very small lots on the farm side but retailing involves sales of very small amounts on the consumer side. It is reported that some common lots of retail purchases in Nigeria were "three lumps of sugar, half a cigarette, individual drops of perfume, and a few sticks of matches". 21/

It should be acknowledged different situations account, in part, for the difference in market conditions between developed and less developed countries. Consumers in the less developed countries have such low incomes they cannot pay for "services" when purchasing necessities. Labor is cheap in those countries. And buying and selling at the consumer level is keenly competitive.

A few large, plantation-type producing units do exist. They are usually integrated with assembly, storage, transport and processing operations that are relatively efficient by modern standards and are more numerous in export than domestic products. The problem of development, however, inevitably involves the "small size" conditions in both production and marketing.

In Thailand it is said that much produce still moves to market centers on the farmers head or shoulders, by bicycle or farm cart and in baskets and bags. 22/ And one observer in Turkey noted grain coming to market by all kinds of conveyances including trucks, carts drawn by oxen and horses, and by donkeyback. 23/

21/ W. F. Mueller, "Some Market Structure Considerations in Economic Development." Journal of Farm Economics, May 1959, p. 415.

22/ Foreign Agriculture, June 22, 1964, p. 3.

23/ Foreign Agriculture, October 14, 1963, p. 6.

Deep baskets, small at the bottom and wide at the top, are used to carry delicate fruit and vegetables from farm to market in the Near East and palm stem containers with sharp inside edges that damage the produce are used in the United Arab Republic. It is estimated that between one-third and one-half of all fruit and vegetables harvested in India are lost due to poor handling and marketing and on the one hand Peshwar peaches are packed ripe and spoil on their way to market while on the other Kanadahar apricots are often picked too green and receive low prices because they do not attain full flavor. ^{24/} Growers of Kenaf in Thailand lower its quality by retting it in roadside ditches of unclean water. ^{25/} In India the Palmyra fiber may be sold by some farmers with sheaths beaten but fiber unextracted, by others with fiber extracted, by some with fiber given a preliminary combing before sale and some farmers dry the fiber before selling while others sell it wet. ^{26/} L. B. Darrah reported in the Seminar on Agricultural Marketing Reform and International Economic Development that farmers in the Philippines sold their corn crop in five forms (husked ears, unhusked ears, shelled, milled and green) and in seven different units of sale (kerosene can, cavan, basket, cart, 100 ears, ganta and individual ear). He further reported that fresh vegetables in a major area are packed field-run in flexible, loose-woven, split-bamboo containers holding 75 to 220 pounds, shipped 150 miles to Manila, and that losses range from 25 to 50 percent of shipping weight.

The following quote rather epitomizes the problems under discussion:

"In many parts of the world cows and buffaloes with dirty udders and flanks are milked without being previously washed; milk handlers are frequently seen with dirty hands and clothing and unsanitary habits; filthy cowsheds are common. Milk can be found exposed in many retail milk shops and containers to manurial and other sources of contamination; the practice of putting leaves, paper and straw over milk to reduce spilling from open cans is widespread; and there is frequent adulteration of milk with dirty water. All such practices can be discouraged by education and proper supervision." ^{27/}

And so the picture is drawn from country-to-country. Such practices contribute to large losses both in quality and quantity, necessitate high cost of marketing, and inject difficulties into the purchase and assembly of products. Frequently, considerable savings and lower cost could be attained in handling and marketing merely by a change in practices, by more uniform receipts and units of sale, and small investments in better containers and types of conveyance. This usually would require some study, foresight and instruction of growers and workers.

^{24/} J. C. Abbott et al, op. cit., p. 35.

^{25/} Foreign Agriculture, June 22, 1964, p. 3.

^{26/} R. N. Chaturvedi, Marketing of Palmyra Fibre in India, Marketing Series No. 82, Government of India, 1955.

^{27/} J. C. Abbott et al, op. cit., pp. 38 and 39.

The economic results are reflected in a comparative study of egg marketing in Denmark and Iran, Table 4. The price paid producers in Iran was about half that paid producers in Denmark although the price to consumers was about the same in both markets. Too, a larger proportion of the considerably higher marketing margin in Iran was taken in collecting and assembling the eggs from the farmer through the wholesales and less margin was taken by the retailer. Similar results are shown for a comparative study of meat marketing in Denmark, United States and Thailand, Table 5. They reflect the high cost of assembly (from the many small-lot surplus producers), handling and moving to the retailer in the less developed countries even though margins for most products in many such countries are probably higher than indicated in the egg study.

The conditions and practices that affect bargaining often perpetuate problems. Quality marketing is discouraged if unrewarded by higher prices and the general practice in most of the countries is uniform pricing to the farmer with price discounts for impurities, shrinkage, or defects applied indiscriminately. The 1959 State of Food and Agriculture (p. 144) indicated cattle were sold per head and pricing was on the basis of height in some areas of Central America, a characteristic directly associated with the animal's ability to travel long distance on foot but indirectly related to meat quality. Eggs marketed in many parts of the study countries are surplus of small flocks kept for the family's home consumption and freshness, size, cleanliness, quantity and quality are generally unregulated.

In many countries the method of sale simply involves growers (or sellers) gathering in an open space and arranging transactions by private bargaining with buyers. Often the sellers are disadvantaged by reason of number, small quantity of product, lack of alternatives or knowledge of such, and few or only one buyer. Too, he is burdened in many places by municipal regulation, taxes and charges of various kinds.

"In the East and elsewhere, the first charge on a farmer's produce, before it enters the market, is often a municipal levy or tax. In the market itself the seller has to pay portorage, brokerage, commission, deductions on account of impurities, driage, charity, and weighing allowances." 28/

Collection of market charges are still farmed out in some European, Latin American and Asiatic countries and it is reported, for example, that collection of municipal dues at the central market in Amman, Jordan was "let" to a group of merchants in 1954 for \$84,000 while the sum collected that year was \$182,000. 29 A study of rice marketing in India revealed many "unjustified" and duplicatory charges and deductions.

28/ J. C. Abbott, Marketing Problems and Improvement Programs, F.A.O., Rome, Italy, 1958, p. 84.

29/ Ibid, p. 86.

Table 4.--Comparison of marketing margin for eggs in Denmark and Iran*

Item	Egg marketing price and margins	
	Copenhagen, Denmark	Tehran, Iran
	---Price in U. S. cents per kg.---	
Price paid to producer	56.3	29.6
Price to wholesaler	61.8	53.4
Price to consumer	73.4	74.2
Total margin	17.1	44.6
	-----Percent-----	
From producer to wholesaler	32.2	53.4
Wholesaler's margin	4.1	13.4
Retailer's margin	63.7	33.2
Total margin	100.0	100.0
Margin as percent of consumer price	23.3	60.1
Margin as percent of producer price	30.4	150.7

*Source: G.F. Stewart and J. C. Abbott, Marketing Eggs and Poultry, FAO Marketing Guide No. 4, Rome, 1961, pp. 126-7. Data are for 1955 in Copenhagen and 1959 in Tehran.

Table 5.--Comparison of source of the marketing margin for meat in specified countries*

Source	Denmark	United States	Thailand--
	Percent	Percent	Bangkok Percent
Farmer to livestock market	10.3	7.5	28.7
From livestock market to retailer <u>1/</u> ..	12.6	8.6	25.6
Retailer's margin	77.1	83.9	45.7
Total margin	100.0	100.0	100.0

*Source: R. F. Burdette and J. C. Abbott, Marketing Livestock and Meat, FAO Marketing Guide No. 3, Rome, 1960, pp. 186-7. Margins are for beef cattle in Denmark and the United States and for oxen in Thailand. Data are for 1955 in the United States, 1956 in Denmark and 1958 in Thailand.

Apparently experience within these countries support the view that subsistent farmers are prepared and willing to take up cash crops rather rapidly if an adequate price incentive is provided. Conditions justify expressed doubt in the literature that prices received by cultivators provide the proper incentive. Certainly there is room for improving conditions and, consequently prices paid growers in many of the markets.

Unfortunately, too, there is widespread indications that sellers bargain in an atmosphere that leaves them little or no knowledge of alternatives in other markets or from other buyers where they exist. Market information, as would be expected for such markets, is noticeable by its non-existence. Iran officials issue bulletins on prices at country points but they often are received too late to be of use. Indian Market committees exhibit prices for their own and nearby terminal markets but these improve the farmers knowledge very little since allowances for transport, marketing charges and local demand supply conditions would be necessary to translate them into a price he could reasonably expect.

Indian Market committees apparently improved some markets by applying some regulation in traditionally unregulated procedures. The illiteracy of farmers and traders in many countries limit the use of printed forms of market information. Some use has been made of the radio as a means of disseminating market information, evidently with success.

The above discussion carries the implicit assumption that cultivators are relatively free agents, albeit uninformed ones, in market bargaining. Unfortunately, this must be accompanied by strong reservations. His low income, or subsistence status, places him in a vulnerable position in his too-frequent need of cash for emergencies, which apparently includes needs for funerals, wedding, special holiday celebrations, church offerings and other such social or prestige items he values as dear as food itself. The merchant-lender credit system is so well reported it needs little elaboration. The grower often has the sale of his crop committed to such lenders as security for credit far in advance of harvest, and more often than not where the system predominates, at prices considerably below those that prevail at harvest.

There is a noticeable lack of research study that would tell us to what extent pricing, interest on credit, and marketing charges are exorbitant in terms of the conditions under which the operations take place. The question, however, has little or no relevance to our objective. For growth and development inevitably changes the conditions. Consequently, the groundwork for growth of market systems needs to be constructed for an effective reflection of price incentives to growers in the less developed countries.

Market Development and Public Policy and Programs

One can hardly survey conditions of market facilities and practices in less developed countries without developing some impressions regarding policies and programs designed to solve problems that are presumed to exist. One such impression that economist are prone, almost invariably, to reach is that

governments are characterized by gross ignorance in some areas regarding what the real problem is and by even grosser inefficiencies in their methods of coping with them. Such impressions are usually reached, however, from the purely economic perspective (or a reasonable facsimile). Unfortunately perhaps, government leaders must consider both the economic and political, as well as social and cultural environments.

The following discussion attempts to outline some of the more general economic impressions about market development developed as a consequence of this study. They are provided as propositions that may be worthy of consideration and further study.

Perhaps foremost is the impression that development planners place a disproportionate emphasis in their programs, at the present level of most country's agricultural attainment, on means of expanding or inducing output at the farm level. The corollary proposition is that too little attention is devoted to improving the market structure which provides the economic incentives to increase output. It may not be too far amiss to suggest that many of the efforts to increase fertilizer use, obtain adoption of improved practices and expand irrigation on farms may be getting far less than full-hearted support from growers due to inadequate price incentives at the markets where they attempt to dispose of their product. In general, most less developed countries have meagre public capital to invest in efforts to increase agricultural output. This capital may obtain much greater returns if allocated to improving market facilities (including farm to market roads), market conditions and market practices in order to increase prices paid the producer rather than if allocated to improving production yields.

A closely related impression is that governments in the less developed countries tend too strongly toward resorting to market regulations, subsidies, price regulation and restrictive export and import measures, means of alleviating the consequence of problems rather than efforts to alleviate or eliminate the problems themselves, many of which lie in the market structure. Possibly they have been too much influenced by the experience of developed economies in this respect. However, there appears to be more favorable potentials for solving some of the more acute market problems at their source in the less developed countries.

Actually, some of the public regulation of markets in the less developed countries provide formidable barriers to development. In Chile slaughter houses formerly were controlled by municipal monopoly. It was illegal to slaughter in other than the municipal slaughter house. The number as well as which industrials could slaughter there were controlled and quotas were set on the number of animals each could kill. Meat could only be sold to butcher shops in the municipality, quotas were set on the amount of meat each butcher shop could sell, and meat was not allowed to be transported from one municipality to another. Regulations in Italian cities require that all food products coming in be sold wholesale in the municipal market (a means of obtaining funds). This eliminates wholesale purchases direct from farmers that may result in considerable saving. These are isolated cases but reliable examples of rather widespread municipal regulations in many of the less developed countries.

Public agricultural market improvement programs apparently have descending order of emphasis that places export commodities in top priority, import substitution commodities next, and domestic consumption commodities in least priority. Apparently, market facilities and practices are generally much better for the export commodities. Quality grade and standards for export commodities probably should receive greater attention than for domestic commodities in the less developed countries since the export commodities generally move into markets in developed countries with more stringent quality and standard requirements as a consequence of higher per capita income. Indeed, it is sometimes the most critical factor in export sales. Effective measures to decrease the tremendous loss that occurs in the movement of products from farms to consumers in the domestic market would probably provide a higher quality product at the retail level as well.

One writer, commenting on the development of processing facilities for farm products, suggested that plans should give priority to domestic consumption requirements leaving exports aside and only to be considered if spontaneous growth in output exceeded domestic needs. One can well understand the pressing need for foreign exchange among developing countries and the heavy reliance on agriculture to obtain it. Nevertheless, better welfare of the domestic population is the appropriate aim of economic development, and higher per capita consumption of foods and fibers contributes to that goal. Inadequate diets, low food intake, and frequent famines that result in starvation and privation of the masses is a reality in many areas. It would seem that improved markets and output of domestically consumed products should have a higher priority.

Unstable price of farm products is considered to be a major problem of agriculture in the less developed countries. Greater short-term stability of market prices for farm products likely contributes positively to growth in output. Too, instability of prices likely will be lessened by improvement of market facilities and operation practices. This last proposition asserts in essence that instability of farm prices in such countries is, in part, a consequence of the conditions of the market system (market structure in its broadest sense) in addition to the basic supply and demand elasticities and lack of precise control over output to which price instability is often attributed. The attainment of more effective facilities and practices that result in more stable prices probably would affect favorably the level of farm prices as well and result in lower prices to the consumer.

For farm product markets in general the greatest returns to public investment may be obtained initially by changes in practices and in improvements in small handling or other facilities, rather than spending large amounts on modern buildings, paved roads, motorized transport and heavy equipment. As regards roads, for example, a sufficient but low cost all-weather road that requires more maintenance may be more feasible in countries where labor for their maintenance is a low-cost input.

The proposition may bear repeating that increasing output for some commodities may best be obtained by simultaneous growth of output and market systems (as for sugar in some countries), or it may be induced by construction of facilities preceding the output for market (as in the case of farm-to-market roads), but output for market in significant amounts is unlikely to precede the construction of facilities essential to their marketing.

In conclusion, examples of more specific types of research studies needed in the area of marketing in the less developed countries are:

- (1) The impact of new, all-weather roads on agricultural production and market development in selected case areas in several less developed countries,
- (2) The extent and source of agricultural product market losses for the major domestically consumed food products in "traditional" market systems of the Philippines, Taiwan and Thailand, and
- (3) To evaluate the economic consequence of municipal and other public levies and regulations on the movement to markets and between markets of agricultural products for domestic consumption in selected countries.