GOVERNMENT EXPENDITURES ON AGRICULTURE IN LATIN AMERICA

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FOREWORD

Government expenditure is a primary determinant of the pace and pattern of agricultural growth. The size of government allocations to agriculture is an important indicator of government commitment to agricultural growth. How the resources are allocated is an important determinant of the efficiency of agricultural growth. Despite the central role of government expenditure little comparative analysis has been made of its size, its allocation, and its effect on agricultural production. As a result, there has been little pressure to develop an adequate data base for such analysis. Conversely, the lack of the requisite data discourages initiation of such analysis.

In the research reported here Victor Elías concentrates on developing an adequate data base for analyzing government expenditures on agriculture for nine Latin American countries for the period 1950-78. Compiling the data on a comparable basis over time and across countries was a time-consuming process. Continued effort is needed to refine and enlarge the data set. Nevertheless, Elías is able to provide useful information on the variability of government expenditures on agriculture and its causes. As a longtime specialist in analysis of sources of growth, Elías uses the data for a preliminary exploration of the effect of government expenditures on growth. Even with the crude data and analytical tools thus far assembled he is able to develop significant results. Refinement of the data and the analysis will continue. In the meantime Victor Elías and the International Food Policy Research Institute are pleased to make available the basic data so laboriously assembled. We hope that it will stimulate further improvement of the data base, similar analysis elsewhere, and fruitful interpretation of the role of public expenditure on agriculture and its interaction with other public policies.

This research is part of a larger effort at the International Food Policy Research Institute concerned with strategies of development as they impinge on the agricultural sector. The work includes macro modeling, empirical analysis of growth in agriculture and other sectors, as well as work on public expenditure.

John W. Mellor

Washington, D.C.
May 1981

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I greatly appreciate the opportunity and financial support given to me by the International Food Policy Research Institute to develop research on government expenditures in the agricultural sector in Latin America. The environment at IFPRI allowed me to acquaint myself with the existing food problems in different countries and the food policy alternatives that could be used to solve at least some of them.

I spent four fruitful months as visiting researcher at IFPRI (December 1978-February 1979 and January-February 1981), attempting to make this study more appropriate for policy analysis. I appreciate the support of the University of Tucuman, which made these visits possible. During this time I received important suggestions from John W. Mellor, Alberto Valdés, Juan A. Zapata, Jorge García, and three anonymous reviewers. Useful comments were also made at a seminar, which will be immensely helpful in the second stage of this project. Phyllis Skillman did more than her share in editing the report.

In addition to those at IFPRI, Manuel L. Cordomi, Antonio Aguirre, Carlos A. Pucci, and the library staff of the Inter-American Development Bank all contributed.

Finally, I would like to dedicate this report to my wife, Ana, and my children Georgina, Cecilia, and Julia.

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SUMMARY

The use of expenditures to influence the agricultural sector is one of many policy tools a government can apply. This study presents estimates of aggregate government expenditures directed to the rural sectors of nine Latin American countries: Argentina, Bolivia, Brazil, Chile, Costa Rica, Colombia, Mexico, Peru, and Venezuela. It covers the period 1950-78 on an annual basis. An effort was made to include estimates for many kinds of expenditures, such as research and extension, irrigation, marketing, transport, health, education, administration, agrarian reform, and so forth. The aggregates of these components are presented in current and real terms. Allocations by central (federal) and state governments and decentralized government agencies are included.

The aim of this report is to identify government expenditure policies for the agricultural sector; to measure their importance in relation to the total government budget and agricultural output; to analyze their trend and variability throughout the time period and from country to country; and to begin to study their effects on agricultural production. Although the study is mostly descriptive, it presents some measurements of the behavior of government expenditure policies.

The report also includes a preliminary analysis of the main determinants of expenditures and outlines ways that the data could be used in further research. The possible effects of government expenditures on agriculture are considered. Concentrating on the production side, an attempt is made to extend a sources-of-growth approach to include aggregate government expenditures as an input in addition to the usual inputs of land, labor, and capital.

The main effort of this research was directed toward assembling as long and as complete a set of data as possible for government expenditures on agriculture in Latin America. Data was selected from a number of sources to arrive at a reasonably homogeneous series. A number of conclusions can be drawn from this data. It clearly shows that the trend of expenditures on agriculture has risen sharply, especially since 1964, in every country with the possible exception of Argentina. The total amount spent by the governments of the nine countries together was about $200 million in 1950 and $2.1 billion in 1978 (in constant 1960 dollars). In the aggregate, government expenditures on agriculture (excluding the health and education components) rose an average of 8 percent per year in the nine countries. Meanwhile agriculture's share of the gross domestic product declined steadily in every country except Chile, where it remained stable. In comparing government expenditures on agriculture to agricultural output, government expenditures ranged from 3 to 20 percent of the value added.

In comparing government expenditures on agriculture to total government expenditures, to agricultural output, and to the gross domestic product, it can be seen that the share of agricultural expenditures in the total government budget varies more than agriculture's share of the other two variables. This indicates that much of this variability is caused by changes in government policy.

The share of government expenditures on agriculture in the total government budget averaged 5 percent for the nine countries together. This represents a smaller share of government budgets than nonagricultural components in every country, and agriculture's share varied more than that of other sectors as well. However, agriculture's share also fluctuated in some other countries, such as the United States, perhaps as a result of transfer payments.

In examining the components of agricultural expenditures (research and extension, irrigation, education, health, and others), the most money is usually spent on education and irrigation, but this varies so from one country to another that it mainly serves to point out an opportunity for studying the effects on agricultural growth of different government expenditure policies.

An attempt to compare the roles of central and state governments and decen-

tralized government agencies in dispersing funds for agriculture is somewhat thwarted by lack of budget information by economic sectors for most state governments. The figures that are available, however, indicate that significant shares of expenditures on agriculture are made at these levels of government. Conclusions drawn from data that excludes them would have to be questionable.

In a preliminary inquiry into the effectiveness of government expenditures on agriculture, it appears that government expenditure policy is responsible for at least 10 percent of the growth of agricultural output. There seems to be a relationship between the increase in government expenditures and the increase in agricultural output, even though land available for agriculture decreased during the same period. These observations lead toward a hypothesis that might be worth investigating in future research.

If policymakers are aware of how much is being spent on different economic sectors and with what possible results, they will be better able to design government expenditure policy for improved effectiveness. Although this research should aid policymakers in their task, it also underlines the need for Latin American governments to improve their budget data and classifications.

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INTRODUCTION

Government Policies

The government in any country influences the economy through many channels. Some of these government activities or policies are: expenditures, taxes, price and quantity controls, credit, tariffs, and monetary policies. They influence the economy by affecting consumption, production, income distribution, trade, and so forth.

To identify the policies that a given government is pursuing, one should have a good description and quantification of all of the above-mentioned activities of that government. Although such a complete classification of government policies would be helpful, this is not an easy task to pursue. There are so many components to each policy that even one of them is difficult to quantify. For example, sales taxes, income taxes, and tariffs are all included in the complex structure of tax policies. In some cases all the components of a government's policy work in the same direction, but in other cases they work in opposite directions because they respond to different objectives.

There are many different approaches to studying government policies. They can be examined for the whole economy or they can be analyzed for one economic sector at a time: first, manufacturing; then agriculture, construction, commerce, and so forth. Studying a policy for one economic sector at a time permits a more complete analysis of that policy and a better measurement of its effects on the particular sector. For these reasons this inquiry is limited to the study of one field of activity—government expenditures—and one sector—agriculture.

In general, government policies are determined by either exogenous or endogenous forces. In a decision on expenditures both probably play a role. Studying the main determinants of a policy decision would be an interesting line of analysis. For the purposes of this study, however, a more detailed description of government policies is needed. Therefore, the traditional macroeconomic classification of monetary, fiscal, and trade policies is not used.

Classifying Government Expenditures

Expenditures policy is probably one of the most important government policies. Almost all government institutions are influenced by it and participate in its implementation.

To characterize expenditure policy requires quantification of total government expenditures and a breakdown of their composition. In general, it is not easy to obtain good estimates of either because the basic budgetary information is organized for different purposes. Because this study is more concerned with the impact of government expenditures on the production side of the economy, only certain kinds of expenditures are considered. For example, transfer payments, which are included in government budgets, should be disregarded.

Government expenditures may be directed to goods and services in which the private sector is not much interested, or they may complement or substitute for private expenditures. In general, the government intervenes wherever the private sector does not play an important role.

Government expenditures can be classified in different ways, depending on their particular objectives. A traditional economic classification is used here; an attempt is made to identify the economic sector to which the expenditure is directed.

Another classification frequently used is the national accounts approach, which divides expenditures between consumption and investment uses. This method follows the same criteria as the classification of private expenditures, and could be useful from a macroeconomic point of view. But as will be explained later, this classification is not very useful from the production viewpoint.

The allocation of expenditures is made using various criteria. Some are made according to previous allocations. Others are made through cost-benefit analysis or other budget criteria such as incremental expenditures. Some are in response to special taxes placed on certain economic sectors, which are already attached to particular expenditures. These criteria must be considered in evaluating the degree of exogeneity in the design of the expenditures composition.

Having separated the expenditures on agriculture from the rest of the government expenditures, it can be seen that there are still a large number of components. Some of these are: irrigation, research and extension, transport, communications, marketing, agrarian reform, public works, health, education, income subsidies to consumption, and production of agricultural products. All of these components include consumption and investment goods.

To determine the effects on production of these policies, the expenditures that could influence production from the supply point of view are considered. The other expenditures also have some effect on the final production outcome, mainly through demand or through the traditional inputs of labor, land, and capital.

Because these expenditures are made for so many different reasons, it may be difficult to perceive that all of them are made in response to a unified government policy. But this does not eliminate the possibility of considering government expenditures as an aggregate—as if they respond to an aggregate policy concept. These aspects could be verified by an empirical study.

Because the objectives are different for each kind of expenditure, some vary more than others from year to year. This causes fluctuations in the aggregate. This is primarily because some of the components are more endogenous than others. In some cases their variability is similar to that of agricultural production—for example, expenditures on price support programs and financing of expenditures tied to tax collections.

The identification of a given government expenditure policy may require a more appropriate definition of the period of time than the basic annual budget period. This could mean that for certain categories of expenditures the unit of measurement should be for a period longer than one year. Clear examples are the expenditures on irrigation and research.

One complication that arises in estimating expenditure policies is that they are made through different government institutions, and in only a few cases are they concentrated in just one institution.[1] First, there are the central and local governments and decentralized government agencies at both of these levels. Second, within the central and local governments there are various institutions making expenditures that could be attributed to the agricultural sector.

It is not necessary to make an extremely detailed classification of expenditures to see the impact on aggregate production. The intention is to capture at the aggregate level effects that are easier to measure at the micro level (for instance, the expenditures for a particular product, such as wheat, maize, or meat). It is possible that some of the effects for a single product could cancel out at the aggregate level. This is not necessarily a disadvantage because the aim is to find an indicator of the overall effect of government expenditure policy.

In addition to the quantification of the amount spent by the government in a given period of time, a detailed description of how policy decisions are made through different institutional organizations would be helpful.

The Analysis

In this study three different analyses of government expenditure policies in the agricultural sector are made. First, time-series estimates are presented of the aggregate of agricultural expenditure and its components. The importance of a government policy is measured by the size of expenditures. Collecting the necessary information from many sources and making them comparable represents a major effort.

Second, the behavior of these expenditures is studied and their main direct determinants traced. The general trend for the

[1] Besides agriculture, some of the ministries that generally dedicate part of their budget to rural concerns are public works, education and welfare, and economic planning.

whole period of the study is analyzed as are changes in this trend in different subperiods. The degree of variability of expenditures and changes in their composition are determined. This is done using simple statistical measures of variability and composition.

Government expenditures in the agricultural sector are then compared with the total government budget, the gross domestic product, and the value added of the agricultural sector. These represent different indicators of government policies, expressed in real terms. The trend and variability of the ratios are analyzed. This part of the study also identifies the direct determinants of the sizes of government expenditures on agriculture and their ratios to the gross domestic product. This descriptive analysis should lead to a more complete understanding of government behavior.

At this stage a complete search for the final determinants of government expenditure policies is not undertaken. Some insights for a more complete study, however, are provided.

The third and final analysis is the study of the effects of government expenditure policy. Although an analysis of these effects should be pursued in conjunction with a wider coverage of government policies (including policies other than those for expenditures), it is hoped that this partial analysis is not too biased because of some exogeneity in government expenditure policies. A high degree of association between different kinds of policies (except for some components of total expenditures) is not expected. It will be seen later on, however, that it is possible to capture some effects of other government policies through the inputs used to study from a sources-of-growth approach the effects on production of government expenditure policies.

In this study only the production effects of government expenditure policies are analyzed. (There are other effects that could have been considered, such as those on rural development, income distribution, income variability, and employment.) A growth-accounting approach is used to identify the major inputs that explain the observed changes in production. Government expenditures are considered as a flow of investment in a so-called public input. The impact of this input on production growth is studied. This final section is quite tentative; it should be considered as only a preliminary use of the government expenditures data and as an example of potential use.

Coverage of the Study

Analyzing government expenditure policies for nine countries makes it possible to compare the results of the three methods mentioned above. This comparative analysis complements the time series study for each country and provides a greater range of variation of the basic information.

The countries included vary in size, stage of development, and in the share of their agricultural sectors in their whole economies. They also have experienced very different rates of growth. This variety should provide enough information to explore in detail a number of hypotheses concerning the role of government expenditure policies both in the aggregate and by components.

It is not possible to obtain data on every agricultural expenditure made by each of the nine governments for each of the 29 years from 1950 to 1978. But by examining the information collected and noting the variety of behavior as well as the similarities, the major determinants of government expenditure policies and their possible effects on the agricultural sector can perhaps be identified. It should be noted, however, that data on agricultural expenditures by states were particularly difficult to obtain.

Previous Studies

There has been a lot of interest among economists in analyzing government expenditures from different points of view. However, the approach followed in this study does not seem to have been attempted before.

In the field of agricultural economics many studies have emphasized different kinds of government expenditures, such as research and extension, irrigation, fertilizer, or seed. These studies try to estimate the size of these expenditures and to look for their effects on agricultural production—mostly at the micro level but sometimes at the macro. Complete references for the studies from which this report draws are

found in the bibliography. Hertford, Orozco, Schuh and Thompson, Boyce and Evenson, Barletta, and others have all prepared such studies for Latin American countries. This report uses some of their findings, but tries to cover government expenditures more thoroughly and to analyze more completely the behavior of government policy. It also takes a closer look at the effects of these expenditures on the aggregate agricultural sector.

There are also many useful studies in the field of public finance, including some special areas where relevant information has been collected for other purposes. For example, there is a budgeting program that classifies government expenditures for budget and economic analysis purposes. Another study has been made of the effects of government expenditures on income distribution. Still other studies evaluate major government expenditures, identify government behavior or welfare by looking at expenditure policies, and study the efficiency and equity of government expenditures at central, state, and local levels. For Latin America much of this work was done by the government budget offices or by international organizations. The works of the Catholic University of Chile, Selowsky, and others should also be mentioned (see the bibliography).

Other studies examine government policies, in particular those for taxes, expenditures, and credit, to see if the rural sector exchanges financial resources with other economic sectors. The objectives of these studies are to analyze agriculture's contribution to economic growth and the effects of government policies on income distribution. Some studies made for Latin American countries along these lines are by Solis, Teubal, Mundlak, and others.

As can be seen in the references for each country, much of the information needed to complete the data for the framework of this report is drawn from these studies. For the section on the effects of government expenditure policies, previous studies are used on the sources of growth of the agricultural sector. These are also listed in the bibliography for each country and include, among others, the works of Hertford, Valdés, Orozco, Langoni, and Reca.

Outside of Latin America, a number of helpful microeconomic studies have been done for different Asian countries. In the case of the United States there are many related studies from the field of public finance. The work of Ott and Ott at the Brookings Institution has been particularly useful.

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AGGREGATE TRENDS AND VARIABILITIES

The Aggregate Concept of Government Expenditure

To arrive at an estimate of aggregate expenditures on the agricultural sector, the budgets of various government institutions must be studied. The expenditures of the central (federal) and state governments and the decentralized government agencies of the nine countries must be accounted for. Within each central and state government, the expenditures made by different ministries or departments must be considered. Not only the expenditures of the Department of Agriculture of each country must be examined, but also the budgets of other departments that serve the agricultural sector.

Expenditures are itemized in government budgets using a functional classification system that is related more closely to the different ministries or departments than to the corresponding economic sectors. For example, a transport expenditure for agriculture may be found in the Department of Public Works budget; expenditures in rural education and health may be included in the Health and Education Department budget; or expenditures on agricultural research done at universities may appear in the Education Department budget.

The procedure is to allocate as agricultural government expenditures all expenditures of the Department of Agriculture. Expenditures from other departments are then estimated using a related series that allocates expenditures according to economic sector. Then the expenditures of decentralized government agencies that directly relate to agriculture are added.

Under this aggregate concept, all kinds of expenditures are included: expenditures for consumption and investment goods, salaries, raw materials, plant and equipment, and so forth. They could be for administration, for research, for construction, or for other purposes.

In this chapter only the aggregate concept is considered. Later, this aggregate data will be used in developing the concept of expenditures as a public input for the production side of agriculture, where the use of the aggregate seems appropriate.[2]

As is usual with classification, there are many criteria that could be used to categorize government expenditures, and there is no one correct way of doing it. In this research, classifying the budget according to current and capital (consumption and investment) expenditures is avoided because it would be arbitrary and useless for this analysis. This study is primarily concerned with effects on production of government expenditures. It is most important that a wide range of expenditures be included, such as research and extension, education, health, irrigation, agrarian reform, and marketing. All of these items could be considered as capital expenditures. Other studies have used means of financing as criteria for classifying expenditures (taxes versus debt), but this method is of no interest here.

The estimates do not include expenditures made by international institutions or foreign countries. The goal at this stage is to know more about domestic government expenditure policies. Previous studies on the expenditures of international institutions in Latin American countries allow comparisons to be drawn between the domestic and international sources of support for the agricultural sector.

Foreign loans directed to the agricultural sector also are excluded. In some cases parts of loan payments may be included in the expenditures, but in general there is no separate account for these estimates. In the

[2] Kendrick uses the concept of total capital, including human and nonhuman capital (John W. Kendrick, *The Formation and Stocks of Total Capital* [New York: Columbia University Press, 1976]). This concept of an aggregate capital was suggested by Frank H. Knight and Irving Fisher.

next chapter some estimates of foreign loans are compared with the figures for expenditures to give an idea of the comparable size of this part of government policy.

Definitions of Data and Variables

The variables used in the expenditure analysis are:

G_{AC} = central government expenditures on agriculture;

G_{AS} = state government expenditures on agriculture;

G_{AD} = decentralized government agencies' expenditures on agriculture;

G_A = total government expenditures on agriculture, equal to the sum of G_{AC}, G_{AS}, and G_{AD}; and

G = total government expenditures for all purposes.

All of these variables are defined for an annual period of time t (a subindex that should be included in all of them but is not used in this section). Therefore, all of them are expenditure flows.

Each of these variables includes expenditures for different purposes, such as irrigation, administration, research and extension, education, health, and so on.

Although it would be more appropriate to measure government expenditures by using the executed budget figures instead of the planned budget figures, this is not always possible. In most cases only the planned government budget is classified by function. In order to take estimates from the executed budget, one has to rely on special studies sometimes made by the budget office itself and sometimes by other researchers. Some studies of the divergences between planned and executed expenditures show large disparities. This problem is taken into account as much as possible. It seems likely that the planned budget for period t would be a good estimate for the executed budget of period $(t-1)$ as most budget decisions are made taking the past trend into consideration. This hypothesis could be tested empirically.

In identifying expenditures on agriculture, it is difficult to be sure that the estimate of G_A includes all the relevant expenditures made by nonagricultural departments. Throughout this report the sources of expenditures will be clarified as much as possible. The Appendix presents in detail the method for constructing the estimates of the different components of G_A. The notes to each table present in detail the source of data and the method used to arrive at the estimates. The Appendix also describes the methodology for obtaining the estimates of expenditures made by nonagricultural departments, such as education and health.

In the construction of the different series, data is taken from various sources of information and put in a common framework. Because of the length of time covered, a number of comparisons and analyses of the coverage and degree of heterogeneity of each source are required. Information is drawn from published and unpublished studies from budget offices and from some international organizations. An effort was made to complete the series for the whole period 1950-78, homogenizing the different sources. In a few cases where data was unavailable for the aggregate expenditures, estimates were made from related series.

Fishing, hunting, and forestry expenditures could not always be split from those for the agricultural sector because these estimates are often included in the agriculture budget. These figures are usually quite small, however.

It is hoped that this study will encourage Latin American governments to clarify their classification of government expenditures. Many governments have already started to work in this direction, but much remains to be done.

The Size and Trend of Government Expenditures

Although the estimate of aggregate government expenditures for the agricultural sector may not be precise, it gives a close idea of their size. In order to cover the whole period 1950-78, estimates of G_{AC} and G_A must be relied on. The longest series for most of the countries is the one for G_{AC} (which covers the central government only), so it will be used to estimate the trend.

Table 1 presents the indexes of real government expenditures in the agricultural sector, expressed in 1960 constant prices. The nominal expenditures are deflated by the implicit gross domestic price index and

Table 1—Indexes of real government expenditures on agriculture, 1950-78

Year	Argentina	Bolivia	Brazil	Chile	Colombia	Costa Rica	Mexico	Peru	Venezuela
1950	87.6	n.a.	n.a.	51.6	52.9	n.a.	124.2	n.a.	26.1
1951	123.8	n.a.	n.a.	52.5	84.9	n.a.	125.6	146.0	26.7
1952	117.2	n.a.	52.4	136.3	82.5	n.a.	117.6	198.9	31.2
1953	145.9	n.a.	68.9	48.1	101.6	n.a.	118.5	166.1	30.0
1954	110.3	n.a.	68.9	46.7	70.1	n.a.	121.4	114.3	30.3
1955	106.8	n.a.	77.7	32.4	71.6	n.a.	110.9	231.2	35.5
1956	127.1	n.a.	81.6	31.6	66.3	n.a.	119.0	294.7	32.6
1957	73.1	n.a.	114.6	54.1	182.3	n.a.	113.5	182.5	47.1
1958	85.2	n.a.	99.0	63.5	124.4	n.a.	113.5	294.2	93.9
1959	72.9	n.a.	89.3	55.2	64.3	100.0	124.9	87.3	80.2
1960	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0
1961	113.8	173.2	107.5	149.7	323.0	n.a.	136.9	222.8	126.9
1962	101.1	202.8	110.2	155.5	235.7	n.a.	121.7	180.4	86.1
1963	96.3	298.3	103.2	167.9	153.4	110.9	182.2	222.2	74.3
1964	117.0	341.9	128.3	127.5	198.4	114.1	249.3	313.2	95.2
1965	116.8	531.8	133.7	154.9	429.6	125.0	148.0	412.2	107.9
1966	135.6	884.4	125.7	188.5	421.8	129.7	157.6	467.7	99.9
1967	162.9	700.6	148.7	213.7	433.9	196.9	250.3	476.7	109.8
1968	184.1	1,054.2	148.1	276.6	599.7	321.9	232.4	513.2	118.9
1969	189.1	956.4	150.3	272.8	592.3	345.3	271.7	493.7	115.7
1970	198.0	1,103.4	166.3	256.3	766.1	320.3	347.3	676.7	125.3
1971	162.7	979.9	161.5	447.0	740.4	448.4	280.6	565.1	142.6
1972	153.5	1,155.3	184.5	427.2	751.8	470.3	427.1	664.0	125.2
1973	145.2	1,506.7	178.1	300.0	596.5	431.3	544.3	920.6	135.9
1974	155.5	1,231.2	216.0	233.8	971.2	464.1	680.2	1,122.8	386.5
1975	149.1	1,402.8	225.7	339.3	396.3	410.9	931.8	1,390.5	320.2
1976	170.5	1,880.4	427.8	168.7	307.8	431.3	627.9	1,297.9	299.2
1977	201.7	2,094.4	471.7	198.9	489.2	535.9	1,148.3	1,210.6	269.1
1978	177.3	2,900.6	670.1	206.6	n.a.	593.8	1,125.8	1,037.0	260.4

Source: Derived from the Appendix, Tables 20-30.

Notes: Indexes for Argentina, Brazil, and Mexico are based on total government expenditures for the agricultural sector, including central and state governments and decentralized government agencies; for the rest of the countries, only central government figures are used. The base year 1960 = 100.

n.a. means "not available."

the wholesale price index for the most recent years.

As is explained in the notes to Table 1, coverage is not the same for all nine countries. This is not a great problem because the countries with less coverage do not have large shares of the other components of G_A. Except for this problem, this appears to be the best way to present the trend of government expenditures in the agricultural sector.

To give a clearer picture of the trend, a graph of the indexes shown in Table 1 is presented in Figure 1. There is a positive trend in government expenditures on agriculture for all nine countries. This positive trend was much more pronounced for some countries (especially Bolivia, Brazil, and Costa Rica) than for others. The lowest increases are observed for Argentina and for Chile due to a decline in recent years. The graph shows that the positive trend did not ascend smoothly for most of the countries. This can also be observed in Table 2, which presents the average annual rate of change of government expenditures for the agricultural sector, computed for different decades. All the countries have variable rates of change. Negative rates of change for Mexico and Peru are observed in the decade 1950-60, and for Argentina, Chile, and Colombia in the decade 1960-70.

Looking at the last column in Table 2, it can be seen that the average annual rate of change of G_A is more than 8 percent for the nine countries together. Except for Argentina, the average annual rate of change is much larger than the rate of economic growth experienced by these countries during this period.

This wide variability of G_A could stem

Figure 1—Trends of indexes of government expenditures on agriculture in Latin America, 1950–78

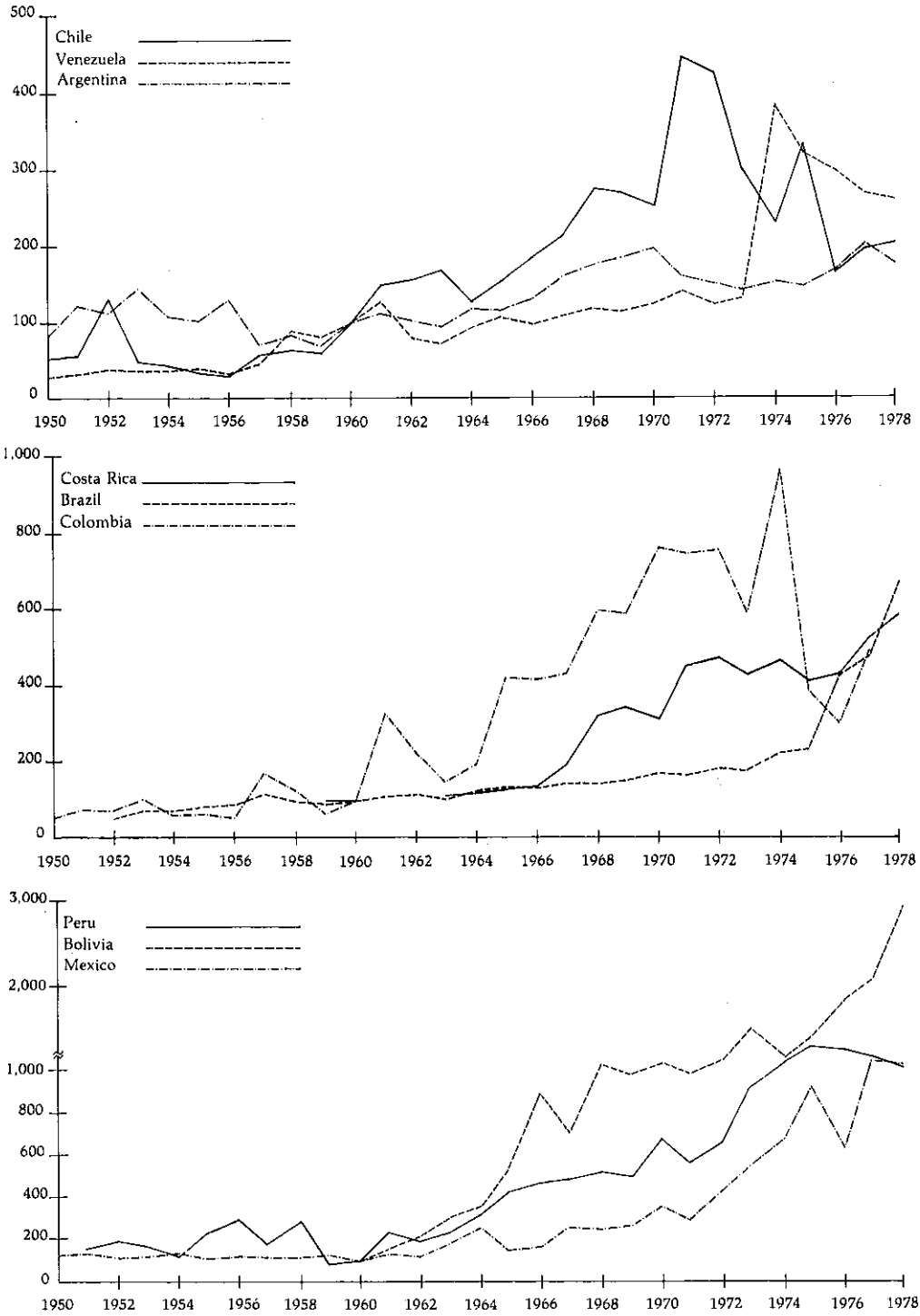

Table 2—Average compounded annual rates of growth of government expenditures on agriculture, 1950-78

Countries	1950-60	1960-70	1970-78	1950-78
		(percent)		
Argentina	1.32	6.83	−1.38	2.52
Bolivia	n.a.	24.01	12.09	18.71
Brazil	8.08	5.09	17.42	9.80
Chile	6.61	9.41	−2.69	4.96
Colombia	6.37	20.36	−6.40	8.24
Costa Rica	n.a.	11.64	7.72	9.90
Mexico	−2.17	12.45	14.70	7.87
Peru	−4.21	19.12	5.33	7.26
Venezuela	13.43	2.26	9.14	8.21

Source: Derived from Table 1.

Notes: The rates are continuous. Irrigation figures were excluded for Brazil, Chile, Colombia, and Peru. The data for Argentina, Brazil, and Mexico are based on total government expenditures for the agricultural sector, including central and state governments and decentralized government agencies. For the rest of the countries, only central government figures are used.

n.a. means "not available."

from many factors. Most of these countries had a high rate of inflation in this period, reducing the reliability of the price index deflator. Time could also cause a degree of heterogeneity in the series. Moreover, in the aggregate some items change more than others (for instance, some subsidies or the state component of G_A). This creates instability in the aggregate.

As will be seen in other chapters, this definite upward trend should have important effects on the growth of the agricultural sector. Looking again at Figure 1, it can be seen that around 1964 most of the nine countries experienced an increase in the positive trend of G_A. This could indicate a degree of interaction between government expenditure policies in Latin American countries.

To compare these government expenditures and to get a better idea of their total size, two estimates for each country are presented. They were obtained from the data with the most complete coverage of expenditures for each country. In Table 3 the education and health components of G_A are excluded; in Table 4 they are included. The decade from 1950-60 is excluded in Table 3 because the data set used for Brazil, Chile, Colombia, and Peru contains more expenditure items but does not include the earlier years. This also explains the lack of some other estimates in Table 3 for those countries. The irrigation component, which is excluded from Table 2 for these countries, is now included to complete the trend for the whole period. Irrigation figures for the other countries are included in Table 2.

The estimates are given in 1960 dollars to facilitate the comparison between countries and to indicate the size of the expenditure. Because of the problems of under- or overvaluation of the dollar in each country, the market exchange rate does not present a viable alternative for comparing expenditures between countries. However, the estimates of purchasing power parity rates made by Kravis et al. and by Salazar-Carrillo indicate similar differences between their estimates and the market rate for eight of the countries considered in this study.[3] (Estimates for Costa Rica are not available.)

To point up the relative significance of the government expenditures for the agricultural sector, as shown in Table 3, these figures can be compared with the $4 billion

[3] Irving B. Kravis, Alan Heston, and Robert Summers, *International Comparison of Real Product and Purchasing Power* (Baltimore, Md.: Johns Hopkins University Press, 1978); and Jorge Salazar-Carrillo, "Real Product and Price Comparisons for Latin America and Other Third World Countries," paper presented at the First Latin American Regional Meeting of the Econometric Society, Buenos Aires, 1980. To compute the figures in 1980 dollars, multiply the numbers in Table 3 by 2.7.

Table 3—Government expenditures on agriculture, 1960-78

Year	Argentina	Bolivia	Brazil	Chile	Colombia	Costa Rica	Mexico	Peru	Venezuela
					(U.S. $ million 1960)				
1960	55.3	1.5	211.8	46.9	n.a.	n.a.	71.8	8.0	n.a.
1961	62.9	2.6	230.9	68.0	n.a.	n.a.	98.2	18.2	n.a.
1962	55.9	3.1	241.9	68.1	n.a.	n.a.	87.4	16.3	n.a.
1963	53.3	4.5	225.7	81.0	n.a.	n.a.	130.7	20.9	n.a.
1964	64.7	5.2	282.4	56.4	n.a.	n.a.	178.9	25.5	n.a.
1965	64.6	8.0	297.8	68.0	n.a.	n.a.	106.2	37.4	n.a.
1966	75.0	13.3	281.6	78.3	n.a.	n.a.	113.1	47.7	n.a.
1967	90.1	10.6	348.5	88.0	247.4	n.a.	179.6	46.3	n.a.
1968	101.8	15.9	n.a.	104.0	366.9	n.a.	166.8	44.8	216.3
1969	104.6	14.4	n.a.	101.0	370.3	n.a.	195.0	41.0	211.6
1970	109.5	16.6	441.9	96.4	537.6	n.a.	249.2	53.7	213.1
1971	90.0	14.8	448.5	166.3	555.2	13.2	201.4	48.4	251.2
1972	84.9	17.4	507.4	161.8	462.9	15.6	306.5	59.4	231.8
1973	80.3	22.7	686.8	n.a.	419.9	15.2	390.6	87.8	242.5
1974	86.0	18.6	866.2	n.a.	n.a.	13.9	488.1	117.0	672.8
1975	82.5	21.1	n.a.	n.a.	366.6	12.4	668.6	n.a.	668.4
1976	94.3	28.3	n.a.	n.a.	317.7	n.a.	450.6	n.a.	636.4
1977	111.6	31.6	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	563.5
1978	97.8	43.7	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.

Sources: Derived from the Appendix, Tables 20-30.

Notes: These figures exclude expenditures on rural education and health. Irrigation figures are included as well as figures for some decentralized government agencies for all of the countries included. This table extends the data included for Argentina, Brazil, and Mexico in Table 1 (and Tables 20-30 of the Appendix) to include the rest of the countries.

n.a. means "not available."

spent by the U.S. government on agriculture in 1960. The nine countries together spent more than $500 million in that year. If the comparison is made for 1978, the amount spent by the Latin American countries collectively is closer to that of the U.S. federal government.

Brazil spent the greatest amount on its agricultural sector, as would be expected from its size. Colombia, Mexico, and Venezuela follow in importance. Venezuela's high rate of expenditure is unexpected, as is Bolivia's. The figures for Bolivia are extremely high for a country its size. Table 3 shows the same upward trend for most of the nine countries that was noted in Table 2.

In Table 4 the aggregate of G_A includes the government expenditures for education and health that could be allocated to the agricultural sector. Thus the figures in Table 4 equal those in Table 3 plus the education and health components. As the Appendix explains, in general the total amount spent by the government for these services is found in the Education and Health Department budgets. Data on school attendance in the urban and rural sectors and those for rural members of health or social security institutions are used to determine the agricultural component of these expenditures.

Table 4 shows the estimates of G_A for selected years (the complete series could be computed from the data provided in the Appendix). If these figures are compared with those for G_{AC} only (which are taken directly from the functional classification of the federal budget), it can be seen how much progress has been made toward estimating total government expenditures for the agricultural sectors of the nine countries.

The education and health components are quite important for Argentina, Colombia, Costa Rica, Mexico, and Venezuela. If the trend is computed using this more inclusive concept, the average annual rate of change shown in Table 2 increases slightly for Argentina, Brazil, Mexico, and Venezuela, whereas it decreases for Bolivia, Chile, and Costa Rica (because the education and health component grew less than the components considered previously).

Foreign Loans

As stated earlier, foreign loans to the agricultural sector are excluded from the

Table 4—Government expenditures on agriculture, including education and health components, selected years

Country	1950	1955	1960	1965	1970	1975
			(U.S. $ million 1960)			
Argentina	94.3	112.2	106.5	155.0	233.7	194.8
Bolivia	n.a.	n.a.	3.4	11.9	23.9	n.a.
Brazil	n.a.	n.a.	264.7	381.6	532.4	n.a.
Chile	n.a.	n.a.	n.a.	84.0	119.7	n.a.
Colombia	n.a.	n.a.	n.a.	n.a.	590.8	437.7
Costa Rica	n.a.	n.a.	n.a.	n.a.	23.1	29.7
Mexico	106.9	109.3	134.2	252.3	489.6	984.3
Venezuela	n.a.	n.a.	n.a.	n.a.	280.9	764.1

Sources: Derived from the Appendix, Tables 20-30.

Note: The figures in this table are the same as those presented in Table 3, except for the addition of the education and health components.

aggregate expenditures. For the sake of comparison, however, these figures will now be examined. Considering only the loans that the Inter-American Development Bank made to the agricultural sector in the nine countries from 1961 to 1977, the total amount of these loans can be compared with the total amount spent by the government in the same period, using the data collected for the indexes in Table 2. The foreign loans/government expenditure ratios are equivalent to 15.6 percent for Argentina, 15.5 percent for Bolivia, 5.1 percent for Brazil, 6.3 percent for Chile, 7.8 percent for Colombia, 47.0 percent for Costa Rica, 17.5 percent for Mexico, 16.9 percent for Peru, and 1.3 percent for Venezuela. The average of this ratio for the nine countries is 8.8 percent. If a more comprehensive concept of government expenditures is considered, as in Table 4, this percentage is much less. These figures for foreign loans made by the Inter-American Development Bank are presented in Table 5. The yearly variations are quite high; for this reason the accumulated figures for the whole period are compared.

Agriculture Versus Other Government Expenditures

Another way to look at the size and trend of government expenditures on agriculture is to compare them with other government expenditures. Comparisons will be made with the following important components of the government budget: education, health, transport, communications, and public works (covering all economic sectors). Only the central government data will be considered for comparability because of the lack of information at the other levels.

Table 6 presents the share of these expenditures in the central government budget. It can be seen that the agricultural share is much smaller than the shares of the others. Furthermore, the shares of the other government expenditures are more stable over the time period. Perhaps because expenditures on education, health, transport, communications, and public works are directed to the whole economy (part of which goes to the agricultural sector), this wider coverage gives them more stability than expenditures that are directed to only one economic sector. Caution must be taken, however, in interpreting this data for the central governments alone. In many cases, especially in Argentina and Brazil, the state governments play a significant role in allocating expenditures. A table that includes state figures could give quite a different picture.

Credit Policy

As specified before, government credit policy is not considered here. This policy could be used, however, to transfer income to the agricultural sector if the government through its banking policy gave credit to agriculture at negative real rates of interest. In some cases this implicit subsidy could be

Table 5—Loans of the Inter-American Development Bank to agriculture in Latin America, 1961-77

Year	Argentina	Bolivia	Brazil	Chile	Colombia	Costa Rica	Mexico	Peru	Venezuela
					(U.S. $ 1,000)				
1961	1,600	2,000	0	12,766	0	2,600	13,000	1,000	0
1962	5,528	9,048	10,609	2,211	0	0	10.658	0	12,700
1963	23,543	1,535	2,000	600	0	669	55,402	905	4,729
1964	20,428	0	2,700	3,485	7,968	360	9,800	3,500	0
1965	0	0	20,500	962	0	5,200	0	0	0
1966	0	0	0	11,000	9,700	399	29,610	38,687	0
1967	11,047	0	15,138	0	22,900	0	67,100	0	0
1968	0	0	0	10,781	10,800	0	58,721	0	0
1969	29,724	4,253	24,184	29,989	9,641	2,500	35,896	0	0
1970	0	0	73,684	0	1,000	0	46,867	16,053	52,708
1971	0	0	0	0	18,429	0	32,000	10,097	0
1972	0	0	9,938	0	0	6,000	75,265	0	0
1973	11,500	0	0	0	6,002	0	48,522	6,000	0
1974	45,280	0	0	17,413	0	0	136,921	0	0
1975	122,963	2,200	40,000	0	0	13,600	154,972	0	0
1976	61,131	4,200	66,400	38,000	64,000	0	46,443	30,000	0
1977	0	8,500	0	0	0	15,300	216,564	0	0

Source: Banco Interamericano de Desarrollo, "Anexo Estadístico del Documento GN-1174-12," Washington, D.C., February 17, 1978.

Notes: These loans were given to both the private and public sectors.

For the whole period, agriculture received the following share of loans: in Argentina, 22.2 percent; in Bolivia, 7.6 percent; in Brazil, 10.3 percent; in Chile, 22.3 percent; in Colombia, 16.5 percent; in Costa Rica, 15.5 percent; in Mexico, 65.1 percent; in Peru, 21.4 percent; and in Venezuela, 22.4 percent.

quite significant—comparable to some of the main components of government expenditures on agriculture.

For example, for Brazil the end balance credit to agriculture made by the Bank of Brazil was more than three times larger than the amount of government expenditures on agriculture in the period 1950-68. If the subsidy were, for example, 10 percent per year of total credit, the income transfer would be about 30 percent of G_A. These figures for Brazil could hold true for many countries. But this is only an exercise; a deeper study of credit policy is needed to give an accurate idea of the size of this policy.

Table 6—Shares of various components of central government expenditures, 1950, 1960, and 1975

Country	Agriculture			Education			Health			Transport and Other[a]		
	1950	1960	1975	1950	1960	1975	1950	1960	1975	1950	1960	1975
	(percent)											
Argentina	2.9	2.5	1.5	10.4	10.9	15.7[b]	5.3	5.8	6.0[b]	14.5	23.9	16.6[b]
Bolivia	n.a.	4.2	23.3[b]	n.a.	n.a.	16.4[b]	n.a.	n.a.	7.4[b]	n.a.	n.a.	8.5[b]
Brazil	4.6	3.9	1.1	n.a.	6.8	6.2[b]	n.a.	4.0	1.6[b]	n.a.	21.6	16.4[b]
Chile	3.3	4.0	5.5[b]	n.a.	12.1	12.6	n.a.	10.2	8.1	n.a.	17.6	14.5
Colombia	4.9	4.5	5.6	5.6	n.a.	19.8	4.6	n.a.	9.3	46.5	n.a.	32.7[b]
Costa Rica	n.a.	1.8	2.9	n.a.	n.a.	22.0	n.a.	n.a.	2.1	n.a.	n.a.	16.7
Mexico	16.6	4.5	10.1	6.4	9.5	15.7	3.1	2.4	3.8	10.8	8.0	15.1
Peru	5.9	2.6	8.5	n.a.	n.a.	21.4	n.a.	n.a.	5.3	n.a.	n.a.	4.3
Venezuela	5.5	7.0	8.6	5.9	7.5	21.3[b]	6.3	6.7	13.3	34.3	23.3	21.3

Sources: Derived from the Appendix, Tables 20-30.

Note: n.a. means "not available."

[a] Includes transport, communications, and public works.

[b] Refers to 1970.

4

THE RELATIVE IMPORTANCE OF GOVERNMENT EXPENDITURES ON AGRICULTURE AND SOME DETERMINANTS

The relative size of government expenditures on agriculture, G_A, will now be shown in comparison to three important variables: total government expenditures (G), the value added of the agricultural sector (A), and the gross domestic product (Y). Each of these three variables satisfies a different purpose of comparison. They are used in a complementary way.

In this chapter these three ratios are given:

G_A/G = the share of government expenditures on agriculture in the total government budget;

G_A/A = the share of government expenditures on agriculture in the value added of the agricultural sector; and

G_A/Y = the share of government expenditures on agriculture in the gross domestic product.

The first ratio, G_A/G, indicates the degree of concern for agriculture of each government during the time period studied. Although expenditure policy is not the only way government intervenes in the agricultural sector, it is an important part of it.

The second ratio, G_A/A, gives another view of each government's effort to support its agricultural sector. Although the effect of government expenditure on agricultural production should be studied using marginal analysis (how much of the change in A is due to G_A), this ratio, for certain production functions, illustrates this effect quite well. For these purposes, the value and the fluctuations of G_A/A are relevant.

The ratio G_A/Y indicates the importance of G_A in the whole economy, making it comparable to other variables expressed in gross domestic product units (Y is used as a kind of numeraire). This ratio could be useful for comparisons between countries.

Table 7 presents the estimates of the three ratios. To compute the ratios, G_A is taken from the data used for the indexes in Table 1.[4]

To obtain an overall picture of the three ratios for the whole period, the arithmetic means, the standard deviations, and the coefficients of variation are all computed. These are presented in Table 8. A number of conclusions can be drawn from it. The average values for the ratios G_A/G, G_A/A, and G_A/Y for the nine countries are about 8 percent, 8 percent, and 1 percent, respectively. But there are large discrepancies between the ratios for the different countries. The stability of these ratios is different for each country. For example, Brazil has the most variability for G_A/G, but the least for the other two ratios (measuring the degree of stability by the coefficient of variation). Bolivia, Chile, and Peru have the most instability if the three ratios are taken together.

The average values of the three ratios for these nine countries are larger than those observed for other countries. The average value of the ratio G_A/G for the United States from 1948-76 was 3.71 percent and the coefficient of variation was 0.56 percent.[5] As can be seen in Table 8, this coefficient of variation is higher than the highest one for Latin America. This could mean that the instability of this ratio is not confined to Latin America. It could be due in part to the inclusion in G_A of some transfer payments and to the fluctuations in the expenditures on some components, such as irrigation.

[4] The indexes from Table 1 were used except for Brazil and Colombia for the ratios G_A/A and G_A/Y. For those countries the data for G_A that includes the expenditure for state governments and decentralized agencies were used.

[5] David J. Ott and Attiat F. Ott, *Federal Budget Policy*, 3rd ed. (Washington, D.C.: Brookings Institution, 1977).

Table 7—Importance of government expenditures on agriculture (G_A) compared to total government expenditures (G), value added of agriculture (A), and gross domestic product (Y), 1950-78

Year	Argentina			Bolivia			Brazil		
	G_A/G	G_A/A	G_A/Y	G_A/G	G_A/A	G_A/Y	G_A/G	G_A/A	G_A/Y
	(percent)								
1950	2.94	3.23	0.602	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.
1951	3.58	4.27	0.808	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.
1952	4.03	4.72	0.823	n.a.	n.a.	n.a.	4.56	1.97	0.554
1953	4.44	4.49	0.970	n.a.	n.a.	n.a.	5.01	2.72	0.745
1954	3.13	3.41	0.702	n.a.	n.a.	n.a.	4.87	2.43	0.653
1955	2.92	3.18	0.626	n.a.	n.a.	n.a.	5.06	2.64	0.715
1956	3.54	3.96	0.745	n.a.	n.a.	n.a.	5.73	2.82	0.723
1957	1.94	2.29	0.399	n.a.	n.a.	n.a.	5.61	3.61	0.936
1958	2.55	2.55	0.422	n.a.	n.a.	n.a.	4.18	3.04	0.748
1959	2.41	2.21	0.387	n.a.	n.a.	n.a.	4.07	2.72	0.664
1960	2.54	2.98	0.495	4.2	1.20	0.371	3.89	2.90	0.680
1961	2.41	3.41	0.533	7.7	1.98	0.631	2.26	2.90	0.661
1962	2.75	2.92	0.477	7.9	2.34	0.698	2.49	2.82	0.645
1963	2.61	2.72	0.460	11.7	3.25	0.969	3.22	2.61	0.594
1964	3.04	3.09	0.497	13.3	3.66	1.063	3.55	3.20	0.718
1965	2.55	2.92	0.462	11.9	5.39	1.547	2.81	2.95	0.731
1966	2.69	3.51	0.541	23.2	8.64	2.386	2.43	2.85	0.650
1967	2.71	4.05	0.649	16.0	7.05	1.845	2.88	3.20	0.736
1968	3.03	4.76	0.706	24.7	10.11	2.608	2.21	3.13	0.672
1969	3.06	4.70	0.680	24.6	9.59	2.251	1.51	3.10	0.625
1970	3.13	4.68	0.677	23.3	13.00	2.328	1.21	3.24	0.627
1971	2.67	4.32	0.530	18.6	10.27	1.885	1.50	2.82	0.548
1972	2.74	4.04	0.485	16.4	10.93	2.357	1.30	3.94	0.560
1973	2.23	3.28	0.432	22.6	13.72	2.456	1.11	3.31	0.475
1974	3.63	3.30	0.434	22.4	14.75	2.749	1.49	4.36	0.549
1975	1.48	3.25	0.425	23.0	16.55	2.977	1.10	4.40	0.552
1976	1.74	4.10	0.502	26.1	20.91	3.549	1.59	n.a.	0.962
1977	2.88	3.55	0.576	26.3	19.13	3.277	1.41	n.a.	0.921
1978	2.50	3.95	0.518	32.9	25.90	4.401	n.a.	n.a.	1.231

Year	Chile			Colombia			Costa Rica		
	G_A/G	G_A/A	G_A/Y	G_A/G	G_A/A	G_A/Y	G_A/G	G_A/A	G_A/Y
	(percent)								
1950	3.33	4.92	0.562	4.89	n.a.	n.a.	n.a.	n.a.	n.a.
1951	3.09	5.11	0.541	6.50	n.a.	n.a.	n.a.	n.a.	n.a.
1952	7.06	13.60	1.317	6.05	n.a.	n.a.	n.a.	n.a.	n.a.
1953	2.38	4.39	0.439	6.15	n.a.	n.a.	n.a.	n.a.	n.a.
1954	2.42	4.22	0.428	3.96	n.a.	n.a.	n.a.	n.a.	n.a.
1955	1.61	2.83	0.292	1.98	n.a.	n.a.	n.a.	n.a.	n.a.
1956	1.63	2.72	0.282	3.30	n.a.	n.a.	n.a.	n.a.	n.a.
1957	2.52	4.75	0.447	10.90	n.a.	n.a.	n.a.	n.a.	n.a.
1958	2.06	5.71	0.515	6.66	n.a.	n.a.	n.a.	n.a.	n.a.
1959	2.19	4.97	0.449	3.35	n.a.	n.a.	1.92	1.047	0.237
1960	4.03	8.14	0.875	4.52	n.a.	n.a.	1.80	0.859	0.224
1961	5.09	10.71	1.090	10.37	10.67	3.30	n.a.	n.a.	n.a.
1962	4.70	11.91	1.075	7.23	12.85	3.76	n.a.	n.a.	n.a.
1963	5.39	11.96	1.108	5.42	10.56	3.00	1.70	0.925	0.226
1964	4.33	8.27	0.808	7.23	8.13	2.49	1.68	0.925	0.227
1965	4.21	9.72	0.936	13.84	11.52	3.31	1.66	0.974	0.229
1966	4.67	12.37	1.062	11.76	9.94	2.78	1.53	0.946	0.219
1967	5.62	13.50	1.177	12.44	10.87	3.02	2.09	1.342	0.309
1968	6.77	21.00	1.481	13.88	14.69	4.06	3.34	2.011	0.462
1969	6.35	20.59	1.380	11.14	18.33	4.92	3.21	1.996	0.460
1970	5.49	19.12	1.199	13.96	21.59	5.60	2.63	1.742	0.392
1971	n.a.	26.89	1.987	12.20	25.02	6.35	3.01	2.598	0.525

(continued)

Table 7—Continued

1972	4.81	26.74	1.914	11.90	20.05	5.05	2.95	2.604	0.508
1973	4.50	20.56	1.343	9.04	16.82	4.42	2.34	2.221	0.429
1974	3.43	10.01	1.068	16.09	n.a.	n.a.	3.03	2.715	0.494
1975	2.20	23.58	1.670	5.61	12.98	3.52	2.92	2.028	0.412
1976	2.46	10.28	0.874	5.21	10.92	2.93	1.87	2.298	0.444
1977	2.66	10.61	1.095	7.61	n.a.	n.a.	2.29	2.394	0.475
1978	1.99	11.36	0.919	n.a.	n.a.	n.a.	2.23	2.526	0.497

Year	Mexico			Peru			Venezuela		
	G_A/G	G_A/A	G_A/Y	G_A/G	G_A/A	G_A/Y	G_A/G	G_A/A	G_A/Y
	(percent)								
1950	16.60	7.84	1.28	n.a.	n.a.	n.a.	5.47	12.52	0.997
1951	14.07	7.75	1.21	5.92	2.60	0.662	4.64	11.25	0.846
1952	10.09	7.07	1.10	7.14	3.46	0.856	5.43	12.27	0.923
1953	11.93	6.68	1.05	5.72	2.28	0.676	5.08	11.39	0.834
1954	9.59	6.07	1.03	3.86	1.62	0.463	4.51	11.50	0.771
1955	8.67	5.20	0.87	6.25	3.40	0.882	4.85	12.77	0.827
1956	8.57	5.59	0.89	7.45	4.85	1.083	3.69	10.98	0.688
1957	8.00	4.96	0.79	4.49	3.15	0.668	4.22	15.22	0.962
1958	7.06	4.66	0.76	6.70	4.74	1.056	7.44	28.99	1.890
1959	7.59	5.25	0.80	2.39	1.44	0.328	5.90	23.77	1.498
1960	4.45	3.94	0.60	2.61	1.64	0.332	6.97	27.44	1.828
1961	6.24	5.24	0.79	4.71	3.38	0.684	8.91	34.23	2.274
1962	5.75	4.40	0.66	3.39	2.64	0.507	6.65	21.76	1.459
1963	8.84	6.35	0.92	3.68	3.61	0.602	5.64	17.17	1.212
1964	9.17	8.13	1.14	4.37	4.80	0.799	7.12	20.38	1.434
1965	4.29	4.54	0.64	5.04	6.32	1.004	7.65	21.82	1.544
1966	5.37	4.71	0.64	5.33	6.97	1.075	6.82	19.24	1.397
1967	6.98	7.38	0.94	5.31	7.28	1.072	7.48	19.83	1.463
1968	6.59	6.69	0.80	5.98	8.21	1.119	7.28	22.03	1.505
1969	6.61	7.75	0.88	5.95	7.85	1.051	6.56	18.98	1.414
1970	8.35	9.39	1.04	7.19	9.58	1.342	7.58	21.44	1.500
1971	6.68	7.46	0.82	5.37	8.02	1.057	7.37	25.86	1.650
1972	7.63	11.34	1.17	8.78	8.62	1.190	6.55	22.84	1.395
1973	8.50	14.17	1.38	9.14	11.68	1.546	7.41	24.07	1.444
1974	9.80	17.25	1.63	8.46	12.80	1.728	8.60	64.70	2.890
1975	10.06	23.29	2.14	11.20	15.91	2.361	8.61	49.24	2.740
1976	6.04	16.47	1.41	10.17	14.67	2.121	8.73	46.60	2.600
1977	5.00	28.39	2.64	9.77	13.75	2.003	6.56	35.85	2.240
1978	4.47	26.98	2.42	8.98	11.77	1.747	7.15	31.86	2.122

Source: Government expenditures on agriculture are taken from the indexes in Table 1, which in turn are derived from the Appendix, Tables 20-30.

Note: n.a. means "not available."

Transfer payments most likely explain the variability in the ratio for the United States.

The differences observed in the average values of the three ratios across countries may also be explained in part by the different roles played by the private sector in each country and by the differences in other government policies. In some countries expenditure policies may be more important than in others. The differences from country to country are more noticeable for the first two ratios: G_A/G and G_A/A. For the gross domestic product, G_A/Y, it looks as if each country is spending a similar proportion.

Some Determinants

In an attempt to identify the primary determinants of government expenditures in the agricultural sector, G_A, the approach chosen for this report is more descriptive than theoretical, although it provides insights into the movements and trends of G_A.

In looking for the direct determinants of the ratio G_A/Y (government expenditures in the agricultural sector as a share of the gross domestic product) and for the absolute value of the expenditures on agriculture,

Table 8—Arithmetic means, standard deviations, and coefficients of variation of the ratios G_A/G, G_A/A, and G_A/Y, 1950-78

Ratios	Argentina	Bolivia	Brazil	Chile	Colombia	Costa Rica	Mexico	Peru	Venezuela
					(percent)				
G_A/G									
Mean	2.82	18.80	2.96	3.82	8.33	2.34	8.03	6.26	6.58
Standard deviation	0.63	7.70	1.53	1.61	3.89	0.60	2.79	2.32	1.41
Coefficient of variation	0.22	0.41	0.52	0.42	0.47	0.26	0.35	0.37	0.21
G_A/A									
Mean	3.58	10.44	3.07	11.74	14.33	1.79	9.48	6.68	24.00
Standard deviation	0.74	6.91	0.56	7.14	4.95	0.69	6.73	4.31	12.56
Coefficient of variation	0.21	0.66	0.18	0.61	0.35	0.39	0.71	0.64	0.52
G_A/Y									
Mean	0.57	1.97	0.70	0.98	3.90	0.38	1.12	1.07	1.53
Standard deviation	0.15	1.10	0.16	0.46	1.14	0.12	0.51	0.53	0.60
Coefficient of variation	0.25	0.56	0.23	0.47	0.29	0.32	0.46	0.50	0.39

Notes: G_A/G = share of government expenditures on agriculture in total government expenditures;
G_A/A = share of government expenditures on agriculture in the value added of agriculture;
G_A/Y = share of government expenditures on agriculture in the gross domestic product.

the following equations are proposed:

$$G_A/Y = G_A/G \cdot G/Y, \quad (1)$$

$$G_A/Y = G_A/A \cdot A/Y. \quad (2)$$

Equations (1) and (2) are two identities, but they separate the value of G_A/Y into two important components. Equation (1) says that the variation in the share of G_A in the gross domestic product (Y) could be due either to the variation of the share of G_A in the total government budget (G) or to variations in the share of the total government budget in Y. Equation (2) says that the variation in G_A/Y could be due to variations of the share of G_A in the value added of the agricultural sector (A) or to the variations of the share of the agricultural sector in the gross domestic product (Y). These two expressions help to identify the sources of variation of G_A/Y, which could explain the main determinants of the changes.

To see which of the ratios to the right of equations (1) and (2) explains the variation of G_A/Y, one can look directly at the values of the ratios presented in Table 7, or compute determination coefficients between them to summarize the information for the whole period.

The ratios G/Y and A/Y can also be computed from Table 7. If this is done, it can be seen that most of the variability in the ratio G_A/Y results from the variability in the ratios G_A/A and G/Y. This is true for most of the countries.

Table 9 presents the simple determination coefficients of the ratios that appear in equations (1) and (2). They are computed for each of the ratios, G_A/Y, and each of the ratios shown in the second line of the table, using the values presented in Table 7 for the period 1950-78. The conclusions derived from Table 9 are significant. There is a closer relationship of G_A/Y with G_A/G than with G/Y. This means that the variations in G_A/Y can be attributed more to the variations in the share of G_A in the total government budget, G. And there is a closer relationship of G_A/Y with G_A/A than with A/Y, which means that the sources of variation of G_A/Y depend more on the variations of the share of G_A in the value added of the agricultural sector, A, than in the share of the agricultural sector in the gross domestic product. In other words, the ratios G/Y and A/Y play a less important role in explaining the variations of G_A/Y.

This finding that the share of government expenditures on agriculture in the total government budget is one of the major causes of change in the share of government expenditures on agriculture in the national income is important (even at this descriptive

Table 9—Simple determination coefficients (R^2) of ratios in equations (1) and (2), 1950-78

Country	R^2 of G_A/Y to:			
	G_A/G	G/Y	G_A/A	A/Y
Argentina	0.65	0.19	0.59	0.29
Bolivia	0.89	0.33	0.88	0.57
Brazil	0.41	0.25	0.03	0.35
Chile	0.96	0.29	0.90	0.41
Colombia	0.22	0.07	0.99	0.53
Costa Rica	0.16	0.09	0.96	0.61
Mexico	0.27	0.31	0.87	0.30
Peru	0.72	0.50	0.87	0.33
Venezuela	0.75	0.82	0.93	0.44

Note: Equation (1) is $G_A/Y = G_A/G \cdot G/Y$ and equation (2) is $G_A/Y = G_A/A \cdot A/Y$, where G_A = government expenditures on agriculture, Y = gross domestic product, G = total government expenditures, and A = value added or output of agriculture.

stage). It indicates that government expenditure policy is an active force; many political decisions are involved in its evolution.

To find the main direct determinants of the absolute value of government expenditures in the agricultural sector, G_A, a simple model is proposed:

$$G_A = f(G, A, Y). \quad (3)$$

Equation (3) presents the variable G_A as a function of three variables: the total government budget (G), the value added of the agricultural sector (A), and the size of the economy measured by the gross domestic product (Y). The variables chosen are not derived from a theory of government expenditure decisions. They merely describe the determinants of the variation of G_A. One can also think of them as trend variables that mainly explain the trend of G_A.

Equation (3) complements the analysis of equations (1) and (2). Their purpose was to identify the sources of variation of the relative share of G_A in the gross domestic product (G_A/Y). Equation (3) refers to the absolute trend and variation of G_A, although the values of the parameters of the variables G, A, and Y also help to explain the behavior of the relative importance of G_A.

Table 10 gives the regression estimates of equation (3). To estimate the regression, G_A, G, and Y are deflated by the implicit gross domestic product deflator and A is deflated by the wholesale price index of agricultural products. Ordinary least squares are applied to estimate the regressions. Although there could be some degree of endogeneity in the

Table 10—Regression coefficients explaining government expenditures on agriculture

Country	Total Government Expenditure (G)	Value Added of Agriculture (A)	Gross Domestic Product (Y)	R^2
Argentina	0.94	1.10	0.06	0.478
	(1.71)	(0.42)	(0.27)	
Bolivia	0.16	12.29	3.39	0.920
	(0.02)	(1.80)	(3.75)	
Brazil	0.17	2.58	0.14	0.770
	(0.63)	(2.73)	(0.59)	
Chile	2.22	−5.45	1.72	0.839
	(0.63)	(−0.83)	(1.77)	
Colombia	1.67	−97.35	25.95	0.869
	(0.87)	(−5.24)	(6.12)	
Costa Rica	0.00	−0.35	0.73	0.922
	(0.51)	(−0.21)	(2.70)	
Mexico	4.40	−17.94	1.95	0.900
	(1.97)	(−2.44)	(2.19)	
Peru	6.92	7.60	−0.16	0.873
	(1.46)	(1.93)	(−0.13)	
Venezuela	6.18	−22.24	1.98	0.970
	(4.84)	(−2.56)	(2.47)	

Note: Values without parentheses represent the regression coefficients and those in parentheses are the t-statistics. The estimated regression equation is $G_A = a + bG + cA + dY$, where G_A is government expenditures on agriculture.

independent variables, this method still seems appropriate.

The regressions in Table 10 fit reasonably well; the R^2 is high for all the countries but Argentina. In four out of the nine countries, only one variable is a major determinant (G for Argentina, A for Brazil, and Y for Chile and Costa Rica). For Bolivia, Colombia, and Peru two variables play important roles; A is the only one that appears for all three countries. For Mexico and Venezuela G, A, and Y are all significant.

Taking all of the results together, the value added of the agricultural sector, A, and the gross domestic product, Y, are each significant in six countries, the total government budget, G, is significant in only three countries.

These results do not contradict the analysis of equations (1) and (2), where the ratio G_A/G played an important role in explaining the variation of G_A/Y. The regression analysis explains the trend of G_A more than its variability.

As mentioned earlier, analyzing the determinants of government expenditures in the agricultural sector is a good start toward building a behavioral model. There are other analyses that could be done, but they would not contribute to the main purpose of this report.

An additional useful description of the series of G_A arises from the application of time-series statistical analysis to see if these series respond to a stochastic process. A reasonable hypothesis could be that the time series of G_A respond to an autoregressive process (as the budget of year t depends on the budgets approved for previous years). The simple determination coefficient between G_A for period t and G_A for period (t−1) is computed. This is an autoregressive process of the first order. The simple determination coefficient R^2 takes values higher than 0.6 for seven countries, and only for Chile and Venezuela is it very low. But when the simple determination coefficient for the same model is computed using the yearly changes of G_A (the change of G_A in period t with respect to the change of G_A in the previous period), it decreases to less than 0.2. The results of this simple time-series analysis support the previous analyses of the behavior of G_A and G_A/Y, using equations (1) to (3).

5

CHANGES IN THE COMPOSITION OF EXPENDITURES

The previous chapter concentrated on the aggregate concept of government expenditures on agriculture, G_A. Now the components of the aggregate and the changes in its composition over time and from country to country will be analyzed.

There are many reasons for studying changes in the composition of government expenditures. In some cases the effects of government expenditure policy cannot be identified using the aggregate approach. In other cases it is necessary to assign different weights to each of the components to arrive at an appropriate aggregate because of differences in the time they take to go into effect or differences in the rate of return of various expenditures. Some variations in the effects of aggregate government expenditures can be explained by differences in their composition. To identify such differences, changes in the composition of expenditures must be studied.

In this report expenditures are broken down into three components: research and extension, irrigation, and education and health.[6] It would be interesting to study other expenditure compositions, for instance, a breakdown by consumption and investment goods, or by economic region; but for the reasons explained in Chapter 3 this is not attempted.

Research and Extension

Government expenditures on research and extension have received a good deal of attention in the field of agricultural economics. There are already a number of studies that provide estimates for Latin American countries. This concentration on the research and extension component evolves from the interest in the analysis and identification of technological change. Technology is believed to play an important role in the growth of the whole economy, and for the agricultural sector it seems possible to determine the size of the investment in technology.

To analyze the role of research and extension expenditures, one could consider various indicators, such as the number of people employed in this activity; the amount of capital input used; and the effect on the product, measured by plant varieties, new seeds, and so forth. However, only the expenditures for each component are examined in this study because it is felt that they already incorporate most of the necessary information for studying the effect of the component on agricultural development.

Expenditures on research and extension are made through federal and state agricultural research and extension stations and through departments of agricultural science at universities. Some countries account for these expenditures separately with a clear classification of the decentralized agencies involved in research. In other countries it is more difficult to get reasonable estimates. These difficulties are compounded if countries have changed their budget classifications during the time period, separating decentralized agencies from the agricultural secretariats. Series jump in some years because of these changes.

Table 11 presents the estimates of the expenditures on research and extension for selected years and their share of total government expenditures in the agricultural sector, G_A. The share is computed using the figures for G_A from Table 3 (which is the table with the highest coverage because it includes some expenditures of decentralized agencies although it excludes the education and health components). Table 11 also uses the data from the Appendix and some of the estimates provided by Boyce and Evenson.[7]

[6] Alberto Valdés suggested the importance of identifying government expenditures on land reforms. These expenditures appear to be significant for some countries, particularly Chile, Peru, and Colombia. Further information on agrarian reform is presented in the "Other Components" section near the end of this chapter.

[7] James Boyce and Robert E. Evenson, *Agricultural Research and Extension Programs* (New York: Agricultural Development Council, 1975).

Table 11—Government expenditures on agricultural research and extension and their share of total spent on agriculture, selected years

Country	Value				Share of G_A			
	1950	1960	1970	1975	1950	1960	1970	1975
	(U.S. $ million 1960)				(percent)			
Argentina	n.a.	10.7[b]	18.7	21.3	n.a.	17.0[b]	17.0	26.0
Bolivia	n.a.	0.3[a]	0.3[c]	0.2[d]	n.a.	17.0[a]	2.0[c]	1.0[d]
Brazil	1.2	3.8	9.0	79.3	n.a.	2.0	2.0	9.0
Chile	n.a.	0.7[a]	1.7	1.4	n.a.	1.5[a]	2.0	1.0
Colombia	2.6	4.1	8.9	12.2[d]	n.a.	7.0	2.0	2.9[d]
Costa Rica	n.a.	n.a.	2.8[c]	1.6	n.a.	n.a.	21.0[c]	13.0
Mexico	0.6	2.9	6.0	15.2	1.0	4.0	2.0	2.0
Peru	n.a.	0.6[a]	5.6[c]	5.9[d]	n.a.	8.0[a]	12.0[c]	5.0[d]
Venezuela	n.a.	60.6	46.3	37.1	n.a.	n.a.	22.0	6.0

Sources: Derived from Table 3 and the Appendix, Tables 20-30. Figures for Bolivia, Peru, 1959 for Chile, and 1974 for Colombia are from James Boyce and Robert E. Evenson, *Agricultural Research and Extension Programs* (New York: Agricultural Development Council, 1975).

Notes: G_A = government expenditures on agriculture. n.a. means "not available."

[a] Refers to 1959.

[b] Refers to 1961.

[c] Refers to 1971.

[d] Refers to 1974.

There are, however, disparities in the estimates for the countries and years for which there are data from both sources. The largest disparities are for Brazil in 1960 and 1970; for Chile in 1970 and 1975; and for Venezuela in 1960, 1970, and 1975.

In the case of Brazil both sources give similar estimates for 1975. For that year expense reports are available from the two decentralized agencies, EMBRAPA and EMBRATER, which coordinate efforts on research and extension in Brazil.[8] As shown in the Appendix, earlier estimates are based on the expenses of some decentralized agencies for products such as coffee, alcohol, and cocoa. The estimates of Boyce and Evenson show a higher increase in these expenditures from 1960 to 1970, but a much lower one from 1970 to 1975.

For Chile the difference is much larger in 1970. The figures of Boyce and Evenson are almost three times higher than the ones reported in Table 11 for the years 1970 and 1975. The differences in both estimates could come from the expenditures made by the universities.

For Venezuela the estimates of this report are more than double the estimates of Boyce and Evenson. Even if only the research component is considered, the figures are higher. Perhaps there are differences in the treatment of administrative costs allocated to these expenditures.[9]

Table 11 shows that the share of this component in G_A is more than 15 percent for Argentina, Costa Rica, and, in some years, Venezuela. It is about 8 percent for Brazil and Peru, and about 3 percent for the other countries.

The trend of the research and extension expenditures differs somewhat across countries and for different decades. In Argentina and Brazil there was an increase in the share of the research and extension component. In Chile and Mexico the share of this com-

[8] EMBRAPA is the acronym for Empresa Brasileira de Pesquisa Agropecuaria. EMBRATER is Empresa Brasileira de Extensão Rural.

[9] Other estimates of research and extension expenditures for 1975 are presented in the work of Peter Oram, "Current and Projected Agricultural Research Expenditures and Staff in Developing Countries," Working Paper 30, International Food Policy Research Institute, Washington, D.C., November 1978. (Mimeographed). These estimates are close to our estimates for some countries, but others are closer to those of Boyce and Evenson.

ponent remained fairly stable. The share of research and extension decreased in the other five countries.

A total amount of $100 million (in 1960 prices) was spent on agricultural research and extension in 1970 for the nine countries together. This amount increased to $174 million in 1975. These figures represent about 15 percent of the amount spent on agricultural research and extension by federal and state governments in the United States.[10]

Irrigation

The irrigation component is another item in government expenditures that often has been analyzed in detail because of its effects on agricultural production. Considering its relevance, data on this component is scarce in Latin America.

Much of Latin America's investment in irrigation is made directly by the private sector. For the most part, each farm unit finances its own irrigation and is the direct recipient of its benefits. The public sector plays an important role when it is necessary to make a large initial investment to be able to irrigate.

In some cases irrigation investment is combined with electricity and drinking water projects. It then becomes difficult to separate the costs corresponding to irrigation. The increase in the hectares of land available for agriculture also indicates the extent of irrigation in some countries. In other countries irrigation figures may be included with other kinds of investments, such as new seed and fertilizer. Sometimes the irrigation component is classified under the Department of Agriculture and sometimes under other departments, such as Public Works or a decentralized agency. These differences probably explain, in part, the scarcity of data for irrigation expenditures.

Table 12 shows the amount spent on irrigation in selected years and its share of total government expenditures on agriculture. As in Table 11, the share of the irrigation component is computed by taking the higher values of G_A presented in Table 3. Although irrigation expenditures vary widely, the share of irrigation in total expenditures indicates that it is extremely important in most of the countries, especially in Argentina, Brazil, and Mexico, where irrigation's share is the highest. In some countries most of the irrigation expenditures are made by state governments. Therefore, it is important to make every effort to include state figures in the estimates of G_A.

As Tables 20-28 in the Appendix show, most of the nine countries invested almost constantly in irrigation. There are jumps in the series for some countries, but this is not the general case.

The Appendix also presents some information on the alternative indicator—the number of hectares of new irrigated land due to public investment (see Table 23). For example, Chile had an annual increase of 12,000 hectares from 1950 to 1965, whereas Mexico's increase from 1950 to 1970 was 80,000 hectares.[11] These figures represent a significant and constant effort by these countries to expand irrigation.

The Education and Health Component

To have as wide a coverage as possible, an effort was made to allocate to G_A the portion of the federal and state expenditures on education and health that are directed to rural people. By using related data on rural school attendance and rural members of social welfare institutions, a reasonable estimate could be achieved. Although they would by helpful, other welfare components were not included.

Because the education and health components of the total government budget are more stable than the agricultural component, the inclusion of these components in G_A contributes to its stability.

For the countries for which they could be obtained, Table 13 shows that the esti-

[10] See Willis Peterson and Joseph Fitzharris, "Organization and Productivity of the Federal and State Research System in the United States," in *Resource Allocation and Productivity in National and International Agricultural Research*, ed. Thomas Arndt, Dana Dalrymple, and Vernon Ruttan (Minneapolis: University of Minnesota Press, 1977).

[11] See Mexico, Nacional Financiera, *Mexico en Cifras* (Mexico, D. F., 1970, 1977).

Table 12—Government expenditures on irrigation and their share of total spent on agriculture, selected years

Country	Value				Share of G_A			
	1950	1960	1970	1975	1950	1960	1970	1975
	(U.S. $ million 1960)				(percent)			
Argentina	n.a.	n.a.	35.0[a]	39.3	n.a.	n.a.	38.9[a]	47.6
Bolivia	n.a.	0.3	1.3	5.2	n.a.	20.0	7.8	24.6
Brazil	34.6	74.3	213.2	569.1[b]	n.a.	35.1	48.2	62.9[b]
Chile	3.6	12.2	7.4	1.9[c]	n.a.	26.0	7.7	1.5[c]
Colombia	n.a.	n.a.	149.6	43.9	n.a.	n.a.	27.8	12.0
Costa Rica	n.a.	n.a.	0.1[a]	0.2	n.a.	n.a.	0.3[a]	1.3
Mexico	57.7	46.2	204.0	383.7	64.8	64.3	81.9	57.4
Peru	3.8	1.0	6.4	38.4[b]	n.a.	12.5	11.9	26.5[b]
Venezuela	6.9	13.3	32.6	45.4	n.a.	n.a.	15.3	6.8

Sources: Derived from Table 3 and the Appendix, Tables 20-30.

Notes: G_A = government expenditures on agriculture. n.a. means "not available."

[a] Refers to 1959.

[b] Refers to 1961.

[c] Refers to 1971.

[d] Refers to 1974.

mates of expenditures for rural education and health are an important part of total government expenditures in the agricultural sector (as shown in Table 4). Education had a higher and more stable share of G_A than health. The share of these expenditures varied widely from one country to another.

In Argentina, Bolivia, Costa Rica, and Mexico the main government efforts in the agricultural sector appear to be directed to education and health. This could have significant consequences for the analysis of the behavior of government policies and the study of its effects.

Table 13—Share of education and health components in total government expenditures on agriculture, selected years

Country	Education				Health			
	1950	1960	1970	1975	1950	1960	1970	1975
	(percent)							
Argentina	36.5	31.2	40.4	42.7	12.2	16.4	12.4	14.9
Bolivia	n.a.	55.6	30.2	n.a.	n.a.	n.a.	n.a.	n.a.
Brazil	7.3[a]	10.0	12.0	7.2[d]	12.2[a]	10.0	4.1	1.6[d]
Chile	n.a.	n.a.	11.1	n.a.	n.a.	n.a.	8.4	n.a.
Colombia	n.a.	10.3[b]	5.9	12.0	n.a.	3.4[b]	3.1	4.2
Costa Rica	n.a.	n.a.	37.9[c]	46.7	n.a.	n.a.	5.3[c]	11.5
Mexico	17.0	42.3	38.8	28.0	0.3	4.2	10.6	9.4
Venezuela	11.2	10.1	18.2	11.8	n.a.	n.a.	n.a.	n.a.

Source: Derived from the Appendix, Tables 20-30.

Note: n.a. means "not available."

[a] Refers to 1952.

[b] Refers to 1961.

[c] Refers to 1971.

[d] Refers to 1974.

Other Components

Other components were considered but not enough information was available to make possible a complete series. The results of some of these inquiries are presented below.

For Chile government expenditures on marketing were about 10 percent from 1954 to 1964. Government expenditures on roads and bridges that could be allocated to the agricultural sector had a share similar to that of irrigation.

For Colombia part of the government expenditures on public works and electricity are allocated to the agricultural sector. These items accounted for about 20 percent of G_A from 1970 to 1974. In Venezuela government expenditures on marketing for the agricultural sector were about 3 percent of G_A in 1970. The public works component was about 3 percent in 1974.

In the case of Bolivia the expenditures on the so-called penetrating roads represented almost 50 percent of total government expenditures on roads for the whole economy from 1963 to 1974.

Large expenditures were made to implement land reform programs in Bolivia, Brazil, Chile, Colombia, and Peru during the period covered by this report. In most cases this component was included in the data in the Appendix, Tables 20-28. Some of these expenditures were made by decentralized agencies.

The following figures indicate the importance of land reform. Bolivia spent almost 10 percent of G_A from 1967 to 1973; Brazil about 12 percent from 1965 to 1968; and Chile about 10 percent in 1964 and almost 30 percent from 1967 to 1972. In Colombia, land reform's share of G_A varied from 5 to 10 percent from 1971 to 1977. In Costa Rica it was important only in 1974 (about 10 percent) and was quite low in the other years. In Mexico the largest expenditures were made before 1950. And finally, in Peru the share of land reform was about 8 percent from 1972 to 1974.

State Governments and Decentralized Agencies

For the aggregate expenditures to be accurate, expenditures by the state governments and decentralized government agencies must be included (Table 14). The limited information that could be obtained for decentralized agencies indicates that they have been responsible for administering

Table 14—Share of government expenditures on agriculture allocated by state governments and decentralized agencies, selected years

Country	State Government				Decentralized Agencies			
	1950	1960	1970	1975	1950	1960	1970	1975
	(percent)							
Argentina	39.5	56.0	52.2	74.9	n.a.	14.6	14.6	20.5
Bolivia	n.a.	n.a.	n.a.	n.a.	n.a.	19.0	7.6	24.4
Brazil	n.a.	28.7	35.0	26.3	n.a.	1.7	2.0	9.2
Chile	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	1.8	1.2
Colombia	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	49.2	70.6
Costa Rica	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	60.7[b]	61.3
Mexico	n.a.	n.a.	n.a.	n.a.	89.7	64.5	83.7	80.0
Peru	n.a.	n.a.	n.a.	n.a.	n.a.	8.6[a]	7.7[b]	3.0[c]
Venezuela	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	18.8	5.2

Source: Derived from the Appendix, Tables 20-30.

Note: n.a. means "not available."

[a] Refers to 1959.

[b] Refers to 1971.

[c] Refers to 1974.

increasingly large shares of federal government expenditures over the years. This has varied widely, however, from time to time and from country to country. Most of these expenditures are directed to research and extension, marketing, or irrigation.

Although observation indicates that state government expenditures on agriculture are significant, at least in some of the countries, for the most part these figures simply are not available. Undoubtedly if additional efforts were able to quantify these expenditures (and further items for decentralized agencies), the series would be much more homogeneous.

Table 14 illustrates the extent of the problem. Its aim is to indicate the shares of the total expenditures on agriculture that are allocated by state governments and by decentralized agencies, but state figures are available only for Argentina and Brazil. From the author's observations, however, it appears that state expenditures are probably not significant in Chile and Mexico, whereas they are extensive in Argentina and Brazil.

In Table 14 the percentages for the decentralized agencies point up dramatically the extent of variation. The large shares of agricultural expenditures allocated by agencies in Mexico is especially interesting.

6

THE EFFECTS OF GOVERNMENT EXPENDITURE POLICIES

The main objective of this chapter is to present a preliminary evaluation of the effects of government expenditure policies on the agricultural sector. Although it would be more significant to analyze the effects of a full range of government policies (expenditures, taxes, quotas, subsidies, credit, foreign exchange, and so on) to obtain a general idea of the net effect of these government interventions on agriculture, it is possible to study the effects of expenditure policies alone. To determine the total effect of government policies, all of them should be included, but this is not necessary to identify partial effects.

All of the government policies can be separated into two groups: expenditure policies and price policies. Price policies mainly affect product and input prices, which can be accounted for by studying the effects on production and the changes in the available quantities of the traditional inputs—labor, capital, and land. This allows a reasonable estimate of the partial effects of government expenditure policies.

According to production theory, changes in production are caused by changes in the inputs used in the production process: labor, capital, land, technology, and so forth. In this study government expenditures are seen as another input, called the public input. The flow of this investment into the production process causes changes in agricultural production.

Government expenditure policies could have other effects besides those on production. For instance, the impact on income distribution could be calculated. But it then becomes necessary to include other government policies besides expenditures because price policies have the greatest influence on income distribution.

The Importance of Agriculture

A large share of the gross domestic product in Latin American countries belongs to agriculture. In spite of its decline in the last two decades, agriculture remains one of the most important sectors. Table 15 indicates the share of the value added of the agricultural sector in the gross domestic product for selected years. According to the figures for 1976, the nine countries can be separated into three groups: agriculture's share of national income in Bolivia, Colombia, and Costa Rica is about 25 percent; in Argentina, Brazil, and Peru it is about 15 percent; and in Chile, Mexico, and Venezuela it is 10 percent or less. Only Chile's share remained stable; the shares of the other eight countries decreased steadily.

Crops Versus Livestock

Table 16 shows that the crop sector within agriculture is much more important than the livestock sector, comparing their contributions to the value added of the agricultural sector. The shares changed slightly during the period, increasing for some countries and decreasing for others. Except for Argentina, the percentage of land devoted to crops is much smaller than the percentage of the value added of agriculture attributed to crops. This difference should be taken into account in analyzing the effect of government expenditures on the growth of the agricultural sector.[12]

During the period studied there was enough change in the composition of agriculture to justify including the crops-versus-

[12] Vittorio Corbo suggested that an analysis of the agricultural composition could help to better identify the parameters in aggregate production functions estimates for this sector.

Table 15—Agriculture's share of the gross domestic product, 1950, 1960, and 1976

Country	1950	1960	1976
		(percent)	
Argentina	19.0	17.0	15.0
Bolivia	n.a.	30.0	28.0
Brazil	28.0	23.0	19.0
Chile	11.0	11.0	10.0
Colombia	40.0	34.0	27.0
Costa Rica	n.a.	29.0	21.0
Mexico	16.0	16.0	10.0
Peru	25.0	20.0	16.0
Venezuela	8.0	6.0	6.0

Sources: The figures were primarily derived from various issues of the national accounts of the countries published by: Argentina-Banco Central; Bolivia-Banco Central; Brazil-Fundacao Cetulis Vargos and Institute Brasileiro de Geografia e Estadistica; Chile-Oficina de Planificacion Nacional and Banco Central; Colombia-Banco de la Republica; Costa Rica-Banco Central de Costa Rica; Mexico-Banco de Mexico and the Nacional Financiera; Peru-Banco Central de Reserva; and Venezuela-Banco Central. In addition, data for Bolivia were drawn from U.S. Agency for International Development, Mission to Bolivia, *Agricultural Development in Bolivia: A Sector Assessment* (La Paz, 1974).

Note: n.a. means "not available."

livestock issue in a broader analysis of the causes of growth in this sector. There is, however, a problem in the basic data on land distribution between crops and livestock that creates some doubts about its interpretation. This problem arises particularly in distinguishing between natural and cultivated land.

In general, many government expenditure policies were directed at the crop sector, so some relationship can be expected among government expenditures, the relative importance of crops, and the size of the effect of this government policy. The requirements for expenditures for crops and livestock could also be different, which could explain some of the differences between countries.

Partial and Total Productivity

Partial productivity can be obtained by estimating the effect of the land input on production, and total productivity by considering all of the traditional inputs together.

Table 17 presents the partial productivity defined by the output/land ratio for seven countries.[13] To facilitate comparisons be-

Table 16—Share of crops versus livestock in the agricultural sector, selected years

Country	Share of Value Added of Crops				Share of Land for Crops			
	1950	1960	1970	1975	1950	1960	1970	1975
					(percent)			
Argentina	51.1	57.9	56.4	56.8	53.6	50.4	57.9	n.a.
Brazil	76.1	69.9	62.2	n.a.	14.3	17.3	19.6	19.6
Colombia	58.2	63.2	59.7	58.6	13.8	16.7	15.6	n.a.
Mexico	71.6	65.0	64.1	58.5	27.9	28.4	28.0	n.a.
Peru	n.a.	n.a.	n.a.	n.a.	n.a.	21.8	n.a.	n.a.
Venezuela	n.a.	51.8	48.1	45.7	40.2	34.4	27.7	23.6

Sources: The figures were primarily derived from various issues of the national accounts of the countries published by: Argentina-Banco Central; Bolivia-Banco Central; Brazil-Fundacao Cetulis Vargos and Institute Brasileiro de Geografia e Estadistica; Chile-Oficina de Planificacion Nacional and Banco Central; Colombia-Banco de la Republica; Costa Rica-Banco Central de Costa Rica; Mexico-Banco de Mexico and the Nacional Financiera; Peru-Banco Central de Reserva; and Venezuela-Banco Central. In addition, data for Bolivia were drawn from U.S. Agency for International Development, Mission to Bolivia, *Agricultural Development in Bolivia: A Sector Assessment* (La Paz, 1974).

Notes: n.a. means "not available." Livestock's share of value added or land is the difference between the figures in the table and 100.

[13] Bolivia and Costa Rica are not included because sufficient information for analysis could not be obtained.

Table 17—Annual value of output per hectare, selected years

Country	1950	1960	1970	1975
	(U.S. $ 1960/hectare)			
Argentina	62.6	64.8	75.5	92.7
Brazil	19.8	25.3	32.0	39.0
Chile[a]	339.7	365.1	493.8	490.7[b]
Colombia	49.0	59.5	69.9	66.4[c]
Mexico	34.9	45.2	57.0	56.1
Peru[a]	243.3	266.9	311.9	n.a.
Venezuela	87.4	102.3	106.1	118.6

Sources: The figures were primarily derived from various issues of the national accounts of the countries published by: Argentina-Banco Central; Bolivia-Banco Central; Brazil-Fundacao Cetulis Vargos and Institute Brasileiro de Geografia e Estadistica; Chile Oficina de Planificacion Nacional and Banco Central; Colombia-Banco de la Republica; Costa Rica-Banco Central de Costa Rica; Mexico-Banco de Mexico and the Nacional Financiera; Peru-Banco Central de Reserva; and Venezuela-Banco Central. In addition, data for Bolivia were drawn from U.S. Agency for International Development, Mission to Bolivia, *Agricultural Development in Bolivia: A Sector Assessment* (La Paz, 1974).

Note: n.a. means "not available."

[a] Only cropland is considered.

[b] Refers to 1976.

[c] Refers to 1973.

tween countries it is expressed in 1960 constant dollars per hectare. For Chile and Peru, only the number of hectares dedicated to crops is used (due to lack of information on total land in the agricultural sector). Therefore, the ratios for these two countries are not comparable with those of the other countries. To compare the figures of the other countries with Chile and Peru, the values in Table 17 must be multiplied by approximately 1.9 for Argentina, 6.0 for Brazil, 6.0 for Colombia, 3.6 for Mexico, and 3.0 for Venezuela. These figures are deducted from the share of crops in total land. Because the primary objective is to study the behavior of partial productivity, the figures are not homogenized.

In general, an increase in the output/land ratio for the whole period can be observed for the seven countries considered in Table 17. The average annual rates of change of this partial productivity indicator are:

Brazil	2.8
Mexico	1.9
Argentina	1.6
Chile	1.4
Colombia	1.3
Peru	1.3
Venezuela	1.1

The output-land ratio increased the most for Brazil and Mexico; Venezuela had the smallest annual rate of change.[14]

According to production function theory, the increase in the output/land ratio could result from many factors, such as an increase in the ratio of other inputs to land or technological changes. Thus, the trend of total productivity should be determined before beginning an analysis of partial productivity.

The total productivity index is defined as the ratio of output to an index of the traditional inputs—land, labor, and physical capital (including tractors, plant and equipment, and stocks of cattle). The index of all these inputs depends on the production function of the agricultural sector. A Cobb-Douglas production function is used. This implies a geometric index of the inputs, weighted with the corresponding output-input elasticities, which in a perfect input market should be equal to the share of the input from total agricultural output.

Table 18 shows the behavior of the total productivity index in selected years. To compute the indexes, the following inputs were considered: land, labor, and physical capital (represented by tractors, plants and equipment, and stocks of cattle). The weights were taken from production function estimates for agriculture for the nine countries. The rate of change of productivity is still significant. This implies that there may still be unidentified nontraditional inputs that were increasing during this period.

[14] The partial productivity estimates for Chile and Peru could be biased because there is a large change in the proportion of crop land to total land.

Table 18—Indexes of total input productivity in agriculture, selected years

Country	1950	1960	1970	1975
Argentina	100.0	96.9	106.5	108.8
Brazil	100.0	113.4	136.3	157.5
Chile	100.0	98.6	120.8	139.6
Colombia	100.0	119.9	135.4	128.0[a]
Mexico	100.0	122.4	158.8	n.a.
Peru	100.0	109.9	118.7	n.a.
Venezuela	100.0	125.0	141.8	151.0

Sources: These data were compiled by the author from the following sources: Victor J. Elías, "Sources of Economic Growth in Latin American Countries," *The Review of Economics and Statistics* 60 (August 1978): 362-370; Lucio Reca and Juan Verstraeten, "La Formacion del Producto Agropecuario Argentino: Antecedentes y Posibilidades," *Desarrollo Economico* 17 (October – December 1977): 371-389; Carlos G. Langoni, "A Study in Economic Growth: The Brazilian Case" (Ph.D. dissertation, University of Chicago, 1970); Alberto Valdés, "Commercial Policy and its Effects on the External Agricultural Trade in Chile, 1945-65" (Ph.D. dissertation, London School of Economics and Political Science, 1971); Ramiro Orozco, "Sources of Agricultural Production and Productivity in Colombia Agriculture" (Ph.D. dissertation, Oklahoma State University 1977); Reed Hertford, *Sources of Changes in Mexican Agricultural Production, 1940-1965*, Foreign Agricultural Economic Report No. 73 (Washington, D.C.: U.S. Department of Agriculture, 1971); Banco de México, supplements to national accounts publications; Banco Central de Reserva de Peru, *Cuentas Nacionales* (Lima, various years); Inter-American Development Bank, *Venezuela 1950-1967* (Washington, D.C., 1968); Venezuela, Banco Central, *Memoria*, various issues.

Notes: The base year 1950 = 100.
n.a. means "not available."

[a] Refers to 1973.

The Sources of Agricultural Growth

Growth accounting provides another method for studying the main causes of growth in Latin American agriculture. Based on a production function theory that makes output a function of all the inputs necessary for the production process, this simple approach says that the rate of change of output is equal to the weighted average of the rates of change of all the inputs plus the rate of change of technology. The interesting thing about this approach is that any element that could affect production could be included as an input, and the method measures the importance of this element.

The growth-accounting approach is not a theory of growth, but it provides a basis for understanding the growth process and for evaluating the importance of each input in this process. To have a theory of growth, an explanation of the behavior of inputs in the production process is also needed. Growth accounting takes into account not only the behavior of each input separately but also the degree of interaction among them.

First, the role played by government expenditures, G_A, in the growth of agriculture must be determined. Then, using the growth-accounting technique, these expenditures are interpreted as an input in the production process. This assumption can then be verified by production function estimates.

There have been many studies of the sources of growth in agriculture in the countries included in this research. These studies provide the basis for determining the relevance of government expenditure policy in the growth of agriculture. Some of the works that are used for this analysis are those of Hertford for Mexico, Orozco for Colombia, Langoni for Brazil, Reca for Argentina, and Valdés for Chile (see the bibliography).

Only a preliminary analysis of the sources of growth in agriculture and the importance of government expenditures is included in this report. The aim is merely to indicate the usefulness of quantifying government expenditure policies and the methodology necessary to evaluate their effects, which may lead eventually to an estimate of the optimum size and composition of government expenditures.

Only the averages for the entire period and some subperiods are given. Table 19 presents the figures for the average annual rate of change of output (value added of the agricultural sector) and of the identified inputs.

The following inputs are included:

1. *land*: number of hectares dedicated to crops and livestock;
2. *labor*: number of people employed in agriculture;

Table 19—Average compounded annual rates of growth of output and inputs, 1950-78

Variable	Argentina	Bolivia	Brazil	Chile	Colombia	Costa Rica	Mexico	Peru	Venezuela
					(percent)				
Output	2.12	2.88	4.54	1.86	3.67	4.53	3.37	1.99	5.08
Land	0.97	n.a.	1.91	−0.01	1.97	n.a.	1.78	1.22	3.74
Labor	0.88	n.a.	1.86	0.71	1.17	n.a.	0.31	1.72	2.24
Capital 1	11.67	n.a.	10.48	n.a.	6.29	n.a.	5.93	n.a.	n.a.
Capital 2	n.a.	2.90	1.90	5.73	4.76	n.a.	4.23	n.a.	3.59
Stock of cattle	1.20	n.a.	3.06	n.a.	1.76	n.a.	n.a.	n.a.	n.a.
Modern inputs	8.40	n.a.	10.00	3.30	10.60	n.a.	9.30	n.a.	6.70
Stock of G_A	1.45	n.a.	3.20	4.86	7.15	n.a.	4.08	4.31	5.66
Total productivity	0.40	n.a.	1.80	1.40	1.10	n.a.	2.30	0.90	1.70

Sources: These data were compiled by the author from the following sources: Victor J. Elías, "Sources of Economic Growth in Latin American Countries," *The Review of Economics and Statistics* 60 (August 1978): 362-370; Lucio Reca and Juan Verstraeten, "La Formacion del Producto Agropecuario Argentino: Antecedentes y Posibilidades," *Desarrollo Economico* 17 (October–December 1977): 371-389; Carlos G. Langoni, "A Study in Economic Growth: The Brazilian Case" (Ph.D. dissertation, University of Chicago, 1970); Alberto Valdés, "Commercial Policy and its Effects on the External Agricultural Trade in Chile, 1945-65" (Ph.D. dissertation, London School of Economics and Political Science, 1971); Ramiro Orozco, "Sources of Agricultural Production and Productivity in Colombia Agriculture" (Ph.D. dissertation, Oklahoma State University, 1977); Reed Hertford, *Sources of Changes in Mexican Agricultural Production, 1940-1965*, Foreign Agricultural Economic Report No. 73 (Washington, D.C.: U.S. Department of Agriculture, 1971); Banco de México, supplements to national accounts publications; Banco Central de Reserva de Peru, *Cuentas Nacionales* (Lima, various years); Inter-American Development Bank, *Venezuela 1950-1967* (Washington, D.C., 1968); Venezuela, Banco Central, *Memoria*, various issues.

Notes: Capital 1 includes only tractors; Capital 2 includes plant and equipment. In Mexico and Venezuela, Capital 2 also includes the stock of cattle. Modern inputs denote fertilizer and new seed varieties. Stock of G_A is the stock of public input developed from the flow of government expenditures to agriculture, an initial value of public input for 1950, and a 5 percent rate of depreciation (using the inventory approach). n.a. means "not available."

3. *capital 1:* stock of capital measured by the number of tractors expressed in common horsepower;
4. *capital 2:* stock of capital including plant and equipment (in Mexico and Venezuela it also includes tractors and the stock of cattle), expressed in constant 1960 prices;
5. *stock of cattle:* number of cattle at the end of each year;
6. *modern inputs:* an index of the use of modern inputs, such as fertilizers and new seeds;
7. *stock of G_A:* the stock of public input, defined as the flow of government expenditures to the agricultural sector, G_A. This input is measured as a stock of capital, using the inventory approach. The stock of public input in period t is then equal to the stock of public input in period (t — 1), plus the gross investment in period t, minus the depreciation in this period. The gross investment in period t is the government expenditures in the agricultural sector G_A in this period. Then with an estimate of the initial stock of capital for 1950, which is the beginning of the period, and a rate of depreciation of about 5 percent, the series for the stock of public input for the whole period can be constructed.

To arrive at the average annual rate of growth of the output presented in the first line of Table 19, a weighted average must be computed of the average annual rate of growth of the inputs that are given in the other lines in Table 19.

To clarify the role of government expenditures, the only inputs included in the first stage are land, labor, capital 1, capital 2, and the stock of cattle. The weights used for the inputs are: 0.50 for land; 0.28 for labor; 0.08 for stocks of capital (1 and 2); and 0.14 for

stocks of cattle. These weights were chosen from production function estimates and national account figures for the functional distribution of income in agriculture. In a later study different weights will be used for each country.

This exercise yields some positive residuals, equal to the average rate of growth of output less the weighted average of the rate of growth of the inputs included in the first computation. This residual is the average annual rate of change of total productivity, and it is shown in the last line of Table 19.

The final exercise of this preliminary investigation is to try to relate the rate of growth of total productivity with modern inputs (invested by the private sector) and with public input (derived from government expenditure policy). The last three lines of Table 19 illustrate the behavior of these three variables.[15]

The rate of change of modern inputs is high for all the countries. Changes in public input are also high, except for Argentina. Both of these inputs grew at a much faster rate than total productivity. Combined they probably account for the behavior of total productivity, and in part this can be seen in the observed rates of change of these three variables across countries.

As was observed in Chapter 3, government expenditures in the agricultural sector increased after 1964. If the average annual rate of growth of agricultural output is computed for the period 1960-78 for five of the nine countries, an increase in this rate of growth can be observed that is a little higher than the average figures for the entire period 1950-78 shown in Table 19. This change in trend was not apparent, however, for Mexico, Peru, and Venezuela.

A useful way of summarizing the information provided in Tables 17-19 is to make comparisons using order statistics, comparing extreme values of the different variables presented in these tables. For example, for all of the countries a certain negative relationship can be seen between the rate of growth and the levels of partial productivity (the output/land ratio presented in Table 17). This result disagrees with previous studies that found a positive relationship.

However, there does seem to be a positive relationship between the rates of growth of partial productivity (the output/land ratio) and total productivity (shown in Table 19). This result implies an increase in all partial productivities, which is in agreement with previous studies. In the same context a negative relationship (across countries) is found between the rate of growth of the public input and that of the so-called modern inputs. This suggests that these inputs can substitute for each other.

If only the extreme values of the observed rate of growth of public input and total factor productivity are considered, a positive relationship can be found between them. This relationship across countries is not as strong as that observed for each country through different periods.

There is a puzzling aspect of the relationship between the rate of growth of public input and that of land input. The relationship was negative for each country during the entire period studied but positive when comparisons were made between countries.

These are only some of the implications of the analysis to date. There are many others that could be deduced from a more detailed analysis. They are enough, however, to indicate the usefulness of the approach and the information presented.

Another way of studying the possible effects of government expenditure policies is to look at the interaction of G_A with other inputs. It is possible that the growth of the public input is the result of the decline in the growth (or constancy) of land input. The public input developed faster after 1960 to compensate for the declining growth of land. This relationship is observed for most of the nine countries and is a promising line for future analysis.

Future Analysis

As stated, this chapter contains only a preliminary investigation of the relationship between government expenditures and agriculture. The sources-of-growth methodology

[15] As suggested by Vittorio Corbo, one could work with production instead of output and include the modern and public inputs directly in the production function along with the traditional inputs.

is a good framework for this analysis, worth pursuing further.

Future analysis must examine more closely the relationships between output and traditional inputs and total productivity and nontraditional inputs, such as modern and public inputs. It must also explore more thoroughly the correct definition of public input and study the effects of changes in its composition.[16] The basic information provided in this report should be a good beginning for this endeavor.

[16] The author is grateful to John W. Mellor and Marc Nerlove for pointing out the importance of identifying lags in the effects of different kinds of expenditures and some methodologies to identify them.

7

CONCLUSIONS

To summarize the conclusions drawn from the data, aggregate government expenditures for the agricultural sector (excluding the health and education components) have increased at an average annual rate of change of 8 percent for the nine countries together. This rate of change varied widely from country to country throughout the time period studied.

These aggregate government expenditures for agriculture represented about 1 percent of the gross domestic product on average; the maximum was 4 percent for Colombia. The average share of the agricultural component of the total government budget was more than 5 percent and varied greatly. In comparing government expenditures on agriculture to agricultural output, government expenditures varied from 3 to 20 percent of the value added. The variability observed in the share of the government expenditures on agriculture compared with the gross domestic product was due more to the variability of the share of agriculture in the total government budget. The main determinants of the amount spent by government on agriculture were the value added of the agricultural sector and the gross domestic product.

The transport, health, and education components of the aggregate government expenditures increased less than the other categories, suggesting that it is necessary to consider government expenditures as a whole. The agricultural component of the government budget varied more than the nonagricultural portions. The expenditures made through local governments and decentralized agencies are an extremely significant part of the aggregate component. Looking at the expenditures of central governments only does not present a true picture. However, data on state expenditures is extremely limited.

The total amount spent by the governments of the nine countries on the agricultural sector was about $200 million in 1950, and $2.1 billion in 1978 (expressed in constant 1960 U.S. dollars). When these government expenditures are considered as a flow of investment of an input called the public input, a high degree of association can be seen between the output/land ratio in the agricultural sector and the public input/land ratio. This association is particularly close for Argentina, Brazil, Chile, Mexico, and Venezuela.

By studying the components of government expenditures on agriculture, it can be seen that irrigation and education are generally the most important factors, although the composition of expenditures varies widely from country to country.

Latin American governments need to improve their budget data and its classification. If policymakers have a more definite idea of the effectiveness of expenditures as a policy tool, they can make better policy decisions.

APPENDIX

NOMINAL EXPENDITURES IN THE AGRICULTURAL SECTOR

The basic estimates for government expenditures on agriculture are presented in a common framework in Tables 20-28. Though many sources were examined for the expenditures of each country, complete series for all the components of total expenditure were not always available. So in order to complete some series, the figures had to be taken from several sources or, not often, estimates had to be made.

The main sources of information were the budget classifications by the national secretariats. These sometimes included figures for such expenditures as irrigation, sometimes not. From more disaggregated data came data on research and extension, irrigation, research done at universities, and other items in governmental budgets. The figures for each country have the expenditures of the central government as a base, but usually include federal decentralized agencies and local governments as well.

To estimate indirect expenditure, a simple method of determining allocations was applied. Expenditures for education in the agricultural sector were computed as:

$$G_e(A) = (P_r/P \cdot G_p/G_e + H_r/H \cdot G_h/G_e + S_r/S \cdot G_s/G_e)\, G_e ,$$

where

$G_e(A)$ = indirect expenditures on education allocated to the agricultural sector;
P_r = student registration in the primary schools in the rural areas;
P = student registration in the primary schools in the whole country;
H_r = student registration in high schools in rural areas;
H = student registration in high schools in the whole country;
S_r = student registration at the university level in the agricultural department;
S = student registration at the university level in all departments;
G_p = government expenditures on primary schools;
G_h = government expenditures on high schools;
G_s = government expenditures on universities; and
G_e = $G_p + G_h + G_s$, total government expenditures on education.

The terms in parentheses represent the share of education expenditures on rural areas. This share is estimated for each year from the series of its different components defined above.

This estimate of $G_e(A)$ may be too high because the education expenditure per student could be lower for rural schools than urban schools. More students probably drop out in rural areas, but this would not affect this method.

The share of health in indirect expenditures in agriculture can be computed by using the proportion of the membership of social security institutions that lives in rural areas. This can only be done for the few countries for which comprehensive data on membership in these institutions are available. For others, a less precise indicator must be used, such as the share of the rural population in total expenditures on health corrected to take account of the smaller health expenditure per person in rural areas.

The reliability of our method of allocation of education expenditure can be verified for Colombia, for which an independent estimate was made by Selowsky.[17] He tried to estimate the amount of education a rural family was getting in 1974. For primary schools, his estimates were almost the same as the estimates in this paper.

Many problems are not completely resolved. For example, the expenditures could

[17] Marcelo Selowsky, *Who Benefits from Government Expenditure? A Case Study of Colombia* (Washington, D.C.: International Bank for Reconstruction and Development, 1978).

include some financed by loans that are budgeted jointly with the payments for the services of past loans, producing a double counting. For example, 1975 expenditures could include some financed by loans received in 1972 and payments of loans made in past years that were included as expenditures in the years that these loans were used.

In some countries there is no clear distinction between decentralized agencies and public enterprises. This creates the problem of including government expenditures that could be recovered through sale of services to the agricultural sector, as is the case with public enterprises. Every effort was made to exclude public enterprises from the estimates. This should be reconsidered after a complete discussion of the criteria for including or excluding a given expenditure from the public sector.

Some double counting problems could occur when the state government expenditures are added because the central government made a contribution to the state government. That contribution could be attributed to agricultural expenditures in the budgets at both levels of government. This problem does not seem to be important in Latin America.[18]

Finally, as stated above, gross expenditures are computed without considering the receipts that the government could receive for selling its services. This could be a significant source of revenue for some governments, but it does not seem to be for the governments considered here.[19]

Table 20—Basic data on government expenditures in the agricultural sector of Argentina, 1950-78

Year	Direct Expenditures of Central and State Governments and Decentralized Agencies	Direct Expenditures on Research and Extension	Direct Expenditures on Irrigation	Indirect Estimates of Expenditures on Education	Indirect Estimates of Expenditures on Health
		(million current new pesos)			
1950	3.8	n.a.	n.a.	2.7	0.9
1951	7.2	n.a.	n.a.	3.7	1.5
1952	8.7	n.a.	n.a.	4.3	1.9
1953	11.7	n.a.	n.a.	4.5	2.2
1954	9.5	n.a.	n.a.	5.4	3.1
1955	10.0	n.a.	n.a.	6.1	2.9
1956	15.4	n.a.	n.a.	7.2	3.8
1957	10.5	n.a.	n.a.	5.6	3.8
1958	16.1	n.a.	n.a.	16.6	6.9
1959	28.0	n.a.	n.a.	28.5	10.2
1960	45.8	n.a.	n.a.	27.5	14.9
1961	57.9	9.9	n.a.	40.7	17.8
1962	65.6	10.1	n.a.	55.5	22.3
1963	79.0	12.7	n.a.	73.0	24.7
1964	120.0	21.5	n.a.	133.7	38.8
1965	155.4	23.1	n.a.	163.0	54.3
1966	225.2	32.5	n.a.	224.9	66.7
1967	344.9	67.6	n.a.	303.1	93.9
1968	434.5	69.5	n.a.	348.9	102.3
1969	486.3	85.6	n.a.	416.9	138.4
1970	572.6	97.8	n.a.	494.1	155.2
1971	636.7	110.0	247.7	494.7	171.9
1972	973.7	195.4	392.4	752.7	271.9
1973	1,445.2	400.1	635.4	2,110.3	397.0

(continued)

[18] According to J. S. Sarma, this double-counting problem should be eliminated because it can be quite important in some countries—India, for example.

[19] Sarma also urges consideration of a net concept of government expenditures in which the amount that the government could recover by selling modern inputs is subtracted from the total.

Table 20—Continued

1974	3,495.8	584.6	1,548.8	3,659.9	1,091.9
1975	5,009.0	1,287.7	2,380.6	5,054.5	1,768.4
1976	34,298.3	6,550.9	n.a.	n.a.	n.a.
1977	101,968.0	17,478.5	n.a.	n.a.	n.a.
1978	220,519.0	50.302.1	n.a.	n.a.	n.a.

Sources: The figures for direct expenditures of central and state governments and decentralized agencies are from Argentina, Secretaria de Estado de Hacienda de la Nación, *Presupuestos de la Administración Nacional, Destino de las Erogaciones, 1941-1970* (Buenos Aires, 1977); Argentina, Secretaria de Estado de Hacienda de la Nación, *Presupuestos Provinciales y Presupuesto Nacional* (Buenos Aires, 1975); Argentina, Secretaria de Estado de Hacienda de la Nación, *Presupuestos Provinciales y Presupuesto Nacional* (Buenos Aires, 1977); and Carlos-Diaz Alejandro, *Essays on the Economic History of the Argentine Republic* (New Haven: Yale University Press, 1970).

The data for direct expenditures on irrigation are from Argentina, Secretaria de Estado de Hacienda de la Nación, *Presupuestos de la Administracion;* Argentina, Secretaria de Estado de Hacienda de la Nación, *Prepuestos Provinciales,* 1975; and Argentina, Secretaria de Estado de Hacienda de la Nación, *Prepuestos Provinciales,* 1977. These expenditures include land improvement and drainage in addition to irrigation.

To get the figures for direct expenditures on research and extension, Instituto Nacional de Tecnologia Agropecuaria, *Memoria y Balance Anual* (Buenos Aires, 1970-78); and Horacio Arce, Pedro Skupch, and Carlos Pozzo, "Una Estimación de los Gastos de Investigación y del Número de Investigadores en la República Argentina, 1961-66," Instituto de Investigaciones Económias, Universidad de Buenos Aires, 1968 were used.

Notes: Where n.a. is used, the information was not available.

A recent study made by the Finance Department of the central government provided a basis on which to estimate the direct expenditures of central and state governments and decentralized agencies. Even though the study included decentralized agencies (Junta Nacional de Granos, Junta Nacional de Carne, and some others engaged mainly in marketing activities), it is not certain that the total for the agricultural sector included the budget of the National Institute of Agricultural Technology (INTA). A part of the general expenditures for economic development was added to the figures for the central government.

The direct expenditures on research and extension include the budget of the INTA and spending on research by the national universities. The latter is not very important. It was about 10 percent of total expenditures on research and extension between 1960 and 1970. It has since decreased to about 5 percent. These percentages were used to estimate research expenditures by the universities between 1967 and 1976.

Data for expenditures on irrigation are scarce. Most of the figures used in this table are from the budgets of state governments. This could imply that the main expenditures on irrigation by the central government come from other ministries.

The estimates of expenditures on education were made using the method explained in the text of the Appendix. Figures for expenditures by level of education and student registration in rural and urban schools were needed for this. Agriculture's share in education expenditures varied between 18.9 percent (in 1950) and 26.4 percent (in 1975). Most of these expenditures were for primary education.

To calculate expenditures on health, the share of the rural population in the total population was used and adjusted by the per capita spending on health in rural areas, which is much lower than in urban areas.

Table 21—Basic data on government expenditures in the agricultural sector of Bolivia, 1959-78

Year	Total Direct Expenditures of the Central Government and Decentralized Agencies	Direct Expenditures on Research and Extension	Direct Expenditures on Irrigation	Indirect Estimates of Expenditures on Education	Investment on Penetrating Roads
	(million current Bolivian pesos)				(current U.S. $ 1,000)
1959	n.a.	2.9	n.a.	n.a.	n.a.
1960	17.9	n.a.	3.4	22.4	n.a.
1961	33.1	n.a.	5.2	23.4	n.a.
1962	40.1	4.9	4.6	29.2	n.a.
1963	59.7	n.a.	6.1	33.6	1,572
1964	73.5	n.a.	5.5	38.0	79
1965	120.1	4.3	20.2	57.8	42
1966	204.4	n.a.	17.6	82.5	2,160
1967	164.9	n.a.	20.6	89.3	5,406
1968	251.9	5.7	21.0	98.0	1,300
1969	236.4	n.a.	25.0	101.4	1,683
1970	291.1	n.a.	22.0	125.8	1,400
1971	257.8	4.9	74.0	135.1	3,355
1972	338.8	n.a.	47.0	158.6	3,300
1973	650.0	n.a.	62.0	215.4	480
1974	883.8[a]	5.3	104.0	n.a.	214
1975	1,081.9[a]	n.a.	264.0	n.a.	n.a.
1976	1,516.2[a]	n.a.	n.a.	n.a.	n.a.
1977	1,825.3[a]	n.a.	n.a.	n.a.	n.a.
1978	2,789.4[a]	n.a.	n.a.	n.a.	n.a.

Sources: The figures for direct expenditures of the central government and decentralized agencies are from Banco Central de Bolivia, *Cuentas Nacionales*, Publicación No. 1 (La Paz, 1978); Banco Central de Bolivia, *Boletín Estadístico* (La Paz, 1978); U.S. Agency for International Development (USAID), Mission to Bolivia, *Agricultural Development in Bolivia: A Sector Assessment* (La Paz, 1974); International Bank for Reconstruction and Development (IBRD), *World Tables, 1976* (Washington, D.C., 1976); International Monetary Fund, *Government Financial Statistics Yearbook*, Vol. 4, 1980 (Washington, D.C., 1980).

The decentralized agencies for which figures are included are: the National Wheat Institute, the National Agrarian Reform Service, the National Colonization Institute, the National Community Development Service, and the Bolivian Development Corporation.

The data for direct expenditures on research and extension are found in James Boyce and Robert E. Evenson, *Agricultural Research and Extension Programs* (New York: Agricultural Development Council, 1975).

To get figures for direct expenditures on irrigation, Banco Central de Bolivia, *Cuentas Nacionales;* Banco Central de Bolivia, *Boletín Estadístico;* and USAID, Mission to Bolivia, *Agricultural Development*, are used.

The indirect estimates of expenditures on education were made from figures found in Banco Central de Bolivia, *Cuentas Nacionales;* Banco Central de Bolivia, *Boletín Estadístico;* and IBRD, *World Tables, 1976.*

The figures for investment on penetrating roads are estimates from Hernán Zeballos-Hurtado, "From the Uplands to the Lowlands: An Economic Analysis of Bolivian Rural-Rural Migration" (Ph.D. dissertation, University of Wisconsin, 1975).

Notes: The figures in this table are for the central government and some decentralized agencies. Most of the decentralized agencies are responsible for trade problems or colonization programs.

Investment on penetrating roads can be attributed to the agricultural sector. The figures in the table represent more than 60 percent of all investment on roads. These figures are as important as the figures for expenditures on irrigation in the table.

For research and extension, only the number of agricultural research stations created in Bolivia between 1946 and 1974 is presented. These stations were created regularly during the period. They numbered 15 in 1974. The series is taken from Carlos Cosio, *La Evolución Agrícola en Bolivia* (La Paz: Organización de Estados Americanos, 1971).

[a] This figure is an estimate.

Table 22—Basic data on government expenditures in the agricultural sector of Brazil, 1950-78

Year	Direct Expenditures of Central and State Governments and Decentralized Agencies	Direct Expenditures of the Central Government	Direct Expenditures on Research and Extension	Direct Expenditures on Irrigation	Indirect Estimates of Expenditures on Education	Indirect Estimates of Expenditures on Health
			(million current new cruzeiros)			
1950	n.a.	n.a.	0.03	0.9	n.a.	n.a.
1951	n.a.	n.a.	0.06	1.0	n.a.	n.a.
1952	n.a.	1.3	0.09	1.0	0.3	0.5
1953	n.a.	2.0	0.11	1.2	0.5	0.7
1954	n.a.	2.4	0.14	1.7	0.6	0.9
1955	n.a.	3.2	0.15	1.8	0.7	1.0
1956	n.a.	4.1	0.17	2.1	0.8	1.3
1957	n.a.	6.5	0.28	3.8	1.3	1.8
1958	n.a.	6.2	0.38	5.5	1.9	2.0
1959	13.2	7.5	0.48	6.8	2.6	2.7
1960	18.7	10.3	0.51	10.1	3.6	3.6
1961	26.8	9.5	0.66	14.9	5.7	n.a.
1962	42.6	18.1	1.26	25.6	9.7	8.7
1963	70.8	41.1	2.15	42.0	14.0	14.4
1964	165.5	98.4	3.74	99.3	32.3	23.9
1965	269.0	124.1	9.84	166.5	79.3	41.0
1966	349.4	149.0	14.53	220.5	91.3	71.1
1967	526.2	235.7	16.30	371.7	117.5	86.9
1968	670.7	254.6	26.70	n.a.	164.8	102.6
1969	831.5	281.3	45.70	n.a.	266.3	n.a.
1970	1,100.0	340.7	43.40	1,025.9	328.9	n.a.
1971	1,286.8	391.7	58.20	1,313.9	305.8	110.6
1972	1,720.0	494.5	73.70	1,721.6	448.8	135.8
1973	1,931.2	562.2	89.30	3,485.8	507.5	157.4
1974	3,129.6	1,066.8	133.00	5,992.8	716.7	n.a.
1975	4,261.5	1,140.9	1,089.00	n.a.	n.a.	n.a.
1976	11,968.6	2,671.6	2,076.00	n.a.	n.a.	n.a.
1977	18,176.9	4,057.4	3,326.00	n.a.	n.a.	n.a.
1978	35,537.5	n.a.	n.a.	n.a.	n.a.	n.a.

Sources: The figures for the direct expenditures of central and state governments and decentralized agencies are from Brasil, Secretaria de Planeamiento, Subsecretaria de Orcamento e Financas, *Projecto de Ley Orcamentaria* (Brasilia, 1970-76); Brasil, Secretaria de Planeamiento, Subsecretaria de Orcamento e Financas, "Demostracao da Despesa Pelas Unidades Orcamentarias Segundo as Categorias Economicas," Brasil, 1960-74 (mimeographed); and Instituto Brasileiro de Geografia e Estatística, *Anuário Estatístico* (Rio de Janeiro, 1974). The figures for the direct expenditures of the central government alone are from those three sources and Marvin Anderson, "The Planning and Development of Brazilian Agriculture, Some Quantitative Extensions" (Ph.D. dissertation, Cornell University, 1972).

The data for the decentralized agencies include some of the expenditures of the Brazilian Coffee Institute (IBC), the Sugar and Alcohol Institute (IAA), the Brazilian Institute of Agrarian Reform, and the National Institute of Agrarian Development.

The data on the direct expenditures on research and extension are found in Anderson, "Planning and Development"; Julio Penna and Augusto Monteiro, "A Taxo de Retorno de Pesquisa e Extansao Agrícola de Cacao Brasileiro," *Estudos Econômicos* 6 (No. 3, 1976): 51-82; and São Paulo, Secretaria de Agricultura, "Retorno Social aos Investimentos em Pesquisa na Cultura do Cafe," São Paulo, 1977 (mimeographed). To get the figures for the direct expenditures on irrigation, Instituto Brasileiro de Geografia e Estatistica, *Anuário Estatistica;* and Instituto Brasileiro de Estatistica, *Brasil: Series Estatisticas Retrospectivas* (Rio de Janeiro, 1970) were used.

The indirect estimates of expenditures on education and health were made from figures found in Brasil, Secretaria de Planeamiento, Subsecretaria de Orcamento e Financas, *Projecto de Ley Orcamentaria;* Brasil, Secretaria de Planeamiento, Subsecretaria de Orcamento e Financas, "Demostracao da Despesa"; Instituto Brasileiro de Geografia e Estadistica, *Anuário Estatístico;* Instituto Brasileiro de Estatistica, *Brasil: Series Retrospectivas;* G. Edward Schuh, *The Agricultural Development of Brazil* (New York: Praeger, 1970).

Notes: The two columns for total government expenditures may not include all expenditures included in the columns for expenditures on research and extension and for irrigation. It can be seen that the central government spent only 40 percent of total government expenditures in the last decade.

The estimates of expenditures on research and extension only include figures for research and extension on two products, coffee and cacao. Much of this spending was done by local governments. The central government spent only 5 percent of all its expenditures on research and extension between 1950 and 1964, but 20 percent of them on it after 1975.

The two national organizations for research and extension, the Empresa Brasileira de Pesquisa Agropecuario (EMBRAPA) and the Empresa Brasileira de Extension Rural (EMBRATER) spent Ncr 1,089 million in 1975, Ncr 2,076 million in 1976, and Ncr 3,323 million in 1977. These were large proportions of total expenditures, possibly a larger proportion than the estimates presented in the table for 1950-74. Schuh noticed an expansion of the States Extension Organizations from 193 in 1960 to 575 in 1966, and a large increase in the number of technicians employed.

Anderson attempted to evaluate the ways the government intervened in agriculture. He covered such elements as marketing and credit.

The estimates of spending on irrigation were made using a series for public investment on fixed capital (the series came from national accounts) and estimates made by a mission from the World Bank on the proportion of government spending corresponding to irrigation works.

The figures for direct expenditure on irrigation are, for some years, greater than the figures for direct expenditures of central and state governments and decentralized agencies. This is because the figures on irrigation expenditures are from the budget of the secretary of public works, which is not included in the figures for government expenditures.

Between 1960 and 1974, 8 percent of all public investment was made on irrigation. The figures for 1950-60 in the table were made using this percentage.

The indirect estimates of expenditures on health and education were made using the procedures described in the Appendix. The proportion of all expenditures on education attributed to agriculture was about 8.5 percent.

Table 23—Basic data on government expenditures in the agricultural sector of Chile, 1950-78

Year	Direct Expenditures of the Central Government and Decentralized Agencies	Direct Expenditures on Research and Extension	Indirect Estimates of Expenditures on Education	Indirect Estimates of Expenditures on Health	Direct Expenditures on Irrigation	Land Placed Under Irrigation by Government Investment
	(million current escudos)					(hectares)
1950	0.7	n.a.	n.a.	n.a.	0.14	8,280
1951	0.9	n.a.	n.a.	n.a.	n.a.	12,420
1952	3.1	n.a.	n.a.	n.a.	n.a.	...
1953	1.3	n.a.	n.a.	n.a.	n.a.	17,745
1954	2.1	0.07	n.a.	n.a.	0.49	...
1955	2.6	n.a.	n.a.	n.a.	n.a.	300
1956	4.1	n.a.	n.a.	n.a.	n.a.	2,980
1957	9.2	n.a.	n.a.	n.a.	n.a.	...
1958	14.2	n.a.	n.a.	n.a.	n.a.	111,137
1959	17.2	n.a.	n.a.	n.a.	n.a.	2,400
1960	36.4	n.a.	n.a.	n.a.	12.8	1,909
1961	51.3	n.a.	n.a.	n.a.	15.8	743
1962	61.0	n.a.	n.a.	n.a.	15.9	2,600
1963	93.2	n.a.	n.a.	n.a.	36.5	1,500
1964	103.0	1.0	n.a.	n.a.	28.5	18,000
1965	168.0	6.2	39.2	10.8	44.5	10,600
1966	266.0	11.8	36.7	17.5	52.4	n.a.
1967	387.0	10.4	60.2	18.5	72.2	n.a.
1968	656.0	13.2	112.7	49.7	54.9	n.a.
1969	891.0	17.9	125.9	92.1	59.8	n.a.
1970	1,163.0	22.8	173.7	131.4	97.0	n.a.
1971	2,564.0	45.2	n.a.	n.a.	186.6	n.a.
1972	4,573.0	69.7	n.a.	n.a.	416.3	n.a.
1973	16,727.0	n.a.	n.a.	n.a.	n.a.	n.a.
1974	105,800.0	n.a.	n.a.	n.a.	n.a.	n.a.
1975	634,788.0	7,484.9	n.a.	n.a.	n.a.	n.a.
1976	1,014,000.0	n.a.	n.a.	n.a.	n.a.	n.a.
1977	2,222,000.0	86,602.0	n.a.	n.a.	62,217.0	n.a.
1978	3,300,000.0	n.a.	n.a.	n.a.	n.a.	n.a.

Sources: The figures on direct expenditures of the central government and decentralized agencies are from Universidad de Chile, Instituto de Economía, *Desarrollo Económico de Chile 1940-1956* (Santiago de Chile: Editorial Universitaria, 1957); Markos Mamalakis, *Historical Statistics of Chile 1840-1965* (Westport, Conn.: Greenwood Press, forthcoming); Chile, Oficina de Planificacion Nacional (ODEPLAN), *Balance Económico de Chile 1960-1970* (Santiago de Chile: Editorial Universitaria, 1973); Universidad Católica de Chile, Programa Posgrado de Economía Agraria, *Chile Agricultural Sector (Overview 1964-1974)* (Santiago de Chile, 1976); and Chile, Ministerio de Hacienda, *Ley de Presupuesto del Sector Publico* (Santiago de Chile, 1977).

The decentralized agencies include: Servicio Agricola Ganadero; Instituto de Desarrollo Agropecuario; Corporación de Reforma Agraria; Oficina de Planificacion Agricola; Instituto de Investigaciones Agropecuarias; Instituto de Capacitación e Investigacion en Reforma Agraria; Sociedad de Comercialización de la Reforma Agraria; Instituto de Educación Rural; and Instituto de Desarrollo Indígena—all connected with the Ministry of Agriculture; and some other agencies connected with the Ministries of Economy, Finance, Public Works, Land and Colonization, and Education, such as Empresa de Comercio Agricola, Instituto de Investigaciones e Recursos Naturales, Dirección de Riegos, and Dirección de Tierras y Bienes Nacionales. To get the figures for direct expenditures on irrigation, Universidad de Chile, Instituto de Economia, *Desarrollo Económico de Chile;* Universidad Católica de Chile, Programa Posgrado de Economía Agraria, *Chile Agricultural Sector,* and Chile, Ministerio de Hacienda, *Ley de Presupuesto* were used.

The estimates of indirect expenditures on health and education were made from data in ODEPLAN, *Balance Economico de Chile;* and Universidad Católica de Chile, Programa Posgrado de Economía Agraria, *Chile Agricultural Sector.*

The series on land placed under irrigation by government investment is from N. Wollman, *The Water Resources of Chile* (Baltimore, Md.: Johns Hopkins University Press, 1968). It includes new land and new equivalent land.

Notes: The study made by the graduate program in agricultural economics at the Catholic University of Chile covered several components. Among these are the institutions under the ministries. For example, the Secretary of Agriculture has 10 institutions, the Secretary of Economy has 13, the Secretary of Finance has 1, the Secretary of Public Works has 2, the Secretary of Land and Colonization has 1, and the Secretary of Education has 1.

The main institutions under the Ministry of Agriculture were Servicio Agricola Ganadero (SAG), allocated 34 percent of the budget; Instituto de Desarrollo Agropecuario (INDAP), allocated 33.4 percent of the budget; and Instituto de Investigaciones Agropecuarias (INIA), allocated almost 11 percent of the budget. The institutions of the Ministry of Agriculture employed 11,000 people in 1970 and almost 21,500 people in 1974.

The Corporacion de Fomento de la Produccion was under the Ministry of Economy. This institution promotes industrial growth. Agriculture received 10 percent of its assets between 1950 and 1954.

The study of the Catholic University of Chile also estimated spending on research and extension. These estimates included allocations to government and to universities. The latter, the University of Chile, the Catholic University of Chile, and Concepcion University, received almost 40 percent of the money allocated to research and extension in 1966. This percentage is much higher than the universities of Argentina received.

Estimates of the amount of electricity consumed by agriculture and the price per kilowatt appear in the study. Unfortunately, the implicit subsidy cannot be calculated because no figures for the shadow price of electricity are available.

Marketing expenditures were estimated to be 8.7 percent of expenditures by the central government in 1964, and 12 percent of them in 1974.

Wollman's series on new and equivalent land placed under irrigation by government investment can be compared with the figures for direct investment on irrigation appearing in the table. Because there is a lag between expenditures and the appearance of new irrigation facilities, a direct correspondence cannot be found.

R. Crosson, *Agricultural Development and Productivity Lesson from Chilean Experience* (Baltimore, Md.: Johns Hopkins University Press, 1970) gives an idea of the importance of public investment for irrigation. Public investment was 2 percent of private investment in irrigation in 1950, but almost 7 percent of it in 1959.

The procedure used to estimate indirect expenditures on education and health is described in the Appendix. The proportion of all expenditures on education attributed to agriculture was less than 20 percent.

An estimate of agriculture's share of public investment on roads and bridges can be found in the study by the Economic Institute of the University of Chile. This share was about 0.51 million escudos in 1954. A similar amount was spent on irrigation in that year.

Table 24—Basic data on government expenditures in the agricultural sector of Colombia, 1950-77

Year	Direct Expenditures of the Central Government and Decentralized Agencies	Direct Expenditures of the Central Government	Direct Expenditures on Research and Extension	Direct Expenditures on Irrigation	Indirect Estimates of Expenditures on Education	Indirect Estimates of Expenditures on Health
			(million current Colombian pesos)			
1950	n.a.	25.4	7.8	n.a.	15.7	9.9
1951	n.a.	44.9	9.9	n.a.	n.a.	n.a.
1952	n.a.	44.3	13.5	n.a.	n.a.	n.a.
1953	n.a.	57.2	12.4	n.a.	22.5	15.6
1954	n.a.	43.9	16.6	n.a.	29.5	n.a.
1955	n.a.	44.8	17.9	n.a.	n.a.	n.a.
1956	n.a.	44.8	19.3	n.a.	n.a.	n.a.
1957	n.a.	144.1	17.0	n.a.	n.a.	n.a.
1958	n.a.	111.5	22.4	n.a.	56.1	22.5
1959	n.a.	61.5	23.8	n.a.	73.0	n.a.
1960	n.a.	103.7	26.1	n.a.	87.7	30.5
1961	1,004.9	362.5	38.9	n.a.	120.3	n.a.
1962	1,286.4	282.0	37.2	n.a.	237.5	n.a.
1963	1,306.9	226.2	26.0	n.a.	289.4	53.3
1964	1,340.3	340.3	31.8	n.a.	344.3	n.a.
1965	2,010.5	804.1	50.8	n.a.	281.4	59.1
1966	2,046.5	907.5	49.9	n.a.	334.4	91.1
1967	2,505.1	1,011.3	75.9	1,069.5	375.2	96.5
1968	3,914.5	1,528.1	115.5	1,880.7	395.8	112.9
1969	5,459.3	1,633.5	140.3	872.9	546.3	224.0
1970	7,314.0	2,329.5	167.6	2,821.0	652.9	348.6
1971	9.762.0	2,509.3	198.4	1,902.6	n.a.	418.3
1972	9,361.9	2,876.6	n.a.	1,618.7	n.a.	376.1
1973	10,710.7	2,782.0	n.a.	1,430.9	1,464.5	519.0
1974	n.a.	5,794.0	n.a.	1,923.0	n.a.	n.a.
1975	14,119.8	2,796.0	n.a.	1,915.7	2,304.3	803.8
1976	15,604.0	2,752.0	n.a.	2,003.1	n.a.	n.a.
1977	n.a.	5,542.0	n.a.	n.a.	n.a.	n.a.

Sources: The figures for direct expenditures of the central government and decentralized agencies were found in Colombia, Ministerio de Hacienda y Crédito Público, Dirección General de Presupuesto, *Boletines* (Bogotá, 1970); Contraloría General de la República de Colombia, Dirección de Análisis Financiero y Estadística, *Estadística Fiscal del Estado,* tomo 1 (Bogotá, 1976); Contraloría General de la República de Colombia, Dirección de Análisis Financiero y Estadística, *Informe Financiero,* Julio 1978; Colombia, Departamento Nacional de Planeación, *Anuario de Estadística Fiscales y Financieras* (Bogotá, 1957-73); and S. Kalmanovitz, *La Agricultura en Colombia 1950–72* (Bogotá: Departamento Administrativo Nacional de Estadística, 1978). The figures for the expenditures of the central government alone are from those five sources and Banco de la República, *Revista del Banco de la República,* various issues.

The decentralized agencies include: Instituto Colombiano Agropecuario; Instituto de Mercade Agropecuario; Instituto Colombiano de Reforma Agraría; Instituto de Hidrologia, Meteorología y Adecuación de Tierra; and Programa de Desarrollo Rural Integrado.

The data for direct expenditures on research and extension are from Ramiro Orozco, "Sources of Agricultural Production and Productivity in Colombia Agriculture" (Ph.D. dissertation, Oklahoma State University, 1977); and the data for direct expenditures on irrigation are from Colombia, Departamento Nacional de Planeación, "Estimacion de Inversiones Públicas," Bogotá, 1978. (Mimeographed.)

The indirect estimates of expenditures on education were made from data in Colombia, Ministerio de Hacienda y Credito Público, Dirección General de Presupuesto, *Bolitines;* Contraloría General de la República de Colombia, Dirrección de Análisis Financiero y Estadística, *Estadística Fiscal,* tomo 1; Contraloría General de la República de Colombia, Dirección de Análisis Financiero y Estadística, *Informe Financiero,* Julio 1978; Colombia, Departamento Nacional de Planeación, *Anuario de Estadístico;* J. P. Jallade, *Public Expenditures and Income Distribution in Colombia* (Washington, D.C.: International Bank for Reconstruction and Development, 1973); and Colombia, Ministerio de Educación, Oficina de Planeamiento Educativo, *La Educacion en Colombia* (Bogotá, 1972).

The data from which the indirect estimates of expenditures on health were made are from Colombia, Ministerio de Hacienda y Crédito Publico, Dirección General de Presupuesto, *Boletines;* Contraloría General de la República de Colombia, Dirección de Análisis Financiero y Estadística, *Estadística Fiscal,* tomo 1; Contraloría General de la República de Colombia, Dirección de Análisis Financiero y Estadística, *Informe Financiero,* Julio 1978; Colombia, Departamento Nacional de Planeación, *Anuario Estadístico;* and Colombia, Departamento Nacional de Planeación, "Le Economía Colombiana 1950-1975," *Revista de Planeamiento y Desarrollo* 9 (October - December 1977):1-278.

Notes: Though data for decentralized agencies before 1961 are not available, there is evidence that their expenditures were important. For example, the Instituto Colombiano Agropecuario (ICA) was created in 1962, but its functions had been served by the Special Studies and Department of Agrarian Research since 1950. The Marketing Institute was created in 1944, and the Institute of Agrarian Reform began operating in 1950.

Figures from Orozco, "Sources of Production and Productivity," show how important the expenditures of each level of government are to research and extension. In 1960 the central government spent 2,294 million Colombian pesos on research and extension, local governments spent 631 million, and municipalities spent 714 million (figures for the decentralized agencies were not given). In 1970 the central government spent 18,238 million Colombian pesos on research and extension, decentralized agencies spent 17,620 million, local governments spent 4,113 million, and municipalities spent 4,946 million. The figures in Dragoslav Avramovic, *El Desarrollo Economico de Colombia: Problemas y Perspectivas,* Informe del Banco Mundial (Bogotá: Biblioteca Banco Popular, 1973) are even higher. Estimates of expenditures on research and extension for rice, wheat, and soybeans can be found in Reed Hertford, J. Ardila, A. Rocha, and C. Trujillo, "Productivity of Agricultural Research in Colombia," in Thomas Arndt, Dana Dalrymple, and Vernon Ruttan, eds., *Resource Allocation and Productivity in International Agricultural Research* (Minneapolis, Minn.: University of Minnesota Press, 1977). These figures are 0.08 million Colombian pesos in 1950, 1.52 million in 1960, 18.62 million in 1970, and 25.98 million in 1972. They are less than 10 percent of the figures shown in the table.

The data used to derive the estimates of direct expenditures on irrigation were based on a broader conception of public investment in agriculture than the data used to derive the other columns in the table. This series could, therefore, cover more types of expenditures. Only direct expenditures on research and extension were subtracted from it. Separate estimates from other sources were not to be had, with the exception of some figures from the Colombian Institute for Agrarian Reform (INCORA). These figures are less than half the figures in the table for the years between 1967 and 1975.

The procedure used to derive the indirect estimates of expenditures on education could be verified with the help of Marcelo Selowsky, *Who Benefits from Government Expenditure?: A Case Study of Colombia* (Washington, D.C.: International Bank for Reconstruction and Development, 1978). Selowsky used a sample survey in 1974 to estimate how much education a rural family was getting. He concluded that 1,502 million Colombian pesos were being spent on primary education. The estimate in the table is about the same.

The estimates made for this report show that agriculture's share of primary education is about 40 percent; of medium education, 3 percent; and of university education, 15 percent. These figures are averages for the entire period covered.

Another indication of the amount of government expenditures on education going to agriculture is provided by the number of rural students enrolled at the Servicio Nacional de Aprendizaje. Rural students made up 1 percent of enrollment in 1960, 42 percent in 1970, and 27 percent in 1974.

Orozco, "Sources of Production and Productivity," and Kalmanovitz, *La Agricultura en Colombia* present figures giving the share of new loans given to agriculture. In 1960, 1,273 million pesos were given out in new loans, 74 percent of the direct expenditures of the central government on agriculture. In 1970, 1,987 million pesos (adjusted to 1960 values) were given out in new loans, 80 percent of the direct expenditures of the central government on agriculture. These figures show how important a part of public policy credit is when compared to direct expenditures. The amount of the subsidy, if there is one, still needs to be evaluated through differences in interest rates.

Table 25—Basic data on government expenditures in the agricultural sector of Costa Rica, 1959-78

Year	Direct Expenditures of the Central Government	Direct Expenditures of the Central Government and Decentralized Agencies	Direct Expenditures on Research and Extension	Direct Expenditures on Irrigation	Indirect Estimates of Expenditures on Education	Indirect Estimates of Expenditures on Health
			(million current cruzeiros)			
1959	6.2	n.a.	n.a.	n.a.	n.a.	n.a.
1960	6.4	n.a.	n.a.	n.a.	n.a.	n.a.
1961	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.
1962	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.
1963	7.7	n.a.	n.a.	n.a.	n.a.	n.a.
1964	8.2	n.a.	n.a.	n.a.	n.a.	n.a.
1965	9.0	n.a.	n.a.	n.a.	n.a.	n.a.
1966	9.4	n.a.	n.a.	n.a.	n.a.	n.a.
1967	14.3	n.a.	n.a.	n.a.	n.a.	n.a.
1968	23.7	n.a.	n.a.	n.a.	n.a.	n.a.
1969	26.0	n.a.	n.a.	n.a.	n.a.	n.a.
1970	25.0	n.a.	n.a.	n.a.	56.7	7.6
1971	37.5	96.1	20.5	0.2	64.2	9.0
1972	41.7	120.8	23.3	0.7	75.2	9.9
1973	43.6	134.3	24.7	0.8	93.8	11.1
1974	65.4	171.7	22.6	1.5	146.9	42.6
1975	69.3	183.7	23.3	2.4	204.2	49.8
1976	77.9	n.a.	n.a.	n.a.	263.3	64.5
1977	114.0	n.a.	n.a.	n.a.	315.1	65.1
1978	135.0	n.a.	n.a.	n.a.	402.0	104.5

Sources: The figures for direct expenditures on the central government are from Banco Interamericano de Desarrollo, División de Estudios Generales, *Desarrollo Agropecuario y Rural de Costa Rica* (Washington, D.C., 1978); Banco Central de Costa Rica, *Memoria Anual* (San Jose de Costa Rica, 1975); Banco Central de Costa Rica, *Cuentas Nacionales* (San Jose de Costa Rica, 1978); Costa Rica, Dirección General de Estadísticas y Censos, *Anuario Estadístico* (San Jose de Costa Rica, 1976); and Kenneth Ruddle and Kathleen Barrows, *The Statistical Abstract of Latin America* (Berkeley, Cal.: University of California Press, 1972).

Banco Interamericano de Desarrollo, División de Estudios Generales, *Desarrollo Agropecuario y Rural* was the source for the data on direct expenditures of the central government and decentralized agencies, direct expenditures on research and extension, and direct expenditures on irrigation.

The decentralized agencies include: Instituto de Tierras y Colonización; Oficina Nacional del Café; Consejo Nacional de Producción; and Servicio Nacional de Electricidad.

Notes: The study by the Interamerican Development Bank shows that the decentralized agencies spent more than the central government between 1971 and 1975, so that the direct expenditures of the central government and the decentralized agencies are more than twice the direct expenditures of the central government alone. Other indications of the amount of spending on education for agriculture are provided by the number of agricultural technicians graduated, which was 25 in 1965 and 511 in 1973, and the registration in the Agriculture Department of the University of Costa Rica, which increased from 712 in 1973 to 1,238 in 1977.

Table 26—Basic data on government expenditures in the agricultural sector of Mexico, 1950-78

Year	Direct Expenditures of the Central Government	Direct Expenditures of the Central Government and Decentralized Agencies	Direct Expenditures on Research and Extension	Direct Expenditures on Irrigation	Indirect Estimates of Expenditures on Education	Indirect Estimates of Expenditures on Health
			(million current Mexican pesos)			
1950	59	575	4	372	118	2
1951	76	657	5	502	n.a.	2
1952	90	652	6	548	n.a.	3
1953	91	655	6	506	n.a.	3
1954	131	759	12	604	n.a.	3
1955	163	770	16	602	268	14
1956	184	880	16	588	n.a.	24
1957	213	904	24	641	n.a.	36
1958	238	938	30	644	n.a.	42
1959	324	1,074	32	748	n.a.	52
1960	318	897	36	577	710	71
1961	325	1,270	43	943	n.a.	132
1962	349	1,163	42	813	n.a.	159
1963	380	1,794	40	1,412	n.a.	185
1964	424	2,594	45	2,168	n.a.	500
1965	456	1,576	46	1,106	1,577	600
1966	486	1,745	93	1,255	n.a.	632
1967	498	2,851	127	2,349	1,972	676
1968	562	2,710	114	2,131	2,191	778
1969	590	3,292	147	2,661	2,611	759
1970	718	4,398	106	3,600	3,345	886
1971	783	3,728	123	2,630	n.a.	1,080
1972	1,397	5,899	203	3,731	n.a.	1,780
1973	2,179	8,699	220	4,849	n.a.	2,003
1974	2,850	13,318	302	7,743	5,957	2,003
1975	4,035	20,169	460	11,574	n.a.	2,983
1976	n.a.	16,613	505	9,492	n.a.	n.a.
1977	42,264	37,110	n.a.	n.a.	n.a.	n.a.
1978	n.a.	42,710	n.a.	n.a.	n.a.	n.a.

Sources: The figures for the direct expenditures of the central government, the direct expenditures of the central government and decentralized agencies, and the indirect estimates of expenditures on education are from México, Nacional Financiera, *Mexico en Cifras* (México D.F., 1970, 1977); Banco de México, *Informe Anual* (México D.F., 1975-77); and Banco de México, *Indicadores Economicos* (Mexico, D.F., 1977, 1978).

The decentralized agencies include the National Institute of Agricultural Research (INIA) and the National Corporation for Peoples Subsistence (CONASUPO); the central government data include the Department of Agrarian and Colonization Affairs.

Table 26—Continued

The data for direct expenditures on research and extension are from México, Nacional Financiera, *México en Cifras;* Reed Hertford, *Sources of Changes in Mexican Agricultural Production, 1940-1965,* Foreign Agricultural Economic Report No. 73 (Washington, D.C.: U.S. Department of Agriculture, 1971); and Nicolas Ardito Barletta, "Costs and Social Benefits of Agricultural Research in Mexico" (Ph.D. dissertation, University of Chicago, 1971).

México, Nacional Financiera, *México en Cifras* was the source for the figures on direct expenditures on irrigation. It and Organización de Estados Americanos, "El Sector Salud en México," México D.F. (mimeographed) were used to derive the indirect estimates of expenditures on health.

Notes: The direct expenditures of the central government include the budget of the central government and expenditures of the Departamento de Asuntos Agrarios. The direct expenditures of the central government and decentralized agencies include the direct expenditures of the central government and public investment in agriculture (in irrigation, for example). This means that some items may have been counted twice.

No comprehensive account of the expenditures on research and extension is available. For irrigation, there are estimates of the area being irrigated because of public investment, but because the figures in the table are available, they are not needed. The percentage of people from rural areas in the total number of associates of the Instituto Mexicano de Seguridad Social (IMSS) can be used to calculate expenditures on health. This percentage should be a more appropriate measure than the percentage of the population living in rural areas, which varied between 2 and 13 percent between 1950 and 1978.

The proportion of all credit that went to agriculture was 12 percent in 1950 and 9 percent in 1970.

Some estimates of spending on roads and electricity are available, but figures needed to infer the amount that went to agriculture are not.

Table 27—Basic data on government expenditures in the agricultural sector of Peru, 1950-78

Year	Direct Expenditures of the Central Government	Direct Expenditures On Research and Extension	Direct Expenditures on Irrigation
		(million current soles)	
1950	n.a.	n.a.	47
1951	127	n.a.	n.a.
1952	184	n.a.	n.a.
1953	157	n.a.	n.a.
1954	119	n.a.	191
1955	258	n.a.	n.a.
1956	351	n.a.	n.a.
1957	231	n.a.	n.a.
1958	400	n.a.	n.a.
1959	142	16.7	n.a.
1960	189	n.a.	27
1961	437	n.a.	75
1962	372	45.2	107
1963	485	n.a.	164
1964	773	n.a.	129
1965	1,154	121.4	342
1966	1,470	n.a.	671
1967	1,681	n.a.	657
1968	2,131	191.2	533
1969	2,212	n.a.	414
1970	3,248	n.a.	439
1971	2,840	290.3	642
1972	3,464	n.a.	964
1973	5,410	n.a.	1,971
1974	7,814	359.8	3,819
1975	11,956	n.a.	n.a.
1976	14,895	n.a.	n.a.
1977	19,185	n.a.	n.a.
1978	25,937	n.a.	n.a.

Sources: The figures for the direct expenditures of the central government are from Peru, Banco Central de Reserva, *Cuentas Nacionales* (Lima, 1950); Peru, Banco Central de Reserva, *Appendixes to Cuentas Nacionales* (Lima, 1976); Peru, Banco Central de Reserva, *El Desarrollo Económico y Financiero del Peru* (Lima, 1972); Peru, Ministerio de Economia y Finanzas, Dirección General de Presupuesto Público, *Evaluacion de la Ejecución del Presupuesto del Sector Público* (Lima, 1975); Peru, Instituto Nacional de Planificación, *Informe del Peru al Comité Interamericano de la Alianza para el Progreso* (Lima, 1966); and International Monetary Fund, *Government Financial Statistics Yearbook*, Vol. 4, 1980 (Washington, D.C., 1980).

James Boyce and Robert E. Evenson, *Agricultural Research and Extension Programs* (New York: Agricultural Development Council, 1975) was the source for the data on direct expenditures on research and extension.

The figures for direct expenditures on irrigation were found in Peru, Banco Central de Reserva, *Cuentas Nacionales;* and International Bank for Reconstruction and Development, *World Tables, 1976* (Washington, D.C., 1976).

Table 28—Basic data on government expenditures in the agricultural sector of Venezuela, 1950-78

Year	Direct Expenditures of the Central Government	Direct Expenditures of the Central Government and Decentralized Agencies	Direct Expenditures on Research and Extension	Direct Expenditures on Irrigation	Indirect Estimates of Expenditures on Education	Direct Expenditures on Social Welfare[a]
			(million current bolivares)			
1950	118	n.a.	n.a.	22	19	n.a.
1951	110	n.a.	n.a.	24	21	n.a.
1952	129	n.a.	n.a.	18	21	n.a.
1953	124	n.a.	n.a.	22	22	n.a.
1954	126	n.a.	n.a.	58	24	n.a.
1955	148	n.a.	n.a.	88	24	n.a.
1956	140	n.a.	n.a.	79	25	n.a.
1957	229	n.a.	69	31	26	n.a.
1958	465	n.a.	100	23	39	n.a.
1959	383	n.a.	122	41	59	n.a.
1960	468	n.a.	200	44	76	n.a.
1961	606	n.a.	160	n.a.	84	n.a.
1962	416	n.a.	139	89	86	n.a.
1963	372	n.a.	108	76	101	n.a.
1964	513	n.a.	151	n.a.	n.a.	n.a.
1965	581	n.a.	151	n.a.	n.a.	n.a.
1966	547	n.a.	169	n.a.	n.a.	n.a.
1967	613	n.a.	182	162	166	98
1968	675	865	178	143	185	72
1969	668	861	179	157	209	70
1970	780	935	203	143	250	48
1971	941	1,168	166	140	283	49
1972	883	1,152	171	155	336	52
1973	1,102	1,386	172	155	426	51
1974	3,656	4,485	284	402	547	62
1975	3,434	5,051	281	343	723	n.a.
1976	3,447	5,166	350	326	854	n.a.
1977	3,415	5,040	404	n.a.	1,036	n.a.
1978	3,554[b]	n.a.	n.a.	n.a.	n.a.	n.a.

Sources: The figures for direct expenditures of the central government are from Venezuela, Ministerio de Fomento, Dirección General de Estadísticas y Censos Nacionales, *Anuário Estadística 1957-1963* (Caracas, 1974); Venezuela, Ministerio de Hacienda, *Memoria 1975* (Caracas, 1975); Venezuela, Ministerio de Hacienda, *Introduccion a la Memoria de 1975* (Caracas, 1975); Venezuela, Banco Central, *Informe Económico* (Caracas, 1976); and Venezuela, Banco Central, *Informe Económico* (Caracas, 1977).

Venezuela, Banco Central, *Informe Económico* (Caracas, 1976); and Venezuela, Banco Central, *Informe Económico* (Caracas, 1977) were also used to get the figures for direct expenditures of the central government and decentralized agencies.

The figures in the other columns of the table are from Venezuela, Ministerio de Fomenta, Dirección General de Estadísticas y Censos Nacionales, *Anuario Estadística 1957-1963;* Venezuela, Ministerio de Hacienda, *Memoria 1975;* Venezuela, Ministerio de Hacienda, *Proyectos de Ley de Presupuesto;* Venezuela, Ministerio de Hacienda, *Introduccion a la Memoria de 1966;* and Venezuela, Ministerio de Hacienda, *Introduccion a la Memoria de 1975.*

Notes: The importance of local government spending has decreased in recent years. It made up 11.5 percent of total government spending in 1960; 6.2 percent in 1970, and only 4.1 percent in 1975. Therefore it is not included in the figures on government expenditures in the table. The figures for direct expenditures of the central government and decentralized agencies do not include expenditures from ministries other than agriculture.

The decentralized agencies include: Instituto Agropecuario Nacional; Fondo de Investigación Agropecuaria; Investigación y Extensión Agropecuaria; and Corporación de Mercadeo.

The estimates of expenditures on research and extension are from the budget of the Instituto Agropecuario Nacional. The budget of the Fondo Investigación Agropecuario provides estimates specifically for research. They are, for 1962, 24.0 million bolivares; for 1963, 28.6; for 1964, 34.6; for 1965, 31.9; for 1966, 33.0; for 1975, 59.8; for 1976, 72.7; for 1977, 79.1; and for 1978, 102.0 (these figures are in current bolivares; the figures for the years not included in this list are not available).

The average share for agriculture of spending for education was 15 percent, according to an estimate made from data in L. Heaton, *The Agricultural Development of Venezuela* (New York: Praeger). Heaton also presents a series on the number of graduates in agricultural engineering.

Some estimates of expenditures on marketing were also made for this report: 15.0 million bolivares in 1969 and 1,238.0 million bolivares in 1976.

[a] This column includes items such as housing and sanitation in rural areas.

Table 29—Government expenditures on agriculture in the currency of each country, 1950-78

Years	Argentina	Bolivia	Brazil	Chile	Colombia	Costa Rica	Mexico	Peru	Venezuela
	(million new pesos)	(million pesos)	(million new cruzeiros)	(million escudos)	(million pesos)	(million cruzeiros)	(million pesos)	(million sole)	(million bolivares)
1950	40.1	n.a.	n.a.	18.8	54.9	n.a.	1,114	n.a.	122.1
1951	56.7	n.a.	n.a.	19.1	88.0	n.a.	1,127	276	125.1
1952	53.7	n.a.	n.a.	49.6	85.6	n.a.	1,055	376	146.3
1953	66.8	n.a.	n.a.	17.5	105.4	n.a.	1,063	314	140.3
1954	50.5	n.a.	n.a.	17.0	72.7	n.a.	1,089	216	142.1
1955	48.9	n.a.	n.a.	11.8	74.3	n.a.	995	437	166.1
1956	58.2	n.a.	n.a.	11.5	68.8	n.a.	1,067	557	152.7
1957	33.5	n.a.	n.a.	19.7	189.0	n.a.	1,018	345	220.7
1958	39.0	n.a.	n.a.	23.1	129.0	n.a.	1,018	556	439.5
1959	33.4	n.a.	16.7	20.1	66.7	6.4	1,120	165	375.5
1960	45.8	17.9	18.7	36.4	103.7	6.4	897	189	468.3
1961	52.1	31.0	20.1	54.5	335.0	n.a.	1,228	421	594.1
1962	46.3	36.3	20.6	56.6	244.4	n.a.	1,092	341	403.2
1963	44.1	53.4	19.3	61.1	159.1	7.1	1,634	420	347.8
1964	53.6	61.2	24.0	46.4	205.7	7.3	2,236	592	445.9
1965	53.5	95.2	25.0	56.4	445.5	8.0	1,328	779	505.4
1966	62.1	158.3	23.5	68.6	437.4	8.3	1,414	884	467.6
1967	74.6	125.4	27.8	77.8	450.0	12.6	2,245	901	514.2
1968	84.3	188.7	27.7	100.7	621.9	20.6	2,085	970	557.0
1969	86.6	171.2	28.1	99.3	614.2	22.1	2,437	933	541.7
1970	90.7	197.5	31.1	93.3	794.4	20.5	3,115	1,279	586.6
1971	74.5	175.4	30.2	162.7	767.8	28.7	2,517	1,068	667.8
1972	70.3	206.8	34.5	155.5	779.6	30.1	3,831	1,255[a]	586.3
1973	66.5	269.7	33.3	109.2	618.6	27.6	4,882	1,740[a]	636.4
1974	71.2	220.4[a]	40.4	85.1	1,007.1	29.7	6,101	2,122	1,809.9[a]
1975	68.3	251.1[a]	42.2	123.5	411.0	26.3	8,358	2,628[a]	1,499.6[a]
1976	78.1[a]	336.6[a]	80.0	61.4[a]	319.2	27.6	5,632	2,453[a]	1,401.2[a]
1977	92.4	374.9[a]	88.2[a]	72.4[a]	507.3	34.3	10,300[a]	2,288[a]	1,260.1[a]
1978	81.2	519.2[a]	125.3[a]	75.2[a]	n.a.	38.0	10,098[a]	1,960[a]	1,219.6[a]

Table 30—Aggregated government expenditures on agriculture, 1950-78

Year	Argentina	Bolivia	Brazil	Chile	Colombia	Costa Rica	Mexico	Peru	Venezuela
					(U.S. $ million 1960)				
1950	48.4	n.a.	n.a.	17.9	8.5	n.a.	89.1	n.a.	37.0
1951	68.5	n.a.	n.a.	18.2	13.7	n.a.	90.2	10.2	37.9
1952	64.9	n.a.	72.1[a]	47.3	13.3	n.a.	84.4	13.9	44.3
1953	80.7	n.a.	94.7[a]	16.7	16.4	n.a.	85.0	11.6	42.5
1954	61.0	n.a.	94.7[a]	16.2	11.3	n.a.	87.1	8.0	43.1
1955	59.1	n.a.	106.3[a]	11.2	11.6	n.a.	79.6	16.2	50.3
1956	70.3	n.a.	112.2[a]	11.0	10.7	n.a.	85.4	20.6	46.3
1957	40.5	n.a.	157.6[a]	18.8	29.4	n.a.	81.4	12.8	66.9
1958	47.1	n.a.	136.1[a]	22.0	20.1	n.a.	81.4	20.6	133.2
1959	40.3	n.a.	122.8	19.2	10.4	1.1	89.6	6.1	113.8
1960	55.3	1.5	137.5	34.7	16.1	1.1	71.8	7.0	141.9
1961	62.9	2.6	147.8	52.0	52.1	n.a.	98.2	15.6	180.0
1962	55.9	3.1	151.5	54.0	38.0	n.a.	87.4	12.6	122.2
1963	53.3	4.5	141.9	58.2	24.7	1.3	130.7	15.5	105.4
1964	64.7	5.2	176.5	44.2	32.0	1.3	178.9	21.9	135.1
1965	64.6	8.0	183.8	53.8	69.3	1.4	106.2	28.8	153.2
1966	75.0	13.3	172.8	65.4	68.0	1.5	113.1	32.7	141.7
1967	90.1	10.6	204.4	74.2	70.0	2.3	179.6	33.3	155.8
1968	101.8	15.9	203.7	96.0	96.7	3.7	166.8	35.9	168.8
1969	104.6	14.4	206.6	94.7	95.5	3.9	195.0	34.5	164.2
1970	109.5	16.6	228.7	88.9	123.6	3.7	249.2	47.3	177.8
1971	90.0	14.8	222.1	155.1	119.4	5.1	201.4	39.5	202.4
1972	84.9	17.4	253.7	148.2	121.3	5.4	306.5	46.4[a]	177.7
1973	80.3	22.7	244.9	104.1	96.2	4.9	390.6	64.4[a]	192.8
1974	86.0	18.6[a]	297.1	81.1	156.6	5.3	488.1	78.5	548.5
1975	82.5	21.1[a]	310.3	117.7	63.9	4.7	668.6	97.2[a]	454.4
1976	94.3[a]	28.3[a]	588.2	58.5[a]	49.7	4.9	450.6	90.8[a]	424.6
1977	111.6	31.6[a]	648.5[a]	69.0[a]	78.9	6.1	824.0[a]	84.7[a]	381.8
1978	97.8	43.7[a]	921.3[a]	71.7[a]	n.a.	6.8	807.8[a]	72.5[a]	369.6[a]

Source: Derived from Table 29.

Note: The following foreign exchange rates were used: 0.828 for Argentina; 11.88 for Bolivia; 0.136 for Brazil; 1.049 for Chile; 6.429 for Colombia; 5.599 for Costa Rica; 12.5 for Mexico; 27.02 for Peru; and 3.3 for Venezuela.

[a] This figure is an estimate.

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