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Accounting for Sustainable Agricultural Growth in Central America

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Abstract

Agricultural growth remains fundamentally important for future economic growth and development possibilities in Central America. Based on a conceptual understanding of agricultural growth and empirical evidence based on the past and recent experience in Central America and other regions of the world, the purpose of this paper is to outline reasonable growth possibilities for agriculture in Central America in the future. While individual countries must decide for themselves, 4% per year average growth in real agricultural GDP is a high but possible objective to attain. The analysis explains why most of this growth must come from yield growth (3%), with essentially no growth in land and minor growth in net social values per unit of output (1%). Growth in net social values per unit of output (per unit profits minus any externalities) must come mainly from reductions in input costs and externalities associated with production. The key area of focus for the future is how to increase labor productivity without substantially increasing the use of other inputs that also have negative environmental and health effects.

Keywords: agricultural growth, Central America, productivity

JEL codes: O47, O13, Q10

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I. INTRODUCTION

A goal of 5.0% real GDP growth per capita is stated as a key macroeconomic objective in the Central America Project's recently completed "Central America in the Twenty First Century: An Agenda for Competitiveness and Sustainable Development" (INCAE/CLADS and HIID, 1999), (Table 8.1 on page 134). Given that actual performance during the early 1990s was substantially less at 1.4% per capita during 1993-1996 (INCAE/CLADS and HIID, 1999 p. 134), this growth objective implies a substantial jump in annual growth rates in all countries in the region over the next twenty years. Given that population growth was and remains likely to be in the range of two to three percent per year, this per-capita growth objective implies that total GDP must grow in the range of seven to eight percent per year for the next 20 years to meet the stated macroeconomic objective of the "Agenda".

While aggregate GDP growth was in the range of 3.5-4.5% per year in the early 1990s, Table 1 shows that annual average growth during 1990-1997 in agricultural GDP was about 1.2% in El Salvador, about 3% in Costa Rica, Guatemala, and Honduras, and a historical high of 8.7% in Nicaragua.[1] Given that population growth was between 2-3% in each country, per-capita agricultural growth during the periods 1971-1990 and 1990-1997 were close to zero or negative in all countries except Nicaragua. Nicaragua experienced substantially negative growth rates in per capita GDP during 1971-1990, but has achieved some substantial improvements during the 1990-1997 period of almost 5.75% per year. In many respects, this high growth rate is just catching up for lost growth in the previous twenty years. Given that agricultural and related food-processing activities remain key sectors of the economies of Central America, the lack of growth in agriculture can have substantial impacts on the region's ability to meet it's growth objectives.[2]

There is now a long history of analysis documenting growth patterns and realistic possibilities for agriculture's role in the overall economic growth and development of economies. As Lewis (1954, p. 433) notes, "industrial and agrarian revolutions always go together" and "economies in which agriculture is stagnant do not show industrial development". Timmer (1988, p. 276)

[1] For reference, from Table 1, annual average agricultural GDP growth in Nicaragua was about 1.14% per year during the period 1971-1990.

[2] Depending on the country, agriculture currently provides between 10-30% of GDP, 40-70% of total exports, and 25-60% of total employment (e.g., see USDA, ERS, 1994).

concludes that history "supports the strong link between agricultural and industrial growth, at least in market-oriented economies". Thus, for the coming century, substantially higher levels of agricultural growth will be needed for agriculture to play its role in total GDP growth in Central America. Two key questions remain:

(1) based on historical experience, what levels of agricultural growth are likely to be feasible to obtain over some period of time (e.g. over the next 20 years); and

(2) given an understanding of the sources of growth in agriculture, from where must such growth come?

The purpose of this paper is to begin to answer these two questions. Toward this end, the paper is organized as follows. Section II provides a brief introduction to the role of agriculture in economic development and poverty alleviation. The point to be made is that while agricultural growth plays an important role in a country's national economic growth, such growth does not necessarily go hand-in-hand with rural poverty alleviation. Section III summarizes existing information on agricultural growth rates over the past few decades that, in a practical sense, provides some indication of reasonable rates that might be achieved in Central America. Of particular relevance is that agricultural growth rates will be less that total GDP growth rates due to the low income elasticities of demand (positive but less than one) for most agricultural commodities (see, e.g., Timmer,1988, p. 279). Section IV then develops some simple accounting identities that are useful for understanding how agriculture grows over time, and which sources of growth are relevant and reasonable for Central America to pursue. A wide variety of country and regional data are provided to develop an empirical understanding of these growth sources. Section V concludes by outlining a set of key agricultural growth objectives that are reasonably possible for Central America over the next 15-30 years.

II. THE ROLE OF AGRICULTURE IN ECONOMIC DEVELOPMENT AND POVERTY ALLEVIATION

In the future, Central American economies will probably proceed on a normal development path where: (1) the total monetary value of agriculture grows over time; (2) the share of agriculture in GDP declines; and (3) the share of the agricultural labor force as a percentage of the total labor force declines. As Timmer (1988) reports, this declining share of agriculture in terms of total output and labor force is "uniform and pervasive" and has occurred throughout the world.

The fact that agriculture's share in total GDP will decline over time does not imply that agricultural growth is unimportant for the economy or that it should be neglected by governments. The positive benefits of a strong and growing agriculture on the rest of the economy has been well understood for some time. For example, these positive benefits can be summarized as follows:

> Expanding agricultural production through technological change and trade creates important demands for the outputs of other sectors, notably fertilizer, transportation, commercial services, and construction. At the same time, agricultural households are often the basic market for a wide range of consumer goods that loom large in the early stages of industrial development – textiles and clothing, processed foods, kerosene, and vegetable oils, aluminum hollowware, radios, bicycles, and construction materials for home improvements (World Bank ,1982, p. 45).

With strong links from macroeconomic prices and policy to agriculture, it can be expected that the sector as a whole will benefit from sound national policies in areas such as trade, exchange rates, democratic foundations of law, and property protection. At the same time, however, it is important to acknowledge that government policies, not resource or technological constraints, have traditionally been the major constraints limiting agricultural development (see, e.g., Hayami and Ruttan, 1985). As Timmer (1988, p. 326) concludes, the "sector in particular is especially vulnerable to well-intended but poorly conceived and managed parastatal organizations that attempt a wide array of direct economic activities, including monopoly control of input supplies…and mandated control over crop marketing and processing". These conclusions do not imply that resource and

technology problems are unimportant, but that policy problems are often a first-level constraint for agricultural growth. Such policy problems also often eliminate incentives for private sectors to overcome more technical problems as they arise.

With over 50% of the population living in rural areas in all countries in the region except Nicaragua (about 38%), agricultural growth is also often expected to be associated with substantial employment and income growth in rural areas. As a result, it is hoped that migration is slowed to urban centers that have already experienced rapid population growth with associated strains on urban infrastructure.

It is now widely recognized, however, that agricultural growth does not automatically lead to poverty alleviation in rural (or urban) areas. Countries with a relatively large percentage of smaller farms producing above family subsistence needs may be able to use agricultural development to reduce rural poverty (Timmer, 1988). In other countries, where a relatively smaller number of larger farms produce most of the marketed surplus, it is much more difficult to reduce rural poverty through simple growth (Johnston and Kilby, 1975). The countries in Central America have rather different distributions of farm sizes and rural land ownership and, as a result, agricultural growth is not a simple solution to problems of rural poverty.

III. AN EMPIRICAL PERSPECTIVE ON AGRICULTURAL GROWTH RATES

For an international perspective on agricultural growth experiences, Section III and IV draw on a variety of data sets compiled by the United States Department of Agriculture (USDA) within the World Agriculture and Trade Indicators (WATI) data set (USDA, 1994), more recent crop production data compiled by the Food and Agriculture Organization (FAO) within the FAOSTAT data set (FAO, 1999), and the United Nations within the International Trade Statistics Yearbooks. The thirty-year time period covered by the WATI data and the almost forty-year time period covered by the FAOSTAT data include the 'green revolution' experience as well as major structural changes in world economies and agricultural development policies.[3]

[3] The USDA discontinued the updating of the WATI data set, which is why information during the later 1990s is not included in the data set.

Table 1 reports the basic agricultural GDP growth experience for the Central American countries of special focus for this analysis, as well as a range of other countries and regions of the world.[4] In sum, while rates have changed somewhat over the time period, the experience in Central America is roughly consistent with growth rates in South America and somewhat worse than that found in other regions of the world reported in Table 1. Given the political conflicts that existed in the region during this time period, agricultural growth in El Salvador and Nicaragua was substantially below other countries and major regions of the world, while the experience in Honduras was about the same as those in South America. Costa Rican and Guatemalan growth rates during the 1971-1990 period were substantially better than these found in Latin America and more closely aligned with rates found in India and Indonesia. While essentially the same as found in Latin America during the 1971-1990 period, growth rates in Honduras during the 1990-1997 period compare quite favorably to the high-growth-rate regions of the world reported in Table 1.

Table 1 also shows that, given existing population growth rates, agricultural growth in per-capital terms in Central America has been minor except for Nicaragua in the 1990s.[5] When compared to other regions of the world, population growth rates during the 1990–1997 period remained relatively high in all the Central American countries reported in Table 1. Except for the recent decline found in Costa Rica, rates in all of these countries are about equal to or higher than that found in the Middle East and North Africa. Such high population growth rates will probably make it more difficult to meet the 5% per capita GDP growth objective.

While Table 1 reports average real GDP growth rates over two periods, Table 2 shows the annual growth experience for the Central American countries during the 1971-1990 period. A basic point illustrated in Table 2 is the high potential yearly variation in agricultural GDP depending on a number of factors, including government policies, world market conditions, and weather. Thus, while positive double digit agricultural GDP growth rates are experienced in the agricultural sector for specific years, such annual changes never occurred in three consecutive years for all countries over the twenty year time period.

[4] For reference, the term "Central America" will be used for the purposes of this study to denote the countries of focus for this paper, which are Costa Rica, El Salvador, Guatemala, Honduras, and Nicaragua.

[5] The data in Table 1 show that, except for the decline in Costa Rica, there was no declined in population growth rates between the 1971-1990 and 1990-1997 periods.

Given this simple look at the recent historical record during a period that included substantial technological developments in agriculture, a real growth rate of total agricultural GDP of 4% is clearly on the optimistic side over some substantial period of time (e.g. the next 20 years). Even assuming population growth rates in Central America fall to just 2% per year, the data suggest that a 2% growth rate in real agricultural GDP per capita in Central America over the next 20 years is optimistic but achievable.

While this agricultural growth objective is substantially less than the aggregate growth objective of 5% real per capita GDP growth suggested by the Central America Project, the slower growth rate of agriculture is to be expected (see, e.g., Timmer 1988). This slower growth rate does not, however, imply that agriculture is not important as part of the growth process. Yet, at the same time, it is important to have some range of reasonability for viewing the future growth experience. For example, over the next decade or so, 4% real growth in agricultural GDP should be viewed as a success, even though the related per capita growth rate of 1.5-2% is still substantially less than the 5% aggregate growth rate objective.

While this section summarizes recent experience with the real growth of agriculture GDP, there remains the question of how this growth is obtained; that is, what are the sources of such agricultural growth and which sources are likely to be the most relevant in the coming years in Central America. Some simple accounting identities are outlined in the following section to understand these sources of growth, with a variety of data being provided to understand the empirical significance of these sources.

IV. ACCOUNTING IDENTITIES FOR AGRICULTURAL GROWTH

A. Introduction

The notion of sustainability, sustainable agriculture, and sustainable agricultural growth have evolved fairly recently in discussions of agricultural growth and development. For example, the words "sustainable agriculture", "sustainability", or "sustainable growth" do not even appear in a major work on agricultural development by Hayami and Ruttan (1985). El Ashry (1992) suggests that the importance of sustainable development, whatever it means, was clearly placed on the international development agenda with the publication of Our Common Future (1987). Nonetheless, while "sustainable development" is widely accepted as an objective of almost any country and organization at this time (it's hard to be for "unsustainable development"), the practical use of the concept remains in the realm of publicity, politics, and rhetoric.

Pezzey (1992) summarizes about 30 related definitions or descriptions of sustainability that help give some idea of what various people mean. A recent issue of Land Economics (Volume 73, 1997) shows that, academics at least, have continued to discuss such concepts at length with rather limited practical ramifications. Solow (1993) suggests that: "The best thing I could think of is to say that it (sustainability) is an obligation to conduct ourselves so that we leave to the future the option or the capacity to be as well off as we are". (P. 181). He also states ".....the message I want to leave with you today is that sustainability is an essentially vague concept, and it would be wrong to think of it as being precise, or even capable of being made precise. It is therefore probably not in any clear way an exact guide to policy. Nevertheless, it is not at all useless" (Solow, 1993, p. 180).

Whatever sustainability means, it is clear that a better accounting for all benefits and costs of any economic activity are needed to understand actual levels and growth. Thus, the basic concept of net social return (also called total economic value) and the growth in social returns is a starting point for understanding agricultural growth and evaluating its implications for sustainability.

With the help of some simple accounting identities, the issue of sustained and ecologically sound agricultural growth at the aggregate country level can be discussed. To begin, the net social return to agriculture can be defined simply as total output multiplied by average total net social value per unit of output (i.e. average unit price minus average production costs). Thus agriculture grows

over time by: (1) increasing outputs of various commodities given fixed average net social value; or (2) increasing net social value per unit of output.

For notational simplicity, consider first agriculture as an aggregate sector (we disaggregate later). In this case, let:

Y	=	aggregate output
p	=	average market price per unit of output
c	=	average farm production costs per unit of output (e.g., land, labor, inputs, etc.)
A	=	area of land in agriculture
y	=	Y/A which is "average yield"
M	=	labor used in agriculture
l	=	Y/M which is "average labor productivity"
m	=	M/A which is "average labor intensity".

Note that in the above formulation, aggregate output is a function of many inputs besides labor and land, where Y = F(M, A, Z) and Z represents other agricultural inputs (some variable inputs perhaps such as seeds and chemicals, some capital inputs such as machines, irrigation, and some resource endowments such as soils, weather, etc.). As a result, it is important to remember that data on yields y and labor productivity l are economic variables that depend on a combination of technological possibilities (the function F) as well as inputs choices.

Given the above notation, a simple definition of agricultural GDP is: Figure 1 Equation 1

$$R = (p - c)\,Y = (p - c)\,y\,A = (p - c)\,l\,m\,A$$

where the second formulation in (1) decomposes total output Y into yield times land (yA), and then the third formulations decomposes yield into labor productivity times labor intensity (y = Y/A = (Y/M)*(M/A) = l*m).

Agricultural GDP, or simply returns R in equation (1), is just based on revenues and costs from agriculture that are observed by the agricultural sector as market transactions. Thus, these private returns ignore the monetary value of any positive or negative external environmental impacts (as well as any distortions in the economy from government policies). These agricultural externalities are often discussed in practice in terms of deforestation and habitat for biodiversity, pesticide and

fertilizer use, and soil degradation and erosion (see, e.g., Larson and Perez, 1999).

A good place to start to think about agricultural externalities is whether they are due to decisions at the intensive margin or at the extensive margin. Externalities at the intensive margin (i.e. per hectare on existing agricultural lands A) are related to yields and how such yields are obtained. Externalities at the extensive margin are associated with the conversion of lands to agricultural uses.

Let externalities at the intensive margin (per hectare) equal I, where:

Equation 2

$$I = \alpha \; y = \alpha \; l \; m$$

Remember that I above is defined for each hectare A, so that total externalities at the intensive margin are I*A.

Combining (1) and (2), a first definition of net social value of agriculture (an 'externality' adjusted notion of agricultural GDP) on existing land can be defined as:

Equation 3

$$S_I = (\; p \; - c - \; \alpha \;) \; Y \; = \; (\; p - c - \alpha \;) \; y \; A \; = \; (\; p \; - c - \; \alpha \;) \; l \; m \; A$$

where S_I is used to denote social returns to agriculture on existing land A. In the above calculation, the term α is defined in terms of per hectare, with $\alpha > 0$ being a cost and $\alpha < 0$ being a benefit.[6] Equation (3) can now be used to define the growth in total social value of agriculture over time. For notation, let $\pi = p - c - \alpha$, which is just a simple definition of agricultural GDP net of environmental costs per unit of aggregate output Y. With this notational adjustment, the social growth (in percentage terms) of agriculture over time, when just externalities at the intensive margin are considered, can be defined as:

[6] Note that this definition of adjusted GDP is not as complete an adjustment as discussed within the 'resource accounting' literature. For an introduction to such topics, see Vincent (1997).

Equation 4

$$\frac{S_{I'}}{S_I} = \frac{\pi'}{\pi} + \frac{Y'}{Y} = \frac{\pi'}{\pi} + \frac{y'}{y} + \frac{A'}{A} = \frac{\pi'}{\pi} + \frac{l'}{l} + \frac{m'}{m} + \frac{A'}{A}$$

where the notation x' denotes time the derivative dx/dt.

Agriculture growth in (4) ignores any externalities associated with bringing new land into production (i.e. A'). Discussions about land conversion to agriculture, lost habitat for biodiversity, etc, essentially implies that there are external costs of bringing new land into production. For simplicity, let β represent external costs per hectare from bringing new land into production. In this case, let $S_E = \beta A$(new land) represent the social costs of agriculture at the extensive margin, and a definition of total social returns to agriculture is defined simply as $T = S_I + S_E$, where growth in value at the intensive margin is given in (4) and growth in costs at the extensive margin are:

Equation 4

$$\frac{S_{E'}}{S_E} = \frac{\beta'}{\beta} + \frac{A'}{A}$$

represents the growth in social costs at the extensive margin, where it is assumed in (5) that A' is greater than zero.

In sum, equation (4) for the intensive margin and equation (5) for the extensive margin can be combined, after some rearranging, to define a total growth in agriculture, T'/T as:

Equation 5

$$\frac{T'}{T} = \frac{S_{I'}}{S_I}\left(\frac{S_I}{T}\right) - \frac{S_{E'}}{S_E}\left(\frac{S_E}{T}\right)$$

which is just the sum of growth rate defined in (4) and (5) weighted by the relative shares of S_I and S_E in the total T.

From equation (6), (5), and (4), it is possible to conclude that the social returns from agriculture can grow in 6 ways, all else constant:

(1) increases in simple agricultural net profits per unit of output over time, $\pi' > 0$, by earning higher average prices p', reducing production costs c', and/or reducing environmental externalities $\alpha' < 0$.;
(2) increases in yield by increasing labor productivity l';
(3) increases in yield by increasing labor intensity m';
(4) increases in land A';
(5) decreases in external costs β' at the extensive margin; and
(6) increases in the share of agriculture from the intensive margin S_I.

Equation (6) provides a useful starting point for identifying the key sources of agricultural growth that will be needed to achieve any sustained growth objective for agriculture. For example, as discussed in Section 1 and summarized in Table 1, a real agricultural GDP growth rate objective of 4% per year for a sustained number of years is perhaps an achievable upper boundary on an agricultural growth objective for Central America over the next several years.

In the following discussion, information is provided on the various components of growth outlined in equation (6). These historical data can provide some perspective on what has been achieved in Central America and elsewhere, which can help to focus attention on the key sources of growth and ranges of reasonable possibilities. Output growth (Y'/Y) is discussed first, and then information is provided on yield growth (y'/y) and land growth (A'/A). Following this overview, more detailed information is provided on labor productivity (l'/l), and labor intensity (m'/m). Finally, information on agricultural prices as well as a discussion of agricultural externalities is provided.

B. Output, Yield, and Land Growth

Table 3.A and 3.B provide information on aggregate agricultural output growth rates (Y'/Y) experienced in Central America and other regions of the world, as well as separate information on

crop and livestock production. For the most part, aggregate output growth ranged from 2–4% per year over the 1961–1991 time period in major agricultural regions of the world, with similar rates for the separate categories of crop and livestock production. While growth rates in Nicaragua and El Salvador for the 1961–1991 period were below rates found in most parts of the world (1.6 and 1.96 respectively), growth rates in Costa Rica (3.68), Guatemala (3.29), and Honduras (3.4) were on average higher than those found in South America (2.71), South Asia (2.69), East Asia (2.18), and on average in the world economies (2.36). Including the longer time period in Table 3.B, Nicaragua's growth has improved substantially, including the 1990s (2.21); while El Salvador's has fallen slightly (1.60). The other three countries have remained on more or less similar growth paths.

Since aggregate output grows through higher aggregate yield (y'/y) and increased land (A'/A), Table 4 shows that the majority of the growth in crop production since 1961 has come from higher yields in all countries and regions reported in Table 4 except for South America and Thailand. Even in Guatemala and Honduras, where cropland growth rates of 0.68% and 0.73% per year respectively were substantially higher than world averages, yield growth rates were substantially higher (3.04% and 2.88% respectively) than land growth rates. Cropland growth rates in Central America were substantially below levels found in South America and Thailand.

Regarding livestock output growth, the general pattern remains the same for most countries and regions of the world. The livestock growth rate of 2.36% per year as a world average from Table 3 was due mainly to productivity growth with only minor increases in pasture lands (0.22% from Table 4). Costa Rica and Thailand are the two outliers, where almost all livestock output growth was due to more land in pastures. In other words, there was essentially no productivity improvements in the livestock sector as a whole during the 1961–1991 period, and there is little indication from Table 3.B that substantial productivity growth occurred during the 1991–1998 period either. Given concerns that such pastures' growth was at the expense of environmentally sensitive lands, such pasture growth is probably not a viable source of livestock growth in the future in Costa Rica.

Tables 7.A–D, 8.A–D, 9.A–D show similar patterns of yield and land growth for the traditional export crops of coffee, sugar, and bananas. In the early 1960s, from Tables 7.A and 7.B, coffee yields were about the same on average in Costa Rica and El Salvador and in the range of 0.7–0.9 MT/Ha. However, while coffee yield growth was essentially zero over the 1961–1991 period in El Salvador, coffee yields grew by about 2.5% per year on average in Costa Rica, so that yields were

in the range of 1.3-1.5 MT/Ha by 1991. Land growth in coffee was essentially zero in both countries, as well. From Tables 7.C and 7.D, while starting from substantially lower levels in the early 1960s, yield growth rates were also relatively strong in Honduras and Guatemala (2.6% and 1.7% as annual averages, respectively) with little additional land growth in coffee in Guatemala but substantial growth of 3.3% in Honduras.

For sugar cane, from Tables 8.A–8.D, the rather substantial output growth rates of over 4% per year on average during the 1961–1991 period have been roughly split between yield growth and land growth for Costa Rica, El Salvador, and Guatemala, while yield growth was responsible for most of the sugar case output growth in Honduras. Tables 9.A–9.D provides similar information for bananas, as well.

Regarding cereal production, Table 10 shows output growth rates of around 2–3% per year in Central America, East Asia, South Asia, and South America, with a wide range of experience related to yields and land growth. The relatively high yield growth rates in Guatemala and Costa Rica compared well with the higher rates found in South Asia, while rates in El Salvador and Nicaragua were similar to those found in East Asia and South America. For the most part, cereal yield growth rates even during periods of substantial technological improvements and additional modern inputs have been less than 3% per year. For example, Norton and Alwang (1993, p. 228) show that yield growth rates in India before the 'green revolution' during 1949–1975 were about 1.5% per year, and then increased to 2.28% per year during the 1975-1983 period due mainly to new technologies (seeds, irrigation, and fertilizers).

Similar to cereal production reported in Table 10, Table 11 shows that production of fruits have also grown roughly in the 1.8–2.7% range in Central America, except for the substantially higher rate of 5.14% per year in Costa Rica. In comparison, rates in East and South Asia were between 2.68–3.2% per year, with a slightly higher rate of 3.47% in South America on average.

For vegetables, growth rates in Costa Rica and Honduras of over 5% per year over the 1961–1991 period were substantially higher than in the rest of the region–South and East Asia, and South America.

Thus, at least based on historical experience, given reasonable technological possibilities, technological advance, and reasonable agricultural and general economic policies, aggregate yield growth in the range of 2–3 % per year is optimistic but probably achievable in Central America.

Thus, if a reasonable aggregate growth objective is T'/T = 4% per year with little additional growth in land (A'/A in the range of 0 to 0.5% for example), it seems reasonable to expect that 2–3% of growth can come from yield increases, 0-0.5% of growth can come from land increases, and of the remaining amount, 1–2% must come from higher social values per unit of output.

C. Decomposing Yield Growth into Labor Productivity (l'/l) and Labor Intensity (m'/m)

As explained earlier, yield growth can be decomposed into a combination of labor productivity growth and labor intensity growth. Since agricultural wages and incomes are closely related to labor productivity, such labor productivity improvements are traditionally an important way to improve the welfare of agricultural populations (depending upon how such growth is distributed among workers, land owners, and owners of other factors of production) (Timmer, 1988, p. 304). Table 5 reports labor productivity information for each country for the 1961–1991 time period as well as the period annual average. Labor productivity in agriculture ranged from a low of 0.5% per year in Nicaragua, to 1.1–1.6% per year in Honduras, Guatemala, and El Salvador. Labor productivity growth was the highest in Costa Rica, at 2.9% per year. Except for Costa Rica, labor productivity growth rates were relatively higher in other regions of the world, including 2.36% in South America, 3.19% in East Asia, 3.61% in North America, and 5.23% in Western Europe.[7]

Table 6 provides basic information on labor intensity (m = M/A) and the growth in labor intensity (m'/m) in Central America. Simple intensity levels as of 1991 ranged from relative land abundance in Costa Rica (m = 0.08) and Nicaragua (m = 0.07), a middle position of Honduras (m = 0.20), to relative land scarcity in El Salvador (m = 0.45) and Guatemala (0.41).[8] In terms of the growth in labor intensity (m'/m), the data show that labor intensity actual fell on average by 1.5% per year in Costa Rica, grew slightly in El Salvador (m'/m = 0.35%) and Nicaragua (0.67%), and grew rather strongly in Guatemala (2.5%) and Honduras (1.58%).

The contrast between labor productivity growth and labor intensity growth experience in Costa Rica and the rest of the region parallels to an important degree the experience from other regions of

[7]For reference, these labor productivity growth rates were quite consistent with growth rates observed, for example, in the U.S. Nordhaus (1992) reports that U.S. labor productivity grew by 2.9% per year during the 1948-1973 period, which then slowed to 0.9% per year during 1973-1989.

[8] Of course these numbers say nothing about actual distribution of land ownership and land access.

the world. In some countries, growing labor productivity in agriculture combined with growth in the rest of the economy allows labor to be absorbed outside the agricultural sector. The Costa Rican data in Tables 5 and 6 are relatively consistent with the "Korea-Taiwan-Japan" model of agricultural development (see Timmer, 1988, p. 309). Technologies that improved labor productivity also substituted for simple labor. As a result, labor productivity in Costa Rica grew by 2.9%, labor intensity fell by -1.5% per year, and aggregate yield growth was 2.9-1.4 = 1.5% for all crop and livestock production (on all cropland and permanent pastures).[9]

In other countries, with slower productivity improvements due to lack of technological diffusion, poor policies, or both, lower labor productivity growth rates and the positive growth rates in labor intensity are clear signals of the lack of agricultural development and improvements in rural welfare. For example, in Honduras, the majority of aggregate yield growth came from labor intensity (1.58% from Table 6)), with only a 1.15% annual average increase in aggregate labor productivity from Table 5.

D. Growth in Net Social Value per Unit of Output ($\pi = p - c - \alpha$)

Besides simple aggregate output growth due to increases in land, labor, and labor productivity, agricultural growth could also occur through increases in net value per unit of output, defined as $\pi = p - c - \alpha$ However, due to a combination of inelastic consumer demands (i.e. own-price elasticity of demand between -1 and 0) and low income elasticities of demand (i.e. income elasticity of demand less than 1), the experience with basic growth in agricultural prices over longer periods of time is not too encouraging in general.

For reference, the growth in $\pi = p - c - \alpha$ can be defined as:

Equation 6

$$\frac{\pi'}{\pi} = \frac{p'}{p}\frac{p}{\pi} - \frac{c'}{c}\frac{c}{\pi} - \frac{\alpha'}{\alpha}\frac{\alpha}{\pi}$$

[9]For reference, a 3% annual average labor productivity growth rate would imply that labor productivity doubles in about 25 years. Assuming real wages are related to such labor productivity, this growth rate would imply that agricultural wages would also double in 25 years if real output prices remained constant.

which is just the growth in real output prices p, real input costs c, and externalities α weighted by their share relative to unit profits π.

For example, regarding growth in basic prices of agricultural commodities (p'/p), Table 12 reports information on international export prices of major agricultural products during the 1980-1996 time period. During this time period, export prices of major commodities have remained constant or fallen in real terms except for fruits (+40%), with apples growing by 87% and lemons growing by 57%, while grapefruits fell by 16%. In total, prices for primary commodities from developing countries fell by 32%, with food prices falling by 23%. Norton and Alwang (1993) also provide information on similar negative real price trends for maize, rice and wheat for a longer time period of 1961–1991. For the most part, at least for broader aggregates of agricultural products, it seems unrealistic to expect that there will be substantial and sustained increases in "average" prices, with some substantial risk that prices could fall over time.

Tables 14.A–14.E provide information on prices paid to producers in Central America during the 1961–1995 time period. Given substantial inflation in each economy during these years, discussions of nominal price data are not very useful. To develop a measure of real prices, Table 13 provides a deflator for each country during the 1980–1995 time period based on GDP deflators for the period 1980–1990 and 1990–1997 provided in the World Development Indicators database (see World Bank, 1999). Thus, it is just necessary to multiply the nominal data in Tables 14.A–14.E by the country deflator in Table 13 to develop a measure of real prices paid to farmers in each country.

Table 14.F provides a summary of changes in real terms of prices paid to farmers during the 1980–1995 time period. In general, real prices received fell between 20–60% over the fifteen year period for all the reported commodities in each country. Given the exceptionally high levels of inflation in Nicaragua, real price data are not computed in Table 14.F. Only coffee prices in Guatemala grew substantially over the time period (+422% over 15 years), based on the reported data, although it is not clear if this reflects reality or issues in data reporting. Nominal prices paid in local currency for pineapples, maize, and vegetables are provided in Table 15, Table 16, and Table 17. Using again the GDP deflator information in Table 13, there was negative real price growth in these commodities as well. In short, these data seem to confirm the basic trend of negative real growth in agricultural prices paid to farmers.

Regarding input costs per unit of output, first note that fertilizer costs per unit of output, $c^f = F*r^f / Y = (f/y)*r^f$ where $f = F/A$. As a result the growth in fertilizer costs over time can be written as:

Equation 7

$$\frac{c^{f'}}{c^f} = \frac{f'}{f} - \frac{y'}{y} + \frac{r^{f'}}{r^f}$$

In other words, fertilizer costs grow if application rates grow faster than yields or if real prices increase. Table 18 shows the substantial absolute growth in fertilizer consumption by main ingredient over the 1961–1996 time period. Inorganic fertilizer use has increased substantially in the region since the early 1960s, with growth rates (exponential) in the range of 4–8% for nitrogen, except for the low of 2% in El Salvador. Similarly, phosphate growth rates were in the 3–6% range, although use in Honduras grew by over 9% per year.

Table 19 shows fertilizer application rates (total NPK) in kg/hectare for the countries in Central America as well as South Asia, East Asia, and South America. For all countries in Central America, fertilizer application rates grew more quickly than yields (see Table 4). This trend reflects, in part, the technological relationship between fertilizer use and yields and in part that fertilizer use (and the correlated use of other inputs such as pesticides) can substitute for labor, thereby reducing labor intensity and increasing labor productivity (as in Costa Rica).

Further analysis is needed to determine if local currency prices for fertilizers has increased or decreased. In terms of export prices (in $US), crude fertilizer export prices fell in real terms by about 27% between 1980 and 1996 (UN, International Trade Statistics Yearbook, 1996, Vol. I, p. S135). As the same time, the local currencies were falling against the U.S. dollar, which implies that real prices in local currencies may have increased. In terms of actual fertilizer imports, based on data from the International Trade Statistics Yearbooks (UN, various years), for example, an average price per ton for all fertilizers imported was $212 in 1980, $227 in Costa Rica in nominal terms, $191 in 1980, and $175 in 1996 in Guatemala in nominal terms. The price differences between Costa Rica and Guatemala probably reflect a different composition of various types of fertilizers. Thus, in dollar terms, there has been little real growth in fertilizer import prices. The level of currency depreciation in the region associated with domestic inflation probably means, however, that real prices to farmers increased over this period. Thus, the lower inflation rates of recent years in the region should have some important positive impact on agriculture just from lower import prices of key inputs.

Regarding pesticides, similar equations for the growth of pesticide costs per unit of output can be defined as in Equation (8) for fertilizers. However, unlike pesticides and agricultural output prices, it seems clearer that pesticide application rates and prices have increased. For example, in Costa Rica, pesticide imports grew from about 12,000 MT to about 16,000 MT between 1980 and 1996, with an average import price (CIF) of $2911/MT in 1980 and an average price of $5505/MT in 1996. While quantities were substantial smaller in Guatemala (4700 tons imported in 1980 and 9000 tons in 1996), Guatemala paid similar, though slightly lower, import prices to Costa Rica. As of 1997, Guatemala became a net exporter of pesticides, with about $48 million in imports and about $49 million in exports.

While complete data are not yet organized, it seems likely that pesticide application rates have increased, real pesticide prices have increased due to the increase in import dollar prices and domestic inflation (unless government subsidies have kept pesticide prices low), and given yield growth rates, pesticide costs per unit of output have grown.

Some indirect costs, α in equation (7), are relatively easy to quantify in simple financial terms. For example, if a shipment of Honduran shrimp to the U.S. tested positively for some pesticide used in crop production, and as a result Honduran shrimp was excluded from the U.S. market for some time, this direct economic loss to the shrimp industry would be an indirect cost in crop production. Such possibilities are very real. In a recent example, Guatemalan raspberries were excluded from the U.S. market in 1997 and were banned from March 15-August 15, 1998 due to cyclospora concerns (900 confirmed cases in the U.S. from Guatemalan raspberries imports). The lost profits to raspberry growers and exports from cyclospora in principle are not too difficult to calculate. Many other examples of such direct financial impacts exist. Other types of indirect economic effects, such as those related to human health damages from agricultural chemicals or the benefits to biodiversity from shade coffee production, are not so easy to translate into financial terms. The risk is that since they are not easy to quantify in financial terms, they are either ignored in policy decisions or are overstated by other groups based on passionate arguments but soft analysis. Table 20 shows pesticide imports and exports in Central America.

At the same time, due in large part to environmental, health, and social concerns in major importing markets such as the U.S. and E.U., there is growing awareness that markets may begin to incorporate environmental and health concerns directly into market prices or other market

advantages (additional quota for some commodities, shelf space in retail outlets, etc.). In effect, there is the possibility that formerly indirect benefits from agricultural production are being incorporated into market prices or other competitive advantages for certain countries or commodities. Examples include potential price premiums for organic produce and additional quotas for countries producing commodities in preferred ways (e.g. sugar quota changes in Canada). Lumped here under the heading of 'green premiums', there is growing awareness with little solid information that Central America may be well positioned to take advantage of such premiums in export markets. Questions remain as to the current and future importance of such premiums in international markets, as well as in Central America's comparative advantage in capturing such possibilities in the future.

As Larson and Perez (1999) summarize, concerns about on-farm impacts focus on chemical use (mainly pesticides), and soil erosion and soil degradation. Regarding soil erosion and degradation, their summary of the existing literature suggests that soil erosion at the intensive margin does not pose a serious threat to the farm productivity. To be sure, there are clearly examples of severe erosion in Central America, but existing literature does not indicate that such erosion is a significant constraint on future agricultural growth from these existing commercial lands. The potential problems that occur off-farm from soil erosion, as well as at the extensive margin from erosion on marginal, subsistence, and newly deforested agricultural lands, are clearly real, although there is little directly relevant information to put easy monetary figures on the magnitude of the issues.

Pesticide use in Central America has received substantial attention due to negative consequences of pesticide use on the environment and human health (see, e.g., Larson and Perez 1999 for a survey). Based on just the acute health effects to agricultural workers, Larson and Perez (1999) suggest that the direct health costs of acute pesticide poisonings in the region could easily be in the range of 2.5% of total agricultural GDP. This number does not include any other types of environmental and health effects from past use of organochlorine pesticides and current use of more toxic but less persistent pesticides (e.g., organophosphates).[10]

[10] As discussed in Larson and Perez (1999), the main groups of pesticides currently used in Central America are: (1) organophosphates, carbamates and pyrethroids as insecticides; (2) dithiocarbamic fungicides; and (3) phenoxyacids, dipyridyls, and triazines as herbicides.

V. CONCLUSIONS

As outlined in the introduction in Section I, the main purpose of this paper was to answer two key questions regarding agricultural growth in Central America:

(1) what levels of agricultural growth would be feasibly obtained over a given period of time (e.g. over the next 15 and 30 years); and

(2) given an understanding of the sources of growth in agriculture, from where must such growth come?

To answer the first question, Section III provides a range of data on agriculture for Central America and other regions of the world. A survey of country and regional experience presented in Section III suggests that a 4% annual average growth rate in agricultural GDP is a feasible objective for Central America in the next 15–30 years. This rate is substantially higher than growth rates experienced in the region during the 1971–1997 time period, although the lack of growth and relatively slow growth in El Salvador during 1971–1997 and Nicaragua during 1971–1990 suggests that there is some room for 'catching up'.

To answer the second question, Section IV provides a set of accounting identities that decompose aggregate growth in three main terms: higher average aggregate yield growth (i.e. intensifying), additional land growth in agriculture (i.e. extensifying), and creating additional net social value per unit of output (net market profits per unit of output minus external costs).

Based on this decomposition of agricultural growth into three key sources, the data and analysis in Section IV can be used to develop country-specific objectives for these sources of growth. It is likely that most of the future growth in GDP will have to come from yield increases, with minor increases in land and modest increases in net social value per unit of output. For example, in countries with little additional land to bring into agricultural production without important environmental ramifications, a reasonable combination could be: 3% growth in aggregate yield, 0% growth in land under production, and a 1% growth in real social value per unit of output.

Given the importance of aggregate average yield growth in the future, the analysis in Section IV decomposes yield growth into the growth in labor productivity and labor intensity (labor per hectare). Historically, in economies experiencing reasonably good levels of agricultural and general economic growth, most of the growth in yields has been due to labor productivity growth, with little additional labor use per hectare. As has occurred in Costa Rica, it will be likely in the future that labor intensity will decline or at least remain substantially below the growth in labor productivity.

Given that agricultural incomes (and welfare of agricultural populations) are related to labor productivity, such productivity growth is clearly desirable. While this relationship could change if land ownership patterns change in some countries, it is equally likely that labor productivity growth could be greater than yield growth, in which case labor intensity will fall (as already has occurred in Costa Rica).

Regarding net social values per unit of output, which may need to be in the 1% annual level to achieve an overall growth objective of 4%, it is likely that all of this growth will have to come from negative growth in input costs per unit of output and negative growth in external costs per unit of output.[11]

In large part, the general experience based on international prices and country-specific prices is that real prices for agricultural commodities have varied substantially across years but generally fallen over time, except for a few very specific items (see Tables 12–17). Thus, on average, it is unlikely that increases in the average price received for all agricultural commodities is going to be an important source of real agricultural growth in the future. Prices for certain commodities are higher and may grow in real terms over time, and it is clear that agriculture in Central America needs to continue to take advantage of such price opportunities if and when they arise. However, experience tends to confirm that such price growth does not last over longer periods of time. In large part, there will remain a premium on the sector's ability to identify and respond quickly to market opportunities as a means of increasing the aggregate prices. This continued switching into higher priced commodities will help to slow the general decline in prices in other crops.

Regarding costs of production per unit of output, as outlined in Section IV, what matters for agricultural growth is the growth in average input costs per unit of output, which can be decomposed into the growth in application rates plus the growth in input prices minus the growth in yields. The data presented in Section IV indicate that real prices have grown over time for fertilizers and substantially over time for pesticides, with local currency prices of fertilizers being driven by domestic inflation in Central America. Pesticides prices have experienced real positive growth in terms of international prices and local currency prices.

[11] In simple terms, if input demands per hectare are own-price elastic, then a 1% increase in an input price (e.g. fertilizer) should result in a 1% decrease in application rates. In this simple case then, input costs per unit of output would increase by the negative of the fall in yields due to less input use.

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APPENDIX

Table 1
Annual Average Real Growth Rates in Agricultural GDP 1971-1997
In percentage terms

	Annual Growth 1971-1990	Annual Growth 1990-1997	Pop. Growth 1971-1990	Pop. Growth 1990-1997
Costa Rica	2.76	2.9	2.81	2.1
El Salvador	-2.03	1.2	2.02	2.4
Guatemala	3.31	2.9	2.77	2.8
Honduras	2.05	3.1	2.96	3
Nicaragua	1.14	8.7	2.94	3

	Annual Growth 1980-1990	Annual Growth 1990-1997	Pop. Growth 1990-1997
Indonesia	3.4	2.8	1.7
Thailand	4	3.6	1.2
India	3.1	3	1.8
East Asia & Pacific	4.7	3.8	1.3
Latin America & Carib.	1.9	2.6	1.7
Middle East & North Africa	4.6	3.2	2.5

Data for 1971-1990 based on author's calculations using WATI data set.
Data for 1980-1997 from WDR 1998, Table 11, p. 210-211.

Table 2
Annual Real Growth in Agricultural GDP 1971-1990

Year	Costa Rica	El Salvador	Honduras	Guatemala*	Nicaragua
1971	-2.92%	1.07%	0.26%	5.59%	3.29%
1972	8.19%	-2.44%	5.94%	7.33%	-2.05%
1973	2.36%	17.53%	7.89%	6.79%	10.97%
1974	5.38%	-4.91%	-4.46%	6.37%	23.30%
1975	7.37%	-3.08%	-5.07%	1.95%	-18.64%
1976	5.43%	26.27%	14.89%	7.39%	9.57%
1977	19.82%	24.73%	14.71%	7.81%	13.57%
1978	-3.46%	-12.72%	0.32%	5.00%	-0.21%
1979	-5.54%	5.69%	2.06%	4.71%	-20.82%
1980	0.75%	-11.64%	-7.10%	3.75%	-14.08%
1981	24.89%	-21.29%	-3.09%	0.66%	-8.38%
1982	-2.93%	-9.46%	-2.02%	-3.55%	9.11%
1983	-5.79%	-8.11%	-5.00%	-2.55%	9.35%
1984	2.95%	-2.63%	-2.40%	0.49%	6.45%
1985	-8.77%	-7.88%	3.59%	-0.61%	-8.11%
1986	16.61%	12.29%	8.32%	0.14%	-14.27%
1987	-10.21%	-28.08%	0.06%	3.55%	37.08%
1988	3.47%	3.08%	-0.15%	3.90%	-13.72%
1989	-0.18%	-13.42%	2.35%	3.96%	4.64%
1990	-2.27%	-5.57%	9.87%	3.50%	-4.30%
Period Average	2.76%	-2.03%	2.05%	3.31%	1.14%

* Author's calculations based on WATI Data Set
(GDP 1987 real local currency times percentage of GDP in agriculture)
(Data for Guatemala reflect total GDP because of missing information on)
pecentage of GDP in Agriculture. For reference as of 1990,
agriculture accounted for about 26% of total GDP in the country).
(As of 1997, this number declined slightly to 24%).

Table 3A
Agricultural Output Growth Rates 1961-1991

Country/Region	Annual Growth Total Agriculture	Annual Growth Crops	Annual Growth Livestock
Costa Rica	3.68	3.64	3.75
El Salvador	1.96	1.69	2.79
Guatemala	3.29	3.76	1.65
Honduras	3.4	3.64	2.76
Nicaragua	1.6	1.98	0.94
South America	2.71	2.88	2.44
South Asia	2.69		
East Asia	2.18		
Indonesia	3.72	3.67	4.28
Thailand	4.09	4.09	4.04
World	2.36	2.36	2.36

Author's calculations based on WATI data set.

Table 3B: Additional Production Index numbers 1989-1991= 100
And Annual Average Growth Rates *(part 1)*

Crops

Year	1961	1962	1963	1964	1965	1966	1967	1968	1969	1970	1971	1972	1973	1974	1975	1976	1977	1978	1979
Costa Rica	30.8	32.4	33.8	33.3	37	40.9	42.9	47.4	52.8	55.4	60.8	60.6	65.5	60.9	64.8	64.3	66.4	69.7	69.8
El Salvador	68.6	73	82.8	84.1	86.8	83.3	82.9	79	87	88.8	99.7	100.4	102.8	111.7	118.9	103.3	110.6	125.3	127.3
Guatemala	35.5	40.5	44	47.2	49.8	50.5	47.2	54.3	55.5	56.7	55.6	63.3	68.6	76.9	77.5	81.2	88.2	92.3	87.2
Honduras	43.9	45	45.2	50.5	51.5	60.5	68	71.6	74.1	71	75.8	80.2	76.4	71	58.8	68.1	76.6	83.6	89
Nicaragua	60.7	75.3	83.8	103.4	117.3	109.2	120.1	115.6	112.4	101.6	109	113.9	120.7	151.1	143.3	139.7	142.9	157.5	143

Livestock

Year	1961	1962	1963	1964	1965	1966	1967	1968	1969	1970	1971	1972	1973	1974	1975	1976	1977	1978	1979
Costa Rica	29.5	28.4	32.8	34.9	34.3	31.7	34	38.8	41	43.8	47	48.7	49	52.3	64	73.3	75.9	72	77.8
El Salvador	49.7	50.3	53.8	50.8	52.9	55.4	56	54.4	57.5	57	57.7	61.2	65.7	73.4	74.4	89.5	84.7	93	93
Guatemala	46	46	49.7	50.8	49.9	48.6	53.2	59.1	62.2	66.5	71	73.5	72.8	70.5	73.5	75.8	78.9	77.9	72.4
Honduras	41.1	42.8	43.7	42.3	42.6	43.7	49.2	52.4	52.8	54.8	62.3	64.9	66.5	61.1	65.8	69	68.8	85.2	62.4
Nicaragua	63.5	65.2	73.7	74.1	73.5	82.1	86.4	96.8	106.7	118.1	120.7	130.2	123.4	113.1	139.2	154.7	164.4	172.8	205.4

Total Agriculture

Year	1961	1962	1963	1964	1965	1966	1967	1968	1969	1970	1971	1972	1973	1974	1975	1976	1977	1978	1979
Costa Rica	30.6	31.1	33.8	34.1	36.3	37.5	39.7	44.4	48.7	51.4	55.8	57	60.3	58.6	65.6	68.8	71.3	71.1	73.1
El Salvador	63.7	67	74.7	74.2	77.1	75.4	75.3	72.3	78.3	79.3	86.6	88.1	91.1	99.6	104.7	99.8	102.6	115.1	116.7
Guatemala	38.2	41.6	45.2	47.9	49.4	49.5	48.2	55	56.6	58.6	59.3	65.7	68.9	74.2	75.3	78.9	84.8	87.4	81.9
Honduras	42.6	44	44.6	47.7	48.3	54.6	61.7	65.2	67	65.7	71.4	75.1	73	67.8	60.6	68	73.5	83.4	79.4
Nicaragua	62	71.2	79.8	91.5	99.4	98.4	106.4	108.1	110.3	108.6	114.2	121.3	121.9	135.8	142.5	146.8	152.3	164.8	170.2

FAOSTAT data and Author's calculations.

Table 3B: Additional Production Index numbers 1989-1991= 100
And Annual Average Growth Rates *(part 2)*

Crops

Year	1980	1981	1982	1983	1984	1985	1986	1987	1988	1989	1990	1991	1992	1993	1994	1995	1996	1997	1998
Costa Rica	69.9	72.1	69.3	74.8	78.3	73.6	76.5	78.8	83.2	93.5	102.2	104.4	113.7	99.8	116.4	125.7	132.6	125.2	124.8
El Salvador	122.2	111.7	105.5	106.7	110.7	105.8	98.8	94.3	94	93.5	101.9	104.6	119.7	107.2	101.3	103.6	102.1	99.2	108.6
Guatemala	91	90.6	88.6	82.5	84.3	87.8	90.8	90.2	93.9	94.8	101.6	103.6	108.4	103.3	102.6	107.5	109.5	118.8	110.7
Honduras	88.7	93.5	92.3	89	84.6	86.3	86.6	91.9	93.7	97.3	102.5	100.2	101.2	106.5	107.5	107	119.5	117.2	123.1
Nicaragua	92.4	133.1	128.9	130.2	137.1	117.9	112.1	103.6	100.6	97.8	96.7	105.4	104.5	94.4	99.2	113.8	116.8	114.8	118.3

Livestock

Year	1980	1981	1982	1983	1984	1985	1986	1987	1988	1989	1990	1991	1992	1993	1994	1995	1996	1997	1998
Costa Rica	75.8	78	69.9	72.7	77.3	90.3	89.8	93.5	92.6	94.9	98.6	106.5	99.2	97.6	109.9	118.4	120.8	119.8	122.6
El Salvador	92	81.5	78.2	73.3	80.1	85.9	88.4	87	94.8	101.9	100.5	97.6	98.8	103	101.2	105.9	109	122.8	129.5
Guatemala	78.2	77.5	79.5	85.8	88.6	85	78.9	86.3	93.2	101.4	102	96.6	96.2	106.8	114	118.7	123.2	125.1	125.3
Honduras	87.8	92.3	79.8	70.5	72.8	75.2	70	86	91.8	94.2	101.4	104.4	107.6	106.1	116	101.1	115.8	120.1	123.9
Nicaragua	122.2	91.4	103.9	101.5	105.2	100.1	93.4	86.8	83.5	99.7	105.4	95	104.4	121.6	118.6	111.7	113.9	120.1	119.9

Total Agriculture

Year	1980	1981	1982	1983	1984	1985	1986	1987	1988	1989	1990	1991	1992	1993	1994	1995	1996	1997	1998	Annual Average Growth
Costa Rica	72.4	73.4	70	74.5	78.5	80.8	82.4	85.4	86.8	93.6	100.1	106.3	109.4	99.7	113.3	122.3	127.4	121.3	122.2	3.92
El Salvador	113	102.8	97.3	96.1	101.7	99.9	96.3	92.9	94.6	95.7	102.4	102	111.2	105.4	101.1	102.8	102.2	105.6	112.9	1.68
Guatemala	87	86.7	85.7	83.1	85.2	86.5	86.9	88.6	93.5	96.4	101.7	101.9	104.3	103.8	105.8	111.1	114	121.4	115.7	3.12
Honduras	87.9	93.4	87.8	82.5	81.4	83.3	81.9	89.7	93.4	96.4	101.9	101.7	102.9	104	107.9	103.8	115.6	114.5	120.2	3.02
Nicaragua	105.1	115.8	118.2	117.4	123	108.9	102.4	95.1	92	98.2	100.6	101.2	104.2	106	107.4	111.5	114	117	118.6	2.21

FAOSTAT data and Author's calculations.

Table 4: Aggregate Yield and Land Use Growth Rate 1961-1991

Country/Region	Annual Growth Crop Production per Hectare	Annual Growth Cropland	Annual Growth Permanent Pasture
Costa Rica	3.31	0.32	3.16
El Salvador	1.26	0.41	0.03
Guatemala	3.04	0.68	0.8
Honduras	2.88	0.73	0.83
Nicaragua	1.73	0.25	1.12
South America	1.12	1.74	0.58
Indonesia	2.77	0.87	-0.22
Thailand	1.66	2.39	3.99
World	2.11	0.24	0.22

Author's calculations based on WATI data set.

Table 5 Average Agricultural Labor Productivity in Central America (1961-1991)

Year	Costa Rica		El Salvador		Guatemala		Honduras		Nicaragua	
	l = Y/M	l'/l	l = Y/M	l'/l	l = Y/M	l'/l	l = Y/M	l'/l	l = Y/M	l'/l
1961	1872		932		736		819		1267	
1962	1864	-0.0043	945	0.0139	809	0.0992	829	0.0122	1420	0.1208
1963	2015	0.0810	1034	0.0942	852	0.0532	826	-0.0036	1523	0.0725
1964	1981	-0.0169	1007	-0.0261	888	0.0423	859	0.0400	1754	0.1517
1965	2081	0.0505	1018	0.0109	906	0.0203	865	0.0070	1881	0.0724
1966	2174	0.0447	988	-0.0295	897	-0.0099	953	0.1017	1810	-0.0377
1967	2245	0.0327	972	-0.0162	871	-0.0290	1051	0.1028	1971	0.0890
1968	2409	0.0731	893	-0.0813	943	0.0827	1098	0.0447	1990	0.0096
1969	2578	0.0702	940	0.0526	969	0.0276	1123	0.0228	2029	0.0196
1970	2681	0.0400	930	-0.0106	984	0.0155	1111	-0.0107	2009	-0.0099
1971	2882	0.0750	1021	0.0978	979	-0.0051	1187	0.0684	2058	0.0244
1972	2887	0.0017	1049	0.0274	1071	0.0940	1221	0.0286	2102	0.0214
1973	3065	0.0617	1075	0.0248	1132	0.0570	1163	-0.0475	2068	-0.0162
1974	2948	-0.0382	1208	0.1237	1198	0.0583	1080	-0.0714	2262	0.0938
1975	3249	0.1021	1284	0.0629	1208	0.0083	989	-0.0843	2331	0.0305
1976	3363	0.0351	1232	-0.0405	1295	0.0720	1059	0.0708	2357	0.0112
1977	3502	0.0413	1310	0.0633	1354	0.0456	1128	0.0652	2431	0.0314
1978	3551	0.0140	1467	0.1198	1326	-0.0207	1233	0.0931	2575	0.0592
1979	3633	0.0231	1504	0.0252	1268	-0.0437	1184	-0.0397	2579	0.0016
1980	3580	-0.0146	1439	-0.0432	1296	0.0221	1261	0.0650	1615	-0.3738
1981	3642	0.0173	1327	-0.0778	1306	0.0077	1284	0.0182	1747	0.0817
1982	3397	-0.0673	1290	-0.0279	1286	-0.0153	1212	-0.0561	1797	0.0286
1983	3510	0.0333	1319	0.0225	1185	-0.0785	1114	-0.0809	1756	-0.0228
1984	3773	0.0749	1410	0.0690	1202	0.0143	1062	-0.0467	1768	0.0068
1985	3787	0.0037	1400	-0.0071	1188	-0.0116	1024	-0.0358	1517	-0.1420
1986	3820	0.0087	1363	-0.0264	1153	-0.0295	982	-0.0410	1394	-0.0811
1987	3888	0.0178	1337	-0.0191	1114	-0.0338	1042	0.0611	1322	-0.0516
1988	3980	0.0237	1304	-0.0247	1146	0.0287	1058	0.0154	1231	-0.0688
1989	4100	0.0302	1287	-0.0130	1156	0.0087	1067	0.0085	1262	0.0252
1990	4307	0.0505	1433	0.1134	1207	0.0441	1084	0.0159	1261	-0.0008
1991	4323	0.0037	1413	-0.0140	1186	-0.0174	1106	0.0203	1274	0.0103
Average		0.0290		0.0155		0.0169		0.0115		0.0052

Table 6 Agricultural Labor per Hectare ("labor intensity") in Central America (1961-1991)

	Costa Rica		El Salvador		Guatemala		Honduras		Nicaragua	
Year	m = M/A	m'/m	m = M/A	m'/m	m = M/A	m'/m	m = M/A	m'/m	m = M/A	m'/m
1961	0.1405		0.4122		0.2226		0.1278		0.0573	
1962	0.1412	0.0044	0.4192	0.0170	0.2280	0.0242	0.1299	0.0159	0.0574	0.0009
1963	0.1419	0.0052	0.4268	0.0181	0.2336	0.0247	0.1313	0.0111	0.0575	0.0013
1964	0.1384	-0.0250	0.4332	0.0149	0.2392	0.0238	0.1324	0.0081	0.0575	0.0002
1965	0.1341	-0.0306	0.4453	0.0280	0.2449	0.0236	0.1340	0.0119	0.0573	-0.0029
1966	0.1300	-0.0309	0.4670	0.0486	0.2508	0.0243	0.1345	0.0040	0.0572	-0.0017
1967	0.1321	0.0160	0.4891	0.0475	0.2557	0.0196	0.1350	0.0040	0.0570	-0.0031
1968	0.1280	-0.0309	0.5061	0.0348	0.2621	0.0249	0.1356	0.0044	0.0570	-0.0009
1969	0.1246	-0.0263	0.5212	0.0297	0.2691	0.0267	0.1362	0.0044	0.0571	0.0024
1970	0.1216	-0.0242	0.5328	0.0224	0.2755	0.0238	0.1371	0.0062	0.0573	0.0040
1971	0.1208	-0.0064	0.5282	-0.0088	0.2815	0.0220	0.1378	0.0056	0.0580	0.0113
1972	0.1217	0.0074	0.5315	0.0062	0.2862	0.0164	0.1383	0.0033	0.0586	0.0101
1973	0.1128	-0.0732	0.5311	-0.0006	0.2898	0.0126	0.1403	0.0142	0.0593	0.0116
1974	0.1131	0.0030	0.5291	-0.0038	0.2947	0.0169	0.1421	0.0134	0.0600	0.0119
1975	0.1097	-0.0307	0.5237	-0.0102	0.3016	0.0234	0.1434	0.0088	0.0606	0.0112
1976	0.1061	-0.0321	0.5115	-0.0234	0.3055	0.0129	0.1447	0.0093	0.0613	0.0115
1977	0.1028	-0.0318	0.4934	-0.0355	0.3074	0.0063	0.1453	0.0038	0.0618	0.0078
1978	0.1000	-0.0269	0.4925	-0.0018	0.3144	0.0229	0.1486	0.0227	0.0621	0.0047
1979	0.0970	-0.0299	0.4697	-0.0464	0.3222	0.0249	0.1521	0.0240	0.0624	0.0044
1980	0.0945	-0.0261	0.4638	-0.0125	0.3279	0.0175	0.1562	0.0270	0.0627	0.0047
1981	0.0923	-0.0227	0.4578	-0.0130	0.3351	0.0221	0.1601	0.0245	0.0630	0.0054
1982	0.0902	-0.0230	0.4523	-0.0119	0.3406	0.0163	0.1645	0.0275	0.0637	0.0118
1983	0.0914	0.0126	0.4481	-0.0094	0.3452	0.0134	0.1692	0.0285	0.0642	0.0069
1984	0.0898	-0.0171	0.4457	-0.0053	0.3546	0.0272	0.1732	0.0241	0.0650	0.0131
1985	0.0888	-0.0107	0.4418	-0.0089	0.3614	0.0194	0.1776	0.0255	0.0657	0.0109
1986	0.0884	-0.0052	0.4414	-0.0008	0.3693	0.0219	0.1824	0.0267	0.0662	0.0073
1987	0.0888	0.0052	0.4416	0.0005	0.3766	0.0196	0.1873	0.0268	0.0672	0.0148
1988	0.0884	-0.0043	0.4431	0.0033	0.3866	0.0265	0.1921	0.0258	0.0679	0.0105
1989	0.0881	-0.0036	0.4455	0.0054	0.3953	0.0225	0.1960	0.0205	0.0684	0.0079
1990	0.0878	-0.0038	0.4484	0.0066	0.4048	0.0241	0.2007	0.0239	0.0693	0.0124
1991	0.0877	-0.0009	0.4542	0.0130	0.4151	0.0255	0.2045	0.0189	0.0701	0.0111
Average		-0.0154		0.0035		0.0210		0.0158		0.0067

M = economically active agricultural labor
A = total ag land including crop land and pasture

Author's Calculations based on WATI data set.

Table 7A Costa Rica Coffee Production 1961-1998 (FAOSTAT Data)

Year	Hectares Harvested	Production (MT) Green Coffee	Yield (MT/Ha)	Yield Growth	Land Growth
1961	73,000	61,769	0.846		
1962	74,800	54,523	0.729	-0.139	0.025
1963	83,900	62,295	0.742	0.019	0.122
1964	84,100	47,219	0.561	-0.244	0.002
1965	86,000	58,384	0.679	0.209	0.023
1966	88,000	68,344	0.777	0.144	0.023
1967	90,000	76,014	0.845	0.088	0.023
1968	92,000	69,372	0.754	-0.107	0.022
1969	94,000	84,549	0.899	0.193	0.022
1970	95,000	73,192	0.770	-0.143	0.011
1971	95,000	89,350	0.941	0.221	0.000
1972	95,000	78,787	0.829	-0.118	0.000
1973	83,407	95,721	1.148	0.384	-0.122
1974	83,406	84,287	1.011	-0.119	0.000
1975	84,759	80,248	0.947	-0.063	0.016
1976	81,750	81,784	1.000	0.057	-0.036
1977	81,000	87,183	1.076	0.076	-0.009
1978	81,000	98,549	1.217	0.130	0.000
1979	81,750	98,575	1.206	-0.009	0.009
1980	81,750	106,389	1.301	0.079	0.000
1981	85,000	113,102	1.331	0.022	0.040
1982	85,000	115,087	1.354	0.018	0.000
1983	87,000	124,008	1.425	0.053	0.024
1984	90,000	136,857	1.521	0.067	0.034
1985	90,000	124,000	1.378	-0.094	0.000
1986	111,000	128,227	1.155	-0.162	0.233
1987	93,000	138,000	1.484	0.285	-0.162
1988	93,000	144,900	1.558	0.050	0.000
1989	105,000	157,000	1.495	-0.040	0.129
1990	115,000	151,100	1.314	-0.121	0.095
1991	106,000	158,000	1.491	0.134	-0.078
1992	106,000	168,000	1.585	0.063	0.000
1993	105,000	148,000	1.410	-0.111	-0.009
1994	108,966	149,700	1.374	-0.025	0.038
1995	108,000	156,360	1.448	0.054	-0.009
1996	93,000	173,400	1.865	0.288	-0.139
1997	93,000	142,560	1.533	-0.178	0.000
1998	93,000	138,000	1.484	-0.032	0.000
Average Annual Growth				0.025	0.009

Table 7B Coffee Production in El Salvador 1961-1998 (FAOSTAT Data)

Year	Hectares Harvested	Production MT Green Coffee	Yield (MT/HA)	Yield Growth	Land Growth
1961	126,300	122,500	0.970		
1962	128,000	98,300	0.768	-0.208	0.013
1963	130,000	122,700	0.944	0.229	0.016
1964	132,000	123,100	0.933	-0.012	0.015
1965	134,000	109,200	0.815	-0.126	0.015
1966	136,000	123,100	0.905	0.111	0.015
1967	138,000	144,800	1.049	0.159	0.015
1968	118,000	123,800	1.049	0.000	-0.145
1969	110,900	143,980	1.298	0.237	-0.060
1970	120,000	129,490	1.079	-0.169	0.082
1971	141,600	144,624	1.021	-0.053	0.180
1972	146,200	147,476	1.009	-0.012	0.032
1973	146,200	126,500	0.865	-0.142	0.000
1974	147,268	159,436	1.083	0.251	0.007
1975	147,268	161,415	1.096	0.012	0.000
1976	147,268	138,690	0.942	-0.141	0.000
1977	147,268	147,465	1.001	0.063	0.000
1978	147,268	158,490	1.076	0.075	0.000
1979	170,000	185,625	1.092	0.015	0.154
1980	185,000	184,230	0.996	-0.088	0.088
1981	185,000	180,000	0.973	-0.023	0.000
1982	185,315	174,616	0.942	-0.032	0.002
1983	185,315	154,560	0.834	-0.115	0.000
1984	170,616	163,852	0.960	0.151	-0.079
1985	163,948	148,810	0.908	-0.055	-0.039
1986	161,000	138,184	0.858	-0.054	-0.018
1987	159,000	147,890	0.930	0.084	-0.012
1988	161,000	120,290	0.747	-0.197	0.013
1989	151,000	121,900	0.807	0.080	-0.062
1990	173,000	147,200	0.851	0.054	0.146
1991	186,000	149,450	0.803	-0.056	0.075
1992	163,900	175,720	1.072	0.334	-0.119
1993	163,940	140,576	0.857	-0.200	0.000
1994	168,420	140,534	0.834	-0.027	0.027
1995	163,100	139,513	0.855	0.025	-0.032
1996	163,940	148,859	0.908	0.062	0.005
1997	166,000	124,500	0.750	-0.174	0.013
1998	166,000	110,400	0.665	-0.113	0.000
period average				-0.001	0.009

Author's calculations based on FAOSTAT data.

Table 7C Coffee Production in Guatemala 1961-1998

Year	Hectares Harvested	Production (MT) Green Coffee	Yield (MT/Ha)	Yield Growth	Land Growth
1961	230,000	100,600	0.437		
1962	232,000	117,700	0.507	0.160	0.009
1963	235,000	104,400	0.444	-0.124	0.013
1964	237,000	105,200	0.444	-0.001	0.009
1965	237,000	126,100	0.532	0.199	0.000
1966	237,000	106,200	0.448	-0.158	0.000
1967	237,000	102,363	0.432	-0.036	0.000
1968	237,000	112,392	0.474	0.098	0.000
1969	237,000	118,685	0.501	0.056	0.000
1970	224,600	126,546	0.563	0.125	-0.052
1971	225,000	128,386	0.571	0.013	0.002
1972	245,200	142,682	0.582	0.020	0.090
1973	254,462	145,642	0.572	-0.016	0.038
1974	251,657	157,437	0.626	0.093	-0.011
1975	256,869	139,091	0.541	-0.134	0.021
1976	258,410	158,433	0.613	0.132	0.006
1977	258,568	168,217	0.651	0.061	0.001
1978	255,585	169,636	0.664	0.020	-0.012
1979	255,600	164,810	0.645	-0.029	0.000
1980	243,570	177,430	0.728	0.130	-0.047
1981	263,480	193,830	0.736	0.010	0.082
1982	272,440	189,330	0.695	-0.055	0.034
1983	266,700	183,010	0.686	-0.013	-0.021
1984	231,700	196,610	0.849	0.237	-0.131
1985	229,460	181,630	0.792	-0.067	-0.010
1986	236,390	196,560	0.832	0.050	0.030
1987	217,070	193,200	0.890	0.070	-0.082
1988	234,500	179,400	0.765	-0.140	0.080
1989	234,500	193,200	0.824	0.077	0.000
1990	243,950	202,400	0.830	0.007	0.040
1991	266,000	196,190	0.738	-0.111	0.090
1992	262,500	206,586	0.787	0.067	-0.013
1993	260,000	208,650	0.803	0.020	-0.010
1994	262,027	213,900	0.816	0.017	0.008
1995	265,940	210,920	0.793	-0.028	0.015
1996	266,420	213,188	0.800	0.009	0.002
1997	269,080	218,858	0.813	0.016	0.010
1998	260,000	183,000	0.704	-0.135	-0.034
annual average				0.017	0.004

Author's calculations based on FAOSTAT data.

Table 7D Coffee Production in Honduras 1961-1998

Year	Hectares Harvested	Production (MT) Green Coffee	Yield (MT/HA)	Yield Growth	Land Growth
1961	77,518	21,450	0.277		
1962	80,391	27,939	0.348	0.256	0.037
1963	83,263	29,014	0.348	0.003	0.036
1964	86,137	29,276	0.340	-0.025	0.035
1965	80,645	32,195	0.399	0.175	-0.064
1966	92,947	33,569	0.361	-0.095	0.153
1967	94,881	35,041	0.369	0.023	0.021
1968	96,815	36,512	0.377	0.021	0.020
1969	98,749	37,984	0.385	0.020	0.020
1970	100,683	39,456	0.392	0.019	0.020
1971	102,617	40,927	0.399	0.018	0.019
1972	104,551	42,399	0.406	0.017	0.019
1973	101,589	41,778	0.411	0.014	-0.028
1974	108,419	45,342	0.418	0.017	0.067
1975	110,353	46,814	0.424	0.014	0.018
1976	112,287	48,285	0.430	0.014	0.018
1977	114,221	49,757	0.436	0.013	0.017
1978	114,651	59,796	0.522	0.197	0.004
1979	118,792	72,547	0.611	0.171	0.036
1980	118,792	64,228	0.541	-0.115	0.000
1981	122,864	75,347	0.613	0.134	0.034
1982	122,500	72,420	0.591	-0.036	-0.003
1983	123,689	79,474	0.643	0.087	0.010
1984	122,365	72,545	0.593	-0.077	-0.011
1985	124,166	75,091	0.605	0.020	0.015
1986	122,741	76,318	0.622	0.028	-0.011
1987	124,723	79,877	0.640	0.030	0.016
1988	126,310	94,046	0.745	0.163	0.013
1989	141,096	100,234	0.710	-0.046	0.117
1990	143,555	119,784	0.834	0.175	0.017
1991	146,669	101,890	0.695	-0.167	0.022
1992	148,818	111,660	0.750	0.080	0.015
1993	150,606	110,481	0.734	-0.022	0.012
1994	178,978	126,182	0.705	-0.039	0.188
1995	183,691	132,400	0.721	0.022	0.026
1996	208,639	145,600	0.698	-0.032	0.136
1997	193,555	145,920	0.754	0.080	-0.072
1998	240,000	147,200	0.613	-0.186	0.240
annual average				0.026	0.033

Author's calculations based on FAOSTAT data.

Table 8A Sugar Cane Production in Costa Rica 1961-1998

Year	Hectares Harvested	Production (MT)	Yield (MT)	Yield Growth	Land Growth
1961	21,200	1,069,722	50.5		
1962	21,500	1,085,835	50.5	0.001	0.014
1963	24,700	1,258,117	50.9	0.009	0.149
1964	25,800	1,330,361	51.6	0.012	0.045
1965	26,700	1,397,153	52.3	0.015	0.035
1966	31,600	1,664,443	52.7	0.007	0.184
1967	30,600	1,645,187	53.8	0.021	-0.032
1968	32,000	1,726,711	54.0	0.004	0.046
1969	33,300	1,792,224	53.8	-0.003	0.041
1970	38,100	2,134,787	56.0	0.041	0.144
1971	36,400	2,097,983	57.6	0.029	-0.045
1972	39,216	2,301,427	58.7	0.018	0.077
1973	38,763	2,341,294	60.4	0.029	-0.012
1974	36,763	2,192,581	59.6	-0.013	-0.052
1975	37,019	2,323,870	62.8	0.053	0.007
1976	38,130	2,291,585	60.1	-0.043	0.030
1977	40,000	2,519,421	63.0	0.048	0.049
1978	46,049	2,578,741	56.0	-0.111	0.151
1979	46,699	2,615,128	56.0	0.000	0.014
1980	44,937	2,516,456	56.0	0.000	-0.038
1981	45,018	2,521,865	56.0	0.000	0.002
1982	43,682	2,446,200	56.0	0.000	-0.030
1983	45,419	2,543,489	56.0	0.000	0.040
1984	52,425	2,935,809	56.0	0.000	0.154
1985	49,405	2,949,551	59.7	0.066	-0.058
1986	50,032	2,801,814	56.0	-0.062	0.013
1987	47,761	2,674,639	56.0	0.000	-0.045
1988	47,865	2,680,461	56.0	0.000	0.002
1989	40,000	2,370,000	59.3	0.058	-0.164
1990	31,000	2,630,000	84.8	0.432	-0.225
1991	35,000	2,830,000	80.9	-0.047	0.129
1992	36,000	3,040,000	84.4	0.044	0.029
1993	36,127	3,180,000	88.0	0.042	0.004
1994	38,000	3,200,000	84.2	-0.043	0.052
1995	38,000	3,450,000	90.8	0.078	0.000
1996	45,500	3,620,000	79.6	-0.124	0.197
1997	39,000	3,620,000	92.8	0.167	-0.143
1998	40,000	3,620,000	90.5	-0.025	0.026
period annual average				0.019	0.021

Author's calculations based on FAOSTAT data.

Table 8B Sugar Cane Production in El Salvador 1961-1998

Year	Hectares Harvested	Production (MT)	Yield (MT/Ha)	Yield Growth	Land Growth
1961	24,500	895,900	36.6		
1962	26,000	1,030,000	39.6	0.083	0.061
1963	23,000	987,700	42.9	0.084	-0.115
1964	23,700	1,018,900	43.0	0.001	0.030
1965	27,700	1,366,000	49.3	0.147	0.169
1966	29,000	1,487,500	51.3	0.040	0.047
1967	27,900	1,560,800	55.9	0.091	-0.038
1968	28,000	1,508,700	53.9	-0.037	0.004
1969	29,600	1,469,000	49.6	-0.079	0.057
1970	27,900	1,587,000	56.9	0.146	-0.057
1971	36,200	1,991,000	55.0	-0.033	0.297
1972	37,500	2,312,000	61.7	0.121	0.036
1973	32,629	2,440,000	74.8	0.213	-0.130
1974	36,232	2,953,000	81.5	0.090	0.110
1975	41,958	3,166,000	75.5	-0.074	0.158
1976	41,600	3,177,000	76.4	0.012	-0.009
1977	41,265	3,550,000	86.0	0.126	-0.008
1978	41,223	3,596,000	87.2	0.014	-0.001
1979	37,021	3,321,000	89.7	0.028	-0.102
1980	34,056	2,564,000	75.3	-0.161	-0.080
1981	27,440	2,263,000	82.5	0.095	-0.194
1982	31,500	2,372,000	75.3	-0.087	0.148
1983	34,020	3,016,000	88.7	0.177	0.080
1984	39,410	3,402,000	86.3	-0.026	0.158
1985	40,385	3,455,000	85.6	-0.009	0.025
1986	42,070	3,647,000	86.7	0.013	0.042
1987	41,125	3,405,000	82.8	-0.045	-0.022
1988	33,810	2,736,000	80.9	-0.023	-0.178
1989	28,910	2,582,000	89.3	0.104	-0.145
1990	31,920	2,956,500	92.6	0.037	0.104
1991	49,910	4,038,000	80.9	-0.126	0.564
1992	51,800	4,464,000	86.2	0.065	0.038
1993	47,740	4,148,000	86.9	0.008	-0.078
1994	46,900	3,929,300	83.8	-0.036	-0.018
1995	46,154	3,477,817	75.4	-0.101	-0.016
1996	53,967	3,936,000	72.9	-0.032	0.169
1997	51,000	4,793,630	94.0	0.289	-0.055
1998	64,000	4,500,000	70.3	-0.252	0.255
period annual average				0.023	0.035

Table 8C Sugar Cane Production in Guatemala 1961-1998

Year	Hectares Harvested	Production (MT)	Yield (MT/Ha)	Yield Growth	Land Growth
1961	29,600	1,533,000	51.8		
1962	33,400	1,973,400	59.1	0.141	0.128
1963	29,800	2,020,300	67.8	0.147	-0.108
1964	35,900	2,156,800	60.1	-0.114	0.205
1965	32,900	2,115,900	64.3	0.070	-0.084
1966	36,000	2,532,300	70.3	0.094	0.094
1967	37,100	2,683,400	72.3	0.028	0.031
1968	33,800	2,290,600	67.8	-0.063	-0.089
1969	36,100	2,658,600	73.6	0.087	0.068
1970	35,800	2,632,500	73.5	-0.002	-0.008
1971	40,723	2,785,453	68.4	-0.070	0.138
1972	44,587	3,272,661	73.4	0.073	0.095
1973	52,697	4,008,627	76.1	0.036	0.182
1974	58,473	4,422,759	75.6	-0.006	0.110
1975	75,670	5,093,000	67.3	-0.110	0.294
1976	76,720	6,845,000	89.2	0.326	0.014
1977	60,690	6,600,000	108.7	0.219	-0.209
1978	53,760	5,360,000	99.7	-0.083	-0.114
1979	58,660	4,830,000	82.3	-0.174	0.091
1980	69,580	5,700,000	81.9	-0.005	0.186
1981	79,660	6,300,000	79.1	-0.035	0.145
1982	70,070	7,420,000	105.9	0.339	-0.120
1983	70,210	6,500,000	92.6	-0.126	0.002
1984	73,080	6,560,000	89.8	-0.030	0.041
1985	72,380	6,580,000	90.9	0.013	-0.010
1986	72,380	7,000,000	96.7	0.064	0.000
1987	81,340	6,870,584	84.5	-0.127	0.124
1988	90,300	7,567,229	83.8	-0.008	0.110
1989	88,830	7,615,300	85.7	0.023	-0.016
1990	112,000	9,603,100	85.7	0.000	0.261
1991	122,500	10,798,800	88.2	0.028	0.094
1992	125,930	11,307,600	89.8	0.019	0.028
1993	129,150	11,741,100	90.9	0.012	0.026
1994	129,500	11,862,420	91.6	0.008	0.003
1995	138,600	15,443,780	111.4	0.216	0.070
1996	178,580	15,582,930	87.3	-0.217	0.288
1997	154,000	17,687,010	114.9	0.316	-0.138
1998	180,000	18,189,380	101.1	-0.120	0.169
period annual average				0.026	0.057

Author's calculations based on FAOSTAT data.

Table 8D Sugar Cane Production in Honduras 1961-1998

Year	Hectares Harvested	Production (MT)	Yield (MT/Ha)	Yield Growth	Land Growth
1961	33,800	804,300	23.8		
1962	33,200	781,500	23.5	-0.011	-0.018
1963	32,600	791,800	24.3	0.032	-0.018
1964	33,200	796,900	24.0	-0.012	0.018
1965	33,000	807,900	24.5	0.020	-0.006
1966	35,100	898,300	25.6	0.045	0.064
1967	38,000	986,500	26.0	0.014	0.083
1968	41,400	1,099,700	26.6	0.023	0.089
1969	45,900	1,240,200	27.0	0.017	0.109
1970	49,600	1,363,400	27.5	0.017	0.081
1971	52,000	1,407,112	27.1	-0.016	0.048
1972	55,000	1,484,814	27.0	-0.002	0.058
1973	52,000	1,440,000	27.7	0.026	-0.055
1974	48,000	1,415,972	29.5	0.065	-0.077
1975	50,000	1,505,948	30.1	0.021	0.042
1976	50,000	1,541,782	30.8	0.024	0.000
1977	55,000	1,844,738	33.5	0.088	0.100
1978	68,000	2,164,484	31.8	-0.051	0.236
1979	75,000	2,555,446	34.1	0.070	0.103
1980	85,000	2,905,730	34.2	0.003	0.133
1981	70,000	2,920,360	41.7	0.220	-0.176
1982	62,000	3,095,570	49.9	0.197	-0.114
1983	52,500	3,150,283	60.0	0.202	-0.153
1984	44,450	3,054,318	68.7	0.145	-0.153
1985	44,785	2,988,885	66.7	-0.029	0.008
1986	41,820	2,988,614	71.5	0.071	-0.066
1987	41,000	2,658,945	64.9	-0.093	-0.020
1988	38,430	2,509,136	65.3	0.007	-0.063
1989	40,664	2,724,727	67.0	0.026	0.058
1990	40,743	2,897,863	71.1	0.061	0.002
1991	41,734	2,730,136	65.4	-0.080	0.024
1992	42,750	2,838,776	66.4	0.015	0.024
1993	42,000	2,918,792	69.5	0.047	-0.018
1994	41,408	3,077,814	74.3	0.070	-0.014
1995	42,241	3,059,115	72.4	-0.026	0.020
1996	42,752	3,580,200	83.7	0.156	0.012
1997	43,935	3,768,350	85.8	0.024	0.028
1998	36,000	3,580,045	99.4	0.159	-0.181
period annual average				0.042	0.006

Author's calculations based on FAOSTAT data.

Table 9A Banana Production in Costa Rica

	Hectares Harvested	Production (MT)	Yield (MT/Ha)
1961	23,400	398,339	17.02
1962	27,100	472,532	17.44
1963	26,100	442,036	16.94
1964	28,100	483,076	17.19
1965	27,800	516,122	18.57
1966	27,200	570,634	20.98
1967	26,500	592,811	22.37
1968	29,700	799,960	26.93
1969	37,400	961,973	25.72
1970	38,900	1,146,307	29.47
1971	39,500	1,250,000	31.65
1972	39,500	1,250,000	31.65
1973	36,155	1,289,401	35.66
1974	36,155	1,151,278	31.84
1975	40,065	1,220,690	30.47
1976	42,067	1,187,147	28.22
1977	37,000	1,124,691	30.40
1978	25,212	1,182,962	46.92
1979	25,291	1,154,325	45.64
1980	25,822	1,107,518	42.89
1981	26,725	1,141,290	42.70
1982	27,398	1,153,305	42.09
1983	24,846	1,155,355	46.50
1984	24,985	1,168,623	46.77
1985	19,982	1,007,889	50.44
1986	20,218	1,096,229	54.22
1987	21,250	1,142,607	53.77
1988	22,176	1,162,058	52.40
1989	24,722	1,512,000	61.16
1990	31,817	1,740,000	54.69
1991	33,400	1,720,000	51.50
1992	38,119	1,920,000	50.37
1993	40,000	1,500,000	37.50
1994	52,707	2,000,000	37.95
1995	52,165	2,300,000	44.09
1996	49,191	2,400,000	48.79
1997	49,000	2,300,000	46.94
1998	49,000	2,200,000	44.90

Table 9B Banana Production in El Salvador

	Hectares Harvested	Production (MT)	Yield (MT/Ha)
1961	12,100	49,000	4.05
1962	12,600	51,000	4.05
1963	12,900	52,000	4.03
1964	13,300	53,000	3.98
1965	14,200	55,000	3.87
1966	11,300	57,600	5.10
1967	9,100	41,000	4.51
1968	7,600	43,500	5.72
1969	7,500	43,000	5.73
1970	7,900	45,200	5.72
1971	8,700	49,511	5.69
1972	9,300	50,000	5.38
1973	9,300	52,000	5.59
1974	9,300	53,000	5.70
1975	9,300	53,000	5.70
1976	9,300	53,000	5.70
1977	9,500	53,000	5.58
1978	9,500	53,000	5.58
1979	9,400	52,000	5.53
1980	8,000	44,000	5.50
1981	7,300	40,000	5.48
1982	6,900	38,000	5.51
1983	6,200	34,000	5.48
1984	5,615	30,883	5.50
1985	6,000	33,000	5.50
1986	6,460	35,530	5.50
1987	6,500	35,750	5.50
1988	5,390	35,800	6.64
1989	5,460	60,730	11.12
1990	5,600	62,560	11.17
1991	5,600	62,600	11.18
1992	6,160	67,600	10.97
1993	6,100	65,000	10.66
1994	6,440	62,727	9.74
1995	6,370	77,386	12.15
1996	6,370	77,386	12.15
1997	6,370	77,386	12.15
1998	6,370	77,386	12.15

Table 9C Banana Production in Guatemala

	Hectares Harvested	Production (MT)	Yield (MT/Ha)
1961	22,000	369,000	16.77
1962	21,000	335,500	15.98
1963	21,000	362,100	17.24
1964	21,000	332,400	15.83
1965	21,000	285,800	13.61
1966	21,000	336,300	16.01
1967	21,000	336,800	16.04
1968	25,000	452,100	18.08
1969	27,000	478,200	17.71
1970	26,000	486,700	18.72
1971	25,000	450,000	18.00
1972	25,000	440,000	17.60
1973	25,000	429,000	17.16
1974	25,000	439,900	17.60
1975	21,000	374,000	17.81
1976	25,000	451,000	18.04
1977	24,000	450,000	18.75
1978	25,000	465,000	18.60
1979	20,000	380,000	19.00
1980	24,000	449,000	18.71
1981	26,000	500,000	19.23
1982	28,000	592,000	21.14
1983	24,000	433,000	18.04
1984	22,000	429,000	19.50
1985	18,000	484,000	26.89
1986	18,000	474,000	26.33
1987	18,000	438,000	24.33
1988	18,500	398,000	21.51
1989	18,500	497,000	26.86
1990	18,500	454,215	24.55
1991	20,000	504,979	25.25
1992	20,000	484,095	24.20
1993	21,000	489,900	23.33
1994	21,000	638,000	30.38
1995	21,000	705,000	33.57
1996	21,000	728,000	34.67
1997	21,000	655,599	31.22
1998	23,000	660,000	28.70

Table 9D Banana Production in Honduras

	Harvested Hectares	Production (MT)	Yield (MT/Ha)
1961	29,555	737,145	24.94
1962	26,624	673,016	25.28
1963	23,234	631,293	27.17
1964	28,212	714,764	25.34
1965	27,048	724,500	26.79
1966	29,733	981,400	33.01
1967	38,188	1,241,623	32.51
1968	40,642	1,344,160	33.07
1969	42,852	1,416,595	33.06
1970	41,465	1,348,266	32.52
1971	45,500	1,512,000	33.23
1972	48,971	1,618,500	33.05
1973	37,600	1,503,800	39.99
1974	30,138	1,276,600	42.36
1975	36,882	783,426	21.24
1976	37,000	1,073,962	29.03
1977	38,000	1,235,054	32.50
1978	39,500	1,266,518	32.06
1979	32,152	1,449,127	45.07
1980	38,200	1,401,000	36.68
1981	39,000	1,355,160	34.75
1982	33,430	1,424,942	42.62
1983	28,675	1,186,386	41.37
1984	20,394	992,636	48.67
1985	20,766	1,091,409	52.56
1986	19,806	1,032,010	52.11
1987	20,652	1,166,284	56.47
1988	21,065	1,179,900	56.01
1989	21,084	1,091,948	51.79
1990	21,099	1,045,718	49.56
1991	17,483	972,532	55.63
1992	17,483	1,022,681	58.50
1993	23,327	1,012,868	43.42
1994	22,385	839,136	37.49
1995	22,392	866,814	38.71
1996	22,571	1,022,120	45.28
1997	22,341	945,650	42.33
1998	23,000	890,000	38.70

Table 10 Annual Average Cereal Production Growth 1961-1991

Country	Yield Growth	Land Growth
Costa Rica	3.3	-0.64
El Salvador	1.87	1.36
Guatemala	2.56	0.21
Honduras	0.77	1.85
Nicaragua	1.27	0.5
East Asia	1.32	-1.13
South Asia	2.36	0.44
South America	1.57	0.82

Author's calculations based on WATI data.

Table 11 Annual Average Growth in Fruit and Vegetable Production (metric tons) 1961-1991

Country	Fruits	Vegetables
Costa Rica	5.14	5.66
El Salvador	2.21	1.12
Guatemala	1.91	3.9
Honduras	1.81	5.53
Nicaragua	2.7	2.66
East Asia	3.2	2.63
South Asia	2.68	3.35
South America	3.47	2.53

WATI Data.

Table 12 International Export Price Index Numbers

Items	Years (1980 = 100) 1985	1990	1996	% Growth 1980-1996
Primary Commodities Developing Countries	87	71	68	-32%
Food Developing Countries	63	69	77	-23%
Meat	68	110	99	-1%
Dairy Products	73	110	99	-1%
Sugar	15	45	43	-47%
Cereals	70	84	93	-7%
Vegetables	61	112	91	-9%
Coffee	81	46	65	-35%
Fruits	84	131	140	40%
Lemons	78	108	157	57%
Grapefruit	81	108	84	-16%
Bananas	98	150	95	-5%
Apples	71	139	187	87%

Source: United Nations "1996 International Trade Statistics Yearbook, Volume II Trade by Commodity", United Nations, New York, 1997. page S 134.

Table 13 Annual GDP Deflator by Country for 1980 - 1997

Year	Costa Rica	El Salvador	Guatemala	Honduras	Nicaragua
1980	1.000	1.000	1.000	1.000	1.0000000000
1981	0.809	0.860	0.873	0.946	0.1913509376
1982	0.655	0.739	0.761	0.895	0.0366151813
1983	0.530	0.636	0.664	0.847	0.0070063493
1984	0.428	0.547	0.580	0.801	0.0013406715
1985	0.347	0.470	0.506	0.758	0.0002565387
1986	0.280	0.404	0.441	0.717	0.0000490889
1987	0.227	0.347	0.385	0.678	0.0000093932
1988	0.184	0.299	0.336	0.642	0.0000017974
1989	0.149	0.257	0.293	0.607	0.0000003439
1990	0.120	0.221	0.256	0.574	0.0000000658
1991	0.102	0.201	0.228	0.477	0.0000000392
1992	0.086	0.183	0.203	0.396	0.0000000234
1993	0.073	0.167	0.181	0.329	0.0000000140
1994	0.062	0.152	0.162	0.273	0.0000000083
1995	0.053	0.138	0.144	0.227	0.0000000050
1996	0.045	0.126	0.128	0.189	0.0000000030
1997	0.038	0.115	0.114	0.157	0.0000000018

Data based on period deflators reported in
World Bank, World Development Indicators
1999

Table 14A Sugar Cane Prices, Local Currency, Nominal Values

Sugar Cane	Producer Pr (Lc)	Costa Rica	El Salvador	Guatemala	Honduras	Nicaragua
Year	1966	46	11	10	10	87
	1967	46	11	13	11	70
	1968	50	12	13	11	70
	1969	50	12	11	12	70
	1970	49	13	13	12	70
	1971	48	15	11	13	70
	1972	53	14	11	13	70
	1973	56	15	17	14	80
	1974	92	16	19	14	90
	1975	148	32	21	17	100
	1976	110	33	18	19	100
	1977	127	33	23	19	120
	1978	129	33	25	19	120
	1979	134	38	24	21	120
	1980	186	41	30	25	130
	1981	301	40	18	35	176
	1982	510	40	18	30	221
	1983	867	45	18	32	221
	1984	840	50	18	33	221
	1985	894	55	19	30	606
	1986	1,000	66	26	30	1,934
	1987	1,100	72	26	31	7,700
	1988	1,223	77	23	31	34,000
	1989	1,766	94	25	31	0
	1990	2,017	108	32	31	0
	1991	2,597	127	44	50	70
	1992	3,312	134	66	50	72
	1993	3,566	138	77	65	100
	1994	4,211	140	80	70	150
	1995	4,288	140	82	73	170
% Real Price Change 1980-1995		22.18%	-52.88%	-60.64%	-33.72%	

Table 14B Banana Prices, Local Currency, Nominal Prices

Bananas	Producer Pr (Lc)	Costa Rica	El Salvador	Guatemala	Honduras	Nicaragua
Year	1966	445	0	0	125	377
	1967	456	96	53	127	314
	1968	448	96	58	123	314
	1969	441	89	58	130	314
	1970	472	96	70	104	314
	1971	425	97	78	108	344
	1972	474	111	62	108	390
	1973	484	115	70	108	500
	1974	707	135	74	116	550
	1975	1,031	156	80	116	560
	1976	1,093	274	91	116	570
	1977	1,167	285	77	116	640
	1978	1,255	290	100	120	650
	1979	1,441	305	100	124	798
	1980	1,739	316	114	149	1,041
	1981	4,108	326	118	157	1,041
	1982	7,352	330	100	152	1,041
	1983	8,431	240	80	161	1,041
	1984	9,603	327	50	161	1,911
	1985	10,779	360	40	163	1,911
	1986	10,800	581	34	170	4,400
	1987	11,880	1,015	41	170	17,300
	1988	12,000	1,179	59	170	75,700
	1989	13,000	1,056	96	170	0
	1990	14,000	1,124	91	180	1
	1991	15,000	1,265	114	190	260
	1992	16,000	1,426	287	200	270
	1993	18,000	1,422	330	200	390
	1994	20,000	1,740	350	266	600
	1995	25,000	1,800	509	528	800
% Real Price Change 1980-1995		-23.81%				

Table 14C Coffee Prices, Local Currency, Nominal Prices

Coffee, Green	Producer Pr (Lc)	Costa Rica	El Salvador	Guatemala	Honduras	Nicaragua
Year	1966	4,817	0	100	1,389	10,800
	1967	4,379	1,786	95	1,279	10,500
	1968	4,306	1,703	93	1,257	9,870
	1969	4,188	1,673	106	1,213	9,600
	1970	5,178	2,210	99	1,609	10,600
	1971	4,561	1,967	100	1,584	11,100
	1972	4,461	1,855	100	1,514	11,000
	1973	6,144	2,831	122	1,795	11,400
	1974	7,665	2,654	143	2,177	13,600
	1975	7,723	1,739	851	1,772	14,000
	1976	14,305	6,348	1,429	1,860	18,300
	1977	27,557	10,271	2,671	1,870	29,400
	1978	21,488	7,034	431	4,481	27,890
	1979	19,092	8,870	342	5,113	22,035
	1980	21,648	8,380	310	3,410	38,417
	1981	34,198	6,890	252	2,860	25,820
	1982	63,489	3,768	236	2,959	27,750
	1983	57,251	3,646	289	2,545	35,043
	1984	72,967	4,026	309	2,796	61,026
	1985	88,872	4,572	403	2,846	219,908
	1986	97,400	8,910	722	4,782	501,000
	1987	107,000	6,128	779	3,582	1,900,000
	1988	107,000	7,688	863	3,574	8,000,000
	1989	107,000	8,152	900	4,066	24
	1990	107,000	8,586	990	3,564	90
	1991	130,000	8,415	2,000	5,424	27,000
	1992	135,000	5,882	948	5,298	28,600
	1993	200,000	6,000	1,144	6,656	41,200
	1994	200,000	6,300	1,200	6,776	60,000
	1995	201,000	6,500	12,200	6,864	60,000
% Real Price Change 1980-1995		-50.79%	-89.30%	466.71%	-54.31%	

Table 14D Orange Prices, Local Currency, Nominal Prices

Oranges	Producer Pr (Lc)	Costa Rica	El Salvador	Guatemala	Honduras	Nicaragua
Year	1966	500	0	45	100	572
	1967	470	55	45	101	643
	1968	470	55	46	99	690
	1969	540	51	45	94	667
	1970	610	55	49	94	738
	1971	610	55	47	105	809
	1972	665	63	44	110	920
	1973	780	65	46	110	1,180
	1974	1,180	77	47	110	1,290
	1975	1,410	89	50	115	1,320
	1976	1,320	156	60	115	1,340
	1977	1,380	163	70	115	1,510
	1978	1,450	165	88	121	1,530
	1979	1,460	173	112	149	1,880
	1980	1,610	177	142	161	1,850
	1981	2,030	184	122	178	2,000
	1982	4,220	186	103	167	2,150
	1983	4,500	318	103	158	2,360
	1984	4,500	332	108	166	2,600
	1985	4,500	521	116	163	2,600
	1986	4,500	639	138	152	6,000
	1987	5,000	806	137	168	23,700
	1988	5,000	780	182	168	104,000
	1989	5,000	808	200	170	0
	1990	5,500	596	300	180	1
	1991	5,500	734	350	200	350
	1992	6,000	688	400	220	370
	1993	6,897	796	430	250	540
	1994	10,345	1,354	450	324	780
	1995	12,069	1,000	0	337	900
% Real Price Change 1980-1995		-60.27%	-22.03%			

Table 14E Other Fruits, Local Currency, Nominal Prices

Lemons and Limes	Producer Pr (Lc)	El Salvador	Grapefruit and Pomelos	Producer Pr (Lc)	Honduras
Year	1966	0	Year	1966	0
	1967	225		1967	0
	1968	225		1968	0
	1969	210		1969	0
	1970	225		1970	193
	1971	227		1971	192
	1972	260		1972	196
	1973	270		1973	194
	1974	320		1974	194
	1975	340		1975	233
	1976	370		1976	239
	1977	390		1977	242
	1978	410		1978	314
	1979	430		1979	337
	1980	460		1980	276
	1981	480		1981	302
	1982	500		1982	365
	1983	500		1983	377
	1984	521		1984	332
	1985	390		1985	373
	1986	607		1986	364
	1987	1,106		1987	453
	1988	812		1988	453
	1989	1,142		1989	379
	1990	1,375		1990	420
	1991	923		1991	450
	1992	942		1992	500
	1993	1,225		1993	600
	1994	2,131		1994	660
	1995	2,000		1995	704

Table 14F Changes in Real Prices Paid to Producers
(1980-1995, Local Currency and GDP Deflator)

		% Change 1980-1995
Sugar Cane	Costa Rica	22
	El Salvador	-52
	Guatemala	-60
	Honduras	-33
Bananas	Costa Rica	-23
Coffee	Costa Rica	-50
	El Salvador	-89
	Guatemala	466
	Honduras	-54
Oranges	Costa Rica	-60
	El Salvador	-22
Lemons and Limes	El Salvador	-40
Grapefruit	Honduras	-42

Table 15 Pineapple Prices, Local Currency, Nominal Prices

Pineapples	Producer Pr (Lc)	Costa Rica	El Salvador	Guatemala	Honduras	Nicaragua
Year	1966	518	0	0	114	208
	1967	483	124	97	120	234
	1968	477	124	97	150	251
	1969	452	115	96	170	243
	1970	492	124	100	184	269
	1971	432	125	95	219	295
	1972	480	143	97	253	330
	1973	563	149	104	325	430
	1974	1,000	176	138	328	470
	1975	2,000	203	182	295	480
	1976	3,000	352	194	238	490
	1977	4,000	369	191	234	550
	1978	5,000	450	196	249	560
	1979	6,000	500	198	259	680
	1980	7,000	650	214	340	670
	1981	8,000	700	240	335	730
	1982	9,000	850	237	398	780
	1983	10,000	456	245	403	860
	1984	10,500	440	244	451	940
	1985	11,000	1,760	248	314	1,000
	1986	11,500	1,870	345	287	2,300
	1987	12,000	1,936	400	262	9,000
	1988	12,500	939	424	262	39,600
	1989	13,000	1,100	473	196	0
	1990	14,000	1,100	528	280	0
	1991	14,800	1,191	594	320	130
	1992	15,000	1,162	638	350	140
	1993	15,625	1,263	660	450	200
	1994	19,531	1,857	680	473	300
	1995	23,437	1,600	980	513	500

Table 16 Maize Prices, Local Currency, Nominal Values

Maize	Producer Pr (Lc)	Costa Rica	El Salvador	Guatemala	Honduras	Nicaragua
Year	1966	429	0	73	138	522
	1967	471	206	94	145	587
	1968	505	205	95	140	630
	1969	499	171	82	124	609
	1970	529	183	95	133	674
	1971	585	176	81	135	739
	1972	595	185	76	135	783
	1973	672	197	118	150	717
	1974	1,071	212	134	165	870
	1975	1,482	184	153	192	1,170
	1976	1,340	335	131	192	1,020
	1977	1,225	456	162	242	1,230
	1978	1,300	494	177	238	1,160
	1979	1,436	404	173	284	1,200
	1980	1,863	410	220	254	1,304
	1981	3,035	410	216	244	1,692
	1982	8,382	458	198	286	1,923
	1983	10,350	464	214	308	2,717
	1984	9,624	482	190	275	3,541
	1985	11,660	458	220	311	4,850
	1986	13,668	671	387	347	19,266
	1987	13,668	795	328	356	130,300
	1988	13,668	868	307	349	192,000
	1989	15,205	1,082	448	388	1
	1990	19,653	1,352	770	636	2
	1991	22,511	1,552	704	739	600
	1992	24,898	1,489	770	772	629
	1993	25,042	1,428	990	1,087	866
	1994	29,000	2,181	1,050	1,777	1,449
	1995	32,000	1,436	1,000	1,777	1,270

Table 17 Vegetable Prices, Local Currency, Nominal Prices (*part 1*)

Cabbages	Year									
Producer Pr (Lc)	1966	1967	1968	1969	1970	1971	1972	1973	1974	1975
Costa Rica	637	594	588	556	606	532	591	693	1,050	1,260
El Salvador	122	118	118	110	118	119	136	141	166	192
Guatemala	122	119	119	118	123	117	120	128	169	220
Honduras	100	120	130	150	183	185	190	190	191	192
Nicaragua	771	867	930	899	995	1,091	1,156	1,060	1,284	1,300

Tomatoes	Year									
Producer Pr (Lc)	1966	1967	1968	1969	1970	1971	1972	1973	1974	1975
Costa Rica	1,513	1,357	1,757	1,652	2,261	2,348	1,959	2,296	3,470	4,170
El Salvador	122	118	118	110	118	119	136	141	166	192
Guatemala	118	93	110	100	100	90	100	100	130	140
Honduras	40	60	70	90	111	121	157	130	127	138
Nicaragua	633	712	764	738	817	896	949	870	1,054	1,070

Onions, Dry	Year									
Producer Pr (Lc)	1966	1967	1968	1969	1970	1971	1972	1973	1974	1975
Costa Rica	1,049	589	945	1,328	1,111	943	1,037	1,315	1,299	1,859
El Salvador	81	79	79	73	79	80	91	95	112	129
Guatemala	122	119	119	118	123	117	120	128	169	220
Honduras	571	290	280	250	282	343	348	329	300	368
Nicaragua	548	616	661	639	707	775	821	753	912	920

Table 17 Vegetable Prices, Local Currency, Nominal Prices (*part 2*)

Cabbages Producer Pr (Lc)	1976	1977	1978	1979	1980	1981	1982	1983	1984	1985
Costa Rica	1,170	1,230	1,290	1,300	1,430	1,800	3,740	4,710	5,040	5,550
El Salvador	337	351	357	374	390	430	490	550	574	440
Guatemala	240	230	240	244	263	262	259	267	266	300
Honduras	192	196	270	286	374	431	315	403	383	348
Nicaragua	1,320	1,490	1,520	2,150	2,310	2,880	3,750	4,120	4,530	8,000

Tomatoes Producer Pr (Lc)	1976	1977	1978	1979	1980	1981	1982	1983	1984	1985
Costa Rica	3,880	4,070	4,260	4,290	4,740	5,980	5,050	9,890	13,730	14,220
El Salvador	337	351	357	374	390	400	449	455	614	424
Guatemala	140	140	150	150	160	160	170	180	180	200
Honduras	159	194	188	228	260	290	245	245	242	223
Nicaragua	1,090	1,220	1,250	1,770	1,900	2,370	3,080	3,380	3,720	6,600

Onions, Dry Producer Pr (Lc)	1976	1977	1978	1979	1980	1981	1982	1983	1984	1985
Costa Rica	1,317	1,611	2,552	3,464	2,379	6,809	5,752	11,265	15,639	16,200
El Salvador	227	236	240	251	261	268	273	277	572	783
Guatemala	240	230	240	244	263	262	259	267	300	400
Honduras	474	507	534	567	617	666	787	736	953	874
Nicaragua	940	1,060	1,080	1,520	1,640	2,050	2,660	2,920	3,210	5,700

Table 17 Vegetable Prices, Local Currency, Nominal Prices (*part 3*)

Cabbages Producer Pr (Lc)	1986	1987	1988	1989	1990	1991	1992	1993	1994	1995
Costa Rica	6,050	6,650	8,000	8,600	9,700	13,000	16,000	22,000	26,000	43,000
El Salvador	738	770	990	1,100	1,400	1,694	2,800	3,234	933	1,500
Guatemala	450	500	531	580	630	770	924	924	930	0
Honduras	285	285	285	220	270	300	350	400	400	410
Nicaragua	18,200	72,200	317,000	1	4	1,070	1,100	1,600	2,400	2,800

Tomatoes Producer Pr (Lc)	1986	1987	1988	1989	1990	1991	1992	1993	1994	1995
Costa Rica	15,490	17,040	20,600	22,100	24,800	33,200	36,500	50,000	60,000	99,000
El Salvador	598	1,305	669	1,452	2,620	3,007	3,670	3,374	4,179	4,000
Guatemala	208	218	258	306	319	440	480	480	500	0
Honduras	211	211	211	154	200	280	350	550	616	715
Nicaragua	15,000	59,000	260,000	1	3	880	930	1,300	1,960	2,200

Onions, Dry Producer Pr (Lc)	1986	1987	1988	1989	1990	1991	1992	1993	1994	1995
Costa Rica	18,000	22,000	24,680	32,300	49,000	67,920	37,920	87,080	54,491	98,500
El Salvador	871	960	563	1,320	1,500	1,818	1,537	3,706	2,269	2,400
Guatemala	550	600	719	800	1,100	1,114	1,254	1,144	1,150	0
Honduras	932	932	932	550	1,000	1,000	1,100	1,100	1,156	1,188
Nicaragua	13,000	51,400	225,000	1	2	760	810	1,160	1,700	1,900

Table 18 Fertilizer Consumption in Central America (*part 1*)

Nitrogenous Fertilizers Consumption (Mt)	Year 1961	1962	1963	1964	1965	1966	1967	1968	1969	1970	1971	1972	1973	1974
Costa Rica	6,226	8,831	21,000	24,000	10,000	16,700	15,700	29,000	39,980	37,365	26,800	25,900	34,000	33,900
El Salvador	12,064	16,527	29,413	30,775	21,608	34,905	29,263	34,000	35,000	45,000	63,000	65,000	68,000	62,500
Guatemala	9,035	8,900	11,436	9,050	7,301	19,502	13,592	23,702	19,396	28,977	13,239	23,571	32,000	36,900
Honduras	5,252	6,245	7,000	7,000	8,000	10,000	8,000	10,000	13,000	15,000	16,000	14,000	14,000	9,500
Nicaragua	3,357	3,169	9,744	10,000	15,014	12,656	15,911	16,100	17,000	16,295	17,312	17,500	35,000	22,000

Phosphate Fertilizers Consumption (Mt)	Year 1961	1962	1963	1964	1965	1966	1967	1968	1969	1970	1971	1972	1973	1974
Costa Rica	8,254	11,179	9,000	4,500	4,500	4,500	6,000	6,800	5,200	6,000	21,923	9,900	10,000	12,000
El Salvador	3,843	4,682	8,098	9,575	8,279	11,427	12,667	16,500	10,800	12,300	11,800	22,500	31,800	28,100
Guatemala	3,902	4,044	5,713	6,600	4,864	11,058	10,384	12,700	10,378	11,560	8,738	15,700	7,345	13,869
Honduras	278	331	350	500	1,000	1,000	1,600	2,000	2,500	1,500	2,000	2,000	2,000	2,200
Nicaragua	73	135	200	300	10,387	7,204	6,624	8,854	7,888	7,026	5,000	6,300	12,000	10,000

Potash Fertilizers Consumption (Mt)	Year 1961	1962	1963	1964	1965	1966	1967	1968	1969	1970	1971	1972	1973	1974
Costa Rica	4,207	4,204	4,500	4,500	10,000	7,600	8,900	12,000	9,000	6,000	8,550	12,000	20,000	26,600
El Salvador	4,704	5,185	8,332	11,706	4,825	6,823	3,591	7,000	8,200	7,687	6,000	7,000	10,000	8,000
Guatemala	2,138	2,314	2,371	3,128	2,327	2,690	1,190	4,845	2,971	5,775	2,841	3,500	11,077	13,838
Honduras	76	91	200	300	500	650	5,000	6,000	7,000	7,500	9,500	7,900	8,000	7,000
Nicaragua	635	152	60	100	3,824	2,231	2,349	2,665	2,258	2,549	3,770	5,400	7,500	3,400

Table 18 Fertilizer Consumption in Central America (*part 2*)

Nitrogenous Fertilizers Consumption (Mt)	1975	1976	1977	1978	1979	1980	1981	1982	1983	1984	1985	1986	1987
Costa Rica	31,100	28,488	40,543	40,880	39,400	40,500	45,200	49,000	54,000	50,600	49,000	52,000	55,000
El Salvador	65,000	77,106	77,118	84,192	50,600	47,649	66,521	44,236	59,376	39,831	61,151	49,120	64,471
Guatemala	35,100	49,926	52,000	52,000	58,200	51,900	47,000	58,700	41,700	55,500	60,000	80,000	83,800
Honduras	11,400	11,000	15,200	9,900	10,400	16,000	14,100	12,821	19,016	23,000	14,131	11,638	17,306
Nicaragua	16,500	22,942	36,000	35,000	17,800	30,000	39,000	14,200	51,402	38,027	44,935	55,132	44,100

Phosphate Fertilizers Consumption (Mt)	1975	1976	1977	1978	1979	1980	1981	1982	1983	1984	1985	1986	1987
Costa Rica	15,000	10,384	10,000	11,000	12,700	13,000	10,200	12,800	14,000	17,000	11,600	14,000	10,000
El Salvador	20,200	16,400	22,400	23,314	18,100	12,000	20,086	12,541	21,119	11,189	20,828	14,830	26,645
Guatemala	15,300	26,700	26,800	23,314	22,000	18,600	30,300	18,100	15,800	21,900	22,000	28,000	26,600
Honduras	3,700	9,000	5,500	7,000	3,100	5,200	4,200	2,600	3,440	4,779	2,748	5,632	6,556
Nicaragua	2,400	14,000	10,000	9,000	4,800	15,000	7,500	6,400	10,000	5,111	8,640	12,190	7,900

Potash Fertilizers Consumption (Mt)	1975	1976	1977	1978	1979	1980	1981	1982	1983	1984	1985	1986	1987
Costa Rica	20,000	16,820	16,000	28,000	27,000	20,000	17,000	10,200	20,300	28,700	20,000	19,000	30,000
El Salvador	8,700	8,690	6,018	4,024	6,000	703	1,817	3,379	1,591	3,839	2,656	2,425	1,357
Guatemala	4,600	17,907	24,628	20,000	20,200	15,000	11,953	12,121	10,569	12,800	13,080	15,000	12,000
Honduras	4,900	5,400	7,200	6,500	6,000	7,300	10,100	8,800	5,737	8,668	5,941	7,904	10,000
Nicaragua	400	10,952	2,358	4,499	300	9,200	13,800	2,800	9,200	5,450	9,410	588	2,900

Table 18 Fertilizer Consumption in Central America (*part 3*)

Nitrogenous Fertilizers Consumption (Mt)	1988	1989	1990	1991	1992	1993	1994	1995	1996	Exponential Growth Rate
Costa Rica	59,000	63,000	55,600	62,400	65,000	60,000	70,000	70,000	0	5.29
El Salvador	67,847	56,155	53,218	55,403	53,669	56,463	46,400	41,900	50,000	2.28
Guatemala	82,200	90,500	88,000	98,000	100,000	99,000	126,000	115,000	110,000	7.93
Honduras	21,521	20,299	11,105	20,000	20,922	33,000	38,000	37,000	50,000	4.23
Nicaragua	55,000	21,918	31,798	26,606	26,000	21,000	19,000	25,000	28,000	4.18

Phosphate Fertilizers Consumption (Mt)	1988	1989	1990	1991	1992	1993	1994	1995	1996	Exponential Growth Rate
Costa Rica	15,900	14,000	15,000	20,000	18,000	20,000	27,000	20,170	27,690	3.7
El Salvador	24,931	17,863	18,920	19,132	18,932	14,319	25,000	27,000	30,000	3.08
Guatemala	30,000	18,000	27,000	27,000	35,000	35,000	37,000	37,000	32,000	5.66
Honduras	8,217	5,977	2,070	8,013	12,000	23,000	13,000	13,000	14,000	9.47
Nicaragua	12,000	7,566	6,095	6,199	400	6,000	8,000	8,000	9,000	5.69

Potash Fertilizers Consumption (Mt)	1988	1989	1990	1991	1992	1993	1994	1995	1996	Exponential Growth Rate
Costa Rica	26,000	30,000	38,000	38,000	41,766	28,000	32,000	32,000	32,000	5.92
El Salvador	4,478	3,954	3,159	3,022	2,410	2,055	5,000	7,000	8,000	-2.6
Guatemala	15,700	16,000	17,000	18,000	30,000	26,000	20,000	32,000	30,000	8
Honduras	10,138	7,194	1,819	7,588	8,000	9,000	6,000	8,000	14,000	8.91
Nicaragua	5,000	5,803	2,117	2,000	4,900	0	4,000	3,000	2,000	5.54

Table 19 Fertilizer Use per Hectare

	1961	1991	Annual Average % change
Costa Rica	39	228	6.06
El Salvador	32	106	4.07
Guatemala	10	76	6.99
Honduras	4	17	4.94
Nicaragua	3	27	7.6
South Asia	6	78	11.47
East Asia	196	372	2.16
South America	8	43	5.77

Table 20 Pesticide Imports and Exports in Central America (*part 1*)
(Domestic Consumption minus Production equal Imports minus Exports)

Pesticides (Trade) Imports (1000$)	Year 1961	1962	1963	1964	1965	1966	1967	1968	1969	1970	1971	1972	1973
Costa Rica	1,520	2,203	2,555	2,516	2,810	2,727	3,170	4,715	5,104	5,432	5,691	6,760	8,833
El Salvador	4,260	3,570	5,060	7,370	5,260	6,411	7,627	4,084	8,184	21,248	2,008	2,374	4,447
Guatemala	4,179	5,040	7,492	9,186	8,995	6,395	5,475	4,033	4,395	3,714	7,350	4,138	6,889
Honduras	1,507	1,752	1,700	2,325	2,631	2,520	3,243	4,364	3,069	3,086	3,752	4,628	5,034
Nicaragua	3,772	6,220	6,700	4,958	4,040	6,056	18,026	6,783	2,308	2,744	2,780	3,416	4,991

Pesticides (Trade) Exports (1000$)	Year 1961	1962	1963	1964	1965	1966	1967	1968	1969	1970	1971	1972	1973
Costa Rica	70	40	80	210	160	305	332	437	385	581	834	1,388	2,276
El Salvador	520	510	1,090	2,200	2,580	2,138	3,651	3,574	2,304	1,920	2,473	2,839	5,203
Guatemala	0	4	0	47	203	810	483	313	313	587	1,672	2,488	3,108
Honduras	0	0	0	11	61	97	33	118	80	50	71	42	22
Nicaragua	10	40	110	540	820	740	812	431	642	540	331	901	1,437

Table 20 Pesticide Imports and Exports in Central America (*part 2*)
(Domestic Consumption minus Production equal Imports minus Exports)

Pesticides (Trade) Imports (1000$)	1974	1975	1976	1977	1978	1979	1980	1981	1982	1983	1984	1985	1986
Costa Rica	12,263	14,644	16,493	23,017	25,679	31,734	35,287	34,954	35,268	42,713	36,508	30,737	28,975
El Salvador	6,961	7,103	8,204	14,381	14,764	17,460	10,835	15,599	15,811	11,387	13,494	25,600	9,149
Guatemala	8,007	9,342	8,424	13,541	16,932	27,263	16,506	17,092	16,942	24,856	28,208	26,659	22,734
Honduras	6,227	7,360	10,323	13,235	19,032	24,579	21,321	30,065	26,335	27,088	27,428	23,506	30,807
Nicaragua	7,870	7,733	8,135	16,441	15,980	6,274	21,458	24,816	15,649	24,766	24,706	27,332	19,452

Pesticides (Trade) Exports (1000$)	1974	1975	1976	1977	1978	1979	1980	1981	1982	1983	1984	1985	1986
Costa Rica	3,587	5,399	8,790	10,601	14,035	11,861	10,709	10,006	13,749	10,000	6,540	4,911	9,377
El Salvador	3,425	4,832	5,793	5,751	5,032	4,291	6,077	4,015	2,924	5,111	4,674	3,107	4,828
Guatemala	5,205	7,128	7,668	10,207	17,218	13,566	23,052	27,992	23,942	15,856	16,354	10,337	6,819
Honduras	47	61	33	222	82	183	232	265	86	18	1	2	48
Nicaragua	5,762	3,827	5,541	9,139	9,017	2,507	1,907	730	440	540	77	100	120

Table 20 Pesticide Imports and Exports in Central America (*part 3*)
(Domestic Consumption minus Production equal Imports minus Exports)

Pesticides (Trade) Imports (1000$)	1987	1988	1989	1990	1991	1992	1993	1994	1995	1996	1997	Exponential Growth Rate
Costa Rica	32,797	25,000	22,248	43,508	50,306	46,528	46,373	72,089	85,224	75,404	75,000	11.09
El Salvador	6,849	12,000	14,007	6,764	8,918	11,919	10,599	14,274	17,769	16,933	18,562	3.5
Guatemala	15,239	25,440	25,439	36,402	36,359	49,893	37,153	40,734	50,136	47,598	48,909	7.43
Honduras	25,364	27,000	28,000	23,687	28,676	24,376	40,897	33,923	37,561	41,131	32,016	10.15
Nicaragua	58,107	20,694	17,461	17,570	17,721	8,076	13,083	15,479	19,853	18,274	21,658	5.19

Pesticides (Trade) Exports (1000$)	1987	1988	1989	1990	1991	1992	1993	1994	1995	1996	1997	Exponential Growth Rate
Costa Rica	7,162	5,227	5,944	5,063	6,284	8,149	4,628	9,354	14,309	13,908	14,000	14.62
El Salvador	6,378	3,800	4,868	3,958	7,539	7,654	6,429	6,536	6,899	8,591	11,286	5.09
Guatemala	1,980	7,879	4,110	4,905	7,862	8,782	11,641	17,159	28,556	38,332	49,508	16.57
Honduras	6	10	15	181	150	105	698	1,140	503	313	148	3.73
Nicaragua	801	1,504	962	747	1,013	1,527	1,201	573	413	379	283	2.17