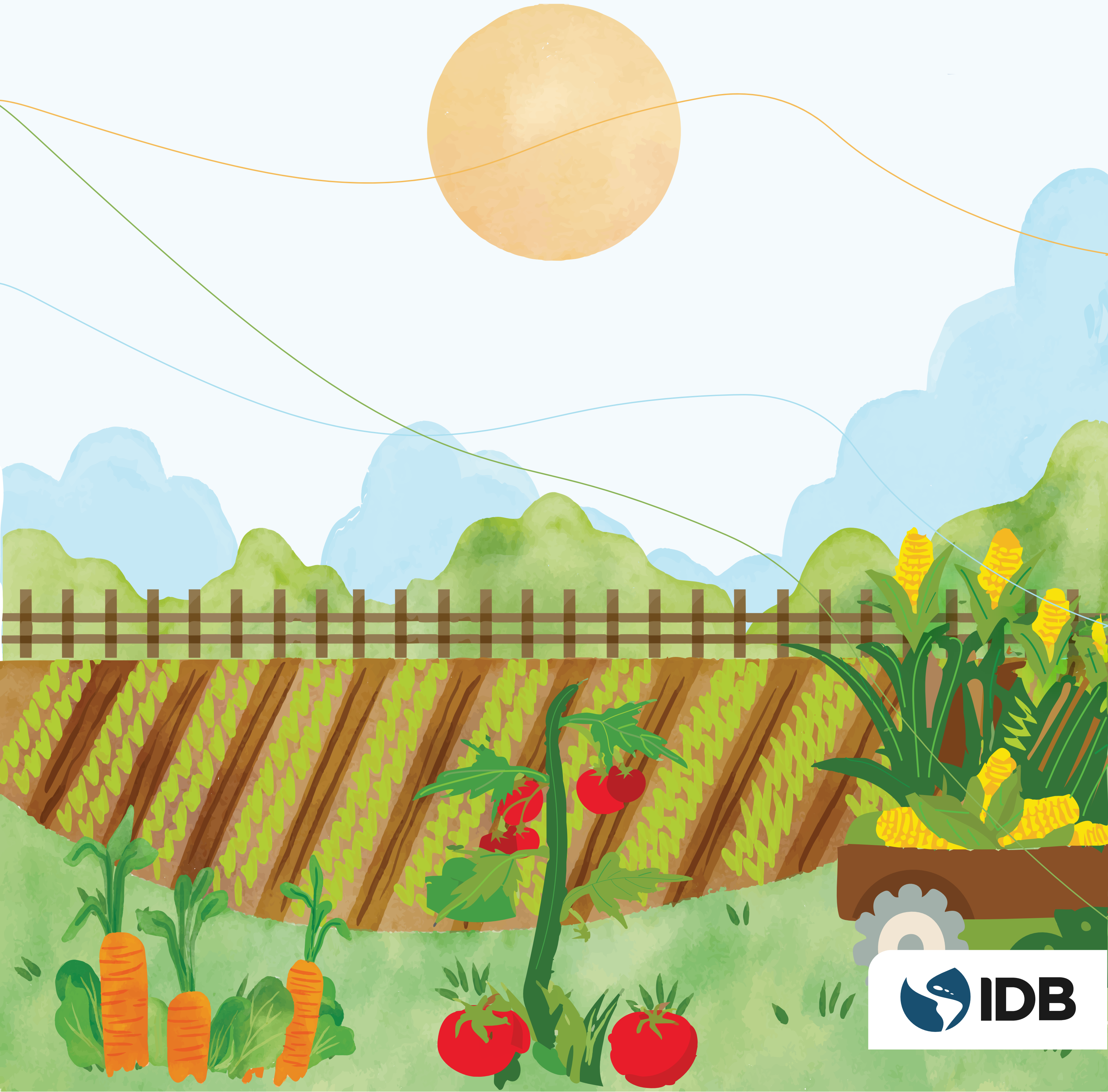
AGRICULTURAL PRODUCTIVITY IN LATIN AMERICA AND THE CARIBBEAN (1961–2021):

SUBREGIONAL AND NATIONAL ANALYSIS



IDB

AGRICULTURAL PRODUCTIVITY IN LATIN AMERICA AND THE CARIBBEAN (1961-2021):

Subregional and National Analysis

AUTHORS

Lina Salazar • Diana Tadeo • Luis Álvarez
Sebastián Bernal Hernández • Pedro Martel

Cataloging-in-Publication data provided by the
Inter-American Development Bank
Felipe Herrera Library

Agricultural Productivity in Latin America and the Caribbean (1961-2021): Subregional and National Analysis/ Lina Salazar, Diana Tadeo, Luis Alvarez, Sebastián Bernal Hernandez, Pedro Martel.
p. cm. — (IDB Monograph; 1298)
Includes bibliographical references.
1. Agricultural productivity-Latin America. 2. Agricultural productivity-Caribbean Area. 3. Rural development-Latin America. 4. Rural development-Caribbean Area. 5. Food security-Latin America. 6. Food security-Caribbean Area. I. Salazar, Lina. II. Tadeo, Diana. III. Alvarez, Luis. IV. Bernal, Sebastián. V. Martel, Pedro. VI. Inter-American Development Bank. Agriculture and Rural Development Division. VII. Series.
IDB-MG-1298

Design: Estudio 643
Art Direction: Natalia Gómez
Illustrations : Free vectors designed by Freepik, www.freepik.com

Edition: Maria Soledad Balduzzi Fiallos

Keywords: Agricultural Productivity, Productivity Growth, Agricultural Production, Agriculture and Food Security

JEL Codes: Q15, Q54, O13

http://www.iadb.org

TABLE OF CONTENTS

1. LATIN AMERICA AND THE CARIBBEAN

LATIN AMERICA AND THE CARIBBEAN

The agricultural sector is a critical driver of economic growth, environmental sustainability, and food security in Latin America and the Caribbean (LAC). Therefore, understanding the underlying dynamics that have shaped its evolution over time is essential for identifying the main challenges and opportunities it faces. This study aims to analyze the historical trends and determinants that have influenced the sector's growth over the past sixty years, thereby contributing to informed decision-making and the formulation of more effective public policies to enhance productivity, resilience, and environmental sustainability. To this end, the sector's performance is analyzed at the regional, subregional, and national levels, compiling disaggregated information for twenty-five countries.

Although agricultural production in the region continues to expand, recent trends indicate a deceleration in productivity growth and an increasing reliance on input intensification. These developments pose significant challenges to the sustainability and efficiency of LAC's agricultural production systems.

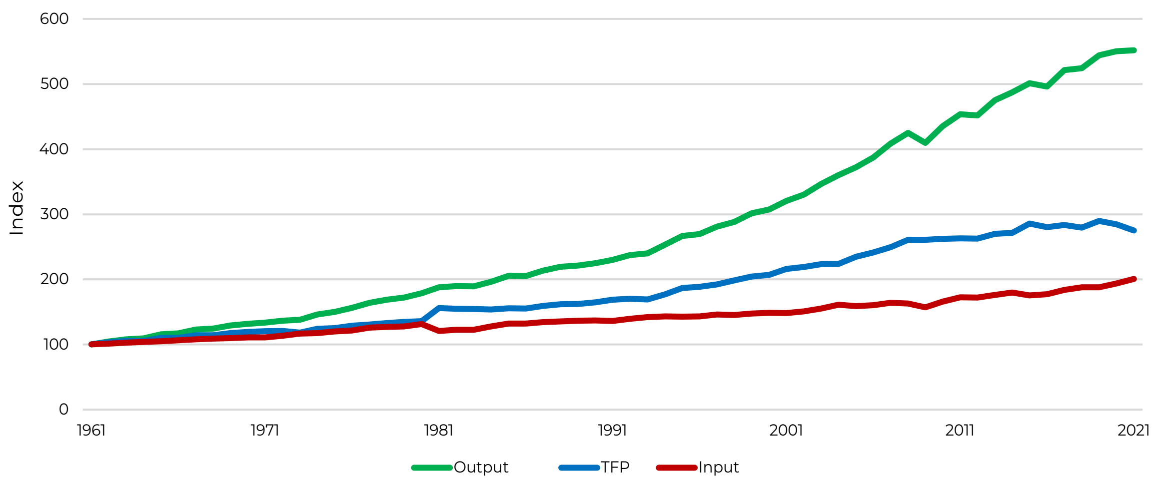
The country profiles presented in this study offer a comprehensive overview of the main historical dynamics of agricultural productivity, highlighting divergent trajectories across subregions and countries. Based on a dataset developed by the USDA and complemented by data from the FAO and ILO for the period 1961–2021, the profiles synthesize trends in production growth, total factor productivity (TFP), and input use. It is worth noting that this study does not directly analyze factors such as trade dynamics, investment, or human capital development. Nevertheless, these elements are highly relevant, as they significantly influence the determinants of agricultural production—particularly total productivity (TFP) and input use. The literature has shown, for instance, that international trade can facilitate the adoption of modern technologies through the importation of machinery and integration into global markets (Caunedo & Kala[1], 2022; Farrokhi & Pellegrina[2], 2023). Similarly, foreign direct investment has the potential to enhance agricultural productivity, especially when supported by local capacities to absorb and adapt new technologies (Han, Smith, & Wu, 2023[3]).

Beyond their informational value, these profiles serve as a reference tool for researchers, policymakers, and other stakeholders engaged in the region's agricultural development. By fostering a deeper understanding of productive dynamics and their underlying determinants, this work seeks to provide evidence that supports the design of efficiency-oriented strategies and promotes inclusive, long-term sustainable development across Latin America and the Caribbean.

[1] Caunedo, J., & Kala, N. (2022). Mechanizing agriculture. NBER Working Paper No. 29061. National Bureau of Economic Research. https://doi.org/10.3386/w29061
[2] Farrokhi, F., & Pellegrina, H. S. (2023). Trade, technology, and agricultural productivity. Journal of Political Economy, 131(9), 2509–2560. https://doi.org/10.1086/724319
[3] Han, Y., Smith, R. B., & Wu, L. (2023). Foreign direct investment and agricultural total factor productivity: An empirical study of agricultural enterprises. China Agricultural Economic Review, 16(1), 1–25. https://doi.org/10.1108/CAER-02-2023-0035

Over the past sixty years, the Latin American and Caribbean (LAC) region has experienced significant growth in agricultural production, with output increasing nearly sixfold. An analysis based on USDA-ERS data[4] reveals that the region has recorded an average annual growth rate of 2.9% in agricultural production (see **Figure 1**), primarily driven by positive trends in Total Factor Productivity (TFP), which grew at an average annual rate of 1.7%, despite periods of slower expansion. To a lesser extent, input use also increased during this period, averaging 1.2% per year. In the most recent decade (2010–2020), however, TFP in LAC stagnated, contributing to a marked deceleration in agricultural output growth.

Figure 1: Agricultural Output, Inputs, and TFP
Latin America and the Caribbean (1961-2021)

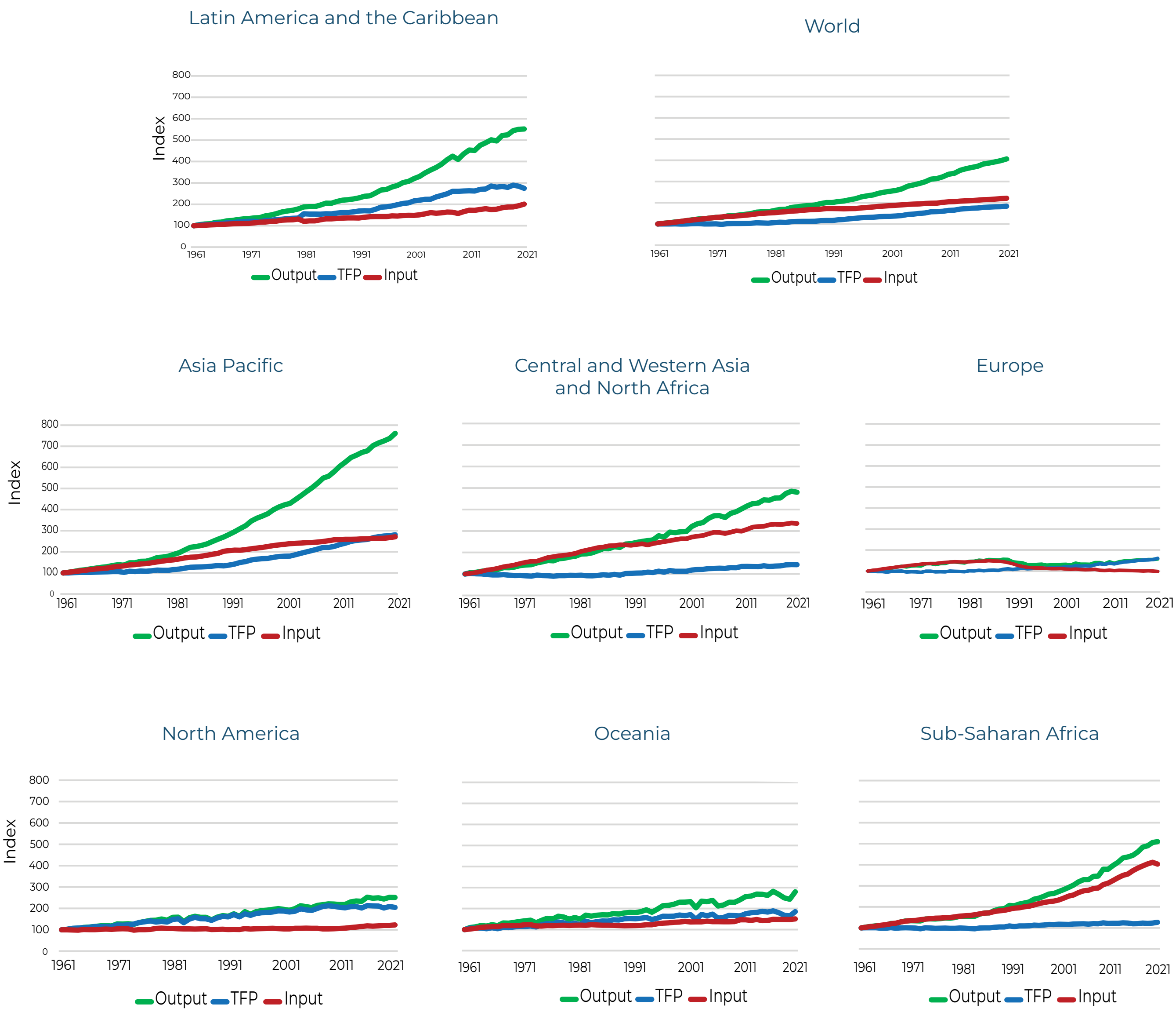


Source: Authors' calculations based on USDA-ERS data.

When compared with other regions globally, LAC has demonstrated sustained agricultural growth, although the rate has fluctuated throughout the period analyzed. The region ranks as the second-largest agricultural producer after Asia and has outperformed the global average in TFP growth, reaching levels comparable to those observed in Asia. By contrast, the growth of input use in LAC has aligned with the world average but remained below that of Central and Western Asia, North Africa, and Sub-Saharan Africa (see **Figure 2**).

4. U.S. Department of Agriculture, Economic Research Service. *International Agricultural Productivity* data product, September 2023 (visited August 2024).

Figure 2: Agricultural Output, Inputs, and TFP by Region (1961–2021)

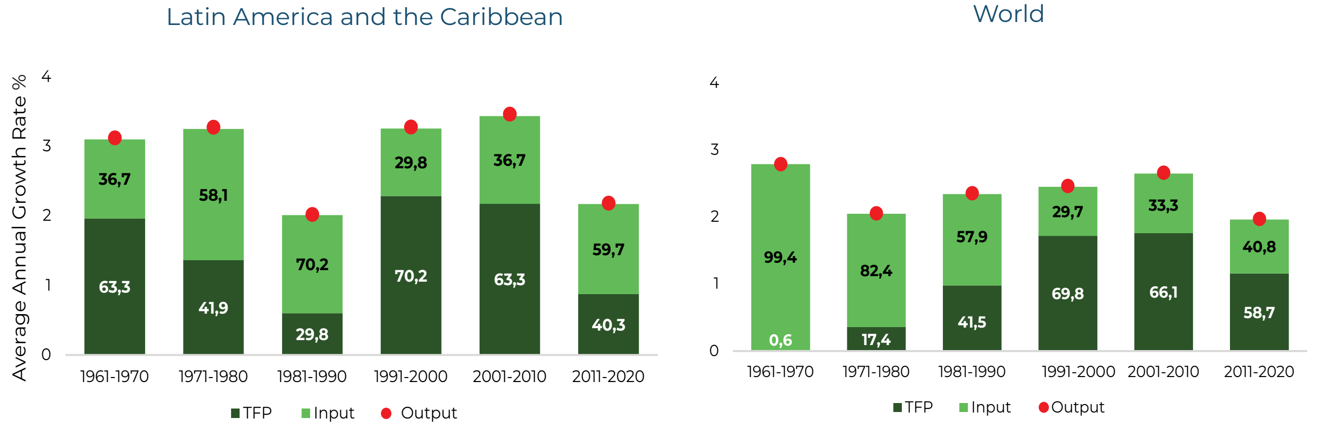


Source: Authors' calculations based on USDA-ERS data.

A more detailed analysis of the decomposition of agricultural output growth in LAC reveals a significant slowdown during the 1980s and 2010s, whereas at the global level similar slowdowns occurred in the 1970s and 2010s. The weak production growth in LAC during these periods can be attributed to slow gains in TFP, with average annual rates of 0.6% between 1981 and 1990 and 0.9% between 2011 and 2020. By contrast, the most substantial increases in TFP in the region were observed during the 1990s and 2000s, with annualized growth rates of 2.3% and 2.2%, respectively (see **Figure 3**).

Notably, between 1991 and 2010, TFP contributed at levels comparable to the global average; however, in the most recent decade, its contribution declined significantly, falling below the global level.

Figure 3: Agricultural Output Growth Decomposition by decade

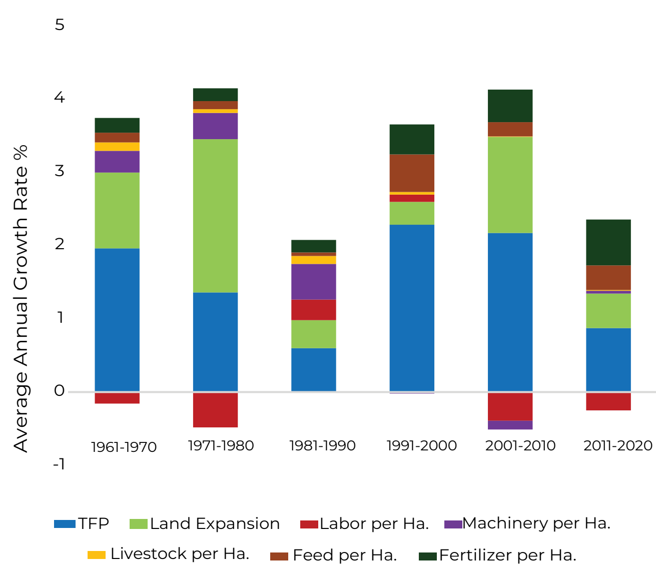


Source: Authors' calculations based on USDA-ERS data.

Figure 4 illustrates the decomposition of input growth over the past six decades, revealing the following:

1. Land expansion exhibited sustained growth, peaking in the 1970s.
2. The contribution of inputs such as materials (e.g., fertilizers and animal feed) and livestock to agricultural output has been consistently positive throughout the entire period.
3. The contribution of agricultural labor to output growth was negative during the first two and the last two decades of the analysis.

Figure 4: Resource Decomposition of Agricultural Output Growth Latin America and the Caribbean

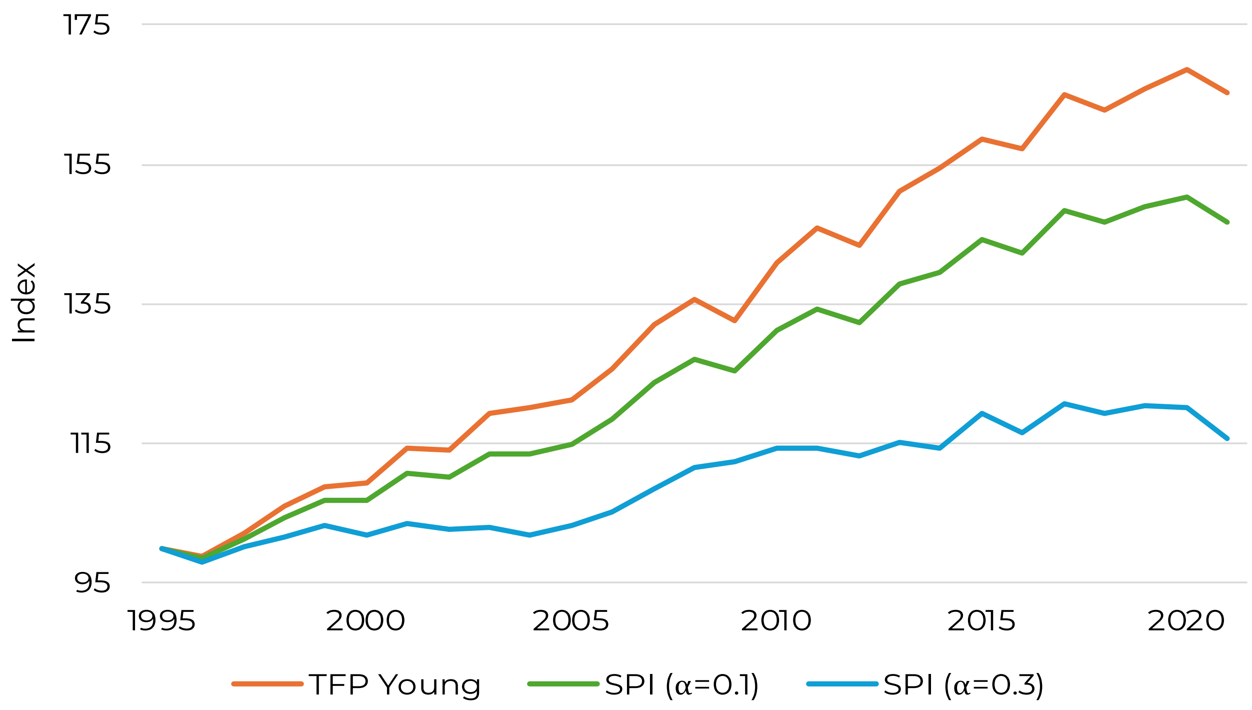


Source: Authors' calculations based on USDA-ERS data.

While the decomposition of agricultural growth allows for the identification of the main drivers of agricultural output, this conventional analysis does not consider the environmental impacts generated by the production process. To address this limitation, Sustainable Productivity Indices (SPI)[5] have been estimated using the Young[6] methodology (**see Figure 5**).

The SPI penalizes agricultural output growth based on the magnitude of unwanted byproducts such as greenhouse gas emissions, deforestation, soil erosion, pesticide risk, water stress, and nutrient budget[7]. Consequently, the SPI value varies according to the generation of these byproducts. As shown in the figure below, when a 10% weight is assigned to unwanted byproducts generated by agricultural output, the SPI follows a trajectory similar to that of TFP, reducing productivity growth from 1.95% to 1.48% (TFP vs. SPI) over the last 26 years. However, increasing the weight to 30% significantly widens the gap between the two trends. Under this scenario, over the past ten years, sustainable productivity has grown at an average annual rate of 0.14%, compared to 1.25% for TFP .

Figure 5: TFP vs. SPI Latin America and the Caribbean



Source: Authors' calculations using FAOSTAT data.

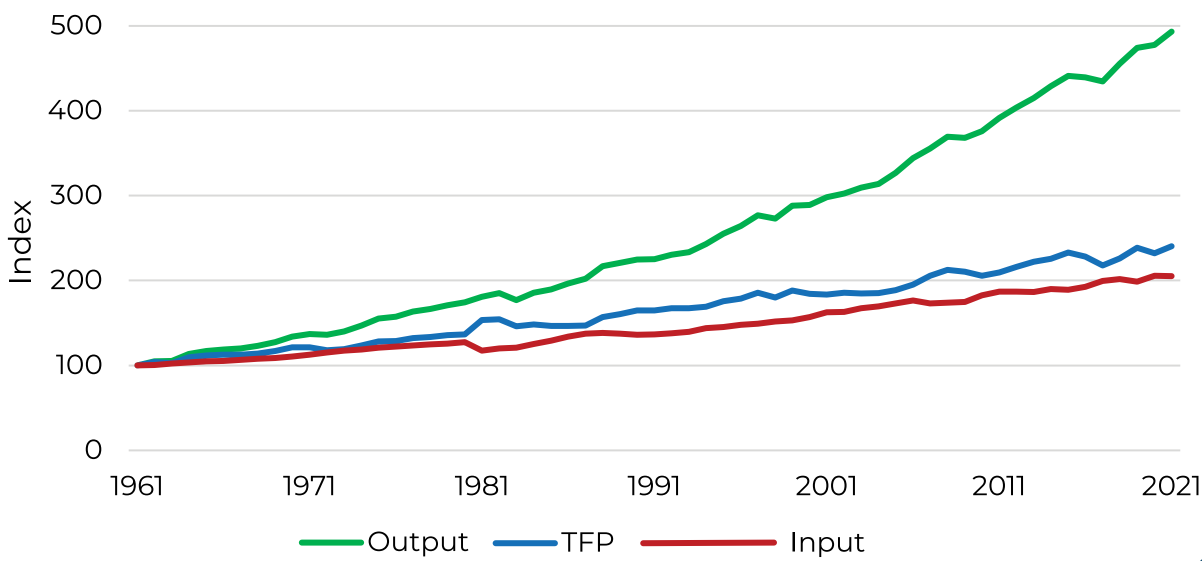
[5] IFPRI and IDB, 2025.
[6] The Geometric Young Index (GY) is a multiplicative index that compares vectors of quantities using weights based on average value shares—derived from average prices when available—fulfilling the axioms of a proper index such as transitivity (O'Donnell, 2018).
[7] The surplus in the budget corresponds to pollution resulting from the production process, particularly the residual nitrogen in soils following the cropping cycle.

2. ANDEAN GROUP

ANDEAN GROUP

Over the past six decades, agricultural output in the Andean Group has increased nearly fivefold. An analysis using USDA-ERS data[1] reveals agricultural production in the subregion grew at an average annual rate of 2.7% (see **Figure 1**), primarily driven by gains in Total Factor Productivity (TFP), which increased at an average annual rate of 1.5%. To a lesser extent, during this same period, there was a positive trend in input use, with an annual average growth rate of 1.2%. The predominance of cumulative TFP growth over input use began in the 1980's and has been sustained since.

Figure 1: Agricultural Output, Inputs, and TFP
Andean Group (1961-2021)

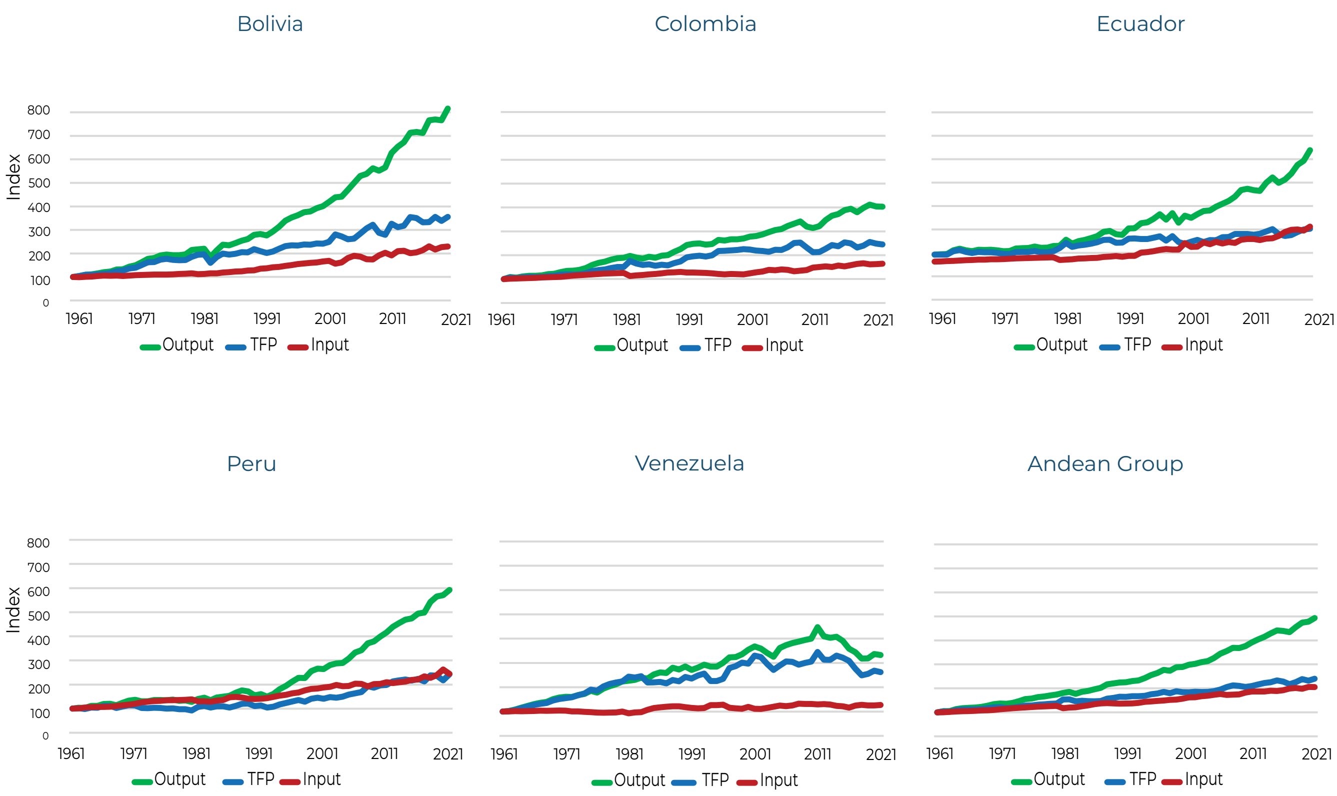


Source: Authors' calculations based on USDA-ERS data.

Within the Andean Group, Bolivia and Venezuela recorded the strongest TFP growth, although Venezuela's performance has remained stagnant since the late 1990s. By contrast, Ecuador and Peru exhibited the highest levels of input[2] use. In terms of overall agricultural output, Bolivia leads with the most dynamic growth, followed by Peru, which has shown significant improvement since the 1990s (see **Figure 2**).

[1]U.S. Department of Agriculture, Economic Research Service. *International Agricultural Productivity* data product, September 2023 (visited August 2024).
[2]Index based on six inputs: labor, machinery, livestock, agricultural land, feed, and fertilizers.

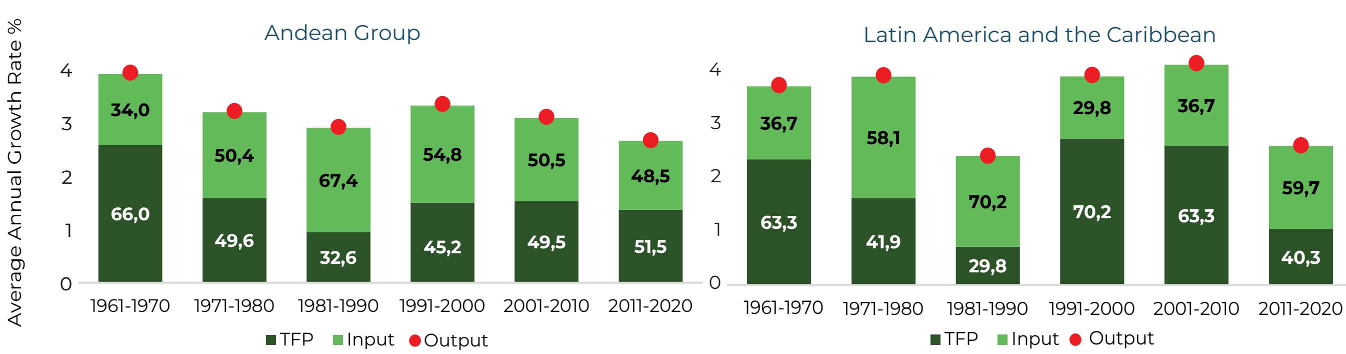
Figure 2: Agricultural Output, Inputs, and TFP by Country/Region (1961-2021)



Source: Authors' calculations based on USDA-ERS data.

The decomposition of agricultural output growth by decade (see **Figure 3**) shows that the Andean Group consistently underperformed relative to the LAC average during the 1970s, 1990s, and 2000s. In the 1970s, this weaker growth was mainly due to reduced input use, whereas in the 1990s and 2000s, it was primarily the result of lower productivity. In the most recent decade (2010-2020), the region achieved an average annual growth rate of 2.2%, with 48% of this growth attributed to input use and 52% to TFP gains.

Figure 3: Agricultural Output Growth Decomposition by decade

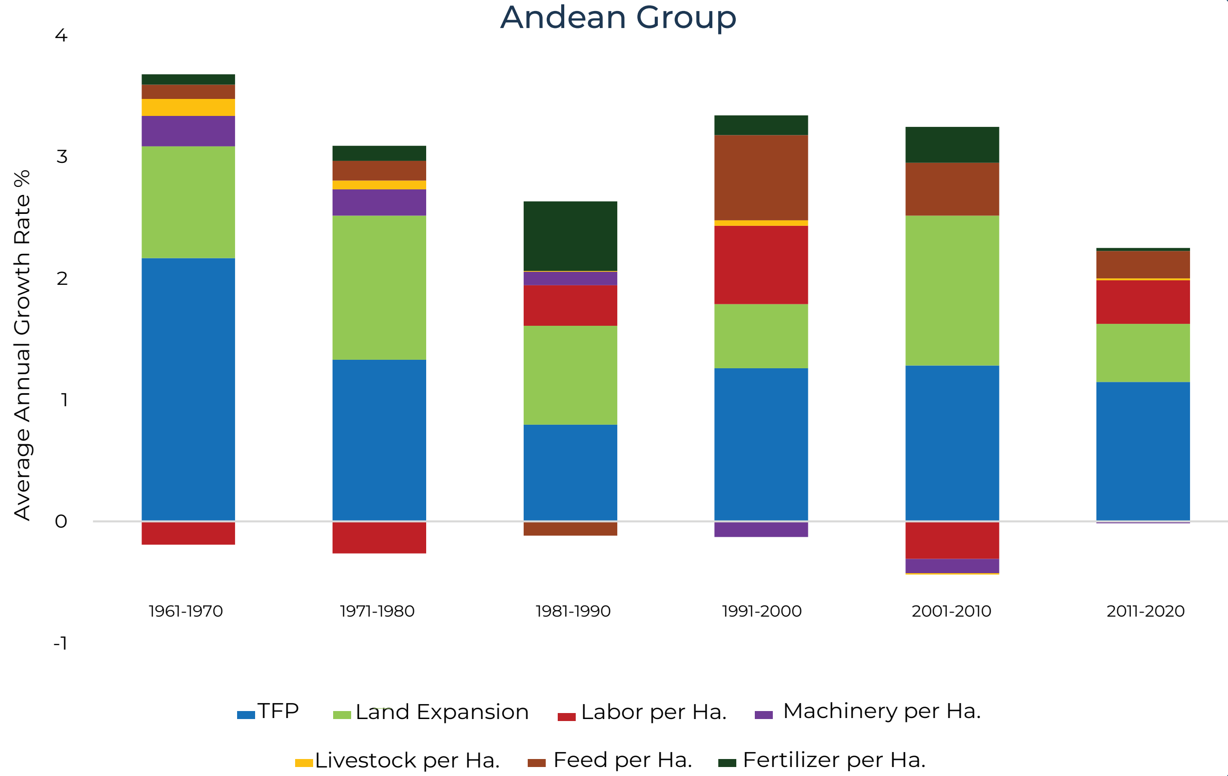


Source: Authors' calculations based on USDA-ERS data.

Figure 4 presents the decomposition of input growth over the past six decades, revealing the following:

1. Land expansion and fertilizer use have increased steadily over the past sixty years.
2. Labor contributed negatively to output growth in three of the six decades analyzed.
3. In the most recent decade, all components contributed positively to growth—except machinery, whose contribution remained nearly constant.

Figure 4: Resource Decomposition of Agricultural Output Growth Andean Group



Source: Authors' calculations based on USDA-ERS data.

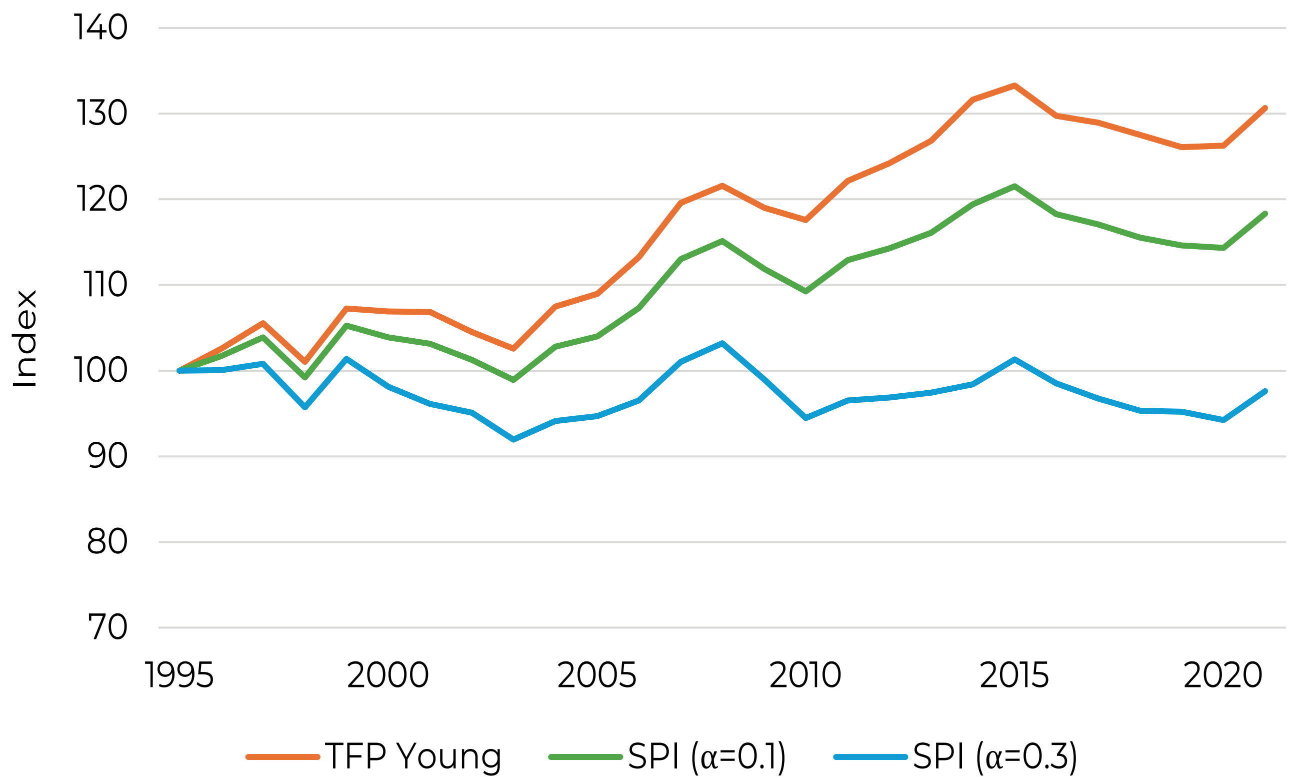
While the decomposition of agricultural growth allows for the identification of the main drivers of agricultural output, this conventional analysis does not consider the environmental impacts generated by the production process. To address this limitation, Sustainable Productivity Indices (SPI)[3] have been estimated using the Young[4] methodology (see **Figure 5**).

[3] IFPRI and IDB, 2025.
[4] The Geometric Young Index (GY) is a multiplicative index that compares vectors of quantities using weights based on average value shares—derived from average prices when available—fulfilling the axioms of a proper index such as transitivity (O'Donnell, 2018).

The SPI penalizes agricultural output growth based on the magnitude of unwanted byproducts such as greenhouse gas emissions, deforestation, soil erosion, pesticide risk, water stress, and nutrient budget[5]. Consequently, the SPI value varies according to the generation of these byproducts. As shown in the figure below, when a 10% weight is assigned to unwanted byproducts generated by agricultural output, the SPI follows a similar trajectory to that of TFP, reducing productivity growth from 1,0% to 0,6% (TFP vs. SPI) over the past 26 years. However, increasing the weight given to unwanted by-products to 30% significantly widens the gap between the two trends.

Under this scenario, over the past ten years, sustainable productivity has grown at an average annual rate of just 0.1% compared to 0.7%. for TFP.

Figure 5: TFP vs. SPI – Andean Group



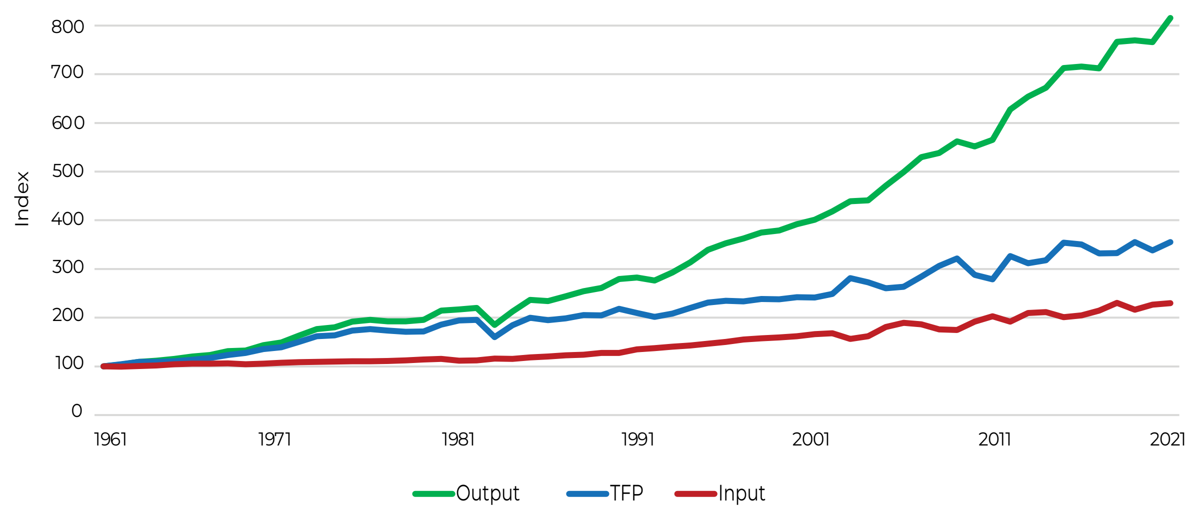
Source: Authors' calculations using FAOSTAT data.

[5] The surplus in the budget corresponds to pollution resulting from the production process, particularly the residual nitrogen in soils following the cropping cycle.

BOLIVIA

Over the past sixty years, Bolivia has experienced significant growth in agricultural output, increasing eightfold. An analysis based on USDA-ERS data[1] reveals that the country recorded an average annual agricultural output growth rate of 3.6% (see **Figure 1**), primarily driven by gains in Total Factor Productivity (TFP), which has grown at an average annual rate of 2.1%. To a lesser extent, input use also increased during this period, with an average annual growth rate of 1.4%. The stronger performance of productivity over input use is a dynamic that began in the began in the 1970s and has continued since.

Figure 1: Agricultural Output, Inputs, and TFP
Bolivia (1961-2021)

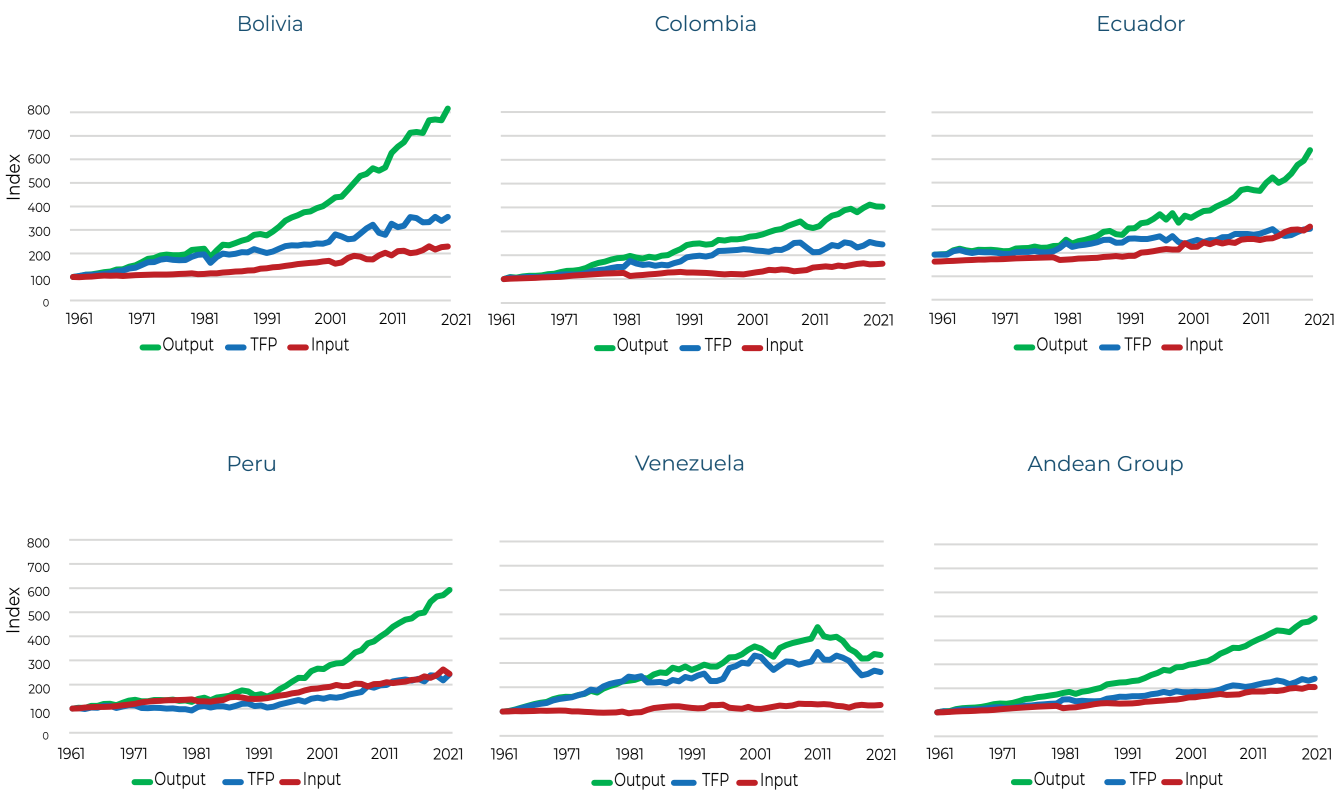


Source: Authors' calculations based on USDA-ERS data.

Within the Andean Group, Bolivia has achieved one of the highest TFP growth rates — comparable only to Venezuela during the first four decades. In terms of input use[2], Bolivia's growth has been similar to that of Ecuador and Peru. Relative to the subregional average, Bolivia's agricultural output has grown well above the Andean Group level, driven mainly by higher productivity (see **Figure 2**).

[1] U.S. Department of Agriculture, Economic Research Service. *International Agricultural Productivity* data product, September 2023 (visited August 2024).
[2]Index based on six inputs: labor, machinery, livestock, agricultural land, feed, and fertilizers.

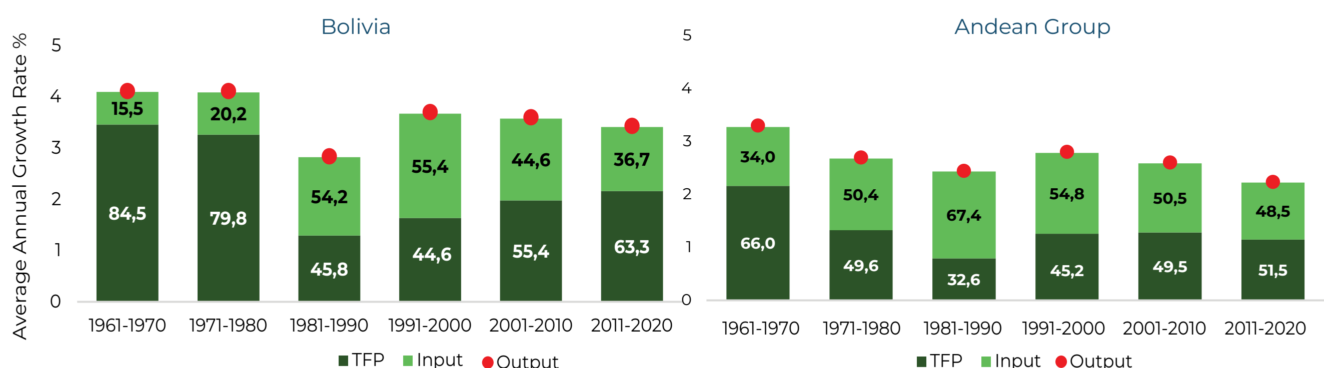
Figure 2: Agricultural Output, Inputs, and TFP by Country/Region (1961-2021)



Source: Authors' calculations using USDA-ERS data.

The decomposition of agricultural output growth by decade (see **Figure 3**) shows that Bolivia consistently outperformed the Andean Group across all periods analyzed. This superior performance was primarily driven by TFP increases that regularly exceeded the subregional average. The contrast is especially evident in the 1970s, when Bolivia's TFP growth reached 3.3%, significantly surpassing the Andean Group's average of 1.3% per year. In the most recent decade (2010–2020), Bolivia recorded an average annual output growth rate of 3.4%, with 37% attributable to increased input use and 63% to gains in TFP.

Figure 3: Agricultural Output Decomposition by decade



Source: Authors' calculations using USDA-ERS data.

Figure 4 presents the decomposition of input growth over the past six decades, revealing the following:

1. Land expansion steadily increased over the past sixty years.
2. Over the last three decades, the contribution of materials (fertilizers and animal feed) was consistently positive.
3. The contribution of machinery to agricultural output growth turned positive in the most recent decade, reversing the contractions observed in the previous twenty years.
4. The contribution of labor to output growth was negative in five of the six decades analyzed.

Figure 4: Resource Decomposition of Agricultural Output Growth Bolivia

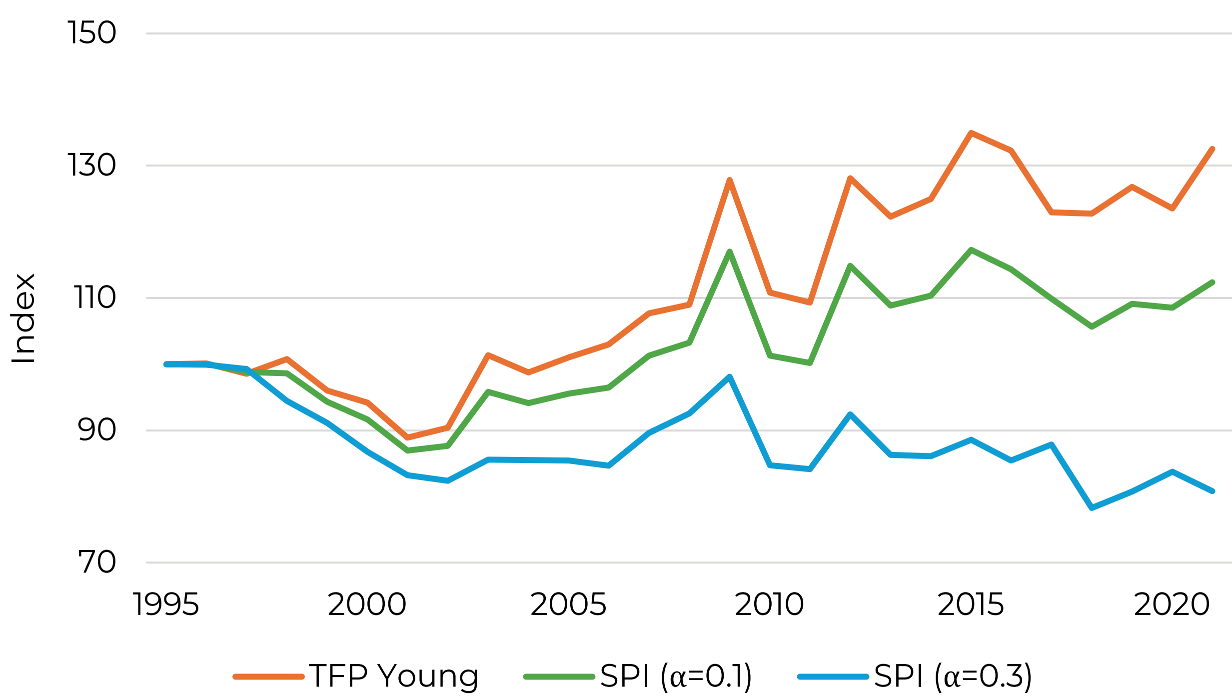
Source: Authors' calculations based on USDA-ERS data.

While the decomposition of agricultural growth allows for the identification of the main drivers of agricultural output, this conventional analysis does not consider the environmental impacts generated by the production process. To address this limitation, Sustainable Productivity Indices (SPI)[3] have been estimated using the Young[4] methodology (see **Figure 5**).

[3] IFPRI and IDB, 2025.
[4] The Geometric Young Index (GY) is a multiplicative index that compares vectors of quantities using weights based on average value shares—derived from average prices when available—fulfilling the axioms of a proper index such as transitivity (O'Donnell, 2018).

The SPI penalizes agricultural output growth based on the magnitude of unwanted byproducts such as greenhouse gas emissions, deforestation, soil erosion, pesticide risk, water stress, and nutrient budget[5]. Consequently, the SPI value varies according to the generation of these byproducts. As shown in the figure below, when a 10% weight is assigned to unwanted byproducts generated by agricultural output, the SPI follows a trajectory similar to that of TFP, reducing productivity growth from 1.1% to 0.4% (TFP vs. SPI) over the last 26 years. However, increasing the weight given to unwanted byproducts to 30% significantly widens the gap between the two trends. Under this scenario, over the past ten years, sustainable productivity has declined at an average annual rate of 0.4%, compared to a 1.9% growth in TFP.

Figure 5: TFP vs. SPI – Bolivia



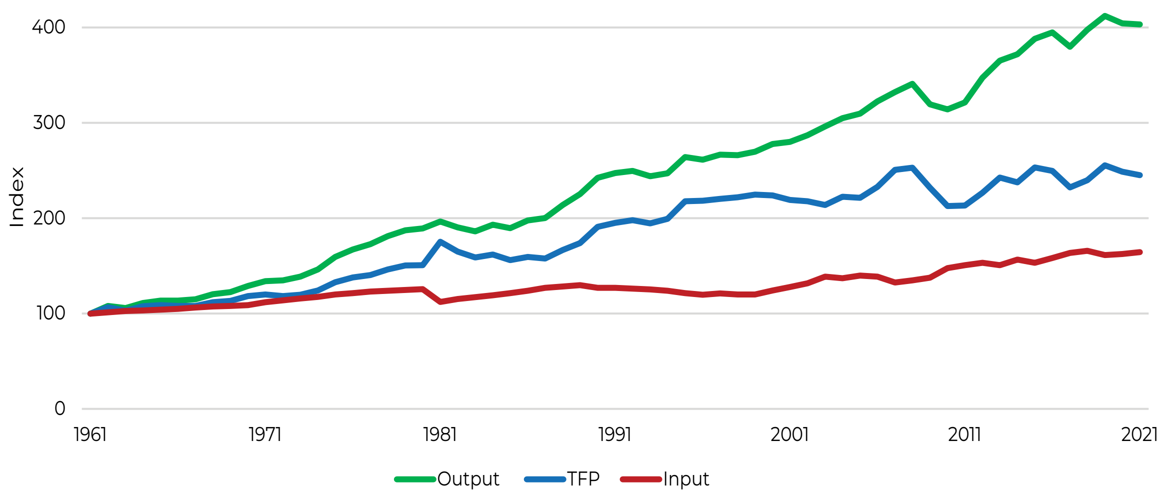
Source: Authors' calculations using FAOSTAT data.

[5] The surplus in the budget corresponds to pollution resulting from the production process, particularly the residual nitrogen in soils following the cropping cycle.

COLOMBIA

Over the past sixty years, Colombia has achieved a fourfold increase in agricultural output. An analysis using USDA-ERS data[1] shows that the country recorded an average annual growth rate of 2.4% (see **Figure 1**), primarily driven by increases in Total Factor Productivity (TFP), which grew at an average annual rate of 1.5%. To a lesser extent, input use also followed a positive trend during this period, though it included episodes of stagnation and even contraction, with an average annual growth rate of 0.8%. The stronger performance of productivity relative to input use began in the 1971–1980 decade and has continued on this trajectory ever since.

Figure 1: Agricultural Output, Inputs, and TFP
Colombia (1961-2021)

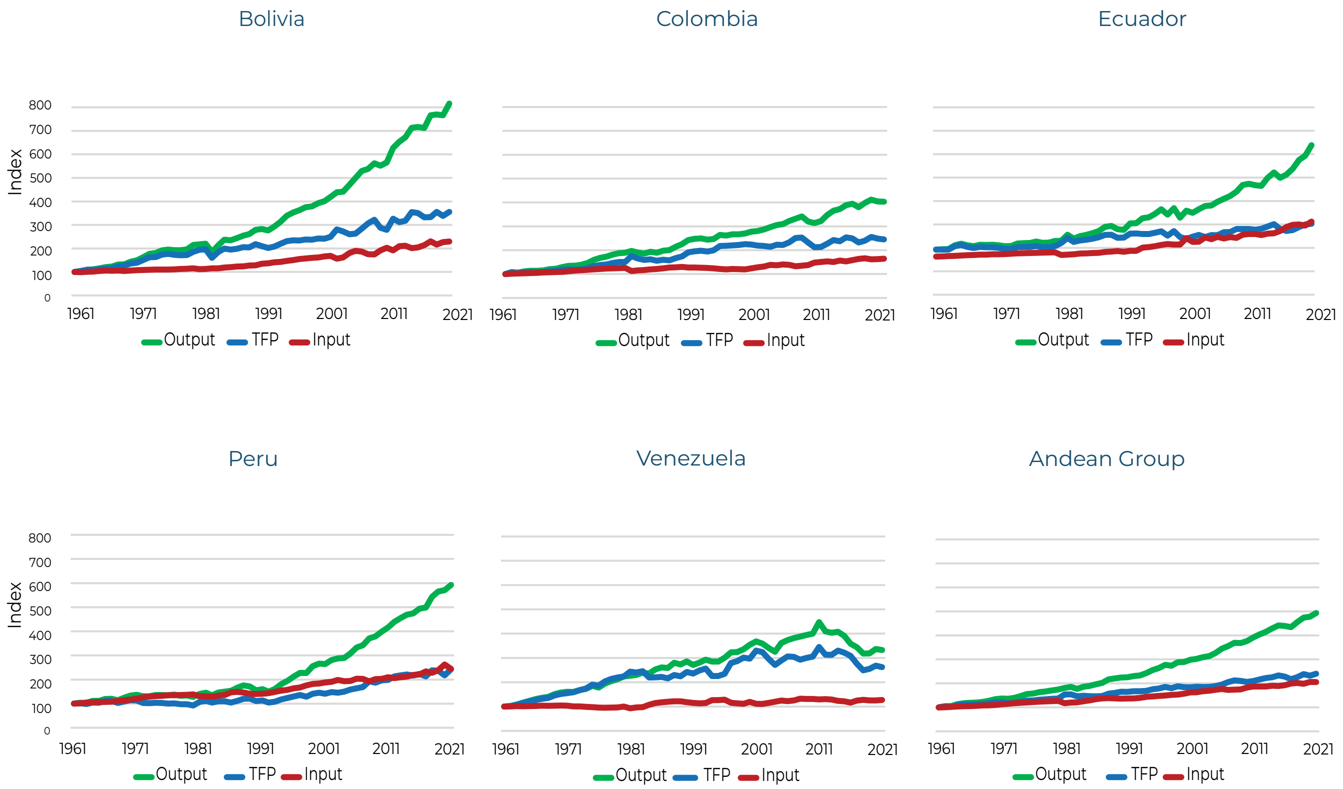


Source: Authors' calculations using USDA-ERS data.

Within the Andean Group, Colombia's TFP growth has been comparable to that of Ecuador and Peru. However, in terms of input use, Colombia has lagged behind most other member countries, surpassing only Venezuela. As a result, the country's agricultural output has remained below the subregional average, primarily due to its relatively low rate of input use[2] (see **Figure 2**).

[1] U.S. Department of Agriculture, Economic Research Service. *International Agricultural Productivity* data product, September 2023 (visited August 2024).
[2] Index based on six inputs: labor, machinery, livestock, agricultural land, feed, and fertilizers.

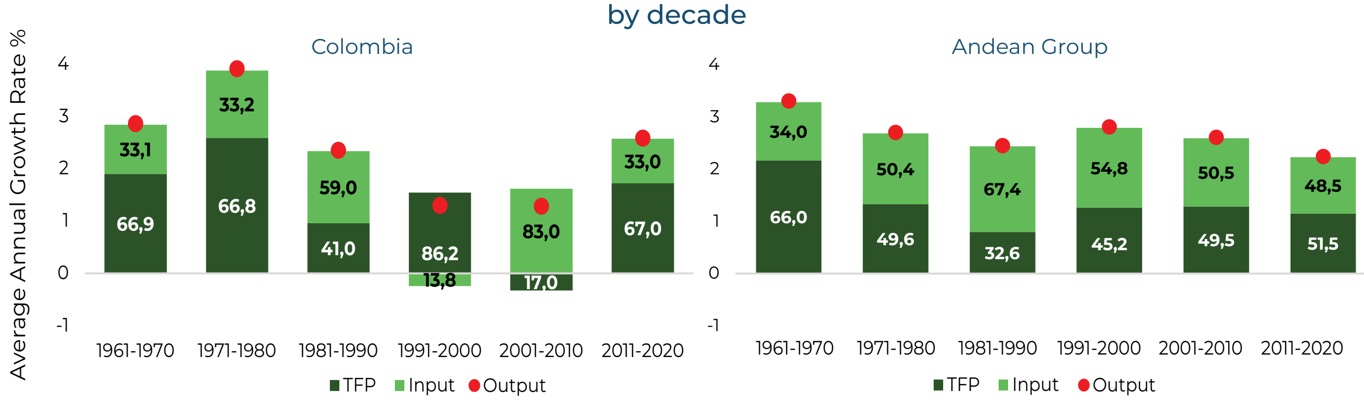
Figure 2: Agricultural Output, Inputs, and TFP by Country/Region (1961-2021)



Source: Authors' calculations based on USDA-ERS data.

An analysis of the decomposition of agricultural output growth by decade (see **Figure 3**) shows that Colombia consistently underperformed relative to the Andean Group during the 1960s, 1980s, 1990s, and 2000s. In the 1990s, this weaker performance was driven by a decline in input use—Colombia recorded an average anual rate of -0.2%, compared to the Andean Group's 1.5%. In the 2000s, the gap was due to weaker productivity, as Colombia experienced a decline of -0.3%, while the Andean Group averaged 1.3% annual growth. In the most recent decade, however, Colombia's performance improved: agricultural output grew at an average annual rate of 2.6%, with 33% of this growth attributed to input use and 67% to gains in TFP.

Figure 3: Agricultural Output Growth Decomposition by decade

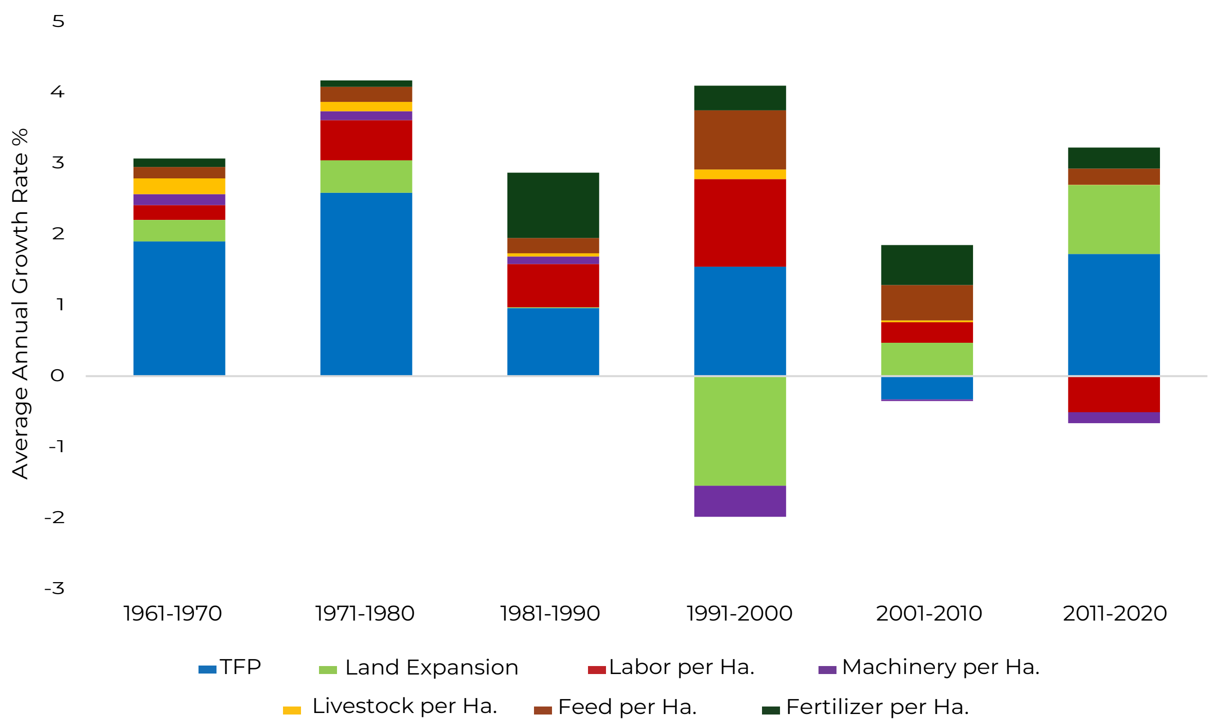


Source: Authors' calculations based on USDA-ERS data.

Figure 4 presents the decomposition of input growth over the past six decades, revealing the following:

1. Land expansion increased in five of the six decades analyzed.
2. The contribution of materials (fertilizers and animal feed) and livestock was consistently positive.
3. In the most recent decade, both labor and machinery contributed negatively to agricultural output growth.

Figure 4: Resource Decomposition of Agricultural Output Growth Colombia



Source: Authors' calculations based on USDA-ERS data.

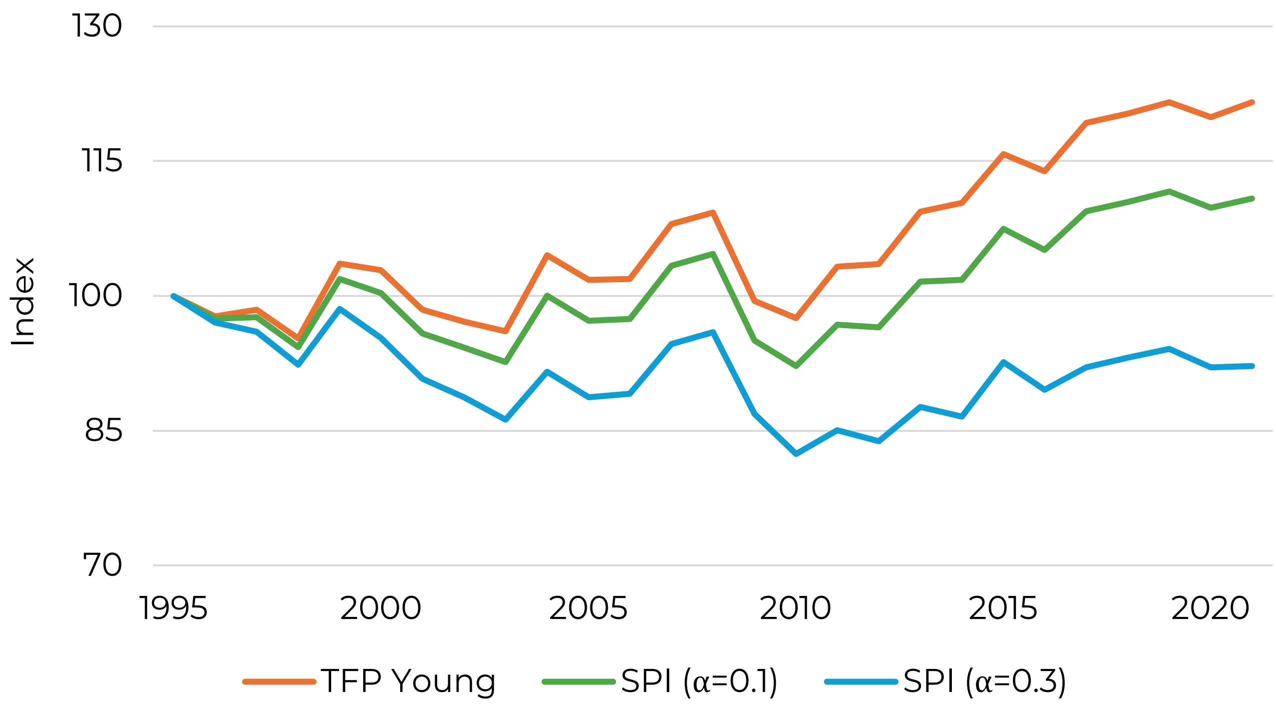
While the decomposition of agricultural growth allows for the identification of the main drivers of agricultural output, this conventional analysis does not consider the environmental impacts generated by the production process. To address this limitation, Sustainable Productivity Indices (SPI)[3] have been estimated using the Young[4] methodology (see **Figure 5**).

[3] IFPRI and IDB, 2025.
[4] The Geometric Young Index (GY) is a multiplicative index that compares vectors of quantities using weights based on average value shares—derived from average prices when available—fulfilling the axioms of a proper index such as transitivity (O'Donnell, 2018)

The SPI penalizes agricultural output growth based on the magnitude of unwanted byproducts such as greenhouse gas emissions, deforestation, soil erosion, pesticide risk, water stress, and nutrient budget[5]. Consequently, the SPI value varies according to the generation of these byproducts. As shown in the figure below, when a 10% weight is assigned to unwanted byproducts generated by agricultural output, the SPI follows a trajectory similar to that of TFP, reducing productivity growth from 0.8% to 0.4% (TFP vs. SPI) over the last 26 years.

However, increasing the weight given to unwanted byproducts to 30% significantly widens the gap between the two trends. Under this scenario, over the past ten years, sustainable productivity grew at an average annual rate of 0.8%, compared with 1.6% for TFP.

Figure 5: TFP vs. SPI – Colombia



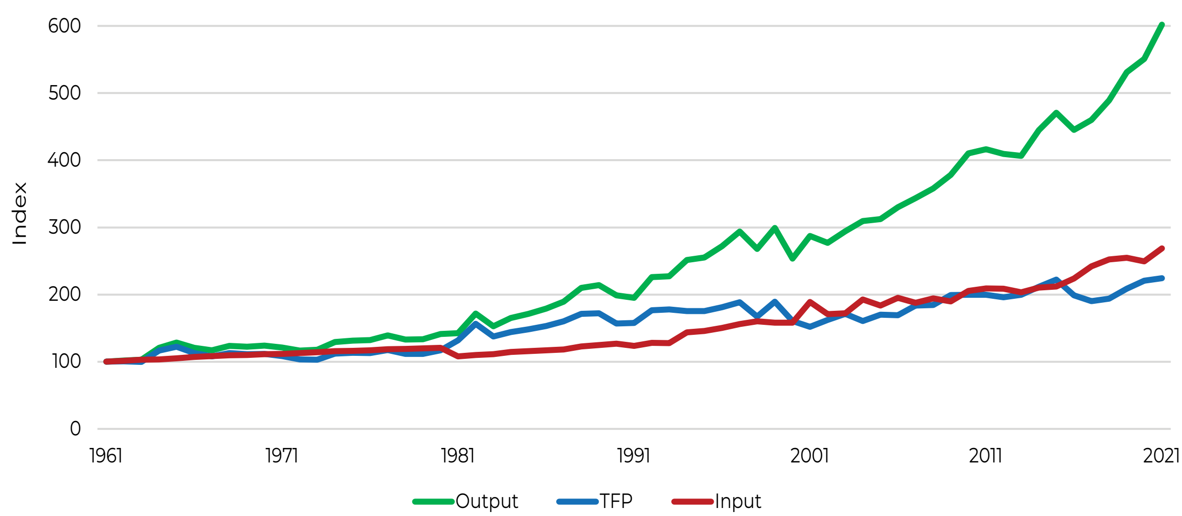
Source: Authors' calculations using FAOSTAT data.

[5] The surplus in the budget corresponds to pollution resulting from the production process, particularly the residual nitrogen in soils following the cropping cycle.

ECUADOR

Over the past sixty years, Ecuador has experienced substantial growth in agricultural output, increasing sixfold. An analysis using USDA-ERS data[1] reveals that the country recorded an average annual growth rate of 3.0% (see **Figure 1**), primarily driven by increased input use, which grew at an average annual rate of 1.7%. To a lesser extent, gains in Total Factor Productivity (TFP) also contributed positively, with an average annual growth rate of 1.4%. During the 1980s, Ecuador's productivity growth outperformed that of previous periods. However, in the 1990s and 2010s, the expansion of input use became the more significant driver of growth.

Figure 1: Agricultural Output, Inputs, and TFP
Ecuador (1961-2021)

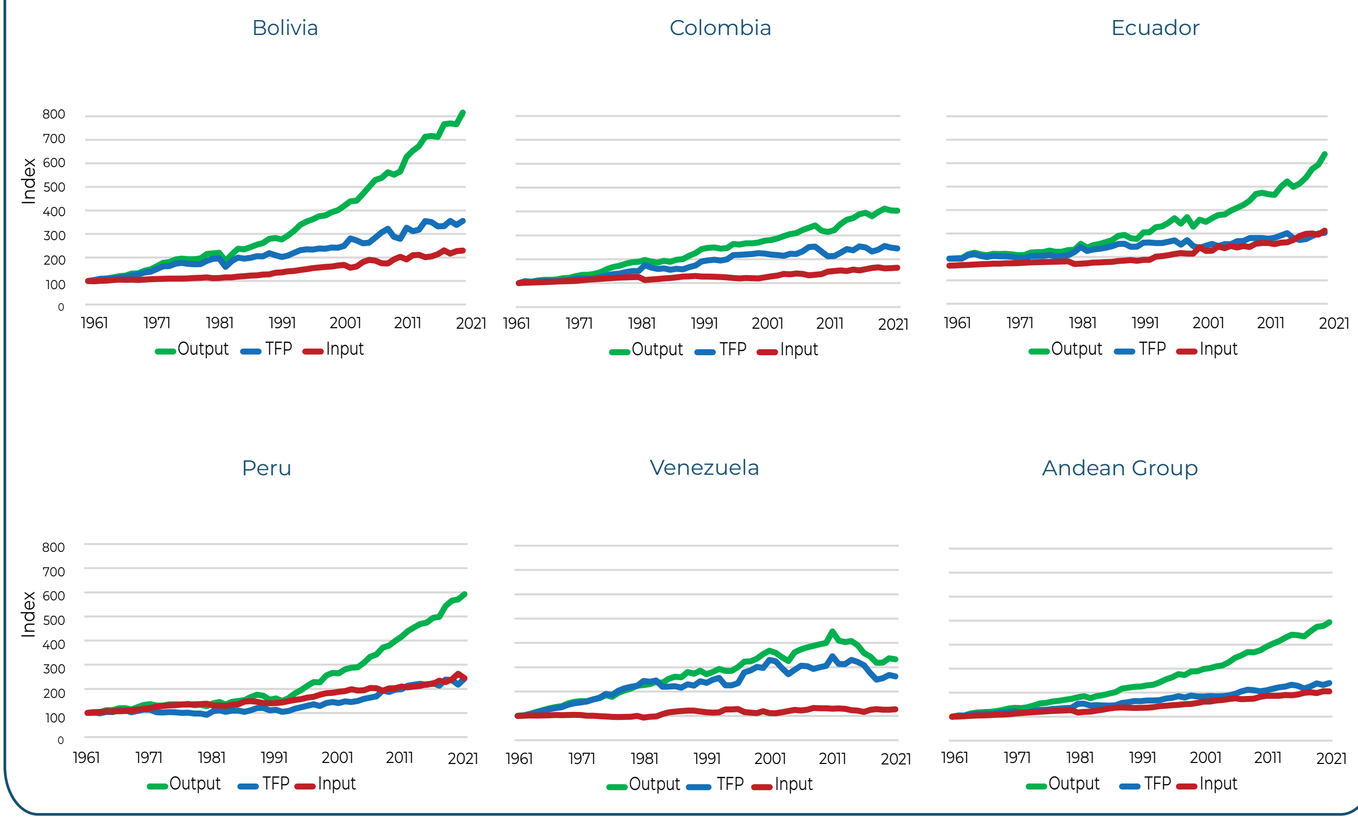


Source: Authors' calculations using USDA-ERS data.

Within the Andean Group, Ecuador's TFP growth has been comparable to that of Colombia and Peru. In terms of input use, Ecuador's growth has followed a pattern similar to Bolivia and Peru. Overall, the country's agricultural output has increased well above the subregional average, driven primarily by a higher rate of input use[2] (see **Figure 2**).

[1] U.S. Department of Agriculture, Economic Research Service. *International Agricultural Productivity* data product, September 2023 (visited August 2024).
[2] Index based on six inputs: labor, machinery, livestock, agricultural land, feed, and fertilizers.

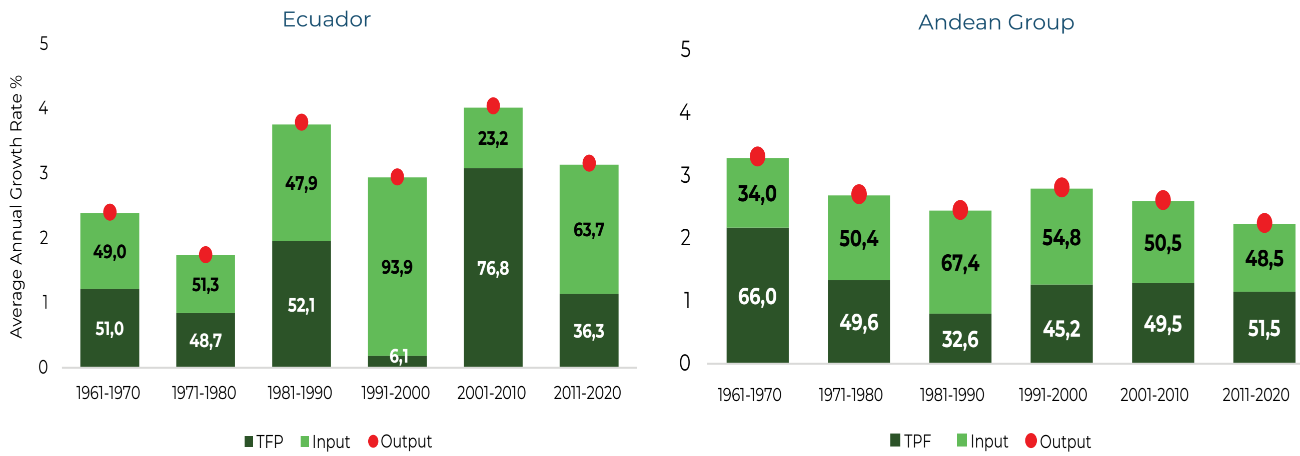
Figure 2: Agricultural Output, Inputs, and TFP by Country/Region (1961-2021)



Source: Authors' calculations using USDA-ERS data.

An analysis of the decomposition of agricultural output growth by decade (see **Figure 3**) shows that Ecuador initially underperformed relative to the Andean Group. However, in the decades that followed, the country's agricultural output grew at a faster rate than the subregional average. This improvement was primarily driven by productivity gains during 1981–1990 and 2001–2010, and by increased input use during 1991–2000 and 2011–2020. In the most recent decade, Ecuador recorded an average annual output growth rate of 3.2%, with 64% of this growth attributed to input use and 36% to gains in TFP.

Figure 3: Agricultural Output Growth Decomposition by decade

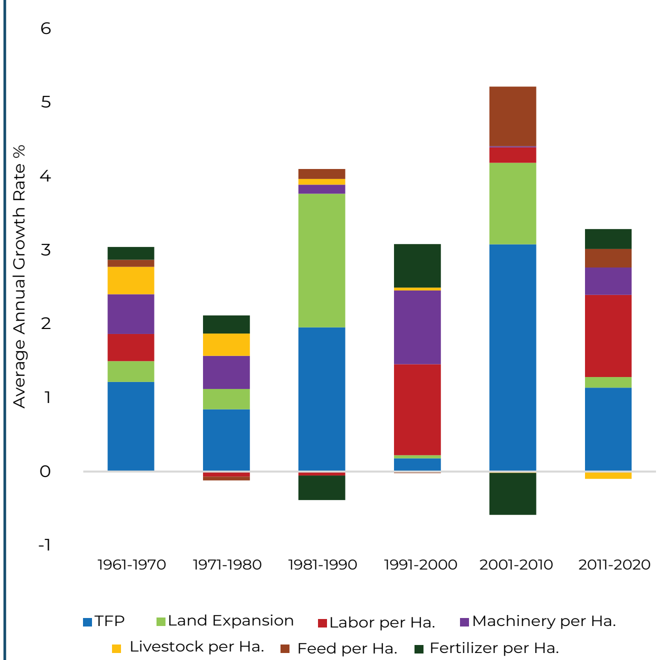


Source: Authors' calculations based on USDA-ERS data.

Figure 4 presents the decomposition of input growth over the past six decades, revealing the following:

1. Land expansion and machinery use have increased consistently over the past sixty years.
2. The 1961–1970 decade was the only period in which none of the productive inputs recorded negative contributions.
3. In the most recent decade (2010-2020), livestock was the only input with a negative contribution to agricultural output growth.

Figure 4: Resource Decomposition of Agricultural Output Growth-Ecuador



Source: Authors' calculations based on USDA-ERS data.

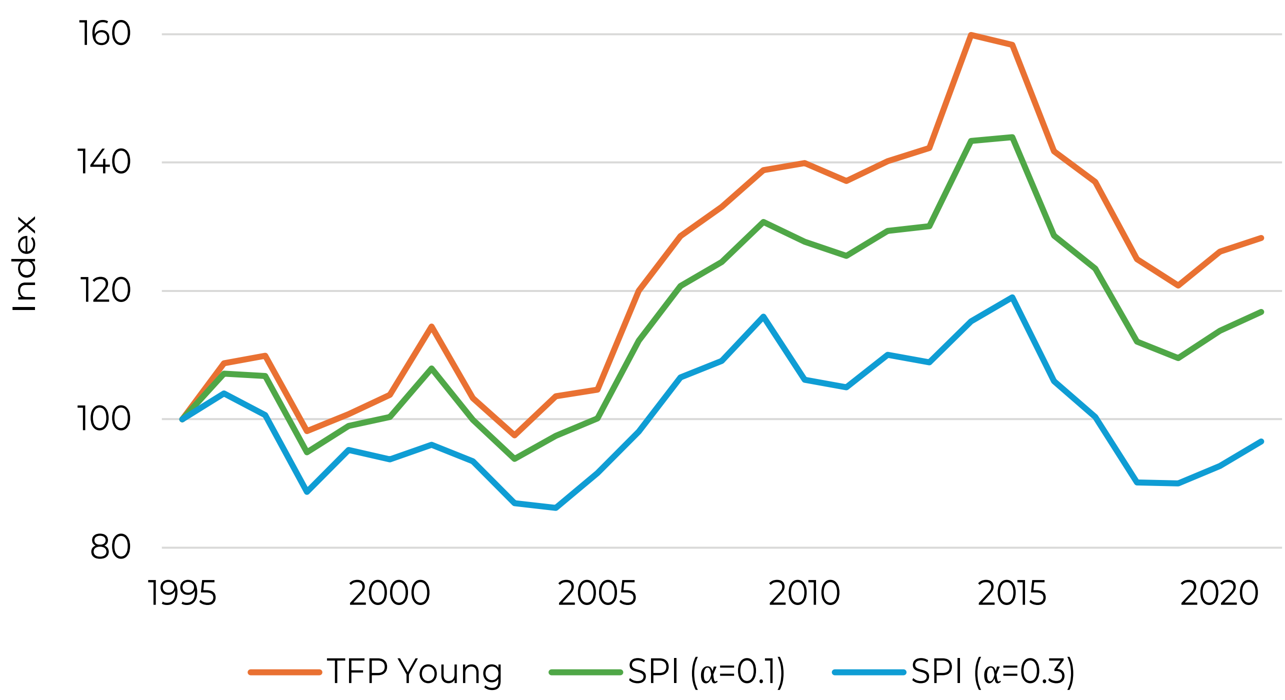
While the decomposition of agricultural growth allows for the identification of the main drivers of agricultural output, this conventional analysis does not consider the environmental impacts generated by the production process. To address this limitation, Sustainable Productivity Indices (SPI)[3] have been estimated using the Young[4] methodology (see **Figure 5**).

[3] IFPRI and IDB, 2025.
[4] The Geometric Young Index (GY) is a multiplicative index that compares vectors of quantities using weights based on average value shares—derived from average prices when available—fulfilling the axioms of a proper index such as transitivity (O'Donnell, 2018).

The SPI penalizes agricultural output growth based on the magnitude of unwanted byproducts such as greenhouse gas emissions, deforestation, soil erosion, pesticide risk, water stress, and nutrient budget[5]. Consequently, the SPI value varies according to the generation of these byproducts. As shown in the figure below, when a 10% weight is assigned to unwanted byproducts generated by agricultural output, the SPI follows a trajectory similar to that of TFP, reducing productivity growth from 1.0% to 0.6% (TFP vs. SPI) over the last 26 years. However, increasing the weight given to unwanted byproducts to 30% significantly widens the gap between the two trends.

Under this scenario, over the past ten years, sustainable productivity has decreased by an average of 0.8% annually, compared to a 0.7% decline in TFP.

Figure 5: TFP vs. SPI – Ecuador



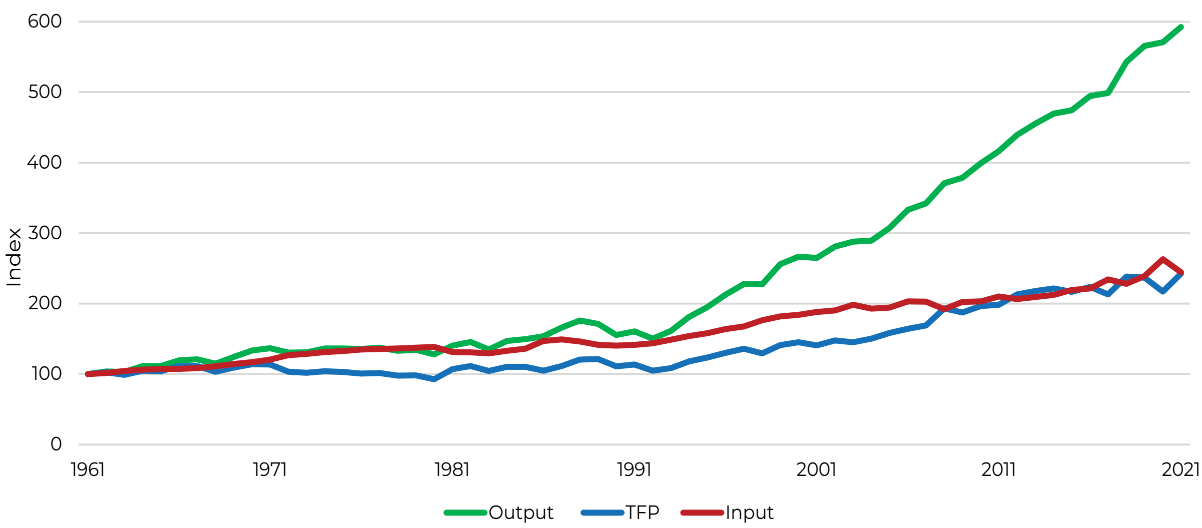
Source: Authors' calculations using FAOSTAT data.

[5] The surplus in the budget corresponds to pollution resulting from the production process, particularly the residual nitrogen in soils following the cropping cycle.

PERU

Over the past sixty years, Peru has experienced significant growth in agricultural output, increasing sixfold. An analysis using USDA-ERS data[1] shows that the country recorded an average annual growth rate of 3.0% (see **Figure 1**), primarily driven by increased input use, which grew at an average annual rate of 1.5%. Total Factor Productivity (TFP) also followed a positive trend over this period, with an average annual growth rate of 1.5%, although it included episodes of stagnation and even contraction. Notably, during the 2010–2020 decade, Peru achieved substantial gains in TFP, with productivity contributing equally to agricultural output growth alongside input use.

Figure 1: Agricultural Output, Inputs, and TFP
Peru (1961-2021)

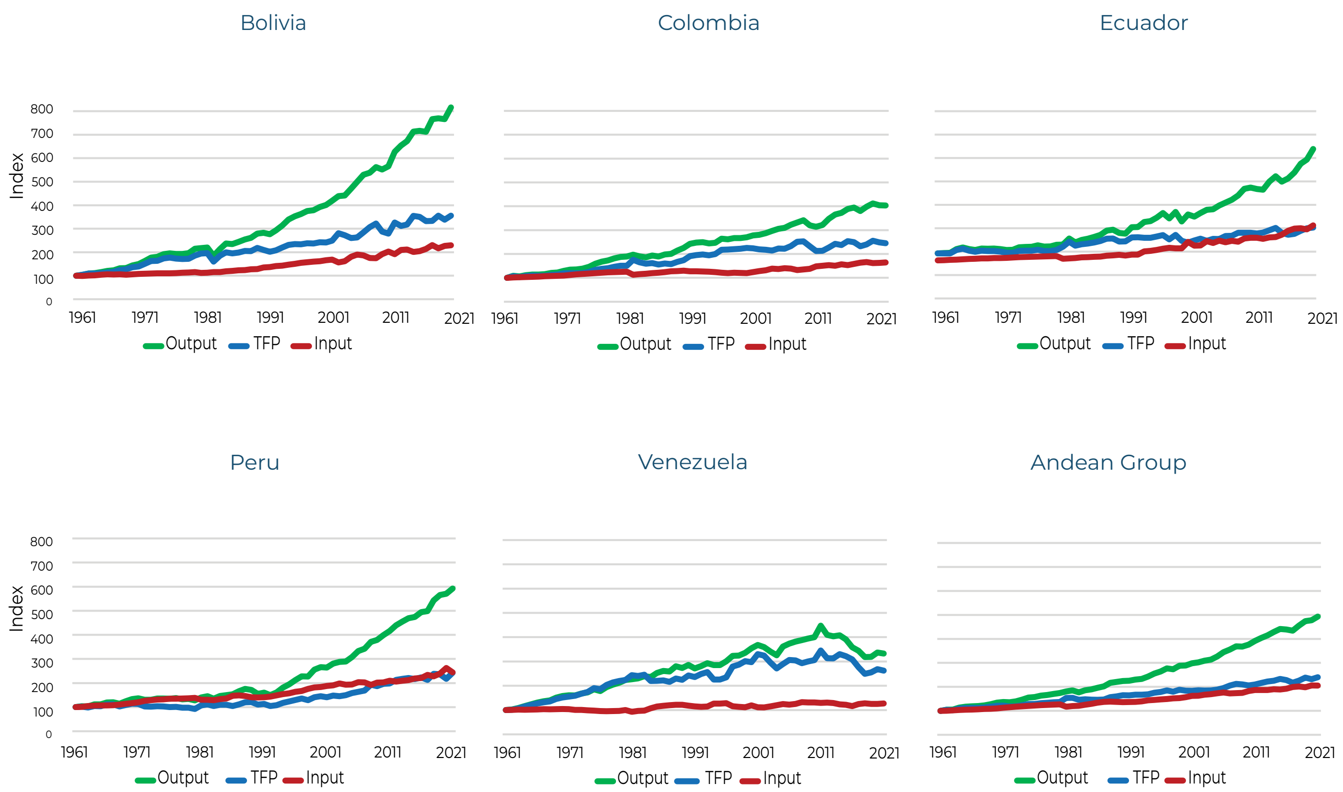


Source: Authors' calculations using USDA-ERS data.

Within the Andean Group, Peru's TFP growth has been comparable to that of Colombia and Ecuador. In terms of input use, Peru's growth has been similar to that of Bolivia and Ecuador. Overall, Peru's agricultural output increased well above the subregional average, driven primarily by a higher rate of input use[2](see **Figure 2**).

[1] U.S. Department of Agriculture, Economic Research Service. *International Agricultural Productivity* data product, September 2023 (visited August 2024).
[2] Index based on six inputs: labor, machinery, livestock, agricultural land, feed, and fertilizers.

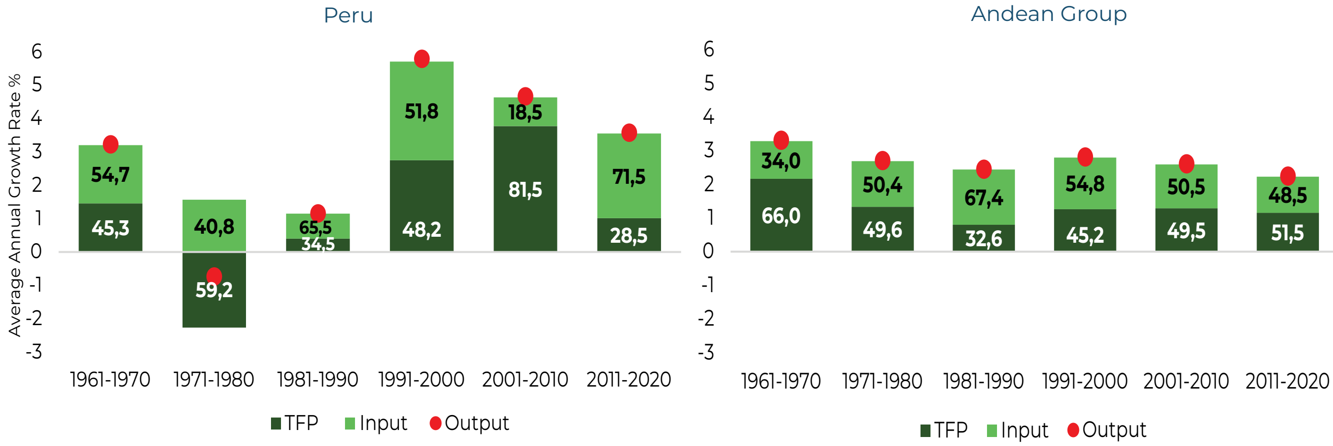
Figure 2: Agricultural Output, Inputs, and TFP by Country/Region (1961-2021)



Source: Authors' calculations using USDA-ERS data.

An analysis of the decomposition of agricultural output growth by decade (see **Figure 3**) shows that Peru underperformed relative to the Andean Group during the 1960s, 1970s, and 1980s, with TFP growth consistently below the subregional average—particularly in the 1970s, when Peru experienced a 2.3% decline in TFP, while the Andean Group grew at 1.3% annually. However, over the last three decades, Peru's agricultural output has surpassed the group, driven primarily by increased input use during 1991–2000 and 2011–2020, and by productivity gains during 2001–2010. In the most recent decade, Peru recorded an average annual output growth rate of 3.6%, with 71% of this growth attributable to input use and 29% to TFP gains.

Figure 3: Agricultural Output Growth Decomposition by decade

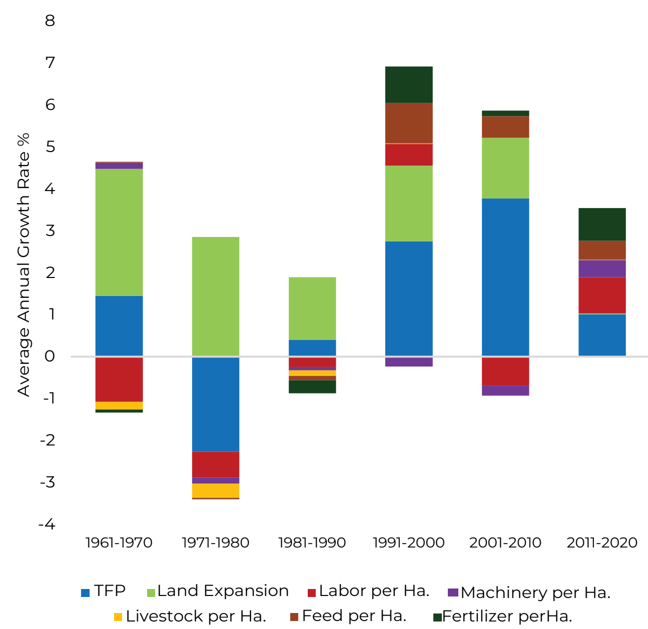


Source: Authors' calculations using USDA-ERS data.

Figure 4 presents the decomposition of input growth over the past six decades, revealing the following:

1. Land expansion recorded increases over the past sixty years.
2. Over the last three decades, the contribution of materials (fertilizers and animal feed) was consistently positive.
3. Machinery contributed positively to agricultural output growth in the most recent decade, contrasting with contractions recorded over the previous forty years.

Figure 4: Resource Decomposition of Agricultural Output Growth-Peru



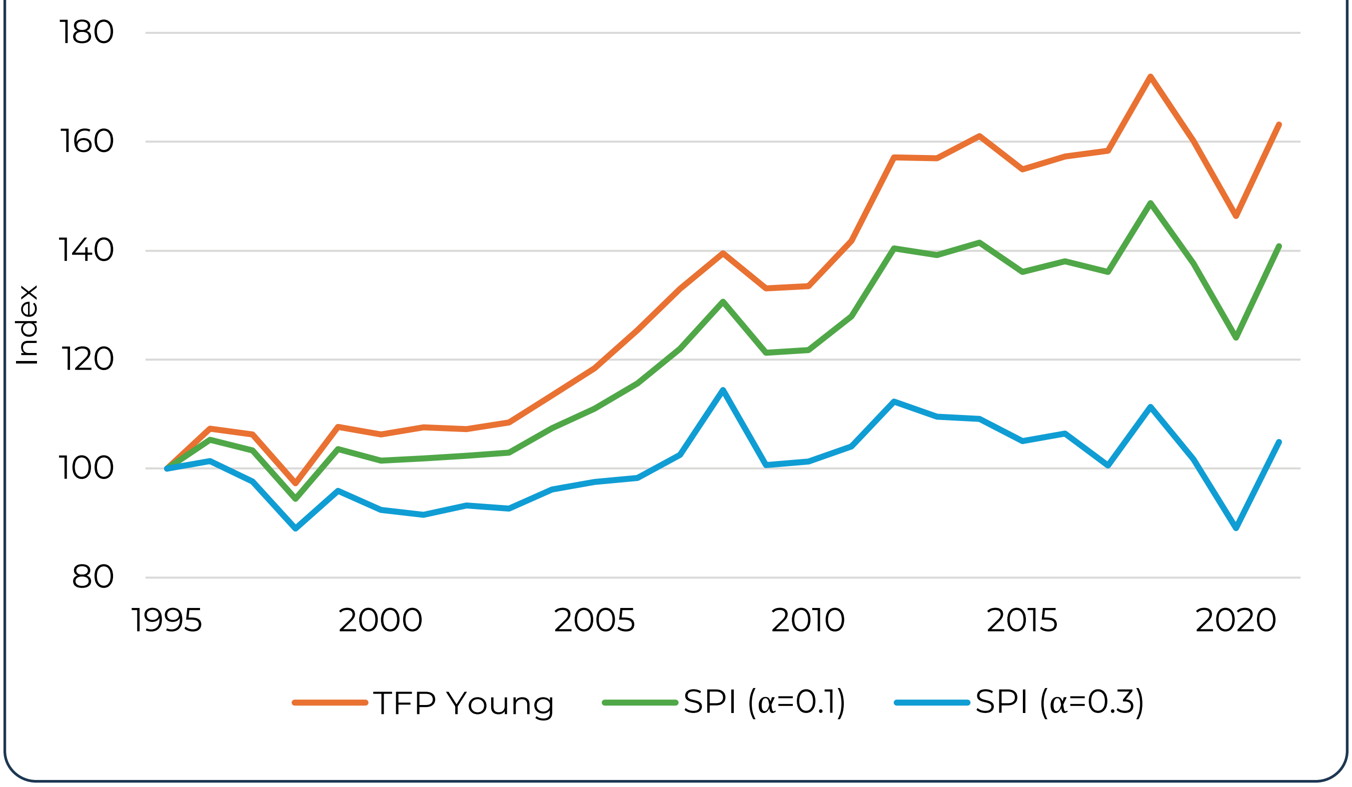
Source: Authors' calculations using USDA-ERS data.

While the decomposition of agricultural growth allows for the identification of the main drivers of agricultural output, this conventional analysis does not consider the environmental impacts generated by the production process. To address this limitation, Sustainable Productivity Indices (SPI)[3] have been estimated using the Young[4] methodology (see **Figure 5**).

[3] IFPRI and IDB, 2025.
[4] The Geometric Young Index (GY) is a multiplicative index that compares vectors of quantities using weights based on average value shares—derived from average prices when available—fulfilling the axioms of a proper index such as transitivity (O'Donnell, 2018).

The SPI penalizes agricultural output growth based on the magnitude of unwanted byproducts such as greenhouse gas emissions, deforestation, soil erosion, pesticide risk, water stress, and nutrient budget[5]. Consequently, the SPI value varies according to the generation of these byproducts. As shown in the figure below, when a 10% weight is assigned to unwanted byproducts generated by agricultural output, the SPI follows a trajectory similar to that of TFP, reducing productivity growth from 1.9% to 1.3% (TFP vs. SPI) over the last 26 years. However, increasing this weight by 30% significantly widens the gap between the two trends. Under this scenario, over the past ten years, sustainable productivity has grown at an average annual rate of 0.07%, compared to 1.4% for TFP.

Figure 5: TFP vs. SPI – Peru



Source: Authors' calculations using FAOSTAT data.

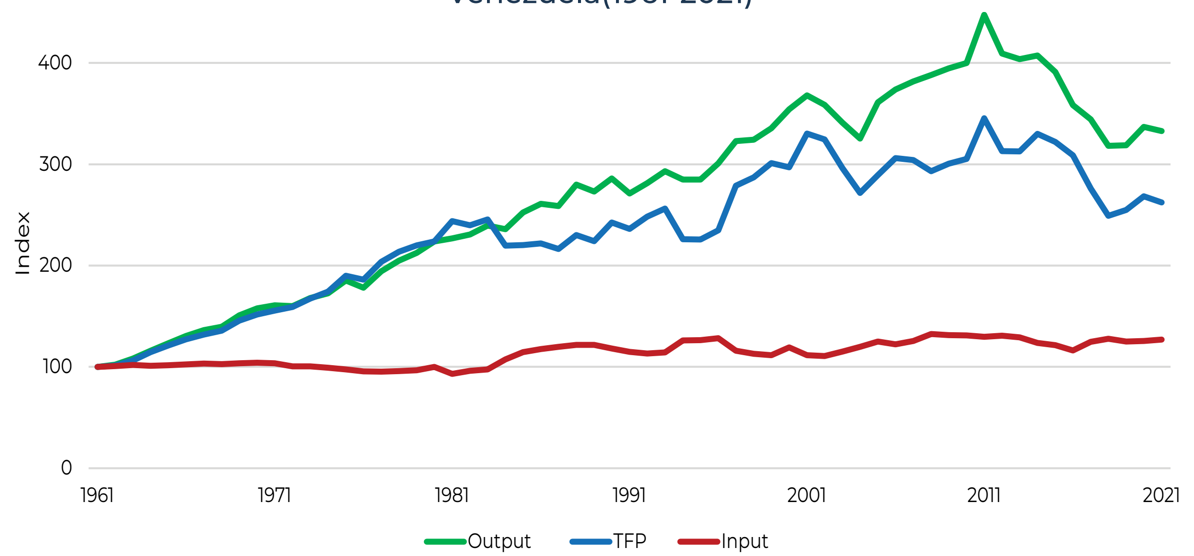
[5] The surplus in the budget corresponds to pollution resulting from the production process, particularly the residual nitrogen in soils following the cropping cycle.

VENEZUELA

During the first five decades, Venezuela experienced significant growth in its agricultural output, increasing fourfold. However, over the past ten years the country experienced a contraction that returned output to levels recorded two decades ago. An analysis using USDA-ERS data[1] shows that Venezuela recorded an average annual growth rate of 2.0% in agricultural output (see **Figure 1**), driven primarily by increases in Total Factor Productivity (TFP), which grew at an average annual rate of 1.6%. It is important to note that, by the late 1990s, the growth of TFP had decelerated significantly, with some declines observed in the most recent years.

To a lesser extent, input use also showed a positive trend over the six decades analyzed, although this included periods of stagnation and even contraction in certain years, resulting in an average annual growth rate of 0.4%.

Figure 1: Agricultural Output, Inputs, and TFP
Venezuela(1961-2021)

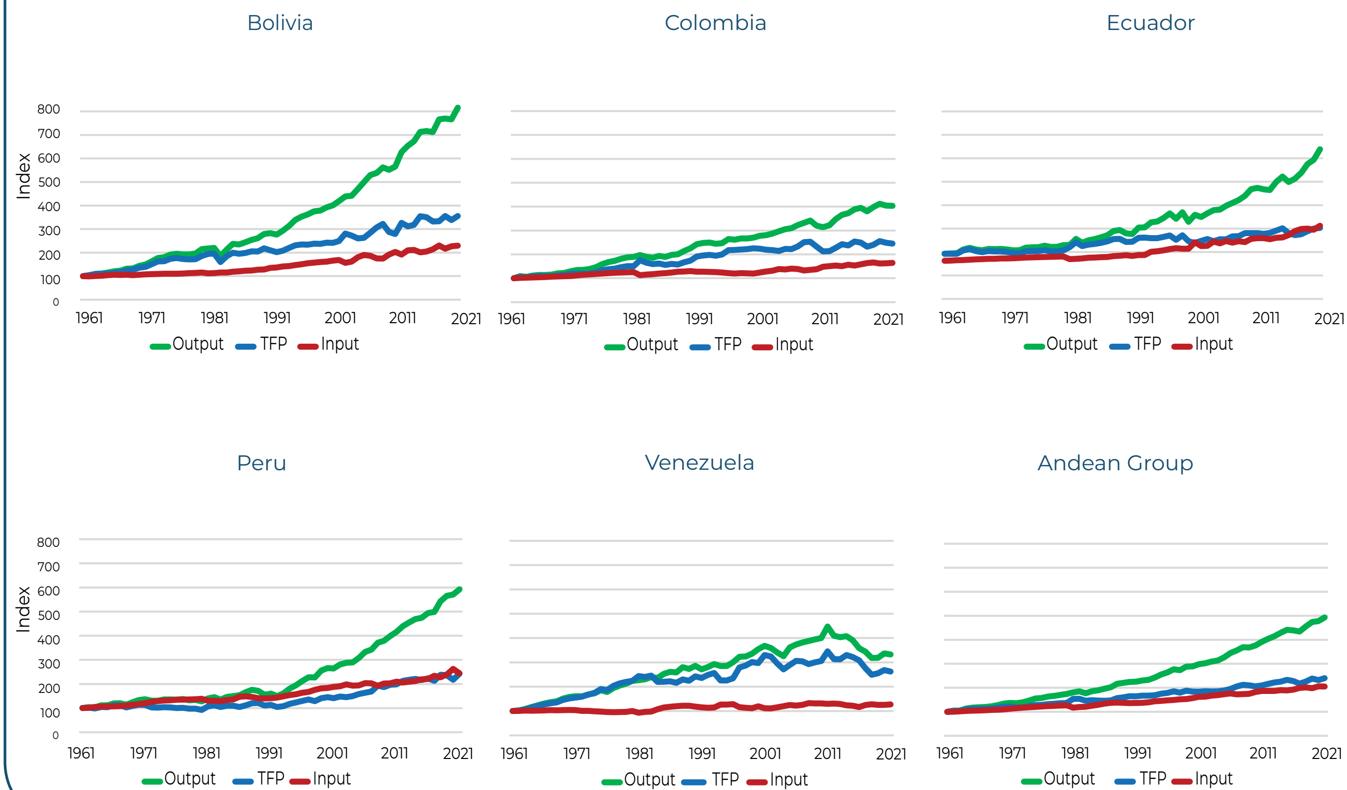


Source: Authors' calculations based on USDA-ERS data.

Within the Andean Group, Venezuela's TFP growth during the first five decades was comparable to that of Bolivia. In terms of input use, the country recorded slower growth than the subregional average. Overall, Venezuela's agricultural output remained below the Andean Group average, reflecting its more limited increase in input use[2] (see **Figure 2**).

[1] U.S. Department of Agriculture, Economic Research Service. *International Agricultural Productivity* data product, September 2023 (visited August 2024).
[2] Index based on six inputs: labor, machinery, livestock, agricultural land, feed, and fertilizers.

Figure 2: Agricultural Output, Inputs, and TFP by Country/Region (1961-2021)

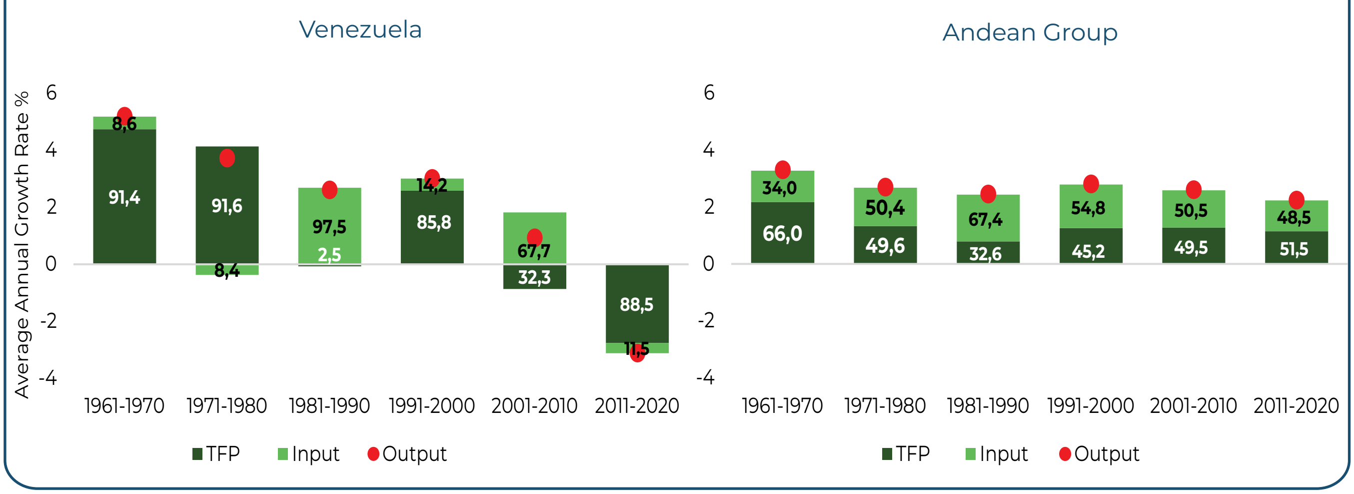


Source: Authors' calculations based on USDA-ERS data.

An analysis of the decomposition of agricultural output growth by decade (see **Figure 3**) reveals that Venezuela outperformed the Andean Group during the first four decades. In the 1960s, 1970s, and 1990s, this stronger performance was driven primarily by greater increases in TFP. In contrast, during the 1980's decade, Venezuela's outperformance relative to the subregional average growth was mainly due to increases in input use.

In the most recent decade, however, Venezuela experienced an average annual output decline of 3.1%. This contraction was largely attributable to falling TFP, which accounted for 88% of the reduction, while lower input use contributed the remaining 12%.

Figure 3: Agricultural Output Growth Decomposition by decade



Source: Authors' calculations based on USDA-ERS data.

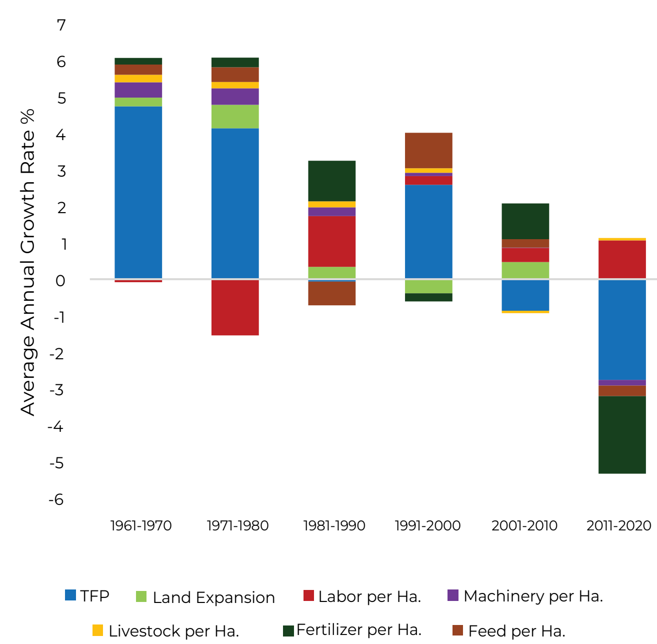
Figure 4 presents the decomposition of input growth over the past six decades, revealing the following:

1. Land expansion contributed positively in four of the six decades analyzed; however, data for the most recent decade is unavailable.

2. During the first two decades, labor was the only input that contributed negatively to agricultural output growth.

3. In the most recent decade, labor and livestock were the only inputs to contribute positively to agricultural output growth.

Figure 4: Resource Decomposition of Agricultural Output Growth - Venezuela



Source: Authors' calculations based on USDA-ERS data.

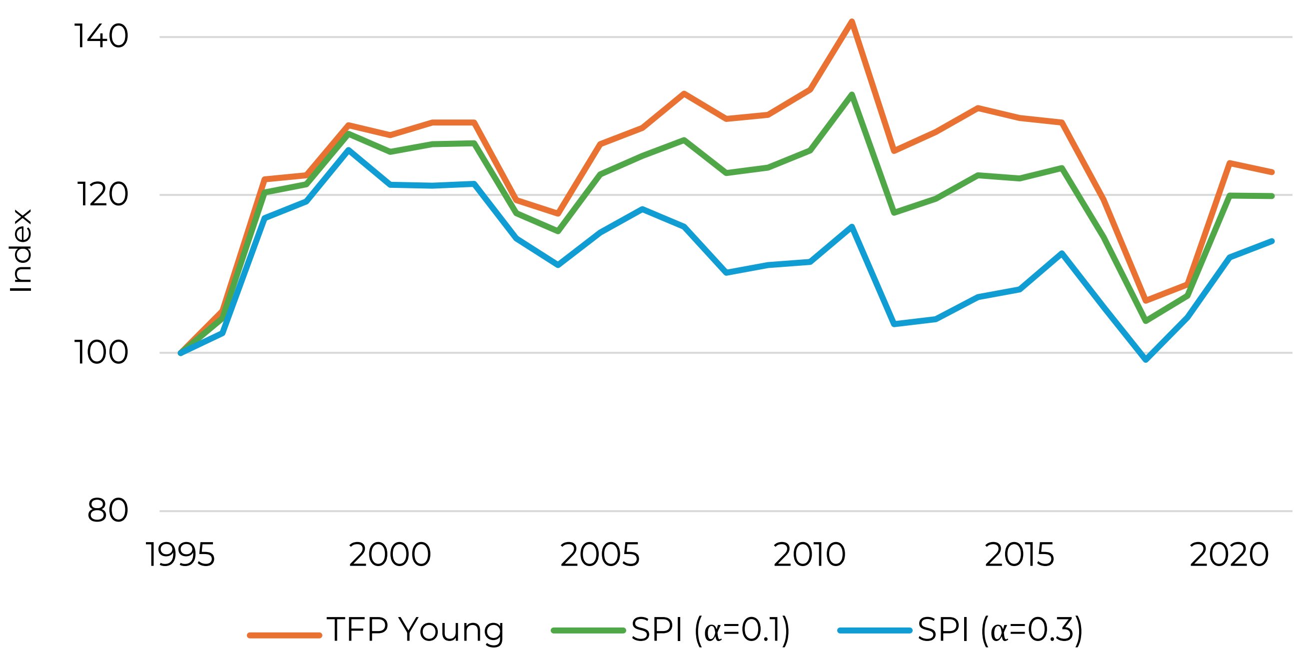
While the decomposition of agricultural growth allows for the identification of the main drivers of agricultural output, this conventional analysis does not consider the environmental impacts generated by the production process. To address this limitation, Sustainable Productivity Indices (SPI)[3] have been estimated using the Young[4] methodology (see **Figure 5**).

[3] IFPRI and IDB, 2025.

[4] The Geometric Young Index (GY) is a multiplicative index that compares vectors of quantities using weights based on average value shares—derived from average prices when available—fulfilling the axioms of a proper index such as transitivity (O'Donnell, 2018).

The SPI penalizes agricultural output growth based on the magnitude of unwanted byproducts such as greenhouse gas emissions, deforestation, soil erosion, pesticide risk, water stress, and nutrient budget[5]. Consequently, the SPI value varies according to the generation of these byproducts. As shown in the figure below, when a 10% weight is assigned to unwanted byproducts generated by agricultural output, the SPI follows a trajectory similar to that of TFP, reducing productivity growth from 0.8% to 0.7% (TFP vs. SPI) over the last 26 years. However, increasing this weight by 30% significantly widens the gap between the two trends.

Figure 5: TFP vs. SPI – Venezuela



Source: Authors' calculations using FAOSTAT data.

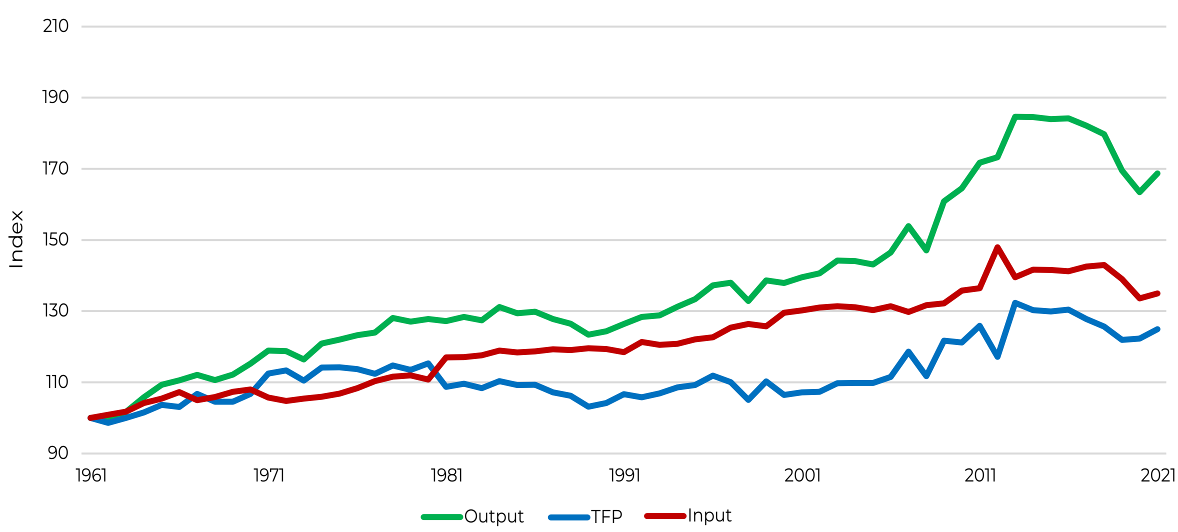
[5] The surplus in the budget corresponds to pollution resulting from the production process, particularly the residual nitrogen in soils following the cropping cycle.

3. CARIBBEAN

CARIBBEAN

Over the past six decades, the Caribbean has experienced modest growth in agricultural output, nearly doubling in size. An analysis using USDA-ERS data[1] shows that the region recorded an average annual growth rate of 0.9% (see **Figure 1**), primarily driven by increases in input use[2], which grew at an average annual rate of 0.5%. To a lesser extent, Total Factor Productivity (TFP) contributed, with an average annual growth rate of 0.4%. The stronger reliance on input use relative to productivity is a trend that began in the late 1970s and has persisted over time.

Figure 1: Agricultural Output, Inputs, and TFP
Caribbean (1961-2021)



Source: Authors' calculations based on USDA-ERS data.

In the Caribbean subregion, different patterns of agricultural performance are observed. The Bahamas has recorded the highest output growth, driven mainly by intensive, increasing, and volatile input use, while its TFP has remained stagnant. Guyana and Suriname have also achieved notable production growth—explained by TFP increases in Guyana and greater input use in Suriname.

In contrast, Haiti, Jamaica, and Trinidad and Tobago display flat trajectories across all three components, with limited dynamism in agricultural output, stagnant TFP, and relatively low levels of input use (see **Figure 2**).

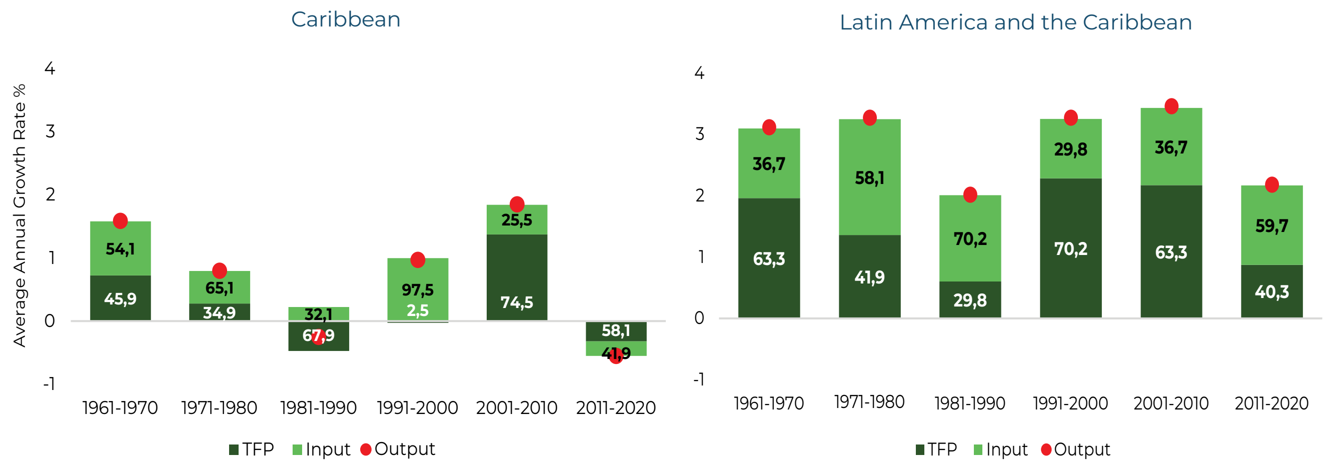
[1] U.S. Department of Agriculture, Economic Research Service. *International Agricultural Productivity* data product, September 2023 (visited August 2024).
[2] Index based on six inputs: labor, machinery, livestock, agricultural land, feed, and fertilizers.

Figure 2: Agricultural Output, Inputs, and TFP by Country– (1961-2021)

Source: Authors' calculations based on USDA-ERS data.

An analysis of the decomposition of agricultural output growth by decade (see **Figure 3**) shows that the Caribbean consistently underperformed relative to the Latin America and the Caribbean (LAC) average over the sixty-year period analyzed. Gains in Total Factor Productivity (TFP) remained persistently below the regional average—particularly in the 1980s, when the subregion recorded a TFP decline of 0.5%, compared to an average annual growth of 0.6% in LAC. In the most recent decade, agricultural production in the Caribbean contracted at an average annual rate of 0.5%, with 42% of this decline explained by reduced input use and 58% by a decrease in TFP.

Figure 3: Agricultural Output Growth Decomposition by decade

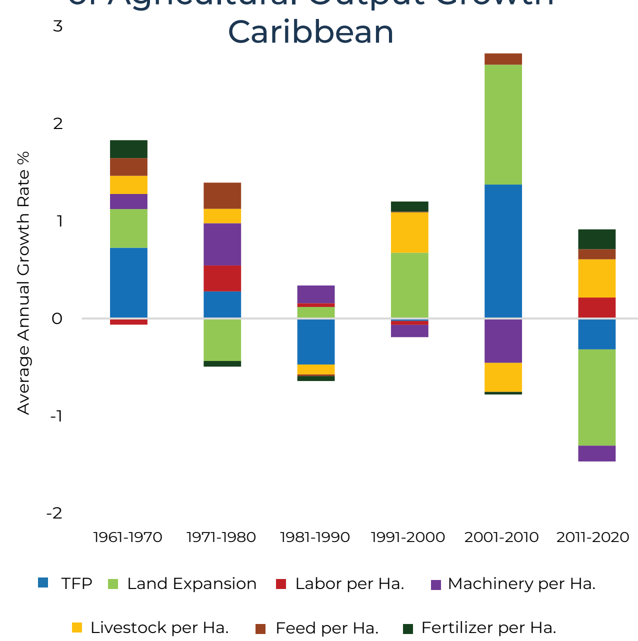


Source: Authors' calculations based on USDA-ERS data.

Figure 4: Resource Decomposition of Agricultural Output Growth for LAC

1. The contributions of land expansion, labor, fertilizers, and livestock to agricultural output growth fluctuated over the sixty-year period, showing both positive and negative variations.
2. The contribution of feed remained positive —or close to zero— throughout the entire period analyzed .
3. In the most recent decade, both land expansion and machinery recorded negative contributions to agricultural output growth.

Figure 4: Resource Decomposition of Agricultural Output Growth Caribbean



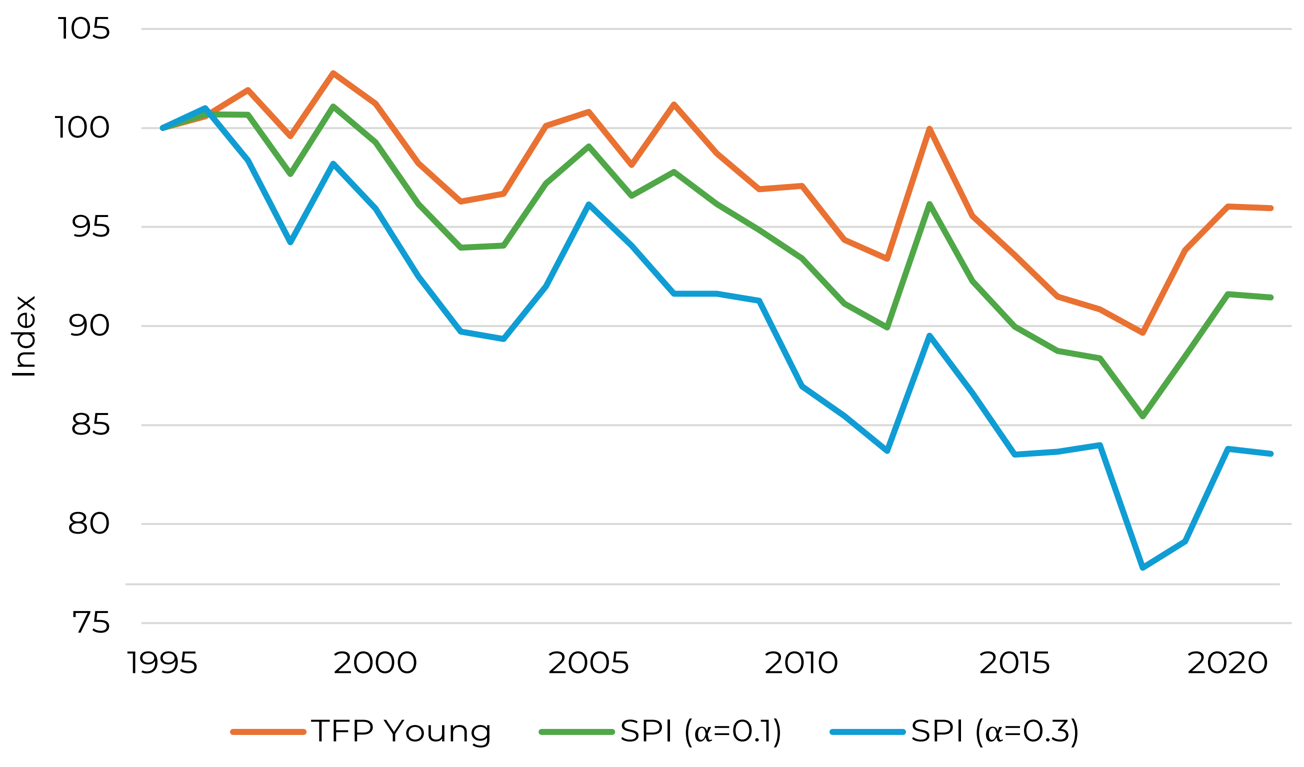
Source: Authors' calculations based on USDA-ERS data.

While the decomposition of agricultural growth allows for the identification of the main drivers of agricultural output, this conventional analysis does not consider the environmental impacts generated by the production process. To address this limitation, Sustainable Productivity Indices (SPI)[3] have been estimated using the Young[4] methodology (see **Figure 5**).

[3] IFPRI and IDB, 2025.
[4] The Geometric Young Index (GY) is a multiplicative index that compares vectors of quantities using weights based on average value shares—derived from average prices when available—fulfilling the axioms of a proper index such as transitivity (O'Donnell, 2018).

The SPI penalizes agricultural output growth based on the magnitude of unwanted byproducts such as greenhouse gas emissions, deforestation, soil erosion, pesticide risk, water stress, and nutrient budget[5]. Consequently, the SPI value varies according to the generation of these byproducts. As shown in the figure below, when a 10% weight is assigned to unwanted byproducts generated by agricultural output, the SPI follows a trajectory similar to that of TFP, reducing productivity growth from -0.16% to -0.34% (TFP vs. SPI) over the last 26 years. However, by increasing the weight given to unwanted byproducts to 30%, it significantly widens the gap between the two trends. Under this scenario, over the past ten years, sustainable productivity declined at an average annual rate of 0.23%, compared to a 0.17% increase in TFP.

Figure 5: TFP vs. SPI – Caribbean



Source: Authors' calculations using FAOSTAT data.

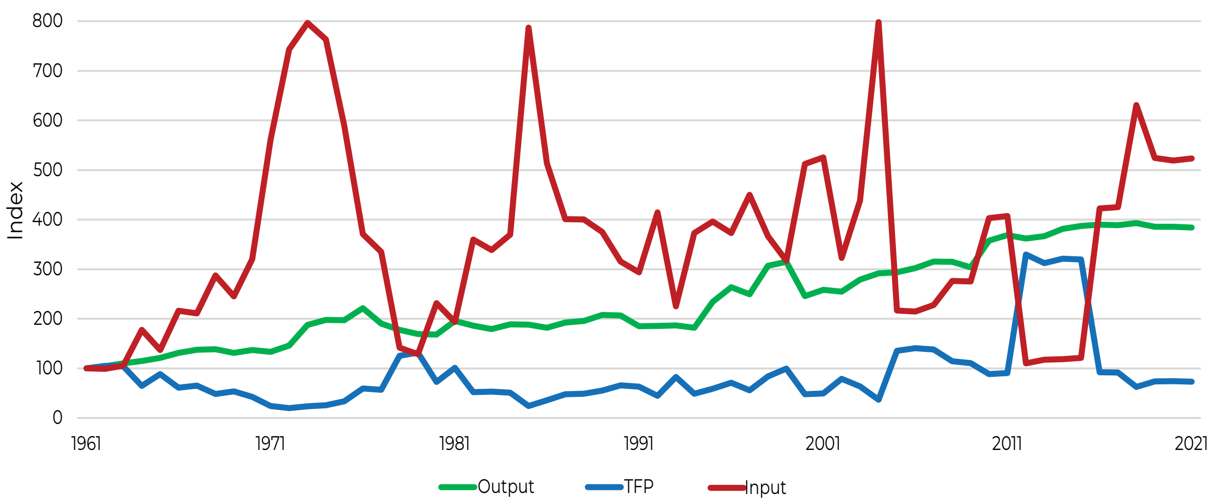
[5] The surplus in the budget corresponds to pollution resulting from the production process, particularly the residual nitrogen in soils following the cropping cycle.

THE BAHAMAS

Over the past sixty years, agricultural output in The Bahamas has increased fourfold. An analysis using USDA-ERS[1] data shows that the country recorded an average annual growth rate of 2.3% in agricultural production (see **Figure 1**), primarily driven by input use, which grew at an average annual rate of 2.8%. In contrast, Total Factor Productivity (TFP) declined over the same period, averaging a 0.5% annual decrease.

The country's strongest TFP performance was observed in the early 2010s, coinciding with a reduction in input use.

Figure 1: Agricultural Output, Inputs, and TFP
The Bahamas (1961-2021)



Source: Authors' calculations based on USDA-ERS data.

Within the Caribbean, The Bahamas has recorded TFP growth below the subregional average. In terms of input[2] use, however, the country outperformed its Caribbean peers, with strong fluctuations observed over the sixty-year period. Consequently, agricultural output in The Bahamas has grown above the Caribbean average, driven primarily by increased input use rather than efficiency gains (see **Figure 2**).

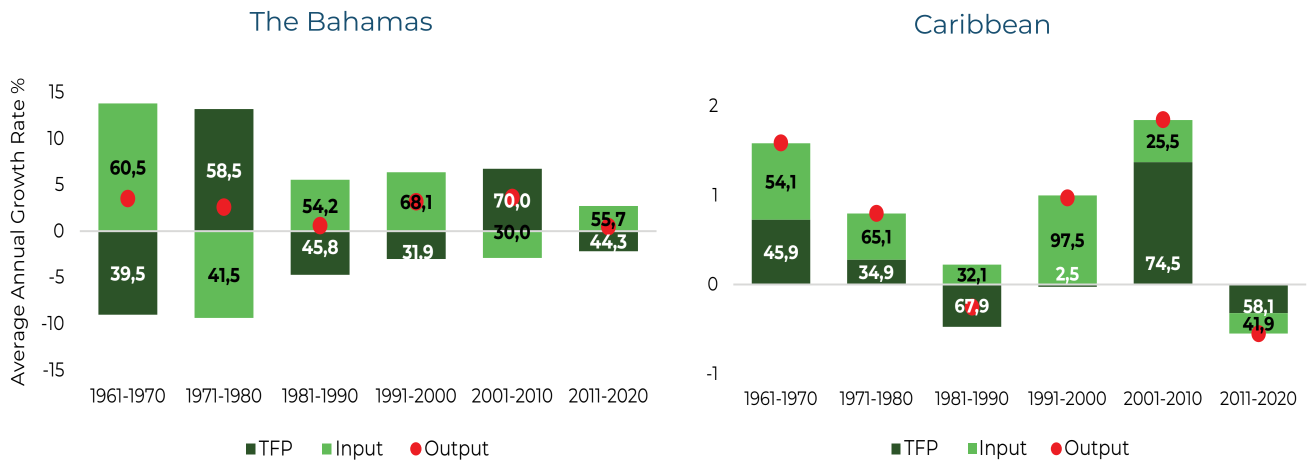
[1] U.S. Department of Agriculture, Economic Research Service. *International Agricultural Productivity* data product, September 2023 (visited August 2024).
[2] Index based on six inputs: labor, machinery, livestock, agricultural land, feed, and fertilizers.

Figure 2: Agricultural Output, Inputs, and TFP by Country– (1961-2021)

Source: Authors' calculations based on USDA-ERS data.

The decomposition of agricultural output growth by decade (see **Figure 3**) shows that The Bahamas consistently outperformed the average of other Caribbean countries across the entire period analyzed. This superior performance was largely driven by TFP gains that exceeded the subregional average in the 1970s and 2000s. At the same time, input use growth also surpassed the subregional average in four of the six decades. In the most recent decade, however, The Bahamas recorded an average annual output growth rate of just 0.5%, with 56% of this growth explained by higher input use (2.7% annually), while the remaining 44% reflected a sharp decline in TFP, which fell at an average annual rate of –2.2%.

Figure 3: Agricultural Output Growth Decomposition by decade



Source: Authors' calculations based on USDA-ERS data.

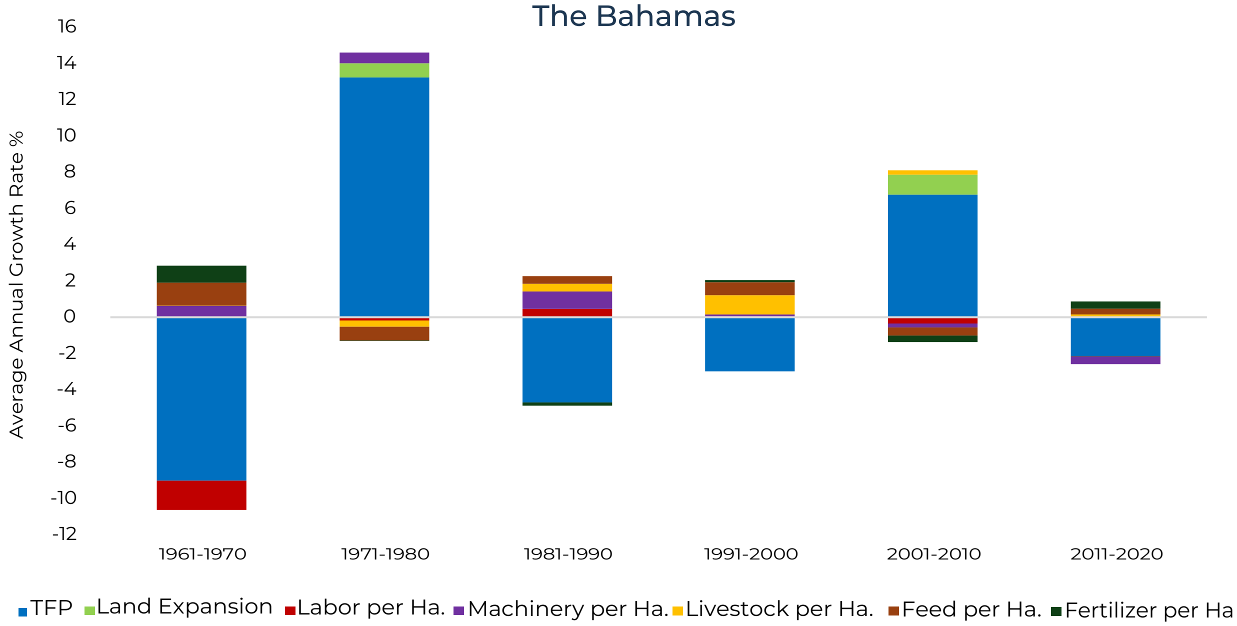
Figure 4 presents the decomposition of input growth over the past six decades, revealing the following:

1. The contribution of land expansion was positive or close to zero throughout the sixty-year period.

2. The contributions of feed, livestock, fertilizers, and machinery showed negative values in several decades over the period analyzed.

3. The contribution of labor to output growth was negative in five of the six decades analyzed.

Figure 4: Resource Decomposition of Agricultural Output Growth The Bahamas

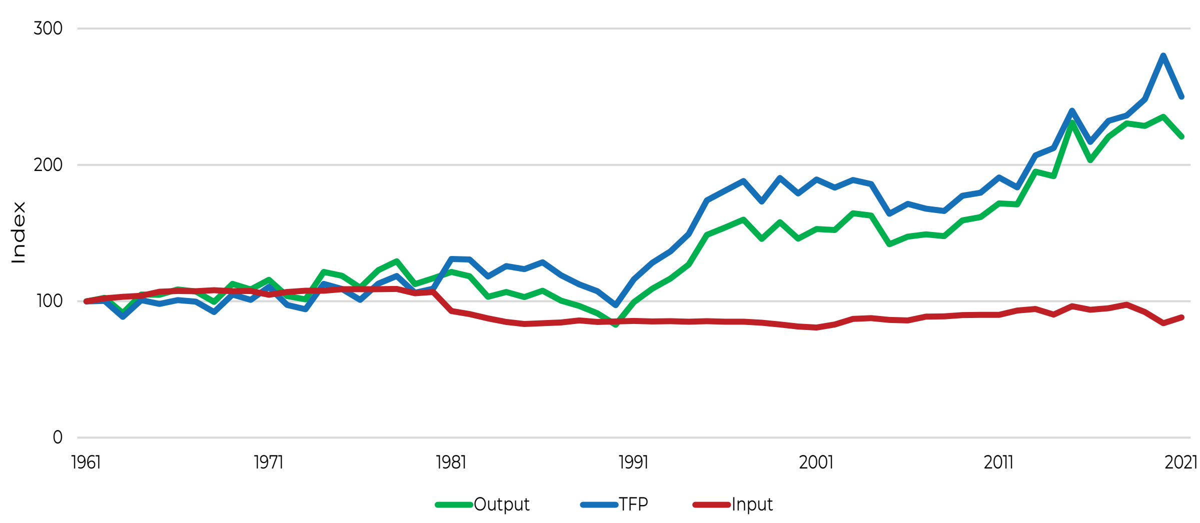


Source: Authors' calculations based on USDA-ERS data.

GUYANA

Over the past sixty years, agricultural output in Guyana has doubled. An analysis using USDA-ERS data[1] reveals that the country recorded an average annual growth rate of 1.3% (see **Figure 1**), primarily driven by increases in Total Factor Productivity (TFP), which grew at an average annual growth rate of 1.5%. During the same period, input use declined slightly, averaging an annual decrease of 0.2%. The stronger performance of output relative to input use began in the 1980's decade and has persisted since.

Figure 1: Agricultural Output, Inputs, and TFP
Guyana (1961-2021)



Source: Authors' calculations using USDA-ERS data.

In the Caribbean subregion, Guyana achieved higher TFP growth rates than its peers. While input use[2] declined —similar to trends observed in Jamaica and Trinidad and Tobago— Guyana's agricultural output growth surpassed the subregional average, driven primarily by substantial productivity gains (see **Figure 2**).

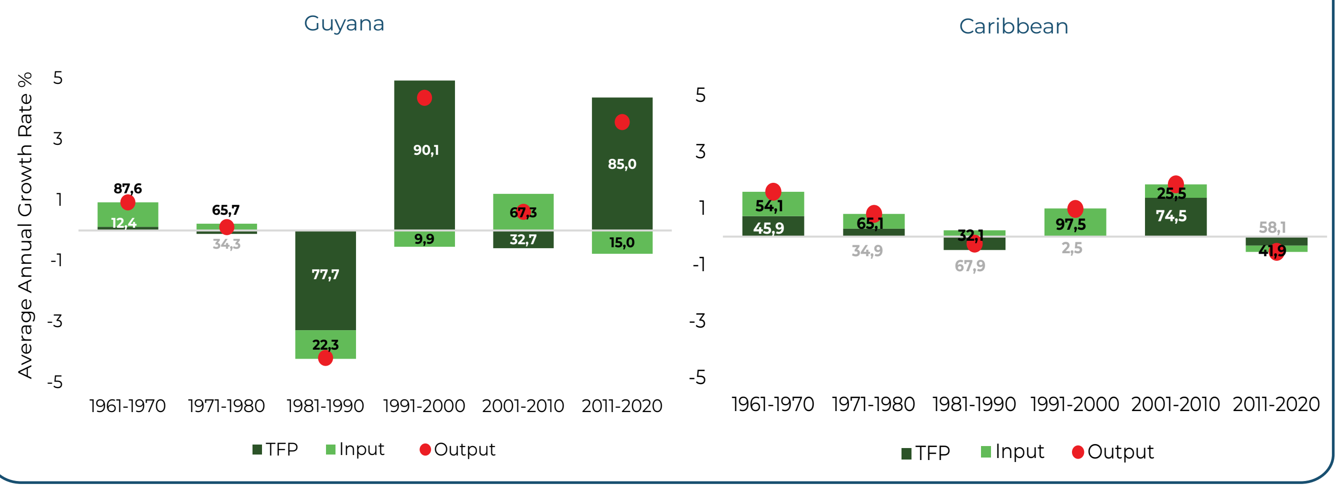
[1] U.S. Department of Agriculture, Economic Research Service. *International Agricultural Productivity* data product, September 2023 (visited August 2024).
[2] Index based on six inputs: labor, machinery, livestock, agricultural land, feed, and fertilizers.

Figure 2: Agricultural Output, Inputs, and TFP by Country– (1961-2021)

Source: Authors' calculations using USDA-ERS data.

An analysis of agricultural output growth decomposition by decade (see **Figure 3**) indicates that Guyana consistently underperformed relative to the subregional average during the 1960s, 1970s, 1980s, and 2000s, with TFP growth consistently below the Caribbean average. The gap was especially pronounced in the 1980s, when Guyana's TFP contracted by 3.3% compared to the regional decline of 0.5%. In contrast, during the 1990s and 2010s, Guyana's agricultural output growth surpassed other countries in the Caribbean, driven mainly by productivity gains. In the most recent decade, Guyana recorded an average annual output growth of 4.4%, with 15% attributed to input use and 85% to TFP improvements.

Figure 3: Agricultural Output Growth Decomposition by decade



Source: Authors' calculations using USDA-ERS data.

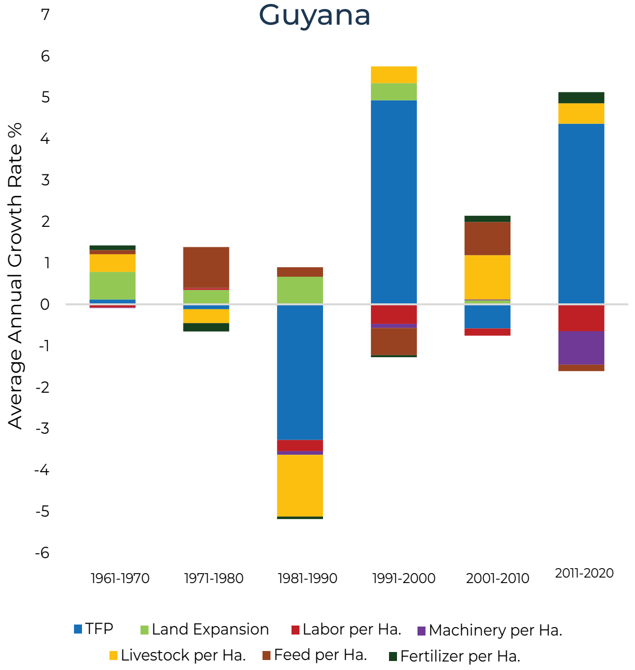
Figure 4 presents the decomposition of input growth over the past six decades, revealing the following:

1. Land expansion increased during the first five decades.

2. Labor contributed negatively to agricultural growth in five of the six decades analyzed.

3. In the most recent decade, labor, livestock feed, and machinery made negative contributions to agricultural output growth.

Figure 4: Resource Decomposition of Agricultural Output Growth Guyana



Source: Authors' calculations using USDA-ERS data.

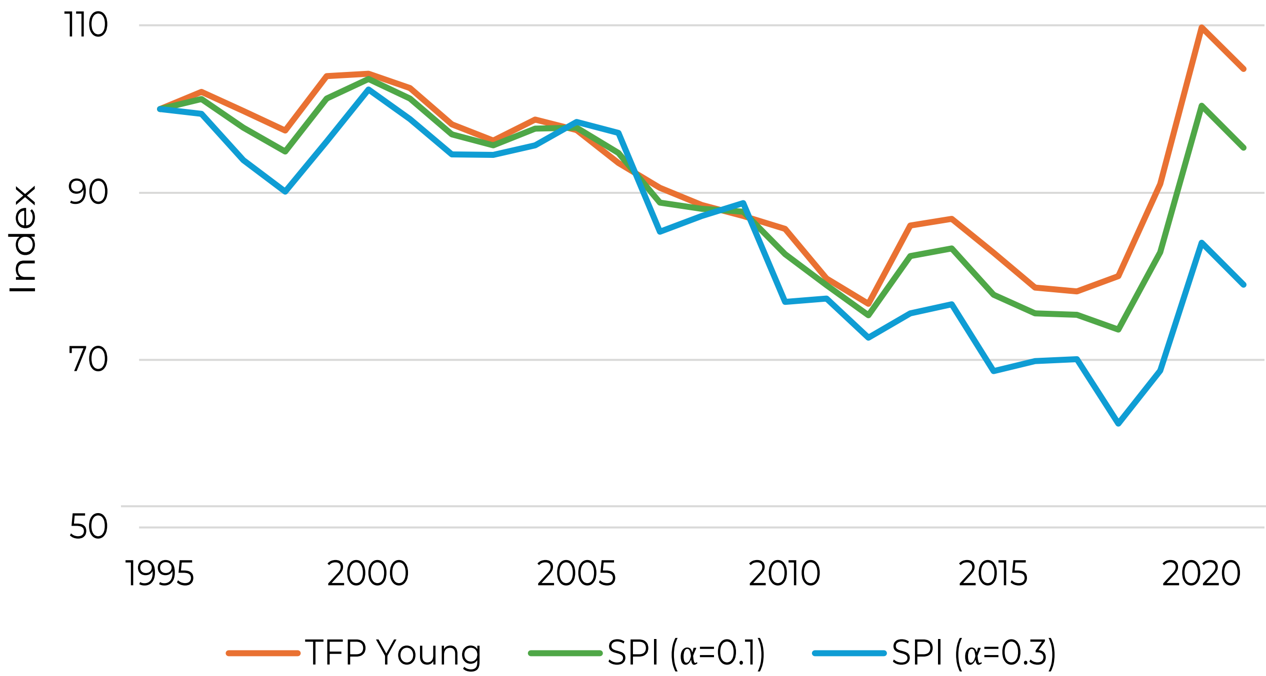
While the decomposition of agricultural growth allows for the identification of the main drivers of agricultural output, this conventional analysis does not consider the environmental impacts generated by the production process. To address this limitation, Sustainable Productivity Indices (SPI)[3] have been estimated using the Young[4] methodology (see **Figure 5**).

[3] IFPRI and IDB, 2025.
[4] The Geometric Young Index (GY) is a multiplicative index that compares vectors of quantities using weights based on average value shares—derived from average prices when available—fulfilling the axioms of a proper index such as transitivity (O'Donnell, 2018).

The SPI penalizes agricultural output growth based on the magnitude of unwanted byproducts such as greenhouse gas emissions, deforestation, soil erosion, pesticide risk, water stress, and nutrient budget[5]. Consequently, the SPI value varies according to the generation of these byproducts. As shown in the figure below, when a 10% weight is assigned to unwanted byproducts generated by agricultural output, the SPI follows a trajectory similar to that of TFP, reducing productivity growth from 0.2% to -0.2% (TFP vs. SPI) over the last 26 years.

However, increasing the weight given to unwanted byproducts to 30% significantly widens the gap between the two trends. Under this scenario, over the last ten years, sustainable productivity has grown at an average annual rate of 0.2%, compared to 2.8% for TFP.

Figure 5: TFP vs. SPI – Guyana



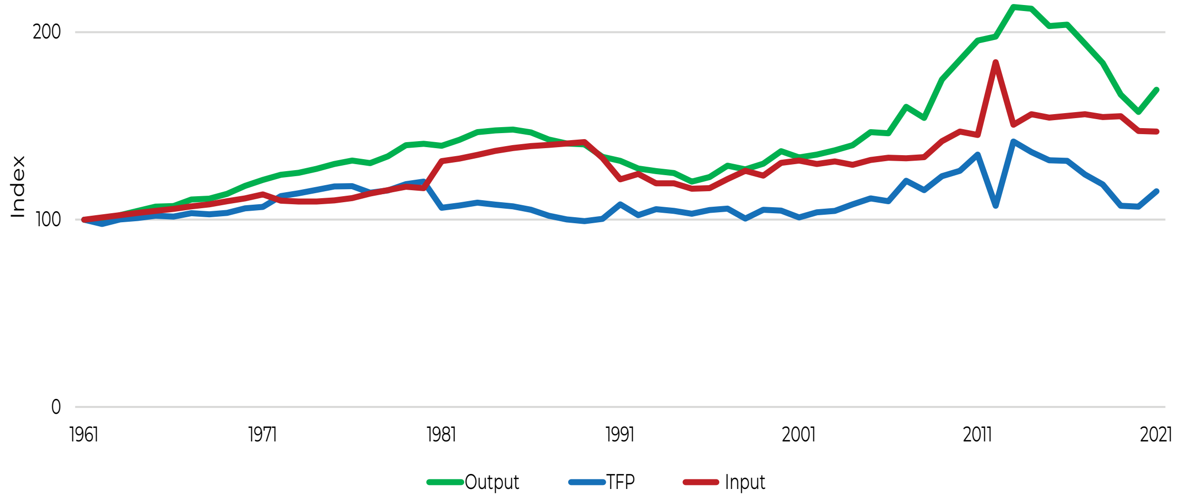
Source: Authors' calculations using FAOSTAT data.

[5] The surplus in the budget corresponds to pollution resulting from the production process, particularly the residual nitrogen in soils following the cropping cycle.

HAITI

Over the past sixty years, Haiti's agricultural output has increased 1.7-fold. An analysis using USDA-ERS data[1] shows that the country recorded an average annual growth rate of 0.9% (see **Figure 1**), driven primarily by input use, which grew at an average annual rate of 0.7%. Over the same period, Total Factor Productivity (TFP) displayed limited evolution, averaging only 0.2% per year. The strongest relative performance of productivity compared to input use occurred during the 2001–2010 decade; however, in the most recent decade, TFP registered a sharp decline.

Figure 1: Agricultural Output, Inputs, and TFP
Haiti (1961-2021)



Source: Authors' calculations using USDA-ERS data.

Within the Caribbean region, Haiti's TFP growth remained slightly below the subregional average. In terms of input use[2], the country followed a trajectory similar to that of its Caribbean peers. Overall, Haiti's agricultural output has expanded at a pace consistent with the subregional average, a trend largely explained by stronger reliance on input use (see **Figure 2**).

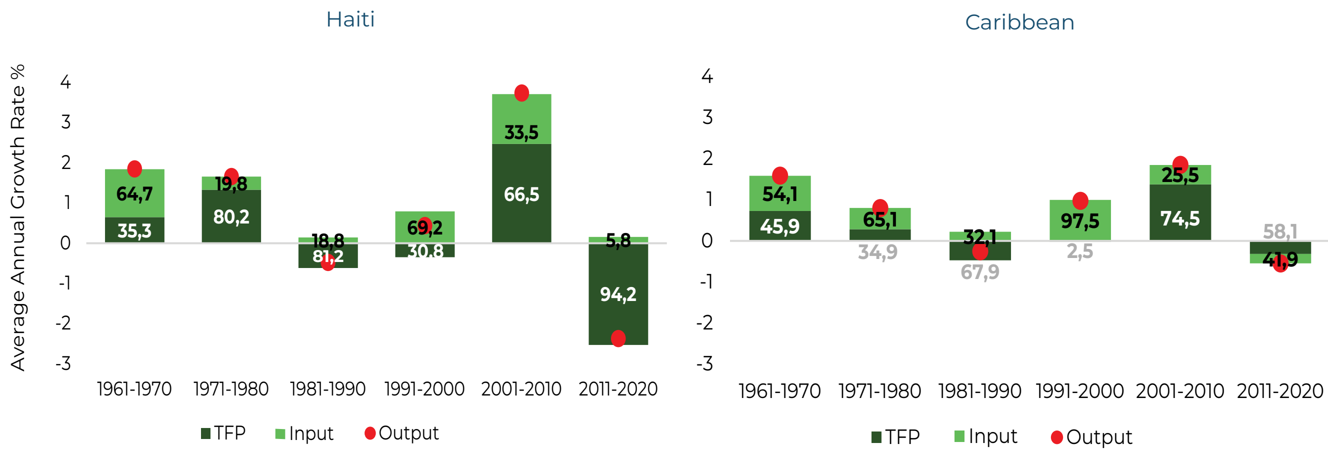
[1] U.S. Department of Agriculture, Economic Research Service. *International Agricultural Productivity* data product, September 2023 (visited August 2024).
[2] Index based on six inputs: labor, machinery, livestock, agricultural land, feed, and fertilizers.

Figure 2: Agricultural Output, Inputs, and TFP by Country– (1961-2021)

Source: Authors' calculations based on USDA-ERS data.

An analysis of agricultural output growth decomposition by decade (see **Figure 3**) shows that Haiti underperformed relative to other Caribbean countries during the 1980s and 1990s. This was largely the result of TFP growth lagging behind the subregional average—particularly in the 1990s, when Haiti recorded a TFP decline of 0.4%, compared to a marginal decrease of just 0.02% for the Caribbean as a whole. In contrast, during the 2001–2010 decade, Haiti's agricultural output grew at a faster rate than the subregional average, supported primarily by productivity gains. However, in the most recent decade, the country recorded an average annual output decline of 2.4%, with 94% of this contraction attributable to a drop in TFP and the remaining 6% to reduced input use.

Figure 3: Agricultural Output Growth Decomposition by decade

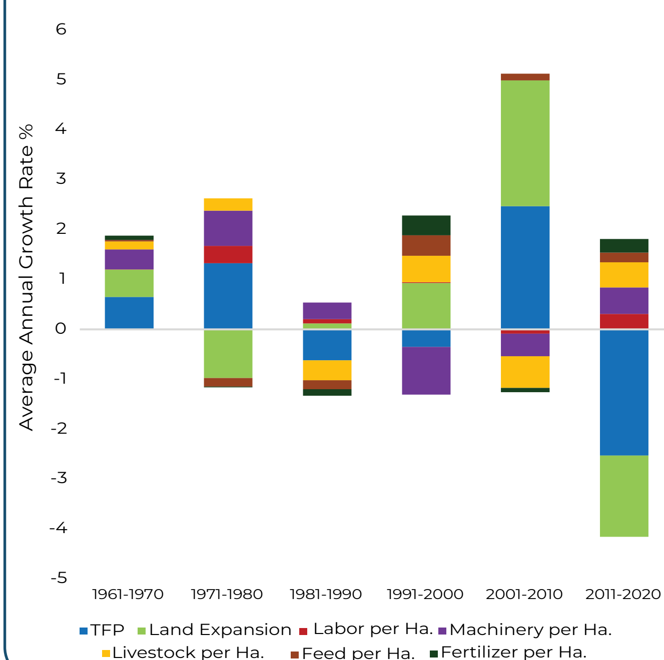


Source: Authors' calculations based on USDA-ERS data.

Figure 4 presents the decomposition of input growth over the past six decades, revealing the following:

1. Land expansion recorded increases beginning in the 1980's; however, its contribution turned negative in the most recent decade.
2. The contribution of labor was slightly positive throughout most of the period analyzed, except during the 2001–2010 decade.
3. In the last decade, livestock feed, fertilizer, and machinery made positive contributions to agricultural output growth.

Figure 4: Resource Decomposition of Agricultural Output Growth - Haiti



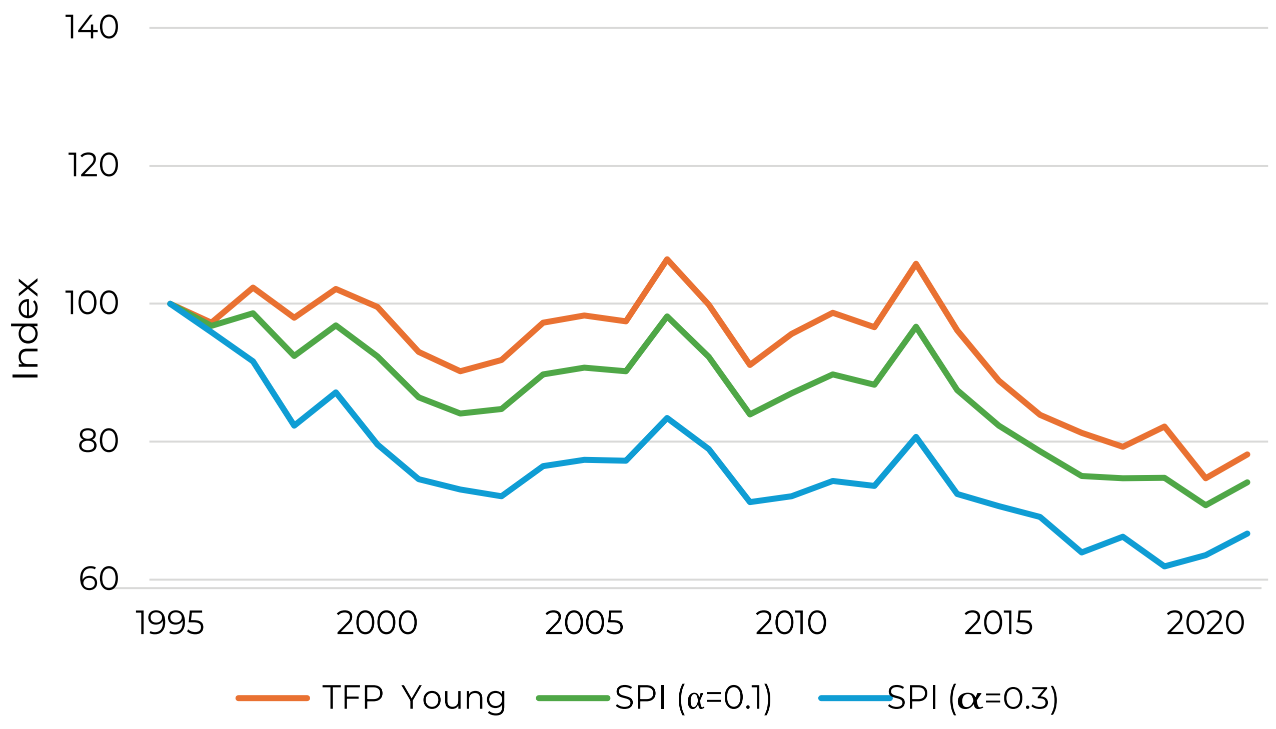
Source: Authors' calculations based on USDA-ERS data.

While the decomposition of agricultural growth allows for the identification of the main drivers of agricultural output, this conventional analysis does not consider the environmental impacts generated by the production process. To address this limitation, Sustainable Productivity Indices (SPI)[3] have been estimated using the Young[4] methodology (see **Figure 5**).

[3] IFPRI and IDB, 2025.
[4] The Geometric Young Index (GY) is a multiplicative index that compares vectors of quantities using weights based on average value shares—derived from average prices when available—fulfilling the axioms of a proper index such as transitivity (O'Donnell, 2018).

The SPI penalizes agricultural output growth based on the magnitude of unwanted byproducts such as greenhouse gas emissions, deforestation, soil erosion, pesticide risk, water stress, and nutrient budget[5]. Consequently, the SPI value varies according to the generation of these byproducts. As shown in the figure below, when a 10% weight is assigned to unwanted byproducts generated by agricultural output, the SPI follows a trajectory similar to that of TFP, accentuating the drop in productivity from -0.9% to -1.1% (TFP vs. SPI) over the past 26 years.

Figure 5: TFP vs. SPI -Haiti



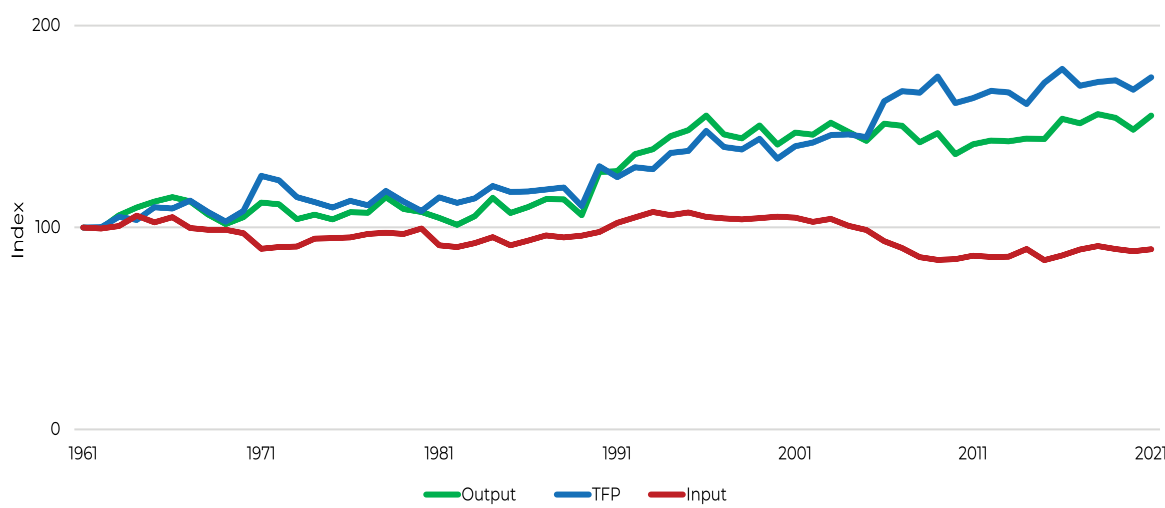
Source: Authors' calculations using FAOSTAT data.

[5] The surplus in the budget corresponds to pollution resulting from the production process, particularly the residual nitrogen in soils following the cropping cycle.

JAMAICA

Over the past sixty years, Jamaica has experienced a 50% increase in agricultural output. An analysis using USDA-ERS[1] data reveals that the country recorded an average annual growth rate of 0.7% (see **Figure 1**), driven primarily by increases in Total Factor Productivity (TFP), which grew at an average annual rate of 0.9%. In contrast, input use declined slightly over the same period, with an average annual decrease of 0.2%. The stronger performance of productivity relative to input use began in the 1971–1980 decade and has persisted in subsequent decades.

Figure 1: Agricultural Output, Inputs, and TFP Jamaica (1961-2021)



Source: Authors' calculations using USDA-ERS data.

In the Caribbean subregion, Jamaica's Total Factor Productivity (TFP) growth has been broadly similar to that of Trinidad and Tobago. However, input use[2] has followed a declining trend, mirroring patterns observed in both Guyana and Trinidad and Tobago. As a result, Jamaica's agricultural output has expanded at a slower pace than the Caribbean average, primarily due to reduced input use (see **Figure 2**).

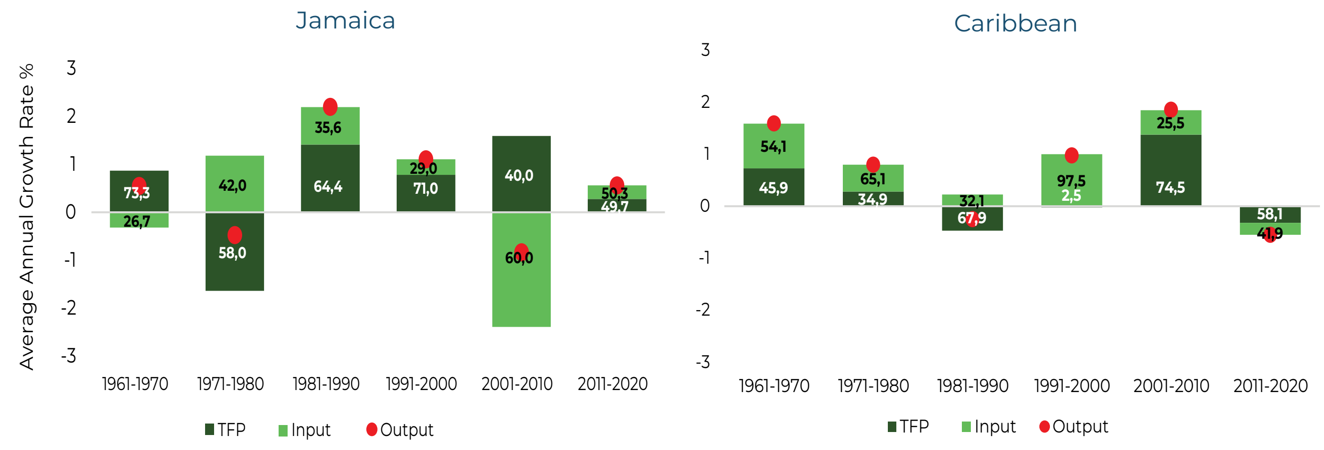
[1] U.S. Department of Agriculture, Economic Research Service. *International Agricultural Productivity* data product, September 2023 (visited August 2024).
[2] Index based on six inputs: labor, machinery, livestock, agricultural land, feed, and fertilizers.

Figure 2: Agricultural Output, Inputs, and TFP by Country– (1961-2021)

Source: Authors' calculations using USDA-ERS data.

An analysis of agricultural output growth decomposition by decade (see **Figure 3**) shows that Jamaica underperformed relative to the Caribbean subregion during the 1960s, 1970s, and 2000s. In the 1960s and 2000s, this weaker growth was primarily due to lower input use. In contrast, the weaker performance in the 1970s was mainly the result of reduced productivity, as Jamaica recorded a TFP decline of 1.6%, compared to the Caribbean average growth of 0.3%. In the most recent decade, Jamaica's average annual output growth was 0.6%, with 50% of this increase attributable to input use and the remaining 50% to TFP growth.

Figure 3: Agricultural Output Growth Decomposition by decade



Source: Authors' calculations using USDA-ERS data.

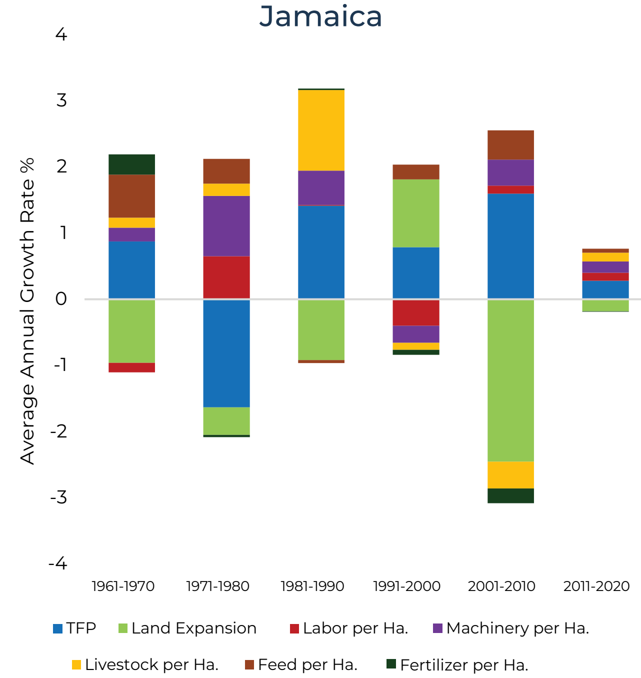
Figure 4 presents the decomposition of input growth over the past six decades, revealing the following:

1. Livestock feed and machinery made positive contributions in five of the six decades analyzed.

2. Land expansion contributed negatively in five of the six decades considered.

3. In the most recent decade, both land expansion and fertilizer use had negative effects on agricultural output growth.

Figure 4: Resource Decomposition of Agricultural Output Growth Jamaica



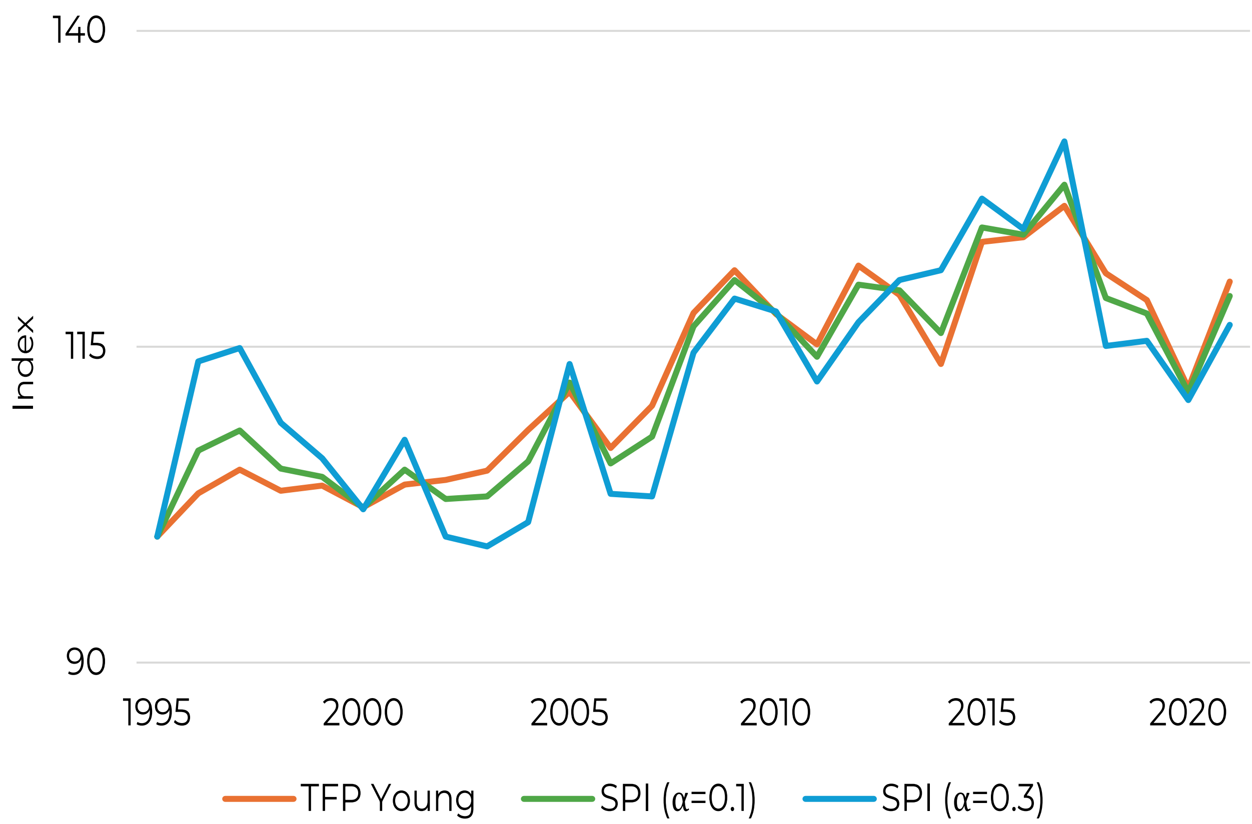
Source: Authors' calculations using USDA-ERS data.

While the decomposition of agricultural growth allows for the identification of the main drivers of agricultural output, this conventional analysis does not consider the environmental impacts generated by the production process. To address this limitation, Sustainable Productivity Indices (SPI)[3] have been estimated using the Young[4] methodology (see **Figure 5**).

[3] IFPRI and IDB, 2025.
[4] The Geometric Young Index (GY) is a multiplicative index that compares vectors of quantities using weights based on average value shares—derived from average prices when available—fulfilling the axioms of a proper index such as transitivity (O'Donnell, 2018).

The SPI penalizes agricultural output growth based on the magnitude of unwanted byproducts such as greenhouse gas emissions, deforestation, soil erosion, pesticide risk, water stress, and nutrient budget[5]. Consequently, the SPI value varies according to the generation of these byproducts. As shown in the figure below, when a 10% weight is assigned to unwanted byproducts generated by agricultural output, the SPI follows a trajectory similar to that of TFP, reducing productivity growth from 0.71% to 0.67% (TFP vs. SPI) over the last 26 years. However, increasing this weight by 30% significantly widens the gap between the two trends. Under this scenario, over the past ten years, sustainable productivity has grown at an average annual rate of 0.39%, compared to 0.42% for TFP.

Figure 5: TFP vs. SPI – Jamaica



Source: Authors' calculations using FAOSTAT data.

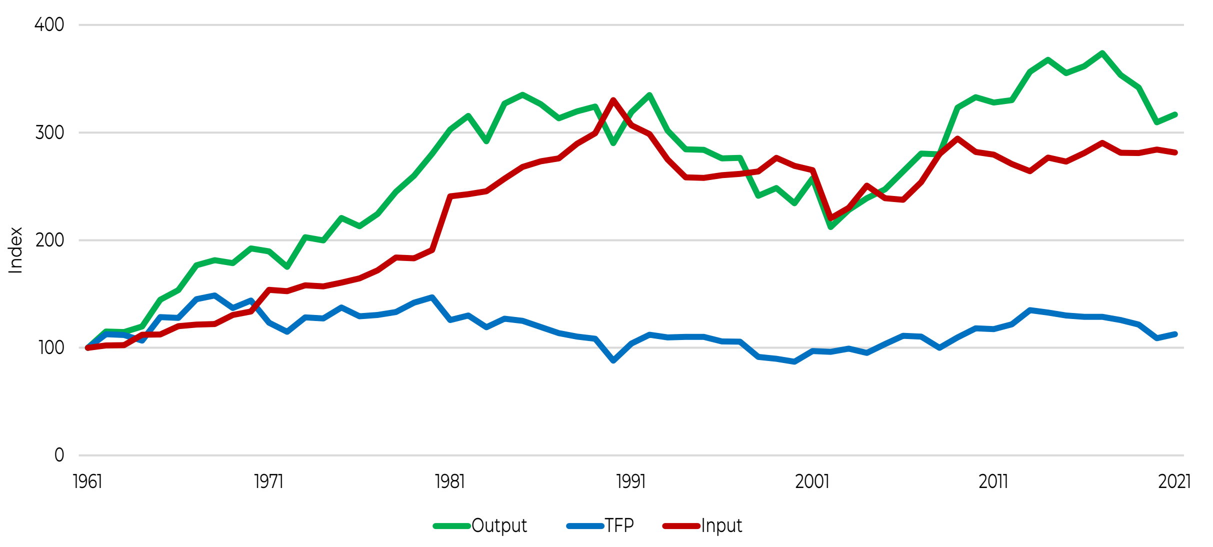
[5] The surplus in the budget corresponds to pollution resulting from the production process, particularly the residual nitrogen in soils following the cropping cycle.

SURINAME

Over the past sixty years, Suriname's agricultural output has tripled. An analysis using USDA-ERS data[1] reveals that the country recorded an average annual growth rate of 1.9% in agricultural production(see **Figure 1**), primarily driven by input use, which grew at an average annual growth rate of 1.7%. In contrast, Total Factor Productivity (TFP) showed only modest growth, averaging 0.2% per year.

Since 1980, productivity has generally recorded negative growth rates, with the exception of the 2001–2010 decade.

Figure 1: Agricultural Output, Inputs, and TFP
Suriname (1961-2021)



Source: Authors' calculations using USDA-ERS data.

Within the Caribbean region, Suriname's TFP growth has been broadly comparable to that of its subregional peers. In terms of input use[2], Suriname has outperformed the subregional average. Overall, Suriname's agricultural output has grown above the subregional average, a trend largely driven by increased input use (see **Figure 2**).

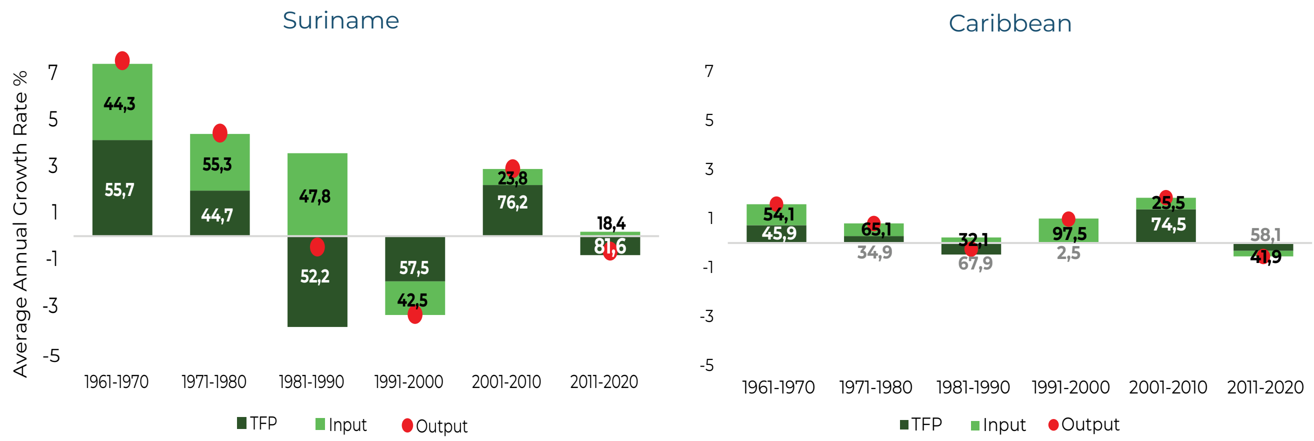
[1] U.S. Department of Agriculture, Economic Research Service. *International Agricultural Productivity* data product, September 2023 (visited August 2024).
[2] Index based on six inputs: labor, machinery, livestock, agricultural land, feed, and fertilizers.

Figure 2: Agricultural Output, Inputs, and TFP by Country– (1961-2021)

Source: Authors' calculations using USDA-ERS data.

An analysis of agricultural output growth decomposition by decade (see **Figure 3**) shows that Suriname outperformed the Caribbean average during the 1960s and 1970s, with TFP increases exceeding the subregional average. This was especially notable in the 1960s, when Suriname's TFP grew by 4.1%, compared to a 0.7% decline in the Caribbean. During the 2000–2010 decade, Suriname's agricultural output once again surpassed the subregional average, driven primarily by productivity gains. However, in the most recent decade, the country experienced an average annual decline in agricultural output of 0.6%, with 18% of the contraction explained by reduced input use and 82% by a drop in TFP.

Figure 3: Agricultural Output Growth Decomposition by decade



Source: Authors' calculations using USDA-ERS data.

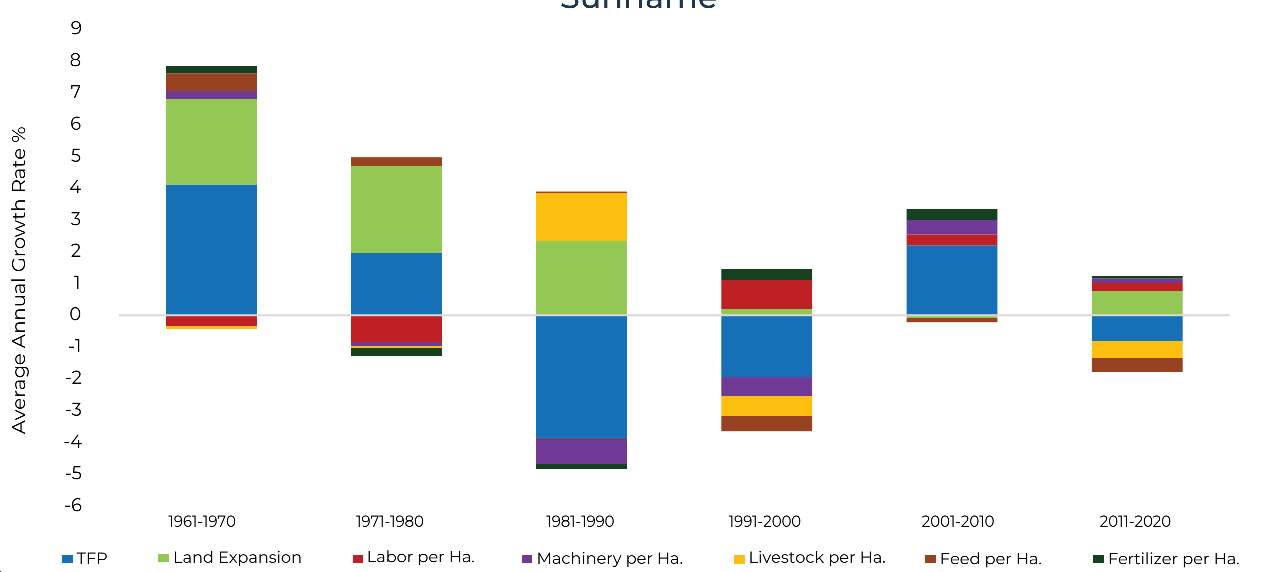
Figure 4 presents the decomposition of input growth over the past six decades, revealing the following:

1. Land expansion showed increases throughout the entire analysis period, with the exception of the 2001–2010 decade.

2. The contribution of labor has been positive since 1990.

3. In the last decade, livestock feed and livestock contributed negatively to agricultural production growth.

Figure 4: Resource Decomposition of Agricultural Output Growth Suriname

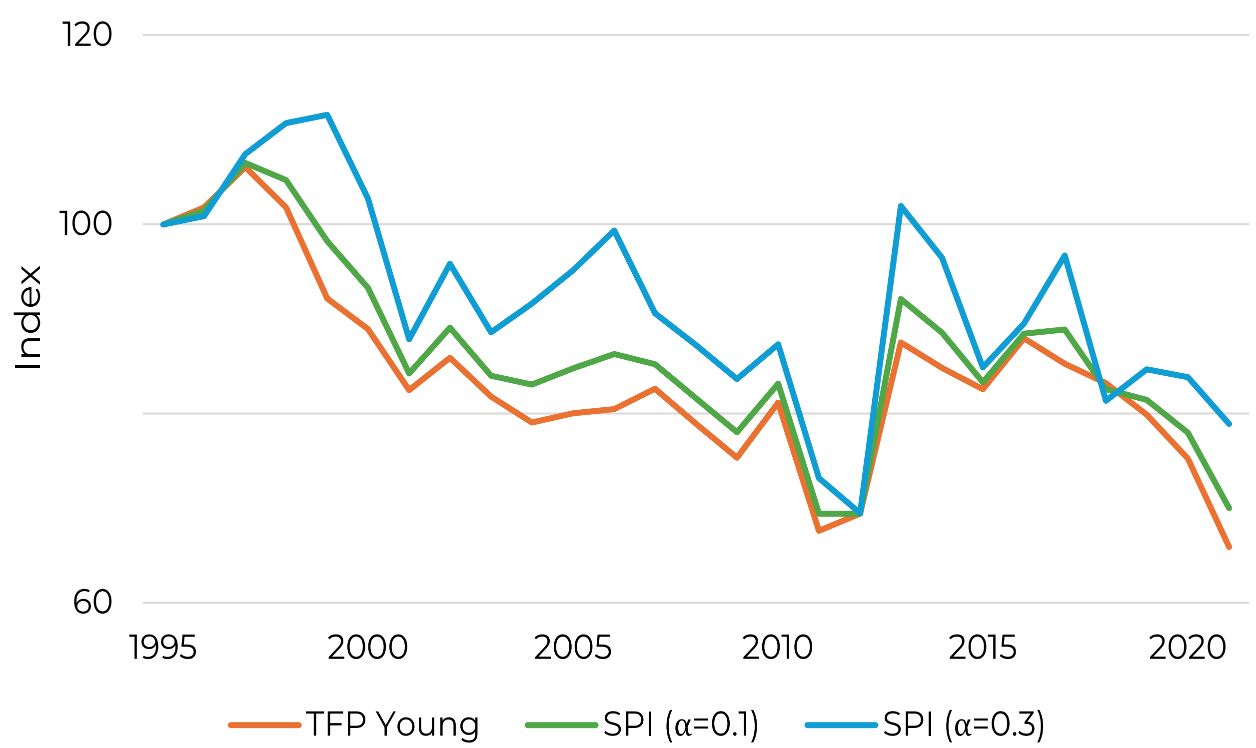


Source: Authors' calculations using USDA-ERS data.

While the decomposition of agricultural growth allows for the identification of the main drivers of agricultural output, this conventional analysis does not consider the environmental impacts generated by the production process. To address this limitation, Sustainable Productivity Indices (SPI)[3] have been estimated using the Young[4] methodology (see **Figure 5**).

The SPI penalizes agricultural output growth based on the magnitude of unwanted byproducts such as greenhouse gas emissions, deforestation, soil erosion, pesticide risk, water stress, and nutrient budget[5]. Consequently, the SPI value varies according to the generation of these byproducts.

Figure 5: TFP vs. SPI – Suriname



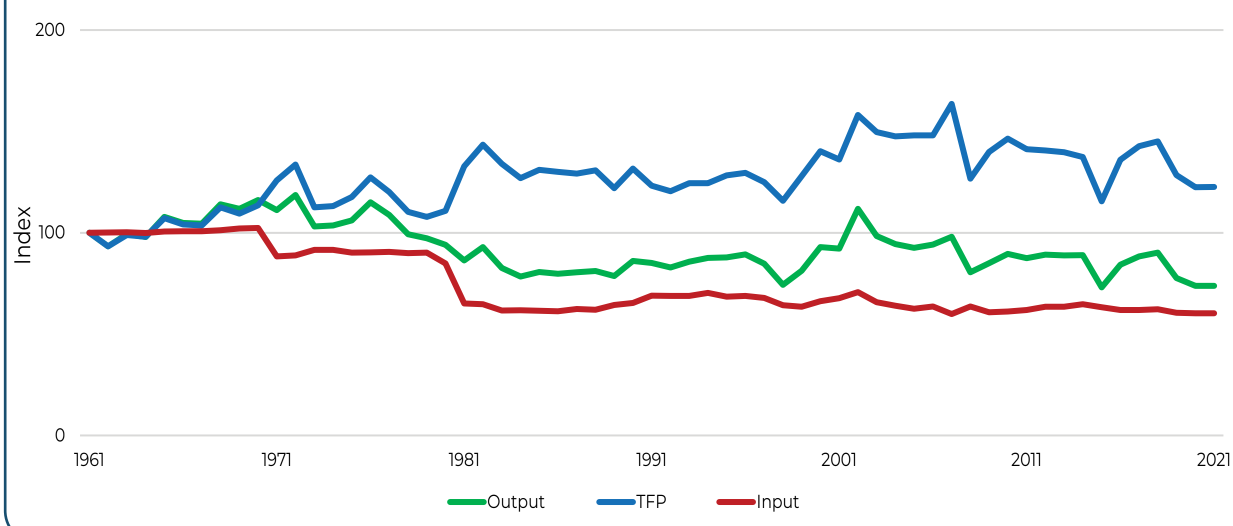
Source: Authors' calculations using FAOSTAT data.

[3] IFPRI and IDB, 2025.
[4] The Geometric Young Index (GY) is a multiplicative index that compares vectors of quantities using weights based on average value shares—derived from average prices when available—fulfilling the axioms of a proper index such as transitivity (O'Donnell, 2018).
[5] The surplus in the budget corresponds to pollution resulting from the production process, particularly the residual nitrogen in soils following the cropping cycle.

TRINIDAD AND TOBAGO

Over the past sixty years, Trinidad and Tobago has experienced a decline in agricultural output. An analysis based on USDA-ERS[1] data shows that the country recorded an average annual decrease of 0.5% in agricultural production (see **Figure 1**), primarily driven by reduced input use, which fell at an average annual rate of 0.8%. In contrast, Total Factor Productivity (TFP) increased at an average annual rate of 0.3%, during this same period. This improvement in productivity relative to input use is a trend that began in the 1960s and has persisted over the years.

Figure 1: Agricultural Output, Inputs, and TFP
Trinidad and Tobago(1961-2021)



Source: Authors' calculations based on USDA-ERS data.

Within the Caribbean, Trinidad and Tobago's TFP growth has been lower than that of Jamaica and Guyana but higher than that of the other countries. In terms of input use[2], it recorded the slowest growth among subregional countries. Overall, the country's agricultural output grew at a rate below the Caribbean average, mainly due to reduced input use (see **Figure 2**).

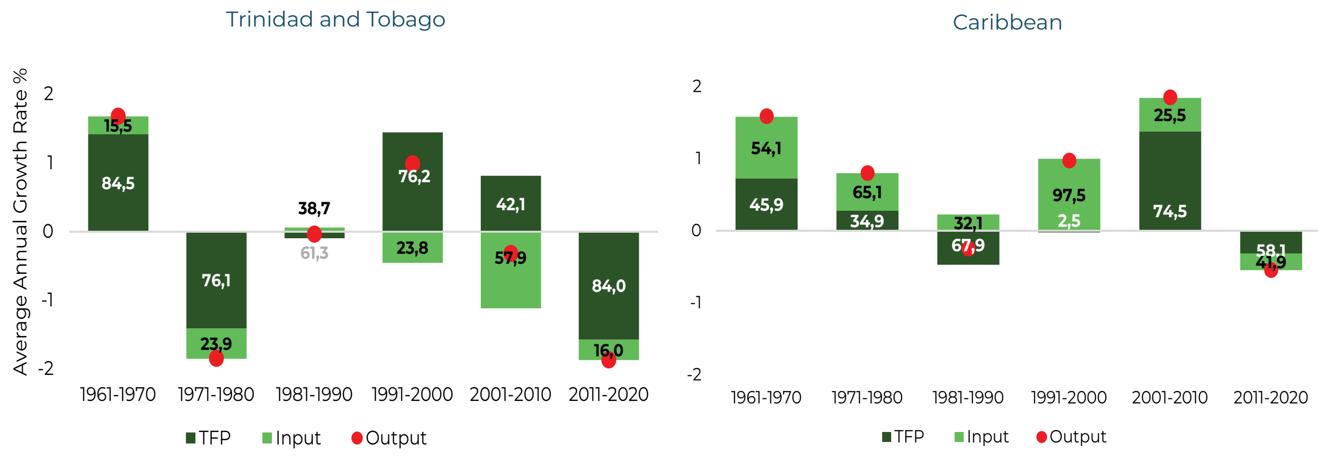
[1] U.S. Department of Agriculture, Economic Research Service. *International Agricultural Productivity* data product, September 2023 (visited August 2024).
[2] Index based on six inputs: labor, machinery, livestock, agricultural land, feed, and fertilizers.

Figure 2: Agricultural Output, Inputs, and TFP by Country– (1961-2021)

Source: Authors' calculations based on USDA-ERS data.

An analysis of agricultural output growth decomposition by decade (see **Figure 3**) shows that Trinidad and Tobago underperformed relative to the Caribbean group during the 1970s, 2000s, and 2010s. In the 1960s and 2010s, weaker output growth was primarily the result of declining productivity. By contrast, in the 2000s, the shortfall was largely attributable to reduced input use—Trinidad and Tobago recorded a decline of 1.1%, compared to the Caribbean average annual growth of 0.5%. In the most recent decade, the country's agricultural output contracted at an average annual rate of 1.9%, with 16% of this decline explained by reduced input use and 84% by a fall in TFP.

Figure 3: Agricultural Output Growth Decomposition by decade



Source: Authors' calculations based on USDA-ERS data.

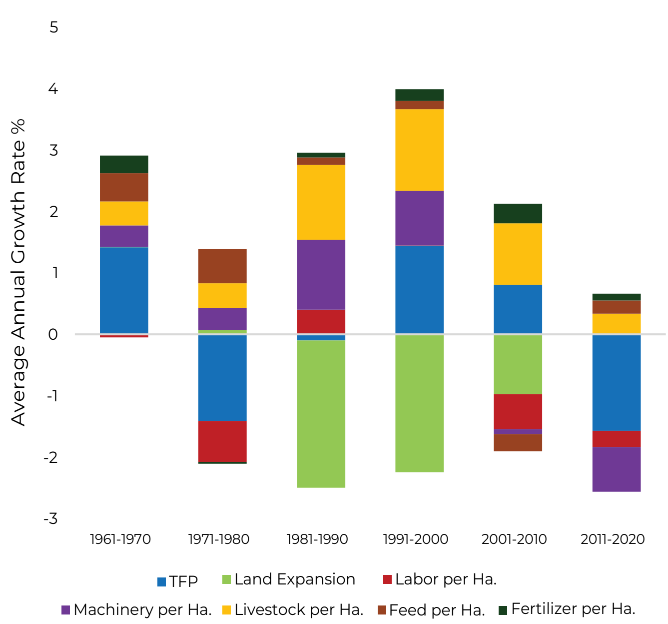
Figure 4 presents the decomposition of input growth over the past six decades, revealing the following:

1. Livestock production has steadily increased over the past sixty years.

2. Contributions from livestock feed and fertilizers were positive in five of the six decades analyzed.

3. In the last decade, only labor and machinery have made negative contributions to agricultural output growth.

Figure 4: Resource Decomposition of Agricultural Output - Trinidad and Tobago



Source: Authors' calculations based on USDA-ERS data.

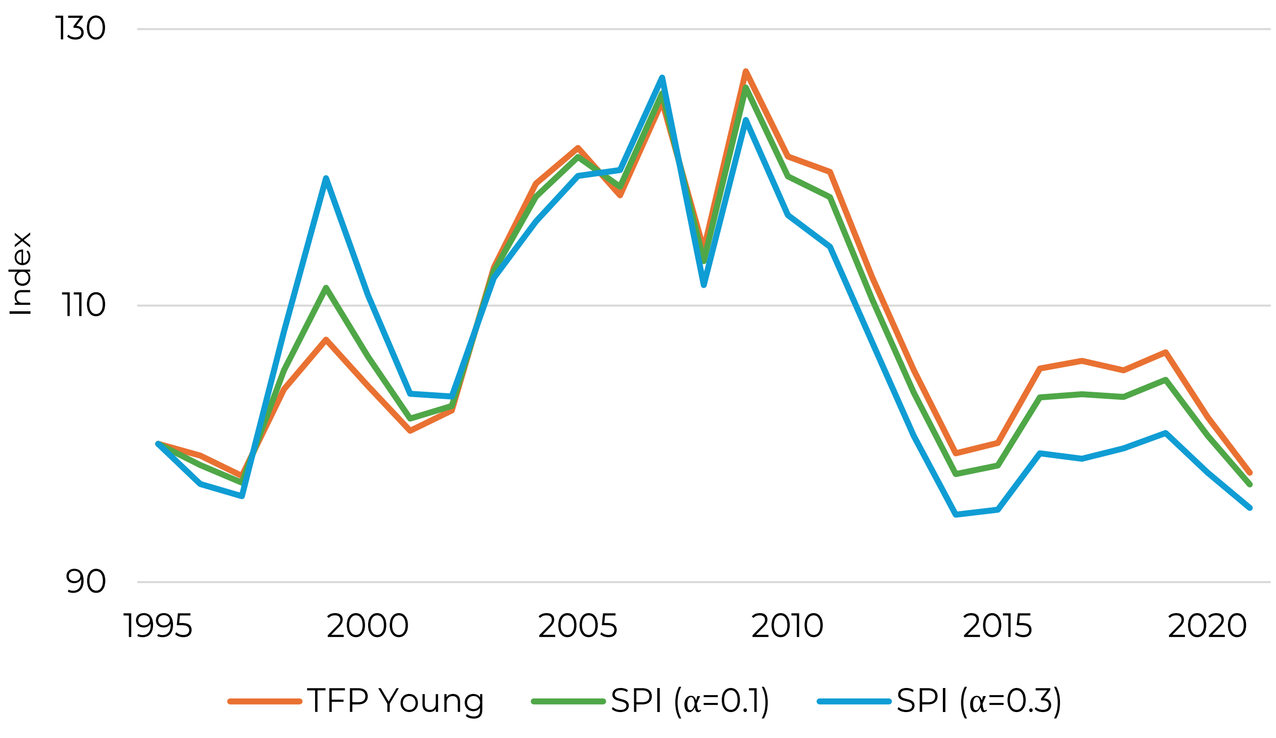
While the decomposition of agricultural growth allows for the identification of the main drivers of agricultural output, this conventional analysis does not consider the environmental impacts generated by the production process. To address this limitation, Sustainable Productivity Indices (SPI)[3] have been estimated using the Young[4] methodology (see **Figure 5**).

[3] IFPRI and IDB, 2025.

[4] The Geometric Young Index (GY) is a multiplicative index that compares vectors of quantities using weights based on average value shares—derived from average prices when available—fulfilling the axioms of a proper index such as transitivity (O'Donnell, 2018).

The SPI penalizes agricultural output growth based on the magnitude of unwanted byproducts such as greenhouse gas emissions, deforestation, soil erosion, pesticide risk, water stress, and nutrient budget[5]. Consequently, the SPI value varies according to the generation of these byproducts. As shown in the figure below, when a 10% weight is assigned to unwanted byproducts generated by agricultural output, the SPI follows a trajectory similar to that of TFP, reducing productivity growth from -0.08% to -0.11% (TFP vs. SPI) over the last 26 years. However, increasing this weight by 30% significantly widens the gap between the two trends.

Figure 5: TFP vs. SPI – Trinidad and Tobago



Source: Authors' calculations using FAOSTAT data.

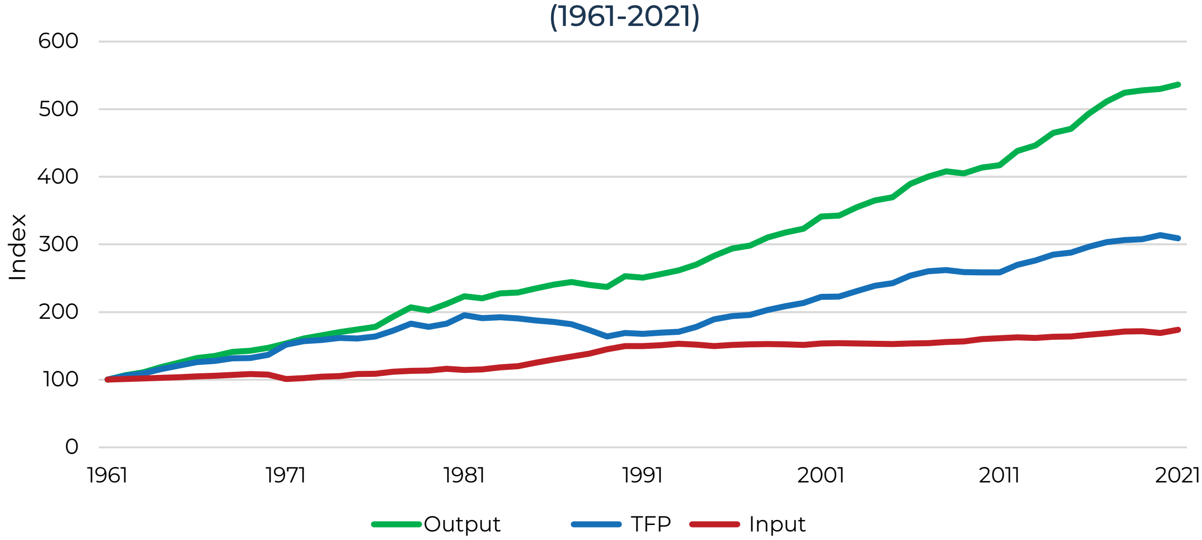
[5] The surplus in the budget corresponds to pollution resulting from the production process, particularly the residual nitrogen in soils following the cropping cycle.

4. CENTRAL AMERICA, MEXICO AND DOMINICAN REPUBLIC

CENTRAL AMERICA, MEXICO AND DOMINICAN REPUBLIC

Over the past sixty years, Central America, Mexico, and the Dominican Republic have experienced significant growth in agricultural production, with output increasing fivefold. An analysis based on USDA-ERS data[1] reveals that the region recorded an average annual growth rate of 2.8% (see **Figure 1**), primarily explained by the increase in Total Factor Productivity (TFP), which grew at an average annual rate of 1.9%. However, this performance included periods of stagnation and even contraction in some years. To a lesser extent, input use[2] also showed a slightly positive trend with an average annual growth rate of 0.9% during the same period. It is worth noting that, in the late eighties, the region experienced a decline in TFP alongside a moderate increase in input use.

Figure 1: Agricultural Output, Inputs, and TFP
Central America, Mexico and Dominican Republic
(1961-2021)

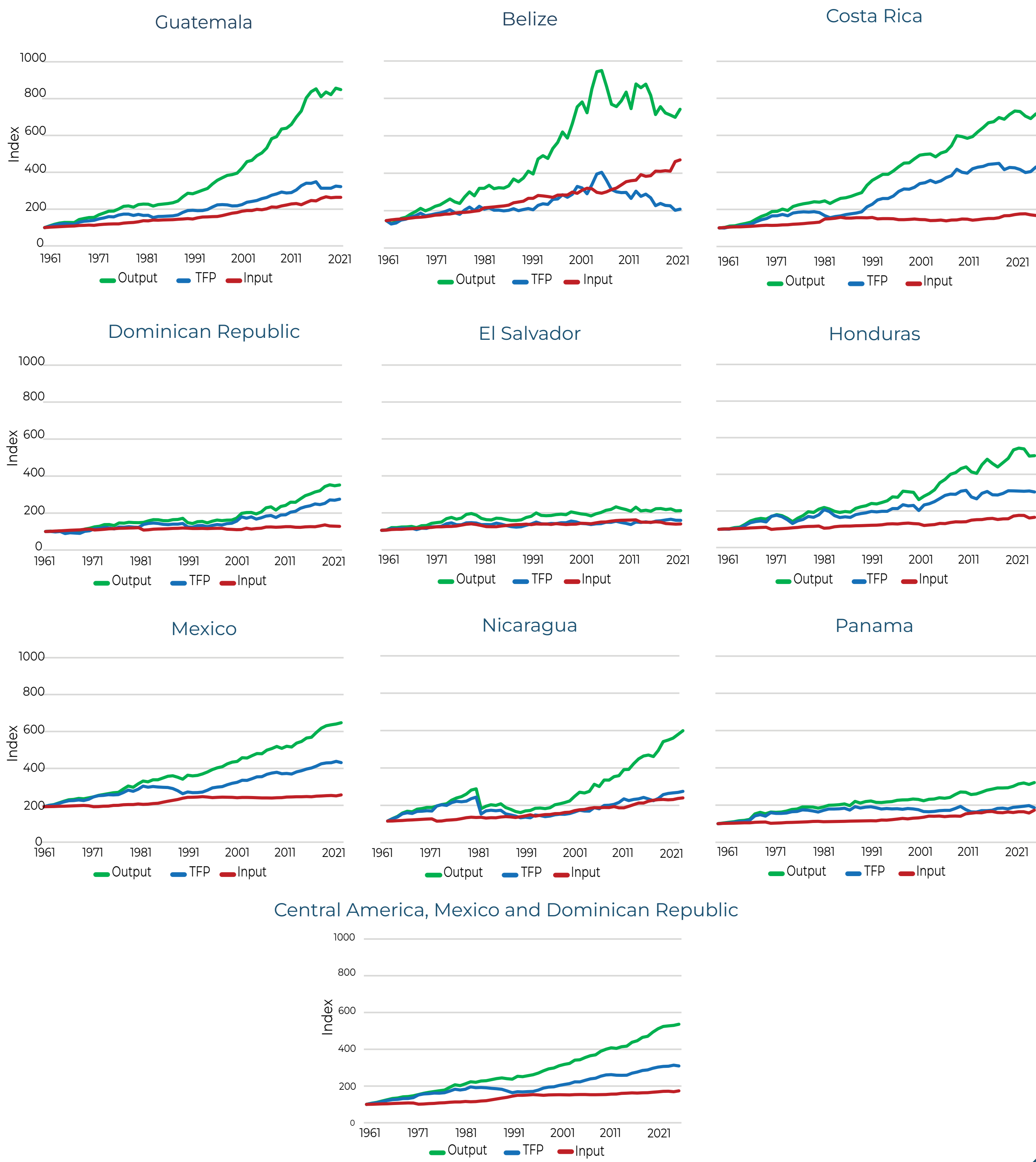


Source: Authors' calculations using USDA-ERS data.

In Central America, countries such as Guatemala, Nicaragua, Honduras, Belize, and Costa Rica followed mixed trajectories in both output and TFP, marked by cycles of growth and decline. Within this group, Guatemala and Belize stood out for experiencing both the most significant increases and the sharpest declines. In contrast, Mexico was the only country in the region that maintained steady output growth throughout the entire period. On the other hand, Panama and El Salvador recorded weaker performance, with output patterns that were either more volatile or largely stagnant. In terms of input use, most countries followed a moderate trajectory, except for Belize and Guatemala, where increases were more pronounced (see **Figure 2**).

[1] U.S. Department of Agriculture, Economic Research Service. *International Agricultural Productivity* data product, September 2023 (visited August 2024).
[2] Index based on six inputs: labor, machinery, livestock, agricultural land, feed, and fertilizers.

Figure 2: Agricultural Output, Inputs and TFP by country-region (1961-2021)

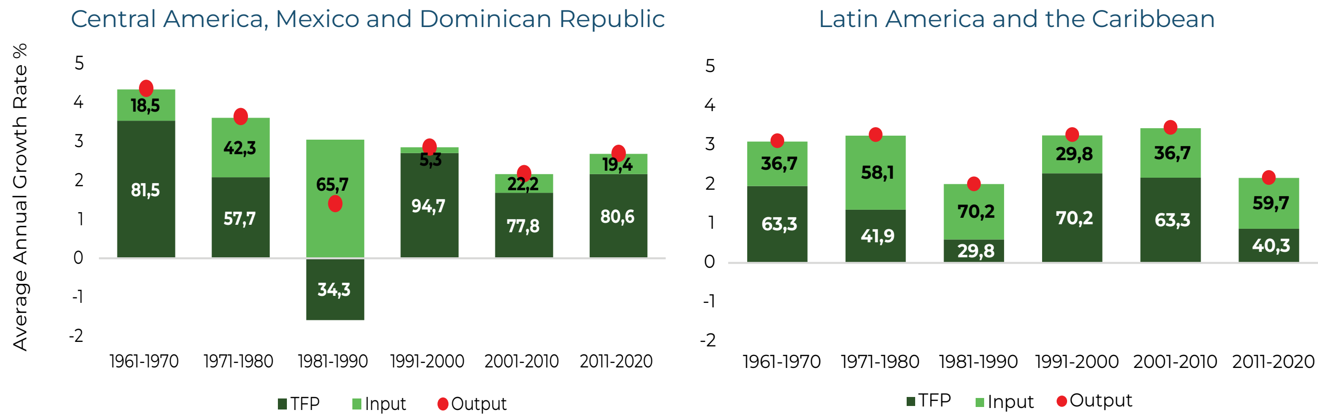


Source: Authors' calculations based on USDA-ERS data.

An analysis of agricultural output growth decomposition by decade (see **Figure 3**) shows that the Central American subregion outperformed the Latin America and Caribbean (LAC) average during the first two decades and once more in the 2010s.

TFP evolution in Central America was frequently higher than the LAC average in four of the six decades analyzed. However, during the 1980s, the subregion experienced a significant decline, with an average annual TFP growth rate of -1.6%, compared to the regional average of 0.6%. In contrast, in the 1960s, the subregion achieved its highest annual TFP growth rate, which closely mirrored the overall trend observed in LAC during that period. In the most recent decade, agricultural output grew significantly, averaging 2.7% annually. Notably, 81% of this growth was driven by TFP improvements (2.2% annually), while only 19% resulted from increased input use.

Figure 3: Agricultural Output Growth Decomposition by decade



Source: Authors' calculations using USDA-ERS data.

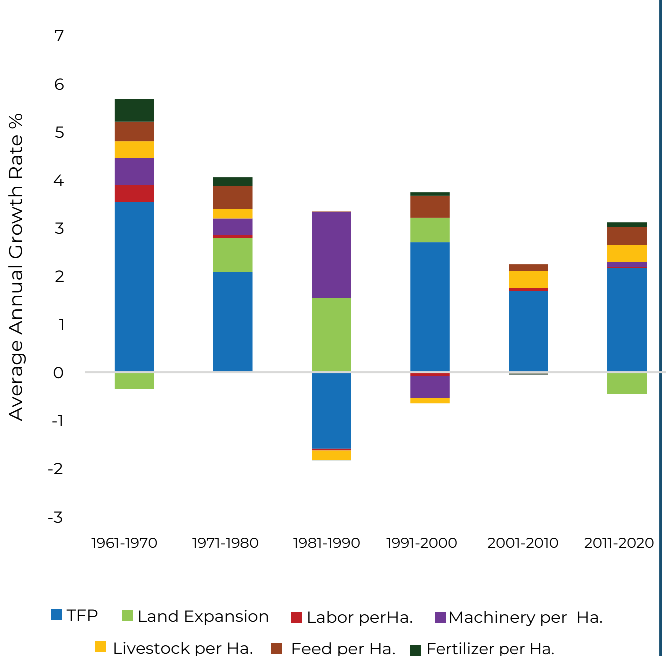
Figure 4 presents the decomposition of input growth over the past six decades, revealing the following:

1. Land expansion has recorded both positive and negative variations throughout the six decades, while labor made negative contributions only during the 1980s and 1990s.

2. Animal feed contributed positively—or at least marginally positively—to agricultural output growth throughout the sixty years analyzed, while fertilizers recorded negative rates in two of the decades.

3. The contribution of machinery was negative during the 1990s and 2000s, while livestock also had a negative impact during the 1980s and 1990s.

Figure 4: Resource Decomposition of Agricultural Output Growth - Central America, Mexico and Dominican Republic

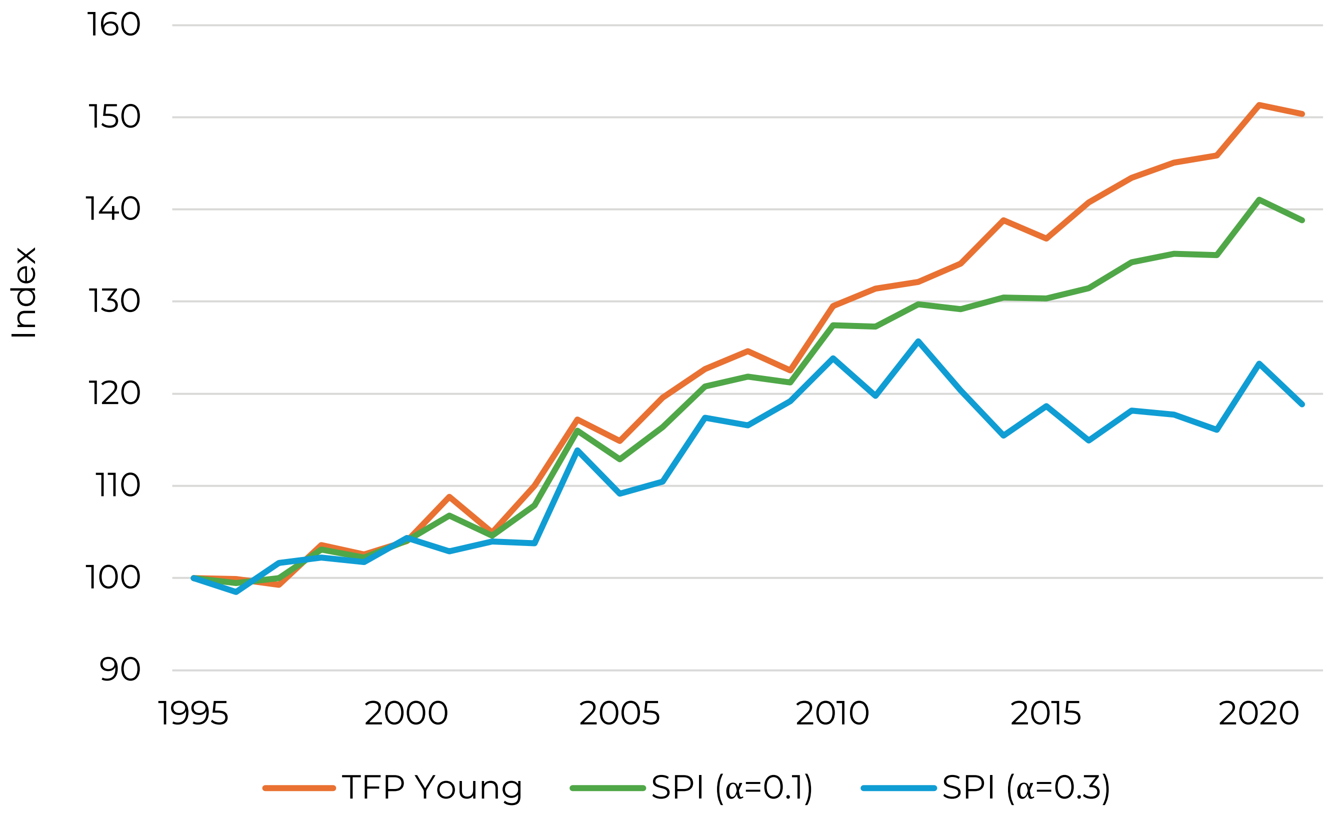


Source: Authors' calculations using USDA-ERS data.

While the decomposition of agricultural growth allows for the identification of the main drivers of agricultural output, this conventional analysis does not consider the environmental impacts generated by the production process. To address this limitation, Sustainable Productivity Indices (SPI)[3] have been estimated using the Young[4] methodology (see **Figure 5)**.

SPI penalizes agricultural output growth based on the magnitude of unwanted byproducts such as greenhouse gas emissions, deforestation, soil erosion, pesticide risk, water stress, and nutrient budget[5]. Consequently, the SPI value varies according to the generation of these byproducts. As shown in the figure below, when a 10% weight is assigned to unwanted byproducts generated by agricultural output, the SPI follows a trajectory similar to that of TFP, reducing productivity growth from 1,6% to 1,3% (TFP vs. SPI) over the last 26 years. However, increasing the weight given to unwanted byproducts to 30% significantly widens the gap between the two trends. Under this scenario, over the past ten years, sustainable productivity has declined at an average annual rate of 0.1%, compared to 1.4% growth in total factor productivity (TFP).

Figure 5: TFP vs. SPI – Central America, Mexico and Dominican Republic



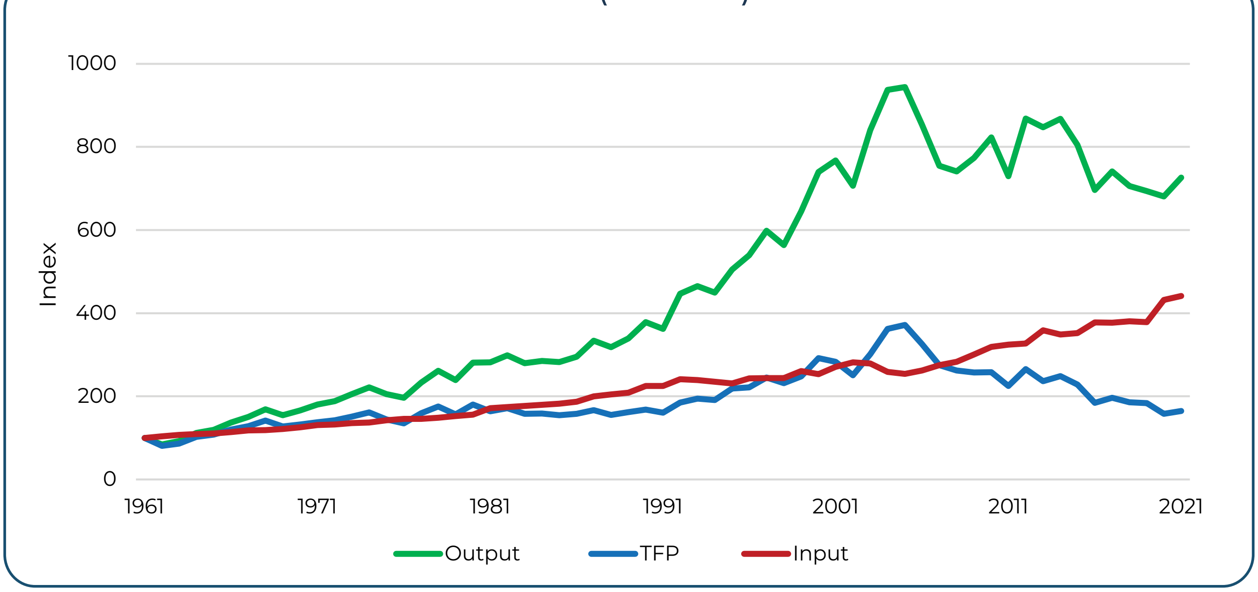
Source: Authors' calculations using FAOSTAT data.

[3] IFPRI and IDB, 2025.
[4] The Geometric Young Index (GY) is a multiplicative index that compares vectors of quantities using weights based on average value shares—derived from average prices when available—fulfilling the axioms of a proper index such as transitivity (O'Donnell, 2018).
[5] The surplus in the budget corresponds to pollution resulting from the production process, particularly the residual nitrogen in soils following the cropping cycle.

BELIZE

Over the past sixty years, Belize has experienced significant growth in agricultural output, increasing ninefold at its peak. An analysis using USDA-ERS data[1] reveals that the country recorded an average annual growth rate of 3.4% in agricultural output (see **Figure 1**), driven primarily by increased input use, which rose at an average annual rate of 2.5%. To a lesser extent, there was a modest improvement in Total Factor Productivity (TFP) during this same period, though this was marked by episodes of stagnation and even contraction in some years, resulting in an average annual TFP growth of 0.8%. However, in the last decade (2010–2020), Belize exhibited a notable decline in TFP, which was reflected in a reduction in agricultural output.

Figure 1: Agricultural Output, Inputs, and TFP
Belize (1961-2021)



Source: Authors' calculations using USDA-ERS data.

In the Central America region, Belize has achieved levels of TFP growth comparable to those of Honduras and Mexico during the first four decades. In terms of input use, Belize showed considerable growth, surpassing the rest of the countries. Overall, the country's agricultural output has increased significantly above the subregional average, supported equally by increases in TFP and a steady evolution in input use[2] (see **Figure 2**).

[1] U.S. Department of Agriculture, Economic Research Service. *International Agricultural Productivity* data product, September 2023 (visited August 2024).
[2] Index based on six inputs: labor, machinery, livestock, agricultural land, feed, and fertilizers.

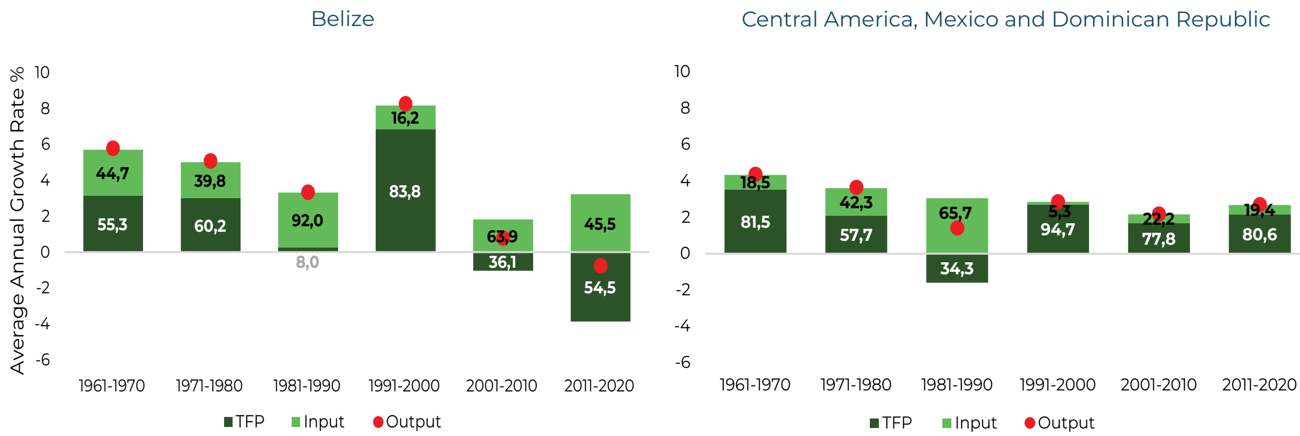
Figure 2: Agricultural Output, Inputs and TFP by country-region (1961-2021)

Source: Authors' calculations using USDA-ERS data.

An analysis of the agricultural output growth decomposition by decade (see **Figure 3**), shows that Belize outperformed other Central American countries in most periods —except for the last two decades.

The country's TFP improvements exceeded the subregional average in several decades, most notably in the 1990s, when TFP increased by 6.8% annually compared compared to the Central American average of 2.7%. However, Belize also experienced significant TFP setbacks, particularly during the 2000s, when it registered an average annual decline of 1.0%, in contrast to the regional increase of 1.7%. A similar trend was observed in the 2010s, when Belize's agricultural output fell by an average of 0.8% per year, with 46% of the decline explained by reduced input use and 54% by a drop in TFP.

Figure 3: Agricultural Output Growth Decomposition by decade



Source: Authors' calculations using USDA-ERS data.

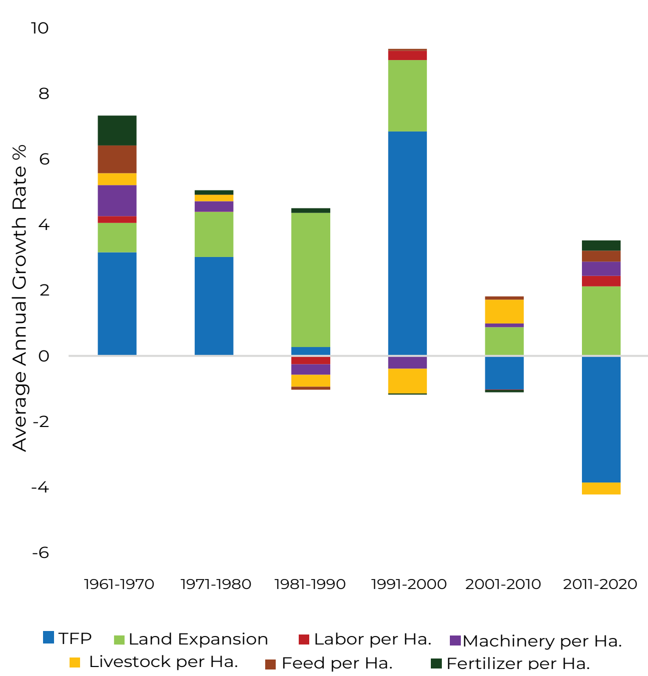
Figure 4 presents the decomposition of input growth over the past six decades, revealing the following:

1. Land expansion has increased over the past sixty years, while labor has contributed moderately or negatively.

2. Throughout the six decades analyzed, the contribution of materials (fertilizers and animal feed) showed a decreasing trend, with the exception of the last decade.

3. The contribution of capital (machinery and livestock) to agricultural output growth has been variable, with both positive and negative rates.

Figure 4: Resource Decomposition of Agricultural Output Growth- Belize

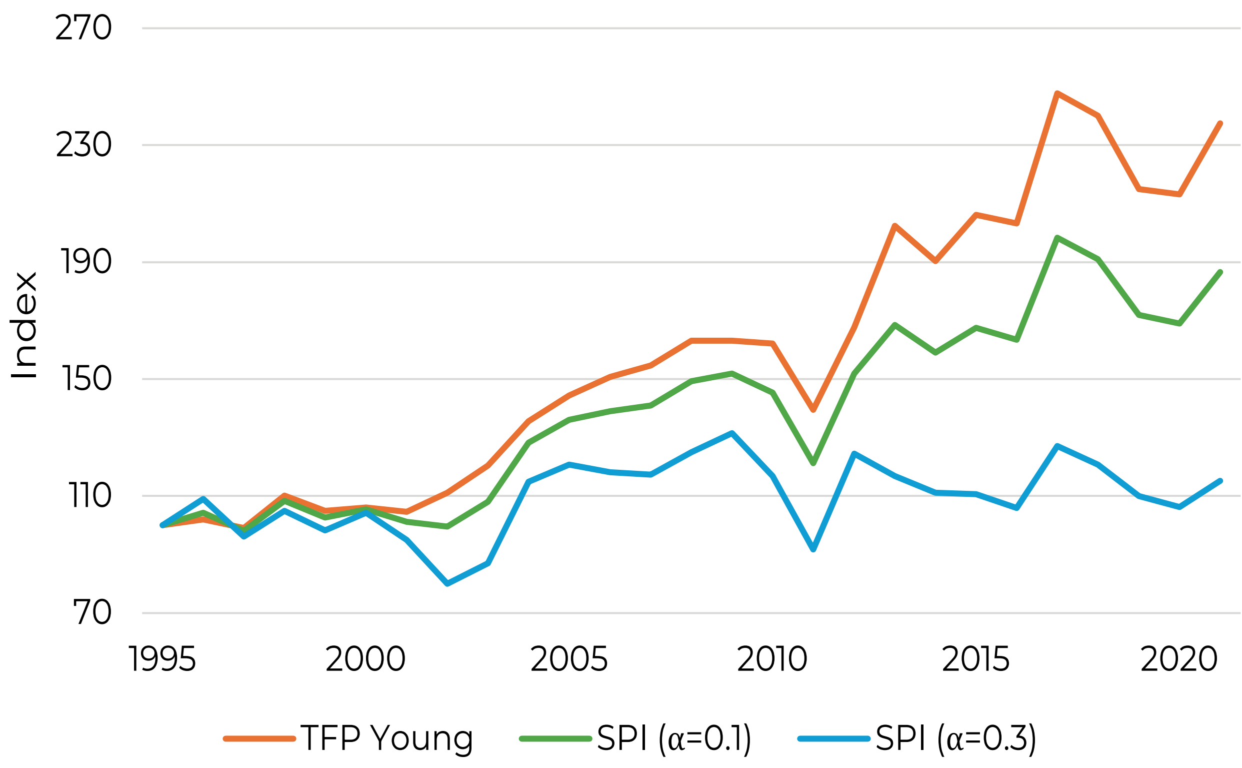


Source: Authors' calculations using USDA-ERS data.

While the decomposition of agricultural growth allows for the identification of the main drivers of agricultural output, this conventional analysis does not consider the environmental impacts generated by the production process. To address this limitation, Sustainable Productivity Indices (SPI)[3] have been estimated using the Young[4] methodology (see **Figure 5**).

The SPI penalizes agricultural output growth based on the magnitude of unwanted byproducts such as greenhouse gas emissions, deforestation, soil erosion, pesticide risk, water stress, and nutrient budget[5]. Consequently, the SPI value varies according to the generation of these byproducts. As shown in the figure below, when a 10% weight is assigned to unwanted byproducts generated by agricultural output, the SPI follows a trajectory similar to that of TFP, reducing productivity growth from 3.4% to 2.4% (TFP vs. SPI) over the last 26 years. However, increasing the weight given to unwanted byproducts to 30% significantly widens the gap between the two trends. Under this scenario, over the past ten years, sustainable productivity has grown by an average of 2.3% annually, compared with 5.5% for TFP.

Figure 5: TFP vs. SPI – Belize



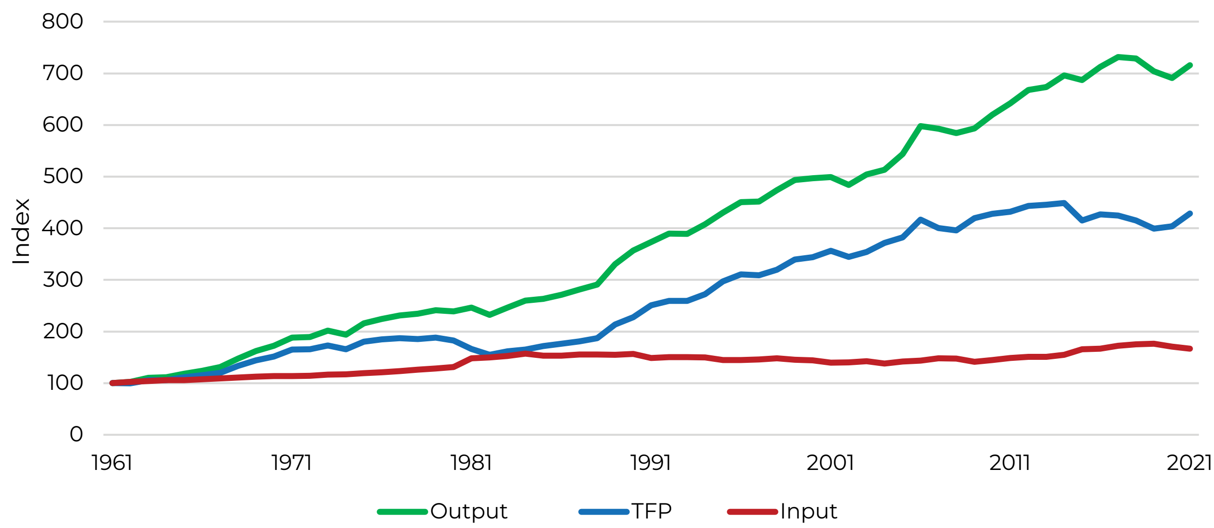
Source: Authors' calculations using FAOSTAT data.

[3] IFPRI and IDB, 2025.
[4] The Geometric Young Index (GY) is a multiplicative index that compares vectors of quantities using weights based on average value shares—derived from average prices when available—fulfilling the axioms of a proper index such as transitivity (O'Donnell, 2018).
[5] The surplus in the budget corresponds to pollution resulting from the production process, particularly the residual nitrogen in soils following the cropping cycle.

COSTA RICA

Over the past sixty years, Costa Rica has experienced significant growth in agricultural output, increasing sevenfold. An analysis based on USDA-ERS data[1] reveals that the country recorded an average annual growth rate of 3.3% in agricultural output (see **Figure 1**), primarily driven by gains in Total Factor Productivity (TFP). While its performance included periods of stagnation and even contraction in some years, it achieved an average annual growth rate of 2.5%. To a lesser extent, input use also contributed, with a modestly positive trend averaging 0.8% annually. Although Costa Rica's performance included periods of stagnation and even contraction, the overall trajectory was positive. However, in the most recent decade (2010–2020), the country experienced a notable stagnation in agricultural output, in sharp contrast to the expansion observed in earlier decades.

Figure 1: Agricultural Output, Input, and TFP
Costa Rica (1961-2021)

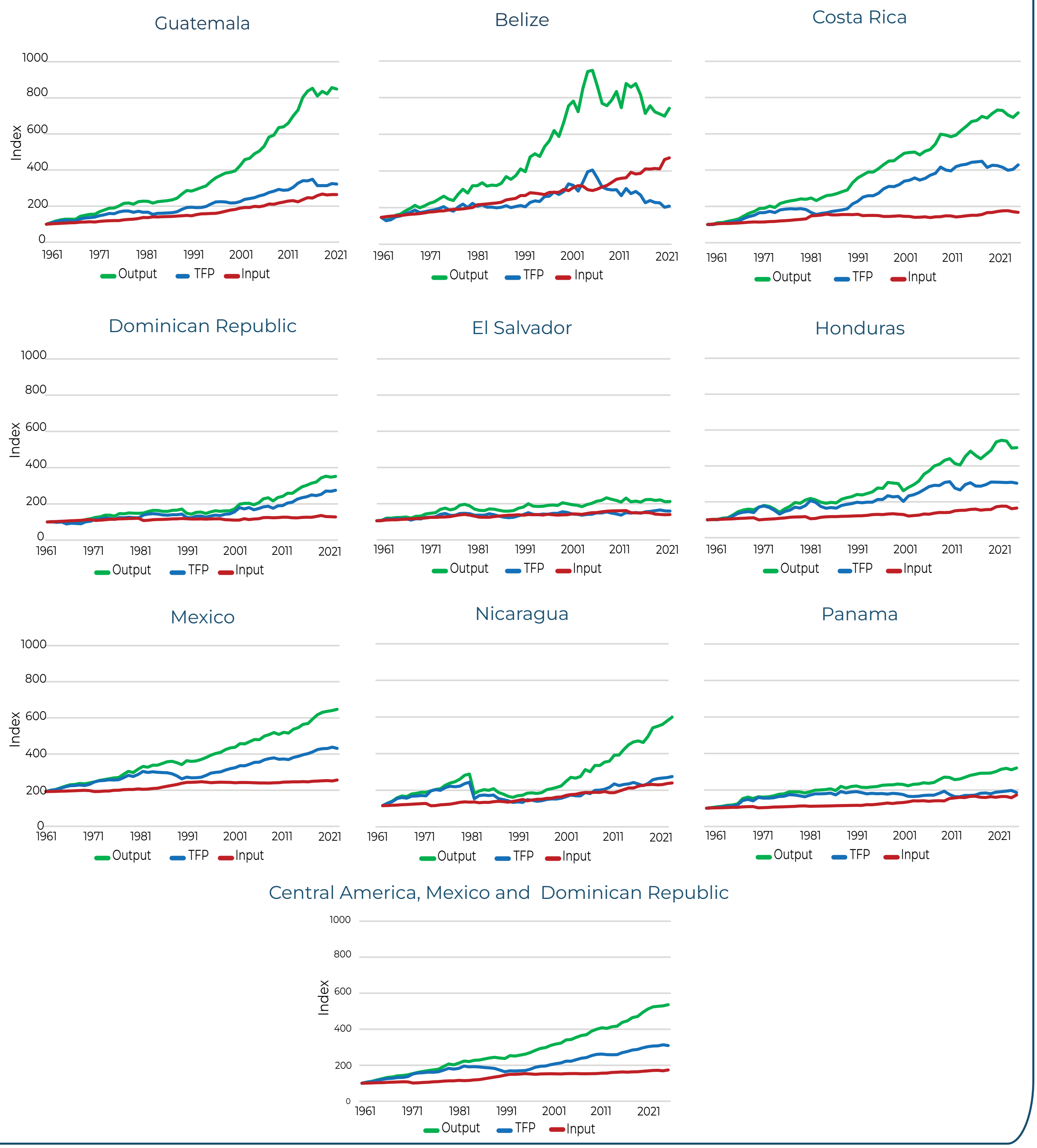


Source: Authors' calculations using USDA-ERS data.

In the Central America region, Costa Rica has achieved TFP growth rates comparable to those of Guatemala and Mexico. In terms of input use, the country has followed growth patterns similar to those of the Dominican Republic, El Salvador, Honduras, and Panama. Overall, Costa Rica's agricultural output has increased well above the Central American average, largely driven by stronger TFP growth and steady increases in input use[2] (see **Figure 2**).

[1] U.S. Department of Agriculture, Economic Research Service. *International Agricultural Productivity* data product, September 2023 (visited August 2024).
[2] Index based on six inputs: labor, machinery, livestock, agricultural land, feed, and fertilizers.

Figure 2: Agricultural Output, Inputs and TFP by country-region (1961-2021)

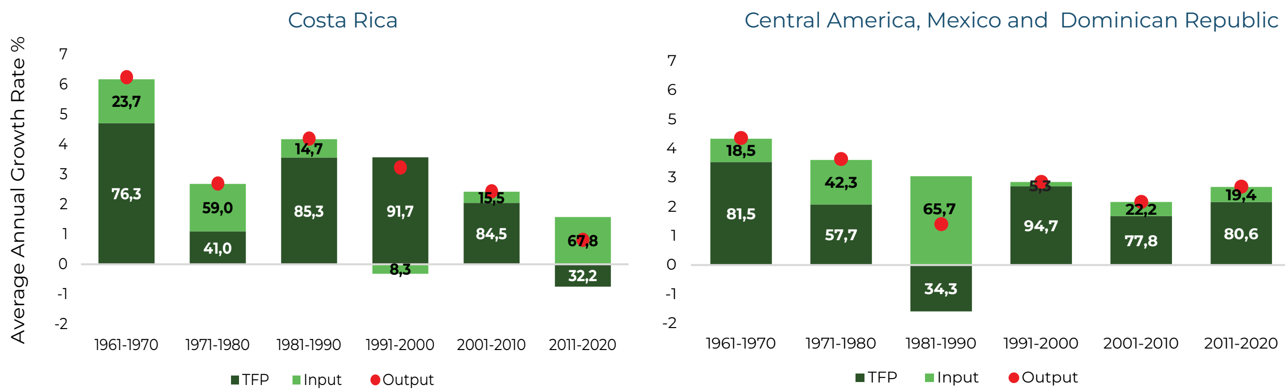


Source: Authors' calculations using USDA-ERS data.

An analysis of agricultural output growth decomposition by decade (see **Figure 3**) shows that Costa Rica outperformed other Central American countries, except during the 1970s and the 2010s.

Over several decades, the country recorded TFP gains above the subregional average — especially during the 1960s, with an annual growth rate of 4.7% compared to 3.5% for Central America, and in the 1990s, with an annual average of 3.5% versus 2.7% for the subregion. However, the country also faced notable setbacks, particularly in the 2010s, when agricultural output grew at an average annual rate of just 0.8%. During this period, 68% of growth was explained by higher input use, while the remaining 32% reflected a decline in TFP.

Figure 3: Agricultural Output Growth Decomposition by decade



Source: Authors' calculations using USDA-ERS data.

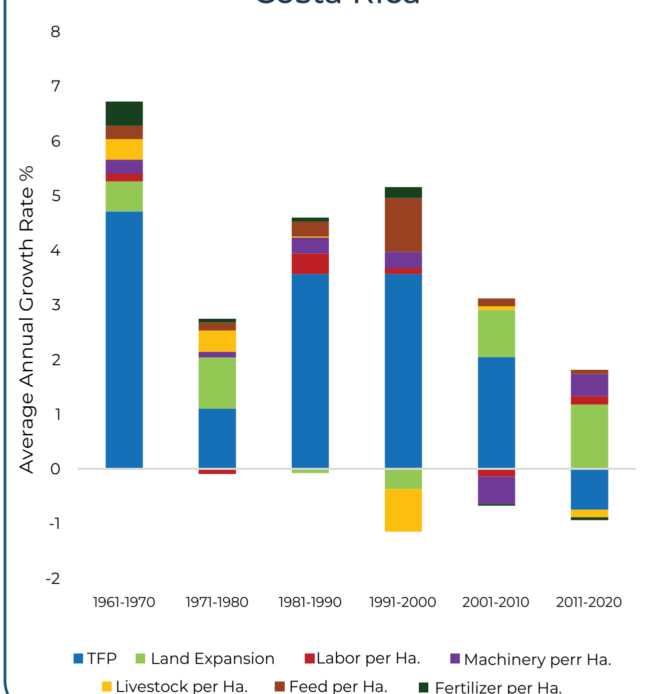
Figure 4 presents the decomposition of input growth over the past six decades, revealing the following:

1. Land expansion showed both positive and negative variations throughout the sixty years period, while labor made a positive contribution in nearly every decade.

2. Over the six decades, the contribution of materials (fertilizers and animal feed) declined.

3. The contribution of capital (machinery and livestock) to agricultural output growth has decreased during the last three decades.

Figure 4: Resource Decomposition of Agricultural Output Growth Costa Rica

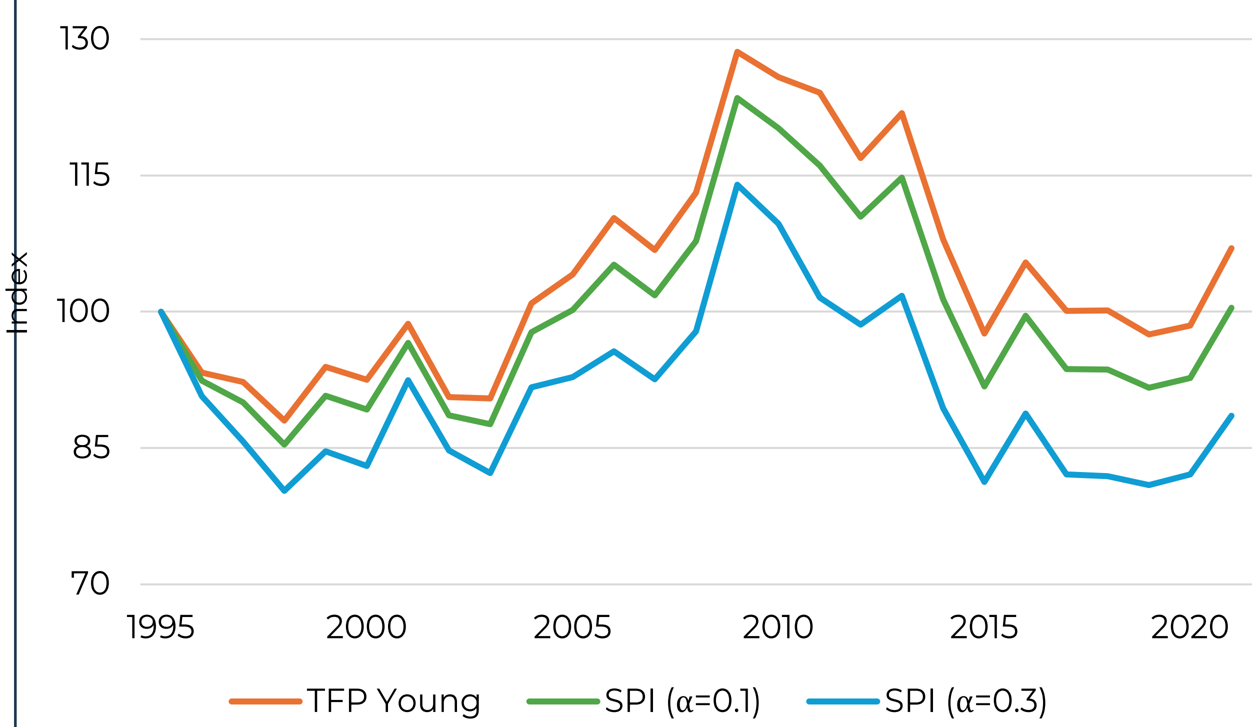


Source: Authors' calculations using USDA-ERS data.

While the decomposition of agricultural growth allows for the identification of the main drivers of agricultural output, this conventional analysis does not consider the environmental impacts generated by the production process. To address this limitation, Sustainable Productivity Indices (SPI)[3] have been estimated using the Young[4] methodology (see **Figure 5**).

The SPI penalizes agricultural output growth based on the magnitude of unwanted byproducts such as greenhouse gas emissions, deforestation, soil erosion, pesticide risk, water stress, and nutrient budget[5]. Consequently, the SPI value varies according to the generation of these byproducts. As shown in the figure below, when a 10% weight is assigned to unwanted byproducts generated by agricultural output, the SPI follows a trajectory similar to that of TFP, reducing productivity growth from 0,3% to 0,02% (TFP vs. SPI) over the last 26 years. However, increasing the weight given to unwanted byproducts to 30% significantly widens the gap between the two trends.

Figure 5: TFP vs. SPI – Costa Rica



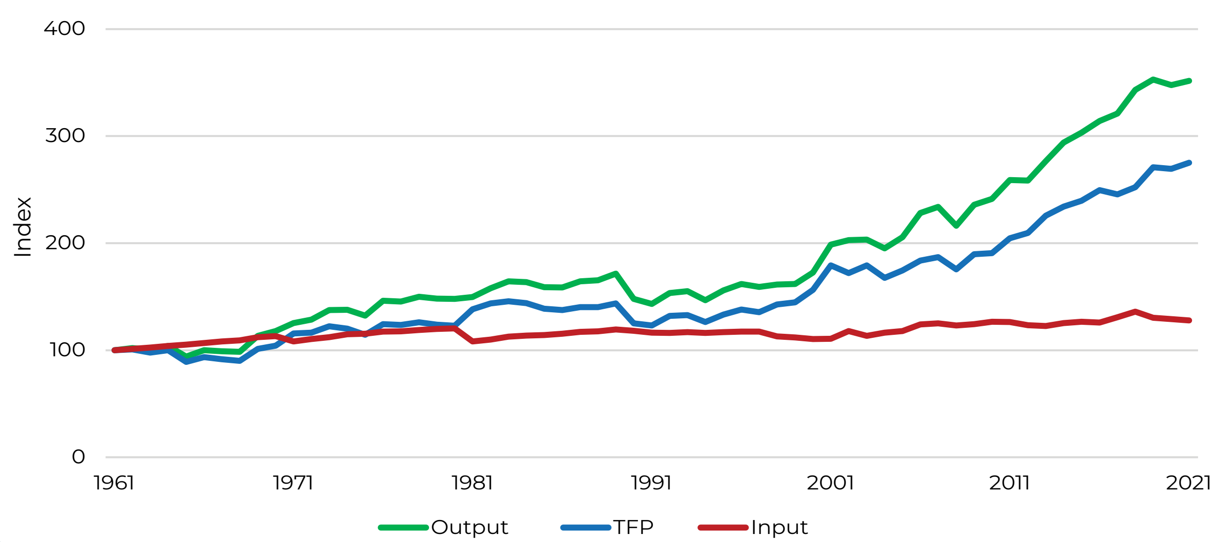
Source: Authors' calculations using FAOSTAT data.

[3] IFPRI and IDB 2025.
[4] The Geometric Young Index (GY) is a multiplicative index that compares vectors of quantities using weights based on average value shares—derived from average prices when available—fulfilling the axioms of a proper index such as transitivity (O'Donnell, 2018).
[5] The surplus in the budget corresponds to pollution resulting from the production process, particularly the residual nitrogen in soils following the cropping cycle.

DOMINICAN REPUBLIC

Over the past sixty years, the Dominican Republic has experienced a substantial growth in agricultural production, with output tripling. An analysis based on USDA-ERS data[1] reveals that the country recorded an average annual agricultural output growth rate of 2.1% (see **Figure 1**), primarily driven by gains in Total Factor Productivity (TFP), which increased at an average annual rate of 1.7%. Input use also contributed modestly, rising at an average annual rate of 0.4% during the same period. This performance, however, included episodes of stagnation and even contraction. Notably, since 2000, the Dominican Republic has recorded marked improvements in agricultural output, in clear contrast to the patterns observed in earlier decades.

Figure 1: Agricultural Output, Inputs, and TFP
Dominican Republic (1961–2021)



Source: Authors' calculations using USDA-ERS data.

Within the Central America region, the Dominican Republic has achieved TFP growth rates comparable to those of Honduras, Guatemala, and Mexico. In terms of input use, its growth has mirrored patterns observed in Costa Rica, El Salvador, and Panama. Overall, Dominican Republic's agricultural output has grown at a rate below the Central American average, driven primarily by TFP gains, while input use[2] has remained relatively modest (see **Figure 2**).

[1] U.S. Department of Agriculture, Economic Research Service. *International Agricultural Productivity* data product, September 2023 (visited August 2024).
[2] Index based on six inputs: labor, machinery, livestock, agricultural land, feed, and fertilizers.

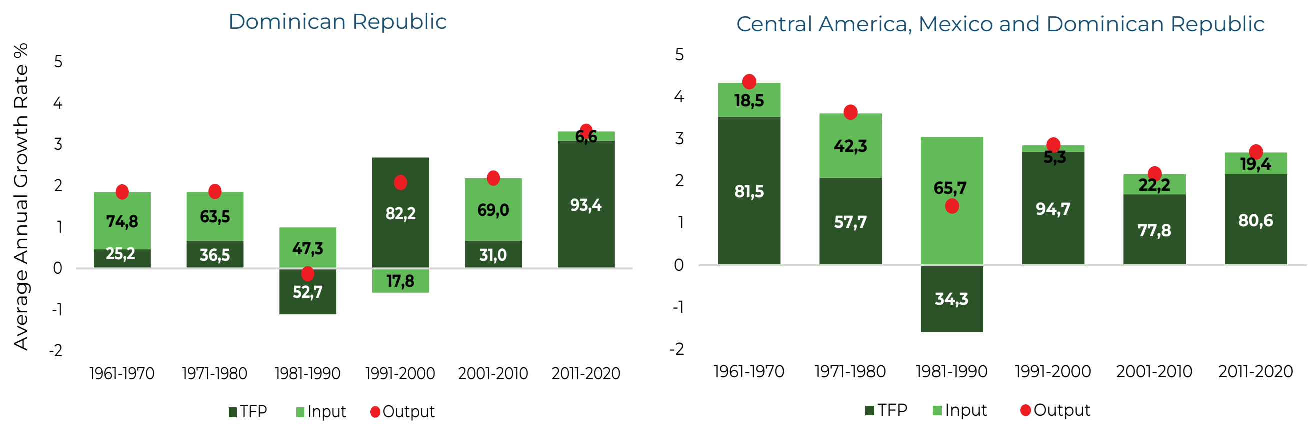
Figure 2: Agricultural Output, Inputs and TFP by country-region (1961-2021)

Source: Authors' calculations using USDA-ERS data.

An analysis of agricultural output growth decomposition by decade (see **Figure 3**) shows that, over the past 30 years, the Dominican Republic has performed strongly compared to other Central American countries.

In several decades, the country recorded TFP growth rates close to or above the subregional average—most notably in the 1990s, with an annual rate of 2.68% compared to 2.7% for Central America, and in the most recent decade, with an average annual rate of 3.1%, versus 2.1% for the subregion. During this latest period, agricultural output grew at an average of 3.3% per year, driven primarily by productivity improvements: 93% of the growth was attributed to TFP gains and only 7% to input use. However, the country also experienced setbacks, particularly in the 1980s, when agricultural output declined slightly, with an average annual rate of –0.1%.

Figure 3: Agricultural Output Growth Decomposition by decade



Source: Authors' calculations using USDA-ERS data.

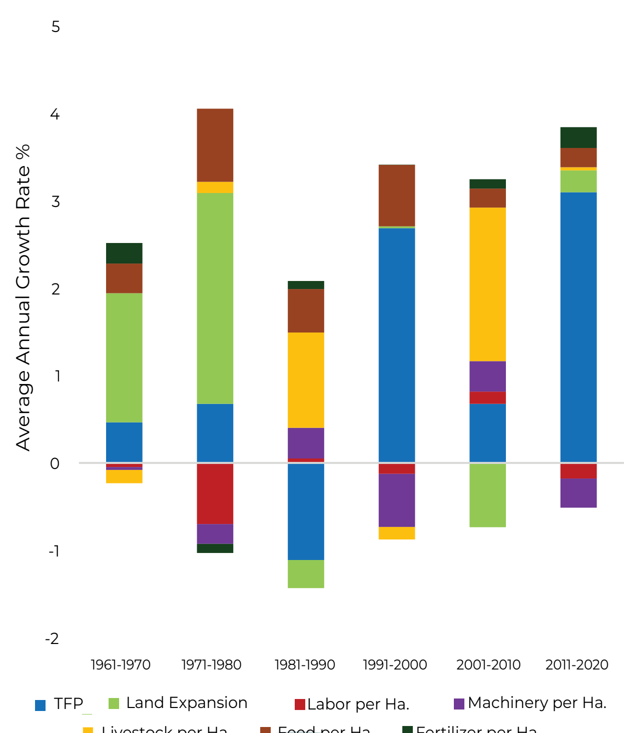
Figure 4 presents the input growth decomposition over the past six decades, revealing the following:

1. Over the last sixty years, land expansion and labor contribution showed both positive and negative variations, with significant impacts in both directions.

2. In the last four decades, the contribution of materials (fertilizers and animal feed) has been positive.

3. The contribution of capital (machinery and livestock) to agricultural output has shown substantial variation, with both positive and negative growth over the six decades.

Figure 4: Resource Decomposition of Agricultural Output Growth Dominican Republic

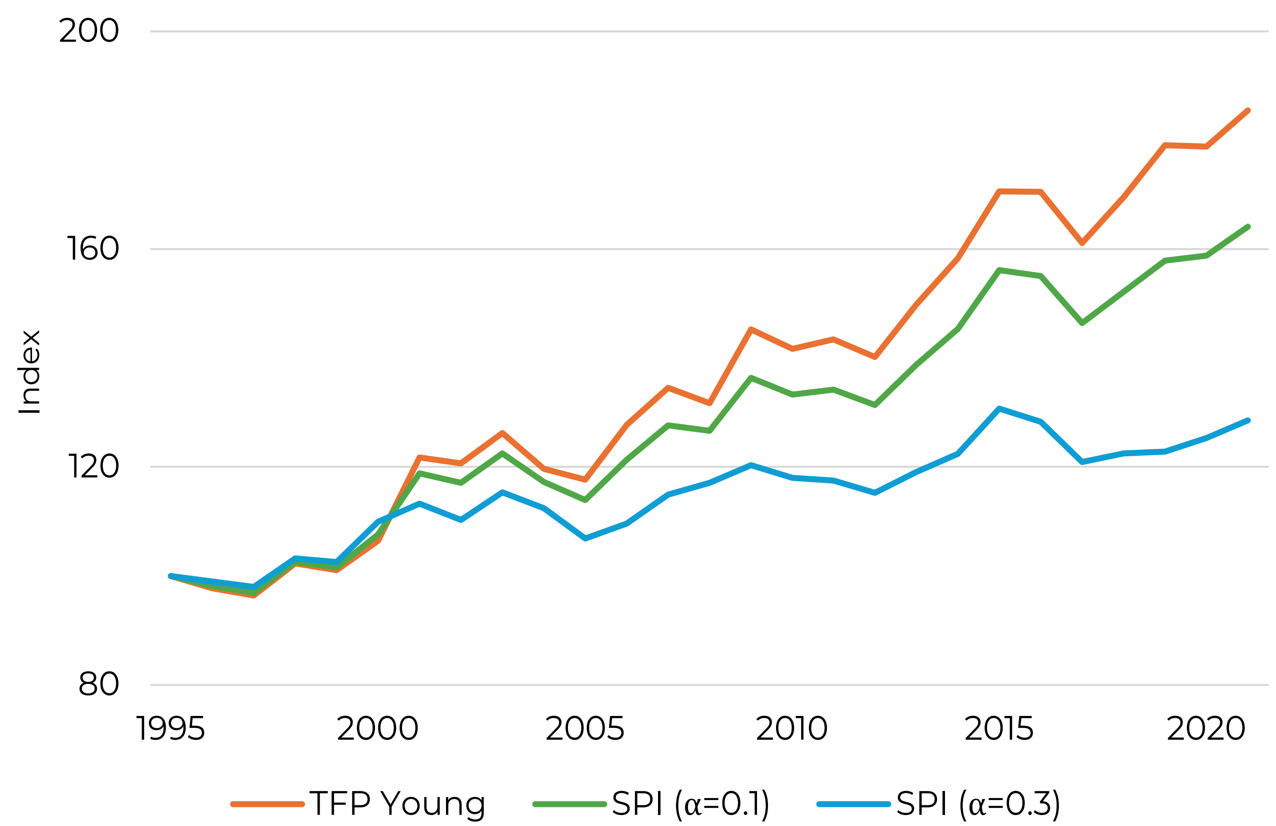


Source: Authors' calculations using USDA-ERS data.

While the decomposition of agricultural growth allows for the identification of the main drivers of agricultural output, this conventional analysis does not consider the environmental impacts generated by the production process. To address this limitation, Sustainable Productivity Indices (SPI)[3] have been estimated using the Young[4] methodology (see **Figure 5**).

The SPI penalizes agricultural output growth based on the magnitude of unwanted byproducts such as greenhouse gas emissions, deforestation, soil erosion, pesticide risk, water stress, and nutrient budget[5]. Consequently, the SPI value varies according to the generation of these byproducts. As shown in the figure below, when a 10% weight is assigned to unwanted byproducts generated by agricultural output, the SPI follows a trajectory similar to that of TFP, reducing productivity growth from 2.4% to 1.9% (TFP vs. SPI) over the last 26 years. However, increasing the weight given to unwanted byproducts to 30% significantly widens the gap between the two trends. Under this scenario, over the past ten years, sustainable productivity has grown at an average annual rate of 0.9%, compared to 2.6% for TFP.

Figure 5: TFP vs. SPI- Dominican Republic



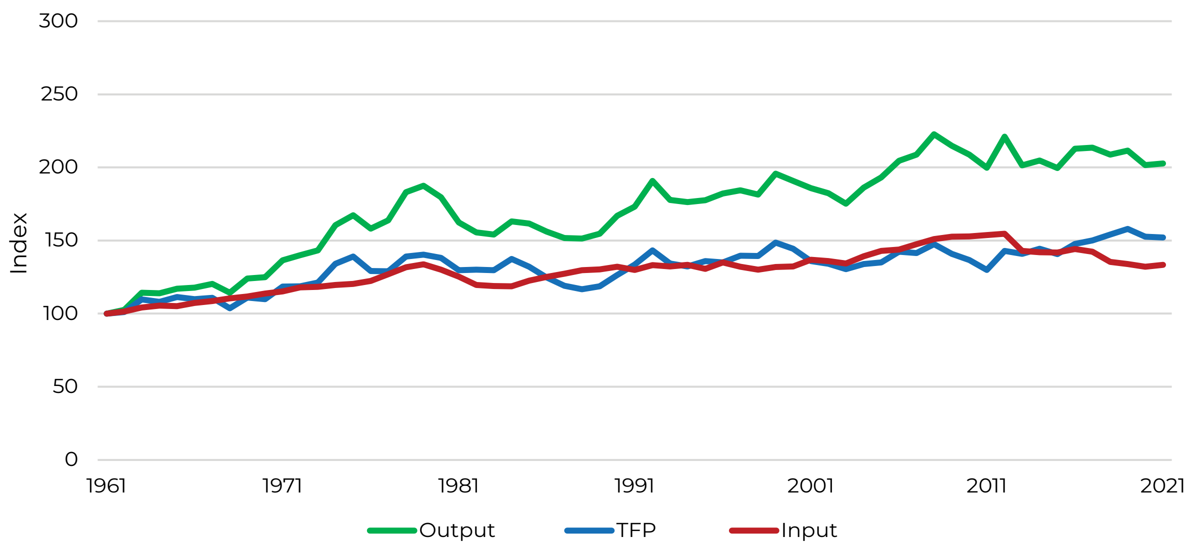
Source: Authors' calculations using FAOSTAT data.

[3] IFPRI and IDB, 2025.
[4] The Geometric Young Index (GY) is a multiplicative index that compares vectors of quantities using weights based on average value shares—derived from average prices when available—fulfilling the axioms of a proper index such as transitivity (O'Donnell, 2018).
[5] The surplus in the budget corresponds to pollution resulting from the production process, particularly the residual nitrogen in soils following the cropping cycle.

EL SALVADOR

Over the past sixty years, El Salvador has experienced significant growth in agricultural production, with output doubling during this period. An analysis based on USDA-ERS[1] data reveals that the country recorded an average annual agricultural output growth rate of 1.2% (see **Figure 1**), primarily driven by increases in Total Factor Productivity (TFP). However, this overall performance also included periods of stagnation and even contraction in some years, with TFP growing at an average annual rate of 0.7%. To a lesser extent, input use also followed a slightly positive trend, increasing at an average annual rate of 0.5% during the same period. Notably, both input use and TFP have followed similar trajectories throughout the timeframe analyzed.

Figure 1: Agricultural Output, Inputs, and TFP
El Salvador (1961-2021)



Source: Authors' calculations using USDA-ERS data.

Within the Central American region, El Salvador's TFP growth has been comparable to that of Nicaragua and Panama. In terms of input use, the country has followed growth patterns similar to those observed in Costa Rica, Honduras, and Panama. Overall, El Salvador's agricultural output has grown at a rate below the Central American average, driven by modest yet steady improvements in both TFP and input use[2] (see **Figure 2**).

[1] U.S. Department of Agriculture, Economic Research Service. *International Agricultural Productivity* data product, September 2023 (visited August 2024).
[2] Index based on six inputs: labor, machinery, livestock, agricultural land, feed, and fertilizers.

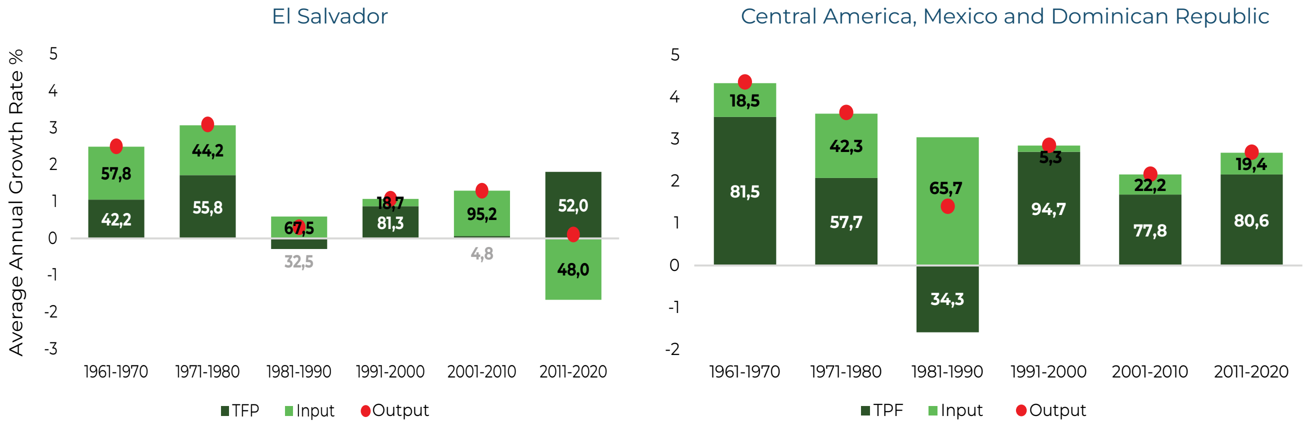
Figure 2: Agricultural Output, Inputs and TFP by country-region (1961-2021)

Source: Authors' calculations using USDA-ERS data.

The decomposition of agricultural output growth by decade (see **Figure 3**) shows that El Salvador consistently underperformed relative to the Central American average throughout the six decades analyzed.

In general, TFP growth in El Salvador has remained below the subregional average, with the only exception being the 1980s, when the country recorded an average annual decline of 0.3%, compared to –1.6% for the subregion. In contrast, during the most recent decade, agricultural output grew by just 0.1% annually, driven primarily by productivity improvements: 52% of this growth was explained by gains in TFP, while the remaining 48% reflected a sharp decline in input use, which fell at an average annual rate of –1.7%. Nevertheless, in the first two decades, agricultural output expanded steadily, reaching an average annual rate of 3% in the 1970s.

Figure 3: Agricultural Output Growth Decomposition by decade



Source: Authors' calculations using USDA-ERS data.

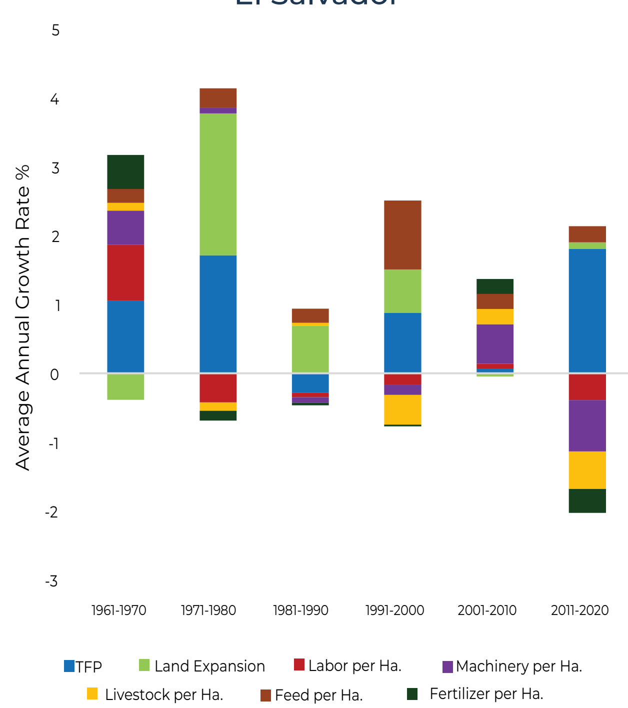
Figure 4 presents the decomposition of input growth over the past six decades, revealing the following:

1. Land expansion and labor contributions have fluctuated between positive and negative values over the past sixty years.

2. Across the six decades analyzed, animal feed consistently contributed positively, whereas fertilizers made positive contributions in only two decades.

3. The contribution of capital (machinery and livestock) to agricultural output growth has recorded considerable positive and negative variations over the last five decades.

Figure 4: Resource Decomposition of Agricultural Output Growth El Salvador

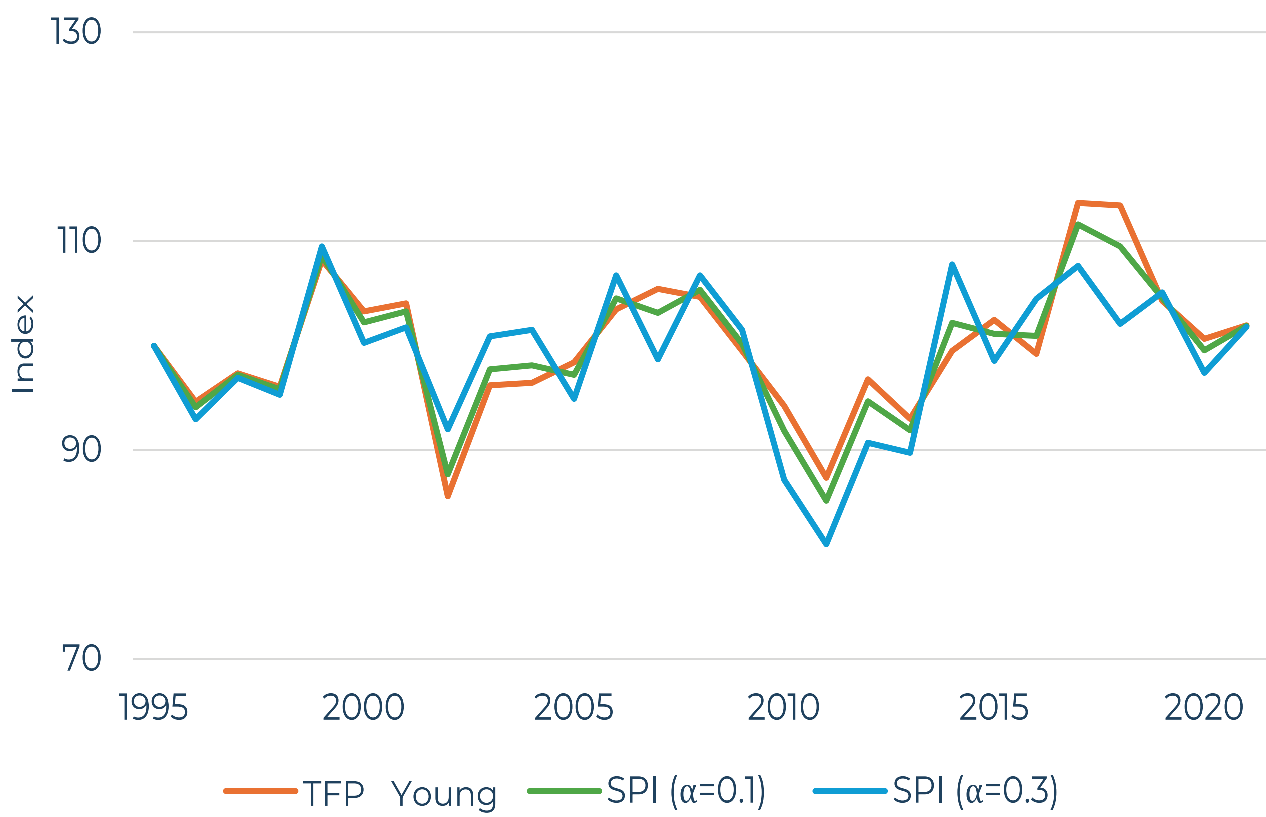


Source: Authors' calculations using USDA-ERS data.

While the decomposition of agricultural growth allows for the identification of the main drivers of agricultural output, this conventional analysis does not consider the environmental impacts generated by the production process. To address this limitation, Sustainable Productivity Indices (SPI)[3] have been estimated using the Young[4] methodology (see **Figure 5**).

The SPI penalizes agricultural output growth based on the magnitude of unwanted byproducts such as greenhouse gas emissions, deforestation, soil erosion, pesticide risk, water stress, and nutrient budget[5]. Consequently, the SPI value varies according to the generation of these byproducts. As shown in the figure below, when a 10% weight is assigned to unwanted byproducts generated by agricultural output, the SPI follows a trajectory similar to that of TFP, reducing productivity growth from 0,073% to 0,072% (TFP vs. SPI) over the last 26 years. However, increasing the weight given to unwanted byproducts to 30% significantly widens the gap between the two trends.

Figure 5: TFP vs. SPI – El Salvador



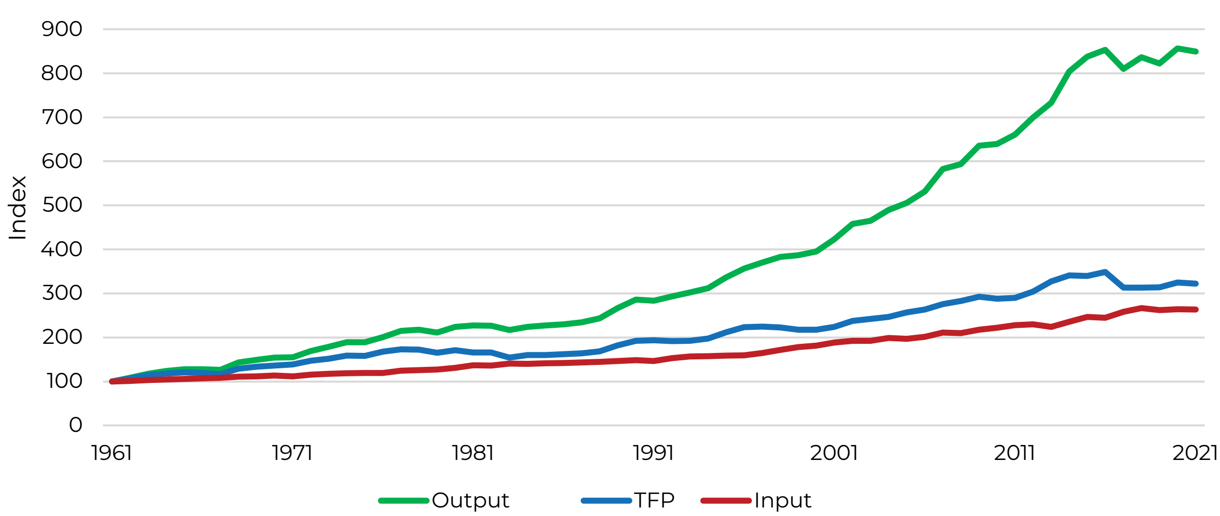
Source: Authors' calculations using FAOSTAT data.

[3] IFPRI and IDB, 2025.
[4] The Geometric Young Index (GY) is a multiplicative index that compares vectors of quantities using weights based on average value shares—derived from average prices when available—fulfilling the axioms of a proper index such as transitivity (O'Donnell, 2018).
[5] The surplus in the budget corresponds to pollution resulting from the production process, particularly the residual nitrogen in soils following the cropping cycle.

GUATEMALA

Over the past sixty years, Guatemala has experienced significant growth in agricultural production, increasing nearly ninefold. An analysis using USDA-ERS data[1] shows that the country recorded an average annual agricultural output growth rate of 3.6% (see **Figure 1**), primarily driven by gains in Total Factor Productivity (TFP), which grew at an average annual rate of 2.0%. To a lesser extent, input use also contributed positively, increasing at an average annual rate of 1.6% over the same period. This overall performance, however, included episodes of stagnation and even contraction. Notably, in the most recent decade (2010–2020), Guatemala's agricultural output growth slowed compared with the stronger performance observed in earlier decades.

Figure 1: Agricultural Output, Inputs, and TFP
Guatemala (1961-2021)



Source: Authors' calculations using USDA-ERS data.

Within the Central American region, Guatemala's TFP growth has been comparable to that of Honduras, Mexico, and the Dominican Republic. In terms of input use, the country has recorded growth rates similar to those of Nicaragua. Overall, Guatemala's agricultural output has increased well above the subregional average, largely driven by stronger TFP gains and a sustained growth in input use[2] (see **Figure 2**).

[1] U.S. Department of Agriculture, Economic Research Service. *International Agricultural Productivity* data product, September 2023 (visited August 2024).
[2] Index based on six inputs: labor, machinery, livestock, agricultural land, feed, and fertilizers.

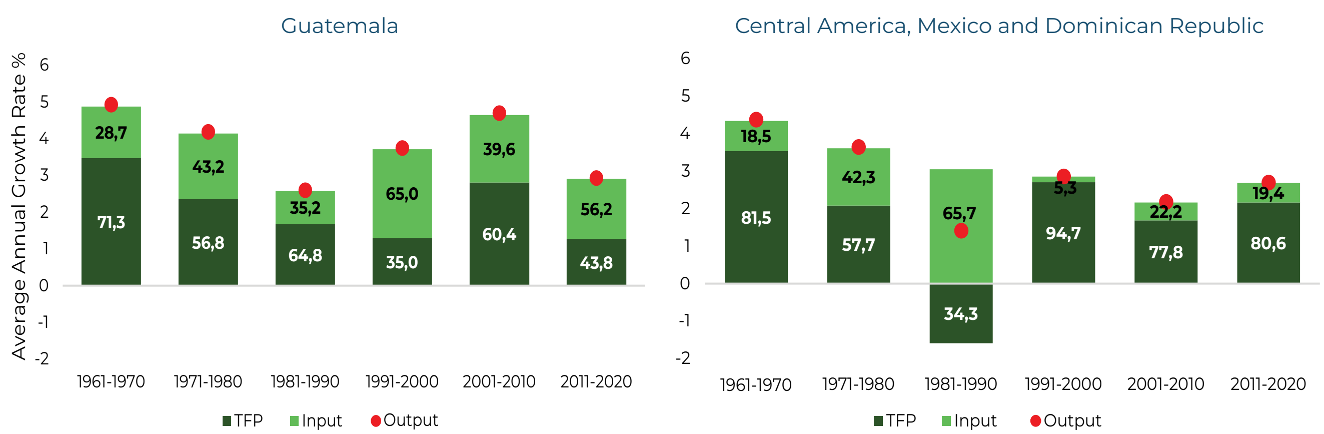
Figure 2: Agricultural Output, Inputs and TFP by country-region (1961-2021)

Source: Authors' calculations using USDA-ERS data.

The agricultural output growth decomposition by decade (see **Figure 3**) shows that Guatemala outperformed the Central American average over the past six decades.

TFP improvements exceeded the subregional average in several periods, especially in the 2000s, when the country's TFP grew at an average annual rate of 2.8%, compared to 1.6% for the subregion. However, the country also experienced episodes of stagnation, particularly in the 1990s, when average annual TFP growth slowed to 1.3%, well below the subregional average of 2.7%, and again in the 2010s. In the most recent decade, Guatemala's agricultural output grew at an average annual rate of 2.9%, with 56% of this growth explained by increased input use and 44% by TFP improvements.

Figure 3: Agricultural Output Growth Decomposition by decade



Source: Authors' calculations using USDA-ERS data.

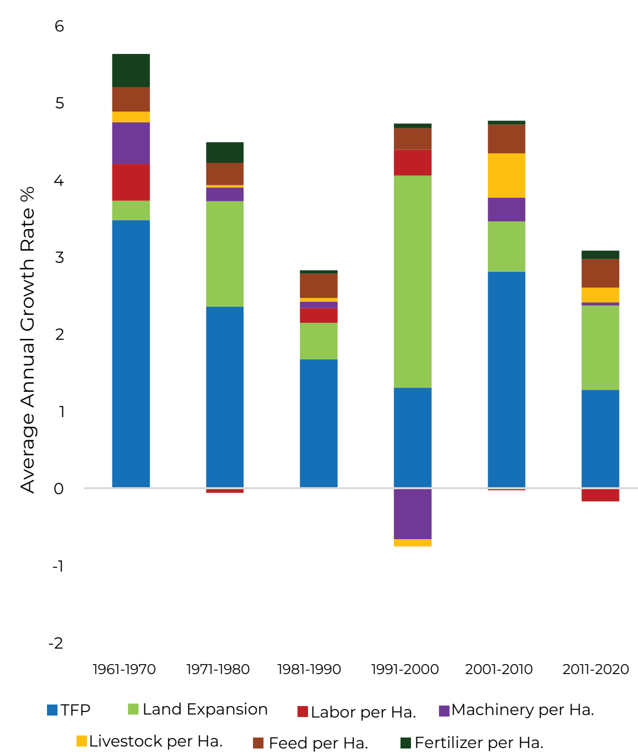
Figure 4 presents the decomposition of input growth over the past six decades, revealing the following:

1. Land expansion has increased steadily over the past sixty years, while the contribution of labor has been moderate or negative.

2. The contribution of materials (fertilizers and animal feed) has remained positive throughout the six decades.

3. The contribution of capital (machinery and livestock) to agricultural output growth was positive in nearly all decades, with the exception of the 1990s.

Figure 4: Resource Decomposition of Agricultural Output Growth - Guatemala

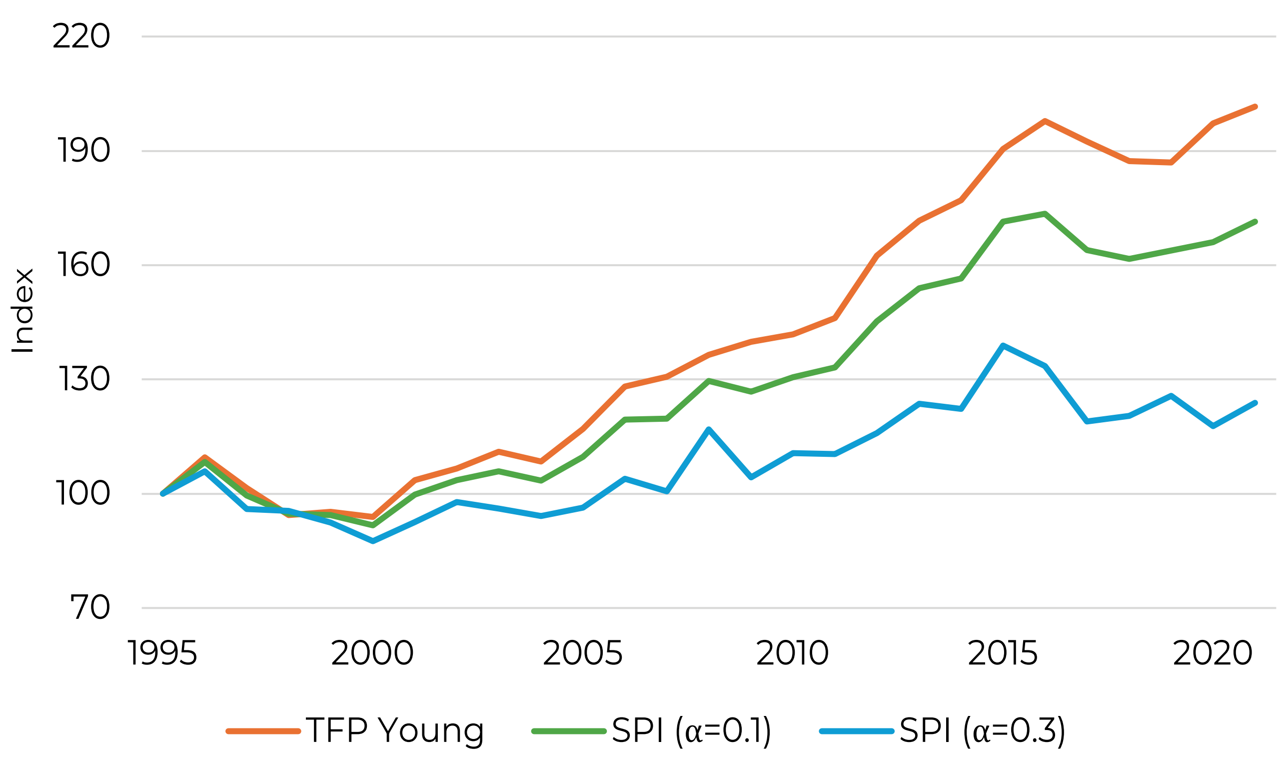


Source: Authors' calculations using USDA-ERS data.

While the decomposition of agricultural growth allows for the identification of the main drivers of agricultural output, this conventional analysis does not consider the environmental impacts generated by the production process. To address this limitation, Sustainable Productivity Indices (SPI)[3] have been estimated using the Young[4] methodology (see **Figure 5**).

The SPI penalizes agricultural output growth based on the magnitude of unwanted byproducts such as greenhouse gas emissions, deforestation, soil erosion, pesticide risk, water stress, and nutrient budget[5]. Consequently, the SPI value varies according to the generation of these byproducts. As shown in the figure below, when a 10% weight is assigned to unwanted byproducts generated by agricultural output, the SPI follows a trajectory similar to that of TFP, reducing productivity growth from 2.7% to 2.1% (TFP vs. SPI) over the last 26 years. However, increasing the weight given to unwanted byproducts to 30% significantly widens the gap between the two trends. Under this scenario, when analyzing the last ten years, sustainable productivity grew by an average of 1.2% per year compared to 3.3% for TFP.

Figure 5: TFP vs. SPI – Guatemala



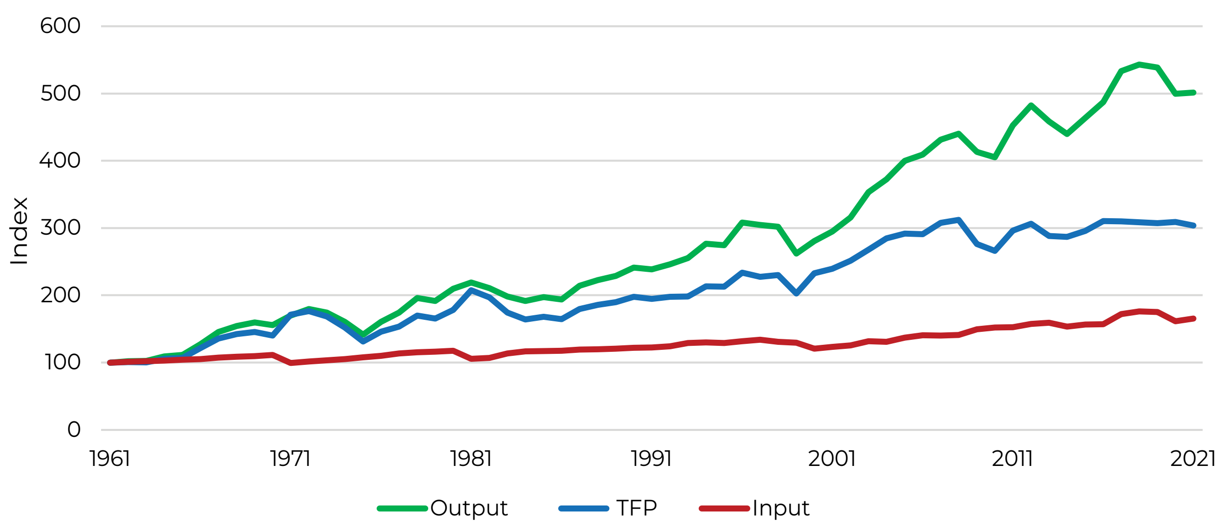
Source: Authors' calculations using FAOSTAT data.

[3] IFPRI and IDB, 2025.
[4] The Geometric Young Index (GY) is a multiplicative index that compares vectors of quantities using weights based on average value shares—derived from average prices when available—fulfilling the axioms of a proper index such as transitivity (O'Donnell, 2018).
[5] The surplus in the budget corresponds to pollution resulting from the production process, particularly the residual nitrogen in soils following the cropping cycle.

HONDURAS

Over the past sixty years, Honduras has experienced significant growth in agricultural output, increasing nearly fivefold. An analysis using USDA-ERS data[1] shows that the country recorded an average annual agricultural output growth rate of 2.7% (see **Figure 1**), driven primarily by increases in Total Factor Productivity (TFP). However, this performance also included periods of stagnation and even contraction in certain years, with TFP growing at an average of 1.9% annually. To a lesser extent, during the same period, input use showed a modest positive trend, averaging 0.8% per year. Notably, in the last decade (2010–2020), Honduras experienced stagnation in TFP, which was reflected in a slower rate of agricultural output growth.

Figure 1: Agricultural Output, Inputs, and TFP
Honduras (1961-2021)

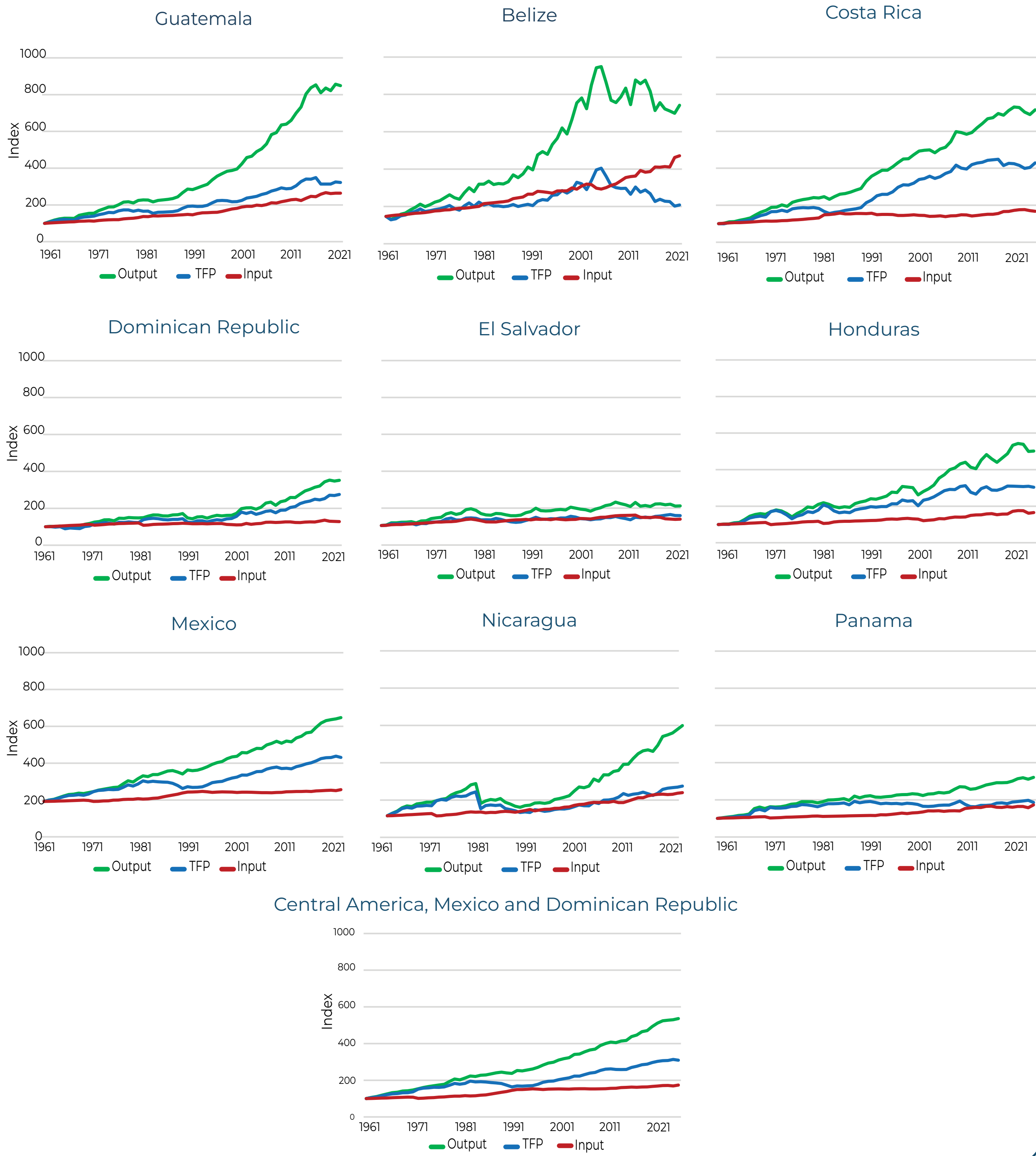


Source: Authors' calculations using USDA-ERS data.

Within the Central American region, Honduras has achieved TFP growth levels comparable to those of the Dominican Republic, Guatemala, and Mexico. In terms of input use, Honduras has displayed growth patterns similar to those of Costa Rica, Mexico, and Panama. Overall, Honduras's agricultural output has grown at a rate close to the subregional average, driven mainly by notable gains in TFP and, to a lesser extent, by increased input use[2] (see **Figure 2**).

[1] U.S. Department of Agriculture, Economic Research Service. *International Agricultural Productivity* data product, September 2023 (visited August 2024).
[2] Index based on six inputs: labor, machinery, livestock, agricultural land, feed, and fertilizers.

Figure 2: Agricultural Output, Inputs and TFP by country-region (1961-2021)

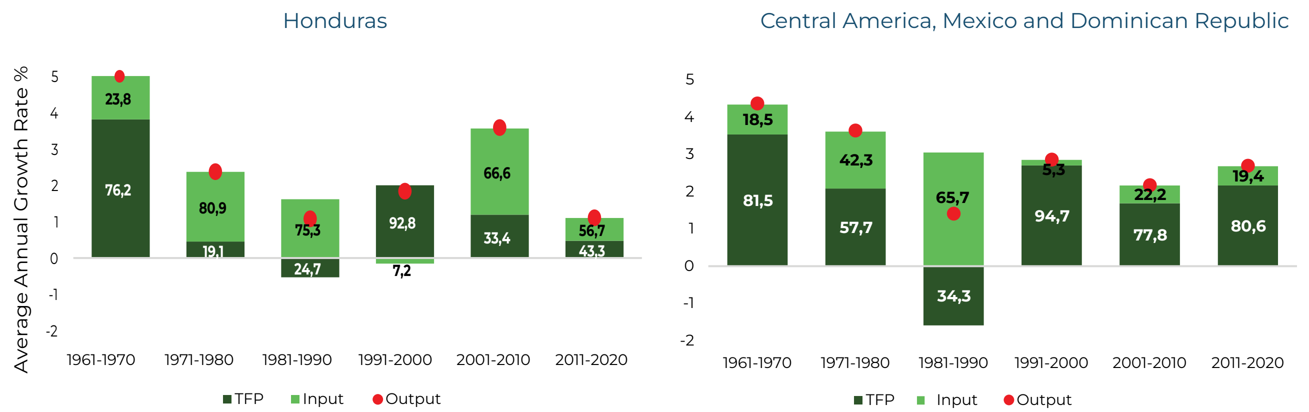


Source: Authors' calculations using USDA-ERS data.

An analysis of agricultural output growth by decade (see **Figure 3**) shows that Honduras outperformed the subregional average in the 1960s and the 2000s.

Although TFP growth in Honduras has generally lagged behind the subregional average, the 1960s were an exception, when the country recorded annual TFP growth of 3.8%, compared with 3.5% for the subregion. Similarly, in the 1980s, Honduras experienced a decline in TFP, reflecting a trend observed across Central America. Finally, it is important to note that in the last decade, agricultural output growth was modest, averaging 1.1% annually. Of this growth, 43% was attributable to improvements in TFP, while the remaining 57% resulted from increased input use, which grew at an annual rate of 0.6%.

Figure 3: Agricultural Output Growth Decomposition by decade



Source: Authors' calculations using USDA-ERS data.

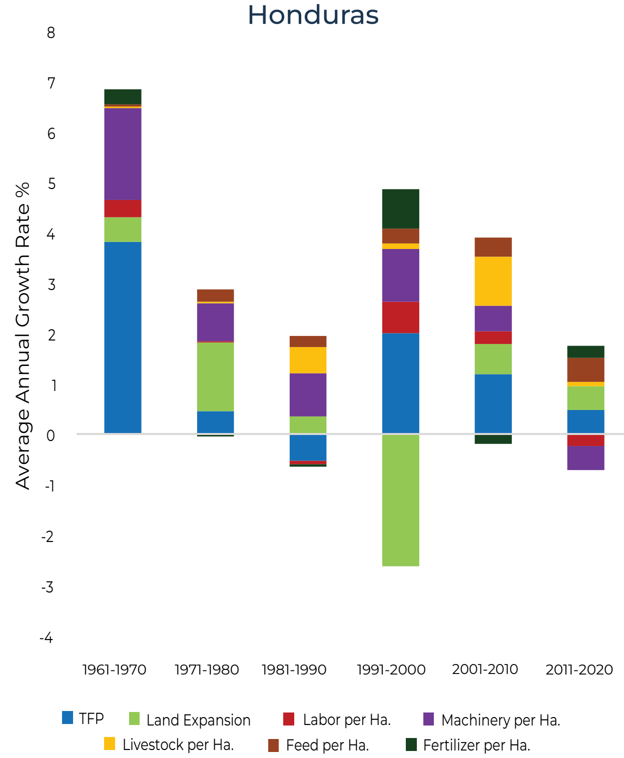
Figure 4 presents the decomposition of input growth over the last six decades, revealing the following:

1. Land expansion contributed positively to growth in all decades except the 1990s, whereas labor made a positive contribution in four decades.

2. The contribution of animal feed remained positive throughout the entire sixty years period, while fertilizers registered positive contributions in only three decades.

3. Machinery contributed negatively to agricultural output growth in the last decade, whereas livestock made consistently positive contributions across the entire period.

Figure 4: Resource Decomposition of Agricultural Output Growth Honduras

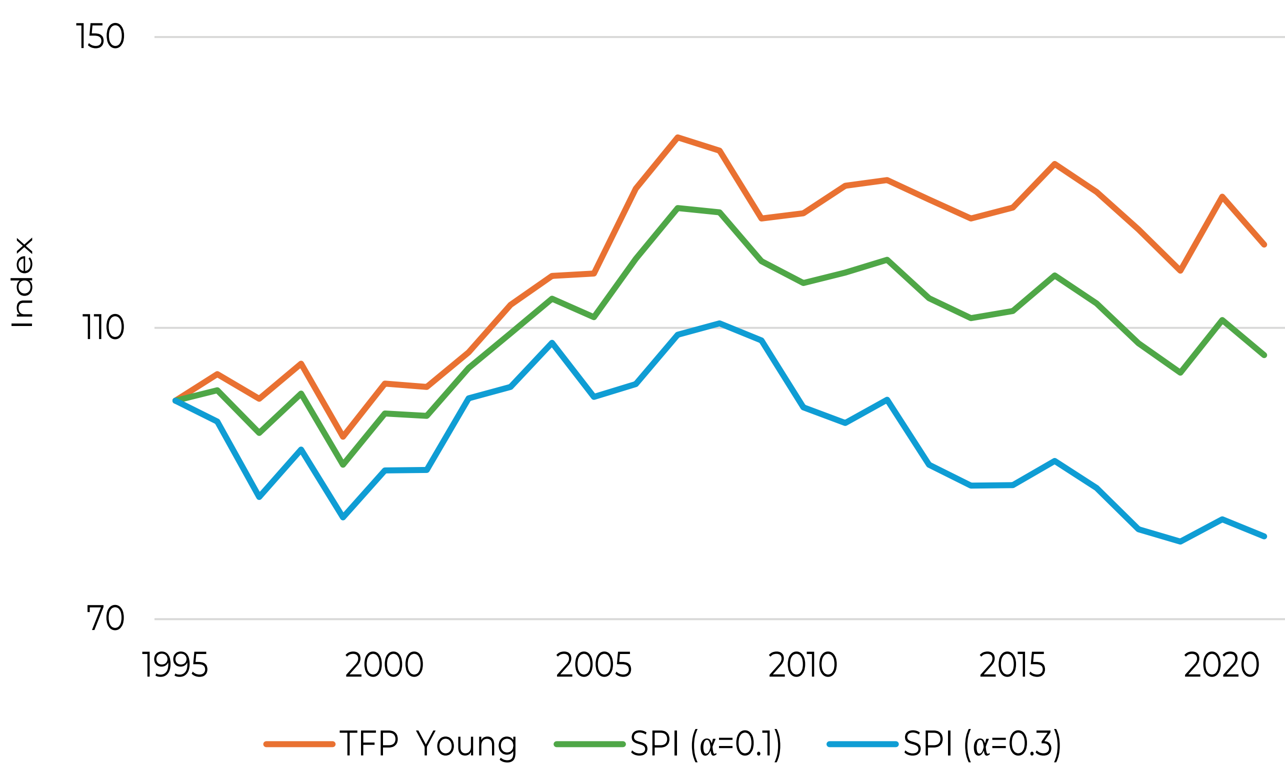


Source: Authors' calculations using USDA-ERS data.

While the decomposition of agricultural growth allows for the identification of the main drivers of agricultural output, this conventional analysis does not consider the environmental impacts generated by the production process. To address this limitation, Sustainable Productivity Indices (SPI)[3] have been estimated using the Young[4] methodology (see **Figure 5**).

The SPI penalizes agricultural output growth based on the magnitude of unwanted byproducts such as greenhouse gas emissions, deforestation, soil erosion, pesticide risk, water stress, and nutrient budget[5]. Consequently, the SPI value varies according to the generation of these byproducts. As shown in the figure below, when a 10% weight is assigned to unwanted byproducts generated by agricultural output, the SPI follows a trajectory similar to that of TFP, reducing productivity growth from 0,8% to 0,2% (TFP vs. SPI) over the last 26 years. However, increasing the weight given to unwanted byproducts to 30% significantly widens the gap between the two trends. Under this scenario, during the last ten years, sustainable productivity declined at an average annual rate of –1.7%, compared with –0.6% for TFP.

Figure 5: TFP vs. SPI – Honduras



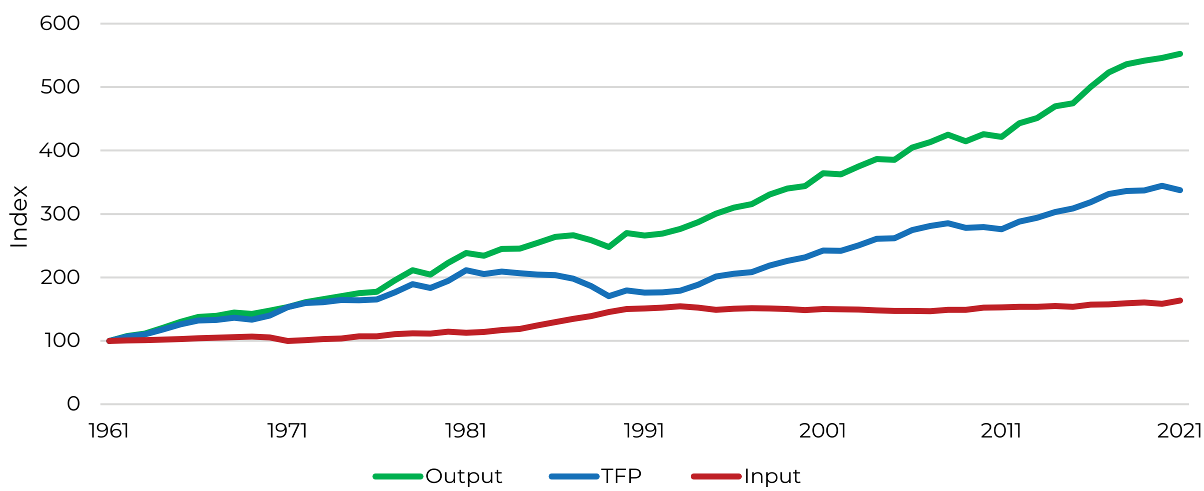
Source: Authors' calculations using FAOSTAT data.

[3] IFPRI and IDB, 2025.
[4] The Geometric Young Index (GY) is a multiplicative index that compares vectors of quantities using weights based on average value shares—derived from average prices when available—fulfilling the axioms of a proper index such as transitivity (O'Donnell, 2018).
[5] The surplus in the budget corresponds to pollution resulting from the production process, particularly the residual nitrogen in soils following the cropping cycle.

MEXICO

Over the past sixty years, Mexico has experienced significant growth in agricultural output, nearly increasing sixfold. An analysis using USDA-ERS data[1] reveals that the country recorded an average annual agricultural output growth rate of 2.9% (see **Figure 1**), driven primarily by gains in Total Factor Productivity (TFP). Although this performance included periods of stagnation and even contraction in certain years, TFP grew at an average annual rate of 2.1%. To a lesser extent, input use also displayed a modest positive trend, increasing at an average annual rate of 0.8%. Notably, in the most recent decade (2010–2020), Mexico experienced a marked increase in TFP, which was reflected in higher agricultural output.

Figure 1: Agricultural Output, Inputs, and TFP
Mexico (1961-2021)

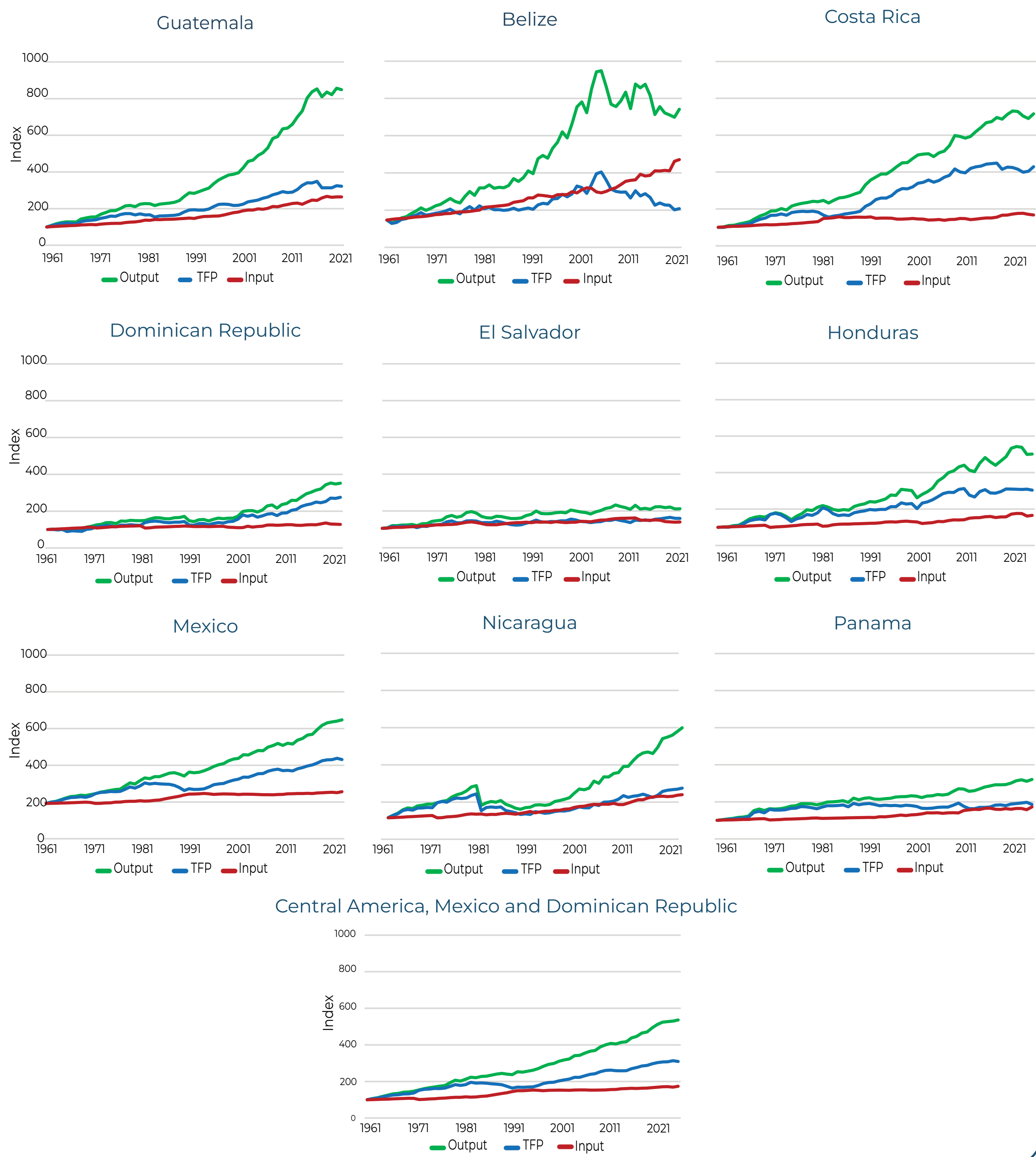


Source: Authors' calculations using USDA-ERS data.

Within the Central American region, Mexico has achieved TFP growth levels comparable to those of the Dominican Republic, Guatemala, and Honduras. In terms of input use, its growth has been similar to that observed in Costa Rica, Honduras, and Panama. Overall, Mexico's agricultural output has grown at a rate close to the subregional average, driven primarily by notable gains in TFP and, to a lesser extent, by increased input use[2] (see **Figure 2**).

[1] U.S. Department of Agriculture, Economic Research Service. *International Agricultural Productivity* data product, September 2023 (visited August 2024).
[2] Index based on six inputs: labor, machinery, livestock, agricultural land, feed, and fertilizers.

Figure 2: Agricultural Output, Inputs and TFP by country-region (1961-2021)

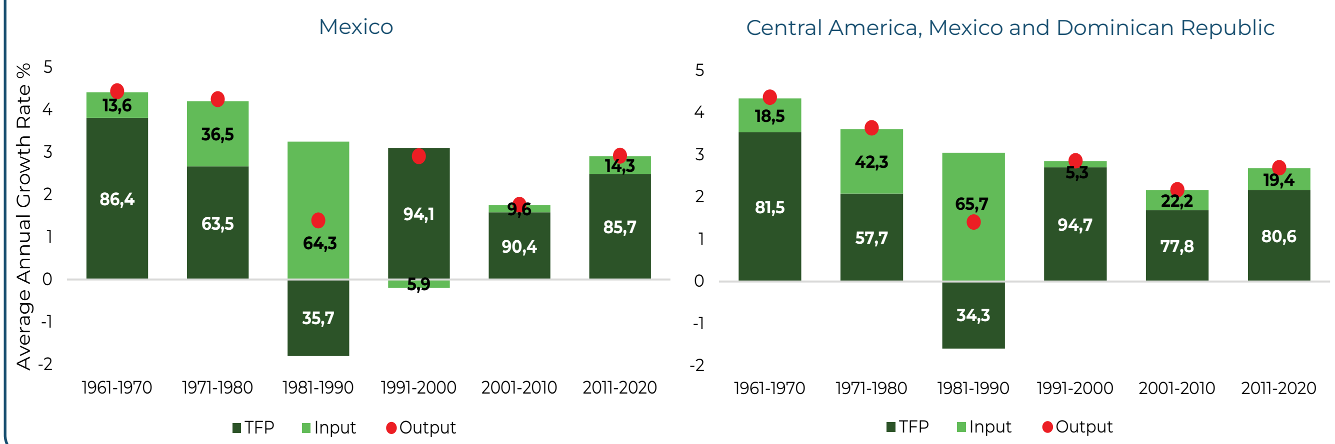


Source: Authors' calculations using USDA-ERS data.

An analysis of agricultural output growth by decade (see **Figure 3**) shows that Mexico outperformed the subregional average in almost every decade, except the 1980s and the 2000s.

TFP growth has generally exceeded the subregional average—again with the exception of those two decades, during which both TFP and output growth slowed. In the 2000s, for example, Mexico recorded an average annual TFP growth rate of 1.6%, slightly below the subregional 1.7%. Similarly, in the 1980s, the country experienced a decline in TFP, reflecting the trend observed across Central America. Finally, the last decade stands out for its strong performance: agricultural output grew at an average annual rate of 2.9%, with 86% of this growth attributable to gains in TFP (2.5% annually) and only 14% to increased input use.

Figure 3: Agricultural Output Growth Decomposition by Decade



Source: Authors' calculations using USDA-ERS data.

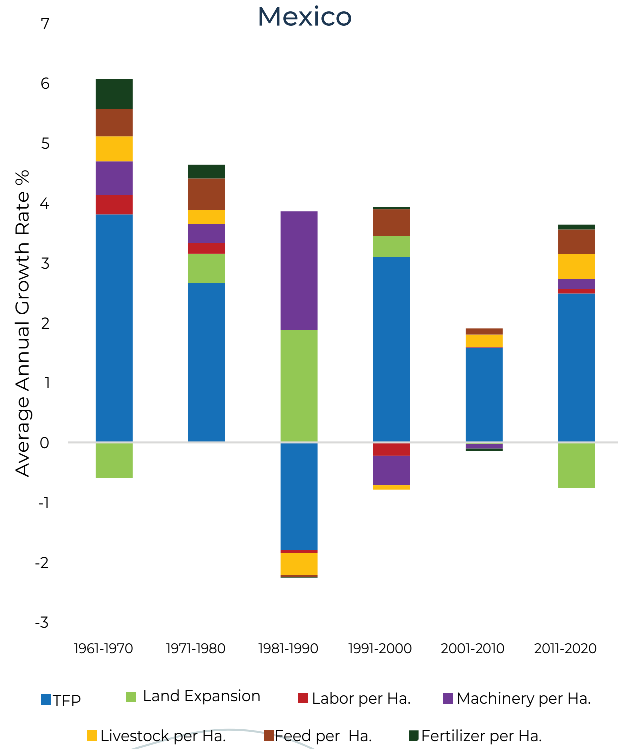
Figure 4 presents the decomposition of input growth over the last six decades, revealing the following:

1. Land expansion and labor contribution have recorded both positive and negative variations throughout the six decades.

2. Animal feed contributed positively for five decades, while fertilizers did so for four.

3. The contribution of machinery to agricultural output growth was negative during the 1990s and 2000s, while livestock has recorded both positive and negative variations.

Figure 4: Resource Decomposition of Agricultural Output Growth Mexico

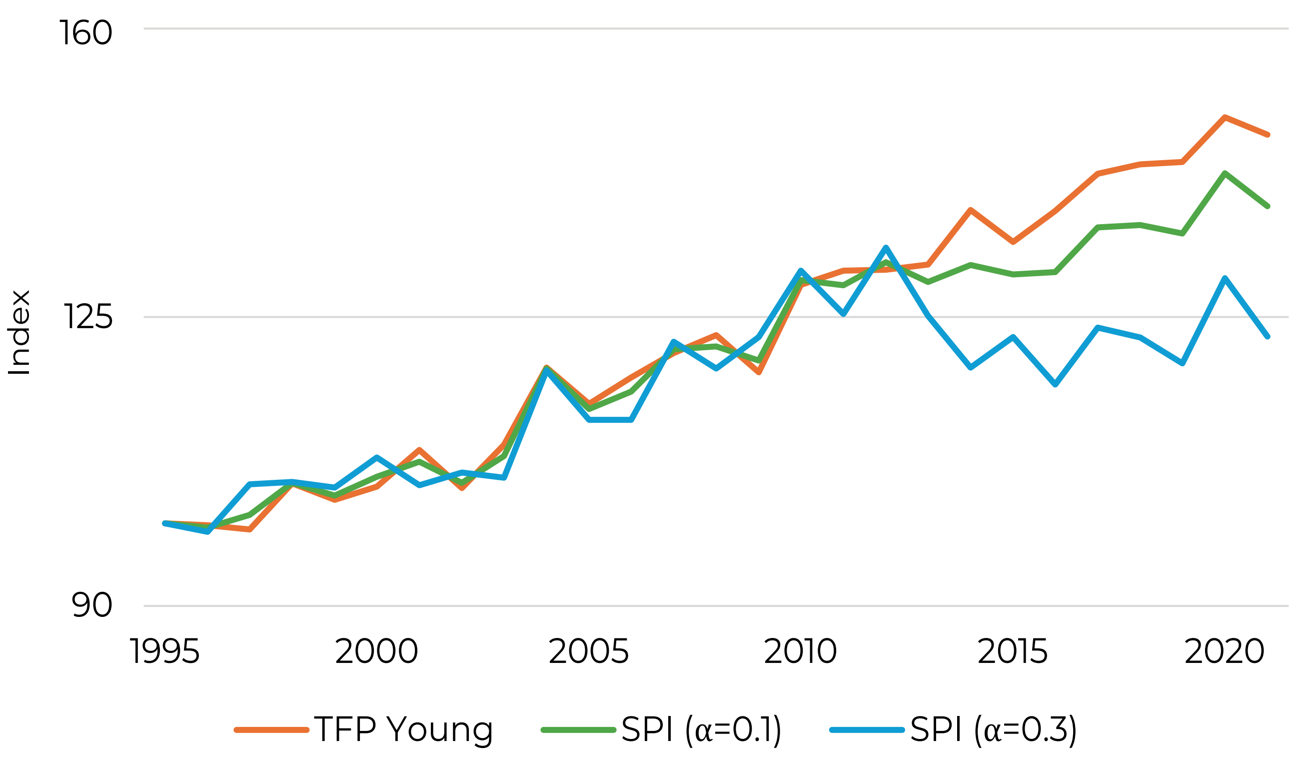


Source: Authors' calculations using USDA-ERS data.

While the decomposition of agricultural growth allows for the identification of the main drivers of agricultural output, this conventional analysis does not consider the environmental impacts generated during the production process. To address this limitation, Sustainable Productivity Indices (SPI)[3] have been estimated using the Young[4] methodology (see **Figure 5**).

The SPI penalizes agricultural output growth based on the magnitude of unwanted byproducts such as greenhouse gas emissions, deforestation, soil erosion, pesticide risk, water stress, and nutrient budget[5]. Consequently, the SPI value varies according to the generation of these byproducts. As shown in the figure below, when a 10% weight is assigned to unwanted byproducts generated by agricultural output, the SPI follows a trajectory similar to that of TFP, reducing productivity growth from 1,5% to 1,3% (TFP vs. SPI) over the last 26 years. However, increasing the weight given to unwanted byproducts to 30% significantly widens the gap between the two trends. Under this scenario, during the last ten years, sustainable productivity declined at an average annual rate of –0.2%, compared with 1.2% for TFP.

Figure 5: TFP vs. SPI – Mexico



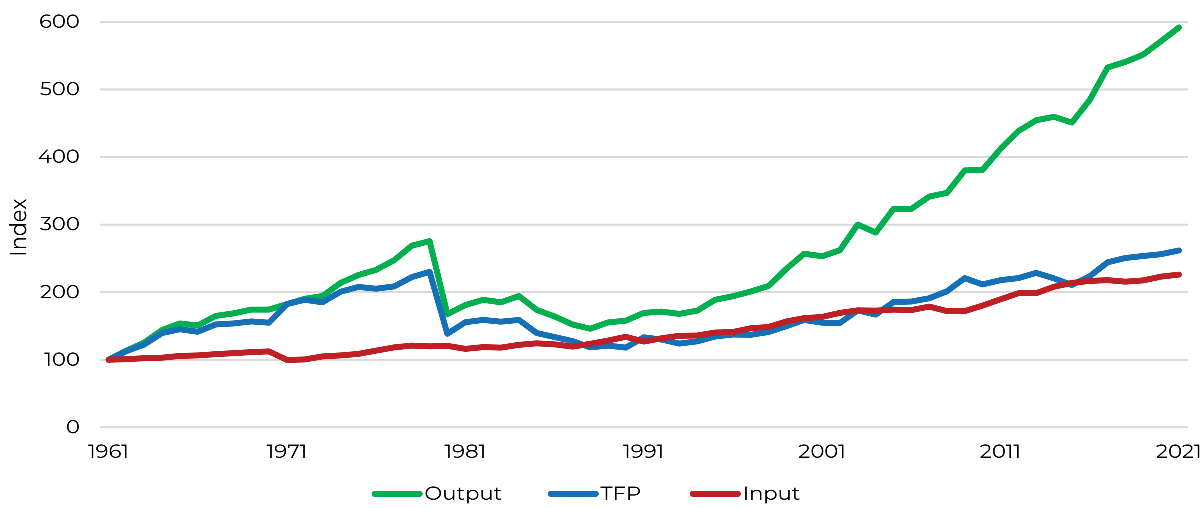
Source: Authors' calculations using FAOSTAT data.

[3] IFPRI and IDB, 2025.
[4] The Geometric Young Index (GY) is a multiplicative index that compares vectors of quantities using weights based on average value shares—derived from average prices when available—fulfilling the axioms of a proper index such as transitivity (O'Donnell, 2018).
[5] The surplus in the budget corresponds to pollution resulting from the production process, particularly the residual nitrogen in soils following the cropping cycle.

NICARAGUA

Over the past sixty years, Nicaragua has experienced a nearly sixfold increase in agricultural production. An analysis using USDA-ERS data[1] reveals that the country recorded an average annual agricultural output growth rate of 3% driven primarily by increases in Total Factor Productivity (TFP). However, this performance included periods of stagnation and contraction in some years, with TFP growing at an average anual rate of 1.6%. During the same period, input use exhibited a modest positive trend, averaging 1.4% per year. Since the late 1980s, Nicaragua has demonstrated a narrowing gap between the growth rates of TFP and input use.

Figure 1: Agricultural Output, Inputs, and TFP Nicaragua (1961-2021)

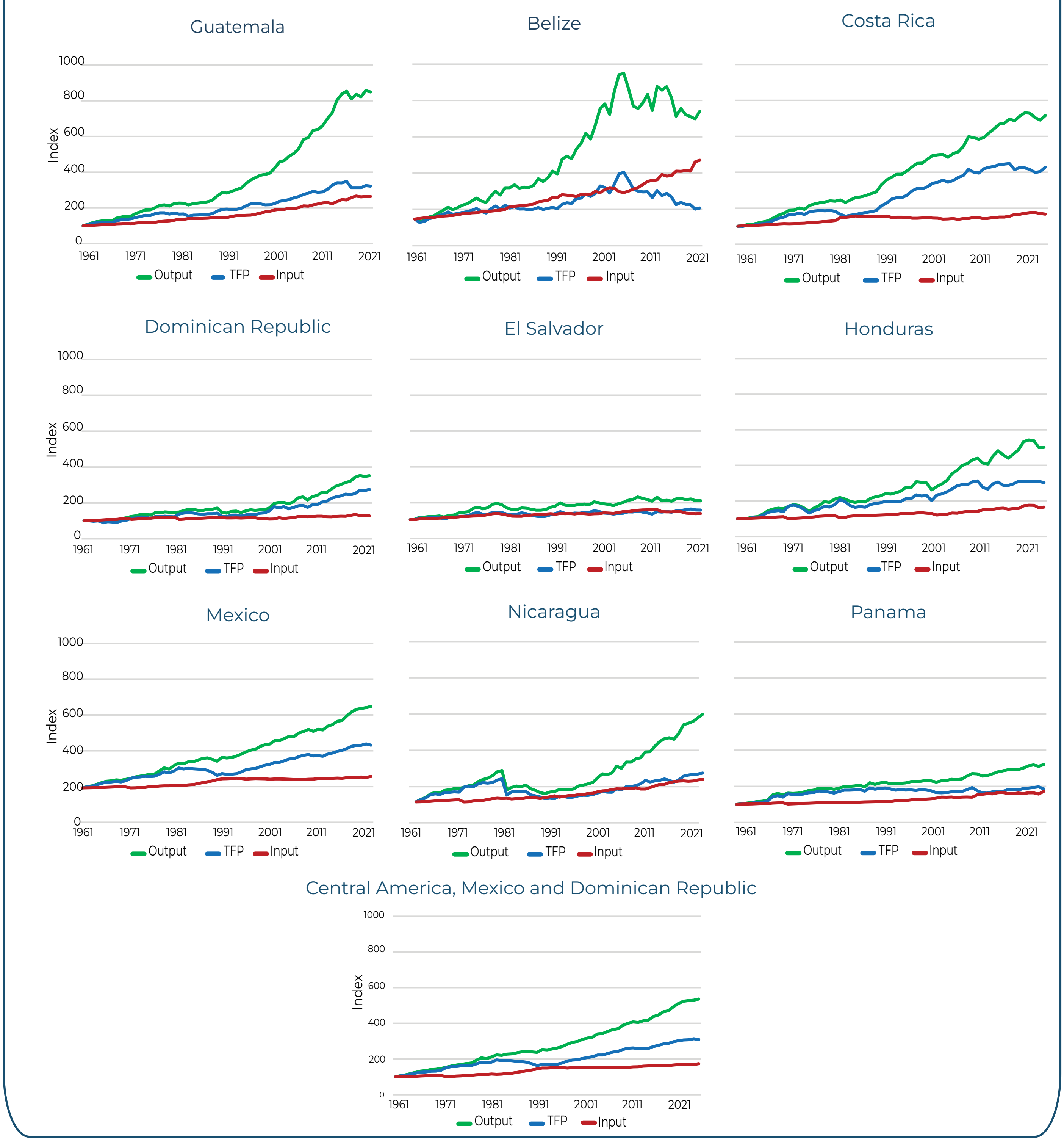


Source: Authors' calculations using USDA-ERS data.

Within the Central American subregion, Nicaragua has achieved TFP growth levels comparable to those of the Dominican Republic and Honduras. In terms of input use, Nicaragua's growth has been similar to that of Guatemala and Panama. Overall, the country's agricultural output has grown at a rate above the Central American average, driven by moderate gains in TFP and, particularly in recent decades, by increased input use[2] (see **Figure 2**).

[1] U.S. Department of Agriculture, Economic Research Service. *International Agricultural Productivity* data product, September 2023 (visited August 2024).
[2] Index based on six inputs: labor, machinery, livestock, agricultural land, feed, and fertilizers.

Figure 2: Agricultural Output, Inputs and TFP by country-region (1961-2021)

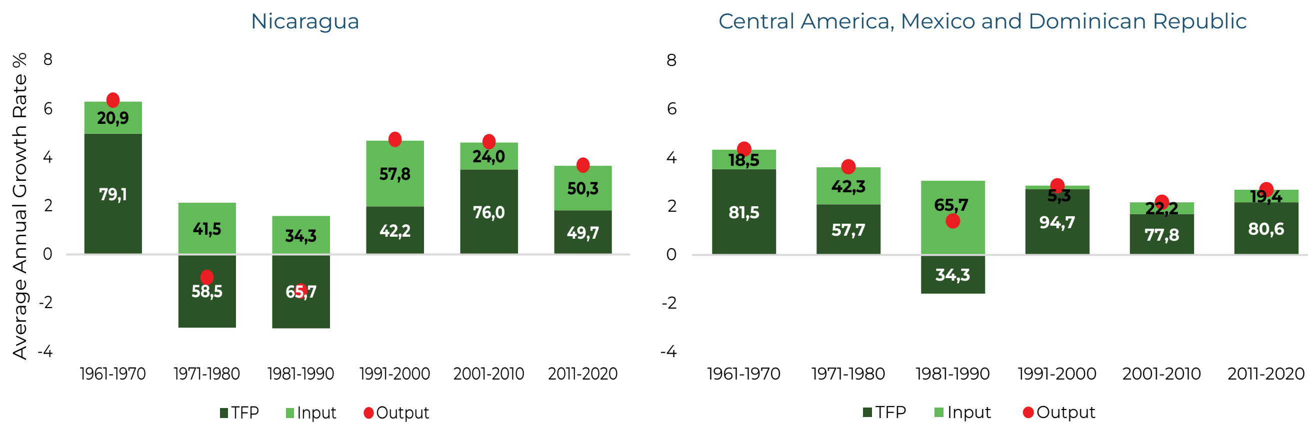


Source: Authors' calculations using USDA-ERS data.

An analysis of agricultural output growth by decade (see **Figure 3**) shows that Nicaragua outperformed the Central American average in almost every decade, with the exception of the 1970s and 1980s.

TFP growth has generally remained below the subregional average, except in the 1960s and the 2000s. In the 2000s, Nicaragua achieved an average annual TFP growth rate of 3.5%, well above the subregional average of 1.7%. Similarly, in the 1960s, the country recorded its highest TFP growth rate, consistent with the broader trend across Central America. Finally, in the most recent decade, Nicaragua experienced strong agricultural output growth, averaging 3.7% annually. Of this growth, 49.7% was attributable to gains in TFP (1.82% annually), while 50.3% resulted from increased input use.

Figure 3: Agricultural Output Growth Decomposition by decade



Source: Authors' calculations based on USDA-ERS data.

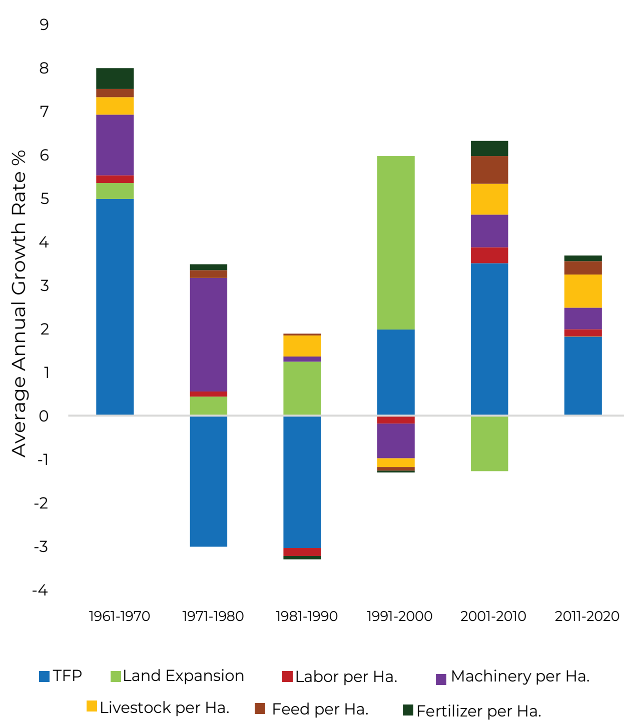
Figure 4 presents the decomposition of input growth over the past six decades, revealing the following:

1. Over this period, both land expansion and labor contributions exhibited positive and negative variations, with land in particular standing out for its significant contributions in both directions.

2. Animal feed and fertilizers contributed positively during most decades, although animal feed registered a negative contribution in one decade and fertilizers in two.

3. In the 1990s, both machinery and livestock made negative contributions to agricultural output growth.

Figure 4: Resource Decomposition of Agricultural Output Growth Nicaragua

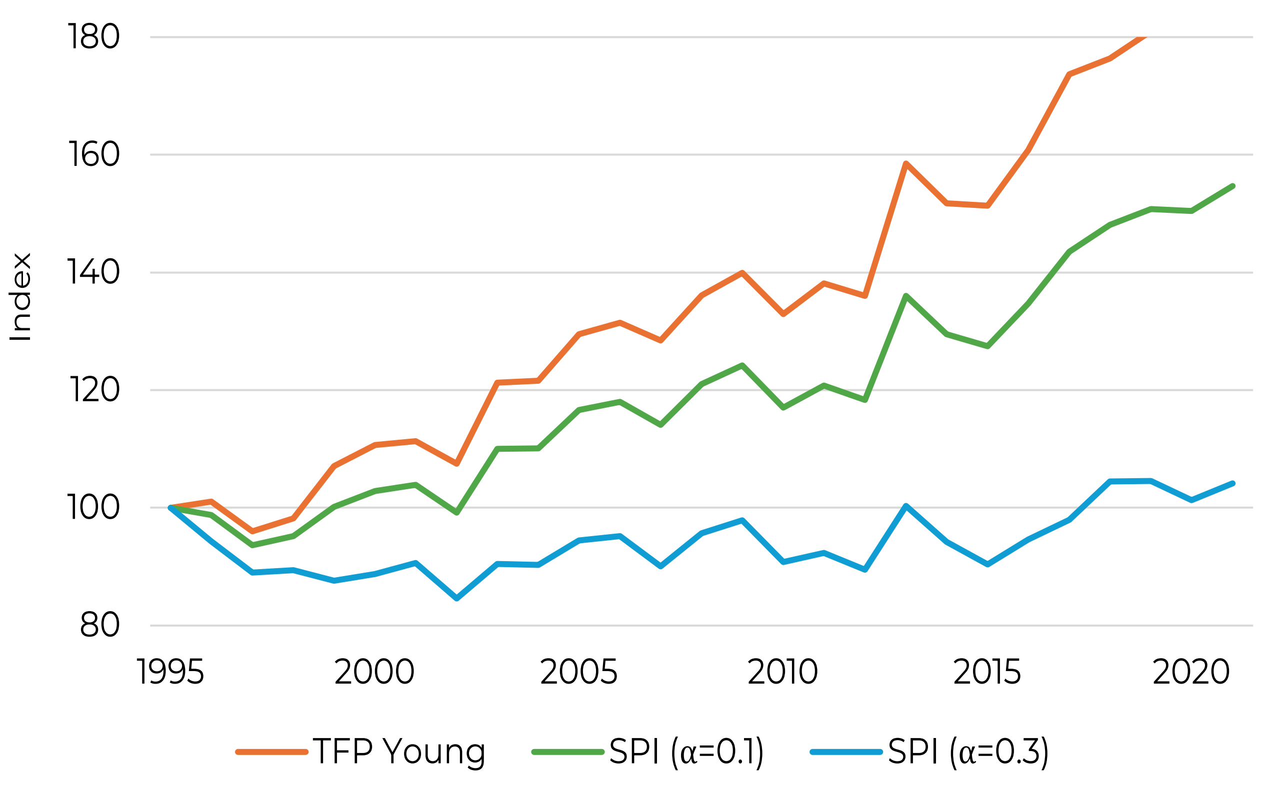


Source: Authors' calculations based on USDA-ERS data.

While the decomposition of agricultural growth allows for the identification of the main drivers of agricultural output, this conventional analysis does not consider the environmental impacts generated by the production process. To address this limitation, Sustainable Productivity Indices (SPI)[3] have been estimated using the Young[4] methodology (see **Figure 5**).

The SPI penalizes agricultural output growth based on the magnitude of unwanted byproducts such as greenhouse gas emissions, deforestation, soil erosion, pesticide risk, water stress, and nutrient budget[5]. Consequently, the SPI value varies according to the generation of these byproducts. As shown in the figure below, when a 10% weight is assigned to unwanted byproducts generated by agricultural output, the SPI follows a trajectory similar to that of TFP, reducing productivity growth from 2,5% to 1,7% (TFP vs. SPI) over the last 26 years. However, increasing the weight given to unwanted byproducts to 30% significantly widens the gap between the two trends. Under this scenario, during the last ten years, sustainable productivity grew at an average annual rate of 1.2%, compared with 3.2% for TFP.

Figure 5: TFP vs. SPI – Nicaragua



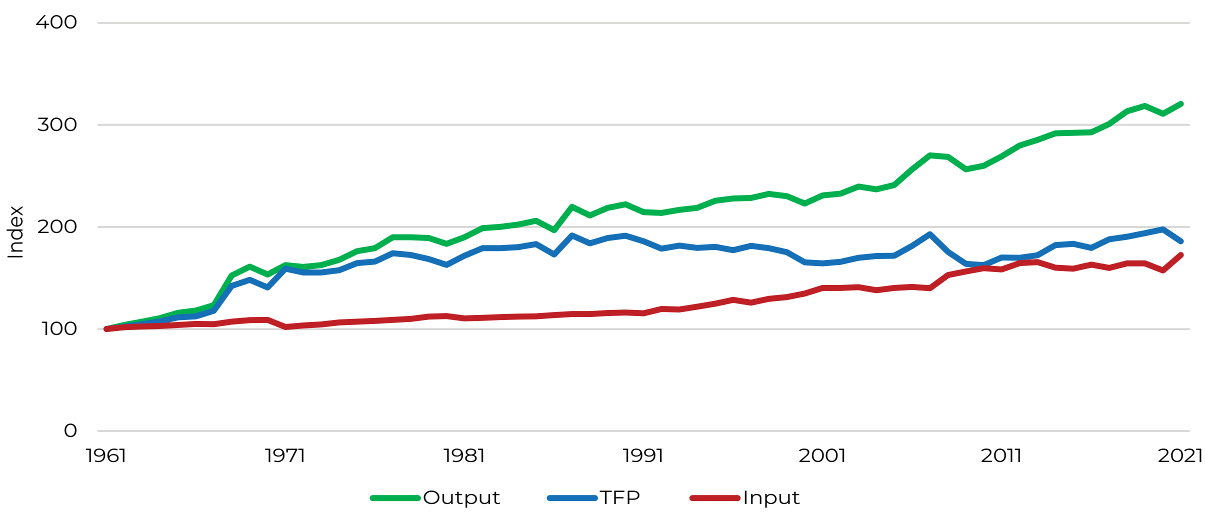
Source: Authors' calculations using FAOSTAT data.

[3] IFPRI and IDB, 2025.
[4] The Geometric Young Index (GY) is a multiplicative index that compares vectors of quantities using weights based on average value shares—derived from average prices when available—fulfilling the axioms of a proper index such as transitivity (O'Donnell, 2018).
[5] The surplus in the budget corresponds to pollution resulting from the production process, particularly the residual nitrogen in soils following the cropping cycle.

PANAMA

Over the past sixty years, Panama has experienced significant growth in agricultural output, nearly tripling in size. An analysis based on USDA-ERS data[1] reveals that the country recorded an average annual agricultural output growth rate of 1.9% (see **Figure 1**), driven primarily by increases in Total Factor Productivity (TFP). Although this performance included periods of stagnation and even contraction in some years, TFP grew at an average annual rate of 1%. To a lesser extent, during the same period, input use displayed a modest positive trend, with an average annual growth rate of 0.9%. Notably, since the late 2010s, Panama has experienced stagnation in TFP, reaching levels comparable to those observed in the mid-1980s.

Figure 1: Agricultural Output, Inputs, and TFP
Panama (1961-2021)

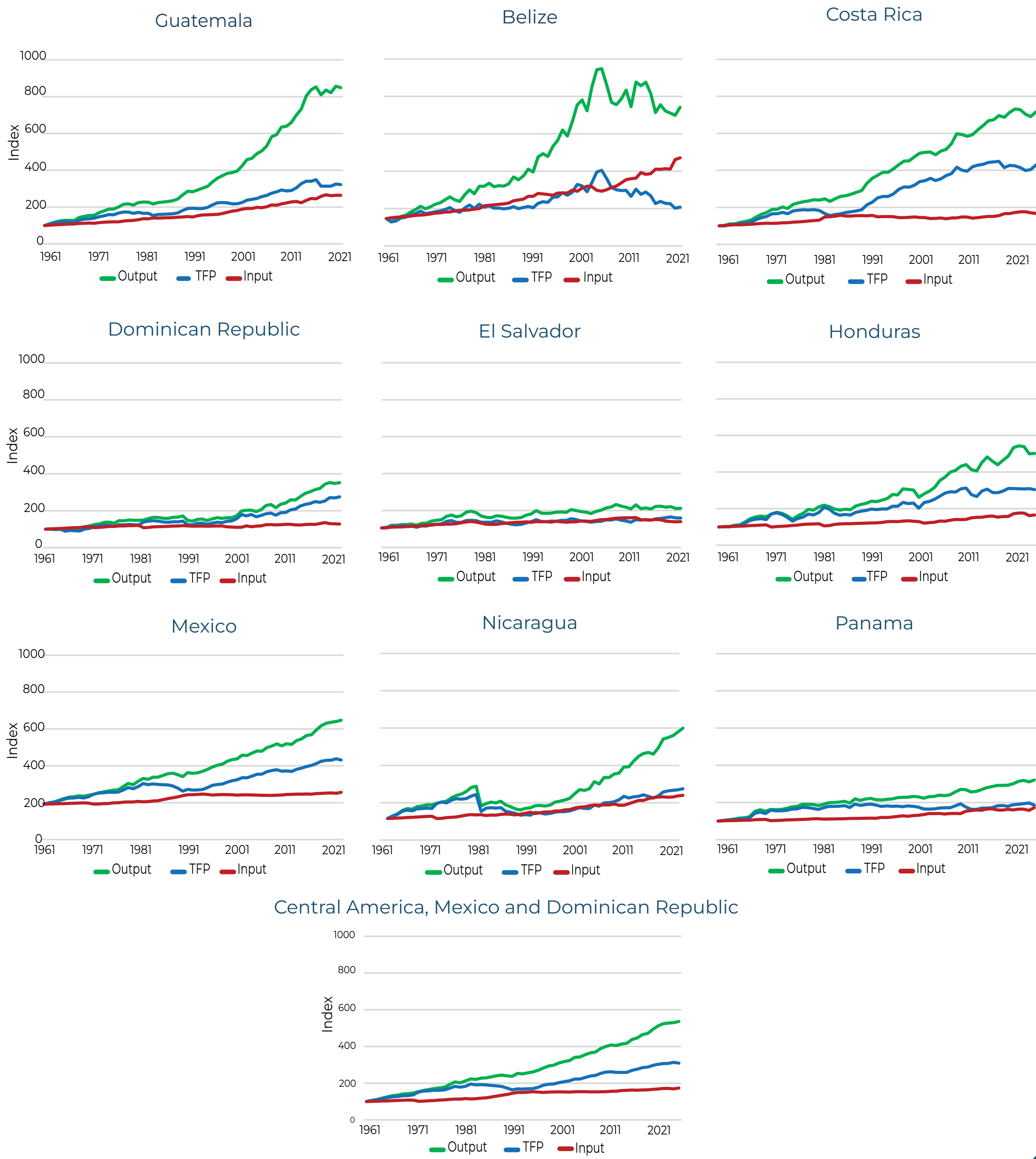


Source: Authors' calculations based on USDA-ERS data.

Within the Central American region, Panama has achieved TFP growth levels comparable to those of Belize and El Salvador. In terms of input use, its growth has been similar to that observed in Guatemala, Honduras, and Nicaragua. Overall, Panama's agricultural output has grown at a rate below the Central American average, driven by notable gains in TFP and, particularly over the past two decades, by increased input use[2] (see **Figure 2**).

[1] U.S. Department of Agriculture, Economic Research Service. *International Agricultural Productivity* data product, September 2023 (visited August 2024).
[2] Index based on six inputs: labor, machinery, livestock, agricultural land, feed, and fertilizers.

Figure 2: Agricultural Output, Inputs and TFP by country-region (1961-2021)

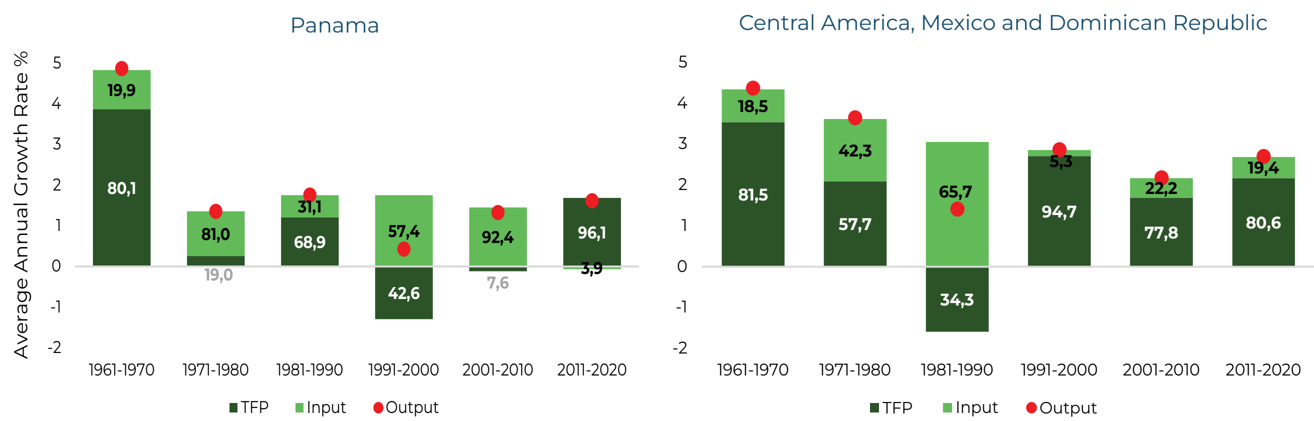


Source: Authors' calculations based on USDA-ERS data.

An analysis of agricultural output growth decomposition by decade (see **Figure 3**) shows that Panama underperformed relative to other Central American countries in most decades, with the exception of the 1960s and 1980s.

TFP growth was consistently below the subregional average, except during these two decades. In particular, during the 1980s, Panama achieved an average annual TFP growth rate of 1.2%, surpassing the subregional average of -1.6%. Similarly, in the 1960s, the country recorded its highest annual TFP growth, aligning with broader regional trends. Finally, the most recent decade stands out for a notable increase in agricultural output, which grew at an average annual rate of 1.6%. This growth was almost entirely driven by productivity gains, with 96% attributed to increases in TFP (1.7% annually), and just 4% explained by input use.

Figure 3: Agricultural Output Growth Decomposition by decade



Source: Authors' calculations using USDA-ERS data.

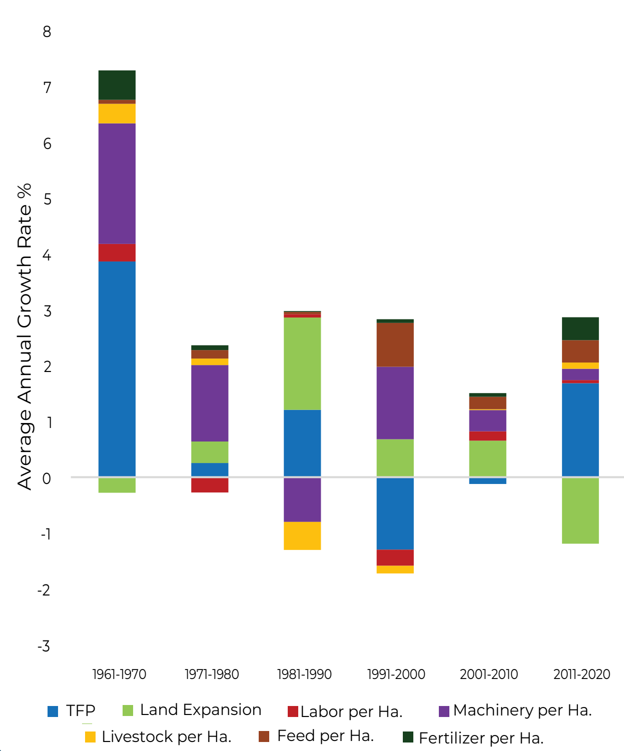
Figure 4 shows the decomposition of input growth over the last six decades, revealing the following:

1. Land expansion and labor contributions exhibited both positive and negative variations over the six decades. Notably, land use recorded strong contributions in both directions.

2. Animal feed and fertilizers consistently contributed positively to agricultural output growth throughout the sixty-year period.

3. Machinery contributed negatively during the 1980s, while livestock recorded negative contributions in both the 1980s and 1990s.

Figure 4: Resource Decomposition of Agricultural Output Growth - Panama

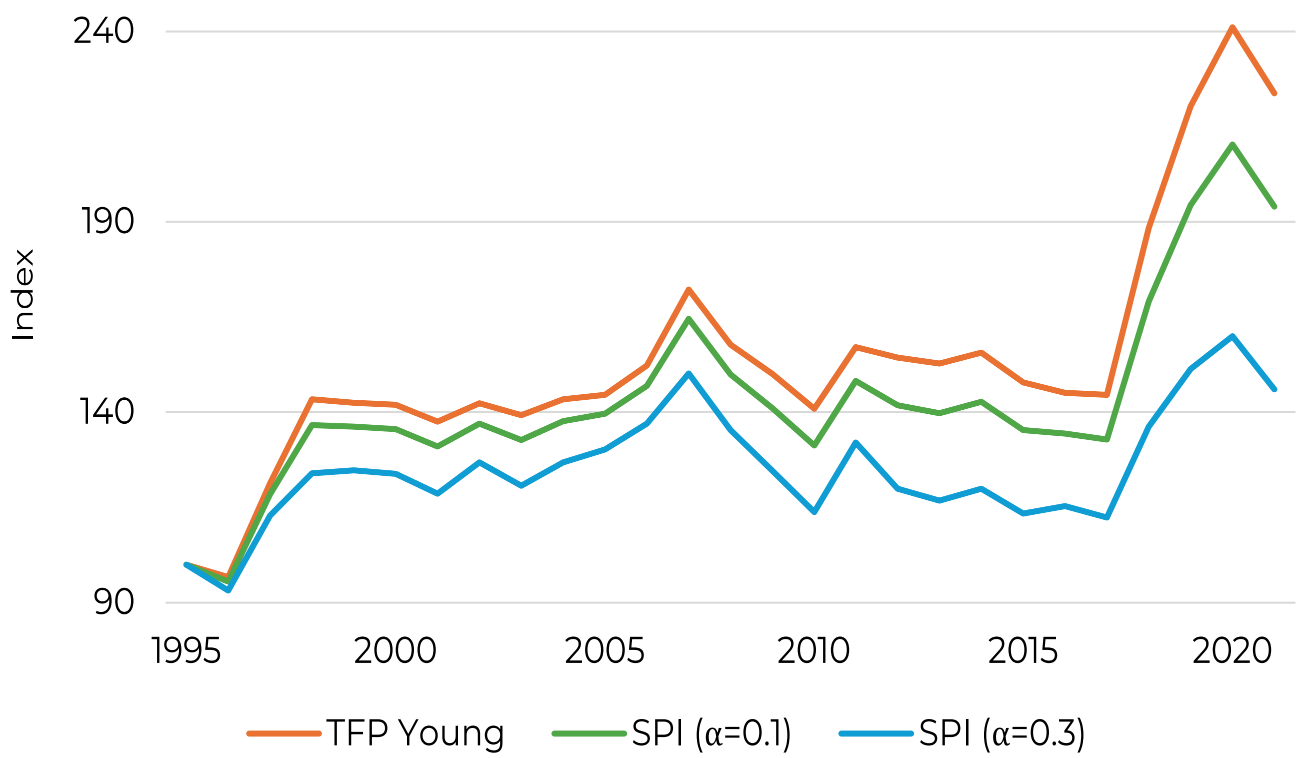


Source: Authors' calculations using USDA-ERS data.

While the decomposition of agricultural growth allows for the identification of the main drivers of agricultural output, this conventional analysis does not consider the environmental impacts generated by the production process. To address this limitation, Sustainable Productivity Indices (SPI)[3] have been estimated using the Young[4] methodology (see **Figure 5**).

The SPI penalizes agricultural output growth based on the magnitude of unwanted byproducts such as greenhouse gas emissions, deforestation, soil erosion, pesticide risk, water stress, and nutrient budget[5]. Consequently, the SPI value varies according to the generation of these byproducts. As shown in the figure below, when a 10% weight is assigned to unwanted byproducts generated by agricultural output, the SPI follows a trajectory similar to that of TFP, reducing productivity growth from 3,1% to 2,6% (TFP vs. SPI) over the last 26 years. However, increasing the weight given to unwanted byproducts to 30% significantly widens the gap between the two trends. Under this scenario, during the last ten years, sustainable productivity grew at an average annual rate of 1.0%, compared with 3.6% for TFP.

Figure 5: TFP vs. SPI – Panama



Source: Authors' calculations using FAOSTAT data.

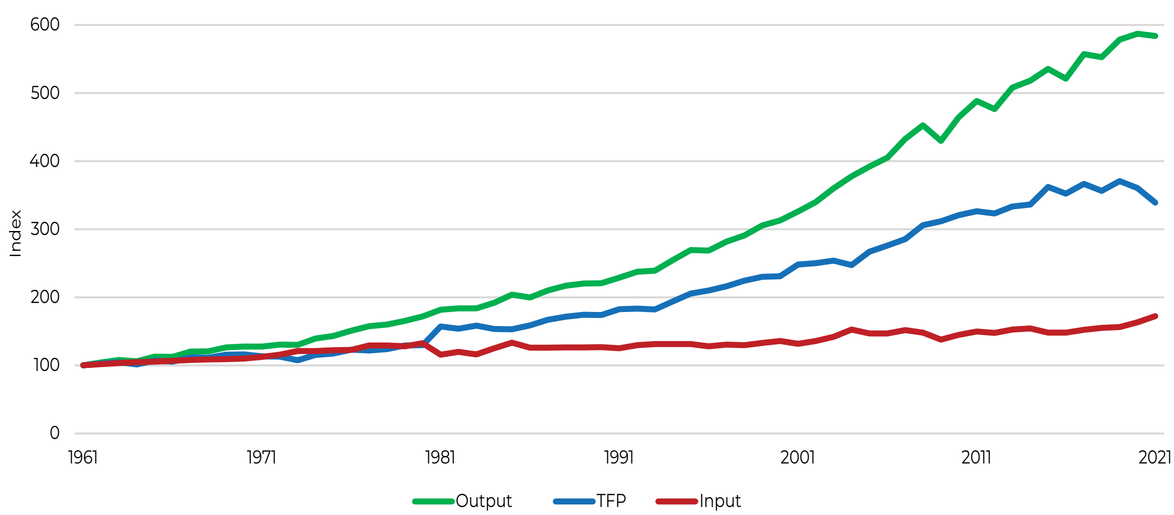
[3] IFPRI and IDB, 2025.
[4] The Geometric Young Index (GY) is a multiplicative index that compares vectors of quantities using weights based on average value shares—derived from average prices when available—fulfilling the axioms of a proper index such as transitivity (O'Donnell, 2018).
[5] The surplus in the budget corresponds to pollution resulting from the production process, particularly the residual nitrogen in soils following the cropping cycle.

5. SOUTHERN CONE

SOUTHERN CONE

Over the last sixty years, the Southern Cone has experienced significant growth in agricultural output, increasing nearly sixfold. An analysis based on USDA-ERS[1] data reveals that the region recorded an average annual agricultural output growth rate of 3.0% (see **Figure 1**), driven primarily by sustained gains in Total Factor Productivity (TFP), which grew at an average annual rate of 2.1%. Although this positive trend was evident, TFP growth also included periods of deceleration. Input use contributed as well—though to a lesser extent—growing at an average annual rate of 0.9%. Notably, in the most recent decade (2010–2020), the region experienced marked stagnation in TFP, with its contribution to output growth aligning closely with that of input use.

Figure 1: Agricultural Output, Inputs, and TFP
Southern Cone (1961-2021)

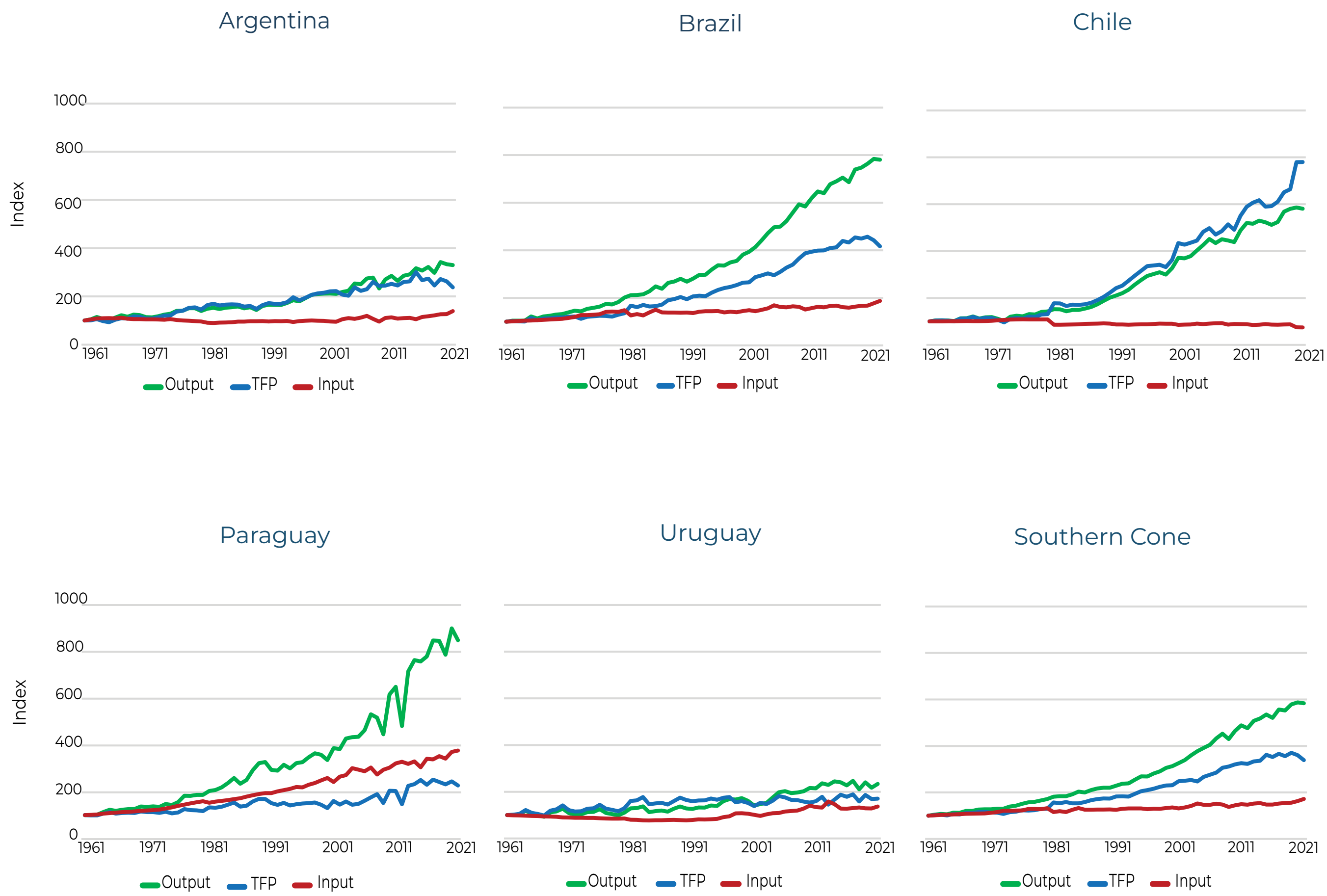


Source: Authors' calculations using USDA-ERS data.

Within the Southern Cone, Chile, Brazil, and Paraguay stand out for their sustained agricultural output growth. In Chile and Brazil, this growth was driven primarily by improvements in Total Factor Productivity (TFP). By contrast, Argentina and Uruguay exhibited stagnant productivity levels, which constrained their agricultural output growth relative to other countries in the subregion. Paraguay's strong performance, in turn, was largely driven by sustained increases in input use[2] (see **Figure 2**).

[1] U.S. Department of Agriculture, Economic Research Service. *International Agricultural Productivity* data product, September 2023 (visited August 2024).
[2] Index based on six inputs: labor, machinery, livestock, agricultural land, feed, and fertilizers.

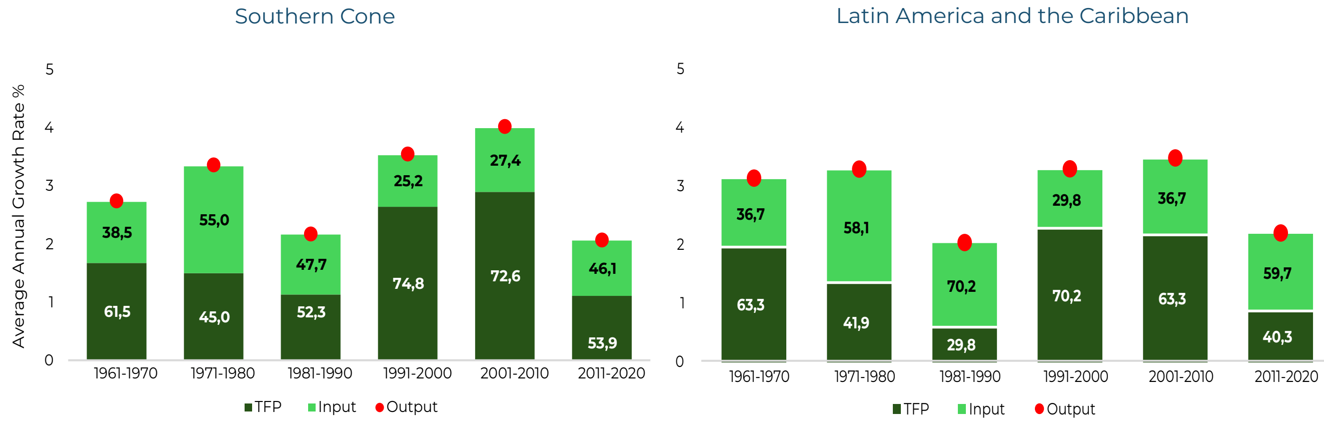
Figure 2: Agricultural output, inputs and TFP by country-region (1961-2021)



Source: Authors' calculations using USDA-ERS data.

An analysis of agricultural output growth by decade (see **Figure 3**) shows that the Southern Cone underperformed relative to the Latin America and Caribbean (LAC) average during the 1960s, with TFP growth falling below the regional level. During that period, the subregion recorded an average annual output growth rate of 1.7%, compared with 2.0% for LAC as a whole. However, in the decades that followed, the Southern Cone's agricultural output consistently outpaced the regional average, driven primarily by productivity gains. In the most recent decade (2010–2020), the subregion registered an average annual growth rate of 2.1%, with 54% attributable to TFP increases and 46% to expanded input use.

Figure 3: Agricultural Output Growth Decomposition by decade



Source: Authors' calculations using USDA-ERS data.

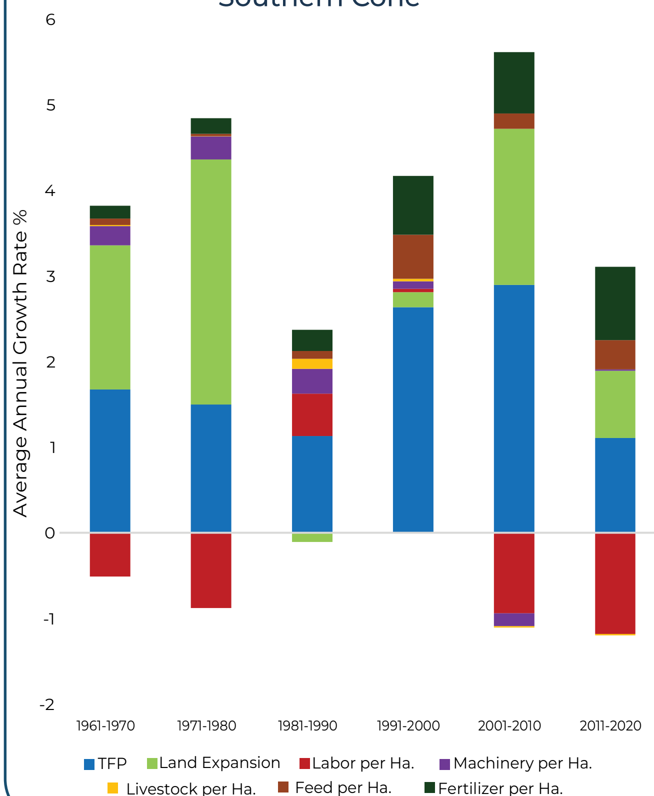
Figure 4 illustrates the decomposition of input growth over the past six decades, revealing the following

1. Land expansion recorded increases in five decades, while labor contributed negatively in four decades.

2. Materials (such as fertilizers and animal feed) contributed positively throughout the entire period.

3. Capital (machinery and livestock) made a positive but marginal contribution to agricultural growth overall, with both components contributing negatively in the 2000s, and livestock again in the 2010s.

Figure 4: Resource Decomposition of Agricultural Output Growth Southern Cone

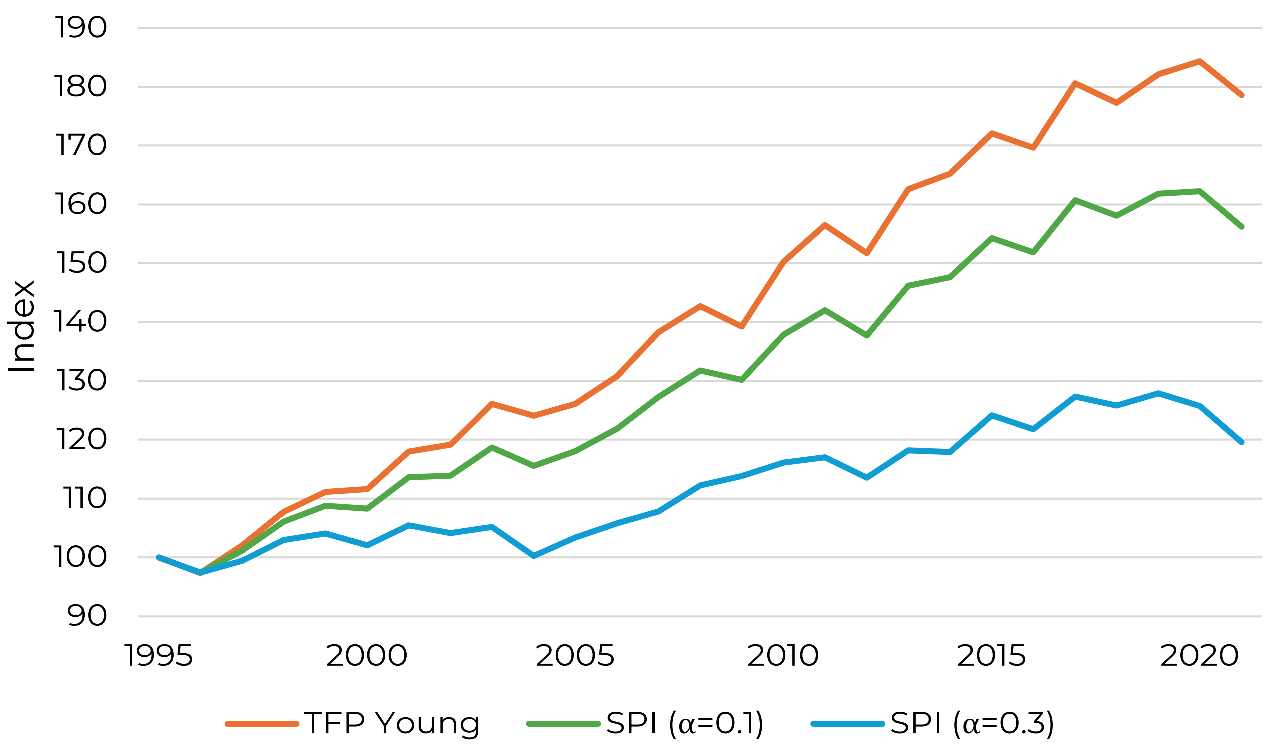


Source: Authors' calculations using USDA-ERS data.

While the decomposition of agricultural growth allows for the identification of the main drivers of agricultural output, this conventional analysis does not consider the environmental impacts generated by the production process. To address this limitation, Sustainable Productivity Indices (SPI)[3] have been estimated using the Young[4] methodology (see **Figure 5**).

The SPI penalizes agricultural output growth based on the magnitude of unwanted by-products such as greenhouse gas emissions, deforestation, soil erosion, pesticide risk, water stress, and nutrient budget[5]. Consequently, the SPI value varies according to the generation of these byproducts. As shown in the figure below, when a 10% weight is assigned to unwanted byproducts generated by agricultural output, the SPI follows a trajectory similar to that of TFP, reducing productivity growth from 2.3% to 1.7% (TFP vs. SPI) over the last 26 years. However, increasing the weight to 30% significantly widens the gap between the two trends. Under this scenario, sustainable productivity grew at an average annual rate of 0.2% over the last decade, compared with 1.3% for TFP.

Figure 5: TFP vs. SPI -Southern Cone



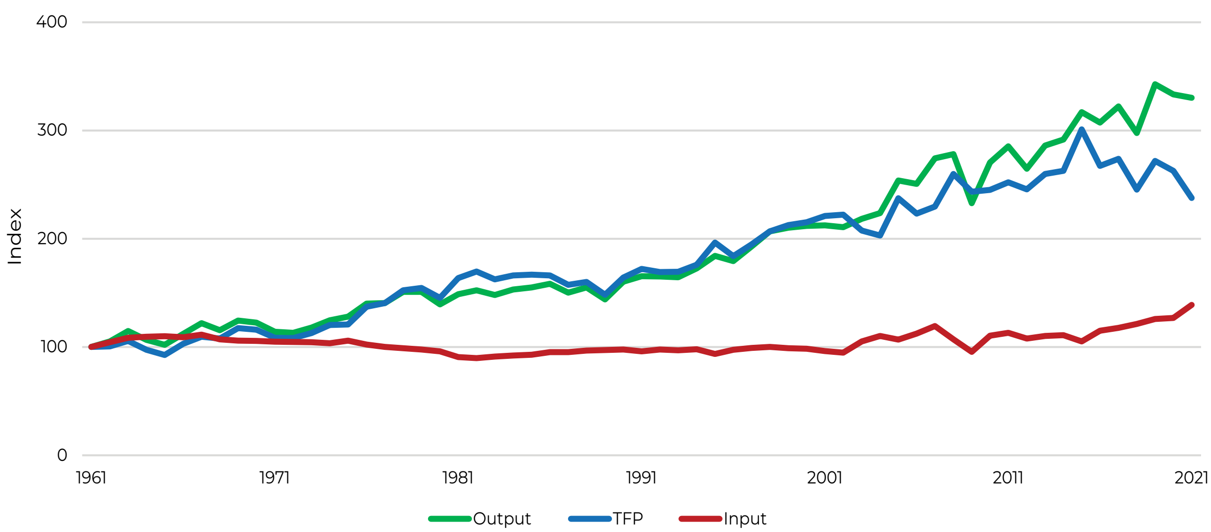
Source: Authors' calculations using FAOSTAT data.

[3] IFPRI and IDB, 2025.
[4] The Geometric Young Index (GY) is a multiplicative index that compares vectors of quantities using weights based on average value shares—derived from average prices when available—fulfilling the axioms of a proper index such as transitivity (O'Donnell, 2018).
[5] The surplus in the budget corresponds to pollution resulting from the production process, particularly the residual nitrogen in soils following the cropping cycle.

ARGENTINA

Over the past sixty years, Argentina has experienced significant growth in agricultural productivity, with output tripling during this period. An analysis of USDA-ERS data[1] reveals that the country recorded an average annual agricultural output growth rate of 2.0% (see **Figure 1**), driven primarily by increases in Total Factor Productivity (TFP), which grew at an average annual rate of 1.5%. By contrast, input use increased at a more moderate average annual rate of 0.5%. Despite this overall positive trend, TFP growth has not been uniform, with periods of stagnation and even contraction observed across the decades. In the most recent decade (2010–2020), TFP growth slowed sharply, averaging just 0.5% annually.

Figure 1: Agricultural Output, Inputs, and TFP
Argentina (1961-2021)

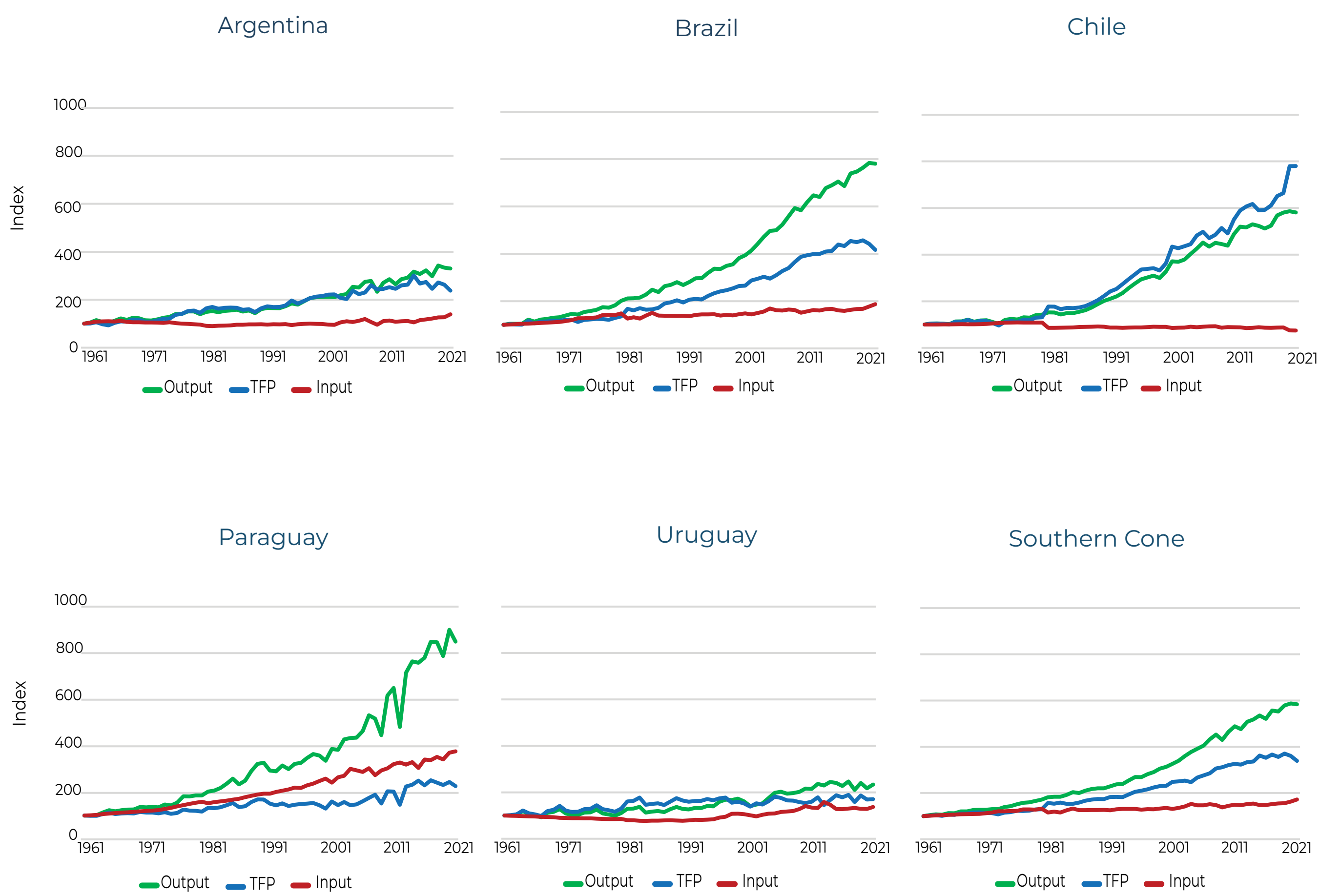


Source: Authors' calculations using USDA-ERS data.

In the Southern Cone, Argentina has recorded TFP growth levels higher than those of Uruguay and Paraguay, but lower than those of Brazil and Chile. In terms of input use, Argentina has shown growth rates comparable to those of Uruguay. Relative to the subregional average, Argentina's agricultural output has increased at a slower pace, largely reflecting its relatively lower input use[2] (see **Figure 2**).

[1] U.S. Department of Agriculture, Economic Research Service. *International Agricultural Productivity* data product, September 2023 (visited August 2024).
[2] Index based on six inputs: labor, machinery, livestock, agricultural land, feed, and fertilizers.

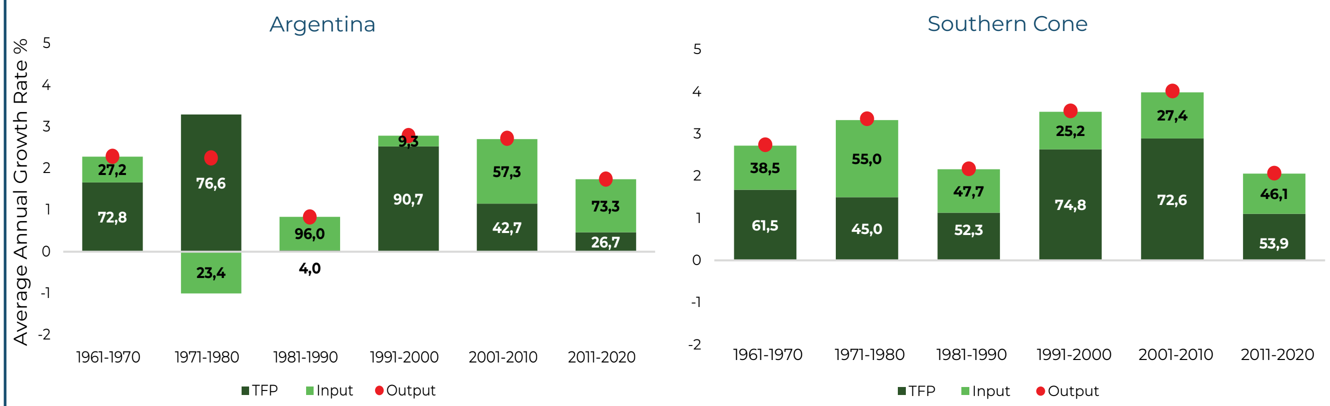
Figure 2: Agricultural output, inputs and TFP by country-region (1961-2021)



Source: Authors' calculations using USDA-ERS data.

Analyzing agricultural output growth by decade (see **Figure 3**), Argentina exhibited relatively weak performance compared with other Southern Cone countries during the 1980s, with TFP growth of just 0.03%, substantially below the subregional average of 1.1% per year. Over the following three decades, however, Argentina's agricultural output recovered, with growth driven primarily by TFP increases during the 1990s. In the most recent decade (2010–2020), Argentina recorded positive output growth of 1.7% annually, with 73% of this increase attributable to input use and 27% to TFP growth.

Figure 3: Agricultural Output Growth Decomposition by decade



Source: Authors' calculations using USDA-ERS data.

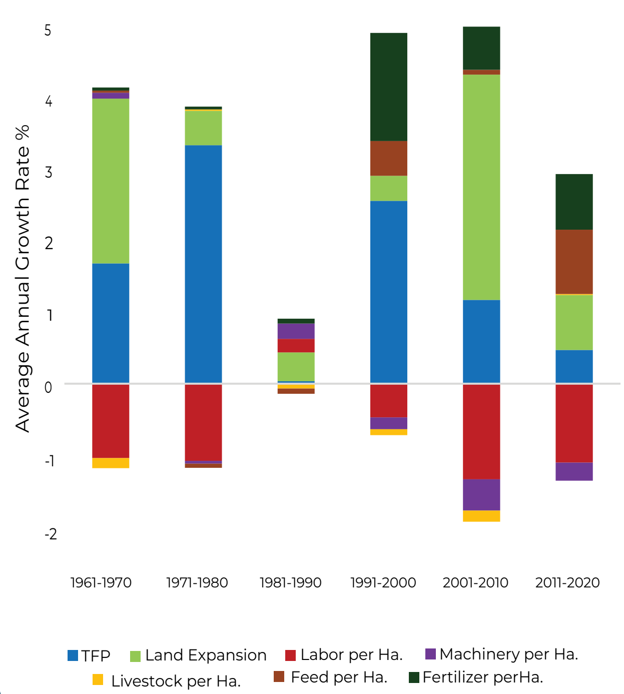
Figure 4 presents the decomposition of input growth over the past six decades, revealing the following:

1. Land expansion exhibited consistent increases over the past sixty years.

2. In the last three decades, the contribution of materials (fertilizers and animal feed) strengthened.

3. With the exception of the 1980s, labor's contribution to agricultural output growth was predominantly negative during the period analyzed.

Figure 4: Resource Decomposition of Agricultural Output Growth Argentina

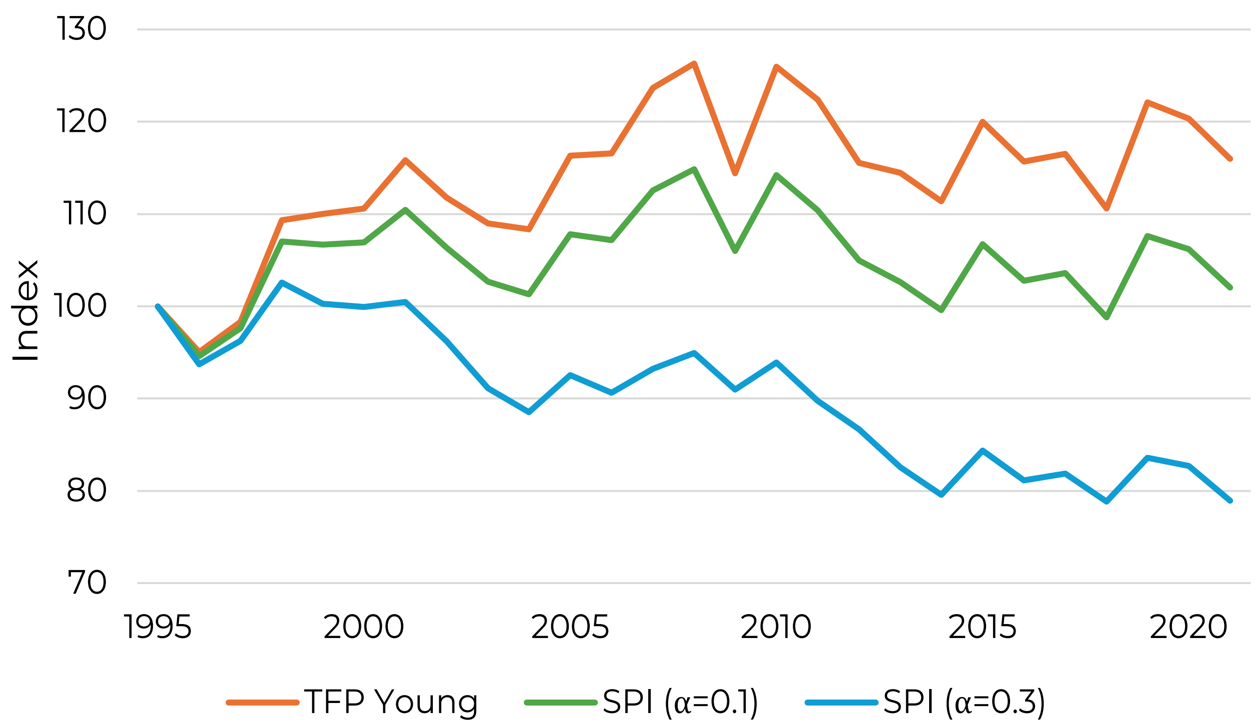


Source: Authors' calculations using USDA-ERS data.

While the decomposition of agricultural growth allows for the identification of the main drivers of agricultural output, this conventional analysis does not consider the environmental impacts generated by the production process. To address this limitation, Sustainable Productivity Indices (SPI)[3] have been estimated using the Young[4] methodology (see **Figure 5**).

The SPI penalizes agricultural output growth based on the magnitude of unwanted byproducts such as greenhouse gas emissions, deforestation, soil erosion, pesticide risk, water stress, and nutrient budget[5]. Consequently, the SPI value varies according to the generation of these byproducts. As shown in the figure below, when a 10% weight is assigned to unwanted byproducts generated by agricultural output, the SPI follows a trajectory similar to that of TFP, reducing productivity growth from 0.6% to 0.1% (TFP vs. SPI) over the last 26 years. However, increasing this weight by 30% significantly widens the gap between the two trends. Under this scenario, during the past decade, sustainable productivity declined at an average annual rate of 1.3%, compared to 0.5% in TFP.

Figure 5: TFP vs. SPI – Argentina



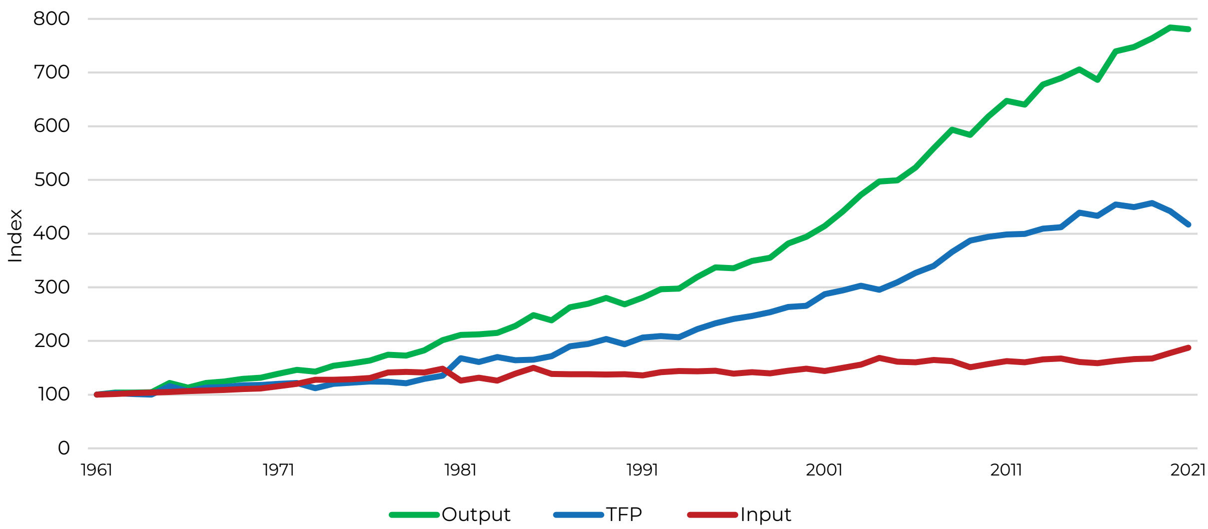
Source: Authors' calculations using FAOSTAT data.

[3] IFPRI and IDB, 2025.
[4] The Geometric Young Index (GY) is a multiplicative index that compares vectors of quantities using weights based on average value shares—derived from average prices when available—fulfilling the axioms of a proper index such as transitivity (O'Donnell, 2018).
[5] The surplus in the budget corresponds to pollution resulting from the production process, particularly the residual nitrogen in soils following the cropping cycle.

BRAZIL

Over the past sixty years, Brazil has experienced significant growth in agricultural output, increasing eightfold. An analysis using USDA-ERS data[1], reveals that the country recorded an average annual growth rate of 3.5% (see **Figure 1**), driven primarily by sustained gains in TFP, which grew at an average annual growth rate of 2.4%. To a lesser extent, input use also increased, with an average annual growth rate of 1.1%. Although Brazil achieved strong TFP growth between 1991 and 2010, this growth slowed in the most recent decade (2010–2020).

Figure 1: Agricultural Output, Inputs, and TFP
Brazil (1961-2021)

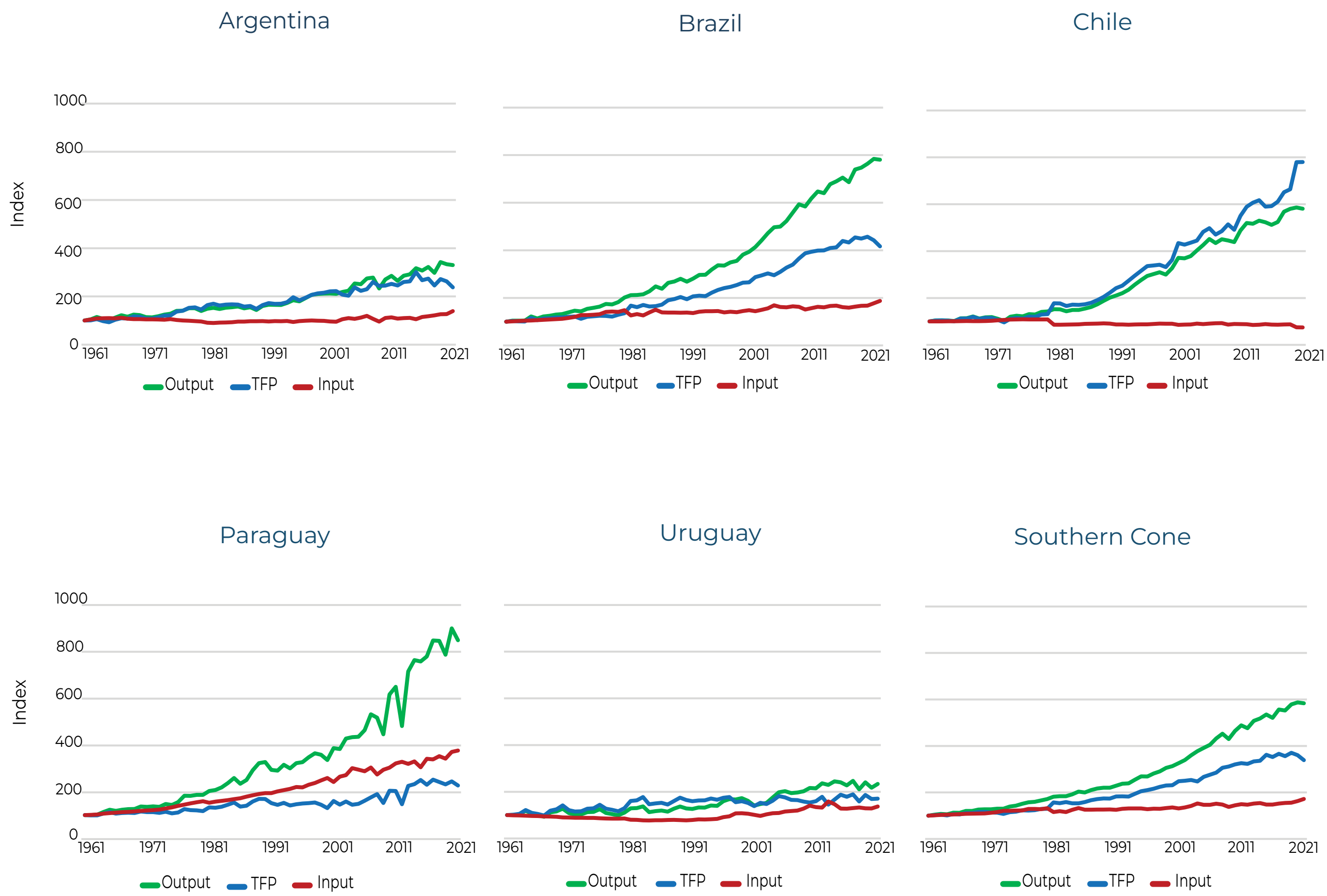


Source: Authors' calculations using USDA-ERS data.

Brazil has demonstrated strong TFP growth within the Southern Cone, with only Chile recording higher levels. In terms of input use[2], Brazil's growth has been comparable to the subregional average. Overall, Brazil's agricultural output has exceeded the Southern Cone average, driven primarily by sustained gains in TFP (see **Figure 2**).

[1] U.S. Department of Agriculture, Economic Research Service. *International Agricultural Productivity* data product, September 2023 (visited August 2024).
[2] Index based on six inputs: labor, machinery, livestock, agricultural land, feed, and fertilizers.

Figure 2: Agricultural output, inputs and TFP by country-region (1961-2021)



Source: Authors' calculations using USDA-ERS data.

Analyzing agricultural output growth by decade (see **Figure 3**), Brazil consistently outperformed the Southern Cone average throughout the entire period analyzed. Total Factor Productivity (TFP) growth also generally exceeded the subregional average, with the exception of the 1970s, when Brazil's TFP grew by 1.4% compared with the Southern Cone average of 1.5% per year. In the most recent decade (2010–2020), Brazil recorded an average annual agricultural output growth rate of 2.2%, with 54% of this growth attributable to TFP gains and 46% to increased input use.

Figure 3: Agricultural Output Growth Decomposition by decade

Source: Authors' calculations using USDA-ERS data.

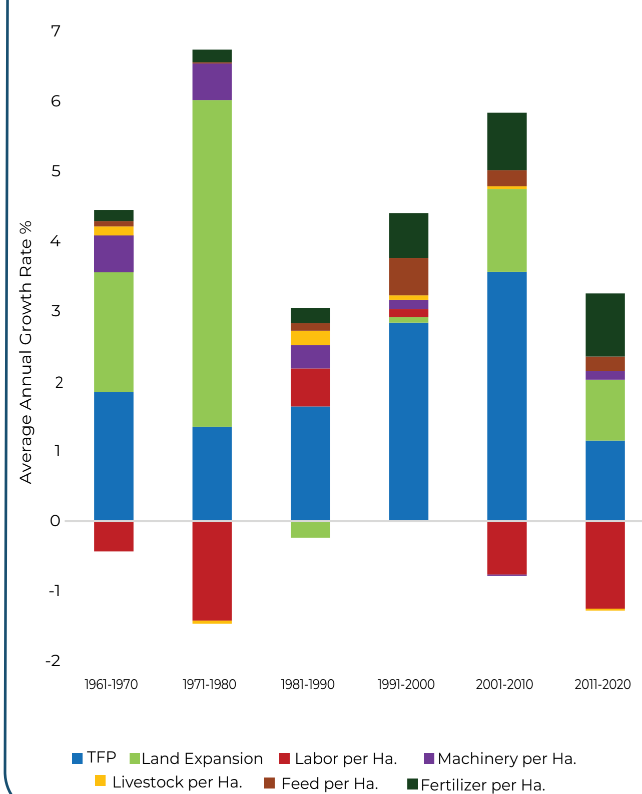
Figure 4 presents the decomposition of input growth over the past six decades, revealing the following:

1. Land expansion contributed positively to agricultural output growth over the past sixty years, except during the 1981–1990 period.

2. Over the six decades, the contribution of materials —specifically fertilizers and animal feed—remained positive.

3. With the exception of the 1981–2000 period, labor's contribution to agricultural output growth was consistently negative over the past sixty years.

Figure 4: Resource Decomposition of Agricultural Output Growth-Brazil

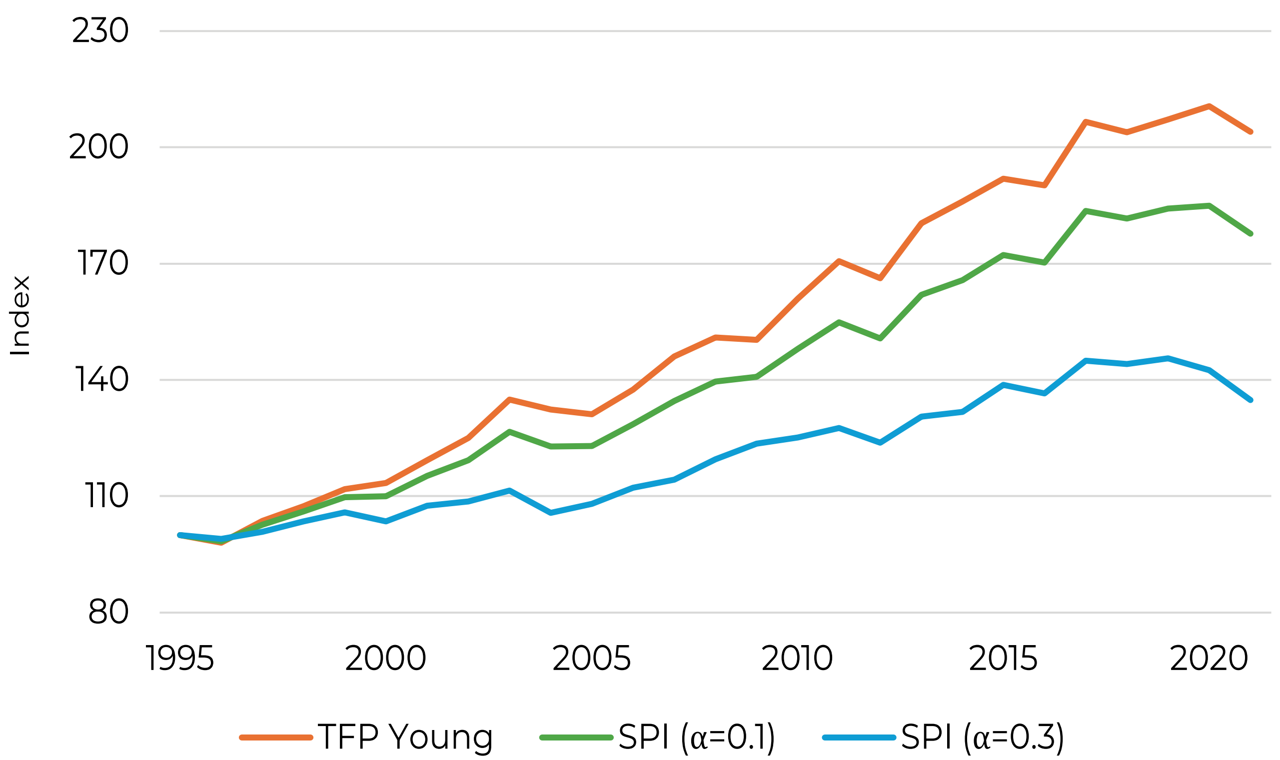


Source: Authors' calculations using USDA-ERS data.

While the decomposition of agricultural growth allows for the identification of the main drivers of agricultural output, this conventional analysis does not consider the environmental impacts generated by the production process. To address this limitation, Sustainable Productivity Indices (SPI)[3] have been estimated using the Young[4] methodology (see **Figure 5**).

The SPI penalizes agricultural output growth based on the magnitude of unwanted byproducts such as greenhouse gas emissions, deforestation, soil erosion, pesticide risk, water stress, and nutrient budget[5]. Consequently, the SPI value varies according to the generation of these byproducts. As shown in the figure below, when a 10% weight is assigned to unwanted byproducts generated by agricultural output, the SPI follows a trajectory similar to that of TFP, reducing productivity growth from 2.8% to 2.2% (TFP vs. SPI) over the last 26 years. However, increasing this weight by 30% significantly widens the gap between the two trends, Under this scenario, over the past ten years, sustainable productivity increased at an average annual rate of 0.6%, compared to 1.8% for TFP.

Figure 5: TFP vs. SPI – Brazil



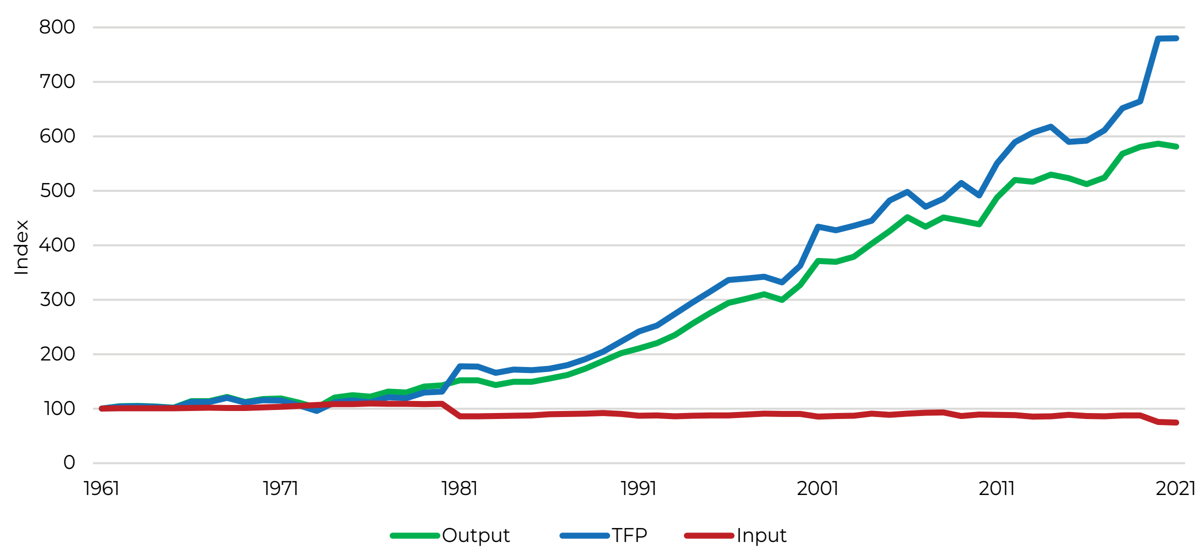
Source: Authors' calculations using FAOSTAT data.

[3] IFPRI and IDB, 2025.
[4] The Geometric Young Index (GY) is a multiplicative index that compares vectors of quantities using weights based on average value shares—derived from average prices when available—fulfilling the axioms of a proper index such as transitivity (O'Donnell, 2018).
[5] The surplus in the budget corresponds to pollution resulting from the production process, particularly the residual nitrogen in soils following the cropping cycle.

CHILE

Over the past sixty years, Chile has experienced significant growth in agricultural output, increasing sixfold. An analysis using USDA-ERS data[1] reveals that the country recorded an average annual agricultural output growth rate of 3.0% (see **Figure 1**), driven primarily by a strong upward trend in Total Factor Productivity (TFP), which grew at an average annual rate of 3.5%. By contrast, input use declined over the same period, with an average annual decrease of –0.5%. While TFP growth remained moderate—below 2%—in the initial decades, Chile has experienced a notable acceleration in productivity growth since 1980.

Figure 1: Agricultural Output, Inputs, and TFP
Chile (1961-2021)

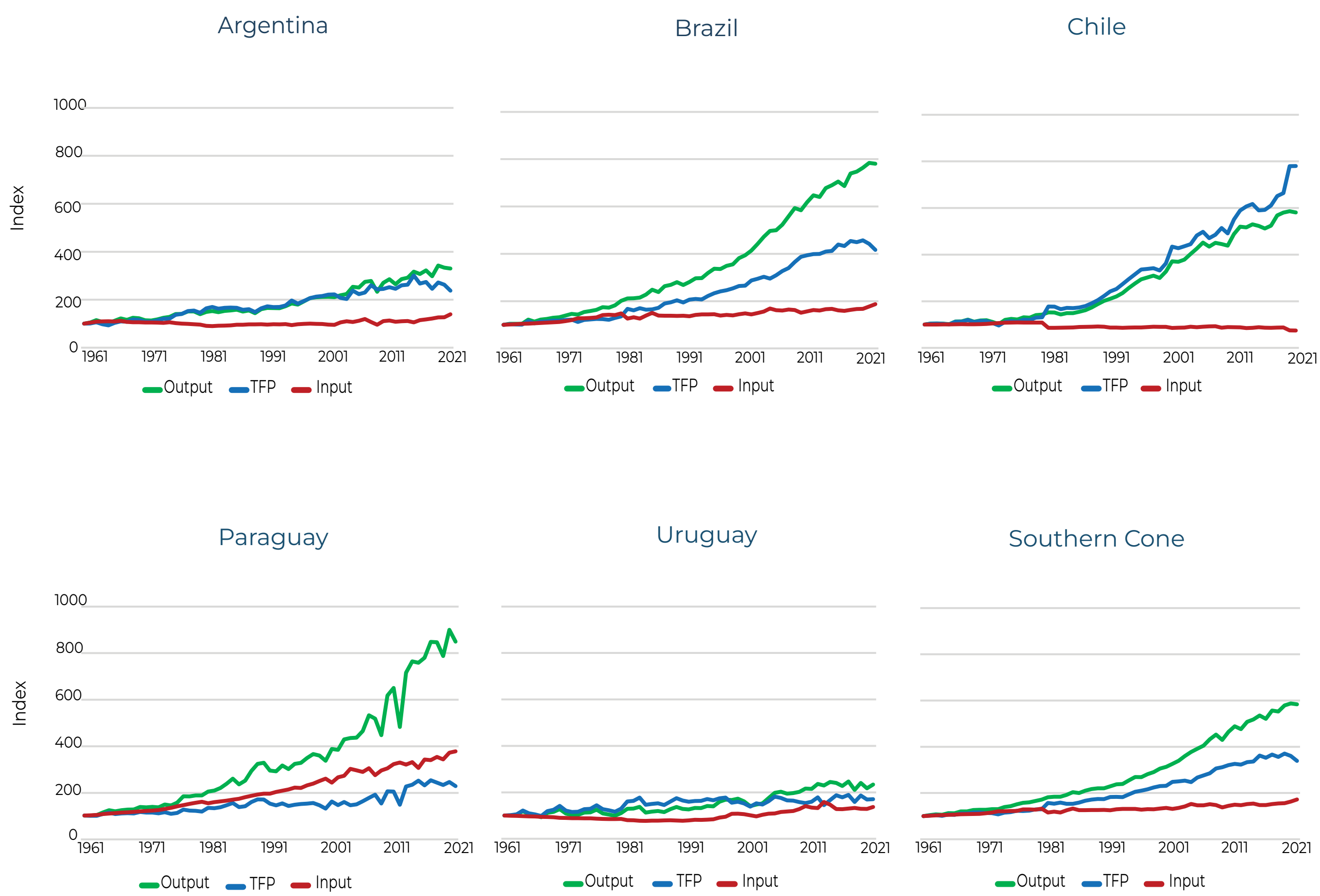


Source: Authors' calculations using USDA-ERS data.

Within the Southern Cone, Chile has recorded the highest levels of TFP growth in the subregion. In terms of input use[2], it stands out as the only country to have consistently registered negative growth rates. As a result, Chile's agricultural output has grown well above the Southern Cone average, driven primarily by strong productivity gains (see **Figure 2**).

[1] U.S. Department of Agriculture, Economic Research Service. *International Agricultural Productivity* data product, September 2023 (visited August 2024).
[2] Index based on six inputs: labor, machinery, livestock, agricultural land, feed, and fertilizers.

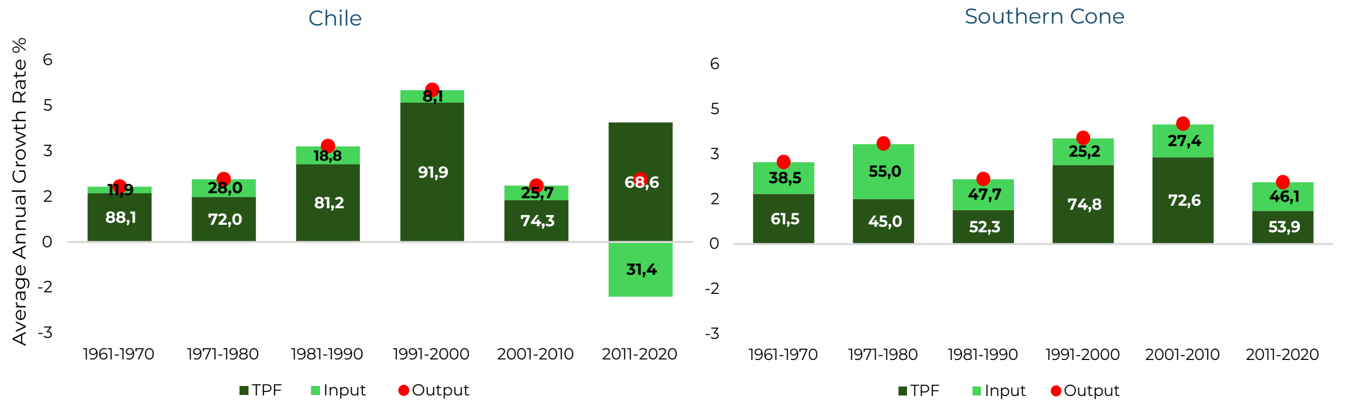
Figure 2: Agricultural output, inputs and TFP by country-region (1961-2021)



Source: Authors' calculations using USDA-ERS data.

Analyzing agricultural output growth by decade (see **Figure 3**), Chile showed relatively weak performance in the 1960s and 1970s compared with other Southern Cone countries, with TFP increases similar to the subregional average. During this period, the average growth rate of input use was close to zero. In the following two decades, however, Chile's agricultural output growth outpaced that of its subregional peers, driven primarily by substantial productivity gains. In the most recent decade (2010–2020), Chile recorded an average annual output growth rate of 2.1%, with 31% attributable to input use and 69% to TFP growth.

Figure 3: Agricultural Output Growth Decomposition by decade



Source: Authors' calculations using USDA-ERS data.

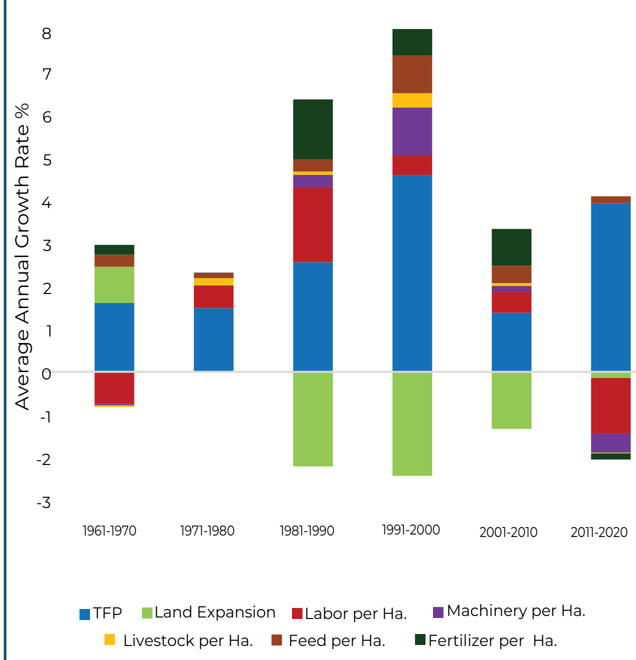
Figure 4 presents the decomposition of input growth over the past six decades, revealing the following:

1. Land expansion has exhibited a declining trend since 1980.

2. Over the past six decades, the contribution of materials (fertilizers and animal feed) has generally been positive, except in the most recent decade, when fertilizer use contributed negatively.

3. Labor's contribution to agricultural output growth was negative during both the first and last decades.

Figure 4: Resource Decomposition of Agricultural Output Growth Chile

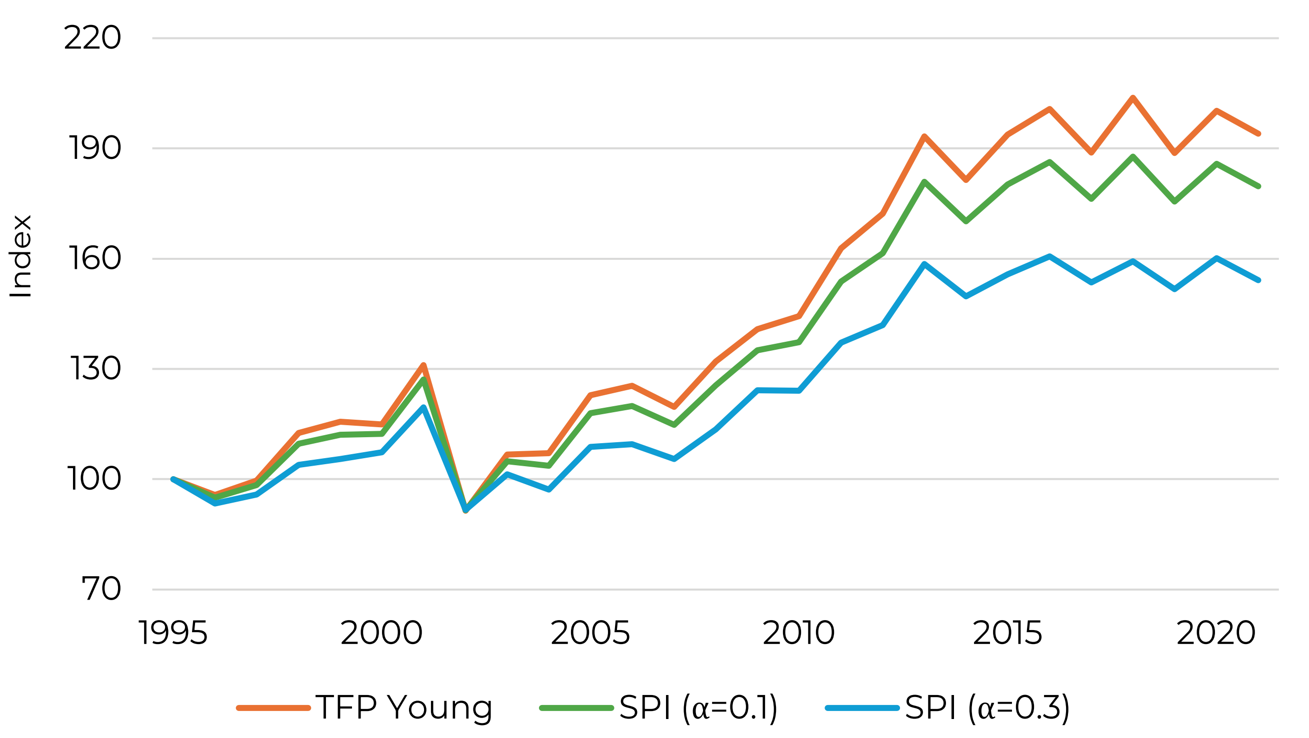


Source: Authors' calculations using USDA-ERS data.

While the decomposition of agricultural growth allows for the identification of the main drivers of agricultural output, this conventional analysis does not consider the environmental impacts generated by the production process. To address this limitation, Sustainable Productivity Indices (SPI)[3] have been estimated using the Young[4] methodology (see **Figure 5**).

The SPI penalizes agricultural output growth based on the magnitude of unwanted byproducts such as greenhouse gas emissions, deforestation, soil erosion, pesticide risk, water stress, and nutrient budget[5]. Consequently, the SPI value varies according to the generation of these byproducts. As shown in the figure below, when a 10% weight is assigned to unwanted byproducts generated by agricultural output, the SPI follows a trajectory similar to that of TFP, reducing productivity growth from 2,6% a 2,3% (TFP vs. SPI) over the last 26 years. However, increasing this weight by 30% significantly widens the gap between the two trends. Under this scenario, over the past ten years, sustainable productivity has grown at an average annual rate of 1.2%, compared to 1.8% for TFP.

Figure 5: TFP vs. SPI – Chile



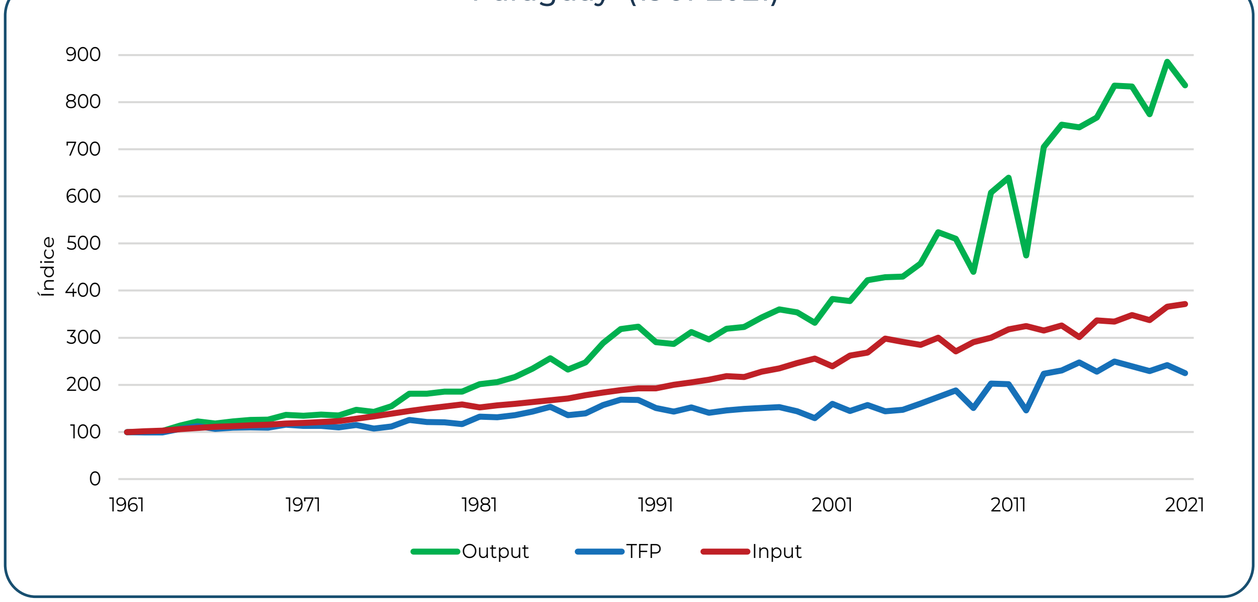
Source: Authors' calculations using FAOSTAT data.

[3] IFPRI and IDB, 2025.
[4] The Geometric Young Index (GY) is a multiplicative index that compares vectors of quantities using weights based on average value shares—derived from average prices when available—fulfilling the axioms of a proper index such as transitivity (O'Donnell, 2018).
[5] The surplus in the budget corresponds to pollution resulting from the production process, particularly the residual nitrogen in soils following the cropping cycle.

PARAGUAY

Over the past sixty years, Paraguay has experienced significant growth in agricultural output, increasing more than eightfold. An analysis using USDA-ERS data[1] reveals that the country recorded an average annual agricultural output growth rate of 3.6% (see **Figure 1**), driven primarily by increases in input use, which grew at an average annual rate of 2.2%. To a lesser extent, Total Factor Productivity (TFP) also contributed positively, despite periods of stagnation and contraction, with an average annual growth rate of 1.4%. In the most recent decade (2010–2020), however, the contribution of TFP to agricultural output growth surpassed that of input use.

Figure 1: Agricultural Output, Inputs, and TFP
Paraguay (1961-2021)

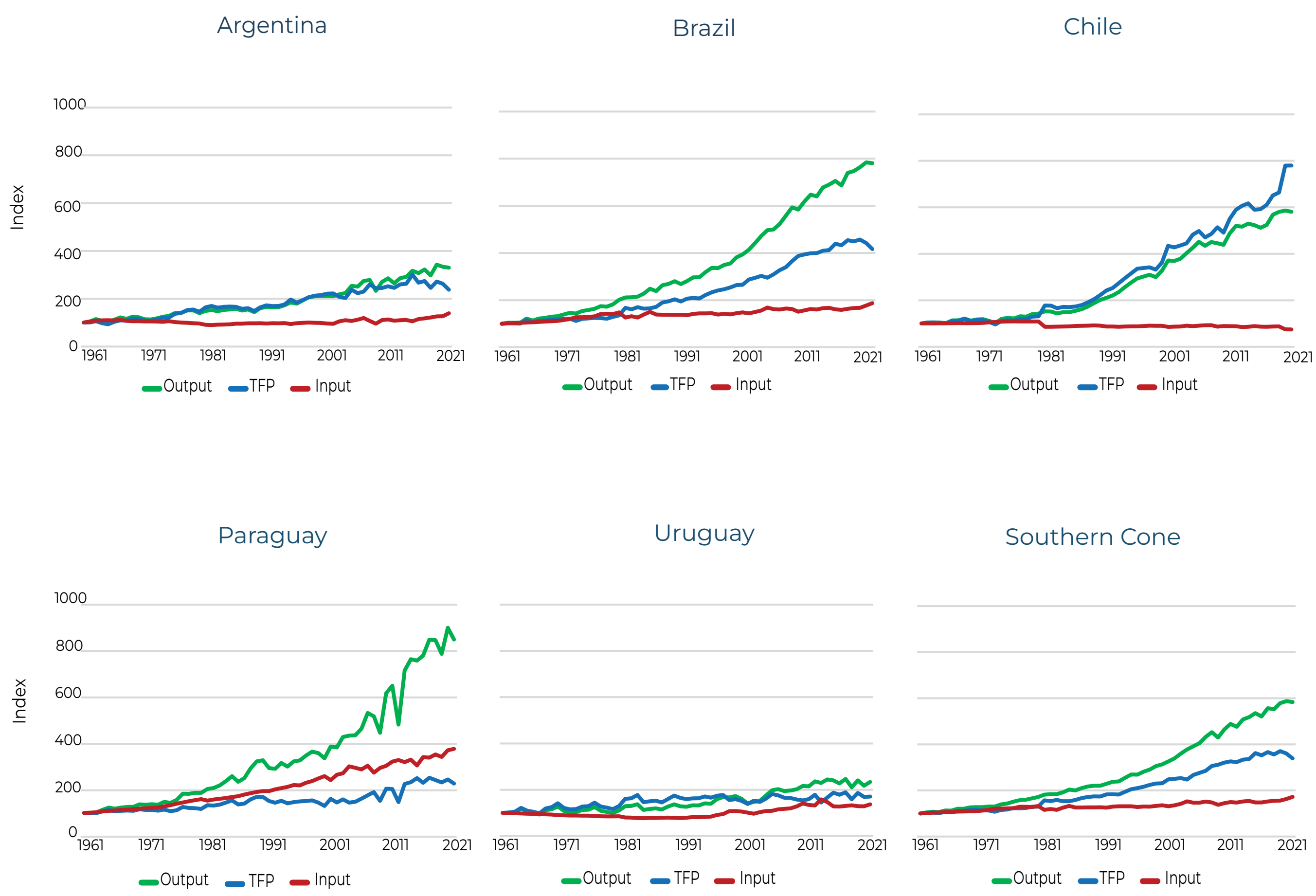


Source: Authors' calculations using USDA-ERS data.

In the Southern Cone, Paraguay has achieved TFP growth levels comparable to those of Brazil and Chile, the highest in the subregion during the period analyzed. In terms of input use, Paraguay recorded the fastest growth rate in the subregion. Overall, Paraguay's agricultural output has expanded well above the Southern Cone average, driven largely by increased input use[2] (see **Figure 2**).

[1] U.S. Department of Agriculture, Economic Research Service. *International Agricultural Productivity* data product, September 2023 (visited August 2024).
[2] Index based on six inputs: labor, machinery, livestock, agricultural land, feed, and fertilizers.

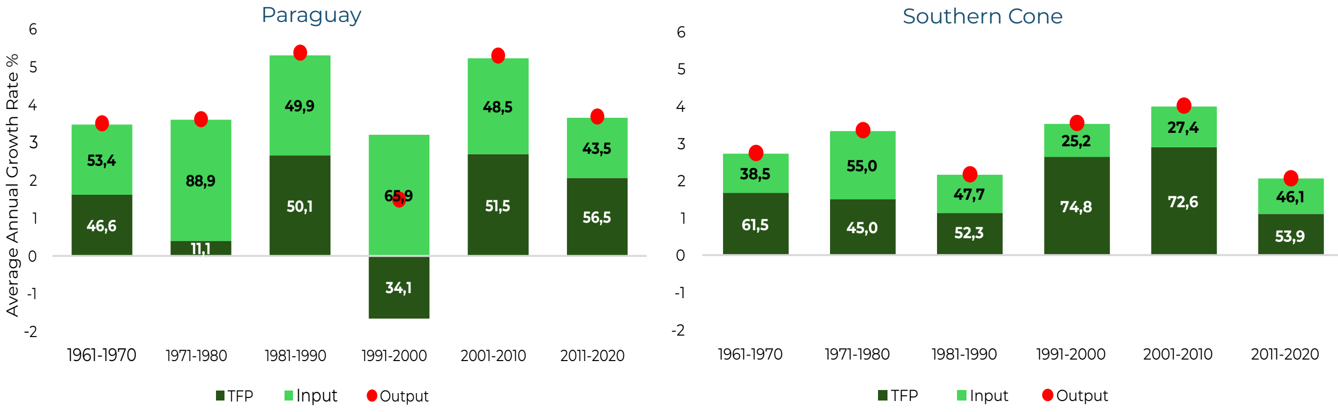
Figure 2: Agricultural output, inputs and TFP by country-region (1961-2021)



Source: Authors' calculations using FAOSTAT data.

The decomposition of agricultural output growth by decade (see **Figure 3**) shows that Paraguay performed similarly to the Southern Cone average during the 1970s, with TFP increasing by 0.4% compared with the subregional average of 1.5%. In the following decades—except for the 1991–2000 period—Paraguay's agricultural output growth outpaced that of its subregional peers, driven primarily by TFP gains that exceeded the growth rate of input use. In the most recent decade (2010–2020), the country recorded an average annual output growth rate of 3.7%, with 44% attributable to input use and 56% to TFP growth.

Figure 3. Agricultural Output Growth Decomposition by decade



Source: Authors' calculations using USDA-ERS data.

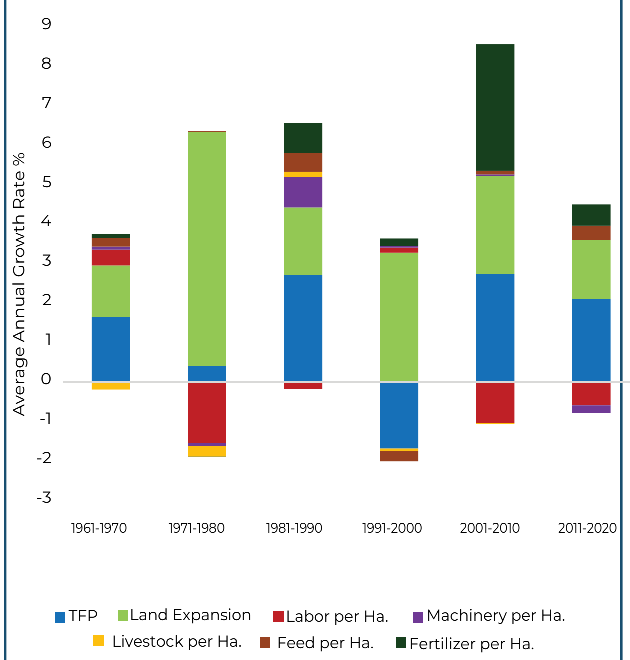
Figure 4 presents the decomposition of input growth over the past six decades, revealing the following:

1. Land expansion increased over the past sixty years.

2. The contribution of materials (fertilizers and animal feed) to output growth was positive during the 2001–2020 period.

3. Labor contributed negatively to agricultural output growth over the last two decades.

Figure 4: Resource Decomposition of Agricultural Output Growth- Paraguay

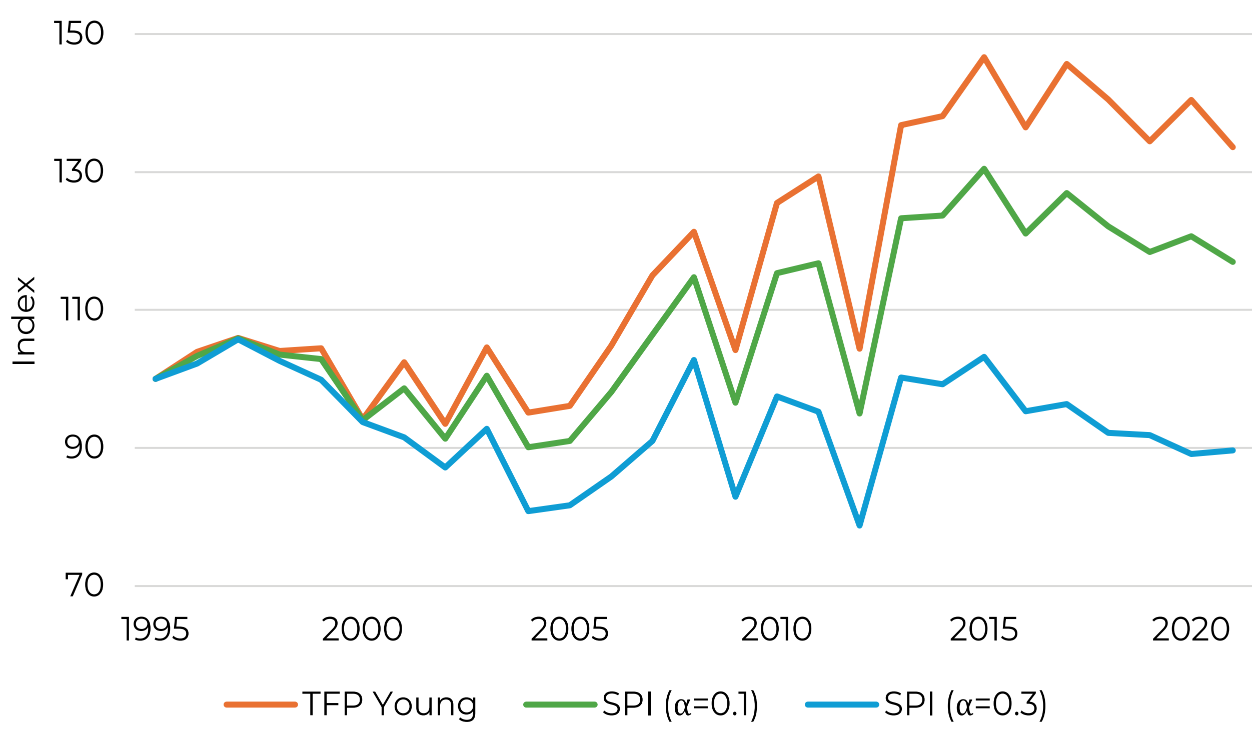


Source: Authors' calculations using USDA-ERS data.

While the decomposition of agricultural growth allows for the identification of the main drivers of agricultural output, this conventional analysis does not consider the environmental impacts generated by the production process. To address this limitation, Sustainable Productivity Indices (SPI)[3] have been estimated using the Young[4] methodology (see **Figure 5**).

The SPI penalizes agricultural output growth based on the magnitude of unwanted byproducts such as greenhouse gas emissions, deforestation, soil erosion, pesticide risk, water stress, and nutrient budget[5]. Consequently, the SPI value varies according to the generation of these byproducts. As shown in the figure below, when a 10% weight is assigned to unwanted byproducts generated by agricultural output, the SPI follows a trajectory similar to that of TFP, reducing productivity growth from 1,1% a 0,6% (TFP vs. SPI) over the last 26 years. However, increasing this weight by 30% significantly widens the gap between the two trends. Under this scenario, over the past ten years, sustainable productivity declined at an average annual rate of 0.6%, compared to a 0.3% increase in TFP.

Figure 5: TFP vs. SPI – Paraguay



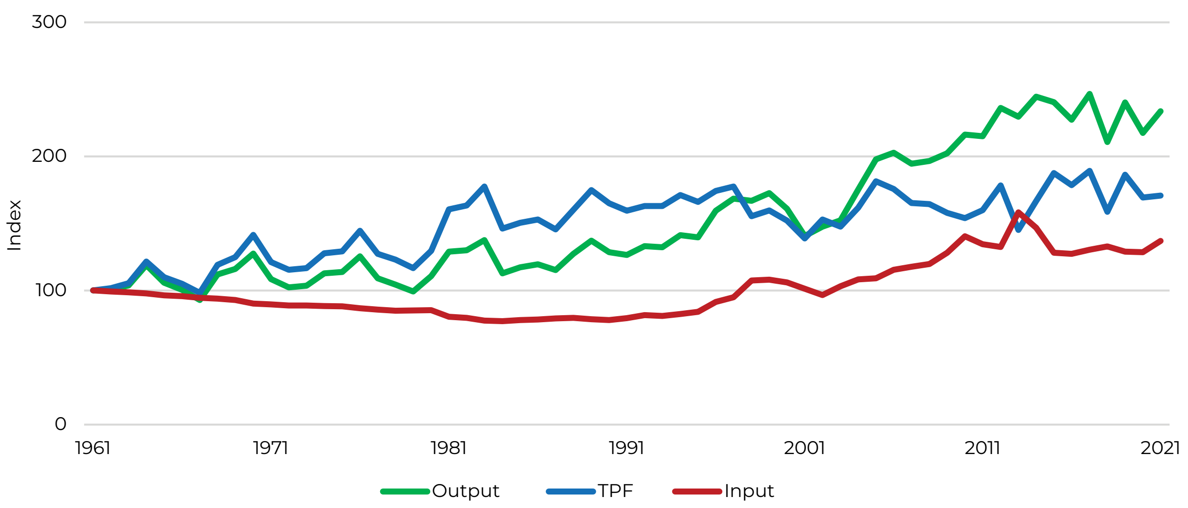
Source: Authors' calculations using FAOSTAT data.

[3] IFPRI and IDB, 2025.
[4] The Geometric Young Index (GY) is a multiplicative index that compares vectors of quantities using weights based on average value shares—derived from average prices when available—fulfilling the axioms of a proper index such as transitivity (O'Donnell, 2018).
[5] The surplus in the budget corresponds to pollution resulting from the production process, particularly the residual nitrogen in soils following the cropping cycle.

URUGUAY

Over the past sixty years, Uruguay has experienced modest growth in agricultural output, increasing 2.3-fold. An analysis using USDA-ERS data[1] reveals that the country recorded an average annual agricultural output growth rate of 1.4% (see **Figure 1**), driven primarily by gains in Total Factor Productivity (TFP), which increased at an average annual rate of 0.9%. Over the same period, input use grew more slowly, averaging 0.5% per year. Since the 1970s, TFP has exhibited periods of stagnation and occasional contraction. Notably, in the most recent decade (2010–2020), TFP growth enabled Uruguay to offset a decline in input use in agricultural production.

Figure 1: Agricultural Output, Inputs, and TFP
Uruguay (1961-2021)

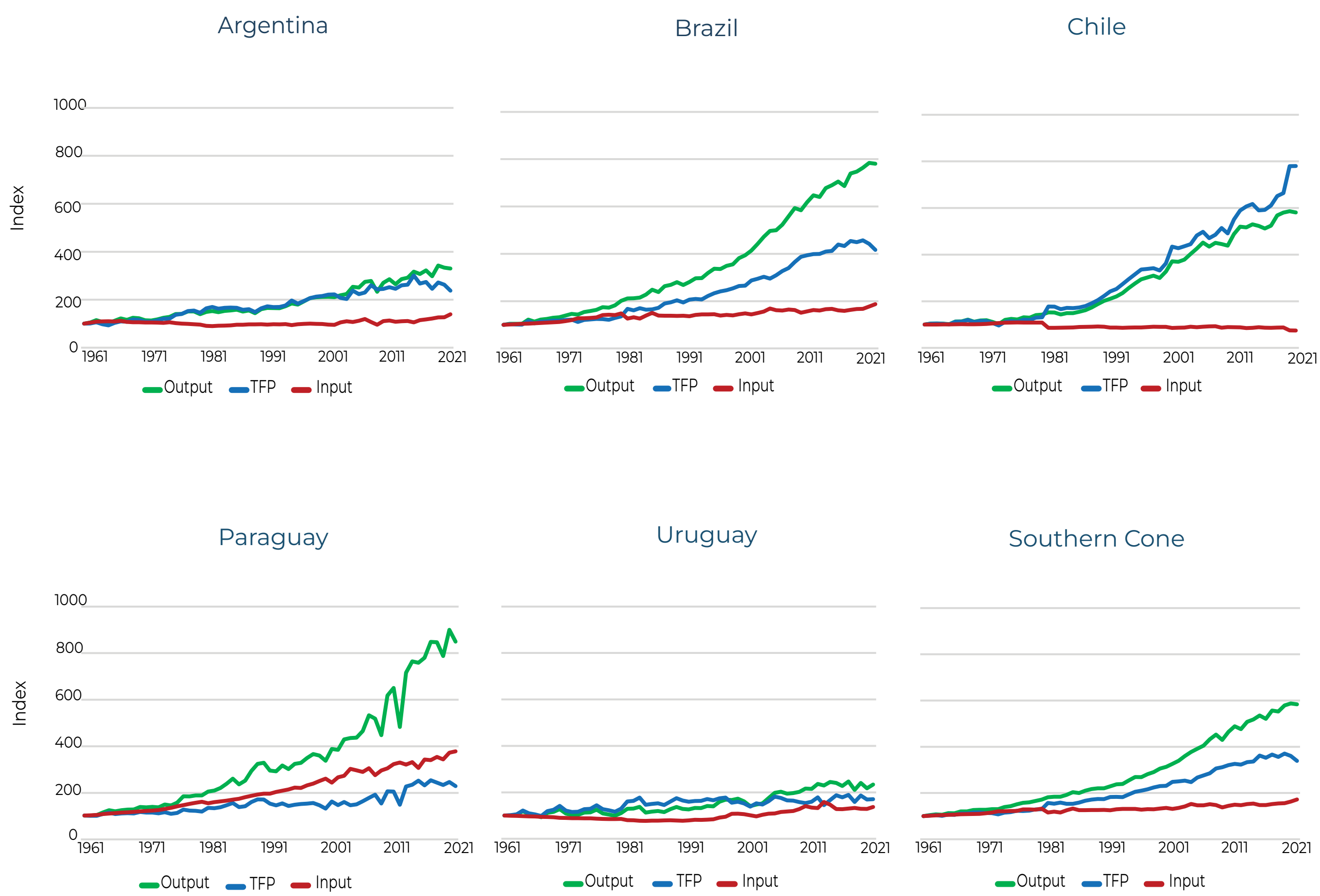


Source: Authors' calculations using USDA-ERS data.

In the Southern Cone, Uruguay has achieved lower levels of TFP growth than the subregional average. In terms of input use, Uruguay's growth has been comparable to that of Argentina but remains below the subregional average. Overall, Uruguay's agricultural output has expanded at a rate well below the Southern Cone average, reflecting both limited TFP growth and lower input use[2] (see **Figure 2**).

[1] U.S. Department of Agriculture, Economic Research Service. *International Agricultural Productivity* data product, September 2023 (visited August 2024).
[2] Index based on six inputs: labor, machinery, livestock, agricultural land, feed, and fertilizers.

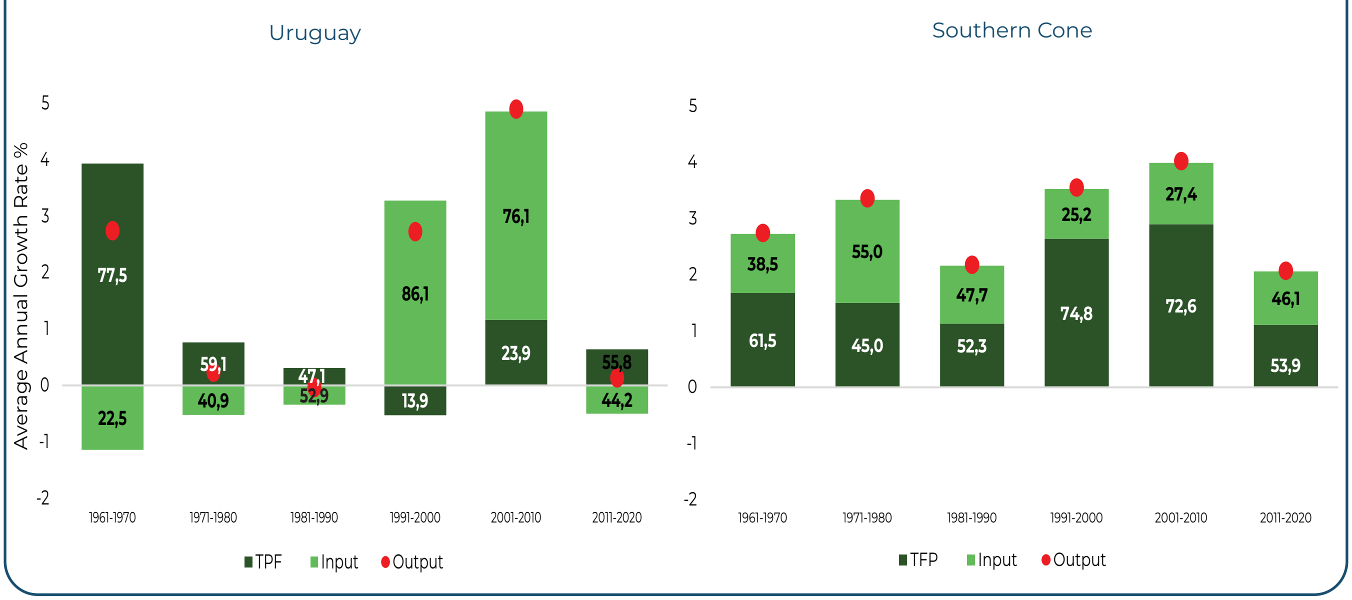
Figure 2: Agricultural output, inputs and TFP by country-region (1961-2021)



Source: Authors' calculations using USDA-ERS data.

The decomposition of agricultural output growth by decade (see **Figure 3**) shows that Uruguay underperformed relative to the Southern Cone average during the 1970s and 1980s, with TFP increases falling below the subregional level—particularly in the 1980s, when Uruguay's TFP grew by just 0.3% compared with the Southern Cone average of 1.5% per year. Between 1990 and 2010, Uruguay's agricultural output increased, and during the 2001–2010 decade it even surpassed the Southern Cone average, driven mainly by increases in input use. In the most recent decade (2010–2020), Uruguay recorded average annual output growth of 0.1%, explained entirely by gains in TFP, as input use declined.

Figure 3: Agricultural Output Growth Decomposition by decade



Source: Authors' calculations using USDA-ERS data.

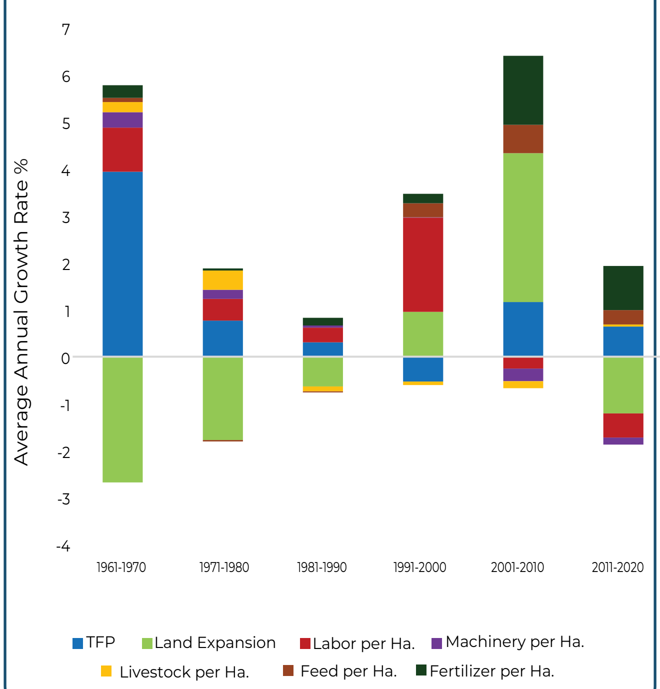
Figure 4 presents the decomposition of input growth over the past six decades, revealing the following:

1. Land expansion increased between 1991 and 2010.

2. Over the past four decades, the contribution of materials (fertilizers and animal feed) remained positive

3. Labor contributed positively between 1961 and 2000 but declined over the last two decades.

Figure 4: Resource Decomposition of Agricultural Output Growth Uruguay

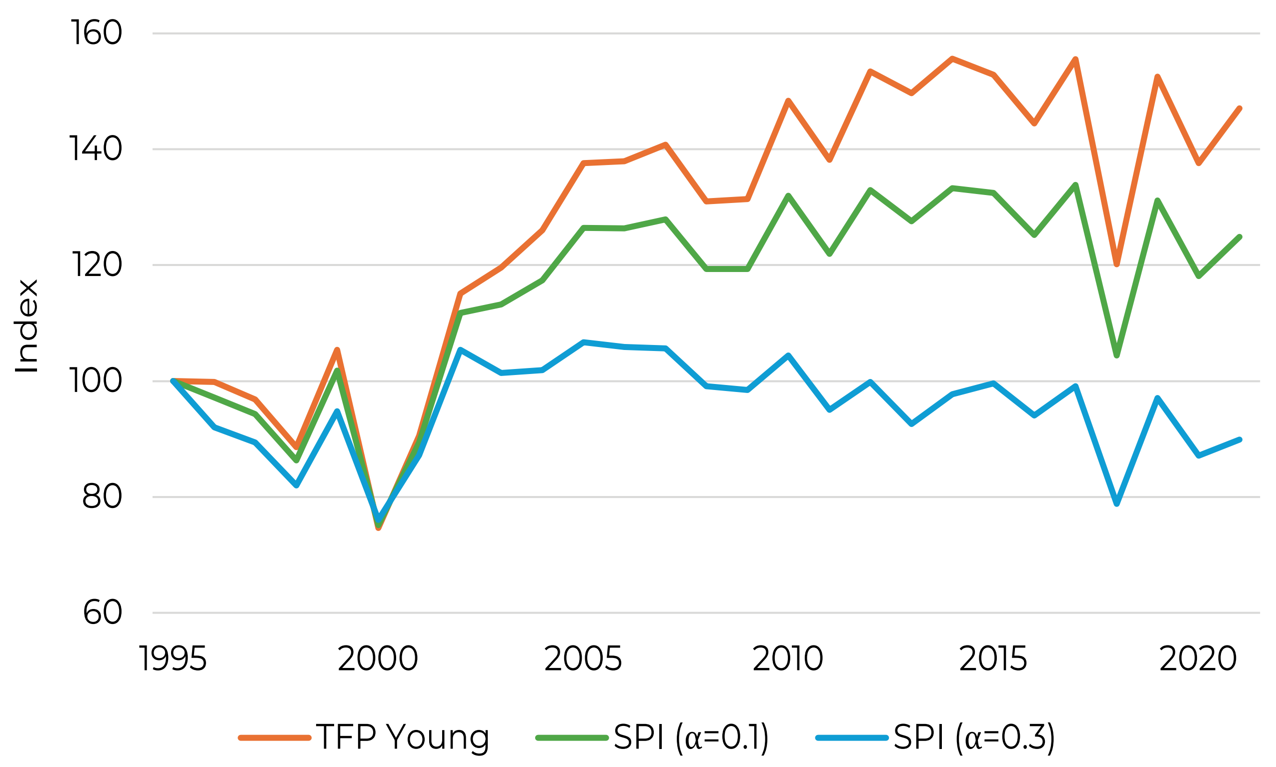


Source: Authors' calculations using USDA-ERS data.

While the decomposition of agricultural growth allows for the identification of the main drivers of agricultural output, this conventional analysis does not consider the environmental impacts generated by the production process. To address this limitation, Sustainable Productivity Indices (SPI)[3] have been estimated using the Young[4] methodology (see **Figure 5**).

The SPI penalizes agricultural output growth based on the magnitude of unwanted byproducts such as greenhouse gas emissions, deforestation, soil erosion, pesticide risk, water stress, and nutrient budget[5]. Consequently, the SPI value varies according to the generation of these byproducts. As shown in the figure below, when a 10% weight is assigned to unwanted byproducts generated by agricultural output, the SPI follows a trajectory similar to that of TFP, reducing productivity growth from 1,5% a 0,9% (TFP vs. SPI) over the last 26 years. However, increasing this weight by 30% significantly widens the gap between the two trends. Under this scenario, over the past ten years, sustainable productivity declined by an average of 0.6% per year, compared with TFP growth of 0.6%.

Figure 5: TFP vs. SPI – Uruguay



Source: Authors' calculations using FAOSTAT data.

[3] IFPRI and IDB, 2025.
[4] The Geometric Young Index (GY) is a multiplicative index that compares vectors of quantities using weights based on average value shares—derived from average prices when available—fulfilling the axioms of a proper index such as transitivity (O'Donnell, 2018).
[5] The surplus in the budget corresponds to pollution resulting from the production process, particularly the residual nitrogen in soils following the cropping cycle.

IDB

Improving lives