



FEED THE FUTURE

The U.S. Government's Global Hunger & Food Security Initiative



State of the Digital Agriculture Sector

Harnessing the Potential of Digital for Impact Across Agricultural
Value Chains in Latin America and the Caribbean



BEANSTALK



Latin America and the Caribbean

ROLE OF AGRICULTURE AND SMALLHOLDER FARMERS IN LATIN AMERICA AND THE CARIBBEAN

Latin America and the Caribbean countries, abundant with natural resources, including a third of the world's freshwater resources and high-quality agricultural soil, vary significantly in the structure and scale of their agricultural sectors. The region's GDP contribution from the agriculture, forestry, and fishing sector stands at 6.9%, with country-specific percentages ranging from under 3% in the Caribbean countries like Trinidad and Tobago, St. Lucia, and Panama to over 10% in Honduras, Haiti, Nicaragua, and Bolivia.

The agriculture sector in the LAC region is a crucial employment source, engaging 15.0% of the region's labor force. In countries like Haiti, Ecuador, Bolivia, Guatemala, and Nicaragua,

the labor force engaged in agriculture approaches one-third, mostly comprising smallholder farmers working on labor-intensive crops. However, in Southern Cone countries where agriculture is highly mechanized, this percentage drops below 10%. The World Bank estimates that the LAC region hosts 13 million smallholder farms out of a total 15 million farms in the region.⁸⁶ The agricultural sector in LAC holds great potential, often touted as the “next global breadbasket,”⁸⁷ but it will require significant productivity gains, especially in smallholder farming.

⁸⁶ Virginia Tech: GAP report, 2021

⁸⁷ IDB & Global Harvest: The Next Global Breadbasket, How Latin America Can Feed the World, 2014

Agriculture Sector Contribution to GDP	Agriculture Sector Contribution to Sector Employment	Key Crops
6.9% ⁸⁸	15% ⁸⁹	Corn, soybean, sugarcane, wheat, coffee, beans
Average Size of a Smallholder Farm	Number of Smallholder Farmers	Share of Female Workers
2.5 ha (1.3 ha in the Caribbean) ⁹⁰	~15m ⁹¹	>30%

Table 39. Role of Agriculture in Latin America and the Caribbean

Number of active D4Ag solutions (2022)	240
Number of active D4Ag solutions (2018)	200
Most commonly observed use case	Enterprise Management & Efficiency
Median number of users per solution	40,000
Proportion of innovators breaking even	67%

Table 40. D4Ag Reach and Adoption in LAC

D4AG REACH AND ADOPTION PROGRESS IN LAC

A total of 240 D4Ag tools have been identified in the region, with over 80% of these concentrated in just three countries: Brazil, Argentina, and Colombia. Brazil has emerged as a regional leader in D4Ag innovation, accounting for more than 60% of all identified solutions in the region.

88 World Bank Data, “Agriculture, forestry, and fishing, value added (% of GDP)”, 2021

89 World Bank Data, “Employment in Agriculture (% of total employment)”, 2021

90 ECLAC, FAO and IICA (2019), The Outlook for Agriculture and Rural Development in the Americas: 2019–2020

91 Home | OECD iLibrary ([oecd-ilibrary.org](https://www.oecd-ilibrary.org/))

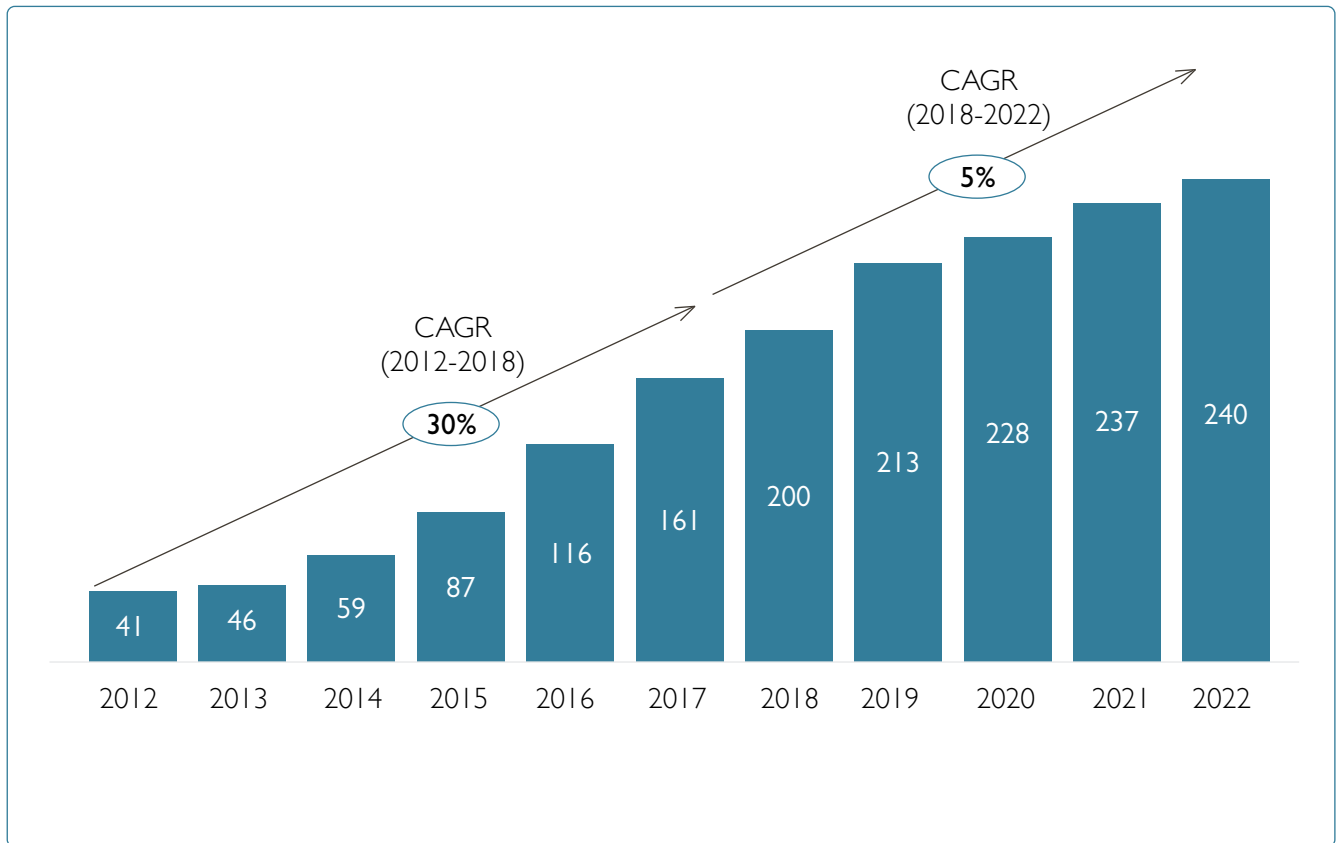


Figure 81. Number of Active D4Ag Solutions in LAC, 2012-2022

Latin American D4Ag solutions also tend to have a 20%–50% smaller user base size than their peers in Africa or Asia. This is in part due to the smaller addressable market in the region, as well as the fact that D4Ag innovators in Latin

America tend to focus more on larger-scale commercial farmers than on smallholders. As a result, few digital tools have managed to exceed 25,000 registered users, with most having less than 10,000 registrants. Interestingly, **the**



Source Source: Feed the Future Flickr. Photo credit: Patrick Meinhardt for Catholic Relief Services



Figure 82. Number of Active D4ag Solutions, by Country HQ, 2022.

proportion of innovators breaking even is 67%, higher than the global average. This promising finding can be attributed to a few key factors. One significant contributor is the presence of larger, more tech-intensive farms

in regions like Brazil and Argentina. These larger farms typically have greater capacity to invest in and benefit from D4Ag solutions due to their scale of operations; and their readiness and willingness to pay for these technologies

can help drive revenue for D4Ag innovators, aiding their journey to financial breakeven. Furthermore, the strategic orientation of D4Ag innovators toward business-to-business (B2B) solutions, such as supply chain management, could also be playing a role. B2B solutions often cater to larger organizations with deeper pockets compared to individual smallholder farmers, enabling them to command higher price points and generate more stable revenue streams. This focus on more lucrative B2B markets can significantly contribute to the higher breakeven rate observed among these D4Ag innovators.

The most commonly observed use case in the Latin American D4Ag landscape is “Enterprise Management & Efficiency,” which contrasts with the “Market Linkages & Advisory Services” that dominate the markets in Africa and Asia, likely reflecting a dominant role of large corporate agribusinesses in the region.

The D4Ag sector in the region showcases diverse levels of development, with certain countries like Brazil standing out as leaders in D4Ag. Interestingly, two-thirds of innovators

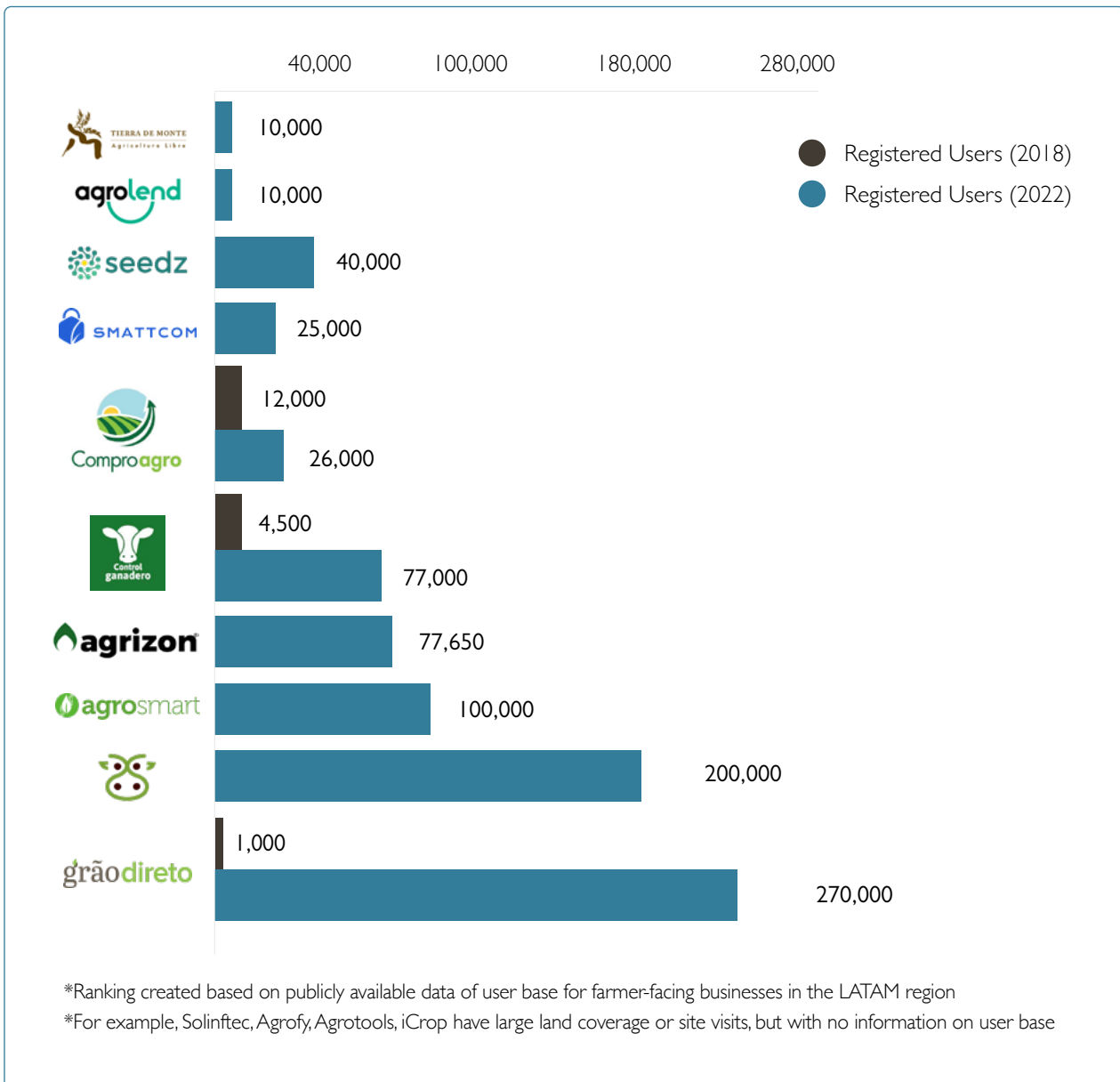


Figure 83. Registered Users of Top-10 D4Ag Solutions. LAC, 2022

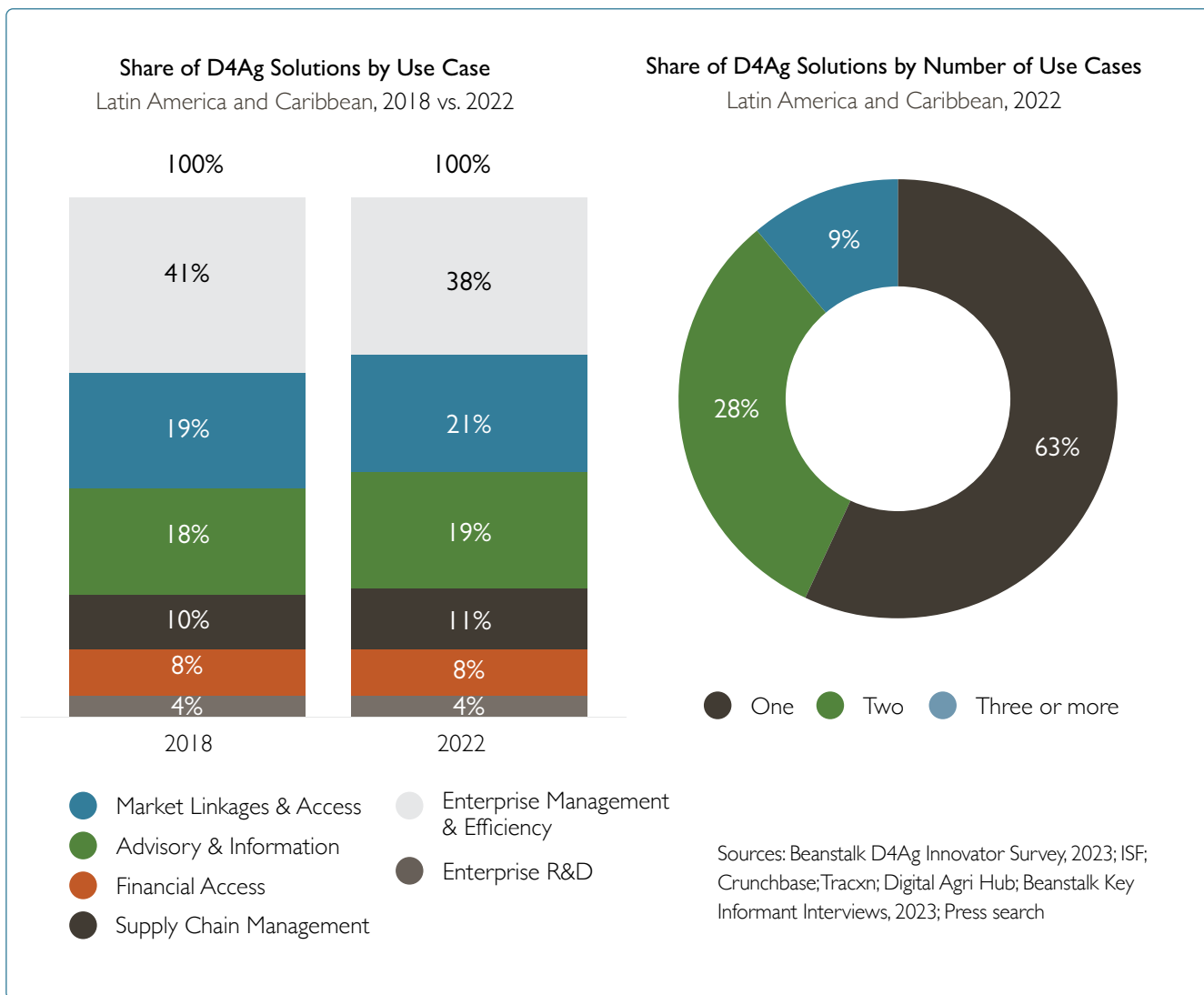


Figure 84. Current & Historical Mix of Use Cases (LAC, % Of Total)

in the region are focusing on “point-solutions,” instead of offering various services, reflecting a targeted approach to solving specific problems faced by rural producers. These tailored solutions, especially in the area of “Enterprise Management & Efficiency,” are often driven by various factors such as accessibility to extensive rural production data, investment preferences of venture capitalists, scalable technology, and alignment with the key pain points identified by rural producers in the region. The nuanced landscape, therefore, illustrates a region that is not only embracing innovation in agribusiness but also shaping it according to unique needs and opportunities.

In 2022, Latin American D4Ag innovators raised US\$613 million in total funding. However, significant investment in the D4Ag sector in Latin America has been limited to a few selected innovators. Notably, eight out of 10 largest investment rounds are concentrated in Brazil, again demonstrating the country’s leading role in the region’s D4Ag development.

	Solution Name	Total Funding (US\$, Mn)	Stage	HQ Country	Operations
1	Frubana	\$ 271.1	Series C		  
2	Solinftec	\$ 146.6	Series C		  
3	Agrolend	\$ 106.8	Series B		
4	Agrofy	\$ 60	Series C		  +7
5	TerraMagna	\$ 42.7	Series A		
6	Agrotools	\$ 21	Series B		 +6
7	Seedz	\$ 16.5	Series A		
8	Agrosmart	\$ 15.5	Series A		 
9	Grão Direto	\$ 14.3	Series A		
10	Rúmina	\$ 5.5	Series A		

Table 41. Top 10 Solutions by Total Amount of Private Funding Raised, 2022, LAC, (US\$, Mn). Source: Crunchbase.

ROLE OF D4AG IN NAVIGATING LAND RIGHTS IN LATIN AMERICA AND THE CARIBBEAN:

Latin America and the Caribbean face widespread land tenure insecurity, a high number of informal property holders, and insecure land rights for women and indigenous communities. These issues are intensified by outdated, complex land administration systems and disorganized property data, and further complications arise from inadequate land risk assessment resources, poor implementation of existing laws, and a lack

of legal frameworks to pursue reforms.⁹²

1. Land Ownership Disparities:

Historic and systemic issues have resulted in a severe concentration of land ownership in the region, leaving women, indigenous people, and other marginalized groups with smaller, fragmented, or informally held lands. According to FAO, LAC is the region with the most unequal land distribution in the world.⁹³ Moreover, according to Oxfam, the one percent of the largest estates account for more than half of the region's agricultural land; conversely, 80% of the smallest farms occupy less than 13% of productive land.⁹⁴

92 IFAD's support for land and natural resource tenure security. Latin America and the Caribbean. IFAD, 2018

93 Land governance in Latin America and the Caribbean. Innovation and inclusion for economic recovery and resilience. FAO, 2022

94 Oxfam. 2016. Unearthed: land, power and inequality in Latin America.



Papyrus, an organization active in Haiti, has made strides in the digital agriculture sector through the creation of a mobile application designed to assist farmers. The app allows comprehensive tracking of farming processes, from field preparation to the distribution of crops at facilities. It records real-time data from the field and aids in crop monitoring. This wealth of data can not only optimize farming practices but also, unexpectedly, has the potential to address contentious land rights issues in the region.

A few years ago, Papyrus became aware of a significant challenge facing many Haitian farmers: insecure land tenure. Due to the absence of a clear cadastral system, disputes over land ownership are commonplace. The organization realized that the extensive data it had been gathering for approximately eight years could potentially serve as evidence of farmers' land use, helping to clarify land rights issues.

The data can provide a history of farmers' interaction with their land, which, in turn, could be instrumental in aiding farmers in obtaining legal papers and titles to their land. This unexpected use case underlines the importance and potential of the data collected by Papyrus.

The realization of this additional function of the data has placed a new responsibility on the organization, leading them to question how the data can best be utilized to serve the interests of the farmers they work with. This revelation has underscored the need for a more reflective approach on how data collection can be tailored to better serve and benefit the farmers themselves.

Papyrus now carries the burden of this responsibility, recognizing the importance of the historical data they hold about farmers and their farms. The challenge ahead is to figure out the best way to leverage this data, not only to enhance agricultural practices but also to secure farmers' land rights, a vital component in improving their livelihoods and fostering agricultural development.

As one in five people in LAC feel insecure in their rights over their housing and land, these farmers are often discouraged from investing in long-term agricultural improvements, including implementation of D4Ag solutions.⁹⁵ Moreover, many digital solutions in agriculture rely on formal land titles or registration to validate and recognize farmers, and when land rights are informal or unrecognized, these farmers are often left out of such digital programs.

2. Access to Legal Rights and Services:

Many of these disadvantaged groups lack access to legal resources and services to help them secure their land rights formally. Their limited familiarity with legal procedures, language barriers, and geographic isolation further complicate this issue. This reduces their ability to protect their land rights and undermines their confidence in leveraging

land assets for agricultural development.

3. Cultural and Gender Norms:

In many Latin American societies, the longstanding legacies from the era of colonization continue to influence land inheritance and ownership. These historical patterns often disadvantage women and indigenous communities, who still face challenges in fully engaging with and benefiting from the agricultural sector, including the adoption of D4Ag tools.

4. Lack of Representation:

The underrepresentation of disadvantaged groups in policymaking and decision-making processes related to land and agriculture often results in policies that do not consider their needs and constraints, including their ability to adopt and benefit from D4Ag solutions.

⁹⁵ PRINDEX. 2020. Comparative Report: A global assessment of perceived tenure security from 140 countries.

BATTLING DEFORESTATION IN LATIN AMERICA: THE ROLE OF D4AG

Despite the latest strides, deforestation is still a critical concern in Latin America, where the conversion of forests to agricultural land threatens biodiversity, contributes to climate change, and impacts indigenous communities. The Natural Resources Defense Council (NRDC) estimates that deforestation affects between 27% and 43% of land in countries like Peru, Bolivia, Chile, and Ecuador. Soil degradation, another serious issue, results from both deforestation and overgrazing, with erosion impacting more than 68% of South America's soil. Water pollution and scarcity, as

evidenced by Chile's 13-year megadrought, further exacerbate these environmental challenges.⁹⁶

Various countries have made significant strides by implementing rigorous monitoring systems, promoting sustainable land-use practices and fostering international partnerships for conservation. Digital agriculture tools have emerged as powerful allies in the fight against deforestation, assisting farmers in improving agricultural practices, optimizing land use, and conserving forests. These tools often leverage advances in satellite imagery, remote sensing, and machine learning to provide timely, accurate data.

CARBONEXT

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Carbonnext is actively conserving over 1.6 million hectares of the Amazon Rainforest. Its strategy involves monitoring and preserving forest land and selling carbon credits, serving a dual purpose of conservation and sustainable economic activity. Through this model, Carbonnext not only preserves the forest but also contributes to the global fight against climate change by providing a way for other entities to offset their carbon emissions.

re.green

Re.green is a conservation-focused startup that employs spatial analysis technology along with partnerships with local communities to restore and monitor forests. It recently acquired Bioflora, a tree nursery, enhancing its capacity to plant up to two million seedlings annually with potential expansion to plant up to 10 million seedlings per year. Re.green is an innovative solution blending technology and community collaboration to drive reforestation efforts.

MOMBAK

Mombak is a startup that either purchases or leases deforested lands and restores biodiversity to them. Its unique approach ensures the reforestation of depleted lands while promoting biodiversity. Additionally, Mombak places significant emphasis on restoring and protecting local surrounding communities, demonstrating a holistic approach to environmental and social sustainability.

MOSS

Moss operates an online carbon credits platform. Its mission is to help companies offset their carbon emissions, and it does so by providing a marketplace for the trade of carbon credits. By facilitating these transactions, Moss allows for financial incentives in the pursuit of reducing global carbon emissions, thus contributing to the broader climate change mitigation efforts.

Table 42. Examples of Climate-Smart D4Ag Tools in LAC

⁹⁶ Data snapshot: Meet the startups tackling conservation and deforestation in Latin America. AgFunder, July, 2023

FUTURE OUTLOOKS

The unfolding decade presents both challenges and opportunities for the D4Ag sector. As the world grapples with rapid technological advances, climate change, and evolving socioeconomic dynamics, the D4Ag stands poised to play a

transformative role, especially in LMICs. To capture this potential, we have meticulously analyzed and projected the future course of the sector and its impact across three impact vectors: economic, social, and environmental.

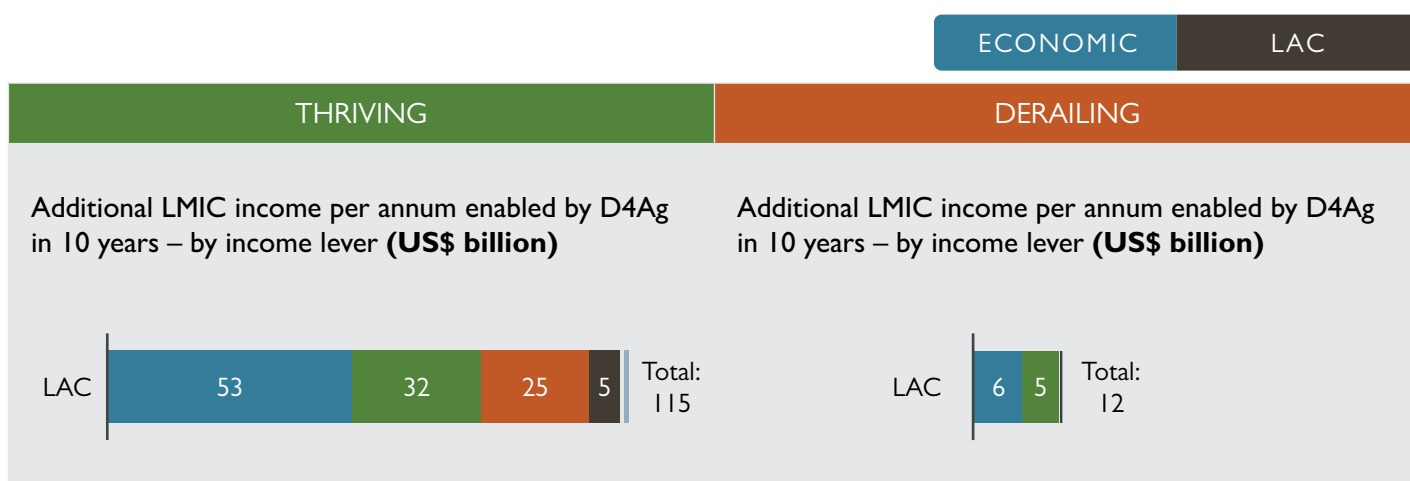
	Economic Projections (Additional LMIC income per annum enabled by D4Ag)	Social Projections (% of potential user base actively using D4Ag)	Environmental Projections (D4Ag-enabled farm-gate GHG change per annum)
Thriving Scenario	US\$ 115 billion	36%	-72 CO ₂ eq megatons
Derailing Scenario	US\$ 12 billion	24%	+52 CO ₂ eq megatons

Table 43. 10 Years' Outlook for the Sector: Latin America and the Caribbean

Economic Projections:

In a thriving D4Ag ecosystem, Latin America and the Caribbean could generate an extra income of US\$115 billion over the next decade, driven predominantly by reduced crop and animal loss, increased quality of produce

and improved labor efficiency. However, if the “derailing” scenario is realized, it might drastically reduce this figure to just 10% of the potential.



- Reduced crop & animal loss
- Increased quality & bargaining power
- Revenue from carbon credits
- Labour efficiency (indirect income)
- Animal feed and fertiliser efficiency
- Machinery maintenance savings

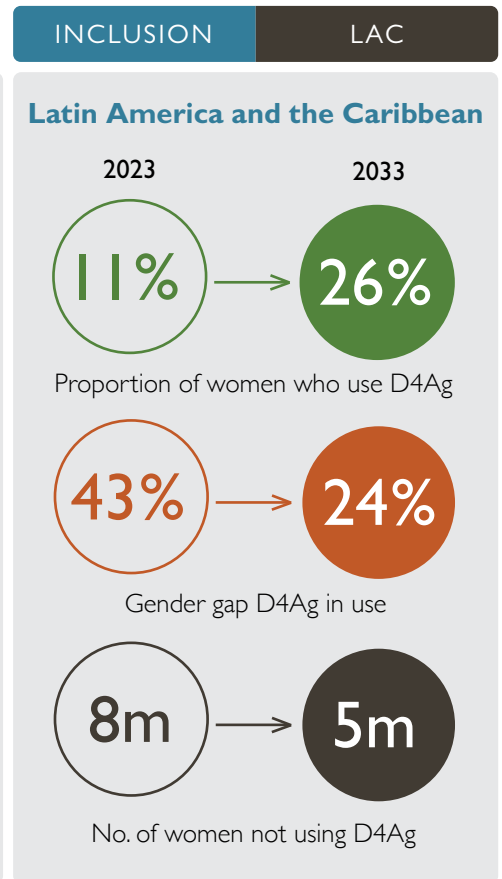
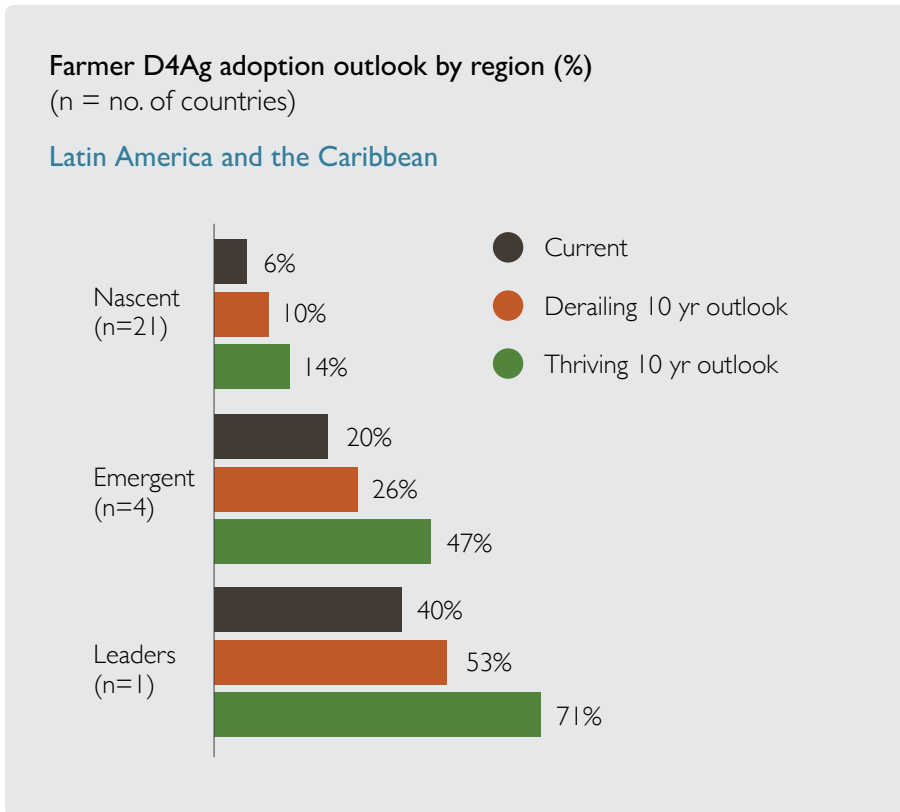
Source: USDA ERS International Agricultural Productivity indices, Beanstalk analysis

Figure 85. Economic Projections Latin America and the Caribbean

Social Projections:

Within Latin America and the Caribbean region, current D4Ag adoption rates stand at 17%, on average, in 2023. We expect that countries like Brazil might achieve a 71% D4Ag adoption rate by the decade’s end. Similarly,

nascent nations might see up to 20% of their farmers adopting D4Ag solutions. Moreover, a thriving scenario could lead to 26% females employed in agriculture using D4Ag tools and bringing the gender gap down by 44%.



Note: Available data was extremely limited. Available country data was extrapolated to represent the entire progression status per region. Where data was not available, the 2016 Digital Adoption Index (DAI) was utilized to estimate current adoption levels. The thriving scenario was projected by using the internet adoption curves of each country with an adjustment factor: Relative to internet adoption, the following lag was assumed for D4Ag adoption: Leaders – 10-year lag, Emergent – 12-year lag, Nascent – 15-year lag.

Source: Various, World Bank World Development Indicators (Individuals using the Internet (% of population)), Beanstalk analysis

Figure 86. Social Projections Latin America and the Caribbean

Environmental Projections:

Latin America, under thriving conditions, might focus on regenerative forestry and soil practices, as well as reduced animal gases for environmental impact, resulting in emissions decrease of 72 megatons CO₂eq, annually. The

“derailing” scenario could actually bring the emissions up by 52 megatons CO₂eq per year due to increased synthetic fertilizer and farm machinery usage.

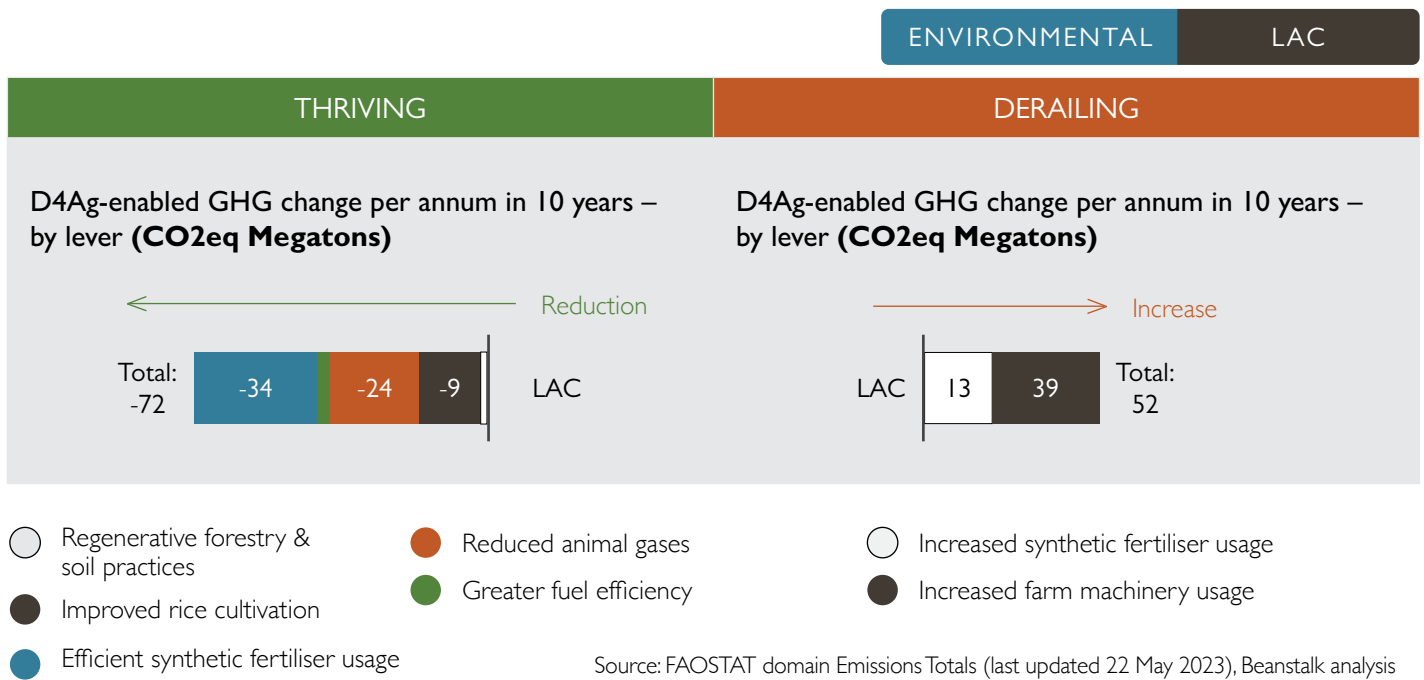


Figure 87. Environmental Projections Latin America and the Caribbean