



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 South Asia



BEANSTALK

South Asia

ROLE OF AGRICULTURE AND SMALLHOLDER FARMERS IN SOUTH ASIA

Approximately 40% of South Asia's population are involved in agriculture; however, this number ranges widely from 62% in Nepal to 26% in Sri Lanka. Agriculture is also a significant contributor to the economies of South Asian countries, accounting for more than 20% of GDP in countries like Pakistan and Nepal. In India, the largest and the most populous country of the region, agriculture contributes

to 16.6% of GDP and employs 44% of its total employed population. The role of agriculture in the region is the smallest in Sri Lanka: It contributes to less than 9% of GDP and to 26% of employment.

Smallholder farmers are vital to the economies and food security of the region: In India alone, despite owning only 33% of cultivated land, they produce more than 40% of food grains, and over half of its fruits, vegetables, oilseeds, and other crops.¹⁸

Agriculture Sector Contribution to GDP	Agriculture Sector Contribution to Sector Employment	Key Crops
16% ⁷⁷	41.32% ⁷⁸	Pulses, rice, wheat, sugarcane, groundnut, vegetables, fruit and cotton
Average Size of a Smallholder Farm	Number of Smallholder Farmers	Share of Female Workers
<2 ha	~180 m ⁷⁹	35% ⁸⁰

Table 35. Role of Agriculture in South Asia

77 World Bank Data, "Agriculture, forestry, and fishing, value added (% of GDP)", 2021

78 World Bank Data, "Employment in Agriculture (% of total employment)", 2021

79 Supply chains can't ignore 150 million small farmers, India needs a fair farm data standard - Solidaridad Network; IFAD – organizing smallholder farmers in Pakistan | Agribusiness Support Fund; iFarmer: The tech-enabled one-stop solution for smallholder farmers | The Daily Star; Nepali farmers diversify their income streams amidst climate crisis (unep.org); CSA in Sri Lanka

80 Asian Development Blog, 2015

81 Smallholder farmers in India: Food security and agricultural policy 2002/03 (fao.org)

D4AG REACH AND ADOPTION PROGRESS IN SOUTH ASIA

The D4Ag landscape in South Asia has been growing in the past five years, albeit at a slower pace than in 2012–2018, a trend observed globally. The region currently hosts around

288 active D4Ag solutions, with 35% of these launched after 2018. India clearly stands as the undisputable regional leader in the D4Ag domain, being home to approximately 90% of the D4Ag startups operating in South Asia.

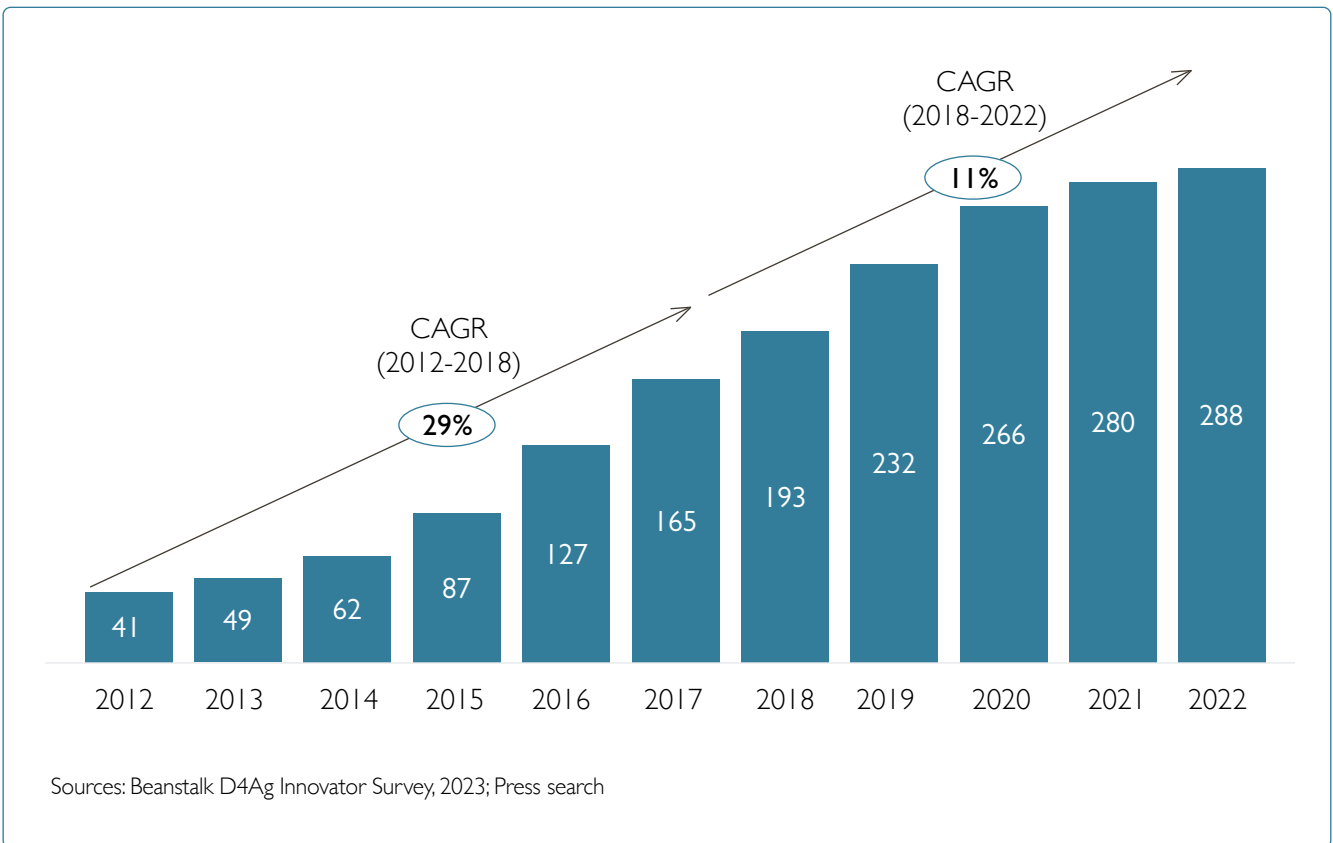


Figure 74. Number of Active D4Ag Solutions in South Asia, 2012-2022

Number of active D4Ag solutions (2022)	288
Number of active D4Ag solutions (2018)	193
Most commonly observed use case	Market Linkages & Access
Median number of users per solution	64,260
Proportion of innovators breaking even	52%

Table 36. D4Ag Reach and Adoption in South Asia.

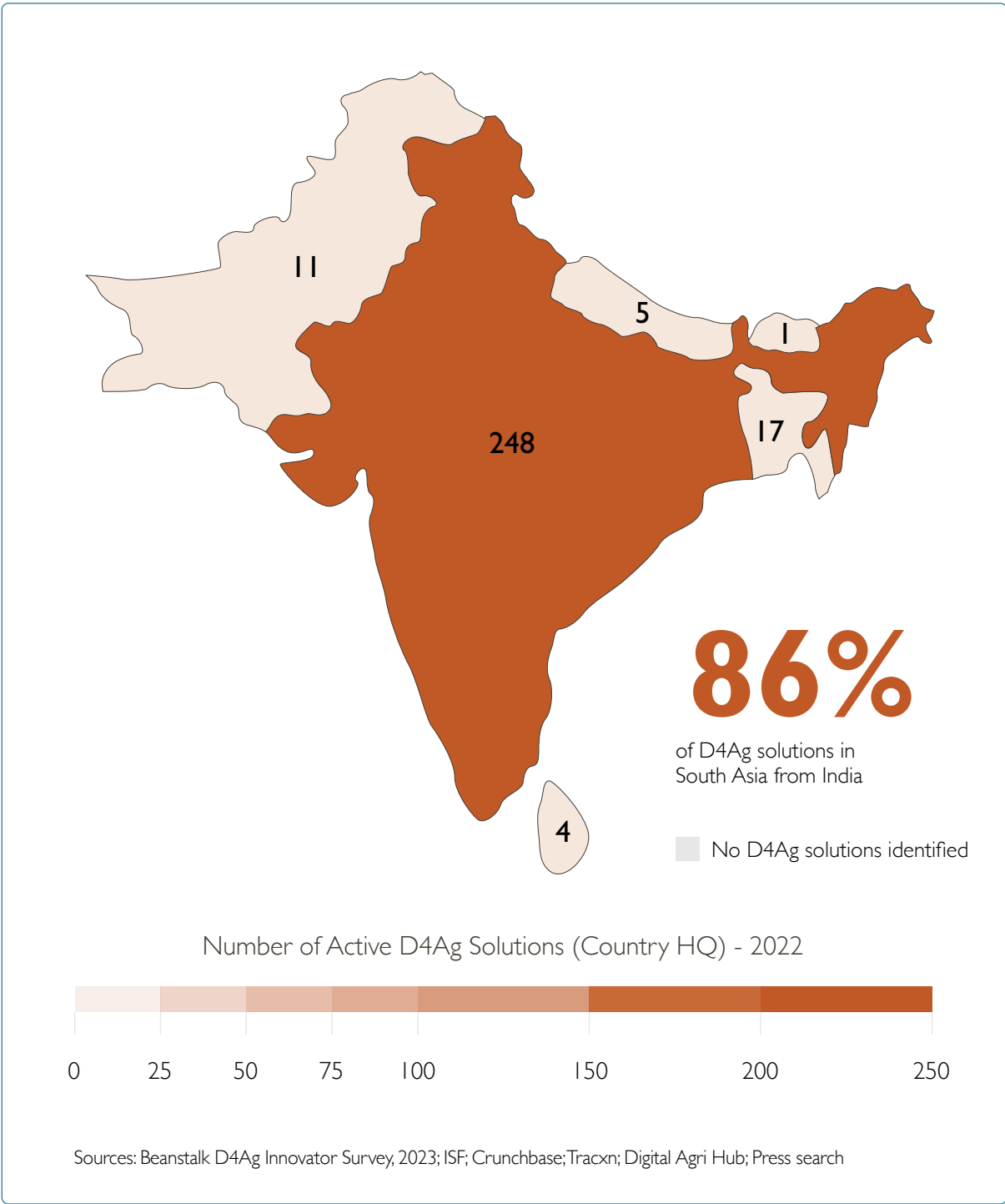


Figure 75. Number of Active D4Ag Solutions Per Country HQ, SA, 2022.

More than 40% of D4Ag solutions in South Asia now offer multiple use cases, indicative of the sector’s maturation. Our interviews have supported this finding; early-stage companies initially focused on single product solutions but have since transitioned to network solutions that leverage digital platforms to achieve

scalability across geographies. This shift in approach reflects the evolving dynamics of the D4Ag sector, where the emphasis has shifted from localized solutions to more extensive, interconnected platforms.

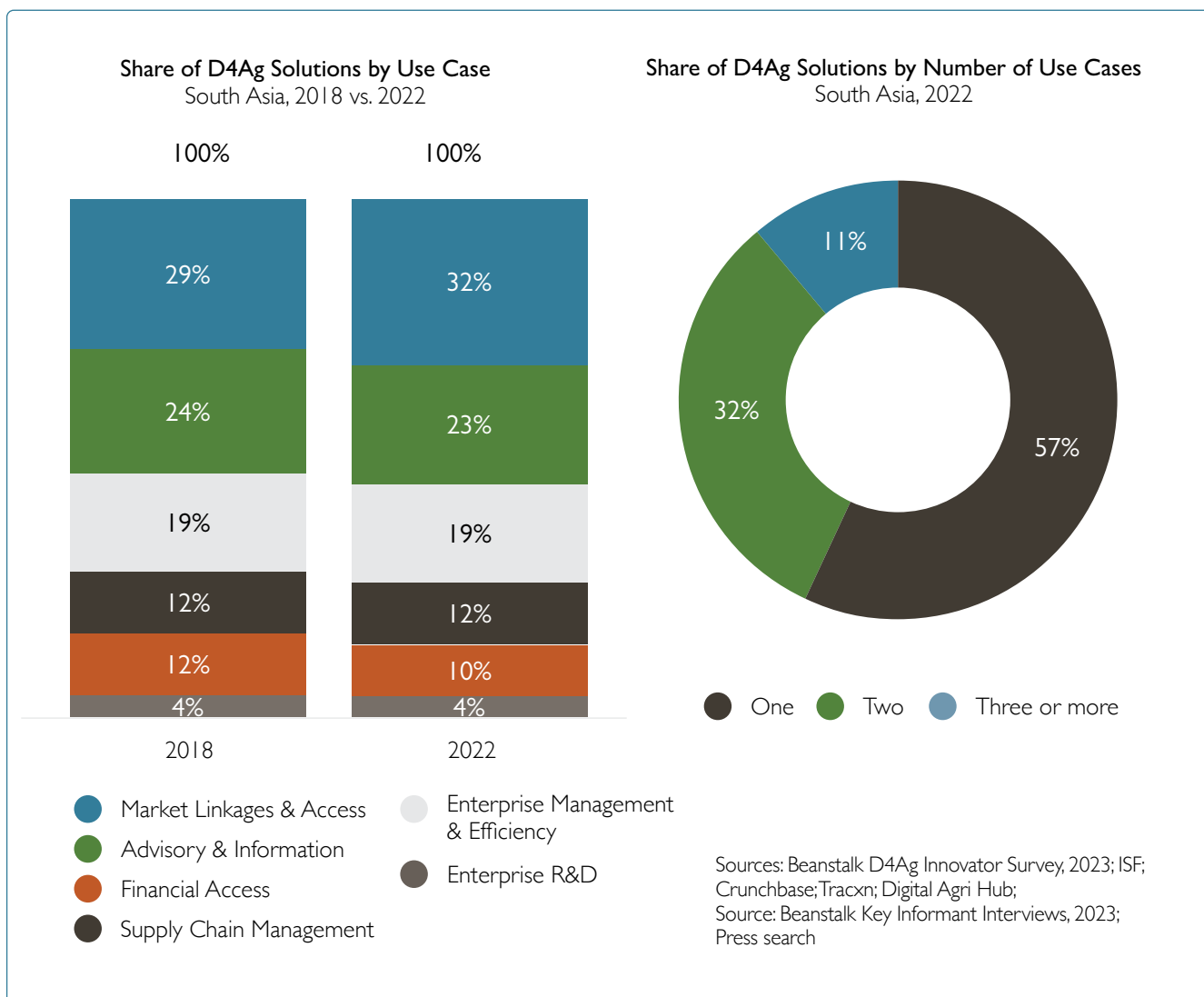


Figure 76. Current & Historical Mix of Use Cases across D4Ag Solutions (SA, % Of Total)

Indian D4Ag innovators have achieved remarkable scale, with **at least 11 solutions having more than two million registered users**, and the largest solution in India—**eNam** is now serving 17.5 million smallholder farmers, or about 15% of India’s smallholder farming population. This significant user base underscores the potential and efficacy of these

digital solutions in transforming the region’s agricultural sector. Moreover, South Asian D4Ag innovators display a higher propensity toward profitability compared to their counterparts in Southeast Asia or Africa: In our interview sample, **60%** reported that they were currently breaking even.

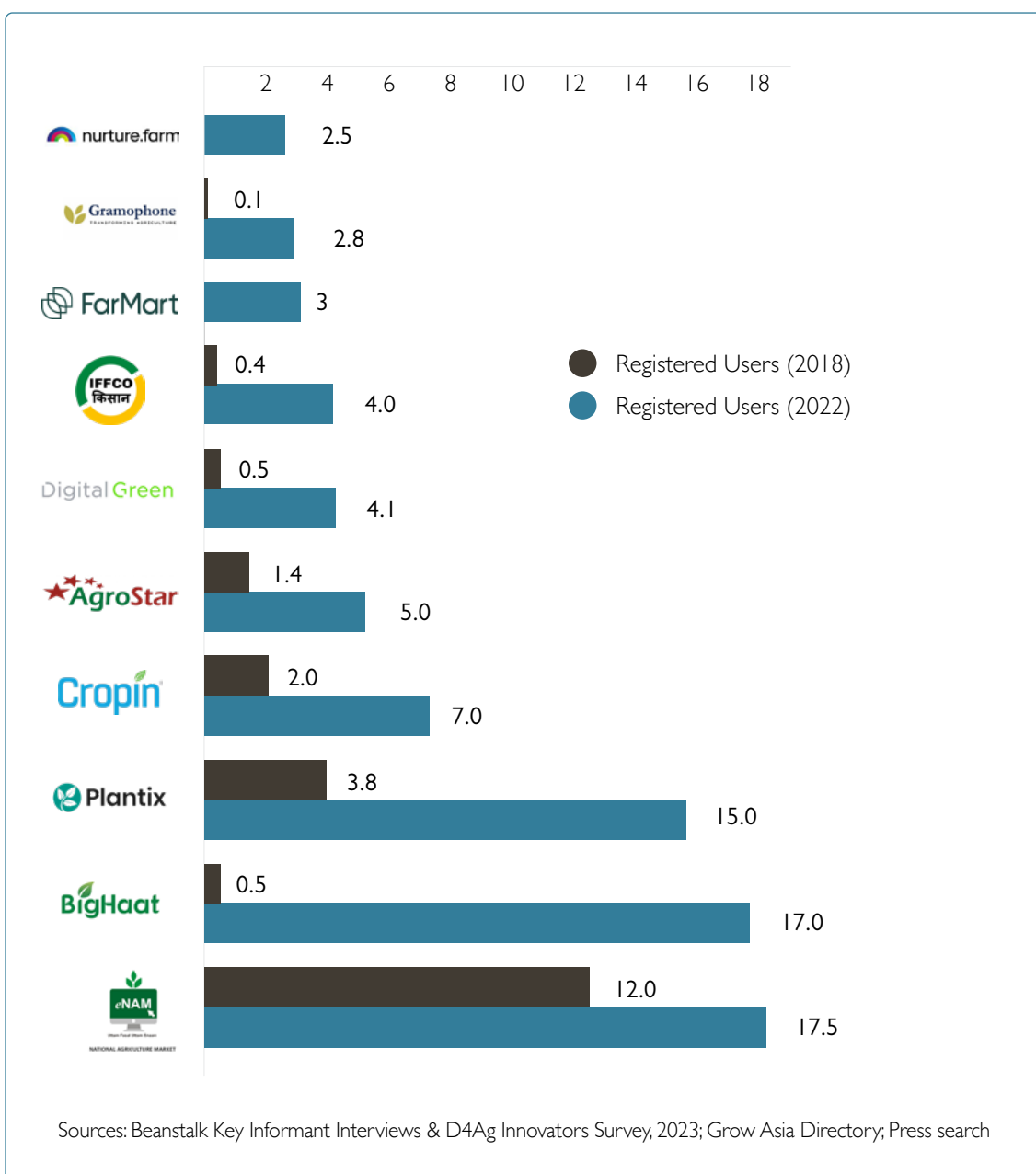


Figure 77. Registered Users of Top 10 D4Ag Solution Providers, SA

The investment landscape for D4Ag in South Asia is also maturing, with several standout innovators in India raising considerable capital from private investors, thereby reaching later stages of growth. **In 2022, Indian D4Ag innovators have raised an astonishing**

US\$641 million in funding from private investors, double than their peers in all African countries together. This indicates a growing investor interest in D4Ag solutions, acknowledging the sector's potential for high returns and significant social impact.














	Solution Name	Total Funding (US\$, Mn)	Stage	HQ Country	Operations
1	Waycool	\$ 363.2	Series D		
2	Ninjacart	\$ 333.2	Series D		
3	DeHaat	\$ 254.3	Series E		
4	Jumbotail	\$ 160.4	Series C		
5	Captain Fresh	\$ 124.2	Series C		
6	Arya.ag	\$ 113.2	Series C		
7	AgroStar	\$ 112.4	Series D		
8	Jai Kisan	\$ 95.7	Series B		
9	ReshaMandi	\$ 54.2	Series A		
10	FarMart	\$ 48.4	Series B		

Table 37. Top 10 Solutions, by Total Amount of Private Funding Raised, 2022, SA, (US\$, Mn).
Source: Crunchbase

Despite India's dominance, other countries like Bangladesh, Pakistan and Nepal have also been making strides in this space, albeit at a slower pace. However, challenges like lower digital literacy, inadequate infrastructure, and limited access to capital are slowing down the pace of adoption.

There is an evident gap when it comes to technology sharing and transfer across countries in the region. Indian innovators, despite achieving significant scale and

sophistication within the country, often do not expand their services to neighboring countries due to an already existing large total addressable market in their country, as well as a variety of challenges such as stark differences in digital infrastructure, literacy levels, agricultural practices, market dynamics, and regulatory environments. This absence of regional cooperation and technology sharing slows down the pace at which these innovations could otherwise disseminate and hampers the broader potential impact of D4Ag solutions in the region.

EMPOWERING SOUTH ASIAN WOMEN VIA D4AG

According to GSMA, **South Asian women are facing the largest digital divide in all LMICs: they are 41% less likely than men to use mobile internet, as compared to 36% in sub-Saharan Africa, and 2% in Latin America and Caribbean.** South Asian women are also experiencing the largest mobile and smartphone ownership gap (15% and 42%).⁸² Female land ownership rates are also very low, ranging from 4.8% in Bangladesh to 12.8% in India, meaning that the vast majority of women farmers in South Asia are either unpaid family workers or paid laborers on others' farms.⁸³ Among the D4Ag startups we have interviewed, **the median share of female users stands at only 25%, versus 49% in sub-Saharan Africa.**

CLIMATE-SMART DIGITALIZATION OF SOUTH ASIAN LIVESTOCK

South Asia is an important center of livestock production: For example, meat production in India is estimated at 9.23 million tons in 2021–22 (~3% of the total meat production in the world) and is ranked fifth in the world in terms of production volume.⁸⁴ The nation also has the world's largest population of livestock at about 537 million.⁸⁵

Digital technologies are increasingly being recognized as a powerful tool to enhance the resilience of livestock production in South Asia. These technologies offer new opportunities to address these challenges and drive productivity, efficiency, and sustainability in the livestock sector.

Digital Greener **Digital Green: Empowering Women in Agriculture through Digital Solutions**

Digital Green has been at the forefront of integrating gender perspectives into digital agricultural solutions since its inception. With over 75% of the farmers reached being women, Digital Green emphasizes strategies that amplify women's agency and promote an effective partnership between women and men to improve agricultural practices.

Video Content for Equality: Their video content shows both women and men as decision-makers, promoting joint decision-making and celebrating women as progressive farmers.

Technology for Inclusion: They use offline video and voice messaging to reach women farmer groups with limited literacy. For smartphone users, simplified app interfaces and voice-based interactions are designed.

Challenging Gender Norms: Digital Green supports the inclusion of women in agricultural leadership structures and work with governments to remove barriers to women's participation.

Prioritizing Gender Equality: The organization ensures gender sensitivity training for all staff and aims to diversify its leadership. Gender-focused policies and tools are integrated into their operations.

Resource Allocation: Digital Green advocates for and ensures the allocation of adequate resources to implement and expand their gender commitments.

82 GSMA Gender Gap, 2023

83 CIP, International Potato Center, 2020

84 Basic Animal Husbandry Statistics India, 2022

85 India National Dairy Development Board, 2019



Source: Upaj

Advisory & Information: Digital platforms are being used to deliver veterinary services and farmer education, overcoming geographical barriers and enhancing the reach of extension services. **The International Livestock Research Institute (ILRI)** has developed an Android-based **On-farm Feed Advisor** that helps extension staff to advise farmers on how to balance their animals' diet by matching nutrients and production in the feed offered, based on the animal body weight, milk production, and stage of pregnancy. The application selects the cheapest locally available feeds to bridge the nutritional gap. The results are given in the form of an advice memo with information including cost of feeding and additional income before and after balancing

Enterprise Management & Efficiency: Mobile applications are providing farmers with comprehensive livestock management solutions, including reproductive management, and health monitoring. Indian **Stellapps** has developed a wearable cattle tracker that detects heat and various disorders based on their activities and their resting behavior; and a herd management application, providing real time alerts on animal

activities, personalized advisory, and cattle historical data management.

Market Linkages & Access: Digital platforms are linking livestock producers with markets, providing price information, facilitating online sales, and ensuring traceability along the value chain. Pakistan-based **Qurbani App** connects farmers and traders, allowing them to buy and sell livestock. Companies like Animall in India are leveraging digital technologies to integrate smallholder livestock farmers into formal value chains.

Financial Access: Bangladesh-based **iFarmer**, among other services, provides access to finance for smallholder farmers, including livestock producers, by developing risk assessment models in partnerships with banks and NBFIs. It has signed an MOU with a local insurance company to develop a livestock insurance product that could reduce vulnerability of the farmers of iFarmer.

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.

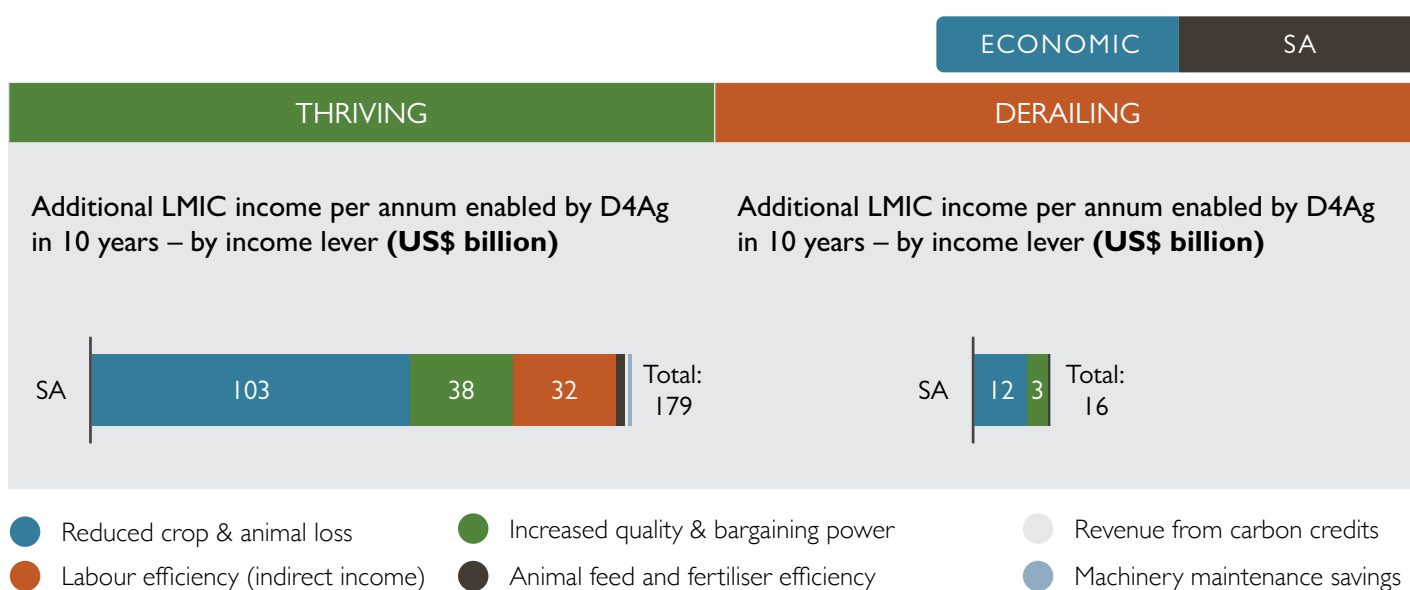
	Economic Projections (Additional LMIC income per annum enabled by D4Ag)	Social Projections (% of potential user base actively using D4Ag)	Environmental Projections (D4Ag-enabled farm-gate GHG change per annum)
Thriving Scenario	US\$ 179 billion	50%	-149 CO ₂ eq Megatons
Derailing Scenario	US\$ 16 billion	21%	+9 CO ₂ eq Megatons

Table 38. 10-Year Future Outlook for the Sector: South Asia

Economic Projections:

South Asia, with India as a key contributor, may see an additional income of US\$ 179 billion if D4Ag thrives over the next decade,

with reduced crop and animal loss contributing more than half of this growth. However, in the negative scenario, this figure could plummet to just 10% of the potential.



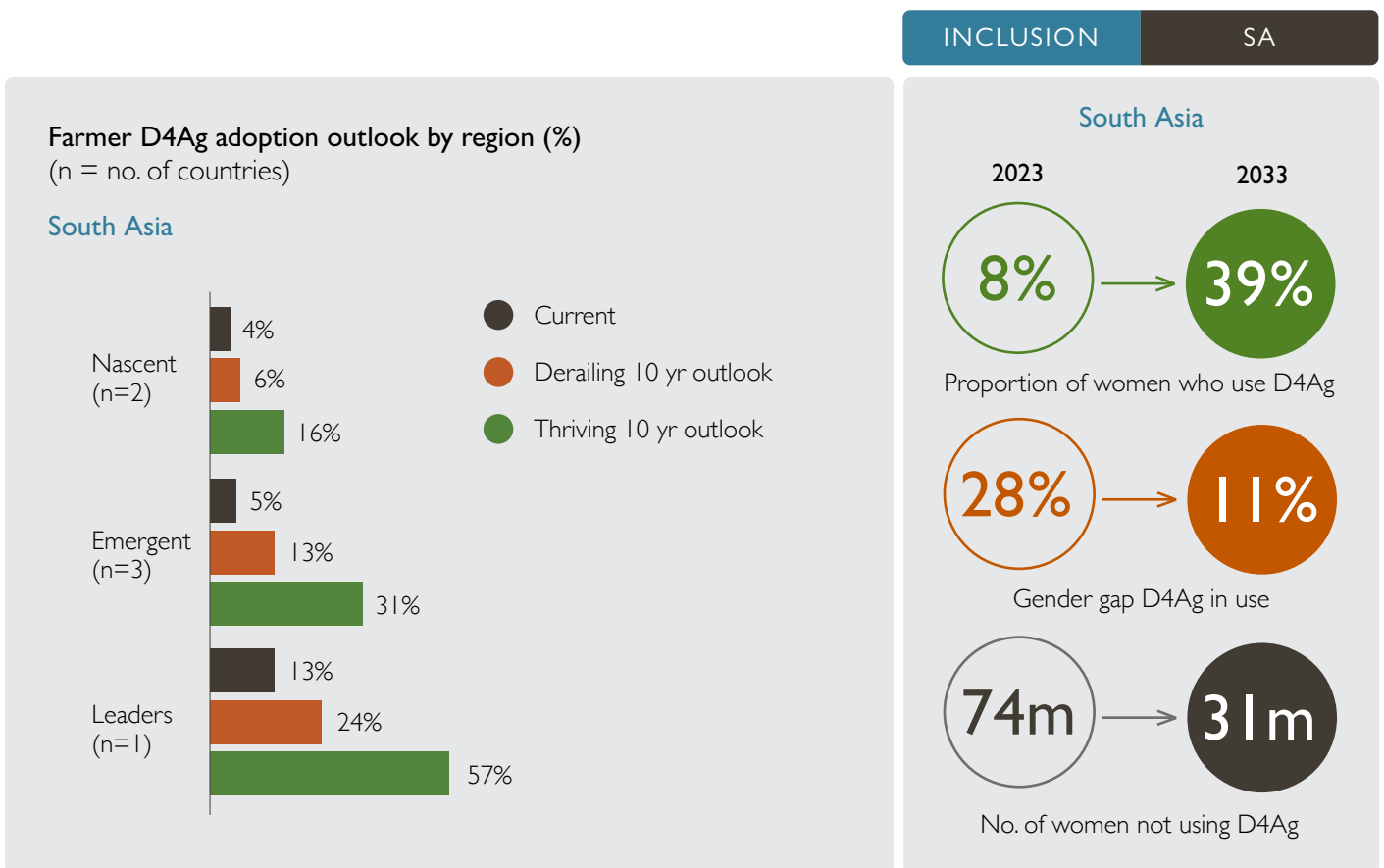
Source: USDA ERS International Agricultural Productivity indices, Beanstalk analysis

Figure 78. Economic Projections South Asia

Social Projections:

With an average D4Ag adoption rate of 10% across the region in 2023, in 10 years' time, India as a leader of D4Ag innovation in the region could experience an adoption rate of 57%, under thriving conditions. Nascent

countries in the region might also see up to 20% of their farmers adopting D4Ag solutions. Moreover, the female agricultural workforce could significantly benefit, **with four out of 10 women adopting D4Ag tools and reducing the gender gap by 60%.**



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 79. Social Projections South Asia

Environmental Projections:

South Asia could lead with the highest reduction in GHG emissions across LMICs (-149 megatons CO₂eq) under a thriving scenario, mainly driven by improving regenerative forestry and soil practices decreasing emissions by 90 megatons CO₂eq per annum. Improved rice cultivation practices is also a crucial driver

of decreasing emissions in the future: We estimate that it has a potential to bring GHG emissions by 33 megatons CO₂eq per annum. However, if the potential of D4Ag is not fully realized, we might see a worrying trend toward increased emissions in the sector by 9 megatons CO₂eq, annually.

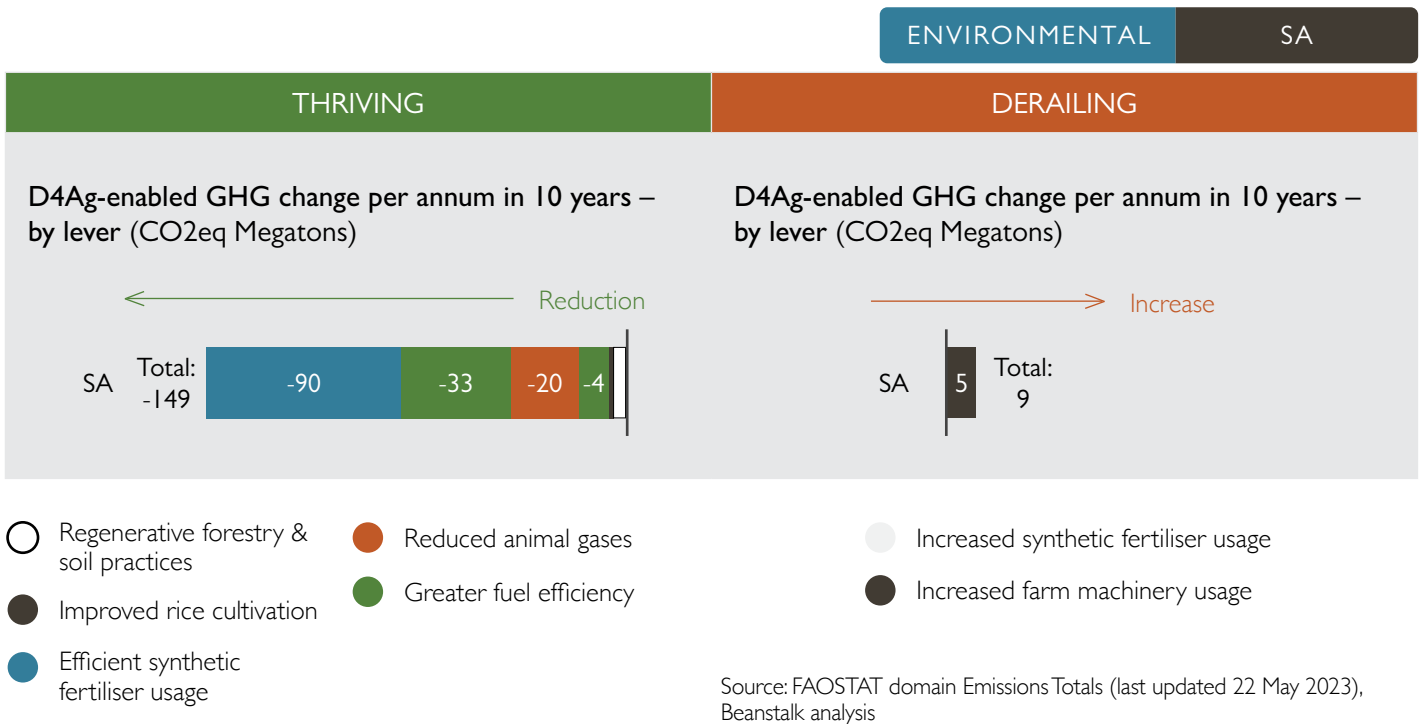


Figure 80. Environmental Projections South Asia