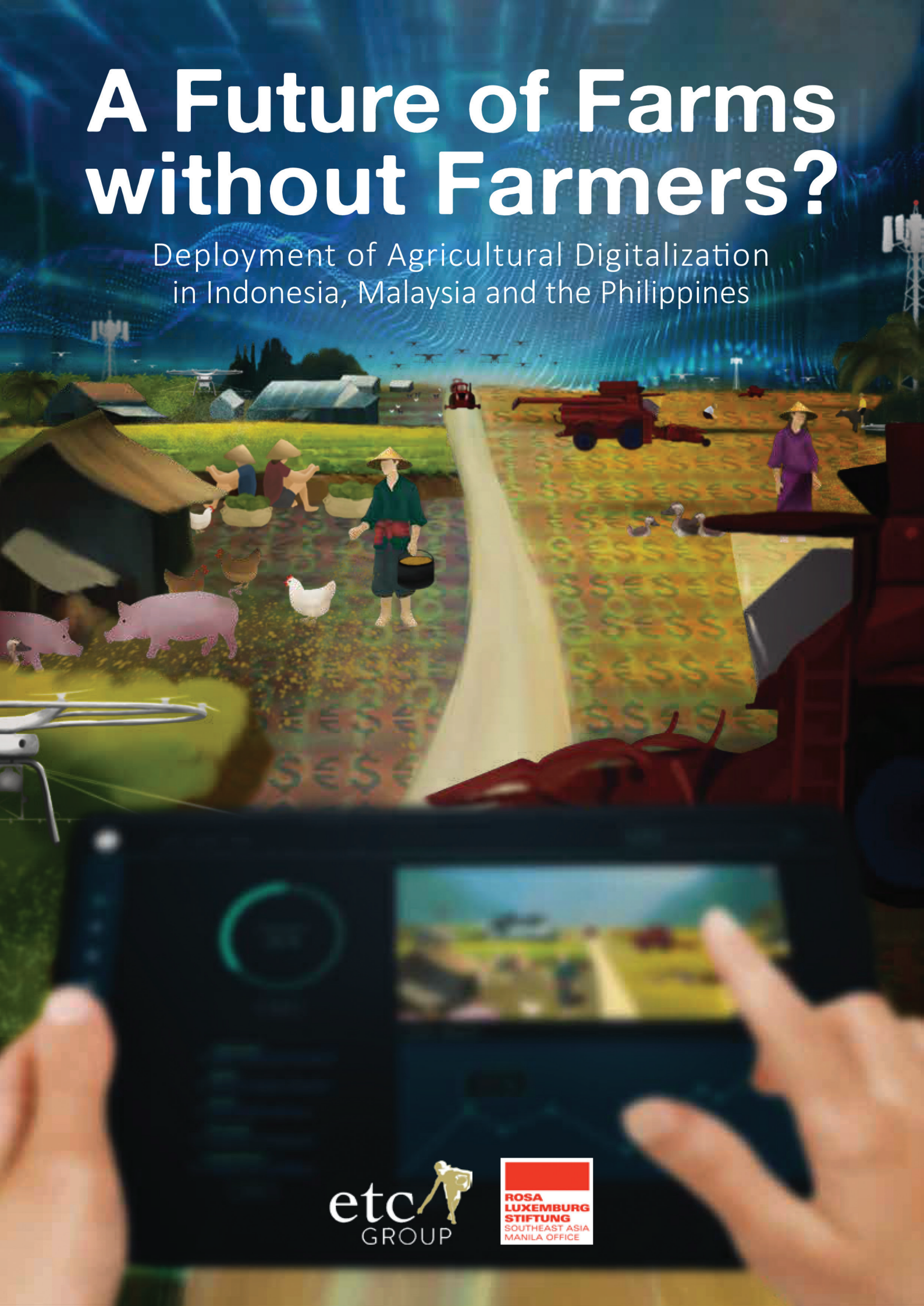
A Future of Farms without Farmers?

Deployment of Agricultural Digitalization in Indonesia, Malaysia and the Philippines



etc GROUP

ROSA LUXEMBURG STIFTUNG
SOUTHEAST ASIA
MANILA OFFICE

ACKNOWLEDGEMENT

We sincerely appreciate the support and trust of the Rosa Luxemburg Stiftung Manila office (RLS-Manila) for making the research possible. This report also draws on discussions and insights generously shared by participants in the roundtable discussions on the deployment of agricultural digitalisation organized by ETC Group in collaboration with RLS-Manila in Kuala Lumpur and Jakarta in August 2023 and in Quezon City in October 2023. This research reflects information and views shared during discussions with government officials, academics, start-ups, civil society actors and farmers in interviews conducted in Indonesia, Malaysia and the Philippines from July to November 2023.

Researchers:
Kavya Chowdhry, Nicole Lainez and Neth Daño

Front Cover: Aurora Francisca Y. Miranda
Editor and Proofreader: Flordeliz Calledo
Illustrations: Aurora Francisca Y. Miranda
Layout Design: Nemcy C. Cruz

References and footnotes:
All links were live/working in October 2023

November 2023

etc GROUP

ROSA LUXEMBURG STIFTUNG
SOUTHEAST ASIA
MANILA OFFICE

INTRODUCTION

Digital agriculture is the application of digital tools and business models integrated with digital technologies across the agricultural-food (agri-food) chain. This includes using digital tools to make genome sequencing and modification faster, developing genetically modified plants and animals, and even producing so-called alt-meat or vat-produced meat alternatives that look and taste like meat, deploying drones in the fields to spray agrochemicals or broadcast seeds, analysing plant health, or installing sensors on farms, greenhouses and vertical gardens to monitor plant growth and support digital tools for cultivation without farmers.

Digitalisation enables the collection of data on plant health, soil moisture, weeds, pests, and the weather, and the use of software and big data analytics to analyze harvested data to provide often-proprietary advice and technical recommendations to farmers on how to farm and manage agricultural activities from production to marketing. Deploying automated farm machinery and robotics in farms and highly controlled environments for agriculture like digital greenhouses, vertical farms and warehouses; delivering groceries, supplies and cooked food to people from restaurants or cloud kitchens via orders placed on mobile apps; and employing digital surveillance of livestock and fisheries are all part of the digital menu in the agri-food systems. The common denominators are digitalisation of data on farmers, their farms and the environment that make farming possible; utilisation of collected data to churn out patterns where technical advice and solutions are based; and dependence on digital tools for decisions in research and development to production and consumption.

The expansion of digital applications in agriculture in Southeast Asia has been quite aggressive in the past half-decade. While it lags behind the neighboring East Asia, in particular in China and Japan (as well as South Korea and Taiwan), digitalisation in the agriculture sector has nevertheless shown consistent progress. Government programs and policies have been calibrated, updated and minted to make digitalisation the norm by establishing digital land registries and setting them as requirement for farmers to qualify for government programs and services, and to facilitate the deployment of digital tools such as drones, sensors and satellites in agricultural activities from planting to marketing. National agricultural development plans and roadmaps were rehashed to align with "Agriculture 4.0," officially heralding the march toward the adoption and application of technologies and tools of the so-called Fourth Industrial Revolution (4IR) across the agricultural sphere.

Everyone is expected to board that digitalisation train or be left behind, as the usual meme goes – never mind if we are kept in the dark on where that train originated, where it is heading and who is manning the control panels. The rationale for the shift to digitalisation are sung in unison across the region, from the perennial call for the modernisation of the sector, which has been lagging for decades and the pitch for uplifting the lives of farmers and rural communities, to addressing the specter of aging farming population and attracting the young generation to go into farming, which the richer neighbors in East Asia have been experiencing.

To understand the developments, trends and issues in the deployment of agricultural digitalisation in Southeast Asia, the researchers zoom in on the current situation in Indonesia, Malaysia and the Philippines. This paper presents the key national policies and programs that promote agricultural digitalisation in these three countries and offers a closer look at examples of public-private collaborations and the enabling role of multilateral development banks. This paper

also examines the interventions and interests of giant agribusiness transnationals (Big Ag) and technology titans (Big Tech) in the digital transformation of agriculture in the subregion as well as the emergence of start-ups that develop and promote digital agricultural technologies (ag tech) in the three countries.

The researchers draw conclusions and insights on these trends that they hope will support civil society organisations and grassroots movements in Southeast Asia weigh their options and make decisions as they experience and confront the challenges – and opportunities – presented by agricultural digitalisation in the years to come.

Laying the Ground for Agricultural Digitalisation

Governments in Indonesia, Malaysia and the Philippines have started laying the ground for digitalisation in the agri-food systems over the five years. Plans and programs for "Agriculture 4.0" proliferated, bearing fancy titles that herald the arrival of the digitalisation train and countries betting the future of their food and agriculture sector on it. The COVID pandemic provided a giant impetus for agricultural digitalisation to gain a strong foothold in the subregion beyond just the roadmaps and grand plans shelved in the bureaucratic maze.

Indonesia

In 2018, the Making Indonesia 4.0 roadmap was released by the Ministry of Industry of Indonesia to deploy five key technologies – AI, robotics, and Internet of Things (IoT), wearable augmented reality and VR, and 3D printing – across the sectors of food and beverage, textile and garment, automotive, chemical and electronics by implementing strategies like providing incentives on technology investment, attracting direct foreign investment, coordinating policy and regulations, building the national digital infrastructure, redesigning educational curriculum to include Fourth Industrial Revolution (4IR) technologies, and providing tax incentives and subsidies. Under the food and beverage sector, the government plans to deploy 4IR technologies to customize food and health products for specific individuals based on their consumer data, use digital technologies to reduce food waste, and utilize e-commerce platforms to directly sell to customers while utilizing drones to deliver products.

In 2021, the Ministry of Communication and Digital Affairs also released a roadmap – the digital roadmap (2021–2024) – that identified four pillars to achieve the digital transformation of the country: digital infrastructure, digital governance, digital economy and digital society. The roadmap aimed to have 4G coverage in all villages in Indonesia by 2022, launch a 5G network in specific locations, launch satellites to expand internet services and construct national data centers. The estimated budget to develop the ICT infrastructure is approximately US$31.1 billion and the aim is to raise 98 percent of this amount from the private sector. Under digital government, the push is to adopt e-government services, while under the pillar of digital society, the government has introduced the Digital Talent Development program under which the public will be trained in digital skills, graduates and professionals will be taught cloud computing and artificial intelligence, and private and public sector officials will be trained in advanced digital skills.[1] In 2016, the Ministry of Communication and Information launched the 1000 Digital Startups[2] to establish 20 new unicorns in Indonesia by 2025 through a collaboration of the public and private sectors to organize coaching programs, workshops and hackathons. In a study by the Asian Development Bank (ADB), which included an interview of 10 agritech start-ups,

1 "Indonesia: Digital Economy Opportunities," International Trade Administration, December 9, 2021, https://www.trade.gov/market-intelligence/indonesia-digital-economy-opportunities
2 "Indonesia: Digital Economy Opportunities."

six out of the 10 respondents have received grants from the Ministry of Education, Culture, Research, and Technology.

The Indonesian government announced a special economic area, called Bukit Algoritma (Algorithm Hill), spread across 888 hectares and modeled after the United States' Silicon Valley, in 2021 for the development of digital technologies like AI, robotics and drones, among others[3] to lead research in neuroscience, nanotechnology, quantum technology, solar cell technology, and space exploration.[4] The construction will be jointly undertaken by the companies of politician Budiman Sudjatmiko and businessman Dhanny Handoko. The first phase of the development, projected to last three years, is financed by an investment of Rp18 trillion (US$1.23 billion).[5] The National Strategy for Artificial Intelligence was also released in 2020 to promote the use of AI in multiple sectors, including food security for smart agriculture, fisheries, and management of natural resources as one of its priorities.[6]

In 2020, the Indonesian Sustainable Development Goals (SDGs) ambassador, in collaboration with the Ministry of Agriculture, launched a program aimed at "creating 100,000 millennial farmers" as part of boosting food security, a priority of the government.[7] Digital technologies are seen as a way of attracting young people to farming. The Food and Agriculture Organization (FAO) also launched the Digital Villages Initiative in Indonesia, among other countries, to promote "digital innovations to support inclusive, gender-sensitive rural development and sustainable agri-food transformation to meet Agenda 2030 goals."[8]

FAO, in close collaboration with the Center of Agricultural Data and System Information (CADIS) of the Ministry of Agriculture (MoA) of Indonesia launched the agriculture digitalisation strategy for the country called an "e-agriculture national strategy" to utilize data to benefit smallholders. According to the strategy, by 2027, Indonesia will have a database for farmland and farmers, a digital early warning system for agriculture-related disasters, and systems for agriculture data collection and analysis. The strategy aims to create a data collection platform (DCP) that can collect agriculture data from various sources to facilitate the implementation of digital solutions. A platform has already been developed by the Faculty of Agriculture Gadjah Mada University, MoA, and FAO that is able to record data in real time, and will be used to calculate farmland and yield.[9]

Malaysia

Malaysia has wholeheartedly embraced digital technologies and the 4IR framing of the World Economic Forum (WEF) and reaffirms that "the 4th Industrial Revolution is characterized by a fusion of technologies that is blurring the lines between the physical, digital, and biological spheres" in its National Fourth Industrial Revolution policy released in 2021.[10] In 2023, the World Economic Forum and the Malaysian government launched the first Center for the Fourth Industrial Revolution in the ASEAN region to drive the country towards a digital economy.[11]

The many reasons behind pushing digital technologies in the agriculture and food sectors include reducing reliance on foreign labor workers,[12] attracting young farmers into agriculture (which is reflected in the training programs funded by the government),

3 "Indonesia: Bukit Algoritma To Become Silicon Valley | Asean at a Glance," ASEAN Today, June 14, 2021, https://en.aseantoday.info/indonesia-bukit-algoritma-to-become-silicon-valley/.
4 Jakarta Post. Bumpy Road to Indonesia's "Silicon Valley," (2021). YouTube. https://www.youtube.com/watch?v=8RXhMPYnIhA.
5 Jakarta Post, Bumpy Road to Indonesia's "Silicon Valley."
6 "Indonesia Artificial Intelligence," Asia Society, accessed November 28, 2023, https://asiasociety.org/policy-institute/raising-standards-data-ai-southeast-asia/ai/indonesia.
7 Office of Assistant to Deputy Cabinet Secretary for State Documents and Translation, "Presidential Special Staffer, Agriculture Ministry Develop Millennial Farmers Program," Sekretariat Kabinet Republik Indonesia, November 4, 2020, https://setkab.go.id/en/presidential-special-staffer-agriculture-ministry-develop-millennial-farmers-program/.
8 "1000 Digital Villages Initiative," FAO, accessed November 28, 2023, https://www.fao.org/platforms/digital-village-initiative/en.
9 "Indonesia Launch National Strategy for Agriculture Digitalization," FAO, February 28, 2023, https://www.fao.org/indonesia/news/detail-events/fr/c/1633033/#:~:text=Working%20together%20with%20Faculty%20of,Agriculture%20War%20Room%20in%20Jakarta.
10 "National Fourth Industrial Revolution (4IR) Policy." Economic Planning Unit, Prime Minister's Department, Government of Malaysia, 2021, https://ekonomi.gov.my/sites/default/files/2021-07/National-4IR-Policy.pdf
11 World Economic Forum, "Centre for the Fourth Industrial Revolution Malaysia to Accelerate Green Transition, Digital Transformation," World Economic Forum, May 15, 2023, https://www.weforum.org/press/2023/05/centre-for-the-fourth-industrial-revolution-malaysia-to-accelerate-green-transition-digital-transformation/.
12 See "National Fourth Industrial Revolution (4IR) Policy," 54, where "Reduction in over reliance on low-skilled foreign labour" is listed as new socioeconomic growth opportunities arising from the application of 4IR technologies across specific sectors.

enhancing the yield and quality of agricultural produce, addressing the impact of the food and agriculture sector on the environment and the climate, and cutting down on Malaysian food imports.

The WEF features prominently in pushing and framing the narrative on digitalisation in Malaysia. This is implemented through government collaboration with private sectors, large funding bodies set up to give capital and technical resources to start-ups, and regulations designed to favor the private sector. The Malaysian 4IR policy highlights the strategic direction for the Malaysian government to embrace digitalisation and outlines five foundational technologies as its focus: artificial intelligence, internet of things, blockchain, cloud computing and big data analytics, and advanced material and technologies. The policy thrusts identified in the 4IR policy aim to equip Malaysians with 4IR knowledge and skill sets, develop digital infrastructure, prepare regulations in line with technological changes, and accelerate 4IR technology innovation and adoption.[13]

In 2021, the Malaysian government also launched MyDigital. This initiative aims to "transform Malaysia into a digitally-driven, high income nation and a regional leader in digital economy" and released the Malaysia Digital Economy Blueprint, which put forward strategies and initiatives to achieve this aim.[14] Overall, the blueprint lays down ways to adopt digitalisation across sectors on a national scale, like adopting digital technologies for public services; encouraging businesses to adopt digital technologies; building digital infrastructures like broadband, submarine cables, and data centers; reskilling the workforce to adopt digital skills to bridge the "digital divide"; and strengthening cybersecurity and regulations around data protection and privacy. The blueprint also lists digitalisation initiatives for the sectors of agriculture, construction, manufacturing and services "to grow the digital economy."[15] Under agriculture, the blueprint is focused on promoting smart farming adoption and the creation of a centralised open data platform to enable this, the creation of at least 5,000 start-ups by 2025, the creation of local digital platforms to enable the digital marketplace, and an increase in digital adoption rate in businesses.[16] The Center for the Fourth Industrial Revolution will also be hosted by MyDigital.[17]

In July 2020, before the blueprint was released, the Malaysian government announced the Dana Penjana Nasional, a RM600 million investment fund by the Government of Malaysia for venture capital firms to invest in start-ups. The RM600 million amount was matched 1:1 by foreign investment institutions to attract investors, making RM1.2 billion available to promote the digitisation of Malaysian businesses.[18] The scheme attracted eight venture capital fund managers from across Singapore, Korea, and Hong Kong, some of which have food and agriculture-related investments in their portfolio.

The Malaysia Digital Economy Corporation (MDEC) is Malaysia's lead agency in digital transformation.These are examples of MDEC activities relevant to the promotion of digital agriculture:

1) MDEC signed an MoU with CIMB Islamic Bank Berhad[19], a bank specialising on investment, consumer banking, and asset and wealth management services, on extending microfinance programs to support digital technologies in agriculture in Malaysia and attract the youth to participate in the agriculture sector. Citing the success of a pilot public-private partnership project in 2018 under which Internet of Things systems allowed farmers to reduce monthly

13 See chapter 3: "National Fourth Industrial Revolution (4IR) Policy."
14 "Malaysia Digital Economy Blueprint," Economic Planning Unit, Prime Minister's Department, February 2021, 10, https://www.ekonomi.gov.my/sites/default/files/2021-02/malaysia-digital-economy-blueprint.pdf.

15 "Malaysia Digital Economy Blueprint," 85
16 "Malaysia Digital Economy Blueprint," 86.
17 World Economic Forum, "Centre for the Fourth Industrial Revolution Malaysia to Accelerate Green Transition, Digital Transformation."
18 "Dana Penjana Nasional," Penjana Kapital Sdn Bhd, accessed November 27, 2023, https://www.penjanakapital.com.my/programs/dana-penjana-nasional.
19 CIMB Bank, "MDEC and CIMB Islamic Sign MoU Providing RM25 Million to Scale AgTech Pilot," April 2, 2021, https://www.cimb.com/en/newsroom/2021/mdec-and-cimb-islamic-sign-mou-providing-rm25-million-to-scale-agtech-pilot.html.

fertilizer usage, lower monthly worker requirements and increase the quality of yield of chilis by 90 percent, MDEC is now pushing for the project to expand nationwide and cover smart shrimp farming, hydroponic farming, drone utilisation at pineapple farms, and smart palm oil farming.

2) The MDEC started a pilot initiative called Digital Agritech[20] to promote Internet of Things, big data analytics, artificial intelligence in agriculture to improve the livelihoods of Malaysian farmers. The projects facilitated by MDEC include smart fertigation, smart misting, smart aquaculture, smart irrigation, smart soil monitoring, smart geo-mapping, and smart barn monitoring. MDEC claims that digital adoption can help improve productivity and income by over 20 percent and reduce operational costs by about 30 percent.

The MDEC also oversees the Cyberjaya, which was envisioned as an IT hub way back in 1997 but is now dubbed "Malaysia's failed Silicon Valley" by some.[21] Global IT firms were attracted to the cheap rent and tax breaks, but the employment they provide is not lucrative and customer service oriented. Now the city wants to rebuild itself to attract start-ups to try out their ideas in this "living lab"[22] through its start-up hub called MaGIC (Malaysian Global Innovation and Creativity Centre), which offers training programs for start-ups along with accelerators.

The National Agrofood Policy, released in 2021, was formulated to move towards "a sustainable, resilient and technology driven agrofood sector that prioritizes food security and nutrition while driving economic growth and enhancing the wellbeing of the people."[23] Embracing modernisation and smart agriculture is one of the thrusts of the National Agrofood Policy. The belief underlying the policy thrust is that using technology can improve the quality and quantity of crop yields, increase productivity, aid farmers in controlling pests and diseases, and make the processes related to agriculture and livestock predictable and efficient. The strategies under this policy thrust include increased adoption of technology and automation in the agrofood sector, increasing fiscal and nonfiscal funding for research and development, innovation, and commercialisation in the sector.

Philippines

In the Philippines, agriculture accounts for about 24 percent of the country's employment. As the people employed in this sector are getting older, government officials working in agriculture are designing policies to attract the Filipino youth to join the agricultural workforce. This entails "a technological transformation program geared towards Agriculture 4.0, which, according to the Department of Agriculture, means incorporating technologies like genetic modification, hydroponics, blockchain, drones, data analytics and nanotechnology in food and agriculture to turn it into a "competitive, science- and technology-backed industry."[24] This transformation is envisioned to bring dignity and prosperity to farming—an incentive for people to continue farming.

Climate action is a principal justification for the Philippines to adopt digitalisation. Emissions from the agriculture sector constitute 29 percent of the country's total emission in 2020, of which 44 percent are emitted from rice cultivation and around 24 percent from agricultural soils. The proponents for the digitalisation of agriculture in the Philippines also hope to achieve increased food productivity and quality, improved rural employment and stronger market linkages. While the more climate-focused concept of "climate-smart agriculture" – which is not necessarily

20 Malaysia Digital Economy Corporation, "Digital AgTech," accessed November 27, 2023, https://mdec.my/digitalagtech.
21 Nicole Kobie, "Inside Cyberjaya, Malaysia's failed Silicon Valley," Wired, April 5, 2016, https://www.wired.co.uk/article/malaysia-cyberjaya-silicon-valley-smart-cities
22 Nicole Kobie, "Inside Cyberjaya,"
23 Ministry of Agriculture and Food Industries, "Executive Summary National Agrofood Policy 2021–2030 (NAP 2.0) Agrofood Modernisation: Safeguarding the Future of National Food Security," October 24, 2021, https://faolex.fao.org/docs/pdf/mal211654.pdf.
24 Department of Agriculture, "Agri chief envisions 'smart farms' run by millennials, X-Gens," November 19, 2020, https://www.da.gov.ph/agri-chief-envisions-smart-farms-run-by-millennials-x-gens-2/

dependent on digital tools - has been on the agenda of the Philippine government for years now, digitalisation is a key component of the more recent vision of "smart agriculture" that involves the use of Internet of Things, smart irrigation and smart greenhouses. While these two concepts should not be conflated, climate action has increasingly become a key justification for promoting "smart agriculture" and other variant labels of agricultural digitalisation.

Digitalisation is only starting to gain traction in the Philippines, particularly in the agricultural sector, despite the country being neighbors to key players in the development of AI and digital tools such as China, Taiwan, Japan and South Korea that, together, manufacture the bulk of computer chips, sensors and other components that enable the growth of global digitalisation.

The Department of Agriculture set PHP2.5 trillion plan to modernise agriculture.[25] In 2018, the country inaugurated its first state-funded smart farm as part of the Smart Plant Production in Controlled Environments (SPICE) project, supported by the Department of Science and Technology. The SPICE project aims to deploy electronics, sensors and automation to promote controlled environments for farming. The SPICE project "aims to remove the visual of farming as a labor-intensive, backbreaking type of work." The International Rice Research Institute (IRRI) developed and disseminated mobile and desktop applications such as the Rice Crop Manager (RCM), which recommends to farmers what they need to do to increase farm yield, and METOS instruments, which enables farmers to monitor weather patterns. CGIAR researchers at the IRRI developed the Philippine Rice Information System (PRiSM) in collaboration with the Philippine Department of Agriculture, which uses satellite imagery crop modelling, cloud computing, drones, smartphone-based field surveys, statistics, and maps to assess crop health, usage of farm inputs on crops, track pests and diseases among other things. PRiSM was put to use in 2014 and it is the first satellite-based rice monitoring system in Southeast Asia. In 2018, IRRI handed over PRiSM to the Government of the Philippines and it is now used to support the Department of Agriculture in its policy making and planning processes. The PhilRice institute sees digital transformation as a key part of its strategic plan from 2023-2028, with a budget allocated for the same. The institute is developing a rice integrated crop management system called PalayCheck, and aiming to set up a Big Data Analytics Center, along with having developed apps that help farmers identify weeds, analyse soil fertilizer requirements, inform farmers on rice varieties.[26]

The Department of Agriculture also initiated an update to the MIS (Management Information System) and Farmers Interventions Monitoring System (FIMS) in a project funded by the World Bank. This system will contain the digital registry of farmers and fisherfolk, a geolocation app for monitoring and evaluation, projects implemented by the Department of Agriculture, and the MS will include the Registry System for Basic Sectors in Agriculture (RSBSA), which has the information of individual farmers and fishers. This information is used to qualify farmers and fisherfolk for the services of the department.

Smartphone applications for agriculture: The Department of Agriculture has developed a number of apps for smartphones that are aimed at enabling farmers and agricultural producers to obtain information on weather, marketing channels and price trends that aim to help improve farm productivity, increase farm income and make informed decisions. There are apps developed to help farmers identify weeds (eDamuhan), compute fertilizer requirements of soil (Minus-One Element Technique), assess the nitrogen status of rice plants

25 "DA sets massive P2.5 trillion plan to modernize Philippine agriculture," Department of Agriculture, May 5, 2022, https://www.da.gov.ph/from-philstar-da-sets-massive-p2-5-trillion-plan-to-modernize-philippine-agriculture/

26 "Digital transformation: our next chapter," Philippine Rice Research Institute, August 26, 2022, https://www.philrice.gov.ph/digital-transformation-our-next-chapter/

based on leaf color (Leaf Color Computing), and give information on suitable rice varieties, seed and grain quality, and yield under local conditions (Binhing Palay). Apps have also been developed to help farmers to keep records of their farming activities and expenses (AgriDoc) and to help policy makers come up with evidence-based decisions (SetLab), as well as an app based on the status of rice farmers and rice value change through online analytics (RiceLytics). The Masagana Rice Industry Development Program (MRIDP), which targets a 97.5 percent rice sufficiency in the Philippines by 2028 also includes technological and digital transformation of the rice industry in the Philippines as one of its strategies. Project SARAI (Smarter Approaches to Reinvigorate Agriculture as an Industry) – developed by a consortium of state colleges and universities and largely funded by the Department of Science and Technology (DOST) and its research agencies – promotes the use of drones for crop health assessment—the SARAI-Enhanced Agriculture Monitoring System (SEAMS), which uses satellite imagery to monitor crop production areas and provides advisories on extreme weather conditions and the Smarter Pest Identification Technology (SPId Tech), which uses facial recognition for the identification of pests and other technologies. This project is funded by the Philippine Council for Agriculture, Aquatic and Natural Resources Research and Development (PCAARD) of the Department of Science and Technology and implemented by the University of Philippines, Los Baños.

As a public financial enabler, the Agricultural Credit Policy Council (ACPC) of the Department of Agriculture extends loans to agriculture-based young entrepreneurs through a dedicated program called Kapital Access for Young Agripreneurs (KAYA) to finance working capital and/or acquisition of fixed asset requirements of start-ups or existing business projects of young entrepreneurs and agri-fishery graduates.[27] The Land Bank of the Philippines launched a lending program for rural banks to digitalise their banking operations to reach and provide services to more Filipinos in the countryside.[28]

It is important to note that there are no available independent studies that so far demonstrate the actual impacts on climate actions, agricultural productivity or farmers' income on the current applications of AI and digital technologies that are adopted and deployed in the Philippines by government agencies, transnational corporations, agritech start-ups and other players in the food system and agriculture sector.

Public-Private Collaborations to Push Digitalisation in Agriculture

Partnerships between government institutions and the private sector have been an important vehicle for deploying new and emerging technologies in agrifood systems in the region. The role assigned to governments in providing an enabling environment to attract private sector interests in areas that require capital investments has been the rationale for changes in and adoption of policies and programs that facilitate the deployment of technologies.

Indonesia

In 2021, the Australian government initiated a project with the National Research and Innovation Agency (BRIN), Bappenas (the Ministry of National Development Planning of Indonesia), the Ministry of Agriculture (MoA) of Indonesia to assess the impact of digital agritech in smallholder farming to identify actions that the Indonesian

27 "Young Agripreneurs Loan Program (KAYA)," Department of Agriculture Agricultural Credit Policy Council, accessed November 28, 2023, https://acpc.gov.ph/kapital-access-for-young-agripreneurs-kaya/.

28 "Landbank launches P1-B facility for rural banks to go digital," News, Land Bank of the Philippines, June 13, 2022, https://www.landbank.com/news/landbank-launches-p1-b-facility-for-rural-banks-to-go-digital.

government agencies can take in the next five to ten years to shift public discourse on digital technologies from shiny tech to transformative solutions and to strengthen the relationship between the Australian Centre for International Agricultural Research and Indonesian government agencies.[29] This project aimed to provide key Indonesian government agencies with a five–10 year roadmap for the next five to 10 years of initiatives and policies they could implement to maximize the impact of digital technologies on agricultural value chains, actions to take and the actors to target to achieve success.[30]

The Dutch government is looking for opportunities to enter the Indonesian agritech sector as well. It concluded a study in 2023, through the Embassy of the Netherlands in Indonesia, that analyzed opportunities for digital transformation in Indonesian agriculture for Dutch investors.

Global consulting firms have also consistently thrown their weight behind digitalisation. McKinsey has advocated for digital technologies in agriculture in Indonesia, mentioning that, "accelerating the adoption of modern agricultural technologies could generate up to $6.6 billion a year in additional economic output from improved yields and reduced costs."[31] It also conducted a survey to understand the steps needed to build a digital agricultural economy for both public and private players.[32] In July 2023, the Ministry of Communications and Information started a collaboration with another global consulting firm – AT Kearney – on a roadmap for the digital transformation of the following sectors: agriculture, maritime, logistics, education, health and tourism. This project will determine the future of digital technologies and their deployment in Indonesia by providing strategies and recommendations that can be implemented by the government.

The International Finance Corporation (IFC), which is the private sector arm of the World Bank, has been investing in agri-tech start-ups. In 2022, it invested a whopping $10 million in Sayurbox, an e-grocery platform that connects farmers to consumers directly.

Malaysia

Maxis, one of Malaysia's largest and oldest telecommunications companies and the Malaysian Agricultural Research and Development Institute (MARDI) under the Ministry of Agriculture and Food Security are working on a pilot that will deploy digital agriculture tools to grow ginger.[33] These tools will include automated fertilizer application, big data analytics and 24/7 surveillance. The initiative also aims to roll out the technology to more than 400 ginger farmers for MARDI to collect data on how to use technology to address food security challenges. The two actors will also collaborate on other projects related to digital agriculture, building on their previous collaboration on grape farming at MARDI Agro Park in Langkawi, Kedah, to help increase yields, resource efficiency and quality of produce.[34]

29 ACIAR, "Digital Agtech in Indonesia's Transforming Smallholder Agriculture Sector: Potentials and Policy Options," ACIAR, accessed November 28, 2023, https://www.aciar.gov.au/project/gmcp-2021-169.
30 ACIAR, "Digital Agtech in Indonesia's Transforming Smallholder Agriculture Sector: Potentials and Policy Options," ACIAR, accessed November 28, 2023, https://www.aciar.gov.au/project/gmcp-2021-169.
31 Rajat Agarwal et al., "Ten Ideas to Unlock Indonesia's Growth after COVID-19," McKinsey & Company, May 3, 2021, https://www.mckinsey.com/featured-insights/asia-pacific/ten-ideas-to-unlock-indonesias-growth-after-covid-19.
32 Suyin Soon, Khoon Tee Tan, and Phillia Wibowo, "Unlocking Indonesian Agriculture's Digital Future," The Jakarta Post, 2021, https://www.thejakartapost.com/academia/2021/04/23/unlocking-indonesian-agricultures-digital-future.html.
33 Cynthia Ignatius, "Maxis and MARDI in Partnership to Explore Agricultural Modernisation," Business Today, January 17, 2023, https://www.businesstoday.com.my/2023/01/17/maxis-and-mardi-in-partnership-to-explore-agricultural-modernisation/.
34 "Taking Agriculture to the 5G Level," The Star, accessed November 28, 2023, https://www.thestar.com.my/news/nation/2020/12/31/taking-agriculture-to-the-5g-level.

As outlined in the policy documents on Malaysian digital economy, the country is focusing on becoming a hub of digital tools and technologies. One of the recent relevant developments is the announcement of Amazon Web Services (AWS) building a large cloud region in Malaysia, which will also be the largest international technological investment in the country, to date, of about US$6 billion until 2037.[35] Microsoft and Google also announced their plans to build their first cloud regions in the country in 2022, with Microsoft aiming to "deliver trusted cloud services locally, with world-class data security, privacy and the ability to store data in-country"[36] and Alibaba is already present in the market. According to the Knight Frank SEA-5 Data Centre Opportunity Index (SEA-5 Index), Malaysia is poised to be the most attractive data center investment location in Southeast Asia.[37] The Singapore moratorium on data centers in 2019 has contributed to the boom in Malaysia data center investments, especially in Johor, which is a few kilometers far from Singapore. Data centers accounted for 7 percent of Singapore's electricity consumption, and that is one of the reasons why the city-state imposed a moratorium. Lower land costs and cheaper electricity rates are a few reasons why companies are going to Johor.[38]

Philippines

The Department of Agriculture urged the American Chamber of Commerce of the Philippines (AmCham) to invest in the agricultural activities of the country, attracting private actors by providing economic incentives and favourable policies and highlighting the role of agro-industrial business corridors in the future of agriculture in the country. The investment areas presented to private actors are commodities with export potential, sustainable water technologies, drone technologies and smart farms, greenhouse technologies, biosecurity measures, and aquaculture and fish farming technologies.

In 2022, GreenPlus, a Korean business that works in aluminum and digital farming, and the DA planned to collaborate on promoting digital technologies like a smart greenhouse in the agricultural sector in the Philippines. The Korean government has also invested in agriculture projects in five regions in the country. In 2019, the Philippine government and officials from Russia talked of setting up a database that would hold information on rice seed varieties and discussed improving drone and satellite monitoring in agriculture.

The Digital Farmers Program, a collaboration between the Department of Agriculture and SMART Telecommunications was launched to introduce farmers to smartphone use, social media, agricultural applications and e-commerce with the help of Filipino youth. The program falls under SMART's plan to "narrow down the digital divide."[39]

Big Tech and Big Ag's Involvement in Digitalisation in Food and Agriculture

Southeast Asia is an important region of operation and investment for transnational agribusiness companies, or Big Ag. Small-scale farmers who constitute the bulk of rural population in Indonesia, Malaysia and the Philippines present a lucrative market for expansion for commercial seeds, agrichemicals, fertilizers and farm machineries for global and regional companies enabled by government

35 "Amazon's Cloud Unit to Invest $6 Bln in Malaysia by 2037" Reuters, March 2, 2023, https://www.reuters.com/technology/amazons-cloud-unit-invest-6-bln-malaysia-by-2037-2023-03-02/.

36 "Microsoft Announces First Malaysian Data Centre Region, Pledges To Train A Million Malaysians," Ministry of Communications and Digital, April 2019, https://www.kkd.gov.my/en/public/news/18761-microsoft-announces-first-malaysian-data-centre-region-pledges-to-train-a-million-malaysians.

37 "Data Centre Research Report Malaysia," Knight Frank, April 2023, https://content.knightfrank.com/research/2643/documents/en/malaysia-data-centre-research-report-2023-10072.pdf.

38 Krishaant Pathmanathan, "Johor – the New Centre for Data Storage," | Free Malaysia Today (FMT)," May 5, 2023, https://www.freemalaysiatoday.com/category/highlight/2023/05/05/johor-the-new-centre-for-data-storage/.

39 "PLDT-Smart Digital Farmers Program seeking more participants," Business World, September 4, 2023, https://www.bworldonline.com/agribusiness/2023/09/04/543203/pldt-smart-digital-farmers-program-seeking-more-participants/

policies and programs. The same pattern can be gleaned in advancing agricultural digitalisation, albeit with new players beyond Big Ag. As the home of the biggest players in the development and commercialisation of digital tools such as agricultural drones and sensors, Asia is witnessing the entry of technology companies on their own or in partnership with the usual key players in the agrifood systems. Global technology platforms. too, a.k.a. Big Tech, are playing prominent roles in deploying digital tools in the food and agriculture sector in the region.

Indonesia

The Indonesian Ministry of Agriculture signed an MoU with Microsoft to promote digital technologies among specifically smallholder farmers to increase their income. The aim is to collect important data from farms, satellites and the weather and then use cloud computing or machine learning to provide a knowledge graph of related information, including establishing fair market prices, identifying bottlenecks and creating accurate crop planting schedules. Microsoft will also establish its first data center region in Indonesia to deliver trusted local cloud services with world-class data security, privacy and the ability to store data in the country.[40]

In 2022, Syngenta launched Centrigo Farming Ecosystem, which will tell farmers how to plant and sell vegetable and corn seeds, as well as pesticides, to them, while Yara will sell soil testing mechanisms to tell farmers how much fertilizers to apply.[41] The PT Bank Rakyat Indonesia, another partner, will provide financial services to farmers through Centrigo Farming Ecosystem while partners Sayurbox and JIVA purchase vegetables and corn, respectively. With such an "ecosystem," touted as an "end-to-end solution" that surrounds farmers from all sides, capturing input selling, telling them how to plant, buying their supply and providing financial services to them, one wonders whether the farmers will have any autonomy over agriculture.

Grow Asia is a nonprofit established by the World Economic Forum and the ASEAN, and it operates in the Philippines, Vietnam, Myanmar and Indonesia; and their aim is to specifically help smallholder farmers in Southeast Asia by deploying digital technologies in agriculture. Grow Asia identified five key agritech business models in Southeast Asia in 2020, which it has been tracking: farmer advisory, peer-to-peer lending, traceability, digital marketplaces, and mechanisation platforms.[42] In October 2022, Grow Asia launched four multi-donor impact funds of US$20.2 million to promote sustainable and inclusive practices in the food, agriculture, and forestry sector in Southeast Asia.

- GrowVentures (US$5.75 million) will invest with the aim to accelerate the adoption of "climate-smart" and digital technologies among farmers.
- GrowHer (US$5.6 million) will invest in women's businesses.
- GrowRight (US$6.6 million) will support more sustainable investments and green finance mechanisms in Southeast Asia's agrifood sector.
- GrowBeyond (US$2.2 million) will focus on accelerating climate change adaptation and resilience.

These funds are currently anchored by investments from Corteva Agriscience, Cargill and Visa, along with funding from the governments of Canada, Germany, Japan, Korea and Switzerland.[43] Grow Asia has also partnered with the Bill Gates–led AGRA to enhance "South-South Cooperation" between the two regions.[44]

40 "Indonesian Ministry of Agriculture signs MoU with Microsoft to strengthen data-driven agriculture ecosystem," February 19, 2021, https://news.microsoft.com/id-id/2021/02/19/indonesian-ministry-of-agriculture-signs-mou-with-microsoft-to-strengthen-data-driven-agriculture-ecosystem/

41 Syngenta Introduces CENTRIGOTM Farming Ecosystem to Indonesia," Jakarta Post, October 7, 2022, https://www.thejakartapost.com/front-row/2022/10/07/syngenta-introduces-centrigo-farming-ecosystem-to-indonesia.html.

42 David Chen, "Smallholder AgriTech Southeast Asia Landscape 2022," Grow Asia DLS (blog), April 12, 2022, https://www.dls.growasia.org/post/smallholder-agritech-southeast-asia-landscape-2022.

43 "Grow Asia Launches USD 20.2m Impact Funds to Accelerate Sustainable Agricultural Transformation," Grow Asia, March 21, 2023, https://www.growasia.org/post/grow-asia-launches-usd-20-2m-impact-funds-to-accelerate-sustainable-agricultural-transformation.

44 "Press Release: AGRA and Grow Asia Enter Collaboration Agreement to Drive South-South Cooperation between Africa and Asia," AGRA, October 26, 2022, https://agra.org/news/agra-and-grow-asia-enter-collaboration-agreement-to-drive-south-south-cooperation

Philippines

Seeds and agrichemical transnationals are all pushing for their own digital/AI-based technologies and products among Filipino farmers mainly as vehicles for selling their patented agrochemicals. BASF (which originally stands for Baden Aniline and Soda Factory), through its Xarvio Scouting app, enables farmers and crop technicians to detect pests and diseases in their farms through photo recognition and recommend the company's proprietary pesticides to address identified problems.[45] The Xarvio app, which can be downloaded by farmers on their smartphones uses a plant modeling platform powered by algorithms designed by BASF to promote their own "solutions." The app also has a "community-based radar function" for farmers to see threats in surrounding fields.

Syngenta and Bayer are also promoting the use of drones for spraying their respective proprietary agrochemicals. Bayer recently launched a strategic partnership with XAG, a leading manufacturer of agricultural drones based in Guangzhou, China, on digital farming technology in Southeast Asia, including the Philippines.[46] The partnership involves distribution of XAG products such as spray drones, agricultural utility vehicles and farm cameras through Bayer's distribution and marketing channels.

A Snapshot of Start-ups Working on Digitising Food and Agriculture

Start-ups in the agricultural sector, especially in agriculture technologies (often referred to as agtech) have sprouted in recent years, especially during the COVID-19 pandemic, when digitalisation played a key role in the agricultural value and supply chains during one of the world's longest and strictest lockdowns.

Indonesia

According to an Asian Development Bank report in July 2023, Indonesia is home to 12 unicorns and one decacorn (privately held tech start-ups valued at US$1 billion and US$10 billion). In 2022, it had the second largest number of start-ups at 2,431 – second only to India among Asian economies.[47] In 2020, agtech start-ups raised more than US$165 million across 26 deals in Indonesia and according to AgFunder's "Asia-Pacific AgriFoodTech Investment Report 2022," Singapore and Indonesia followed China and India as the best-funded countries

45 "BASF Digital Farming Launches Xarvio Scouting in the Philippines," Xarvio Digital Farming Solutions, accessed November 28, 2023, https://xarvio-itl02.basf.com/content/xarvio/global/en/news/basf-digital-farming-launches-xarvio--scouting-in-the-philippine.

46 "Bayer and XAG Collaborate to Bring Digital Farming Technology to Smallholder Farmers in Southeast Asia & Pakistan," XAG, March 19, 2020, https://www.xa.com/en/news/official/xag/77.

47 Samreen Ahmad, "500 Global-Backed Agritech Firm Reaps $3m in Seed Money," Tech in Asia, March 29, 2022, https://www.techinasia.com/plant-cartridge-500-global-backs-3m-seed-round-of-malaysian-agritech-startup.

for agriculture and food technology in 2021. Singapore start-ups raised US$1.1 billion compared to Indonesia's US$816 million. In 2021, 57 agritech investment deals were made in Indonesia. Start-ups operate across agriculture, fisheries and poultry and, according to a report by Rabobank Foundation and Mercycorps Agrifin, have been operating in five key areas: supply chain and data management, market access, digital financial services, digital information and precision agriculture.[48]

Start-up	Area of operation/work	Collaborations and investments raised
TaniHub	An e-commerce platform that connects farmers directly to businesses to supply them orders through their logistics platform called TaniSupply. Under TaniSupply, they run warehousing and processing facilities, claiming that this service will give better returns to farmers by bypassing middlemen. The third service is called TaniFund, which is a peer-to-peer lending platform that connects retail investors to farmers to loan them money to use while growing crops and pay off by selling through TaniHub.[49]	TaniHub raised money from MDI Ventures, the investment arm of Telkom Group, one of Indonesia's largest telecoms, with participation from Add Ventures, BRI Ventures (which is the venture arm of the BRI Bank, one of the largest banks of Indonesia) and Flourish Ventures among others. It raised about US$ 94.5 million until 2022 but had to close its warehouses and lay off employees the same year.[50, 51]
Sayurbox	An e-grocery platform that directly connects farmers to consumers.	In 2022, Sayurbox raised US$120 million in a funding round led by Northstar and Alpha JWC Ventures along with the IFC, which is the private arm of the World Bank, along with existing investors, such as Astra International, Syngenta Group Ventures, and Global Brain.[52]
EdenFarm	This agritech start-up connects farmers with Indonesian businesses to sell them fresh produce, by replacing the middleman to provide better prices for both farmers and buyers.	In 2023, EdenFarm raised US$13.5 million. led by Telkomsel's investment arm TMI Ventures, making the total amount raised by the company US$34.5 million.[53]

48 Homi Kharas, John W. Mcarthur, and Izumi Ohno, "How AgriTech Is Transforming Traditional Agriculture in Emerging Markets," essay, in Breakthrough: The Promise of Frontier Technologies for Sustainable Development (Washington DC: Brookings Institution Press, 2022).
49 Palmera Permata Bachtiar, Hening Wikan Sawiji, Adinda Angelica, Faiq Yahya, and Paul Vandenberg, "Indonesia's Technology Startups: Voices from the Ecosystem," Asian Development Bank, June 2023 https://www.adb.org/sites/default/files/publication/888071/indonesia-tech-startups-voices-ecosystem.pdf
50 "No B2C, no lending, new CEO: Indonesian agritech TaniHub's reality check," The Ken, June 14, 2022, https://the-ken.com/story/no-b2c-no-lending-new-ceo-indonesian-agritech-tanihubs-reality-check/.
51 "Indonesian agritech platform TaniHub Group harvests a $65.5M Series B round," TechCrunch, May 21, 2021, https://techcrunch.com/2021/05/21/indonesian-agritech-platform-tanihub-group-harvests-a-65-5m-series-b-round/.
52 Palmera Permata Bachtiar, Hening Wikan Sawiji, Adinda Angelica, Faiq Yahya, and Paul Vandenberg, "Indonesia's Technology Startups: Voices from the Ecosystem," Asian Development Bank, June 2023. https://www.adb.org/sites/default/files/publication/888071/indonesia-tech-startups-voices-ecosystem.pdf
53 Khamila Mulia, "Indonesian B2B Agritech Startup Eden Farm Raises USD 19 Million to Empower Local Farmers," KrASIA, November 8, 2021, https://kr-asia.com/indonesian-b2b-agritech-startup-eden-farm-raises-usd-19-million-to-empower-local-farmers.

eFishery	It provides farmers with information on feed and a marketplace where it is sold to them, connects them to lenders and fish-buyers, and rents out smart feeders to them, which is an automatic feeding device that stores feed data, recommends when and how much to feed the fish and monitors pond conditions through attached sensors. Breeders rent this smart feeder for about Rp15,000 per month.[54] It provides essential data to lenders to evaluate the farmers' creditworthiness to qualify for loans. It is the first start-up in the global aquaculture industry to pass a US$1 billion valuation after its latest round of fundraising in July 2023.[55]	In the latest funding for eFishery, it raised about US$200 million.[56] It was led by Abu Dhabi–based 42XFund (a fund formed by G42, a UAE-based fund, and Abu Dhabi Growth Fund, which is a sovereign investment fund owned by the Government of Abu Dhabi, UAE), Malaysia's largest public sector pension fund, Swiss asset manager responsibility, 500 Global along with existing investors Northstar, Temasek (Singapore's sovereign wealth fund) and SoftBank,[57] with reports of the largest Japanese agricultural lender Norin Chukin Capital investing.[58]
Aruna	This start-up connects small fisheries to businesses that buy fish and partners with financial institutions and fintech companies and shares the fishers' credit scores with them (based on transaction data) so they can provide loans to fishers.	By 2022, Aruna had raised US$65 million from multiple venture capital firms.[59]
Pitik	Pitik provides farmers with IoT technologies, digital farming applications for real-time farm monitoring, financial services; sells inputs, and even buys the produce from the farmers. The start-up is also reportedly one of Indonesia's largest poultry tech companies, owing to its sale of over 16 million chickens annually.[60]	In 2022, Pitik raised US$14 million, led by Alpha JWC Ventures, one of the biggest venture capitals in Southeast Asia, with participation from MDI Ventures (Telkomsel's venture fund), the growth fund ARISE, and Wavemaker Partners.[61]
Rize	This is platform to implement strategies to decarbonize rice cultivation in Asia by providing farmers with economic incentives.[62] Rize's initial markets are Indonesia and Vietnam, to be followed by India with plans to expand later.	It was formed through a joint venture between Temasek, Wavemaker Impact, Breakthrough Energy Ventures (which counts Bill Gates, Jeff Bezos and Mukesh Ambani as investors)[63]

Interestingly, it was the Indonesian president who launched TaniHub as one of the apps to help farmers back in 2016,[64] which demonstrates the government's support given for private actors in agriculture.

54 Catherine Shu, "Indonesian Aquaculture Startup Efishery Nets $200m at Unicorn Valuation," TechCrunch, July 7, 2023, https://techcrunch.com/2023/07/07/efisher-series-d/.
55 Palmira Permata Bachtiar et al., rep., "Indonesia's Technology Startups, Asian Development Bank, 2023.
56 "Indonesian Aquaculture Startup Efishery Nets $200m at Unicorn Valuation," TechCrunch, July 7, 2023
57 "Landscaping of Digital Food System of Indonesia," Mercy Corps AgriFin, November 2020, https://www.mercycorpsagrifin.org/wp-content/uploads/2021/02/Landscaping-Indonesia-Full-Length.pdf.
58 Lesly Goh and Kelsey Wu, "Investing in Data and Innovation Ecosystem to Transform Indonesia's Agriculture," World Bank Blogs (blog), September 24, 2021, https://blogs.worldbank.org/eastasiapacific/investing-data-and-innovation-ecosystem-transform-indonesias-agriculture.
59 "Indonesia 'Sea-to-Table' Platform Aruna Hooks $35m Led by Prosus and East Ventures Growth Fund," TechCrunch, July 22, 2021, https://techcrunch.com/2021/07/21/indonesia-sea-to-table-platform-aruna-hooks-35m-led-by-prosus-and-east-ventures-growth-fund/.
60 Indonesia News Center, "Cultivhacktion Announces Top Three Digital Solutions Seeking to Address Key Agricultural Sector Challenges in Indonesia," Microsoft, December 10, 2021, https://news.microsoft.com/id-id/2021/12/10/cultivhacktion-announces-top-three-digital-solutions-seeking-to-address-key-agricultural-sector-challenges-in-indonesia/.
61 Palmira Permata Bachtiar et al., rep., "Indonesia's Technology Startups, Asian Development Bank, 2023.
62 Palmira Permata Bachtiar et al., rep., "Indonesia's Technology Startups, Asian Development Bank, 2023.
63 Lesly Goh and Kelsey Wu, "Investing in Data and Innovation Ecosystem to Transform Indonesia's Agriculture," World Bank Blogs (blog), September 24, 2021, https://blogs.worldbank.org/eastasiapacific/investing-data-and-innovation-ecosystem-transform-indonesias-agriculture.
64 "Indonesian President launches e-commerce apps for farmers", GovInsider, April 12, 2016, https://govinsider.asia/intl-en/article/indonesian-president-launches-e-commerce-apps-for-farmers

Malaysia

Startups in the agriculture sector in Malaysia are far smaller in capitalization compared to neighboring Indonesia, but not any less dynamic and aggressive. Ag tech start ups like Plant Cartridge focus in producing high-value crops specifically catered for high-end hotels and restaurants in Kuala Lumpur, tourist destinations and for the middle class in urban areas using their proprietary hydroponics-based technology. There are also smaller and more local start ups focusing on providing technical assistance to small-scale producers and linking them to markets such as AgriData portal in Sabah, and major ones with global investors that produce agricultural drones and farming services such as AeroDyne. Malaysia startups receive minimal funding from the government but could request for technical assistance and use of laboratories and facilities to those that need that.

Start-up	Area of operation/work	Collaborations and investments raised
BoomGrow	This ia an indoor vertical farm company that grows produce in a controlled environment (data on temperature, humidity and other factors is monitored, collected via sensors and analyzed). It is also called Malaysia's first 5G-connected vertical farm.	MDEC, PlaTCOM Ventures, and SME Corp.
SM4RT Tani	This start-up uses drones and soil and weather monitoring sensors to collect farm data to analyse for crop monitoring, field planning and farm inventory management. It also has a digital market platform for goods and services.[65]	The parent company is called SAT.Asia, which has collaborated with SMaju Agro Ventures, Top Fruits, Koperasi Sahabat, YTL Communications (a telecom company), the Malaysian Pineapple Planters Association, and Universiti Malaysia Pahang (UMP).
Braintree	Develops artificial intelligence–driven robots, drone services and proprietary software for farm automation with a special focus on palm oil, paddy and rubber.	Petroliam Nasional Berhad invested an undisclosed amount in Braintree as its first investment in venture capital space via Petronas Ventures. Other investors include 500 Global and AgFunder.[66]
AgriData Portal	Provides farmers access to finance and markets along with bookkeeping features. It aims to expand operations to other Southeast Asian countries.	It collaborated with Sabah Credit Corporation (owned by the state government of Sabah) and Funding Societies, a digital financing platform based in Singapore. The company won RM250,000 in the Grant Category at MyHackathon 2020 organized by the Ministry of Science, Technology and Innovation, Malaysia.[67]

65 Samreen Ahmad, "500 Global-Backed Agritech Firm Reaps $3m in Seed Money," Tech in Asia, March 29, 2022, https://www.techinasia.com/plant-cartridge-500-global-backs-3m-seed-round-of-malaysian-agritech-startup.
66 Samreen Ahmad, "500 Global-Backed Agritech Firm Reaps $3m in Seed Money," Tech in Asia, March 29, 2022, https://www.techinasia.com/plant-cartridge-500-global-backs-3m-seed-round-of-malaysian-agritech-startup.
67 https://www.agridataportal.com/

Start-up	Area of operation/work	Collaborations and investments raised
IRGA	Provides services like iPlant, HARVi, ENVi and URBi: iPLANT uses IoT and cloud computing to provide real-time data on plantations, generates business insights and analyses production output. HARVi is a yet-to-be-launched precision harvesting tool. ENVi deploys multiple sensors to collect farm environment data. URBi is the company's proprietary controlled indoor farming system.	IRGA acquired Kingoya, a plantation tools manufacturing company, to combine the hardware manufacturing of Kingoya with the software of IRGA.
Aerodyne	Developed an app that sells drones and pilot services for agriculture seeding, spraying, plant analysis and mapping.[68]	In 2022, Aerodyne raised US$30 million led by Petronas Ventures.[69] It has raised money from 500 Global and KWAP (the pension scheme for Malaysia's public employees).[70]
Plant Cartridge	Works on controlled-environment agriculture, with features like irrigation and nutrient management systems for crops like leafy vegetables, tuberous plants and fruiting plants. The start-up aims to reduce water consumption and fertilizer and pesticide usage by deploying hardware and software for controlled environment agriculture (CEA).	The company raised US$3 million in seed funding from 500 Global and a private group of business conglomerates in 2022.[71]
Cell Agritech	A leading biotechnology company that operates in Malaysia and Singapore focusing on lab-based cultivation of meat and fish products	Cell Agritech and the Bioeconomy corporation of Malaysia (the lead agency for the bio-based industry), under Ministry of Science, Technology and Innovation (MOSTI), organized the first Malaysia Cultivated Meat Conference in Kuala Lumpur. It announced the launch of the country's first cultivated meat plant in Penang by the end of 2024, with an investment of RM20 million.[72]

68 https://aerodyne.group/agrimor.html
69 "Petronas VC arm leads $30m round of Malaysian drone startup" Tech in Asia, https://www.techinasia.com/aerodyne-bridge-funding-2022
70 "Aerodyne Group Secures USD30 Million in Strategic Investment Bridging Round Led by Petronas," Press release, https://s3.ap-southeast-1.amazonaws.com/aerodyne.group/files/Aerodyne+Group+Secures+USD30+Million+in+Strategic+Investment+Bridging+Round+Led+by+PETRONAS
71 "Plant Cartridge raises $3 million seed funding", March 21, 2022, www.plantcartridge.com
72 Claudia Khaw, "With RM35mil invested so far, this startup is bringing us closer to M'sian lab-grown meat", September 26, 2023 https://vulcanpost.com/839047/cell-agritech-malaysia-cultivated-meat-lab-grown-startup/

Philippines

Agtech start-ups in the Philippines mushroomed during the Covid pandemic, mostly involving digital apps that link producers to urban consumers. Financial technology (fintech) start-ups also boomed during the pandemic, mostly catering to urban consumers and later expanded to agricultural applications.

Start-up	Area of operation/work	Collaborations and investments raised
Mayani (literally "with harvest" in English)	This start-up connects small-scale farmers and fisherfolk to consumers through its platform.	It was backed by funds from the Asian Development Bank (ADB) and the Japan International Cooperation Agency (JICA) along with US$1.7 million seed funding round from AgFunder (Silicon Valley agtech venture capital), Singaporean venture capital firms, and rich Filipino family businesses behind the GMA network and the Abenson Group. [73]
Sustainable Sagada	Provides direct marketing channels for small-scale farmers in Sagada, Mountain Province, in the northern highlands.	
Anihan Technologies (AniTech)	Manufactures and installs locally made sensors that can monitor temperature, humidity and other environmental factors in greenhouses and warehouses. The data gathered by the sensors are then sent to the company's web-based centralized platform, which is accessible through a computer or mobile phone to alert operators or farmers on the status in the controlled environment.	Anitech received 47,000 USD funding from Leave A Nest Capital, a Japanese Venture Capital firm[74]
PearlPay, PayMaya	This start-up offers general payment services at affordable rates and secure end-to-end banking solutions accessible through smartphones, which helps the system gain popularity as an alternative mode of payment for agricultural transactions, especially in rural areas where residents have less access to banking services.	PearlPay is backed by private investors in the Philippines. It signed a partnership with the Philippine Chamber of Commerce and Industry to provide payment digitalisation and connectivity to their member SMEs. PayMaya has raised funds from the International Finance Corporation, Tencent, PLDT (a telecommunications company), among other investors. [75]
GCash	GCash has become quite mainstream in recent years, thanks to its advantage over other fintech solutions, being a subsidiary of one of the two major players in the country's telecommunications sector.	GCash is owned by Globe Fintech Innovations, a joint venture between Globe Telecom, Ant Group (Alibaba Group), and Ayala Corporation (a Filipino business conglomerate).

73 Christian Francisco, "Agritech startup Mayani raises $1.7m in AgFunder-led Seed round", The Independent Investor, January 20, 2023, https://theindependentinvestor.ph/agritech-startup-mayani-raises-1-7m-in-agfunder-led-seed-round/.
74 "Leave A Nest Capital invests in AniTech", April 13, 2023, https://www.lnest.capital/en/release/leave-a-nest-capital-invests-in-anitech-a-company-originating-from-de-la-salle-university-and-the-grand-winner-of-tech-plan-demo-day-in-the-philippines-2021/
75 "Philippines' Voyager Raises $167 Million From KKR, PLDT, Tencent To Expand Fintech Operations", Forbes, June 29, 2021, https://www.forbes.com/sites/jonathanburgos/2021/06/29/philippines-voyager-raises-167-million-from-kkr-pldt-tencent-to-expand-fintech-operations

The Role of Multilateral Banks

The history of technology deployment in Southeast Asia is replete with cases of multilateral development banks that have played active roles in rolling out particular technologies and technological packages. The World Bank has been pivotal in advancing the green revolution agenda across the region over many decades, and the Asian Development Bank has financed programs that promote agricultural biotechnology capacity building. Owing from these experiences, the research also looked into the investments of these banks in agricultural digitalisation.

The Asian Development Bank offers technical assistance programs on digital and artificial intelligence solutions for the agriculture, natural resources and rural development sector to its developing member countries, in particular China and those in Central Asia. A five-year cooperation agreement between the ADB and the Consultative Group for International Agricultural Research (CGIAR) on accelerating and scaling up agricultural innovations for sustainable and inclusive development of agrifood systems in Asia also involves digital agriculture as a target area.

In 2021, the World Bank Group, along with Microsoft, TaniHub Group, GIZ, IPB University, GrowAsia, Data Science Indonesia, FAO, Plug and Play Indonesia, and Planet, launched the inaugural Data Hackathon called "Cultivhacktion" (dubbed by the World Bank as Indonesia's digital agriculture hackaton) National Farmers Day celebration, supported by the Ministry of Agriculture of the Republic of Indonesia and the West Java Provincial Government to encourage young people to develop digital technologies in agriculture in Indonesia.[76, 77]

Officials from the World Bank have written supportively of agritech innovations in Indonesia as well. They have called for an increase in private investments and making the regulatory environment more conducive to digitalisation of agriculture. In "Breakthrough: The Promise of Frontier Technologies for Sustainable Development," a World Bank official has laid out plans to set up an Agriculture Innovation Hub in Indonesia, to be convened likely at the World Bank, as a public-private partnership platform that will raise private sector investments using public sector money to develop an agriculture data exchange platform on public and private data, initiate capacity building program for farmers for the uptake of digital technologies, and link farmers directly with consumers through e-commerce platforms.

In these documents, the oppression/ marginalisation of smallholder farmers is termed "market failure," and the causes listed for their marginalisation are lack of market access and limited access to finance. It also encourages multi-stakeholder partnerships with entities like venture capital firms, Big Tech, agritech start-ups and organisations similar to the World Economic Forum as a way ahead to push for digital innovation in agriculture.

In a study by the Asian Development Bank on start-ups in Indonesia, the respondents mention that government programs that educate farmers about start-ups can be a better option than start-ups spending their time, energy and money going to farms to acquire customers. In this way, perhaps the start-ups expect the government to take the burden of expanding their customer base. Start-ups also expect the government to run digital literacy programs and vocational training so it becomes easier for them to sell their products and services to farmers. They also suggest using the small-scale loans offered by the government to buy agritech products and services that essentially urges spending public money to buy private services to boost their revenue streams.

76 "Young Agripreneurs Loan Program (KAYA)," Department of Agriculture Agricultural Credit Policy Council, accessed November 28, 2023, https://acpc.gov.ph/kapital-access-for-young-agripreneurs-kaya/.
77 Indonesia News Center, "Cultivhacktion Announces Top Three Digital Solutions Seeking to Address Key Agricultural Sector Challenges in Indonesia," Microsoft, December 10, 2021, https://news.microsoft.com/id-id/2021/12/10/cultivhacktion-announces-top-three-digital-solutions-seeking-to-address-key-agricultural-sector-challenges-in-indonesia/.

Start-ups also hope that local governments can give them access to demonstration plots and ponds to conduct market research and allow them to utilize government agricultural extension workers. They also ask whether governments can organize farmers into corporations to make it easier for the start-ups to negotiate with farmers rather than approach them individually.[78]

Conclusions: A New Train in Broken Tracks with No Guardrails

The digitalization train has arrived in Indonesia, Malaysia and the Philippines beyond the pages of ambitious roadmaps and grand plans for Agriculture 4.0. In it are giant agribusiness interests and technology platforms armed with their combined package of technological fixes to the problems in the agri-food systems that are made even more serious by the products that they are selling – toxic agrochemicals that poison the people and the planet, commercial seeds that promote uniformity in the fields and the extinction of traditional varieties, fossil-based fertilizers that induce dependence among farmers and render the soil unhealthy in the long term, and machines that eliminate rural jobs, displace farm workers and make farmers obsolete.

In the margins of this noisy chant to board the digitalization train are the small-scale farmers who continue to be excluded from shaping policies and decisions in agricultural technologies that are granted support and political will by governments. As the digitalisation train arrives in the platform of developing countries in Southeast Asia, the marginalised should be heard. Those in the driving seat should recognize that there is barely any rail to allow the train to move farther – nor are there guardrails to protect the weakest from falling off or being run over by the train. Basic services such as health, education and social protection that will allow smallholder farmers to sustain food production for the majority of the population are severely inadequate in many rural areas across the sub-region. Infrastructure as basic as electricity and internet connectivity, which are needed to make digitalisation feasible as an option for poor farmers are inexistent in many farming communities. Many farmers in Indonesia and the Philippines, in particular, remain too poor to afford digital tools to explore the promises and potentials of these technologies. Allocating public resources to digitalisation as a new priority in the agriculture sector would mean rechannelling existing resources to digitalisation, scampering for new sources of funds and technical assistance in the form of loans and creating an enabling environment and offering partnerships to attract private sector investments to make capital available in areas where public funds are scarce.

Connectivity or access to digital infrastructure, even just internet connection, critically determine access to AI-enabled digital tools and services. There is a wide urban-rural disparity in internet connectivity in the Philippines, with only 22.7 percent of households in rural areas having access to the internet compared to 42.5 percent of households in urban areas.[79] That disparity could be far wider across income groups in rural areas, with smallholders, subsistence farmers, tenants and agricultural workers having much less connectivity than farmers who have larger landholding – which are not captured in official statistics. Similar disparity in connectivity could also be expected among rural women compared to men and across income groups.

The fact that the Philippines has among the slowest internet speeds in the world could be far worse in rural communities, farms and upland communities where there is not enough digital infrastructures

79 ISP.PAGE. (2023, June 27). Internet access in rural Philippines: ISP Today. Bridging the urban-rural gap. https://isp.page/news/internet-access-in-rural-philippines-bridging-the-urban-rural-gap/.

in the cities and towns. The motivation to penetrate potential smartphone users in rural and upland areas explains why most government programs on digital apps and services and their agtech counterparts are designed and implemented in collaboration with either of the two dominant telecom providers in the country. Across Southeast Asia, telecoms invest in internet infrastructures and erect towers in rural and upland areas where government agencies implement programs and the police and the military maintain a presence to protect these infrastructures. Such commercial push, however, will largely depend on the density of potential users in identified service areas, which determine the profitability of setting up internet infrastructure for telecom companies, and less on the actual need to serve marginalized and disadvantaged communities. Commercial access to internet connectivity and digital tools could present additional financial burden on farmers, especially the smallholders and subsistence farmers who mostly live below the poverty line.

Lack of access to electricity or affordable sources of energy remains a reality in the most impoverished communities across Southeast Asia. As many countries in the region continue to rely on coal-fired power generation plants, many marginalized communities remain in the dark, literally, unconnected to the grid, while some manage to get by with small and inexpensive solar panels that provide electricity for basic household needs for a limited time. There is no way digitalisation can support agriculture without access to reliable and steady energy sources that enable communities to catch the train on the platform. New power sources may be built to supply the massive energy guzzled up by artificial intelligence and data centers, but whatever technology-savvy future they promise to smallholders and the rural poor will become a reality only if basic needs are satisfied, basic services are delivered and basic infrastructures are made available.

In the scenario of lack of infrastructure for transport, absence of hospitals and educational institutions, lack of access to land, and corporate control of resources, questions should be asked about how introducing digital technologies in a top-down manner will prove to be a panacea to the agrarian crisis. In a context of absence of enough infrastructure for digital technologies to exist, where those who are being pushed towards or expected to adopt digital tools are not fully informed about digital technology and its impact, let alone be able to participate in its design and assessment processes, the narrative of digitalisation being transformative should be questioned. Will the deployment of digital technologies and the transformation of farms into humanless automated machine–operated endeavors address poverty, hunger and landlessness?

New tech fixes to old problems

According to the Indonesian Peasants Union (SPI), 68 percent of existing land resources are controlled by only 1 percent of the Indonesian population, 15 million people in rural areas and 12 million in urban areas live in extreme poverty, which has led to many conflicts in rural areas. Instead of framing subsistence farming and small-scale fisheries and poultry as inefficient – which need digital technologies to function well – the highly concentrated land ownership that leaves very little resources in the hands of the marginalized small-scale farmers and pushes them into poverty should be squarely addressed.

Digital land registries are offered as a solution to deal with land conflicts and contentious property rights. Farmers in marginalized communities and those who are barely literate often do not have access to government services and programs in agriculture. Digitalisation of farmer registry and imposing registration as a requirement to avail of public services and benefits from programs is the solution. Lack of market information results in small-scale farmers being squeezed the in pricing of agricultural produce and in decision-making regarding which crop to plant based on market needs. The solution offered is signing on to digital apps that provide technical and market advisories to farmers through digital devices. The reduction, even elimination, in recent decades of agricultural extension services that provide technical support to farmers on crop and soil health and advise on increasing farm productivity and sustainability is now being justified by the promotion of digital apps developed by start-ups or in collaboration with technology platforms and telecoms. Digitalization is presented as a panacea to structural problems that have perennially beset the agriculture sector and marginalized small-scale producers who have continuously fed the majority of the population amidst the challenges.

The reality is digital technologies do not alter the fundamental problems prevalent in food and agriculture in developing countries: unequal land access and ownership, the concentration of resources in a few hands, policymaking that elevates pesticide-intensive monoculture, subsidy of export-oriented agriculture, and unequal relationship prevalent in the global economy (which positions the Global South as the exporter of cheap raw materials and importer of cheap finished goods. The potentials and promises of digital technologies to provide higher incomes for small-scale farmers are often touted, and are therefore being pushed onto them. In Indonesia, farmers protested against cheap imports of potatoes from China and Pakistan that pushed their local varieties out of the market and the imports of rice,[80] and the case was similar with other horticultural crops. One of the reasons behind their low income has been government policies that prioritize free trade agreements detrimental to smallholders' interests. In the context of continued inaction on farmers' demands regarding the devastating impact of cheap imports, any positive impact of digital technologies on the farmers' income is highly questionable.

Digital tools for tech-savvy farmers

The reasoning that digital technologies will attract young people into farming mislabels the problem: young people move away from farming because of insufficient remuneration and the lack of respect for farming as a profession and as a decent livelihood in the current paradigm where agriculture is regarded as "backward" and farmers' knowledge is not valued. Whenever new technologies are introduced – imposed in many cases – in agriculture, the burden is placed on the shoulders of marginalized farmers to catch up with the fast-changing technologies even when the necessary capacities and skills to operate, maintain

80 "Indonesia Peasants' Union protest against cheap import of potatoes", December 15, 2016, https://viacampesina.org/en/2016/12/indonesia-peasants-union-protest-against-cheap-import-of-potatoes/

and repair new machineries, gadgets and tools are severely lacking, and even when these technologies have not been tested and proven to be effective. As farmer-participants chorused in a recent meeting of the municipal agriculture and fisheries council in Marihatag, Agusan del Sur, they have seen over the past decades how expensive, modern and imported farm machineries provided by government programs turned into white elephants and rusty scraps after they broke down and no spare parts can be found even if local capacities to repair exist.

Digital literacy among farmer populations across Indonesia, Malaysia and the Philippines remain low, and access to basic education services remains a struggle for most marginalized households where children, often girls, have to drop out of school because of poverty and the need to mobilize every member to eke out a living. According to a Rabobank and MercyCorps Agrifin study from November 2020, the majority of farmers in Indonesia: (1) did not advance beyond primary school, (2) are over 45 years old, (3) do not use the internet, and (4) farm less than 0.5 hectares.[81] Access to AI/digital-enabled technologies by small-scale farmers and fisherfolk remains a critical issue in the Philippines where poverty incidence among farmers and fisherfolk is at around 30 percent compared to the national rate of 18.1 percent in 2021.[82] Prioritizing digital literacy where children have to walk for hours to reach schools, teachers are few and ill-trained and computer facilities are absent is a proposition that is detached from reality.

Who can afford AI-enabled digital tools and services determines who will benefit from the promised advantages and potentials offered by these technologies. As it was the situation for earlier new and emerging technologies that were introduced in the food systems and agriculture sector through the decades, AI and digitalisation could actually aggravate the wide income and wealth gaps in rural areas unless interventions are directed at addressing structural issues of these problems.

Whose knowledge and skills count?

In many analyses, farmers are cast as having low productivity and not able to "keep up" with agricultural mechanisation and trends. In one description, poultry farmers were called "inefficient" and that "they used poultry-rearing methods passed down from one generation to the next, with little scientific basis in their operations." This narrative is flawed on two counts: Firstly, it ignores corporate control in poultry against which small farmers have to compete. In Indonesia, 99 percent of the poultry breeding market is in the hands of just three companies while the animal feed sector is concentrated in the hands of three companies.[83] In fact, in 2016, poultry firms were fined for behaving like a cartel.[84] In this scenario, blaming the farmers and their farms for inefficiency and low productivity is mislabeling the problem and prolonging inaction regarding malpractices that lead to food insecurity, poverty and hunger. Discounting and marginalising diverse knowledge systems evolved by farmers and indigenous communities over centuries would not only make cultures and practices that enabled resilience and adaptation to ecological, environmental and social shocks disappear but would wipe out local and indigenous varieties of crops and species of animals that provide food security for the population.

Digitalisation of local knowledge systems and traditional breeds and species is not a solution when the farmers and communities that apply this knowledge in their daily lives and nurture these crops and animal breeds are no longer around to hand them over to the next generations. Indigenous and local knowledge systems are never static; they continuously evolve as practitioners

81 "Widodo Launches Roadmap for Industry 4.0," https://www.indonesia-investments.com/business/business-columns/widodo-launches-roadmap-for-industry-4.0-making-indonesia-4.0/item8711.

82 ISP.PAGE. (2023, June 27). Internet access in rural Philippines: ISP Today. Bridging the urban-rural gap. https://isp.page/news/internet-access-in-rural-philippines-bridging-the-urban-rural-gap/.

83 "Indonesia's Chicken Industry Dominated by 3 Companies, Minister Says", September 26, 2022, https://en.tempo.co/read/1638647/indonesias-chicken-industry-dominated-by-3-companies-minister-says

84 Viriya Singgih, October 17, 2016, "Public biggest winner in cartel verdict", https://www.thejakartapost.com/news/2016/10/17/public-biggest-winner-cartel-verdict.html.

interact and share knowledge within and across communities over generations. Data centers may be able to store petabytes of data and information on seeds and breeds developed by farmers across Southeast Asia just as gene banks kept their physical version in giant expensive freezers since the Green Revolution areas, but indigenous and local practices, knowledge and wisdom lose their meaning and intrinsic value when they are taken out of the context where they evolve and reduced into computer language bits, 1's and 0's and codes that command high salaries in the job market and shares in stock markets.

> "Who can afford AI-enabled digital tools and services determines who will benefit from the promised advantages and potentials offered by these technologies. As it was the situation for earlier new and emerging technologies that were introduced in the food systems and agriculture sector through the decades, AI and digitalisation could actually aggravate the wide income and wealth gaps in rural areas unless interventions are directed at addressing structural issues of these problems."

Dependence on machines and algorithms to dispense advice based on patterns based on data and digitized information fed into them from "freely available sources" will not capture the dynamic knowledge systems that give meaning to such information and practices that evolved from interactions among people and their relationship with nature. The undervaluing of indigenous and local knowledge systems and their monetization when reduced into data that feed digital systems need to be resisted and the rights and control of farmers and communities over data on them and their farms must be defended.

Digital apps, tools and algorithms: Who owns the data?

Control over data collected from farmers and from their farms through digital apps is glossed over in the deployment of digital tools and services. In most cases, there is no information available on the website of government agencies involved in the development and deployment of these technologies on where the data that they collect are stored and processed, and whether there are agreements on data ownership between these government agencies or agtech start-ups and the commercial provider of cloud services. A farmers' organization in the southern Philippines asked a government agency for access to aggregated data from an area where they are organizing farmers and was turned down as these data are "for government use only." In several interactions with national and local agriculture officials in the Philippines responsible for managing the data collected from farmers in the digital registry system and through government-hosted digital apps, answers have consistently been vague on who has access to the data collected from farmers and their farms, where these are stored and what mechanisms they have put in place to protect the integrity and security of data collected.

When farmers are brought in on these digital platforms/apps to share data about their farms, their poultry and fishing practices, their land, ponds and livestock, rarely are they informed about how the company benefits from their data, let alone the prospect of sharing a percentage of the revenue/profits the company gains from the data-sharing of farmers, and the future revenue gained from the new business strategies the collected and analyzed data help to formulate.

Until issues on farmers' control over agricultural data are addressed, the digital tools and services deployed by the government that extract data

from farmers and their farms, and the digital advice powered by algorithms designed by companies to push for their proprietary products, will only reinforce corporate stranglehold over farmers and the agriculture sector. In most cases, corporations are introducing digital technologies on farms in a regulatory vacuum where there are no laws that protect data obtained from farmers and their farms and there are no guidelines on how the data obtained and analyzed is used.

Artificial intelligence and machine learning systems have inherent biases which have been covered more than enough times – how do we address the biases inherent in these systems? They might privilege one ecology, one crop, one farming system. Reality is complex, and natural socioecological systems are dynamic – are digital tools enough to capture these realities? Agriculture is not just about statistics but also about different societal and ecological parameters interacting with one another. AI systems are often trained on proprietary data (and people from whom the data has been extracted are not paid). Proprietary data has limitations, and the algorithm that underpins AI systems is defined and trained by humans in power, who have their own biases.

In agriculture, this can translate into most AI being trained on a few commercial crops, and these software are trained to categorize small-scale farmers as inefficient (based on the perspective of agritech start-ups, Big Ag and financial institutions) and reward only agriculture which is "productive" according to modern industrial agricultural practices. In contexts where AI systems or "simple apps" that dispense technical advice to farmers are trained from "freely available data," which are largely data on farmers, their farms and the environment, algorithms that power the system are often proprietary and designed by developers with implicit biases. During a webinar organized by an intergovernmental body in Asia-Pacific, one of the researchers for this report asked a digital agriculture app creator if the technical advice on addressing plant and soil health problems provided by their app to farmers include organic agriculture or agroecological practices. His answer was "Not yet." Replicating Green Revolution metrics in farming can lead to highlighting only the productivity of one single cropping at the expense of the vast destruction caused by the pesticides, herbicides and insecticides that such cropping patterns require. It also leads to biodiversity loss, and consequences like water pollution, detrimental impact on human health, negative impacts on pollination and loss in seed diversity.

Accountability to whom?

Many popular start-ups, like TaniHub in Indonesia as a case in point, laid off its workers and shut down its warehouses. In these cases, are the start-ups accountable to the farmers they procured the produce from? When start-ups "advice" farmers on what to grow, how to plant, and which agricultural practices to employ, are they held accountable in case their recommendations cause losses to the farmers?

With the proliferation of drones, there is an emergence of new weeds and weedier old weeds in rice farms where these drones spray agrochemicals. Academics attribute this to "chemical drift," as drones spray pesticides on rice crops from the air albeit at much lower altitude closer to the plant from above when new weeds and weedier old weeds affect farm productivity and farmers' income, who can farmers run to? Who is accountable for the adverse impact on human health, the environment and biodiversity when more and more potent agrochemicals are required to address the problems that arise as a consequence of a techno-fix to old problems in the farm – the agrochemical companies who sell the herbicides, the company that sells or rents out the agro-drones, or the government agencies that promote and enable drone spraying in farms?

Is the digital train different from the previous techno-fix trains?

There can be parallels drawn to the Green Revolution, where the introduction of new technologies is top-down, without adequate consultation with farmers, subsidies and resources are being poured to push proprietary technologies, existing solutions and farmer-led technologies and innovations are being ignored instead of propagated, and farmers' knowledge is not considered scientific. Just as it was in the Green Revolution, the public coffers have lent humongous support to private companies by setting up infrastructure for digital technologies, providing financial incentives, adopting policies and regulations to benefit businesses, introducing digital literacy programs to close the so-called digital divide, providing research and development support via research centers and intangible support through the introduction of start-ups on government platforms, forging collaborations and partnerships with government institutions, and drawing up a plan to provide access to public data. This repeats the tragic patterns of public sector funding most innovation while the private sector reaps the rewards by using taxpayers' money to fund high-risk investments while the "private sector sat waiting behind" and, subsequently, the public sector was not able to reap the rewards from these investments.[85]

Casting private actors as "risk-taking innovators" is a huge disservice to the taxpayers whose money is being used to subsidize the activity of start-ups so they can sell their (unproven) products and services. How do we trust the same companies to push for sustainable and equal agricultural futures when they have financialised, commoditised and destroyed valuable agricultural systems, land and knowledge systems where the survival of communities depend?

None of these so-called digital solutions will address the root causes of climate change; rather, they will involve continued dependence on agrochemicals and synthetic fertilizers and reliance on long value chain which are key contributors to greenhouse gas emissions in agriculture. Neither do they even refer to the environmental and climate footprints of the manufacture and widespread adoption of digital tools and technologies, including the extraction of critical minerals for the production of efficient batteries to power digital technologies, water consumption and land competition around the operation of massive data centers that store and process the data collected from farmers and their farms, and the water and energy use in the production of microchips that serve as the "brain" of digital technologies.

> "Who is accountable for the adverse impact on human health, the environment and biodiversity when more and more potent agrochemicals are required to address the problems that arise as a consequence of a techno-fix to old problems in the farm – the agrochemical companies who sell the herbicides, the company that sells or rents out the agro-drones, or the government agencies that promote and enable drone spraying in farms?"

In the absence of safeguards around data protection, data from farmers has been harvested for corporate profits – enabled by governments. These digital technologies are not the solution to address complex historical, structural and social inequalities as they have been portrayed by those who benefit from them. It is time that we unpack the delusion fed to people so they would board the digitalisation train without asking questions as to who is driving, where the train comes from and where it is heading. The vision of farming without farmers as artificial intelligence and digitalisation powered by algorithm created by those who benefit from these technologies take over agriculture and food systems need to be exposed, resisted and challenged.

85 Mariana Mazzucato, "How taxpayers grow the private sector", CNBC interview, Novermber 16, 2023, https://www.cnbc.com/2023/11/16/private-sector-should-share-wealth-with-taxpayers-mariana-mazzucato.html

ABOUT ETC GROUP

ETC Group is a small, international, research and action collective committed to social and environmental justice, human rights and the defence of just and ecological agri-food systems and the web of life. We focus on understanding and challenging corporate-controlled techno-industrial systems and exposing the dangers of the technological manipulation of life, especially in relation to climate justice and food security. We uphold peasant and indigenous ways of life and knowledge systems; food sovereignty; people's control of technology; and just economies and governance.

www.etcgroup.org

ABOUT RLS MANILA

The Rosa-Luxemburg-Stiftung (RLS) is one of the six major political foundations in the Federal Republic of Germany. The regional office in Manila organizes education and publications in the areas of fundamental social rights and socio-ecological transformation. RLS Manila regularly cooperates with partner organizations throughout the Malay archipelago, particularly those active in the Philippines, Malaysia, and Indonesia.

www.rosaluxmanila.org

etc GROUP

ROSA LUXEMBURG STIFTUNG
SOUTHEAST ASIA
MANILA OFFICE