

CASHING IN ON THE CLIMATE CRISIS THROUGH AGRICULTURAL DIGITALISATION

Emerging Cases in Indonesia, Malaysia
and the Philippines



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Executive Summary

ETC Group's report "Cashing in on the Climate Crisis through Agricultural Digitalisation: Emerging Cases in Indonesia, Malaysia and the Philippines" explores how the climate crisis is being turned into an investment opportunity for financial actors, and how agricultural digitalisation is facilitating the commodification of climate into assets that can be traded, highlighting cases from Malaysia, Indonesia and Philippines.

Our findings show the proliferation of "green" financial instruments like green bonds, promotion of carbon farming to generate carbon credits and for offsets, increasing speculation in carbon trading especially via the introduction of blockchain, and the growing interest of sovereign wealth funds in food and agriculture related technologies. We also highlight the ways in which governments, regional institutions and inter-governmental initiatives are facilitating the financialisation of climate by promoting and enabling digital technologies in agriculture and carbon trading.

The use of agricultural digitalisation to create or enable financial instruments and assets using the climate crisis as justification is a nefarious strategy to evade any real action on the climate crisis while increasing revenue streams, pushing a positive public image on the climate front, and expanding and entrenching control over food and agriculture. Beyond the green veneer, we realize that these technologies are actually carbon-intensive and their sustainability claims are highly dubious. They turn farmers into data extractors, locking them into practices dictated by corporations, undermining farmers' rights and autonomy, and are used by these corporations to keep emitting greenhouse gasses.

Financialization of climate through agricultural digitalisation is yet another means of monetizing data extracted from farmers, their fields and nature, powered by digital technologies that are dependent on extraction of natural resources. These technologies are far from neutral, inherently top-down and rarely developed for the interest of smallholder farmers. Instead of pushing for tricks and false solutions that distract attention from real solutions to the climate crisis, the Global North and corporations should pay reparations that could be used to advance community-based mitigation and adaptation actions such as agroecological approaches in food production and the promotion of dynamic territorial markets without sacrificing biodiversity, the environment and peoples' rights.

Cashing in on the Climate Crisis through Agricultural Digitalisation

Emerging Cases in Indonesia, Malaysia and the Philippines

Introduction

Digital agriculture technologies – or, as questionably termed by industry, “precision agriculture” – collects billions of data points from farms via satellite, drones, sensors, robotics on soil health, moisture levels, seed planting, pest prevalence, weather conditions, among other metrics. Ostensibly, this data is analysed via algorithmic software to prescribe “tailored” agriculture practices, to give on-farm recommendations on agricultural inputs to the farmer, or to animate new forms of automation. Additionally, blockchains that promise to function for food safety, tracking carbon footprints, and engaging in carbon trading are also being deployed mainly by corporate interests. These technologies are being used not only on-farm but throughout the supply chain, from breeding and inputs before the farm level to manufacturing, processing, trading, and consumer delivery.

Digital technologies in food and agriculture now also encompass genetically modified organisms, as the latest digital technologies have increased the speed and design possibilities of gene sequencing, interpretation and, finally, tailored modifications. Lab-cultured “alt-meats” or synthetic proteins – which are made from digitally designed genetically engineered yeast, bacteria, and algae – are another example of the convergence between the biological and the digital realm.¹

Money is being poured into developing and deploying these technologies, ostensibly on the basis that they will address the climate crisis, among other problems. *The State of Climate Tech 2021* report by PricewaterhouseCoopers (PwC), an international professional services firm, defines climate tech as “technologies that are explicitly focused on reducing GHG emissions or addressing the impacts of climate change.” According to the report, it is “a rapidly maturing asset class,” presenting a major commercial opportunity which will be rewarded by the anticipated carbon market.²

Citing growing population, increasing hunger and the devastating impact of the climate crisis on food security, Big Ag corporations like Bayer³, Corteva⁴ and BASF⁵, who are complicit in causing these crises, position themselves as “superheroes”⁶ by developing silver bullet solutions like gene-edited seeds, robotics and automation, digital platforms, drones and other technologies. Bolstering their claims are institutions like Food and Agriculture Organization (FAO), the World Bank, and the Asian Development Bank (ADB), as well as industry trade groups like the Food and Land Use Coalition (FOLU), the World Business Council for Sustainable Development (WBCSD), and the World Economic Forum—all promoting digital technologies to address the climate crisis.

Climate financialisation is the creation of financial instruments and strategies using the climate crisis as a reason. The climate crisis has become an investment opportunity for corporations, investment funds and asset managers. Digital food and agriculture technologies are being deployed to commodify aspects of climate and nature into quantifiable and financial assets which can be traded in the guise of addressing the climate crisis.

¹ Policy Horizons Canada, Government of Canada, “Exploring Biodigital Convergence,” 11 February 2020, <https://horizons.gc.ca/en/2020/02/11/exploring-biodigital-convergence/>

² PwC (PricewaterhouseCoopers), *State of Climate Tech 2021* (London: PricewaterhouseCoopers, 2021), <https://www.pwc.com/gx/en/sustainability/publications/assets/pwc-state-of-climate-tech-report.pdf>

³ Bayer, “We Need to Collaborate at Scale to Tackle the Food Crisis,” <https://www.bayer.com/en/we-need-collaboration-to-tackle-the-food-crisis>

⁴ Corteva, “Almost Half the World’s Farmers Are Women. Helping Them Is Key to Feeding Our Growing Population,” <https://www.corteva.com/who-we-are/outlook/women-farmers-empowerment-and-improving-crop-yields.html>

⁵ BASF (Badische Anilin- und Sodafabrik), “Strong Pipeline of BASF Agricultural Innovations Will Benefit Food Security, Climate and Environment,” 20 April 2022, <https://www.basf.com/global/en/media/news-releases/2022/04/p-22-110.html>

⁶ Bayer, “Why Farming Superpowers Are Critical in the Fight Against Climate Change,” <https://www.bayer.com/en/news-stories/farming-practices-to-help-save-the-planet>

This report explores how the climate crisis is being turned into a business opportunity, and how digital food and agriculture technologies are being deployed to commodify aspects of climate and nature into quantifiable and financial assets which can be traded in the guise of addressing the climate crisis. Climate financialisation is the creation of financial instruments using climate crisis as a reason. This paper tries to show how digital and biodigital technologies in food and agriculture are facilitating the commodification of nature and climate, turning this critical moment into another chance for profit-seeking. Examples from Indonesia, Malaysia and the Philippines are cited to concretise how climate financialisation is evolving in developing countries.

Pulling Profits Out of the Green Hat

In March 2021, a published global assessment of net zero targets found that 702 out of the 2,000 largest publicly listed companies by sales have announced net zero commitments.⁷ About 8,307 companies – including Big Food and Ag companies like Unilever, Nestlé, General Mills, and JBS Foods – and 595 financial institutions have signed up for the United Nations’ Race to Zero initiative, ongoing since May 2020, and committed to reducing their net emissions to zero by 2050.⁸ Net zero is a highly contested and controversial concept introduced and aggressively pushed at the UN by large emitting corporations and countries. Net zero is criticised as a fallacy that involves risky technologies such as geoengineering, questionable schemes, and other false solutions to distract, delay, evade and deny real actions to address the climate crisis.⁹ Now, concerned that their net zero targets announced to evade public scrutiny might entail cutting down on actual



emissions and impacting profits, corporations are scrambling for ways to continue filling their coffers but with a green veneer.¹⁰

In December 2021, the Columbia Center on Sustainable Investment (CCSI) analysed the net zero pledges of corporations and found that 66 percent of them relied on carbon offsets while announcing net zero targets.¹¹ The Intergovernmental Panel on Climate Change (IPCC) classifies carbon offsets as “activities, such as planting and protecting forests, [that] could provide carbon sequestration services that could be sold or traded.”¹² Carbon offsetting involves paying for projects like planting

⁷ George Smeeton, “Report: Fifth of world’s largest companies now have net zero target,” Energy and Climate Unit, 23 March 2021, shorturl.at/BHKO5; NewClimate Institute, Oxford Net Zero, Energy & Climate Intelligence Unit and Data-Driven EnviroLab, “Net Zero Stocktake 2022,” June 2022, <https://ca1-nzt.edcdn.com/Net-Zero-Tracker/Net-Zero-Stocktake-Report-2022.pdf?v=1655074300>

⁸ UNFCCC (United Nations Framework Convention on Climate Change), “Race to Zero Campaign,” <https://unfccc.int/climate-action/race-to-zero-campaign#Race-to-Zero-Partners>

⁹ Corporate Accountability, *The Big Con: How Big Polluters Are Advancing a ‘Net Zero’ Climate Agenda to Delay, Deceive, and Deny*, (Boston: Corporate Accountability, 2021), https://www.corporateaccountability.org/wp-content/uploads/2021/06/The-Big-Con_EN.pdf; Meena Rahman, “The Fallacy of Net Zero Being Ambitious,” *Third World Network*, 2021, <https://twn.my/title2/resurgence/2021/347/cover01.htm>

¹⁰ Sam Meredith, “World’s Biggest Companies Accused of Exaggerating Their Climate Actions,” *CNBC*, 7 February 2022, <https://www.cnbc.com/2022/02/07/study-worlds-biggest-firms-seen-exaggerating-their-climate-actions.html>

¹¹ Jack Arnold and Perrine Toledano, “Corporate Net-Zero Pledges: The Bad and the Ugly,” *CCSI*, 1 December 2021, <https://ccsi.columbia.edu/news/corporate-net-zero-pledges-bad-and-ugly>

¹² IPCC (Intergovernmental Panel on Climate Change), “Carbon Offsets, Tradable Permits, and Leakage,” <https://archive.ipcc.ch/ipccreports/tar/wg3/index.php?idp=174>

trees and forest protection that are said to sequester carbon dioxide from the atmosphere, compensating for carbon dioxide emissions from polluting activities. Such projects are mostly in the Global South and encompass projects claiming to prevent deforestation, promote reforestation or soil-based carbon sequestration, or investing in geoengineering technologies such as carbon capture and storage techniques. The theory is that for every metric ton of carbon dioxide equivalent emissions produced by a company, it funds offset projects, usually carried out in far-off-project locations, that supposedly sequester the equivalent amount of carbon dioxide. These offset projects generate “carbon credits” which are tradable financial instruments bought by companies looking to offset their emissions in the carbon markets.

The voluntary carbon-credit market expanded to \$2 billion in 2021 from around \$520 million in 2020, according to data provider Ecosystem Marketplace.¹³ According to S&P Global, about 25 percent of corporate offset demand is being met by forest-related projects, but the potential of soil carbon as well as ocean-based “blue carbon” in climate mitigation is sparking companies’ interest.¹⁴ Carbon offset transactions currently take place via compliance and voluntary markets.¹⁵ True to their reputation as the “wild west of carbon trading,”¹⁶ voluntary markets are not subject to regulation by regional, national or international bodies – as opposed to compliance markets, which are defined by specific caps and rules around the kind of projects that can be invested in. Voluntary carbon credits are purchased

largely by corporate players for image-building to address public pressure on climate commitments and corporate social responsibility.

To be considered a valid carbon credit in carbon markets, the credits bought from offset projects are supposed to meet three criteria: they should be permanent (referring to length of carbon storage time), they should be additional (the reduction or sequestration would not have occurred in any way without the project), and they should avoid leakage (that is, they should not cause extra carbon emissions somewhere else). In practice, besides numerous technical difficulties to measure these criteria, there are numerous evasion tactics deployed by companies while transacting in carbon offsets, which have raised questions on the credibility of offset projects.

Farming Carbon

In 2021, PepsiCo announced the adoption of what they called “regenerative agriculture practices” across 7 million acres by 2030. A year earlier, Walmart – the world’s largest food and agriculture player – also set a goal to become a regenerative company by 2040. Unilever, meanwhile, developed Regenerative Agriculture Principles; and in 2019, General Mills announced plans to advance-regenerative agriculture on 1 million acres of farmland by 2030.

So-called regenerative agriculture is but one arrow in the quiver of Big Ag’s nebulously defined false-solutions. These companies claim that land and ocean ecosystems have the potential to capture and store carbon. This is drawn from some studies that assert

¹³ Ed Ballard and Dieter Holger, “Proposed Rules Aim to Build Trust in Carbon-Credit Market,” *Wall Street Journal*, 28 July 2022, <https://www.wsj.com/articles/proposed-rules-aim-to-build-trust-in-carbon-credit-market-11659015707>

¹⁴ Gautam Naik and Esther Whieldon, “Carbon Offsets Prove Risky Business for Net Zero Targets,” S&P Global, <https://www.spglobal.com/esg/insights/carbon-offsets-prove-risky-business-for-net-zero-targets>

¹⁵ Christina Seeberg-Elverfeldt, “Carbon Markets – Which Types Exist and How They Work,” chapter 2 in *Carbon Finance Possibilities for Agriculture, Forestry and Other Land Use Projects in a Smallholder Context* (Rome: FAO [Food and Agriculture Organization of the United Nations], 2010), <https://www.fao.org/3/i1632e/i1632e02.pdf>

¹⁶ Patrick Temple-West, “Critics Take Aim at ‘Wild West’ Carbon Offset Market,” *Financial Times*, 8 June 2022, <https://www.ft.com/content/9b02fcf7-9e04-4b71-ad14-251552d5a78e>



helping sequester carbon by adopting specific “sustainable” practices like reduced tillage and cover crops.¹⁸ In 2020, the company paid farmers between \$30 and \$45 per acre under its pilot program and bought the carbon offsets itself to fulfil its sustainability goals.¹⁹ The rationale behind introducing regenerative agriculture by Big Food and Ag becomes clear as they start paying participating farmers by locking them into agreements that require the adoption of specific farming practices and technologies (to comply with additionality and no-leakage criteria to earn carbon credits) over a period of time (to comply with the permanence requirement), earn carbon credits for these companies, and even sell those to the carbon market as offsets from agricultural soils. The scheme allows Big Food and Ag to keep a stranglehold over farmers by requiring them to use the companies’ technologies and products while keeping fossil fuel dependence across the supply chain.

The managing director of Impact Ag, an agricultural asset management company which sold soil carbon credits worth \$387,720 to Microsoft in 2021, believes that agricultural investments can sequester carbon and manage climate challenges²⁰; and according to S&P Global, government policies and private investments are two driving forces for carbon credits in agriculture. But data from the Berkeley Carbon Trading Project²¹ shows that agriculture-related emissions offsetting projects account for just over 1 percent of all carbon credits issued, which might increase sharply in the coming years given the increasing focus on soil-carbon sequestration.

The food and beverage sector accounts for 57 percent of potential demand for carbon credits

that agricultural soils (even industrial soils) could sequester approximately over a billion additional tons of carbon each year, although that claim has been contested.¹⁷ According to its promoters, “regenerative agriculture,” which means soil-based carbon sequestration in agriculture, can be achieved by adopting a mix of specific farming practices like cover cropping, reduced tillage, crop rotation and “precision” agriculture. While increasing carbon in soils is generally to be encouraged – and some of these techniques in the context of agroecological practices may be good – many of these promoted practices interlock neatly with current input-heavy industrial farming methods (e.g., the planting of transgenic soybeans is supposed to “reduced tillage” but instead promotes the heavy use of agrochemicals).

Cargill’s RegenConnect program aims to promote regenerative agriculture practices on 10 million acres in North America by 2030. It will also pay farmers for supposedly

¹⁷ Gabriel Popkin, “A Soil-Science Revolution Upends Plans to Fight Climate Change,” *Quanta Magazine*, 27 July 2021, <https://www.quantamagazine.org/a-soil-science-revolution-upends-plans-to-fight-climate-change-20210727/>

¹⁸ Jesse Klein, “Cargill Aims to Connect Farmers to Carbon Offset Buyers,” *GreenBiz*, 29 September 2021, <https://www.greenbiz.com/article/cargill-aims-connect-farmers-carbon-offset-buyers>

¹⁹ Reuters Staff, “Cargill-Led Fund to Pay US Farmers for Carbon Capture, Exchange Credits,” last modified 9 April 2020, <https://www.reuters.com/article/us-cargill-farming-climatechange-idUSKCN21R1GE>

²⁰ Daniel Kemp, “Carbon Markets Are ‘Huge Opportunity’ for Australian Farmers: Impact Ag Partners,” *Agri Investor*, 22 February 2021, <https://www.agriinvestor.com/carbon-markets-huge-opportunity-for-australian-farmers-impact-ag-partners/>

²¹ Jack Ellis, “Agriculture Produces Just 1% of Carbon Credits, Data Suggests,” *AgFunderNews*, 28 September 2021, <https://agfundernews.com/carbon-credits-just-one-percent-from-agriculture>

in agricultural lands.²² Driven by shareholder and consumer expectations, legal obligations and voluntary goals, the private sector is searching for ways to earn green credentials with its consumers and investors. Buying carbon credits from farmers sequestering carbon through regenerative agriculture is portrayed as a win-win as it is promoted as beneficial for farmers, for whom carbon payments generate an extra source of income for the services they provide to sequester carbon.

Farmers accrue payments for carbon credits for proponent entities by adopting specific agricultural practices – e.g., based on digital prescriptions – mostly dictated by the companies looking to buy and resell carbon credits themselves, and get locked in to these practices for a fixed number of years as a condition for receiving payments.

Expectedly, soil-agriculture-climate initiatives are attracting hundreds of millions of dollars' worth of investments. Bayer, Nutrien, Indigo Ag and Nori (funded by Deere & Company) have introduced their own carbon market, paying farmers for adopting specific agricultural practices and sharing required data on their platforms. Bayer's carbon initiative pays producers for adopting "climate-smart" practices such as no-till, strip-till and the planting of cover crops – all of which lock in use of Bayer's herbicides. Producers are required to plant corn or soybeans, have an active Bayer FieldView Plus account which instructs them how to farm, and agree to share the data needed for the program. In this way, they are effectively being turned into data gatherers for giant corporations poised to profit from streams of incoming data.

Table 1: 11 of the top 15 biggest Big Food and Ag companies have announced commitments to expand regenerative agriculture practices.

Company	Claimed Regenerative Agriculture Goals
Walmart	By 2030, Walmart aims to employ practices that claim to support improved outcomes for soil health, greenhouse gases, water quality and use, biodiversity and farmer livelihoods in 30 million acres in Midwest, USA, and at least 1 million of these acres will demonstrate multiple measurable regenerative outcomes. Walmart's target is to reduce net on-farm greenhouse gas emissions in the Midwest row crop supply chain by 7 million metric tons and support at least 30,000 Midwestern farm operations in the transition to regenerative agriculture. ²³
Schwarz Gruppe (Kaufland, Lidl)	Lidl works with the Earthworm Foundation on a soil health initiative called the Living Soils Initiative, along with Nestlé and McCain, to promote regenerative agriculture practices among its farmers across 1 million hectares by 2025. ²⁴ Kaufland is developing a regenerative farm in Romania across 60,000 square meters. ²⁵
Cargill	Cargill is incentivising farmers to adopt their version of so-called regenerative agriculture practices like planting cover crops, reducing tillage and "optimising" nutrient management, across 10 million acres of North American farmland by 2030. ²⁶ However, to control all this, farmers need, at the same time, to enter into contracts with a digital platform that also prescribes agrochemicals and synthetic fertilizer application

²² S&P Global, "Carbon Farming: Opportunities for Agriculture and Farmers to Gain from Decarbonization," 28 July 2022, <https://www.spglobal.com/esg/insights/topics/carbon-farming-opportunities-for-agriculture-and-farmers-to-gain-from-decarbonization>

²³ John Laney, "Driving Regeneration in Agriculture," Walmart, 1 September 2021, <https://corporate.walmart.com/newsroom/2021/09/01/driving-regeneration-in-agriculture>

²⁴ "Lidl: Four New References of Potatoes from Regenerative Agriculture," *Fresh Plaza*, <https://www.freshplaza.com/north-america/article/9367840/lidl-four-new-references-of-potatoes-from-regenerative-agriculture/>; Flora Southey, "Nestlé, McCain and Lidl Assess Soil Health in France to 'Create Systemic Change,'" *Food Navigator*, 16 December 2020, <https://www.foodnavigator.com/Article/2020/12/16/Living-Soils-initiative-Nestle-McCain-and-Lidl-address-soil-health-in-France>

²⁵ Kaufland, *Our Actions Do the Talking: The Taste of Responsibility*, Sustainability Report 2020 (Neckarsulm: Kaufland, 2020), https://media.kaufland.com/images/PPIM/AP_MarketingDocument/rum/94/35/Asset_10159435.pdf

²⁶ Cargill, "Cargill to Advance Regenerative Agriculture Practices across 10 Million Acres of North American Farmland by 2030," 16 September 2020, <https://www.cargill.com/2020/cargill-to-advance-regenerative-agriculture-practices-across-10>

COFCO	In its 2021 sustainability report, COFCO International mentioned that it aims to promote regenerative agriculture and carbon offsets across its supply chain to accomplish its “sustainable development goals.” Pilot projects in Brazil are expected to allow the measurement of farmers’ carbon emissions in coffee farms to test its guidelines on sustainability and carbon reduction. It also states that its automated sugarcane harvesters help in greenhouse gas (GHG) emission reduction. ²⁷	Nestlé	Nestlé claims that 50 percent of its key ingredients will be sourced through regenerative agricultural methods by 2030 (14 million tonnes) and is investing \$1.26 billion by 2025 to promote regenerative agriculture across its supply chain. ³⁰
Kroger	In its <i>2019 Environmental, Social and Governance Report</i> , Kroger mentioned the regenerative agriculture goal of its supplier General Mills – whose brands include Annie’s, Cascadian Farms, EPIC Provisions and Muir Glen – and its commitment to advance regenerative agricultural practices on 1 million acres by 2030.	Archer-Daniels-Midland (ADM)	In 2022, ADM and PepsiCo announced a 7.5-year strategic collaboration to expand what they call “regenerative agriculture” across 2 million acres in their shared North American supply chains by 2030. It already promotes soybean production (most all of it transgenic) in India and Brazil, which it claims is sustainable because it involves new technologies, it works with the Cool Farm Alliance in Europe (which uses an online application calculate GHG emissions from farms), and it works with other carbon counting platforms like ESMC (Ecosystem Market Services Consortium) which pay farmers for sequestering carbon. ³¹
Costco Wholesale	Costco mentions that it strongly encourages its suppliers to follow regenerative agricultural practices but has not specified a goal yet. ²⁸	Ahold Delhaize	Ahold Delhaize has announced targets for reduction in food waste in its operations, greenhouse gas emissions, work towards zero deforestation in soy, palm oil, cocoa, coffee, tea, wood fibre for its brand products, and other targets. It does not mention a specific regenerative agriculture target, but its CEO mentioned incorporating regenerative agricultural practices when it signed the “EU Code of Conduct for Responsible Food Business and Marketing Practices” as part of the European Green Deal and the Farm to Fork Strategy. ³²
PepsiCo	In 2021, PepsiCo announced that it would promote regenerative farming practices across 7 million acres, approximately equal to its entire agricultural footprint, which it claims would eliminate 3 million tons of greenhouse gas emissions by the end of the decade.	Itochu and FamilyMart	Although Itochu does not refer to regenerative agricultural practices promotion in its 2021 ESG report, it mentions the risks to its business posed by the climate crisis and lists using drones and information and communications technology (ICT) like yield prediction, “accurate fertilization,” spraying location identification, utilising different production methods, and diversifying production areas to address weather risks and claims that it will make its production more efficient. ²⁹

²⁷ COFCO, *Transforming Agriculture in a Changing World: Sustainability Report 2021* (Beijing: COFCO International Ltd, 2021), <https://www.cofcointernational.com/media/2167/cofco-sr21.pdf>

²⁸ Costco, “Environmental Impacts & Land Stewardship,” last modified May 2022, <https://www.costco.com/sustainability-environment.html>

²⁹ Itochu, *ESG Report 2021* (Tokyo: Itochu Corporation, 2021), <https://www.itochu.co.jp/en/csr/pdf/21fulle-all.pdf>

³⁰ Nestlé, “Regenerative Agriculture,” <https://www.nestle.com/sustainability/nature-environment/regenerative-agriculture>

³¹ ADM, “PepsiCo, ADM Announce Groundbreaking Agreement Aiming to Reduce Carbon Intensity by Supporting Regenerative Agriculture Practices on Up to 2 Million Acres of Farmland,” 14 September 2021, <https://investors.adm.com/news/news-details/2022/PepsiCo-ADM-Announce-Groundbreaking-Agreement-Aiming-to-Reduce-Carbon-Intensity-by-Supporting-Regenerative-Agriculture-Practices-on-Up-to-2-Million-Acres-of-Farmland/default.aspx>; Alison Taylor, “ADM Leads the Way on Regenerative Agriculture,” *World Climate Foundation*, 9 November 2021, <https://www.worldclimatefoundation.org/post/adm-leads-the-way-on-regenerative-agriculture>

³² Ahold Delhaize, “Ahold Delhaize signs EU Code of Conduct for Responsible Business and Marketing Practices,” 5 July 2021, <https://www.aholddelhaize.com/en/news/ahold-delhaize-signs-eu-code-of-conduct-for-responsible-business-and-marketing-practices/>

Microsoft's FarmBeats program, which specifically targets smallholders and small-scale farmers in developing countries, brings in data-driven farming techniques, capturing large amounts of data from farms via drones, sensors, satellites and farm machinery, aggregating it and analysing it using machine learning to prescribe recommendations to farmers and give insights on on-farm operations.³³

Microsoft is increasingly resorting to carbon markets, especially farm-based carbon offsets, to reach its net zero goal by 2030, and made headlines for purchasing 200,000 credits from farmers planting crops to trap carbon in the soil.³⁴ This deal was transacted at an undisclosed price, as part of a larger agreement to buy 1.3 million credits.

In 2021, Microsoft and Land O'Lakes, American dairy cooperative, collaborated to develop agriculture technologies for dairy farmers, address lack of rural internet connectivity, and build a carbon credit market for Land O'Lakes growers which would aid in "carbon accounting and the ability to predict the carbon benefits of various practices like no-till, precision nutrient management, and cover crops."³⁵

Ranveer Chandra, chief scientist of Microsoft Azure Global and partner researcher at Microsoft Research, told *AgFunder News*, "If we create a carbon market and have good conservation records, farmers will be happy to adopt different practices, and then you will have other companies not related to agriculture purchasing credits from farmers. It creates a nice cycle that opens new doors."³⁶

Microsoft became the first buyer of carbon credits from Land O'Lakes' subsidiary Truterra, purchasing credits at \$20 per ton for carbon

sequestered in the soil under TruCarbon, which helps farmers in generating and selling carbon credits to private buyers.³⁷ These credits are generated when farmers follow instructions prescribed to them, like adoption of no-till, precision agriculture, cover crops, water conservation practises, and reducing fertilizer runoffs³⁸ and the use of soil testing to verify the carbon sequestered via Truterra technology.³⁹

In February 2021, Indonesia's Ministry of Agriculture signed a memorandum of understanding (MoU) with Microsoft to disseminate cloud-based, machine learning technologies to smallholder farmers.⁴⁰ The MoU will entail building a platform that captures data on crop yields, weather, market demands and prices and aims to turn Indonesia's agriculture into a data-driven industry. Microsoft and the Ministry of Agriculture will hold "collaborative education programs" to assist farmers digitally, and the database will be built on FarmBeats, Microsoft's pet agriculture project running on Microsoft Azure.

Now that Microsoft is signing MoU's with the Agriculture Ministry of Indonesia (as it had with the Agriculture Ministry of India in 2021), it will not be a surprise that this presents an opportunity for Microsoft to promote FarmBeats subscription, specific agricultural practices that claim to sequester carbon, and buy credits to reach its net zero goal by 2030.⁴¹

Digital Technologies: "Carbon Counting Made Easy"?

The Paris Agreement requires all countries to submit their GHG mitigation goals as part of their nationally determined contributions (NDCs). Article 6.4 of the Paris Agreement entails

³³ Microsoft, "FarmBeats: AI, Edge & IoT for Agriculture," <https://www.microsoft.com/en-us/research/project/farmbeats-iot-agriculture/>; Ranveer Chandra, "FarmBeats: Automating Data Aggregation,"

<https://www.microsoft.com/en-us/research/publication/farmbeats-automating-data-aggregation/>

³⁴ Karl Plume, "Farmers Struggle to Break into Booming Carbon-Credit Market," Reuters, 28 April 2021,

<https://www.reuters.com/article/usa-agriculture-carbon-idCNL2N2L1012>

³⁵ Lauren Manning, "Microsoft and Land O'Lakes Are Tackling One of Agtech's Biggest Challenges," *AgFunderNews*, 6 August 2020,

<https://agfundernews.com/microsoft-and-land-olakes-are-tackling-one-of-agtechs-biggest-challenges>

³⁶ Manning, "Microsoft and Land O'Lakes."

³⁷ Jack Ellis, "BRIEF: Microsoft to Purchase Up to \$2m in Carbon Credits from Land O'Lakes," *AgFunderNews*, 8 February 2021, <https://agfundernews.com/trucarbon-microsoft-to-purchase-2m-in-carbon-credits-from-land-olakes>

³⁸ Plume, "Farmers Struggle to Break into Booming Carbon-Credit Market."

³⁹ Chuck Abbott, "Land O'Lakes, Microsoft in Carbon Credit Program," *Agriculture*, 2 May 2021,

<https://www.agriculture.com/news/business/land-o-lakes-microsoft-in-carbon-credit-program>

⁴⁰ Microsoft, "Indonesian Ministry of Agriculture Signs MoU with Microsoft to Strengthen Data-Driven Agriculture Ecosystem," 19 February 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 Ellis, "BRIEF: Microsoft to Purchase Up to \$2m in Carbon Credits."

setting up a UN-authorized carbon market where countries will be able to trade carbon credits generated from the reduction of greenhouse gas emissions from the atmosphere that will replace the Clean Development Mechanism under the Kyoto Protocol. Voluntary carbon markets drew flak for their flawed monitoring, reporting and verification process regarding the questionable quality of carbon credits being traded; for unclear measurement tools; for not following principles of permanence, additionality and leakage; as well as for being time-consuming, expensive and teeming with brokers, among other reasons.

For entities seeking profits, the silver bullet to address this range of concerns is digital technologies. In June 2022, the World Bank published the “Digital Monitoring, Reporting, and Verification Systems and Their Application in Future Carbon Markets”⁴² to illustrate the need for digital monitoring, reporting, and verification (D-MRV) systems for future carbon markets under the goals of the Paris Agreement. It also lists guidelines to promote the use of digital technologies like sensors, satellite, drones, machine learning and blockchain, which claim to accurately measure, analyse, store, verify and trade GHG sequestered by carbon offset projects and address the shortcomings of conventional monitoring, reporting and verifying mechanisms. This turn to digital management of carbon is a bonanza for Big Food and Ag, which are already developing and deploying proprietary technology for farmers to measure, store and verify carbon from agriculture. There is also a concomitant burgeoning industry of actors like monitoring-and-verification companies, farmer tools, consultancy and advisory, trading and certification start-ups, and carbon market registries promising to make the carbon market more transparent through digital monitoring. Although these companies promise more transparency in carbon markets, they end up

appearing as shills of Big Food and Ag for promoting carbon markets and selling carbon offsets to polluters.

Nori, a “carbon removal marketplace,” is a platform for buyers looking to offset their emissions and suppliers removing atmospheric carbon (which currently involves US farmers practising regenerative agriculture). Nori uses independent third-party verifiers and carbon quantification tools to measure, report and verify carbon removal. Suppliers register their carbon removal project with Nori by reporting any new or planned carbon removal practices they have undertaken. An independent third party estimates the carbon removal amount and then generates one NRT (Nori Carbon Removal Tonnes, which represents one tonne of removed CO₂ stored for a minimum of 10 years)⁴³ for farmers for every tonne of removed carbon dioxide emission and stored in soils for a minimum of 10 years.

In Malaysia, a fintech start-up, Pantas (with its website header claiming the carbon counting mantra “What gets measured gets managed”), has developed a carbon accounting software using its proprietary data and carbon emissions factors developed with Institute of Climate Change of Universiti Kebangsaan Malaysia (UKM).⁴⁴ It claims to have made the process of calculating emissions of companies easier and will help them align with global regulations and attract green finance. The proprietary AI-enabled software developed by Pantas claims to help companies collect and analyse emissions-related data and securely disclose quality data with stakeholders.

While companies such as Corteva base their carbon payments on directly measuring soil carbon sequestration using sensors (including remote sensing from satellite), other large players take a different approach. Bayer’s FieldView

⁴² World Bank, *Digital Monitoring, Reporting, and Verification Systems and Their Application in Future Carbon Markets* (Washington DC: World Bank Group, 2022), <https://openknowledge.worldbank.org/handle/10986/37622>

⁴³ Nori, “How the Nori Marketplace Works: Generating NRTs,”

⁴⁴ Pantas, “Pantas and UKM to Develop Climate Fintech Solution to Assist Companies with Calculating and Disclosing Carbon Emissions and Accessing Green Investments,” 15 April 2022, <https://web.archive.org/web/20220517084229/https://blog.pantas.com/newsroom/2022/04/pantas-and-ukm-to-develop-climate-fintech-solution-to-assist-companies-with-calculating-and-disclosing-carbon-emissions-and-accessing-green-investments>

Another Indonesian start-up, Jejak, works on Tree and Forest Monitoring, a Carbon Emission Calculator, and a Tree and Carbon Offset Marketplace. It leads reforestation plans and monitors trees using drones, internet of things, and satellites and analyses data using machine learning to provide accurate information regarding the status of trees, their impact on carbon levels, and environment and biodiversity. Its carbon calculator helps companies in tracking their GHG emissions and also has a carbon marketplace which lets people or businesses adopt trees and offset their carbon emissions. Both these start-ups are seeking or have already collaborated with big businesses looking to reduce their emissions and attract lucrative green investments. Jejak has partnered with the Jakarta Mass Rapid Transit to add a carbon calculator and offset feature to the MRT-J application which lets passengers calculate and offset their emissions by supporting tree-planting campaigns.⁴⁵

platform and its related carbon farming programme is probably the largest source of soil carbon credits. Bayer does not consider it necessary to actually measure soil carbon directly, arguing that its farming prescriptions, generated by artificial intelligence, reliably predict how much carbon will be sequestered and are enough to back soil carbon credits without actual measurement (known as “process-based” rather than “outcome-based”).⁴⁶

Morgan Stanley, one of the world’s biggest financial services corporations, started the Sustainable Solutions Collaborative as part of the Morgan Stanley Institute for Sustainable Investing and the Soil Inventory Project.⁴⁷ It is developing

a database of soil carbon for farmland across the US which distributes low-cost tools to farmers to analyse their soil samples for crop production and carbon farming so that more farmers can switch to regenerative farming. Other suggestions for low-cost devices to measure soil carbon have also been created as methods of carbon measurement are exorbitantly priced for smallholder farmers.⁴⁸

The Soil Inventory Project states that “everyone should be able to know how much carbon is in their ground, what that means, and how it changes over time.” This project propagates “regenerative farming” methods such as no-till agriculture, cover crops, and crop rotation to sequester carbon dioxide in farmlands and assumes that more information being made available to farmers about practices leading to carbon capture will lead to widespread adoption of carbon farming practices. A mobile app to give open access to soil carbon data to farmers is also in the pipeline.

“If we’re able to quantify the benefits of carbon sequestration practices, then companies, investors and consumers can encourage supply chains to adopt practices that produce positive environmental outcomes,” adds Dr. Kristofer Covey, assistant professor of environmental studies and sciences at Skidmore College with the project My Soil Organic Carbon. “And food producers that do will deserve market premiums.”⁴⁹

(Block)Chaining the Carbon Markets

In October 2022, the World Bank’s International Finance Corporation (IFC) division launched a project which uses blockchain to trade carbon credits.⁵⁰ This was spurred by low-quality carbon credits being on the market and instances of

⁴⁵ Microsoft, “Jejak.in Encourages More Indonesians to Take Part in Environmental Protection through Technology,” 5 June 2021, <https://news.microsoft.com/id-id/2021/06/05/jejak-in-encourages-more-indonesians-to-take-part-in-environmental-protection-through-technology/>

⁴⁶ Sara Schafer, “Two Ways to Be Paid for Carbon,” *AgWeb*, 6 January 2022, <https://www.agweb.com/news/business/conservation/two-ways-be-paid-carbon>

⁴⁷ Morgan Stanley, “How Carbon Farming Can Help Save The Earth,” 18 September 2021, <https://www.morganstanley.com/ideas/soil-carbon-sequestration>

⁴⁸ Umesh Acharya, Rattan Lal and Ranveer Chandra, “Data Driven Approach on In-Situ Soil Carbon Measurement,” *Carbon Management*, 2022, 13:1, pp. 401-419, <https://www.tandfonline.com/doi/full/10.1080/17583004.2022.2106310>

⁴⁹ Morgan Stanley, “How Carbon Farming Can Save the Earth.”

⁵⁰ Simon Jessop, Shadia Nasralla and Cole Norton, “EXCLUSIVE: World Bank’s IFC Taps Blockchain for Carbon Offsets,” Reuters, 17 August 2022, <https://www.reuters.com/business/environment/exclusive-world-banks-ife-taps-blockchain-carbon-offsets-2022-08-17/>

double-selling. Many carbon credits are being converted to cryptocurrency tokens and being retired from market circulation, a process which is claimed to enhance transparency in carbon markets.

Toucan, a blockchain-powered decentralised finance platform based in Switzerland, allows users owning carbon credits to link them to digital tokens called Base Carbon Tonnes (BCT) and trade on cryptocurrency exchanges. According to them, this will lead to better transparency by providing real-time pricing data and a public record to track carbon trading. KlimaDAO, a decentralised autonomous organisation, lets people use BCT tokens to buy Klima tokens which can also be traded on cryptocurrency exchanges, inviting carbon speculators. The BCT that Klima earns are stored in its treasury and are retired from circulation, preventing double-selling of carbon credits. This might sound incomprehensible not only to the layperson but also to Verra, the global standard for certifying carbon emissions reductions, which said that it would ban the tokenisation of offsets as it creates “a ‘mind frying’ level of abstraction between an intangible financial instrument and the physical emissions it is meant to represent.”⁵¹ The ban was welcomed by Toucan, and it continues to work with Verra on finding a way forward.

Nori Carbon Removal Tonnes (NRT) might sound like boondoggle already, and Nori’s announcement to soon launch cryptocurrency tokens to trade in carbon credits casts doubts on the real contribution of these digital marketplaces given that they encourage the same speculative crypto market activities in carbon trading. This cryptocurrency will be called \$NORI, which are tradable market commodities, and can be exchanged for one NRT. It is also purported to prevent double-counting of carbon credits. Nori received backlash for using Ethereum

“To accomplish that (scaling carbon removal 1000x), carbon markets will have to look more like commodities markets.

“Atmospheric carbon dioxide is a commodity like oil or gold. There’s a lot of it. Work is required to bring it to market. And society places a value on it.

There’s no reason the carbon market can’t reach commodity market scale. That’s where Nori and the NORI token come in.”

– Nori’s website⁵²

blockchain, one of the most energy-consuming blockchains in the world, to implement its carbon removal programs, rewarding farmers practising regenerative agriculture with money and handing over carbon credits to polluters. It decided to move on to another platform, Polygon, after receiving criticism for the energy-intensive nature of Ethereum.⁵³

In 2022, Ethereum made a claim that it could potentially use 99.5 percent less energy through “the Merge.” According to a *New Scientist* report, this energy saving failed to materialise as miners with expensive and specialised hardware decided to mine coins on other networks.⁵⁴ Questions of how Ethereum will clean up its historic emissions have also been raised. At the recent United Nations Climate Change Conference (COP27) in Egypt, a few big technology companies came together to launch the Ethereum Climate Platform, which has committed to counteract Ethereum’s historic emissions since it was launched in 2015 by funding projects like nature-based carbon opportunities, green hydrogen, zero carbon power, heating, cooling and other utilities, to carbon removal projects, technologies and

⁵¹ Tim McDonnell, “A Crypto Platform Is the World’s Largest Buyer of Carbon Offsets,” *Quartz*, 2 August 2022, <https://qz.com/a-crypto-platform-is-the-world-s-largest-buyer-of-carbo-1849358688>

⁵² Nori, “Our Mission Is to Reverse Climate Change,” <https://nori.com/litepaper>

⁵³ Haje Jan Kamps, “Immune to Irony, Nori Puts a Carbon Market on the Blockchain,” *Tech Crunch*, 24 February 2022, <https://techcrunch.com/2022/02/24/nori-series-a-carbon-blockchain/>

⁵⁴ Matthew Sparkes, “Plan to Cut Ethereum Energy Use Sees Miners Switch Cryptocurrencies,” *New Scientist*, 20 September 2022, <https://www.newscientist.com/article/2338150-plan-to-cut-ethereum-energy-use-sees-miners-switch-cryptocurrencies/>

ecosystem services.⁵⁵ The green credentials of these technologies have been widely questioned.

Blockchain does not seem to address the underlying disadvantages of carbon markets, but that does not deter its proponents from presenting it as a solution due to its apparent “tamper-proof” properties, nor has that stopped some governments from resorting to blockchain for bolstering their climate claims. They claim that blockchain will address double-counting, let only one entity claim carbon credits and provide an “immutable” record of the creation and ownership of the credits.

Unmasking the Tricks in the Green Hat

The promotion of digitally managed regenerative agriculture dictating which practices will be rewarded financially does not acknowledge the diversity of sustainable agricultural practices that have existed for centuries. By rewarding only specific practices (primarily digital agriculture) and crops (mainly uniform and industrial), the myriad of long-proven agricultural practices like shifting cultivation, indigenous mixed cropping systems, diversified and integrated farming and many agroecological practices are ignored and further marginalised. Farmers who are trapped in carbon farming schemes initiated by Big Ag and Big Food players and their agents in the shady carbon trading industry are often locked in the use of technologies and products sold by the same companies that will buy the carbon credits earned from the scheme or sell the credits to other entities as offsets.

There are claims that the use of digital technologies might fix land boundaries within which carbon is sequestered, but how does this idea of individual property rights accommodate ideas of collective ownership of land? Additionally,

signing farmers up for carbon farming payments and credits leads farmers to be ensnared in long multi-year agreements in which the agribusiness firms will increasingly exercise control over the farmers’ actions and limit their agency and freedoms. A farmer registered with the Nori Marketplace, for example, will have to practice specific agricultural practices which Nori claims will sequester carbon for a minimum of ten years to be guaranteed remuneration.

In November 2022, the Indonesian Stock Exchange signed a memorandum of understanding with Metaverse Green Exchange, a Singaporean start-up, to build a carbon registry and exchange by using blockchain, as part of the Indonesian Stock Exchange’s emissions trading scheme, which is slated to be launched by 2025.⁵⁶ The irony of using a power-intensive blockchain to build a carbon registry seems to escape this deal which is using Ethereum to put forward a carbon registry and exchange.⁵⁷

There are numerous concerns with deploying regenerative agricultural practices to sell carbon credits on the carbon market for corporations to meet their net zero targets. Verification claims



⁵⁵ Consensys, “COP27: Leading Technology Companies Launch ‘Ethereum Climate Platform’ Initiative to Address Ethereum’s Former Proof of Work Carbon Emissions,” 17 November 2022, <https://consensys.net/blog/press-release/cop27-leading-technology-companies-launch-ethereum-climate-platform-initiative-to-address-ethereums-former-proof-of-work-carbon-emissions/>

⁵⁶ Rita Liao, “Indonesia Weighs Blockchain-Powered Carbon Trading Scheme,” *Tech Crunch*, 1 November 2022, <https://techcrunch.com/2022/10/31/indonesia-weighs-a-blockchain-powered-carbon-exchange/#:~:text=Indonesia%20wants%20to%20direct%20the,specializes%20in%20digital%20exchange%20technology.>

⁵⁷ Liao, “Indonesia Weighs Blockchain-Powered Carbon Trading Scheme.”

Malaysia Carbon Market Policies

One of the next steps to actualise climate financialisation in agriculture after pushing agritech is the setting up of carbon markets to facilitate trading in carbon credits. Malaysia's stock exchange, Bursa, will open a voluntary carbon market exchange by the end of 2022, which will allow entities to buy carbon credits and offset their emission. Malaysia will adopt the Verra standards, or the Verified Carbon Standards, for its voluntary carbon market and will designate distinct product categories for carbon credits derived from nature-based solutions and technologies that reduce or remove carbon emissions.⁵⁸ It hopes that the carbon market will help achieve its net zero emission goals and invite investments in carbon offsetting projects. (Verra accounts for 70 percent of the voluntary carbon credits worldwide.)⁵⁹

This comes at a time when a massive and controversial carbon trading deal was exposed in Malaysia, under which a Singaporean company, Hoch Standard Ptd. Ltd., with no experience in carbon trading, struck an agreement with the Malaysian state of Sabah to help the state sell carbon credits and credits from water provisioning and charged 30 percent of the revenues for its services. This deal, known as the Nature Conservation Agreement (NCA), gave the company the right to about 4.9 million acres in Malaysian Borneo and raised alarm among the indigenous communities and their state leaders who were concerned that their customary rights and access to the forest might get adversely impacted under such an agreement and that there was a lack of consultation with landowners in the process.⁶⁰ In February 2022, the agreement is "all but dead after being declared illegal by the state's top lawyer, unfeasible by scientists, and unsellable by carbon trading experts."⁶¹

cost about 75 percent of the cost of generating carbon credits and are unaffordable for smallholder -farmers.⁶² If farmers are paid even \$35 or \$40 per acre, which is at the much higher end, it should be asked whether the investments in verification will justify the paltry returns for a smallholder with only a few acres.

After creating a brouhaha over the potential of soil to absorb carbon, researchers cautioned that the potential of soil to sequester carbon might have been overestimated.⁶³ The increase in carbon dioxide levels in the atmosphere can increase plant growth but decrease soil carbon storage. This demonstrates that these grand plans of sequestering carbon via regenerative agriculture may actually be based on shaky science that is increasingly being challenged.

Reliance on carbon credits disincentivises companies to implement actual emission reductions in their operations. Carbon credits allow companies to continue emitting and not change their business-as-usual practices.⁶⁴ The promotion of digital tools to measure carbon for rewarding practitioners of regenerative agriculture with carbon credits come with not just an economic cost but also an ecological and emissions cost. Blockchain, for example, is known to be highly energy consuming, and the claims that these criticisms are being addressed by blockchain proponents leave doubts on actual viability and evade the technology's historic emissions.⁶⁵ Design and usage of digital tools require resource extraction of minerals and rare earths that displaces communities, destroys the environment and biodiversity, violates labour and human rights⁶⁶ and reshapes the geographies of mineral-rich regions.

Digital agriculture involves not only extraction of data from the food and agriculture chain but also extraction of natural resources. One of the

⁵⁸ Bursa Malaysia, "Bursa Malaysia to Launch Voluntary Carbon Market Exchange by Year-End," 15 August 2022, https://www.bursamalaysia.com/sites/5bb54be15f36ca0af339077a/content_entry5c11a9db758f8d31544574c6/62f9c18b5b711a43802a7373/files/15_AUGUST_2022_Bursa_Malaysia_To_Launch_Voluntary_Carbon_Market_Exchange_By_Year-End_.pdf?1660535365

⁵⁹ "Malaysia to Open Voluntary Carbon Market Exchange," 15 August 2022, <https://carboncredits.com/bursa-malaysia-vc-m-exchange/>

⁶⁰ John Cannon, "Malaysian Officials Dampen Prospects for Giant, Secret Carbon Deal in Sabah," *Mongabay*, 10 February 2022, <https://news.mongabay.com/2022/02/malaysian-officials-dampen-prospects-for-giant-secret-carbon-deal-in-sabah/>

⁶¹ Ian Neubauer, "Malaysian State's Top Lawyer Declares Borneo Carbon Deal Dead," *Al Jazeera*, 24 February 2022, <https://www.aljazeera.com/economy/2022/2/24/malaysian-states-top-lawyer-declares-borneo-carbon-deal-dead>

⁶² Plume, "Farmers Struggle to Break into Booming Carbon-Credit Market."

⁶³ Damian Carrington, "One of Earth's Giant Carbon Sinks May Have Been Overestimated - Study," *The Guardian*, 24 March 2021, <https://www.theguardian.com/environment/2021/mar/24/soils-ability-to-absorb-carbon-emissions-may-be-overestimated-study>

⁶⁴ Susanna Twidale, "Carbon Credit Use Could Curb Company Climate Action, Warns UK Advisers," Reuters, 14 October, <https://www.reuters.com/markets/commodities/carbon-credit-use-could-curb-company-climate-action-warns-uk-advisers-2022-10-12/>

⁶⁵ Justine Calma, "After the Merge, Can Ethereum Erase Its Historic Emissions, Too?" *The Verge*, 19 November 2022, <https://www.theverge.com/2022/11/18/23466295/ethereum-the-merge-consensus-climate-platform-emissions>

⁶⁶ Ewelina U. Ochab, "Are These Tech Companies Complicit In Human Rights Abuses of Child Cobalt Miners in Congo?" *Forbes*, 13 January 2020, <https://www.forbes.com/sites/ewelinaochab/2020/01/13/are-these-tech-companies-complicit-in-human-rights-abuses-of-child-cobalt-miners-in-congo/?sh=3ddc825f3b17>

Indonesia has followed an earlier measure taken by Papua New Guinea when it halted carbon project verification located in the country's Sumatra and Kalimantan regions, in relation to Riau Ecosystem Restoration carbon project, a private sector project run by the Singapore-based paper manufacturer Asia Pacific Resources International Limited (APRIL) with support from non-governmental organisations BIDARA, Fauna & Flora International and Laskar Alam. The government claimed that their verification processes are not aligned with Indonesian law.⁶⁷

In March 2022, Papua New Guinea's Ministry for Environment, Conservation and Climate Change issued a moratorium on any new and proposed REDD+ voluntary carbon market projects in the country after Carbon Market Watch raised questions on a project proposal developed by Kanaka Management Services Private Limited regarding its additionality, if logging and agriculture actually posed risk of deforestation in the proposed area, and lack of specific details on stakeholder consultation with local groups. This was going to be a hundred-year carbon credit deal and would have been the second largest voluntary carbon scheme project by Verra if it was approved, generating 8.1 million credits annually.⁶⁸ Critics of the project mentioned how there are carbon brokers in the country who pocket a large part of the profit from carbon credits, leading to small returns for the custodians of forests.⁶⁹ There have been demands for safeguards against exploitation of local communities in these voluntary carbon credit schemes.

most obvious loopholes in the claims around digital farming being sustainable is that the manufacturing and running of digital devices is immensely resource intensive. Collecting information about seeds, pests, weather, commodity pricing, and storing and analysing this

data using machine learning to sell agricultural prescription to farmers on what to plant, when and how requires physical infrastructure, which is obscured by the abstract/ethereal term "cloud." Digitalisation entails setting up data centres which house heat-generating computers and stacks of servers to keep the digital machinery moving. Constructing them requires the acquisition of land and access to water for cooling and entails massive energy bills. Some of the world's largest data centres can each contain many tens of thousands of IT devices and require more than 100 megawatts (MW) of power capacity.⁷⁰

Additionally, gathering data from fields and transferring it over high-energy networks such as 5G, edge or satellite transmission further expands the energy and emission costs. Even the manufacturing of semiconductor chips used in digital devices requires massive amounts of water. The drought in Taiwan in 2021 exposed the consequences of having the largest third-party manufacturer for chips in the world in a drought-struck country. When drought hit Taiwan, the government chose to prioritise the chipmaking industry over farmers, putting a halt on irrigation affecting 183,000 acres of farmland.⁷¹

Carbon offsets reduce complex socioecological practices and lands to just one metric: carbon. However, this does not take into consideration any social, cultural or economic metrics being impacted. There has been enough analysis of carbon offsets promoting "carbon colonialism," displacing indigenous people and communities in the Global South from their lands to promote indiscriminate monoculture tree plantations to attract carbon credits.⁷²

Not all carbon offsets fulfil the conditions of additionality, permanence and leakages. For example, Nori "generates one NRT for farmers for every tonne of removed CO₂ and stored in soils

⁶⁷ S&P Global, "Indonesia Halts Carbon Project Verification Process over Legal Concerns," 14 April 2022, <https://www.spglobal.com/commodityinsights/en/market-insights/latest-news/energy-transition/041422-indonesia-halts-carbon-project-verification-process-over-legal-concerns>

⁶⁸ Jonathan Crook, "Comments on Proposed Verified Carbon Standard (VCS) Project for Reducing Emissions from Deforestation and Forest Degradations in Papua New Guinea," *Carbon Market Watch*, 11 March 2022, <https://carbonmarketwatch.org/publications/comments-on-proposed-verified-carbon-standard-vcs-project-for-reducing-emissions-from-deforestation-and-forest-degradations-in-papua-new-guinea/>

⁶⁹ Rachel Donald, "PNG Suspends New Carbon Deals, Scrambles to Write Rules for the Schemes," *Mongabay*, 4 April 2022, <https://news.mongabay.com/2022/04/png-suspends-new-carbon-deals-scrambles-to-write-rules-for-the-schemes/>

⁷⁰ Energy Innovation, "How Much Energy Do Data Centers Really Use?" 17 March 2020, <https://energyinnovation.org/2020/03/17/how-much-energy-do-data-centers-really-use/>

⁷¹ Raymond Zhang and Amy Chang Chien, "Drought in Taiwan Pits Chip Makers Against Farmers," *The New York Times*, 13 April 2021, <https://www.nytimes.com/2021/04/08/technology/taiwan-drought-tsmc-semiconductors.html?>

⁷² Jess Wang, "Carbon Offsets, a New Form of Neocolonialism," *Columbia Climate School*, 3 May 2021, <https://climatesociety.ei.columbia.edu/news/carbon-offsets-new-form-neocolonialism>

Indonesia Carbon Trading

In March 2022, Singapore and Indonesia signed a memorandum of understanding for cooperation in climate change and sustainability. Under the MoU, Singapore and Indonesia will strengthen collaboration in (a) carbon pricing and markets, (b) nature-based solutions and ecosystem-based approach, (c) clean technology and solutions, and (d) green and blended finance. The workplan under the MoU will include financing carbon credit projects, carbon capture and storage, and the development of renewable energy involving government agencies, academic institutions and private sector. Singapore hopes the deal will help it achieve its net zero goals by mid-century. Indonesia will establish a multilateral and international Blended Finance Alliance under the framework of G20 which will pool funds for projects related to climate change and the United Nations Sustainable Development Goals.⁷³

for a minimum of 10 years.” Agricultural practices are different from forestry and are cyclical and mainly seasonal; therefore, to guarantee that the same set of practices will be continued for ten years is questionable, even untenable in many countries where livelihoods and household food security depend on cultivation of small plots of lands. As the minimum period of guarantee is only ten years, it can imply that the carbon sequestered by the soil, if any, can be reversed after a decade, worsening the climate crisis. Additionality is even harder to prove as it is mostly hypothetical: Would the credits be created had the funding not been there? In the US, Microsoft and BP bought carbon offsets from forests that got burned down in fires. Forestry projects are known to be vulnerable to wildfires, drought and disease, which will only get worse because of

global warming, and agriculture-based carbon-offsets will be at risks in a similar manner.⁷⁴

Greenwashing Investments in the Climate Chaos

Green bonds are financial instruments that are used to fund so-called environmental or climate-friendly projects, providing investors with regular or fixed income payments.⁷⁵ Bonds function as loans that are issued by development banks,⁷⁶ corporations or governments to raise money from investors. At the maturation date, the issuer is bound to return the principal amount to the investors. These bonds, along with so-called social and sustainability-linked bonds, are often deployed to meet the tricky net zero targets of corporate entities and governments. There is no single definition of green bonds, and multiple verification agencies like Climate Bond Standards or the International Capital Markets Association, which issues the Green Bond Principles, can be used by issuers to verify their bonds as green. These are all voluntary guidelines designed by the same industry actors that benefit from the scheme, involving lax rules to entice investments and with virtually no government oversight.

According to Moody's, a financial services firm, issuance of green, social, sustainable and sustainability-linked (GSSS) bonds as a percentage of total global bond issuance rose from roughly 2 percent at the start of 2018 to a peak of over 12 percent at the end of 2021.⁷⁷ Issuance of green bonds reached a record \$517.4 billion in 2021, up 74 percent from \$297 billion in 2020, according to Climate Bonds Initiative. Climate Bonds Initiative⁷⁸ has predicted that annual green bond issuance will have to reach \$5 trillion by 2025 if the global economy is to remain

⁷³ NCCS (National Climate Change Secretariat), "Singapore and Indonesia Sign Memorandum of Understanding Concerning Cooperation on Climate Change and Sustainability," 21 March 2022,

⁷⁴ Camilla Hodgson, "US Forest Fires Threaten Carbon Offsets as Company-Linked Trees Burn," *Financial Times*, 3 August 2021, <https://www.ft.com/content/3f89c759-eb9a-4dfb-b768-d4af1ec5aa23>

⁷⁵ World Bank, "What You Need to Know About IFC's Green Bonds," 8 December 2021, <https://www.worldbank.org/en/news/feature/2021/12/08/what-you-need-to-know-about-ifc-s-green-bonds>

⁷⁶ ADB (Asian Development Bank), "ADB Green and Blue Bonds," <https://www.adb.org/work-with-us/investors/adb-green-bonds>

⁷⁷ Kate Duguid, "Rising Green Bond Issuance Erodes Premiums," *Financial Times*, 18 July 2022, <https://www.ft.com/content/32dbf37c-8ff5-436b-88f3-9873fc864a7b>

⁷⁸ Chris Flood, "Fears Rise Over 'Greenwash' Bonds," *Financial Times*, 21 March 2022, <https://www.ft.com/content/178449a7-8897-4359-b23a-e85524c3e227>

To promote green bond issuance, specific policies on green bond frameworks, like Indonesia's Green Bond & Green Sukuk Framework, are being designed. Under the framework, 9 sectors have been listed as eligible for issuing green bonds and green *sukuk*, and sustainable agriculture is one of them. According to the study entitled "Green Bond Market Survey For the Philippines" by the Asian Development Bank in collaboration with the Global Green Growth Institute, renewable energy, green buildings, sustainable agriculture, and water management are viewed as the most promising sectors for growth in the Philippines' green bond market while renewable energy, energy efficiency, water management, and waste management are viewed as the most promising sectors for growth in Malaysia's green bond market.⁷⁹

on track to achieve net zero carbon emissions by the middle of the century. In 2021, the Asia Pacific region sold \$185.22 billion of green debt. S&P Global reported that the announcement of net zero targets by countries in Asia Pacific in 2021 will boost the issuance of green bonds.⁸⁰

ESG (environmental and social governance) investing markets itself as based on the assumption that investors should take into consideration the environmental, social and governance performance of companies like GHG emissions, biodiversity, deforestation, gender equality, labour standards, diversity and inclusion, management diversity, and not just financial returns while investing their money. However, many of these investments are known to promote greenwashing, enabling companies to obtain loans at lower interest rates and promote a positive image to the public and their investors while often not meeting its requirements.⁸¹

China has faced criticism for using green bonds to finance coal-burning power plants, and regulators are having a hard time assessing the impact of this money and how it is being spent.⁸² In 2022, Bloomberg News analysed more than 100 ESG-related bonds worth almost €70 billion sold by global companies to investors in Europe and found that the majority were tied to climate targets that are weak, irrelevant, or even already achieved.⁸³ Recent exposés on blatant greenwashing and outright manipulation by financial institutions involved in ESG investing have severely eroded public trust on this approach and cast doubts on its future.⁸⁴

There are numerous reasons why both investors and issuers prefer green bonds. Issuers benefit from lower rates of interest if they declare their bonds to be green, or sustainability linked, all the while looking green while investors get to burnish their ESG credentials.⁸⁵ The claims of greenwashing in green bonds are so rampant that issuers are attempting closer scrutiny. In some cases, companies issuing green bonds or sustainability-linked bonds, set targets for themselves which, in some cases, have already been achieved even before issuing the bond.⁸⁶

Bloomberg analysed 140 financial service institutions across the world and found that at least \$203 billion in bonds and loans has been funnelled into renewable projects compared with \$189 billion for hydrocarbons in the first half of 2021, implying that funding for green projects might be increasing as compared to fossil fuels. It seems a win-win for J. P. Morgan, Wells Fargo, Citigroup, and other giant financial institutions as they earn huge issuance fees with each bond or loan,⁸⁷ about 0.6 percent issuance fees for underwriting green bonds and loans.⁸⁸

⁷⁹ ADB, *Green Bond Market Survey for Malaysia*, November 2022, <https://www.adb.org/sites/default/files/publication/838756/green-bond-market-survey-malaysia.pdf>

⁸⁰ S&P Global, "Green Bond Sales to Surge in Asia-Pacific as Region Lays Out Path to Net-Zero," 14 February 2022, <https://www.spglobal.com/marketintelligence/en/news-insights/latest-news-headlines/green-bond-sales-to-surge-in-asia-pacific-as-region-lays-out-path-to-net-zero-68602361>

⁸¹ Jacqueline Poh, "The Booming ESG Bond That's Facing Growing Skepticism," *Bloomberg*, 20 September 2022, <https://www.bloomberg.com/news/articles/2022-09-20/the-booming-esg-bond-that-s-facing-growing-skepticism-quicktake>

⁸² Karoline Kan, Rebecca Choong Wilkins, Sheryl Tian Tong Lee and Adrian Leung, "A \$300 Billion Bond Market Holds the Key to Solving the Climate Crisis," *Bloomberg*, 23 November 2022, <https://www.bloomberg.com/graphics/2022-china-green-bonds/?srnd=premium-asia>; Lyubov Pronina and Tom Freke, "As Green Bonds Boom, So Do 'Greenwashing' Worries," *Bloomberg*, 14 October 2019, <https://www.bloomberg.com/news/articles/2019-10-14/as-green-bonds-boom-so-do-greenwashing-worries-quicktake>

⁸³ Priscila Azevedo Rocha, Akshat Rathi and Todd Gillespie, "Empty ESG Pledges Ensure Bonds Benefit Companies, Not the Planet," *Bloomberg*, 4 October 2022, <https://www.bloomberg.com/news/features/2022-10-04/greenwashing-enters-a-22-trillion-debt-market-derailing-climate-goals>

⁸⁴ Gillian Tett, "ESG Exposed in a World of Changing Priorities," *Financial Times*, 3 June 2022, <https://www.ft.com/content/6356cc05-93a5-4f56-9d18-85218bc8bb0c>

⁸⁵ Azevedo Rocha et al., "Empty ESG Pledges."

⁸⁶ Azevedo Rocha et al., "Empty ESG Pledges."

⁸⁷ Tim Quinson and Mathieu Benhamou, "Banks Always Backed Fossil Fuel Over Green Projects—Until This Year," *Bloomberg*, 19 May 2021, <https://www.bloomberg.com/graphics/2021-wall-street-banks-ranked-green-projects-fossil-fuels/?sref=Ufko9ynM>

⁸⁸ Tim Quinson and Mathieu Benhamou, "Banks Always Backed Fossil Fuel Over Green Projects—Until This Year."

The Philippines was the first country to issue a green bond in the ASEAN region in early 2016,⁸⁹ and most of the green bond issuance in the Philippines has been driven by the private sectors, with one government-backed entity issuing a green bond and no sovereign issuances (government issued bonds or securities to raise money). Most green bonds in the ASEAN region have been issued for funding green energy and buildings with agriculture-, food- and land-use-related bonds numbering just a few.⁹⁰

*287 green, social and sustainability bonds or sukuk have been issued in ASEAN. The following entities have issued bonds which are directly or indirectly related to land, food and agriculture:

1. WLB Asset II B Pte Ltd (Singapore)
2. Agrote Business (M) Sdn Bhd (Malaysia)
3. BDO Unibank, Inc. (Philippines) –
4. Republic of the Philippines (Philippines)
5. Edra Solar Sdn Bhd (Malaysia)
6. Rizal Commercial Banking Corporation (Philippines)
7. CIMB Bank Berhad (Philippines)
8. National University of Singapore (Singapore)
9. UOB(Singapore)
10. Bank Pembangunan Malaysia Berhad (Malaysia)

products to invest in. Investors choose specific asset classes based on their long-term plans. According to PwC's *State of Climate Tech Report 2021*, "food, agriculture and land use" is one of the key sectors attracting investments related to climate tech.⁹¹ Citing the emissions from agricultural and land-use activities and food waste, this sector invites the most investment in plant-based meat and dairy alternatives, insect proteins, lab-grown meat, gene editing, vertical farming, aeroponics, "precision farming," soil carbon sequestration, and management and modification of natural environments, in particular through reforestation, afforestation and avoided deforestation.

Sovereign Wealth Funds (SWFs) are one of the entities that have increasingly been funnelling money into food and agricultural technologies. In 2021, a study on SWFs⁹² analysed 100 venture capital rounds participated by such funds in industries like agtech, biotechnology, food and beverage, farming, or organic farming from 2015 to 2021 and found that biotechnology received the highest interest from SWFs, followed by food delivery and then agtech. Biotechnology investments were directed into companies like Pivot Bio and Perfect Day, which manufacture so-called sustainable fertilizers and the world's first milk protein without animals, respectively. Investments in food delivery, although now declining because of regulatory concerns, include Ele.me, Grab, DoorDash, Rappi and Glovo. Agtech investments were directed towards automation and vertical farms.

Climate Crisis, Agtech and Sovereign Wealth Funds

As financial firms are calling for a diversification of investment portfolios, investors are looking for different financial

The interests of SWFs in agriculture also manifests in the rush to grab farmland following the 2008 food price crisis in Argentina, Australia, Brazil, Kenya, the Sudan, and other countries, while their investments in commodity trading have been making headlines the last few years. History seems to be repeating itself as the

⁸⁹ ADB, "ADB Backs First Climate Bond in Asia in Landmark \$225 Million Philippines Deal," 29 May 2016, <https://www.adb.org/news/adb-backs-first-climate-bond-asia-landmark-225-million-philippines-deal>

⁹⁰ ASEAN (Association of Southeast Asian Nations), "List of ASEAN Green/ Social/ Sustainability Bonds/Sukuk," [https://www.theacmf.org/images/downloads/pdf/List%20of%20ASEAN%20Green%20Social%20Sustainability%20Bonds%20\(290722\).pdf](https://www.theacmf.org/images/downloads/pdf/List%20of%20ASEAN%20Green%20Social%20Sustainability%20Bonds%20(290722).pdf)

⁹¹ PwC, *State of Climate Tech 2021: Scaling Breakthroughs for Net Zero*, <https://www.pwc.com/gx/en/sustainability/publications/assets/pwc-state-of-climate-tech-report.pdf>

⁹² Patrick J. Schena, Jorge Fernandez Vidal, Javier Capape, Adrian Blanco and Javier Bernal, *Sovereign Wealth Funds 2021: Changes and Challenges Accelerated by the COVID-19 Pandemic*, <https://docs.ie.edu/cgc/SWF%202021%20IE%20SWR%20CGC%20-%20ICEX-Invest%20in%20Spain.pdf>

The Tropical Landscape Finance Facility (TLFF) in Indonesia, launched via a partnership between the UN Environment Programme, the World Forestry Centre, and private actors like BNP Paribas and ADM Capital, is building a platform to attract private sector finance by leveraging public sector funds to invest in sustainable land use, including in agriculture and ecosystem restoration, and renewable energy in Indonesia.⁹³ In 2018, the TLFF issued its inaugural bond, also Asia's first corporate sustainability bond, to PT Royal Lestari Utama (RLU), a joint venture between the French Michelin Group and the Indonesian Barito Pacific Group, and the bond was issued to finance sustainable natural rubber production across heavily degraded concession areas in the Jambi and East Kalimantan provinces in Indonesia.⁹⁴ The US Agency for International Development (USAID), in collaboration with RLU, conducted a carbon assessment of the project. In 2019, the Netherlands-based blended finance impact investment fund &Green fund – whose investors are the government of Norway, Unilever, and the Global Environment Facility – invested \$23.75 million in PT RLU. In June 2022, Michelin bought a further 51 percent stake in RLU, thus becoming its sole owner.⁹⁵

RLU operates on a whopping 88,000 hectares in Sumatra and Borneo via three subsidiaries, which they claim were affected by deforestation, and aims to plant 50 percent of this land with rubber while implementing community livelihood and conservation activities and agroforestry on the remaining land. According to a Mighty Earth's satellite image-based analysis and investigation deforestation leading to displacement of indigenous peoples in that area to plant rubber was already occurring prior to the RLU project, by the Barito Pacific

Group's subsidiaries, the partner of Michelin in this sustainable rubber venture.⁹⁶ According to the report, "These subsidiaries destroyed forests that were home to indigenous peoples and endangered species, cleared land to make way for their rubber plantations and then sought public recognition – and investment – for a project to restore half of it."⁹⁷

rush to grab farmland was partly spurred by the climate-friendly promises of biofuels and seen as rewarding investment. Five out of six Gulf Cooperation Council (GCC) SWFs have established public companies to acquire stakes in foreign food and agriculture companies or to build a resilient domestic food and agriculture sector.⁹⁸

In 2021, the Abu Dhabi Development Holding Company acquired a 45-percent stake in Louis Dreyfus Co., which has hitherto remained privately owned. Other similar investments into commodity trading corporations include China Investment Corporation (CIC), Korea Investment Corporation, and Singapore Temasek's investment in Noble Group, later acquired by COFCO, Temasek's investment in Olam. These SWFs mainly belong to nations that rely on food imports (like Singapore, which only produces 10 percent of its food supply and is trying to increase it to 30 percent via offshore fish farms and vertical farming). They are concerned about their future food security in the face of climate crisis, COVID-19, and wars, among other disruptions, and play a role in guaranteeing food security in their nations. That is why they are investing in "novel food" production such as indoor farming, high-tech aquaculture and alternative proteins.

Temasek has doubled down on its agricultural strategy under its new CEO who wants to make

⁹³ TLFF (Tropical Landscape Finance Facility), "About Us," <https://www.tlffindonesia.org/about-us/>

⁹⁴ TLFF, "TLFF Inaugural Transaction: Corporate Sustainability Bond for Natural Rubber Production," January 2019, shorturl.at/egwyY;

⁹⁵ Michelin, "Michelin Buys 51% of Royal Lestari Utama (RLU), a Pilot Project Developing Sustainable Rubber Tree Plantations in Indonesia," 21 June 2022, <https://www.michelin.com/en/press-releases/michelin-buys-51-of-royal-lestari-utama-rlu-a-pilot-project-developing-sustainable-rubber-tree-plantations-in-indonesia/>

⁹⁶ Mighty Earth, *Complicit: An Investigation into Deforestation at Michelin's Royal Lestari Utama Project in Sumatra, Indonesia* (Washington DC: Mighty Earth, 2020), https://www.mightyearth.org/wp-content/uploads/Mighty_Earth_MichelinReport8Oct2020FINAL.pdf

⁹⁷ Mighty Earth, "Complicit."

⁹⁸ See chapter 3 of Schena et al.

food systems resilient to climate change.⁹⁹ Its investments in life sciences and agriculture have grown from \$5.7 billion in 2015 to \$26.7 billion in 2022, investing in firms like Bayer AG, Impossible Foods and Israeli irrigation firms.

Private Equity Firms Investments in Agriculture in the Climate Crisis

Investors are relying on blended finance instruments to raise private sector investments for sustainable landscapes.¹⁰⁰ These investors cite increasing food production for the growing population, the need to reduce GHG emissions, limited land availability, growing public scrutiny of corporations, and the huge market opportunity in changing food production and land management practices as the reason behind growing investor interest in food and agriculture. The Asian division of Proterra Investment Partners (formerly Black River, the investment arm of Cargill) is one of the biggest private equity firms investing in food and ag in Asia Pacific. In an interview, the firm's managing director highlighted that private consumption makes 40 percent of the GDP in Asian countries, emphasizing the contribution of food and agriculture made in Asia Pacific economies.¹⁰¹ China and the larger countries in Southeast Asia are positioned to be the main consumers in the world, according to Proterra, and the rapidly changing consumer behaviour, along with significance of food and agriculture in the economy, are factors attracting private equity interest.

Echoing similar concerns like rising food demand as other investors, Proterra's overall agriculture investment strategy focuses on increased investment in farmland and land acquisition to maximise its productivity.¹⁰² The glowing recognition by Big Ag of carbon as a "new crop" stemming from the potential of soil as a carbon

sink that could earn carbon credits through specific agricultural practices that mostly involve digitalisation might further increase the value of land and spur another scramble for land grab worldwide.¹⁰³

ADM Capital Group, a private equity firm, launched the blended capital \$200 million Asia Climate-Smart Landscape Fund (ACLF) along with US International Development Finance Corporation and the Rabo Foundation in Asia. (Rabobank's venture fund Rabo Frontier Ventures focuses on agtech and fintech. Fintech entails applying technologies to financial services.) This fund will give loans to SMEs in Indonesia's food and farming and agro-forestry sectors, focusing on targets related to GHG emissions, jobs, gender and land restoration.

Driven by strong consumer demand due to the climate crisis, Asia Pacific investments in alternative proteins – including plant-based and cultivated meat, along with fermented proteins – were up 92 percent year on year from \$162 million in 2020.¹⁰⁴ According to the database of the Good Food Institute (GFI), out of the 11 alt-protein companies in Asia Pacific that are currently fundraising, eight are based out of Singapore. Following the trend, Proterra invested in oat milk companies based in Indonesia and Singapore, a plant-based egg company based in Singapore,¹⁰⁵ and a yogurt brand based in China, and it plans to expand in sustainable food categories across APAC. As Proterra's example shows, funding for Asia-Pacific start-ups working on plant-based foods, cell-cultured meat and protein fermentation has increased by 92 percent in 2021, according to GFI's APAC branch. Another private equity besides Proterra which focuses on Asia Pacific food is Better Bite venture capital, a

⁹⁹ David Ramli, "The \$290 Billion Fund Helping Make Tiny Singapore an Agricultural Powerhouse," *Bloomberg*, 26 July 2022,

<https://www.bloomberg.com/news/articles/2022-07-25/singapore-s-290-billion-fund-temasek-is-helping-avert-a-food-crisis>

¹⁰⁰ USAID Green Invest Asia, "How ADM Capital's Asia Climate-Smart Landscape Fund Came Together," <https://open.spotify.com/episode/1pGf7wkJyRgWwDSq0Ws04z?si=aee125094ab6427a>

¹⁰¹ Daniel Kemp, "Interview: Proterra Asia's Tai Lin on the APAC Food Opportunity," *Agri Investor*, 31 May 2021, <https://www.agriinvestor.com/interview-proterra-asias-tai-lin-on-the-apac-food-opportunity/>

¹⁰² Proterra Investment Partners, "Investment Strategies," <https://www.proterrapartners.com/investment-strategies/agriculture-strategy/>

¹⁰³ "Is Carbon the 'Crop' of the Future?" *AgriLife Today*, 27 May 2021, <https://agriflifelife.tamu.edu/2021/05/27/is-carbon-the-crop-of-the-future/>

¹⁰⁴ Yujie Xue, "Alternative Protein Investments Nearly Double across APAC in 2021, as Climate Change Drives Strong Consumer Demand," *Yahoo Finance*, 2 March 2022, shorturl.at/hilpv;

¹⁰⁵ GFI-APAC (Good Food Institute Asia Pacific), "APAC Alternative Protein Company Database," <https://gfi-apac.org/industry/alternative-protein-company-database/#fundraising-database>

Alternative proteins, or alt-proteins (also called petri-proteins, cultured, cell-based, cultivated, lab-grown meat), are being posited as environmentally sustainable and cruelty-free meat-like substances as substitutes for eating meat. These are made from stem cells harvested from animals and cultured in a medium or from genetically engineered organisms fermented to produce meat-like substances.

They are manufactured in industrial processes kept confidential, and consumers are unaware of the exact process by which the food is made. Industrial production of such “meat” and other proteins involves closed fermentation with monoculture feedstocks produced from industrial agriculture practices like sugar or corn and might have antibiotic usage that is not transparently reported, questionable disposal of toxins from bioreactors and sometimes uncoun­ted carbon dioxide emissions from fermentation.¹⁰⁶ Both the life cycle and fermentation emissions make the climate-friendly claims of these novel foods highly questionable.

\$15-million fund, investing in alt-protein start-ups making cultivated meat, cell-based human breast milk, precision-fermented cheese and biomass-fermented protein.

Concerted Push for Ag Digitalisation

The push for agricultural digitalisation, along with its increasing role in financialising the climate crisis, is a concerted effort coming from global and regional institutions that are enabled by states. In the following section, we look at a few examples of national governments launching initiatives to raise investments in digital

agriculture, regional institutions that are running projects promoting digital agriculture, and policy support for the same.

AIMing at Digital Innovation for Climate

The Agriculture Innovation Mission for Climate (AIM for Climate, or AIM4C) is a US and UAE initiative launched in 2021 to propel financial investments in technologies in agriculture, portraying hi-tech agribusinesses as part of the solution to address the climate crisis and pushing the idea that technological innovations will address the climate crisis. It has about 275 partners ranging from governments, think tanks, businesses, academia, including 42 national governments (with the Philippines, Singapore and Vietnam from the ASEAN region) and Big Ag corporations like Corteva, BASF, Bayer, Syngenta and JBS.

In 2022, AIM for Climate announced “innovation sprints” at COP27 in Sharm-El Sheikh, Egypt, with a focus on four focal areas: smallholder farmers in low- and middle-income countries, methane reduction, emerging technologies and agroecological research.¹⁰⁷ Innovation sprints are projects proposed and funded by nongovernment partners and chosen by AIM4C as its partners to achieve what it defines as agricultural innovation. To get a peek into what its ideas for innovation are, the COP27 innovation sprints include “improving nitrogen replacement capacity of microbes” proposed by Verra, Pivot Bio and SCS Global; weather intelligence services for smallholder farmers proposed by Bill and Melinda Gates Foundation; planting 250 million trees by 2025 proposed by Rabobank, Syngenta and the Nature Conservancy; cellular agriculture by Aleph Farms; and vertical farming, developing climate smart crop varieties, and other such proposals made by Bayer, USAID, Nestlé, Costco

¹⁰⁶ Jaydee Hanson and Julia Ranney, “Is Lab-Grown Meat Healthy and Safe to Consume?” 20 September 2020, <https://www.centerforfoodsafety.org/blog/6458/is-lab-grown-meat-healthy-and-safe-to-consume>

¹⁰⁷ AIM for Climate, “Innovation Sprint Framework,” https://www.aimforclimate.org/media/buafzujz/2022_feb_aim4c_ispframework.pdf

and the Innovative Genomics Institute.¹⁰⁸ These proposals have attracted millions of dollars of investments and are being run by some of the biggest polluters in the food and agriculture sector.

The International Finance Corporation (IFC) has a project called “Farmer Capacity Development Through Digital Platform and Financing (IFC-604378)”¹⁰⁹ in Indonesia, in which it has invested an undisclosed amount and has partnered with a fintech company which works on agribusiness lending and has integrated its finance services with fertilizers and input companies. The project aims to use digital farmer training platforms to improve access to extension services and test digital financial services by financing farmers.

AIM4C is solely focused on promoting investments in techno fixes which will generate revenue streams for Big Ag and Food firms. It claims to promote “climate-smart” agriculture, which intentionally has a very loose definition, and ends up promoting greenwashing tools for polluters to evade any scrutiny and avoiding real steps to cut emissions while making a buck out of the crisis. The initiative has been criticised for ignoring the voices of indigenous communities and agroecological alternatives, instead resorting to technological salvation in agriculture to address the climate crisis.¹¹⁰

Multilateral Banks' Carrots for Digital Agriculture

Multilateral development banks are presiding over the expansion of digital services through their lending and have been pushing digitisation via projects across the Philippines, Indonesia, India and



other countries. From 2010 to 2019, the Asian Development Bank supported 371 projects that included digital components (including 27 non-sovereign projects) in sectors ranging from telecommunications, education and health to agriculture and food security.¹¹¹ The *Asian Development Outlook 2021*, published by ADB, puts emphasis on the role of sensor technologies, big data analytics and blockchain technology in monitoring and analysing climate conditions and initiating mitigation measures.¹¹² It calls for promoting digital technologies for conservation of resources, farm management and assessment of farming practices on the climate but evades any detailed discussion on the risks posed by these technologies to the environment and human rights.

The ADB has a few projects at the cross-section of climate finance and agriculture. For a project called “Investment Assessment and Application of High-Level Technology for Food Security in Asia,”¹¹³ the ADB has invested \$2 million for technical assistance services to facilitate dissemination of climate-resilient technologies

¹⁰⁸ Rachel Sherrington, “Big Agriculture Casts Itself as Climate Champion Ahead of COP27,” *Desmog*, 6 October 2022, <https://www.desmog.com/2022/10/06/aim4c-under-fire/#:~:text=AIM4C%20argues%20that%20technology%20can,%E2%80%9Cclimate%2Dsmart%E2%80%9D%20solutions.https://docs.google.com/document/d/1UqRf1URiEMDXVsQ2QFyzGLxz1Lxn3UzrxPG0EvmGCMw/edit>

¹⁰⁹ IFC (International Finance Corporation), “Farmer Capacity Development Through Digital Platform and Financing (IFC-604378),” <https://ewdata.rightsindevelopment.org/projects/604378-farmer-capacity-development-through-digital-platfo/>

¹¹⁰ Rachel Sherrington, “Big Agriculture Casts Itself as Climate Champion.”

¹¹¹ ADB, *Digital Technologies for Climate Action, Disaster Resilience, and Environmental Sustainability* (Mandaluyong: Asian Development Bank, 2021), <https://www.adb.org/sites/default/files/publication/700396/digital-technologies-climate-action.pdf>

¹¹² ADB, *Asian Development Outlook 2021 Update: Theme Chapter: Transforming Agriculture in Asia*, September 2021 (Mandaluyong: Asian Development Bank, 2021), <https://www.adb.org/sites/default/files/publication/726556/ado2021-update-theme-chapter.pdf>

like reduced or zero tillage, crop rotation, and information and communication technologies in the East Asia and Pacific region. Other projects like “Scaling Up Private Sector Participation and Use of Market-Based Approaches for Environmental Management”¹¹⁴ and “Protecting and Investing in Natural Capital in Asia and the Pacific”¹¹⁵ promote the idea of market-based solutions and conduct studies to identify and justify natural capital investments, changing legal frameworks to facilitate the idea of natural capital, and attract investments in Asia. These institutions argue that insufficient public sector and international development assistance, which these financial institutions have had a role in slashing down, are reasons to invite more private sector participation.

These projects are examples of public money being used to leverage and facilitate the expansion of private businesses, market-based mechanisms and digital technologies. After decades of introducing policies that undermine the role of public sectors in providing essential services, development banks are promoting the entry of financial actors, investments and green businesses in addressing climate change.

States Enabling Ag Digitalisation

The secretariat of the Association of Southeast Asian Nations (ASEAN), together with its associate institutions, released the draft “ASEAN Guidelines on Promoting the Utilization of Digital Technologies for ASEAN Food and Agriculture Sector” in June 2021.¹¹⁶ Unequivocal in its support for digitisation of the food and agriculture sector in the region, the guidelines prescribe such digitisation as a remedy for population increase, the climate crisis, and COVID-19. It states, “At the macro level, the use of such new technologies can

further ensure productivity, stability, and safety across value chains,” which makes measures of productivity, stability and safety seem value-neutral and does not highlight the political and financial interests behind promoting digitisation in food and agriculture.

While recognising challenges like cybersecurity threats, data privacy and labour replacement, albeit cursorily, the guidelines lay the groundwork for untrammelled involvement of the private sector and increased biodigital convergence in the digital food and agriculture sector by making suggestions like institutionalising national e-agricultural vision on food and agriculture systems investments; promoting research and development program in satellite technology, biotechnology, nanotechnology and robotics; and expecting farmers to be up to speed with the rapidly changing and inaccessible technologies via training and capacity-building programs. It clearly mentioned that farmers “may have to give up some ‘long used to’ activities but it needs to be made clear that new activities to undertake are usually important and likewise made easier.” The extent of involvement of farmers and citizens in drafting the guidelines, which focuses on moulding their role in food and agriculture, is also unclear.

Suggestions made by the guidelines around developing new appropriate digital platforms for exchanging information, transacting business and securing credit and cross-linking platforms do not discuss the pitfalls of farmers turning into data gatherers for companies and companies using advisory services to promote their products and their technologies for surveilling agricultural practices for marketing and businesses. The focus on traceability detecting food safety and fraud risks evades discussion on the precarious and questionable nature of food produced by industrial food production processes.

¹¹³ EWS (Early Warning System), “Regional: Investment Assessment and Application of High-Level Technology for Food Security in Asia (ADB-50058-001),” <https://ewdata.rightsindevelopment.org/projects/50058-001-regional-investment-assessment-and-application-of/>

¹¹⁴ ADB, “Regional: Scaling Up Private Sector Participation and Use of Market-Based Approaches for Environmental Management,” <https://www.adb.org/projects/49354-001/main>

¹¹⁵ ADB, “Regional: Protecting and Investing in Natural Capital in Asia and the Pacific,” <https://ewdata.rightsindevelopment.org/files/documents/01/ADB-50159-001.pdf>

¹¹⁶ ASEAN, “ASEAN Guidelines on Promoting the Utilization of Digital Technologies for ASEAN Food and Agriculture Sector,” June 2021, <https://asean.org/wp-content/uploads/2021/12/FAFD-52.-ASEAN-Guidelines-on-Promoting-the-Utilization-of-Digital-Technologie.pdf>

Digital infrastructure is seen as pivotal for digitisation in agriculture to take place without underscoring the profits earned by telecom companies, Big Tech actors, and satellite companies in the expansion of these services to food and agriculture. MDI Ventures, the investment arm of Telkom Group, one of Indonesia's largest telecoms, invested in TaniHub, a start-up which connects farmers with buyers via its e-commerce platform and gives loans to farmers which they can repay by selling their produce at TaniHub.¹¹⁷ MDI Ventures has also invested in Indonesian start-ups like Pitik that digitises chicken farms and Aruna and Delos Aqua that digitise aquaculture and its supply chains, as well as on a US-based start-up Manus Bio that uses genetic modification/biotechnology to manufacture flavours, food ingredients and agrochemicals.

Southeast Asia's Green Economy 2022 Report by Bain, Microsoft and Temasek mentions sustainable farming as an important sector for carbon abatement which represents a \$30-billion opportunity. Precision agriculture and farmer service platforms are the most attractive segments for investments in this sector as they draw strong regulatory support from governments and have existing infrastructure, especially in Malaysia, Thailand and Vietnam. The obstacles to the widespread adoption of digital technologies in Southeast Asia's agriculture sector are the lack of existing infrastructure (especially in the Philippines), small-farming households and a mosaic of farming practices that are incompatible with the standardising nature of digital technologies. According to the report, Indonesia's small farmers might not be able to afford the cost of digitisation, with the lack of connectivity in rural areas also hindering expansion of digital services and investments in digital technologies.

Malaysia is pursuing digitalisation across its economy quite aggressively. The Malaysian government is trying to portray itself as an attractive destination for investments in agricultural technologies by pushing fiscal and

non-fiscal incentives for technology-related companies. The government has developed digital economy guidelines, set up investment funds, and is designing its own carbon market policies. In the Philippines, the report cited unclear farmland ownership, fragmented farming landscape, less-educated smallholder farmers, lack of technical knowledge, lack of internet connectivity in rural areas and lack of internet usage, and lack of government advocacy and support for digital agriculture as the barriers to increasing investment in agritech services. This assessment portrays the perspective of digital agriculture proponents who regard the consolidation of lands into large holdings as the ideal scenario for digitalisation in agriculture, values digital know-how and tools over traditional agricultural knowledge systems, and extol the efficiency of machine learning over farmers' wisdom.

Beyond Magic Tricks and False Solutions

Technological fixes, market-based instruments like carbon trading and financial instruments that are invented to cash in on the climate crisis are convenient cop-outs for corporations to prevent any real action on the climate crisis. Mining companies, along with oil, gas, and Big Food and Ag companies, continue to emit greenhouse gases across their value chains and expand their operations while buying carbon credits from offset projects that endanger biodiversity and the environment and likely threaten the rights of indigenous communities in the Global South, impacting people who have barely contributed to the climate crisis. Carbon credit and its new digitalised permutations, along with new financial instruments that are designed to profit from the climate crisis are mechanisms for companies to continue with business-as-usual practices while buying their way out of any real emission reduction.

The climate crisis is being treated as an investment opportunity by Big Tech, Big Food and Ag, and finance companies that are using it

¹¹⁷ Catherine Shu, "Indonesian Agritech Platform TaniHub Group Harvests a \$65.5M Series B Round," *Tech Crunch*, 21 May 2021, <https://techcrunch.com/2021/05/21/indonesian-agritech-platform-tanihub-group-harvests-a-65-5m-series-b-round/>

to promote their own proprietary profit-making technologies like cellular agriculture, vertical farms, digital platforms, gene-edited microbes, that have not been proven to contribute to mitigation of greenhouse emissions or climate adaptation but might exacerbate the climate and environmental crises. These climate-related digital technologies are considered by financial institutions as an asset class which is attracting investments from across the board and turning the crisis into profit-generation opportunities.

The logic of carbon credits to pay farmers and indigenous communities for sequestering carbon via agriculture and forestry deflects fundamental discussion on historical responsibility of the Global North and their corporations that should lead to paying reparations to the Global South for the losses and damages caused by the impacts of the climate crisis. Financial instruments created by corporations in response to the climate crisis are, in reality, mere investments to reap returns and accrue interests for investors and do not deliver any genuine reduction in emissions nor help those who are directly impacted and are the most vulnerable. Genuine climate actions on the part of the Global North should deliver public finance and transfer of appropriate and proven technologies to the Global South and communities without any strings attached as part of their moral obligations, historical responsibility and accountability.

Technology for Whom and by Whom?

Technology is not neutral, and most of these technologies that claim to address the climate crisis adopt top-down approaches, are introduced without active participation of small-scale food producers and peasants, and are rarely designed to address the needs of smallholders but are mostly designed to ensnare farmers in profit-making schemes and to render them as sources of data and behaviour patterns which can be mined for machine learning to make decisions without farmers. This is crystal clear in the case of agricultural digitalisation.

Digital technologies are turning corporations into data accumulators and analysers. Data is positioned to investors as one of the most, if not the most, valuable commodities in the 21st century. By getting farmers to subscribe to their digital platforms and extracting valuable on-farm and off-farm data, these companies are positioning themselves as all-knowing entities who will be able to keep an eye on production and consumption across the chain, and eventually aim to dictate it. By using the climate crisis as a reason to introduce these technologies, not only are they adding an additional revenue stream to their bank balance but they may also be making the climate crisis worse with their technologies that require the extraction of mineral resources to produce them, the consumption of so much energy, and the production of toxic wastes.

Many governments are moving hand-in-glove with corporations, incentivising them to invest and enabling the expansion of digitisation across economic sectors. In most cases, digitisation is being introduced without adequate safeguards on data protection, assessment of impacts on the environment and protection of human rights. At its core, financialisation is a strategy with the investors' interest in focus and not the well-being of those vulnerable to the climate crisis; therefore, it functions as a distraction that fails to provide relevant solutions to address the problem.

Financialisation via agricultural digitisation is, at its core, an extractive process, not only extracting data from farmers, consumers, and citizens but also extracting natural resources to keep the digital machinery going. The demand should be for the Global North and their corporations to pay climate reparations to enable real solutions fostered by local communities to mitigate and adapt to the changing climate such as agroecological approaches in food production and territorial markets without sacrificing biodiversity, the environment and people's rights, instead of treating the climate emergency as another opportunity for financial gain.

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.

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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.

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