

THE Ethical CORPORATION MAGAZINE

REGENERATIVE AGRICULTURE BRIEFING

Autumn 2022

- Europe sows seeds for farming revolution
- Betting the carbon farm on biochar
- The push to empower Africa's smallholder farmers

Can the food industry rise to the CLIMATE CHALLENGE?

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Welcome to the Autumn 2022 issue:

Regenerative agriculture briefing

In June, investors representing $17.45 trillion in combined assets called on the Food and Agriculture Organization (FAO) to produce a clear roadmap to achieve a sustainable global food system by 2050.

Food systems account for around a third of global greenhouse gas emissions, and even if fossil fuel emissions were eliminated today, the investors pointed out, emissions from the agriculture, forestry and land use sectors alone would make it impossible to stay within 1.5 degrees Celsius of warming.

And it is not just due to CO_2 emissions from deforestation to make room for crops such as cocoa and soya, and heavy use of agricultural chemicals. According to the FAIRR investor network, which organised the statement, agriculture accounts for 40% of human-generated methane emissions, with the digestive processes of cattle and other livestock alone accounting for 4% of all global emissions – twice the impact of the aviation sector.

This year, we've already seen the impacts of just 1.1C of increased warming with crop yields decimated by unprecedented drought across the globe, and the flooding in Pakistan, which at last count had swept away 1.6 million houses, 750,000 head of livestock and swamped 2 million acres of farmland.

The FAO and the U.N. World Food Programme ›

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VLACHESLAV MUSLIENKO/REUTERS

warned earlier this summer that millions more people are being pushed into extreme food insecurity as a result of overlapping crises of climate shocks, impacts from COVID-19 and the war in Ukraine.

Last September UN Secretary-General Antonio Guterres convened the UN Food Systems Summit, which called for action at all levels to adopt more regenerative agricultural practices. Proponents say practices such as minimal tillage and keeping the land green with cover crops, will restore soils depleted by decades of intensive industrial-scale agriculture, boosting their capacity to absorb CO_2.

It will also fight biodiversity loss, improve water retention and improve farmer resilience in a rapidly warming world.

Among those backing this global agenda are giant global food brands, including Nestle, Unilever, Danone and PepsiCo, which have made sweeping commitments to empower famers to use regenerative methods to produce their key agricultural ingredients as part of their net-zero commitments. But to what extent can these commitments be fulfilled?

In this issue of The Ethical Corporation magazine we assess what it will take for the regenerative agriculture developments that are beginning to take root around the world to grow to the scale needed to transform food systems.

We start with Europe, which has set targets to cut its greenhouse gas emissions by making sustainable agriculture "the new normal". Angeli Mehta reports on a plethora of pilots by corporates, but hears that lack of industry alignment is hindering progress. The Science Based Targets initiative, however, is developing new guidance that will detail how companies account for land-based carbon removals.

She also reports on trials by the likes of McCain, Nestle and PepsiCo in the UK, where the government is also seeking to incentivise more sustainable practices post-Brexit. ›

Regenerative agriculture is even more nascent in the vast industrial-scale farms in the U.S., where $14.2 billion in federal farm subsidies a year prioritise yield maximisation at the expense of soil health and farmers' income. But as Sarah LaBrecque reports, policy changes are afoot, while General Mills is partner in a new Ecosystem Services Market Consortium, which is giving credits to farmers for improved ecosystem services. Meanwhile, in one promising pilot, Unilever, PepsiCo, Cargill and ADM are working together to bring regenerative agriculture to farmers in Iowa.

Most of the crops the world relies on for food have to be grown and ploughed up annually, leading to excessive fertiliser use, water pollution and soil carbon loss. Angeli Mehta reports on global research on planting more resilient perennial crops. These include a wild perennial grass called Kernza, that the Land Institute in the U.S. expects to yield as much grain as annual wheat.

The global wine industry is regarded as a canary in the coal mine for climate change due to grapes' sensitivity to changes in the weather. Mike Scott looks at how winemakers are adapting to become more resilient.

Mark Hillsdon reports on how the beef and dairy industry is responding to the pressure it is coming under, from investors, consumers and policymakers, to cut methane emissions and reduce the huge amounts of water used to irrigate fodder crops such as maize and alfalfa. There are pilot projects, from using seaweed in cattle feed to drip irrigation, but also questions about whether the industry is moving anywhere near fast enough.

He also looks at silvopastoralism, a form of livestock production that works with nature, rather than against it, and how it is being practiced by farmers in Brazil, Kenya and the UK.

Africa is at the sharpest end of the global food crisis, with a fifth of its population facing chronic hunger. But as Mark Hillsdon reports, harnessing regenerative agriculture could be a lifeline for its 350 million smallholder farmers. He examines how companies like Nestle are trying to move their African ingredient-sourcing onto a more sustainable footing.

Karen Luckhurst looks at why companies including Microsoft and Shopify are paying elevated prices to buy offsets in biochar projects, a technology that uses up agricultural waste residues, turning them into a natural fertiliser that raises yields and acts as a carbon sink.



SHUTTERSTOCK

And retailers, big brands and commodity traders now backing initiatives to reduce deforest risk from soy farming, Mark Hillsdon asks whether progress can come fast enough to save the Cerrado in Brazil.

We close this bumper issue with a comment piece from Matthew Spencer, global director of IDH – The Sustainable Trade Initiative, who considers how new EU rules banning the import of commodities associated with deforestation could have a multiplier effect – positively influencing entire supply chains.

One message from this issue that resonated with me was that farmers will only forsake chemical inputs and adopt new, more regenerative practices if they are in the driving seat, empowered with the necessary skills and finance to pay them for the priceless ecosystem services they are providing.

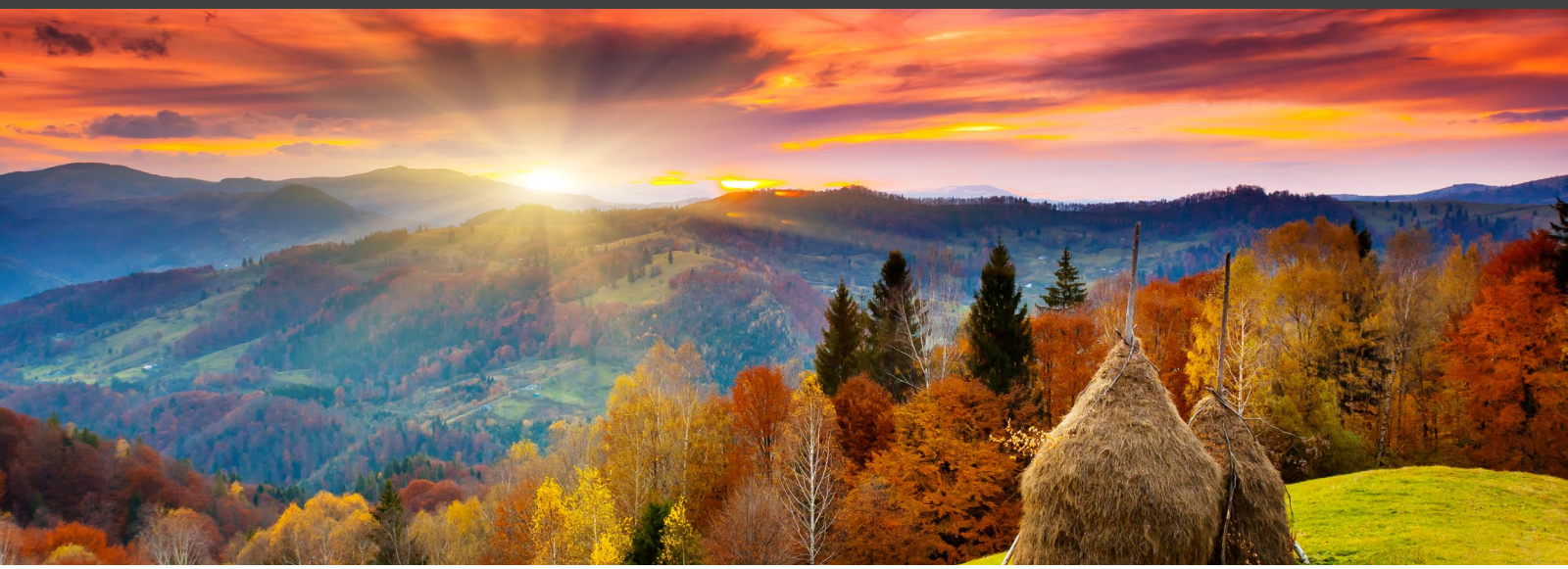
Plenty of food for thought for now. In December we'll be back with an in-depth look at how the finance industry is stepping up to the transition.





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Contents.

8 EUROPE SOWS SEEDS
For farming revolution

13 UK SETS SIGHTS
On greener food system

18 RESTORING LIFE TO
America's stressed soils



23 THE HUNT FOR MORE
Resilient food crops



25 WINEMAKERS SEEK TO WEATHER THE STORM



51 CAN CHANGE COME FAST ENOUGH TO SAVE THE CERRADO?

30 THE METHANE CHALLENGE
For beef and dairy farmers

36 SEEING THE COWS AND TREES
With silvopastoralism

39 CAN AGROFORESTRY SAVE
Africa's denuded soils?

45 BETTING THE FARM
On biochar

57 HOW EU DEFORESTATION RULES
Could be transformative

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Europe sows seeds for FARMING REVOLUTION

Angeli Mehta looks at how the bloc is striving to make sustainable agriculture the 'new normal'

VIEW ONLINE



AB InBev is trialling regenerative practices with its malting barley.

MIKE HUTCHINGS/REUTERS



STEPHANE MAHE/REUTERS

A farmer drives his tractor by cracked and dry earth amid this summer's drought in France.

The clock is ticking. By 2030 – just eight harvests away – the European Union aims to have made big inroads into cutting greenhouse gas emissions from agriculture, and be transforming today's extractive and homogenous food system into a sustainable one.

Agriculture contributes some 10% of Europe's greenhouse gas emissions but it could make a big contribution to capturing carbon and restoring biodiversity. It's estimated that up to 70% of EU soils are unhealthy, and every year hundreds of millions of tonnes of soil are eroded, costing Europe's farmers 1.25 billion euros each year. And that degradation is set to escalate as climate change intensifies.

> **It's estimated that up to 70% of EU soils are unhealthy, costing Europe's farmers 1.25 billion euros each year**

Proposals on soil health – now out for public consultation – aim to make sustainable soil management "the new normal". 2030 targets for the EU's new Farm to Fork strategy include a 20% reduction in fertiliser use, a 50% reduction in the use of chemical pesticides and at least a 50% reduction in nutrient loss.

Public consultation has just concluded on a sustainable food system framework that aims to put sustainability at the heart of food policy and strengthen the resilience of food systems.

But how is the trend of accelerating soil erosion and diminishing soil health to be arrested, and could it even be reversed? The latest buzzword is "regenerative", with many of the world's largest food companies working with farmers on a basket of practices that were last widely used before the advent of industrialised agriculture, such as minimal tillage and keeping the land green with cover crops. ›

What's different now is the use of technology to monitor what is happening in the soil and having the data to compare across terrains and crops.

Companies including McCain, PepsiCo and Cargill have made commitments to advancing regenerative agriculture on millions of acres of land producing staples such as potatoes, wheat and corn.

In August, Carlsberg announced a new agriculture focus that aims to have 30% of its raw materials grown using regenerative practices by 2030, growing to all of them by 2040.

And pilots abound – with Nestle, Diageo, Lidl, AB InBev and Danish-Swedish Dairy cooperative Arla (for example) all involved in projects that could deliver emissions reductions.

Unlike organic, regenerative agriculture is not prescriptive, says Thomas Elmqvist, a professor in natural resource management at the Stockholm Resilience Centre.

"It's the goal that is important. You're open to innovation, new technology, modern plant breeding – all fine, as long as you apply a precautionary principle." Enshrined in European Union law, it essentially means better safe than sorry. "So it opens up much more space for innovation and experimentation, both for industry and farmers," says Elmqvist.

Elmqvist led on a recent project to advise EU policymakers. It identified "a number of these farming practices where you have quite impressive synergies that could enhance biodiversity and increase carbon capture, but you don't have to sacrifice agricultural productivity."

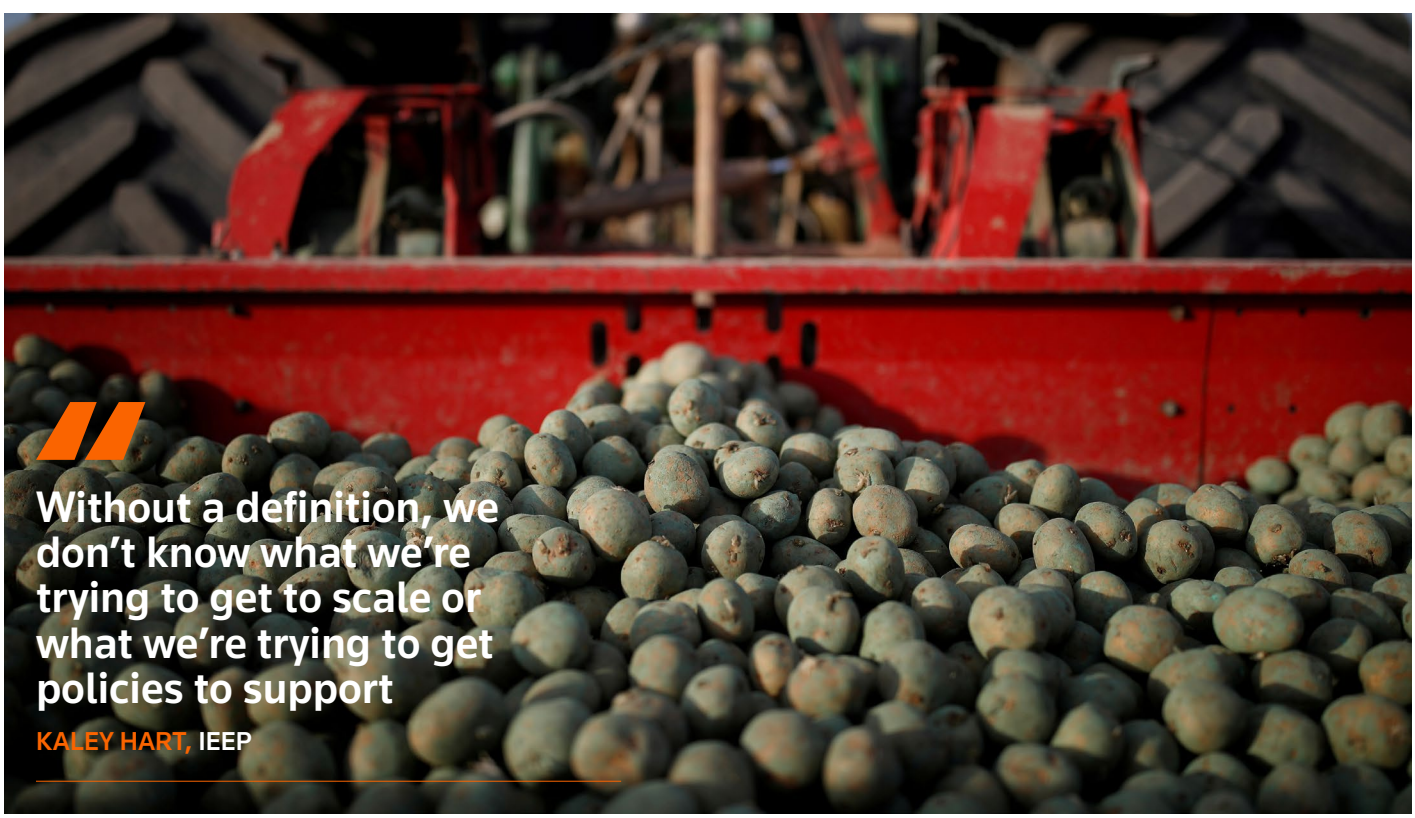
Indeed, some of the pilots now under way with food companies are showing promising results without reductions in yield, and an analysis of 30 long-running farm experiments conducted by the UK's Rothamsted Research suggests practices such as growing a more diverse range of crops and adding organic matter can reduce chemical fertiliser use, while still delivering high yields.

IDENTIFYING KEY INDICATORS

But having no hard and fast definition of regenerative agriculture potentially opens it up to "greenwashing", suggests Kaley Hart, UK executive director at the Institute for European Environmental Policy (IEEP). "It can be more or less ambitious (and) without a definition, we don't know what we're trying to get to scale or what we're trying to get policies to support." Beyond a definition, the right indicators are essential to know if goals are being met, she adds. What the food industry requires "has to be sufficiently robust to really deliver improvements".

Graeme Hamilton, director for sustainability, procurement, and circular ventures at AB InBev, suggests that while there's "a real willingness to understand what are the technical practices a farmer can do on their land to sequester carbon, because (companies) are doing individual pilots, there isn't yet consensus." ›

Companies have made commitments to advancing regenerative practices for staples such as potatoes, wheat and corn.



CHRISTIAN HARTMANN/REUTERS



CHARLES BOWMAN/SHUTTERSTOCK

Groupings such as the SAI Platform are working to get an industry-aligned approach, while one of its partners, the One Planet Business for Biodiversity coalition (OP2B) has agreed a framework for regenerative agriculture and converged on a series of impact indicators. Other companies, like retailer Lidl, are establishing their own metrics.

But regenerative practices have to work at the farm level, not only on individual crops, says Hamilton. OP2B director Stefania Avanzini agrees: "A farmer doesn't have one field for Nestle, one field for McCain." She told a recent soils conference that without alignment on a framework, on indicators, ways of working and co-financing, "transition won't happen because the farmer cannot respond to the specific needs of each company".

The group's first project is in France, exploring crop rotations with 100 farmers on almost 40,000 acres. It is in the early phases, but six companies, including Nestle, McCain, Mondelez and L'Oreal, have made a long-term commitment to buy the wheat, potatoes and sugar beet grown.

> **By having a focus on carbon, we can help incentivise farmers to adopt farming practices that improve soil health**
>
> **ANDREW VOYSEY, Soil Capital**

AB InBev is discovering which regenerative practices work well for its malting barley. Alongside partners, it's working with agronomy firm Soil Capital on a programme that pays for improvements in soil carbon. "By having a focus on carbon, we can do a pretty good job of helping incentivise farmers to adopt farming practices that improve soil health," says Andrew Voysey, head of impact and carbon at Soil Capital. These ultimately build resilience to both drought and flood.

The scheme has just delivered nearly 1 million euros to the first cohort of 100 farmers in France and Belgium for (independently) verified soil carbon improvements, enabling the food and drink companies providing the revenue to demonstrate reductions in carbon emissions in their supply chain.

But an agricultural transition won't happen overnight. In Soil Capital's experience it could take between five and eight years, depending on how heavily farmers have relied on chemical inputs. To reflect that, the scheme works over an initial five-year period. It's also knowledge-intensive, says Voysey. And herein lies the value of the data farmers generate – individual assessments, simulation and benchmarking allow farmers to learn from each other.

BEHAVIOURAL CHANGE

Sharing knowledge and financial risk is going to be key in making the transition, says James Ede, sustainability lead for Cargill's starches, sweeteners and texturisers business, which has also teamed up with Soil Capital. Ede suggests one option would be to encourage farmers to bring different crops into rotation by agreeing to purchase that crop or help them find market access through its partners, ›

The EU's Farm to Fork strategy includes a 20% reduction in fertiliser use by 2030.

thereby diversifying benefits. And sequestering carbon may only be the first service Cargill might purchase – water and biodiversity could follow.

Millions of farmers will have to be convinced to change behaviours. "That's where this advice, and knowledge-sharing and piloting is so critical," says Hart. "And corporations can drive this agenda by requiring their suppliers to produce in certain ways."

Voysey at Soil Capital agrees. "The role of the food and beverage supply chain is to start very clearly, smartly, in commercial terms, signalling to farmers that reducing their carbon footprint to the point where they're not only net zero, but better than that, is going to be valued," he argues. A final piece of the jigsaw is subsidy. "We need to ensure that policy is done in a smart way to work alongside private capital, or private markets" so that "we get more impacts from engaging multiple incentive streams rather than having them compete against each other."

> **The role of the food and beverage supply chain is to clearly signal to farmers that reducing their carbon footprint is going to be valued**
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> **ANDREW VOYSEY, Soil Capital**

As part of the Green Deal to reduce greenhouse gas emissions by at least 55% by 2030, the EU wants to scale up so-called carbon farming. It's expected to publish a regulatory framework for certification of carbon removals so that by 2030 carbon farming practices (such as regenerative agriculture) add 42 million tonnes of carbon dioxide to Europe's natural carbon sinks.

And while companies like Soil Capital will have detailed data for the farmers they work with, such granularity will need to be scaled across the EU. An economic research note from experts at Rabobank raises the question of how the framework will interact with the voluntary standards being set by companies and NGOs. They also caution that a robust mechanism will be needed to account for carbon release caused by natural disasters or new land management decisions, for example.

The Science Based Targets initiative is also developing new guidance (in conjunction with the big multinationals like Nestle, Danone, Ab InBev and Cargill) that will detail how they account for land-based carbon removals.



SHUTTERSTOCK

The Farm to Fork strategy encapsulates a broad range of policy levers aimed at addressing the whole food system. It also includes sustainability labelling of food products. But it's not yet clear what the requirements on food companies will be.

The EU's Farm to Fork and biodiversity strategies themselves are moving towards a more holistic approach to both food production and consumption chains, "but the policy implementation and financial incentives are still a bit fragmented," suggests Elmqvist. "You have some (incentives) in the Common Agriculture Policy (CAP), some in carbon farming and some in ecological restoration."

A reformed CAP, due to take effect from next year, is the main funding vehicle to enable farmers to deliver on the EU's soil health agenda, but member-states will set their own priorities.

But it's not enough to have policy support only at the farm scale, says Elmqvist. "For biodiversity, you have to take a landscape-scale approach. It's really time that we put the landscape scale on the table, and try to think of how can we develop policy and financial incentives for farmers or landowners to start collaborating."

In the meantime, industry pushes on with pilots. "What we can't do is wait for a policy and do nothing," says Hamilton.



Angeli Mehta is a former BBC current affairs producer, with a research PhD. She now writes about science, and has a particular interest in the environment and sustainability. @AngeliMehta.

Nature-depleted UK sets sights on greener food system post-Brexit

Nestle, PepsiCo and McCain Foods are trialling ways of driving down carbon emissions in their supply chains. Angeli Mehta reports



TOBY MELVILLE/REUTERS

Agriculture in the UK is on the threshold of change. Post-Brexit, the UK government and the devolved administrations of Scotland, Wales and Northern Ireland, want to incentivise more sustainable practices as they design farming subsidy schemes to replace Europe's Common Agricultural Policy.

Though they are moving at different speeds, all are aimed at cutting emissions, increasing biodiversity and restoring landscapes in one of the most nature-depleted countries in the world.

And some farmers are calling on the UK to support the transition to regenerative agriculture in response to spiralling fertiliser and fuel costs ›

The future King Charles inspects soil samples at an educational farming centre in Oxfordshire.

LECKFORD ESTATE/WAITROSE



in the wake of Russia's invasion of Ukraine. Multinationals Nestle and PepsiCo have large-scale pilots under way and retailer Waitrose, which owns its own farm, is using it as a test-bed for regenerative practices that will also influence its other producers.

The UK has experienced a steep decline in species abundance and soil health. A 2019 report from the Environment Agency said intensive agriculture had caused arable soils to lose 40-60% of their carbon content. Its outgoing chair, Emma Howard Boyd, described soil carbon loss as "an act of economic and environmental self-harm".

While a soil health action plan for England is on the cards, there is no specific target. The government's advisor, the Climate Change Committee, has urged that this be included "as a priority", given that soil health is key to meeting all other environment targets.

In 2020, agriculture was responsible for 11% of UK greenhouse gas emissions – can this be reversed and its soils become carbon sinks?

In England, the main mechanism for reducing greenhouse gas emissions from the agriculture sector, as well as increasing carbon stores, improving biodiversity and water quality will be the Environmental Land Management Scheme (ELMS). One strand of the scheme is the Sustainable Farming Incentive (SFI). Whereas the European Union's Common Agriculture Policy paid farmers and landowners based on farm size, the SFI will pay for environmental benefits beyond minimum legal requirements. Pilots are under way.

Two other pillars of ELMS will pay for actions in local areas that encourage collaboration between farmers, and bigger landscape-scale initiatives such as peatland restoration. The first 22 landscape projects, sharing a £12 million development grant, were recently announced.

Last year, parliament's Public Accounts Committee criticised the Department for Environment, Food & Rural Affairs (Defra) for a lack of metrics and baseline measures that will allow it to assess the progress of ELMs against net-zero targets.

The system, which will pay farmers and landowners some £2 billion a year, won't be fully in place until 2028.

But finance could also come from companies that are seeking to cut emissions in their supply chains.

FIELD TRIALS

Take Nestle. Ingredient sourcing accounts for 70% of the 92 million tonnes of carbon dioxide emissions in its global supply chain (excluding end-use emissions). The consumer goods giant has set a ›

Waitrose has its own farm, at which it is trialling regenerative practices.



The Sustainable Farming Initiative pays for environmental benefits beyond minimum requirement, such as peatland restoration.

REIMAR/SHUTTERSTOCK



NESTLE

Robin Sundaram, sustainable sourcing manager at Nestle UK: 'We have a massive responsibility.'

> **If we get it right, potentially there's this dual income for farmers, which is going to make them more interested in regenerative agriculture**
>
> **ROBIN SUNDARAM, Nestle UK**

goal of regenerative methods delivering 20% of its key ingredients by 2025, and 50% by 2030.

For Nestle this means grasslands storing more carbon, trees introduced onto pasture land; and regenerative practices such as cover cropping, using organic fertiliser and increasing crop rotations, which will also build climate resilience.

"We buy 1% of the world's agriculture output, so we have a massive responsibility," says Robin Sundaram, sustainable sourcing manager at Nestle UK.

The company has been working with sustainability consultants 3Keel on a Landscape Enterprise Networks (LENs) system, which identifies the businesses working in a landscape, and maps the nature they're reliant on.

Nestle first explored the approach with its milk supplier, First Milk, and farmers in Cumbria, but it is now looking at its second-largest UK-sourced ingredient: wheat. Water companies and West Northamptonshire Council have joined the initiative. Their interest is in flood management and the impact of fertiliser run-off on water quality. Other potential partners include insurers and housing developers, who will from next year have an obligation to deliver a 10% biodiversity net gain, under the Environment Act.

"If we get it right," says Sundaram, "potentially, there's this dual income for farmers (from selling their product and from environmental services), which can only be a good thing, because then ›



REUTERS/ANDREW YATES

Walkers crisps owner PepsiCo aims to boost regenerative practices in its potato sourcing.

IN NUMBERS

UK soils have lost **40%-60%** of their carbon content from agriculture.

England's new scheme will pay farmers and landowners **£2bn** a year.

Nestle aims to deliver **20%** of its key ingredients regeneratively by 2025.

it's going to make them much more interested in implementing regenerative agriculture."

Nestle asked farmers which of a suite of regenerative practices they'd be interested in trialling and what they'd want to earn for those efforts. While a farmer might opt for only one intervention, benefits might accrue to more than one partner, who can then share costs, enabling the whole project to reach more farmers than individual budgets allow. Last year, nearly £1 million was invested, and that's expected to double in the second year, and involve more than twice as many farmers.

Sundaram is cautious about results, saying: "It's early days." Initial data will be in terms of reduction in chemical fertiliser use, or cover crop planting, but longer term he expects that "we'll be able to say we've reduced carbon by X, we're improving biodiversity by Y and we've reduced pollution by Z".

Another company that wants to boost regenerative agriculture practices in its UK supply chain is PepsiCo, maker of Walkers crisps. David Wilkinson, senior director of European agriculture at PepsiCo Europe, says: "When we were thinking about how to reduce (our) carbon footprint, you're very quickly getting into carbon sequestration, into not using too much fertiliser, and applying it at the right times and incorporating crop residues ... and you very quickly start to get into regenerative practices."

Farmers are sharing practices and coming to the company with ideas, forcing it to think differently, says Wilkinson. One example is improving a crop rotation by building in a legume (such as chickpea), to fix nitrogen in the soil. So "we're starting to look at other ways to reformulate certain products that can take advantage of these crops. That doesn't necessarily mean you define whole new products around a new crop, but maybe dried chickpeas could replace 20% of the potato in potato flakes, for instance," he suggests.

Another initiative is fertiliser made from potato peelings, which is being trialled with all PepsiCo's grower groups in the UK. This is the third year of pilots, testing out the impacts of different and targeted application rates. "What we see with our eyes (is) the canopies look good, the crops perform ... and applying less (fertiliser) looks feasible," says Wilkinson. PepsiCo is now building a separate facility to produce the fertiliser for its farmers, using technology from CCm Technologies, a carbon capture and utilisation firm in Swindon.

"I can't remember the last time a farmer said they didn't need to change. They all get it," notes Wilkinson. But "the complexity is bringing this together in today's agricultural supply chain, thinking more about crop rotations versus individual crops, thinking about how you can introduce the right systems to support people renting land, rather than people perhaps owning land."

NEW BUSINESS MODELS

That complexity may explain why regenerative practices are being taken up only slowly. But several coalitions are trying to alter the trajectory.

"If we want to have resilient, productive agriculture going forward, then there's no room for people to take small, incremental steps," says Lesley Mitchell, associate director for sustainable nutrition at Forum for the Future.

The sustainability NGO wants to catalyse change by bringing together all those working on regenerative agriculture in the UK to create new partnerships, to pull retailers into discussions and explore "new business models that enable regenerative producers to reach consumers, ›



MATTHEW J/SHUTTERSTOCK

Crop rotation, cultivating grasslands and cover cropping help retain soil health.

perhaps (through) closer, tighter supply chains."

"There are many, many, many different explorations and pilots and prototyping going on out there. And it's often quite difficult to join those up, and to see where the key learnings are coming," she adds.

Mitchell also hopes to crack the nut of what can be shared in a pre-competitive environment. Pilots could take six to seven years, she says, so "consolidating the information that we have, identifying where there is a wider benefit... Do (businesses) have shared supply chains where they can work through their supply chain to create change?"

Earlier this year, Prince Charles, as he was then, asked companies to form an agribusiness task force as part of the Sustainable Markets Initiative, which he launched with the World Economic Forum. Its aim is to create a "scalable value chain blueprint" where lessons learned in one crop can be transferred more widely.

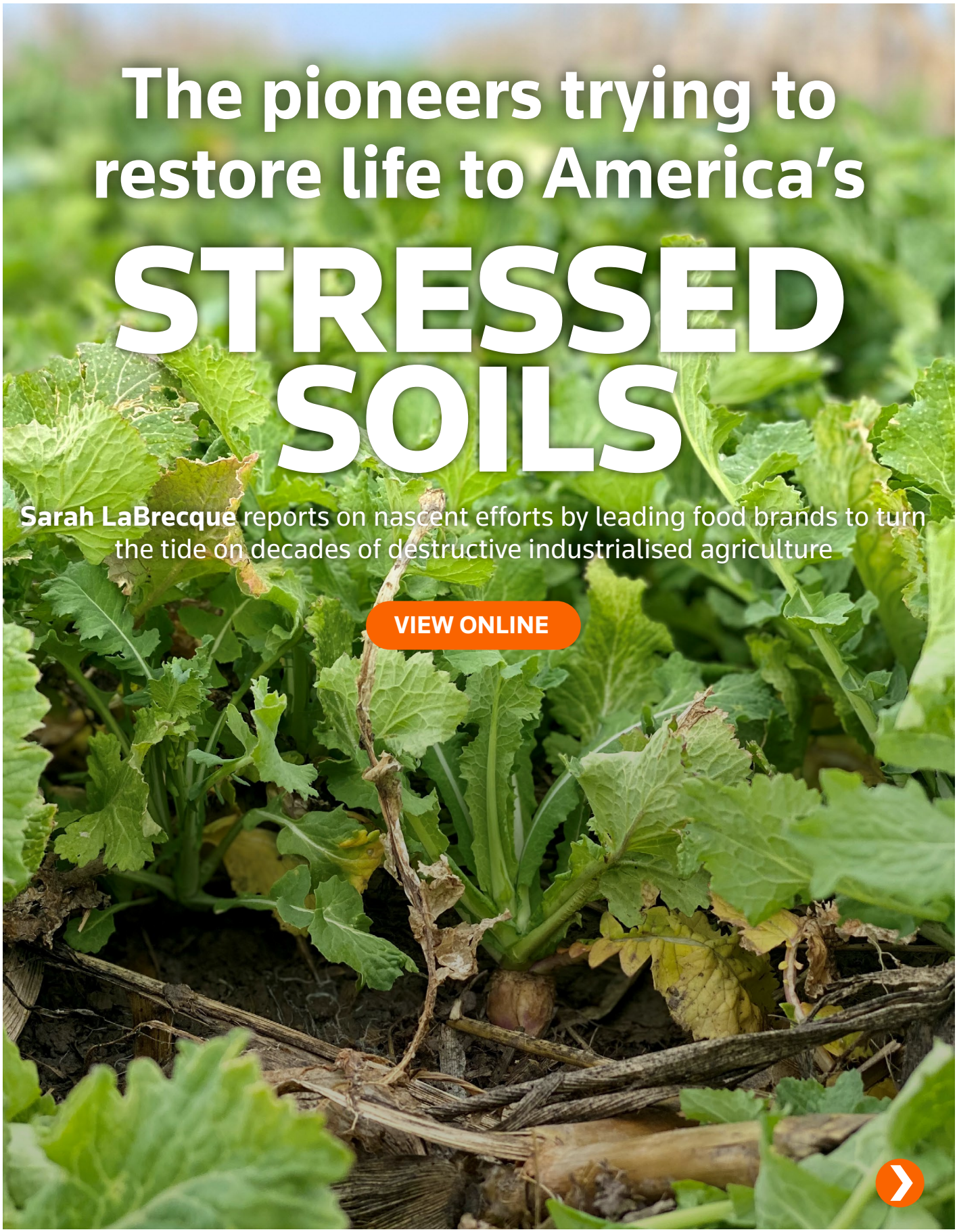
In the UK, potatoes are the target and PepsiCo will work with Canada's McCain Foods, the world's biggest manufacturer of frozen potato products, which has also committed to adopting regenerative practices across its potato crops by 2030.

Another key element is in measuring and reporting. The Sustainable Soils Association, which is focused on restoring soil health, is bringing together retailers, manufactures and others to try to find a way to standardise those processes. Nestle is a founding member.

> **There are many different explorations and pilots and prototyping going on, and it's often quite difficult to join those up**
>
> **LESLEY MITCHELL, Forum For The Future**

Both Wilkinson and Sundaram are optimistic about the direction of travel. "We don't know what the outcome is going to be right now of implementing all this ... (but) we just have to get on the journey," suggests Sundaram.

What is clear is that the net-zero agenda will tie farmers and the food companies they supply much more closely together.



The pioneers trying to restore life to America's STRESSED SOILS

Sarah LaBrecque reports on nascent efforts by leading food brands to turn the tide on decades of destructive industrialised agriculture

VIEW ONLINE

LUKAS FRICKE/HANDOUT VIA REUTERS

"Soils should look like black cottage cheese," says Gabe Brown, a farmer in North Dakota. Brown runs a 5,000-acre farm and ranch, but he is far from a typical midwestern farmer. A pioneer of the regenerative agriculture movement in the United States, Brown is on the road "280 days a year", he tells me in a recent interview, doing talks, liaising with other farmers and stakeholders, and imparting what he knows to anyone who will listen.

Of which there are growing numbers. According to a new report by the non-profit Forum for the Future, the regenerative agriculture movement in the U.S. has "never had more momentum". General Mills, Unilever, PepsiCo and Nestle are among the major food companies pledging large-scale support for this type of farming, which emphasises soil health, biodiversity and avoids the use of synthetic pesticides and fertilisers. Amazon-owned Whole Foods called it the number one food trend in 2020.

Of those food conglomerates recognising the value of more nature-based production, General Mills has been particularly vocal. It has pledged to advance regenerative agriculture on 1 million acres globally by 2030, an area that represents approximately 25-35% of its worldwide sourcing footprint. So far, more than 200,000 acres are enrolled in programmes they support, farmland located mostly in the Northern Plains, Southern Plains and Great Lakes regions of the United States and Canada, according to a spokesperson.

> **General Mills saw the value and resiliency to their supply chain if they educated farmers**
>
> **GABE BROWN, Understanding Ag**

General Mills is a founding member of the non-profit Ecosystem Services Market Consortium (ESMC). It runs an Eco-Harvest market programme, giving credits to wheat, oat, corn and dairy farmers in the U.S. and Canada for "improved ecosystem services" achieved through techniques such as using cover crops and reducing tillage. Started in 2020 as a pilot with the Kansas Department of Health and Environment, General Mills has now invested $3 million to scale up the programme, which quantifies and verifies carbon, greenhouse gas and water outcomes on farms through independent third parties.



GABE BROWN

Gabe Brown at his ranch in North Dakota.

General Mills is also partnering with tech firm Regrow Agriculture to monitor 175 million acres of farmland via remote sensing in North America, Europe and South America. "A key to scaling regenerative agriculture across any region hinges on measurement," says the spokesperson, adding that the partnership with Regrow will enable them to get a more accurate picture of the impact of regenerative practices and their net effect on emissions. Basically, they will be able to see if all of this is working.

In 2018, General Mills approached Brown's consultancy, Understanding Ag, to help teach oat farmers in the Northern Plains region of the U.S. about regenerative practices. "General Mills does not buy directly from farmers. They buy from grain terminals," says Brown. "But they saw the value and resiliency to their supply chains (that could result) if they educated farmers."

It all sounds very altruistic, but what's the true scale of this movement? According to Dr Kristine Nichols, a soil microbiologist and regenerative ›



DANE RHYS/REUTERS

agriculture expert, of the 900 million arable acres in the U.S., only about 1.5% is being farmed regeneratively. The Forum for the Future report says that there have been some positive shifts in the last few years, "around policy change, valuation of ecosystem services, alternative types of financial flows, demonstration of the business case and coalition-building amongst farmers", but these shifts are still nascent.

Nichols and Brown both point to crop insurance as a major sticking point. If farmers want to receive crop insurance for something that happened in the growing season, they need to have followed certain rules, she says. "Meaning you had to have treated with an herbicide, or if you had a cover crop, you had to terminate that cover crop by a particular date; you had to have added the recommended amount of fertiliser." Whereas conventional agriculture is practiced in a very prescriptive way, regenerative is "almost limitless", with regard to the cultivation and management options it might encompass, she explains.

Another barrier to the transition is upfront cost: seeds for cover or companion crops need to be bought, new harvesting or storage equipment procured, livestock potentially integrated. This same type of transition-centred investment is faced by farmers thinking about converting to organic.

> **If farmers want crop insurance they need to follow rules, meaning treating with herbicide or the recommended fertiliser**
>
> DR KRISTINE NICHOLS

In an attempt to overcome those barriers, a group of unlikely allies formed the Practical Farmers of Iowa in 2018: Unilever, PepsiCo, Cargill and ADM. The non-profit and two food brands plus their suppliers began working together on a regenerative agriculture after realising there was overlap both in the region where they sourced soy and corn, respectively, and in their long-term sustainability goals.

In Iowa, as much as 90% of the land is devoted to agriculture, and many farmers produce both ›

Only about 1.5% of the 900m arable acres in the U.S. is being farmed regeneratively.



U.S. President Joe Biden visits a family farm in Illinois - the U.S. Farm Bill is due to be updated later this year.

TOM BRENNER/REUTERS

soy and corn. By implementing a regenerative agriculture programme for farmers who provide crops for Unilever and PepsiCo – the former for use primarily in Hellmann's mayonnaise – a certain amount of de-risking for those farmers can be achieved.

Herrish Patel, nutrition North America general manager at Unilever, says that part of the reason they've been able to scale the project up is because of this shared-cost approach, where not only farmers but a network of interested parties, all shoulder the financial risk. "It's a shared cost; you've got to believe in it and share that investment," he says.

General Mills, maker of Cheerios, has approached Brown to help teach oat farmers regenerative practices.



ANDREW KELLY/REUTERS

And the result? The more than 90,000 acres that were planted regeneratively in 2021 as part of the program meant a 27% reduction in greenhouse gas emissions, according to PepsiCo.

PROOF POINTS

Having such proof points is helpful in trying to affect change at a policy level, says Patel. It's a reference to the U.S. Farm Bill, which is due to be updated next year, although he remains non-specific about what change exactly Unilever is pushing for. "It's too early to share. [But] we will continue to do what we're passionate about, and have a seat at the table and influence as much as we can." There are rumblings that the United States Department of Agriculture (USDA) is alert to the need to adapt. Earlier this year it announced a plan to double the country's cover crop plantings to 30 million acres by 2030 and its Partnerships for Climate-Smart Commodities programme, set out in February, "will provide up to $1 billion for pilot projects that create market opportunities for commodities produced using climate-smart practices".

Across the border in Canada, the Trudeau government has recently announced increased funding to boost regenerative agriculture, with C$25 million ($192.77 million) earmarked for the cost- ›



CANOLA COUNCIL OF CANADA

A canola field in western Canada where most farmers have practiced low and no-tillage since the 1990s.

shared Resilient Agriculture Landscape Program. Although sustainable agriculture proponents, such as the coalition Farmers for Climate Solutions, had hoped for more, they said there were "many positive outcomes" from the proposed new agreement.

Meanwhile, General Mills is working with charity ALUS on the Growing Roots programme, which will support farmers in communities in Saskatchewan and Manitoba who are interested in going regenerative. According to Lara Ellis, senior vice-president, policy and partnerships at ALUS, interest from farmers has been high, with waitlists for participation now being compiled.

While there is still much to be done to scale up regenerative farming in Canada, Manitoba-based Robynne Anderson, who heads up consultancy Emerging Ag, says certain practices are already widespread. "Most of western Canada, probably about 90%, moved to conservation tillage back in the 90s," she says.

A company called Flexi-Coil introduced a piece of equipment that allowed for direct seeding: planting via a small burst of air, and the practice was readily taken up.

Back in the U.S. Midwest, adaptation can't come too soon. Iowa soil, for instance, was once among the most fertile on the planet, but is now rapidly being depleted. The average topsoil depth has decreased from around 14-18 inches at the beginning of the 20th century, to six to eight inches by the year 2000.

"I have never been on a single farm, including my own, (where the soil) is not degraded," says Brown. "With the vast majority of farmers we work with, 75% of the carbon that was once in those soils is now in the atmosphere."

Since transitioning to regenerative methods in the 90s, however, Brown's farm has quadrupled the amount of organic matter in its soils, which are now able to infiltrate 30 inches of rainfall per hour, up from half an inch per hour. "(That's) an unheard of amount," he says.

And as far as infiltration goes, signs do point towards an increased understanding among large companies and government of the value of agricultural methods that put soil health first. Despite the barriers, that shiny altruism that often pervades corporate sustainability agendas perhaps isn't as bogus as it can be in other sectors. "There's no ill will amongst anyone working in this space," says Anderson. Just a diverse group of people working towards a more sustainable agricultural and food future through better soil health: that coveted black cottage cheese.



Sarah LaBrecque is a freelance writer who splits her time between Ottawa, Canada and Hertfordshire. She writes about sustainable business and ethical living for publications such as the Guardian, Positive News, and for a range of B2B clients.

From hemp to Kernza, the hunt for more resilient food crops

VIEW ONLINE



THE LAND INSTITUTE

The world's agriculture systems have become more homogeneous with consequences for food system resilience, security of supply and biodiversity. At the same time, climate change is impacting yields. This summer's drought may mean yields of crops like maize are down as much as 16%, and Russia's invasion of Ukraine has provoked a global grain shortage.

Can we (and our livestock) eat differently and consume more diversely? Most of the crops grown today are annual – so the soil is ploughed yearly, a practice that, alongside fertiliser use, contributes to soil carbon loss and water pollution.

But plant breeders at the Land Institute in the U.S. have been working for 20 years to develop a wild perennial grass – Kernza – that they expect one day to yield as much grain as annual wheat. Kernza has a massive and deep root system.

"It's not that the plant needs less water, it's just better at getting it and retaining it," explains the institute's communications director, Tammy Kimbler. And because the roots stay in the soil, they encourage a diverse community of micro-organisms that contribute to soil health and nutrient retention.

Kernza still requires fertiliser input, but it takes up more than 90% of nitrogen applied, compared with a 40% take-up for wheat – so less is needed, and less is being released into the atmosphere or into waterways.

Today, Kernza is mostly being blended with wheat to make flour for bread products. The Land Institute has worked with brands like Patagonia Provisions, which has developed a commercially available craft beer; General Mills, which is working on a cereal product; and most recently, Carlsberg's research division. In Europe, Kernza ›

has yet to achieve food-grade status, but it's being investigated by farmers in France and Sweden.

Modern agriculture consumes 70% of freshwater supplies, so efforts are also under way to make staple crops such as barley, rice, wheat and soybean less thirsty, and so more drought tolerant. With her research group, Julie Gray, a plant molecular biologist at the University of Sheffield, has genetically engineered a range of crops so they lose less water through their leaves during photosynthesis. The challenge now is to deliver the same improvements via gene editing or plant breeding. In Mexico, where early droughts are wiping out bean crops, researchers have been using thermal imaging cameras to look for bean plant mutations that have higher temperatures at the leaf surface because they're losing less water.

The potato bean, once a staple crop of native Americans, is a good source of dietary fibre, essential amino acids, and is high in protein

MADALINA NEACSU, Rowett Institute

Ten years ago, Madalina Neacsu at the Rowett Institute in Aberdeen started to look for alternative sources of protein that might grow in the UK. Lupins, fava bean, quinoa and chia all made it to her shortlist but the potato bean, once a staple crop of native Americans, had a particular allure. This high protein tuber also provides a good source of dietary fibre, essential amino acids, while the peel and leaves are rich sources of antioxidants (usually associated with fruits like blueberries). And it's good for the soil because it fixes nitrogen.

Field trials are underway at two UK sites.

Neacsu is now working on a five-year project with farmers in Scotland to explore the potential of hemp (once widely grown) to capture and store carbon in soil. It could provide a good rotational crop for wheat, and to make oil.

Neacsu says hemp oil has a good nutritional profile of essential omega fatty acids, as well as dietary fibre. It may also contribute to gut health. There is one major hurdle to cross: hemp is in the same species as cannabis – a class B drug in the UK, so farmers can't produce their own seeds for cultivation.

Angeli Mehta



UNIVERSITY OF ABERDEEN

The Rowett Institute in Aberdeen University is exploring the potential of hemp to capture and store carbon in soil and make oil.



SRUC

The potato bean is undergoing field trials in the UK as an alternative crop staple.

Winemakers turn to sustainability to weather the storm

Mike Scott reports on how an industry that is a canary in the coal mine for climate change is adapting to become more resilient

VIEW ONLINE

Winemaking has always been affected by the weather and climate – it's inherent in the phrase "a good vintage". The quality of the wine can be affected by too much rain or not enough, temperatures that are too high or too low.

But recent extreme weather events around the world – from droughts and heatwaves to floods and prolonged, heavy rainfall – mean that sustainability is becoming ever more important to the sector.

"All seriously minded wine regions in the world today are entirely focused on sustainability. They have to be," says Clare Tooley, a California-based Master of Wine working at Boisset's Collection, which makes wine in Burgundy, the Rhone, Champagne, the South of France and California.

France saw its smallest harvest since 1957 last year, which cost the industry around $2 billion in sales. One vineyard in Champagne produced nothing because of too much rain and a heatwave; normally it would send up to 50,000 bottles to market.

The California wildfires of 2020, and similar events from Australia to Argentina, from Portugal ›

JENNIFER LORENZINI/REUTERS

Grapes rot on the vine amid this year's heatwave and drought in the Chianti region of Tuscany, Italy.



XAVIER AMIRAULT

Xavier Amirault practices agroforestry methods at Clos des Quaterons in France's Loire Valley.

to Provence, Italy and Greece, not only destroy vines. The smoke from the fires can also ruin grapes up to 100 miles away, making the wine they produce undrinkable.

A study published in Proceedings of the National Academy of Sciences found that if temperatures rise by 2 degrees Celsius, viable wine-growing regions could shrink by more than half. Wine is an important indicator of the impacts of climate change because wine grapes are extremely sensitive to the changes in temperature and season that come with climate change. It could also help other agricultural sectors to adapt, in part because of its diversity – more than 1,100 different varieties are grown today, under a wide range of conditions — and partly because harvest data stretches back centuries.

"In some ways, wine is like the canary in the coal mine for climate change impacts on agriculture, because these grapes are so climate-sensitive," says the study's co-author, Benjamin Cook from Columbia University's Lamont-Doherty Earth Observatory and the NASA Goddard Institute for Space Studies.

But the industry's diversity – geographically and historically – means that adaptation strategies look very different in different wine-growing regions. "New Zealand has been pioneering, partly because their smaller scale and relatively newcomer



Wine is an important indicator of the impacts of climate change because grapes are extremely sensitive to changes in temperature and season

status has supported it," says Tooley. "The 'older' territories, like France and Italy for example, have had to adapt and modify systems and farming practices that have been in place for centuries."

Meanwhile, some of the obvious solutions, like increasing irrigation, are needed at a time when climate change has led to massive water shortages, making it more difficult to introduce them. "Water usage is probably the most pressing issue here in the U.S., but also in Australia, South America, South Africa and parts of Europe," says Tooley. Winemakers are using a range of methods to reduce water use, including dry farming, controlled irrigation, water sensors and the use of less thirsty clones and rootstocks.

Some have resorted to spraying grapes with ›

"sunscreen" – made from white clay – or using treated wastewater for irrigation.

In New World wine areas, growers have the option of planting more heat-resistant grape varieties or moving nearer to coasts, where it is cooler. In closely defined appellation areas such as Bordeaux or Barolo, however, moving is not an option. And in some regions irrigation is heavily regulated, says Linda Johnson-Bell, founder of the Wine and Climate Change Institute. "Many regions are running out of water and we are seeing the world's wine map change," she adds.

Wine making is now becoming more established in England and Wales, for example, with even countries such as Scotland and Denmark growing grapes. "We're getting a longer growing season. Ten to 15 years ago, you could not guarantee a mature harvest in the UK, but now you can," she points out.

Many vineyards are turning to traditional methods of production, including regenerative agriculture and agroforestry. While many vineyards feature nothing but vines, a growing number are now using cover crops, such as grasses and legumes, and brassicas like mustard and rapeseed, in between the rows of vines to reduce soil erosion, supply nutrients and ensure soil is aerated, as well as creating a habitat for birds and insects. Vineyards such as Umbria's Di Filippo vineyard and Clos des Quarterons in the Loire Valley, have geese roaming the estate, fertilising the soil and eating pests and weeds.

IN NUMBERS

If temperatures rise **2C**, viable wine regions could shrink by **50%**

Wine packaged in flat plastic bottles takes up **40%** less space during transport

Pernod Ricard is to pilot regenerative agriculture in eight wine regions by **2025**

Moët Hennessy, one of the biggest names in the wine sector, organised the first World Living Soils Forum in Provence earlier this year, and has phased out herbicides in its own vineyards as well as helping its contracted growers to become more sustainable. Another industry giant, Pernod Ricard, plans to develop regenerative agriculture pilot schemes in eight wine regions by 2025. Martell Mumm Perrier-Jouët, for example, has embarked on a four-year programme to trial regenerative viticulture in Cognac and Champagne. It is piloting climate-resistant grape varieties, cover crops and the use of precision farming technology to optimise soil and vine health and increase biodiversity.

"We see regenerative agriculture being as much about people as it is about the land," the company says. "By supporting our farmers to transition ›

FRED GREAVES/REUTERS



A farm worker plants a drought-resistant grapevine in California.



JENNIFER LARSEN MORROW/SHUTTERSTOCK

Clover is planted as a cover crop between vines in Oregon, U.S.

to regenerative agriculture practices, we are encouraging a holistic approach that focuses on the entire farming ecosystem – the terroir, the soil, the wildlife and plants, and of course the people who work the land. We can have a real impact on mitigating climate change, protecting ecosystems, enhancing biodiversity, restoring the soil and improving livelihoods throughout the world."

Other techniques and technologies to reduce the industry's footprint include the use of drones and artificial intelligence, drip irrigation systems and real-time soil sensors.

Wineries are even redesigning cellars to make them more sustainable – using gravity instead of pumps to move the crushed grapes to flow into tanks, reviving a practice that goes back centuries. Chateau Montrose in Bordeaux powers its winemaking process using solar panels and geothermal energy. Packaging, distribution and shipping are also areas with a lot of potential to cut back on CO_2 emissions.

"As an industry we are still heavily reliant on antiquated vessels – let's face it, glass bottles are heavy," says Tooley. "The industry has seen a significant increase in bulk wine shipment for bottling in country of destination rather than (where they are produced). Packaging innovations such as lightweight, recyclable, degradable (paper bottles), cans, pouches, bag-in-box and refill containers continues to evolve."

> **By supporting our farmers to transition to regenerative practices, we are encouraging a holistic approach that focuses on the entire farming ecosystem**

Moët Hennessy's Chateau Galoupet estate in Provence is the first to sell a premium wine in flat bottles made from recycled plastic. The bottles not ›



DOMAINE AMIRAULT

Ducks among vines at Le Clos des Quarterons in France.

only have a lower carbon footprint than glass ones, they also take up 40% less space on a truck and are a 10th of the weight of glass bottles, which makes them easier and more efficient to transport.

"There is a lot of good work taking place around the world," says Richard Bampfield, a master of wine, and co-founder of the Sustainable Wine Roundtable (SWR). "But wine's Achilles' heel is the fact that it is so fragmented. There are dozens of countries producing wine and lots of regions, often acting unilaterally, rather than on a national basis. There are hundreds of thousands of grape growers and wine producers. It's a challenge sharing data and getting people to cooperate."



MOËT HENNESSY

Moët Hennessy's Chateau Galoupet estate's premium wine is sold in flat bottles made from recycled plastic.

The SWR claims to be the only global, independent roundtable to include the whole wine value chain, and it aims to develop a global sustainability reference standard "that learns from the existing regional and local initiatives, building on the best from each", according to Toby Webb, executive director of the SWR. The goal is for the SWR to become a global, multi-stakeholder platform that will allow the wine community to take its place as a sustainability leader.

"Creating a great wine legacy is a multi-generational endeavour. It always has been," says Tooley of Boisset's Collection . "At the very heart of the fine wine world is an understanding that we are simply stewards at any given moment, that the greatest wine will be made by our grandchildren and great grandchildren, and that our duty therefore is to protect what we have inherited and strive to bequeath a healthy future. Sustainability is all we do."



Mike Scott is a former Financial Times journalist who is now a freelance writer specialising in business and sustainability. He has written for The Guardian, the Daily Telegraph, The Times, Forbes, Fortune and Bloomberg.



RICK WILKING/REUTERS

VIEW ONLINE

Beef and dairy firms pushed to innovate to tackle methane emissions

Mark Hillsdon looks at pilot projects from seaweed in cattle feed to new grazing practices, but asks whether the industry is going fast enough

In June, LOME, billed as the world's first low-methane beef, appeared on supermarket shelves in Sweden. It was the outcome of a pilot project by biotech company Volta Greentech, Coop Sweden and food company Protos. The cows had been fed on a food supplement made from red algae, which studies had shown could reduce the methane produce by so-called cow burps by 80%.

For several years seaweed has been touted as a saviour for a beef and dairy sector attempting to get to grips with emissions of methane, a greenhouse gas 80% more potent than carbon. According to the U.N. Environment Programme (UNEP), 32% of human-driven methane emissions are created by livestock manure and belches, but despite its potency, the gas is short-lived in the atmosphere ›



CLODAGH KILCOYNE/REUTERS

Seaweed has been touted as a saviour for dealing with methane emissions from cattle.

compared to CO_2, which means tackling it now can bring quicker returns.

At COP26, over 100 nations pledged to cut methane emissions by 30% by 2030, and high on their list was addressing the impact of a global cattle population estimated at 1.5 billion.

In the wake of the successful court case brought against it in 2020 by Greenpeace for not doing enough to tackle climate change, the Dutch government recently announced sweeping proposals to tackle the country's nitrogen emissions, 41% of which comes from its farming sector. Plans include closing upwards of 11,000 farms, while forcing thousands of other farmers to significantly reduce their livestock.

And with new EU anti-pollution legislation designed to tackle emissions of nitrogen, sulphur and other gases, other countries may follow suit.

Ruaraidh Petre, head of the Global Roundtable for Sustainable Beef, says companies in the beef and dairy industry are starting to look more closely at their supply chains.

"The EU, UK and Japan, they're all starting to ask these large corporations to report on Scope 3 emissions," he says, "(and) if you're going to report on those, you're going to have to know your supply chain pretty intimately."

Investors want more monitoring and measuring from the biggest producers too, explains Max Boucher, senior manager for research and engagement at the FAIRR Initiative, which works with institutional investors on material issues linked to intensive farming systems.

"There is definitely a push for producers to be very transparent about what's happening in their supply chains, and for them to set targets to resolve those issues... (with) clear time-bound milestones," he adds. ›



Lome is billed as the world's first low-methane beef.
VOLTA GREENTECH

Enteric methane in cattle is produced by archaea, a micro-organism in cows' stomachs that allows them to digest plant fibre. Adding supplements such as seaweed to their diet can inhibit the enzyme that triggers the gas.

However, says Petre, scaling up the production of natural additives such as seaweed to meet demand is a huge undertaking, and artificial alternatives may be a more realistic option. Dutch company DSM, for instance, has developed a supplement that can reduce methane by as much as 90% in beef cattle, and is working with JBS, one of the world's largest meatpackers, on a trial with 30,000 cattle to find the best way to integrate it into their feed.

Manure is the other great methane producer. While less of a problem with cattle that graze over extended areas, where it becomes a natural fertiliser, it is a serious issue on farms where cows spend much of their time indoors.

Methane digesters can help bring circularity to manure, says Boucher, by turning it into energy. Some digesters go a step further, extracting nutrients such as nitrogen, potash and phosphorus from the dung, and turning them into a natural fertiliser, leaving just a benign organic material that can then be used as a soil improver.

Storing manure in a slurry lagoon can lead to significant emissions of both methane and nitrous oxide, says Petre, but "if you can capture these two very powerful gases, it can dramatically reduce your emission profile."

How cattle graze can also affect the carbon footprint of beef and dairy farms. The better the grass, the more digestible the diet, explains Petre, and that means fewer emissions. In fact, he says, farms can "easily" cut emissions by 30% by adopting better pasture management, sward composition and more rotational grazing.

Earlier this year, Ben & Jerry's ice cream launched Mootopia, a project to reduce total greenhouse emissions by 50%, on 15 of its dairy farms in North America and the Netherlands by the end of 2024. The $9.3 million project is funded through parent company Unilever's Climate and Nature Fund. ›

IN NUMBERS

DSM's animal feed supplement can reduce methane by as much as **90%** in beef cattle

Ben & Jerry has a project to reduce GHG emissions on **15** dairy farms by **50%**

Regenerative practices in a Danone dairy project in Mexico have seen carbon emissions fall by **13%** and farmer incomes triple



> **Methane digesters turn manure into energy. Some extract nutrients from dung and turn them into a natural fertiliser, leaving a benign organic material**

WIKIMEDIA COMMONS

Cattle are fed seaweed and have access to high-quality forage, with the farms growing more grass and other feed crops such as nitrogen-fixing leguminous plants, which help to maintain healthy soils, increase carbon sequestration and lower synthetic inputs. Solar panels have also been installed on barns, while methane digesters generate both fertiliser and electricity.

In Mexico, the Margarita programme is part of the Danone Ecosystem Fund and has been working with over 500 small-scale dairy producers for the last 10 years. By introducing regenerative practices such as better water management, reforestation and reduced pesticide use, as well as using more locally sourced food in the cattle's diet, farms have reduced their carbon emissions by 13%. The dairy farmers have also seen their incomes triple, with Danone now buying 24% of its milk in Mexico from small-scale producers, the company says.

Another solution for beef may be what is known as the complete cycle farm, when a calf spends its entire life in the same place. Generally, cattle that pass through a succession of farms are not as well-managed, and produce far more emissions as a result. The system means better grass too, so that cow grows faster and can be slaughtered sooner.



HENRY ROMERO/REUTERS

Nearly 90% of beef's water footprint is from irrigating fodder crops such as alfalfa.

We need to find much more water-efficient ways of feeding cattle in areas where they're not just grazing

RUARAIDH PETRE, Global Roundtable for Sustainable Beef

It can also improve the traceability of the cattle, and help close loopholes, says Petre, with the indirect supply of cattle still a major issue in South America. "It is very hard to trace an individual animal unless you have a national identification system," he says. "That is a key aspect of a true sustainable beef supply chain: it has to be transparent, and it has to be traceable ... retailers need to be able to look into their supply chain."

Sustainable densification is another option, with more animals per hectare, breeding taking place at a younger age, and slaughter after 18 months, not 30. In this way it takes less time to produce the same amount of meat, while creating less methane.

But Boucher of FAIRR says one of the downsides to this is that a large population of animals in a small space can lead to issues with water quality, so good slurry management is crucial. But the way in which beef and dairy use water is also under scrutiny.

Nearly 90% of beef's water footprint is from irrigating fodder crops or hay, says Petre. "Feed is highly water intensive," he concedes, pointing to the western U.S. states, where fodder crops such as maize and alfalfa are grown, and aquifers are running dry. "We need to find much more water-efficient ways of feeding cattle in areas where they're not just grazing.

"While overhead sprinklers have become the norm and flood irrigation is a thing of the past in water-scarce environments, there are technologies such as subsurface drip irrigation that can radically further improve irrigation efficiency," he explains.

Dryland crop production, which relies on using moisture stored in the soil, and more drought-tolerant crops, are also being looked at as possible solutions.

In South Africa, several dairy farms that serve Nestle, including the Skimmelkrans Net Zero farm, have computerised soil moisture readers installed on pastures which are irrigated. The probes measure soil moisture at different root depths to maximise water savings.

Alternatives to crops such as soy are also being researched. Candidates include black soldier flies, which are 45% protein and 35% fat, and can be fed ›



ANDRES STAPFF/REUTERS

A cattle ranch in Central Valley, California.

on waste from other industries.

But Felipe Villela, founder of ReNature, which supports farmers and companies to scale up regenerative agriculture, isn't convinced the industry is doing enough to address its environmental impacts. "They're still far away from having truly regenerative beef production, as it demands lots of time, investment and practice in the field. The whole meat sector is moving slowly and not looking at transitioning at scale within their supply-chain but rather just thinking on a pilot mode."

So is the only way to truly address the impact of livestock on the climate to eat less meat and dairy?

"It's about diversification and innovation, rather than completely giving up," says Boucher, but alternative proteins will have a big role to play.

Last year, FAIRR's Appetite for Disruption: The Last Serving, showed that major food companies were responding to the growing consumer demand for meat and dairy alternatives. Names including Nestle and Unilever are among those to have adopted targets for protein diversification, while investment into "cultivated meat and seafood" topped over $1.4 billion in 2021.

Look at the last raft of reports from the Intergovernmental Panel on Climate Change (IPCC), suggests Boucher, and they're "very much supportive of increasing the amount of plant-based protein in global diets and decreasing animal protein. (It) gives as one the clearest routes to achieving the Paris agreement goals."



Mark Hillsdon is a Manchester-based freelance writer who writes on business and sustainability for The Ethical Corporation, The Guardian, and a range of nature-based titles including CountryFile and BBC Wildlife.

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Seeing the cows and the trees



ECOFARMS

VIEW ONLINE

Mark Hillsdon reports on the rise of silvopastoralism, a form of livestock production that works with nature, rather than against it

VIEW ONLINE

Cows have a justifiably bad name for their climate impact, from methane emissions, to water usage, to driving deforestation, with livestock estimated to be responsible for 51% of greenhouse gases in Brazil.

But they can also be farmed in a way that can tip the scales into positive environmental impact. It is a form of agroforestry called silvopastoralism, and is growing in popularity around the world.

On the Brazilian Cerrado, Bruno Junqueira de Andrade has been steadily introducing silvopastoralism to Ecofarms, the farm he took over from his father in 2015. He practices rotational gazing, with cattle given access to nutritious forage grasses, herbs, shrubs and trees. This improves their diet, while the plants boost the fertility of the soil and improve water filtration. The trees also provide shade, offering livestock a welcome respite from the heat.

There are important financial benefits, too. The combination of different plant species ensures fodder is available all year, so there is no longer any need to buy in feed. The plant diversity supports pollinators, and ranchers can also harvest other forest products such as fruit, honey and sustainable firewood.

The addition of trees and other plants can also help to neutralise emissions by increasing carbon storage.

"The whole farm is sustainable," says Andrade, ›



LIVELIHOODS FUNDS

A boom in milk sales means cows are often the most profitable part of a smallholder's farm.

with 45% of the 812 hectares preserved as native forest, and the rest being turned over to silvopastoralism year-by-year.

It's an approach that means Andrade can sell around 300 head of cattle each year through Granbeef, a sustainable Dutch meat brand, with certification by Rainforest Alliance. But a further 800 cows still go to the Minerva slaughterhouse, one of the biggest beef exporters in South America, which, he says, "don't pay a price for sustainability yet".

"It's not easy," he continues. "We need more engagement from consumers for sustainable food. This is happening, but slowly."

Ten thousand kilometres away in Kenya, on the foothills of Mount Elgon, cattle farming takes place on a completely different scale. Here smallholders keep just one or two cows, explains Jonathan Domarle, a senior project manager at Livelihoods Funds, which provides impact investment to support more sustainable food production. The organisation is halfway through a 10-year project to revolutionise dairy farming in the region.

Many cows aren't fed properly, he says, especially in the dry season, when there is little more than nutrient-poor maize stalks available. As a result, cattle are often in poor health, while milk production is low.

> **We need more engagement from consumers for sustainable food. This is happening, but slowly**
>
> BRUNO JUNQUEIRA DE ANDRADE

Yet the cows are often the most profitable part of the farm, he says, thanks to a boom in milk sales across Kenya. By helping the farmers to look at the economics of their farm, Domarle and his team are helping them to meet this demand.

As in Brazil, the emphasis is on improving the quality of the fodder given to the cows, although in this case to improve milk production. By encouraging the farmers to replace some of the maize they grow with nutrient-rich fodder crops such as elephant grass and the shrub *Calliandra calothyrus*, farmers can double the daily milk production from each cow to seven litres, while also boosting its protein content.

The project is also about reducing carbon ›



TWITTER

Tim Downes on his farm in Shropshire where he has introduced more trees for his beef and dairy herds to graze.

emissions, says Domarle, both through farming methods and improving the efficiency of the cow, with a better diet helping to cut the amount of CO_2 produced per litre of milk.

"The key aim is to increase the quantity of milk that each cow produces but without asking the farmer to buy more feed from outside," he says.

It's a long-term progression, but farming is very long-term, and we can't change it in six months

TIM DOWNES

The plots are often no more than couple of hectares, but many are now surrounded by ditches that collect rainwater, their banks carpeted in lush green grasses and sweet potatoes, while trees – some planted for timber, some for fruit – also mark out the boundaries between each plot. This has led to a root system that holds the soil together and prevents erosion.

The scope of the project is huge and has so far engaged with more than 15,000 farmers. Most of the milk is consumed locally but there are also opportunities to sell any excess to local co-operatives and milk companies such as Brookside, which is partly owned by Danone.

In the UK, Tim Downes has found another benefit of silvopastoralism: plant the right trees, he says, and cows can self-medicate.

His Shropshire farm has 150 beef and 500 dairy cows and went organic in 1998. Since then, he has worked with the Woodland Trust to introduce more trees, including willow, which is rich in salicylic acid, an active ingredient of aspirin. By grazing the trees, and eating a nutrient rich willow hay during winter, the farm's medical bills have dropped considerably.

Downes has also planted other native trees, including sycamore and hornbeam, where the emphasis is on improving the soil and pasture. "Rye grass is the mainstay of grassland land production in temperate regions (but) it doesn't root deeply so accesses nutrients in the top of the soil," he explains.

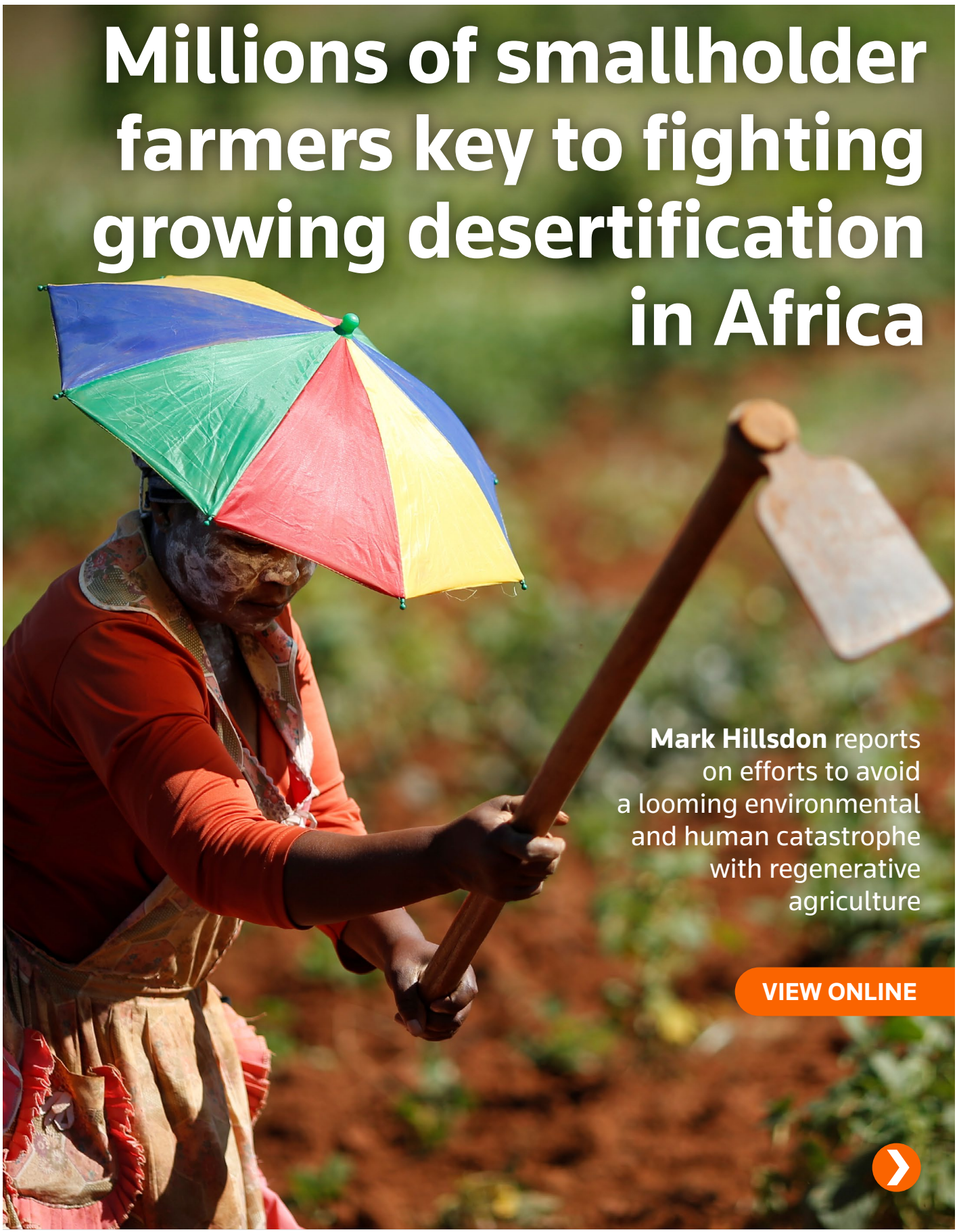
Different trees have different rooting zones, he continues, and bring up different minerals to the surface, allowing different forage crops to thrive. The trees also make the soil more friable, and he has found far more worms at the base of trees then in the more compacted pastures that don't have the sylvan cover.

Downes sells much of his beef to Waitrose's organic scheme. "We couldn't access that market with Waitrose if we were farming intensively," he says, while much of his milk goes to the Organic Milk Suppliers Co-operative. The way in which he runs his farm has also allowed him to access the lucrative American organic market.

"It's a long -term progression," he adds. "But farming is very long-term, and we can't change it in six months."

By Mark Hillsdon

Millions of smallholder farmers key to fighting growing desertification in Africa



SIPHIWE SIBEKO/REUTERS

Mark Hillsdon reports on efforts to avoid a looming environmental and human catastrophe with regenerative agriculture

VIEW ONLINE



REUTERS/BAZ RATNER

More than 65% of Africa's land is considered degraded, and the risk of further desertification grows by the day. Crops now wither in the once fertile fields of northern Ghana, as prolonged droughts dry up water courses, while the mountain forests of Kenya, known as its "water towers", have been stripped back and denuded by agriculture and logging. In Sudan, the arid climate and poor irrigation mean that more than 500,000 hectares are now affected by salinisation.

A vicious circle of unsustainable farming, which exacerbates climate change and leads to further extreme weather events, is behind the degradation of Africa's soils. Western farming techniques, which may have yielded crops and vast profits for the last century or more, are now being found wanting, as more and more inputs are needed to repair soils that have become barren and eroded.

Livestock and poor soil management continue to increase agriculture's carbon footprint, too. It is an environmental catastrophe that also brings human misery: according to the World Economic Forum, 228 million people in Africa face chronic hunger.

A raft of initiatives and projects continue to try and halt the erosion of Africa's ability to feed itself, from philanthropic foundations to corporate interventions, with many are now coalescing around regenerative agriculture as a crucial solution.

According to a report from the International Union for Conservation of Nature (IUCN) and Vivid Economics, harnessing regenerative agriculture to repair Africa's degraded lands could be worth $70 billion to farmers. The report demonstrates how a transition to practices such as agroforestry and better soil management can improve human nutrition and livelihoods, and boost ecosystem health.

It also conservatively estimates that regenerative practices could increase yields by 13% by 2040, while also creating five million new full-time jobs in farming, processing and supportive industries. In the same time frame, if 50% of Africa's farms adopted these techniques, the additional carbon benefit alone could equate to 4.4 gigatonnes of ›

A scientist from the Famine Early Warning System Network in Africa talks to a farmer after he uprooted his drought-hit maize field.



Each of Restore Nature's farms are designed to fit in with local markets that farmers can sell to.

AKINTUNDE AKINLEYE/REUTERS



WIKIPEDIA

carbon dioxide equivalent ($GtCO_2e$) – almost 10 times South Africa's annual emissions.

The catch? Commenting in the report, Elizabeth Nsimadala, president of the Pan African Farmers Organization, said: "It will not be realised at a meaningful scale without the buy-in of millions of smallholder farmers. Agribusinesses and governments need to step up their investments and their supportive policies to give agency to the small farmers who, collectively, can make big changes. Maybe then, the report's best-case scenario will become a reality."

SMALLHOLDER FARMERS

Africa has 350 million smallholder farmers – more people than the population of the United States – and involving them is a key part of Restore Africa, a new carbon finance model established by the Global EverGreening Alliance. It has set out to restore 1.9 million hectares of land across six African countries – Kenya, Ethiopia, Malawi, Tanzania, Uganda and Zambia. In May, Climate Asset Management became the first investor in the programme, with a $150 million financing package.

The project will show how corporate investment can significantly increase the benefits of farmer-led land restoration, explains Chris Armitage, chief executive of the alliance. And crucially, money from nearly half of the carbon credits will go back to the communities.

"It's a paradigm shift in the way we support the world's most vulnerable communities and how we address the impacts of climate change," he says. "It demonstrates a new model for funding large-scale development initiatives, which puts the people directly impacted by climate change first, and in the process, creates more resilient landscapes."

The programme aims to connect multiple stakeholders to create the scale needed to transform and restore ecosystems. And while it ›

The Faidherbia albida is a nitrogen-fixing tree indigenous to Africa that loses its leaves during the growing season allowing light to filter down to crops.

MIKE HUTCHINGS/REUTERS



A subsistence farmer in Malawi carries maize she has bought to feed her family after her crop failed.

is designed to be attractive for corporates and organisations looking to offset their unavoidable carbon emissions, there will be stringent controls, and initiatives that must be signed off by an advisory committee involving the likes of Oxfam and Care International.

"As a result, the corporates that we are working with are only the ones that can demonstrate that they are committed to an ambitious transition," continues Armitage. "They're not doing business as usual and just looking to purchase carbon credits so that they can keep maximising profits."

Restore Africa will include technical assistance, inclusive employment opportunities – particularly for women – and better routes to market. There will also be a transition back to traditional agroforestry practices, with a re-education in techniques that have been lost over the years.

Harnessing this traditional knowledge is central to the model farms being set up by reNature, an organisation looking to regenerate 100 million hectares across Africa, and support 10 million people. The demonstration projects are developed with the support of local NGOs, explains Emily Franklin, reNature's Africa portfolio manager, and based around crops that people are already used to growing.

Each farm is designed to fit in with local markets that the farmers can sell to, she continues, and where possible they look to link with international off-takers, too. "It's not just about food security but also providing an additional income stream," she says.

ReNature also works with companies looking for support as they move their supply chains onto a more sustainable footing. "We work with them to understand their strategy and then target a certain crop ... or a region," says Franklin, before setting up model farms and developing a replicable approach that can be scaled across their supply chain.

"We train local people in the theory behind ›

> **The real drive for regenerative agriculture in Africa is coming from the farmers themselves**
>
> **EMILY FRANKLIN, reNature**

regenerative agricultures and how to implement it," she continues. This then has a multiplier effect, as people replicate on their own plots.

"We are looking for particular outcomes such as increased soil health, increased biodiversity, better farm economic resilience, and obviously a reduction in carbon emissions."

"The real drive for regenerative agriculture in Africa is coming from the farmers themselves," she continues. "Often, they are the ones who are trying to avoid the dependent relationship with chemicals.

"Reduction in input costs helps the farmers become more economically resilient ... (but) they need to learn to trust the new practices, which is where a successful model farm comes in."



DR KOFI BOA/FLICKR

Creeping cow-pea planted with maize as a form of weed control at the Center for No-Till Agriculture in Ghana.

REGENERATIVE AGROFORESTRY

Practices include cover cropping with nitrogen-fixing plants, diversification and crop rotation. There is also a push for no tillage, a transition to biological inputs and agroforestry, with trees allowed to grow among the crops, providing shade and better soil structure and fertility.

To show local farmers how regenerative agroforestry practices can improve biodiversity and restore degraded land, reNature has recently finished implementing a model farm at Ambakofi in Tanzania. The project will restore original forest cover while also encouraging farmers to experiment with different crops, producing fruits and vegetables for food, as well as excess crops, which can be sold.

Local people have already seen that the model farm is more resilient to pests than those plots with a monoculture, explains Franklin, after a liberal application of ash rather than pesticides was used to control an infestation of army worms that had threatened their maize crop.

"It's about rediscovering the old ways," she says. "Regenerative agriculture is completely couched in indigenous knowledge."

Farmers turning towards agroforestry will be keen to rediscover the *Faidherbia albida*, says Armitage, a type of acacia that is indigenous across Africa. The nitrogen-fixing tree has adopted a process called reverse phenology, losing its leaves during the growing season, and allowing light to filter through to crops planted underneath. It then grows a full canopy of leaves at the peak of the dry season, offering shade to crops below, while the dead leaves provide the soil with an organic boost. Scientists are still unsure as to why the tree does this.

The tree was regularly cut back to incorporate European farming systems, says Armitage, but can regenerate from stumps. According to the World Agroforestry Centre, 500,000 farmers in Malawi, Tanzania and Zambia intercrop maize with faidherbia, and have reported a doubling or tripling in maize yields.

Another important tree is *Gliricidia sepium*, which is used for alley-cropping in Zambia, when crops are grown between rows of trees. Branches are regularly cut down and laid on the ground, where the foliage rots into the soil, while the woody biomass left behind is used for firewood. Over a five-year trial, says Armitage, the process proved to be 90% as efficient as applying chemical fertiliser, while also being cheaper and more sustainable. "This is the essence of regenerative farming," he says.

Chris Hogg, Nestle's head of sustainability and communications for Asia, Oceania and Africa, acknowledges the value of regenerative farming, but believes the benefits that conventional agriculture have brought to Africa shouldn't be ignored.

Several reports, including one featured in the journal World Food Security, have found that site-specific nutrient management (SSNM) – or the targeted use of fertilisers – can boost yields and bring benefits that ultimately outweigh the cost of the inputs.

The traditional and the modern need to work together, says Hogg, especially around soil health, where there is now a much more granular and holistic picture of its importance, and how to improve it. ›

IN NUMBERS

More than **65%** of Africa's land is degraded

228 million Africans face chronic hunger

Harnessing regenerative agriculture could be worth **$70bn** for farmers

If **50%** of Africa's farms adopted the techniques it could cut 4.4Gt of CO_2e



DR KOFI BOA/FLICKR

Farmers are shown how to apply fertiliser through mulch and other traditional methods to help improve soil quality.

Around 95% of Nestle's carbon footprint comes from Scope 3 emissions, with two-thirds of these coming from growing ingredients. By 2030, Nestle has set the goal that 50% – or 14 million tonnes – of ingredients will come from regenerative farming, hence the priority of less carbon-intensive farming practices

In Ghana, through a partnership with the Centre for No-Till Agriculture (CNTA), Nestle is working with the maize farmers who supply its nutrition business, to switch from a reliance on expensive ploughing services, to a cheaper "ripping" service. This process exposes less of the soil, helping it to retain its carbon, while also improving the movement of water through the earth and reducing surface run off.

Nestle is also looking to introduce premiums to incentivise farmers. In the past these have rewarded quality and productivity, says Hogg, but could soon include the uptake of regenerative practices, too.

Nestle works with over 600,000 farmers around the world, and Hogg says it is crucial to appreciate "that moving from conventional agriculture to regenerative agriculture is going to be a huge shift".

This is especially true of smallholders. "You can't tell farmers what to do, you have to show them what it can lead to.... If it's not economically viable, it's not going to work," he says. It requires a leap of faith that practices such as cover cropping and no tillage will, eventually, bring increased yields, he adds.

Although there is a lack of data due to the largely embryonic nature of studies into regenerative agriculture, reports have shown that transferring to regenerative practices can lead to a temporary drop in yields. It is not a quick-fix solution, and takes long term adjustments, although in time reduced inputs and new markets can make farms more profitable. But in the middle of a food crisis, driven by a mixture of climate change and shortages caused by the war in Ukraine, it is hard for African farmers to swap proven chemical inputs for natural alternatives.

To address the growing threat of famine, the African Development Bank has approved an emergency budget of $1.5 billion to boost food security on the continent. And while the money will be used on climate-adapted seeds and access to training, in South Sudan alone an additional 30 million tonnes of artificial fertiliser will be spread over the land, ensuring that, in the short term at least, the vicious cycle is set to continue.

By Mark Hillsdon



HUSK

Should we be betting the farm on biochar?

Karen Luckhurst reports on the 'black gold' for soils that is commanding huge sums on carbon offsets markets

Travelling through the Amazon in the 1540s, Spanish explorer Franciso de Orellana discovered a thriving agrarian civilisation with uniquely fertile soil. Today, the nutrient-rich terra preta (black earth) soils remain in the Amazon's Xingu region, even if the inhabitants largely did not survive the conquistadors.

The key to these soils is biochar, a charcoal-like substance produced from burning biomass in the absence of oxygen, a process called pyrolysis. The ancient Amazonians are thought to have produced it by burying smouldering organic matter. Now biochar, often referred to as "black gold", is a rising star of agricultural circular economies, using up waste residues that would previously have been burned or left to decompose, producing heat as ›



ENRIQUE CASTRO-MENDIVIL/REUTERS

A worker prepares to grind biochar made from bamboo residue in Peru.

The icing on the cake is that biochar acts as a carbon sink, leading behemoths like Microsoft and Shopify to buy CO_2 removal certificates

a renewable source of energy, acting as a soil improver and pesticide, and as a food supplement to reduce methane emissions in cattle.

The icing on the cake is that biochar acts as a carbon sink, locking CO_2 out of the atmosphere for hundreds of years. This has led behemoths such as Microsoft and Shopify to buy up biochar CORCs (CO_2 removal certificates) from Finnish carbon offsetting platform Puro.earth.

Biochar's physical and chemical structure enables it to act as a sponge, retaining moisture, micro-organisms and important nutrients such as nitrogen and phosphorus as well as gases, including carbon dioxide and nitrous oxide.

All this has the potential to help the world's estimated 525 million smallholder farmers, many of whom are struggling with depleted soils and drought. In studies, biochar has been shown to be of particular benefit in poor soils, making it of value where deforestation and monoculture cropping have depleted the earth.

HUSK, a social impact business operating in Cambodia, reports that farmers using its biochar are seeing improvements in crop yields. HUSK utilises rice husks, a by-product of processing the third-most produced crop in the world, and at 150 million tonnes a year globally, a massive potential source of biomass.

The concept of biochar is not new to farmers in Asia, who had been producing it for thousands of years. "The challenge is that farmers no longer have access to this biomass," says HUSK chief executive and cofounder Heloise Buckland. "The rice husk ends up being piled up in one place at the industrialised rice mills. And farmers buy synthetic fertilisers, which further degrade their soils."

The company currently operates out of Cambodia's largest organic rice mill. Two continuous pyrolysis units turn the husk into biochar, which is mixed with nutrients, compost ›

and other other rice sector by-products. With 10,000 tonnes of rice husk produced by just one mill, the company is currently utilising just 8% of the available biomass to create 600 tonnes of its carbon-based range of fertilisers every year. These organic fertilisers are sold to farmers at a competitive price of $400 to $500 a tonne via a network of agricultural cooperatives and input distributors across the country. The company is also piloting a "super farmers network" for women, who earn extra income by selling the products door to door and earning a commission.

In trials HUSK has carried out over the last three years, farmers are seeing a positive return on investment of between 15% and 25% from a combination of higher yields and a reduction in the need for fertiliser, the price of which has doubled since 2020. Cambodian soil is in a "desperately bad state", says Buckland, citing a culture of intensive crop cycles and over dependence on synthetic fertilisers. "However, the increase in fertiliser prices has had a significant impact on farmers, and once you can offer a competitive product, farmers know it makes sense to invest in long-term soil improvement."

> **Once you can offer a competitive product, farmers know it makes sense to invest in long-term soil improvement**
>
> **HELOISE BUCKLAND, HUSK**

Soil improvement is one of the steps in a pioneering circular initiative in South Australia, which is using pyrolysis to produce heat for the glasshouse of Tantanoola-based Holla-Fresh, which produces hydroponically grown culinary herbs. The ECHO2 unit, supplied by technology provider Rainbow Bee Eater, creates clean syngas from timber and agricultural residues that are usually burned or left to decompose in land fills, generating CO_2 emissions. The company installed its first ECHO2 commercial module at Holla-Fresh in 2018, and the biochar that results from the process is sold back to farmers as a soil improver by Bio Gro, a local agricultural solutions provider, which also supplies the Holla-Fresh unit with its biomass.

Rainbow Bee Eater has a second project coming on stream in 2023, with six ECHO2 units that will power greenhouses growing tomatoes and capsicums at Katunga Fresh in Victoria, Australia.



RAINBOW BEE EATER

Basil in a greenhouse at Holla-Fresh in Australia, which is heated using syngas from pyrolysis, with biochar as a byproduct.

Peter Burgess, managing director of Rainbow Bee Eater, says he has identified 100 projects that can benefit from similar collaborations.

Until now, the problem has been obtaining finance for further developments due to the novelty of the technology. But carbon credits are changing the landscape. An ECHO2 module operating around the clock has the capacity to remove approximately 5,000 tonnes of CO_2 equivalent (CO_2e) per year, one of the reasons it is one of the projects chosen by Shopify and Microsoft, who have both invested in CO_2 removal certificates (CORCs) based on Puro.earth's puro standard, which has developed a methodology for biochar.

Speaking in a video interview with puro.earth, Burgess said: "The difficulty for us as the creator of these projects is getting finance. If puro.earth can enable forward contracts ... we can then take that to a financier maybe even a bank and that will enable us to finance the project. It's that simple. Most of ›

(these projects) won't happen without this sort of encouragement."

Buckland at HUSK describes carbon credits as "a total game changer". "We certified with the EBC (European Biochar Certificate) in 2019 and started selling the credits at $30 a tonne. Within one year, we tripled that. We've now sold at $200 a tonne and and we are sold out until the last quarter of 2023. So, there's a huge demand."

She welcomed the methodology for biochar published by global standards body Verra in August. "(Verra) is a global standard and people will recognise and trust that, and I think that will really help to inject more finance into the biochar sector."

HUSK plans to scale operations in Cambodia, with a roadmap to replicate further afield in Egypt and South America, and the eventual aim of putting 1 million tonnes of carbon back into the soil by 2025. Carbon credits will also enable HUSK to keep prices of its core product low. "Our end consumers are so price sensitive... we can't add $0.50 onto a kilo of biochar because they won't be able to afford it. These are people earning $5 a day," she says.

'Effectively the income (from credits) enables us to put the carbon into an organic based fertiliser ... So in terms of additionality, for us, it really is a very significant part of our business model."

Biochar carbon credits also have the potential to help lift cocoa farmers out of poverty. The Ithaka Institute, a Swiss-based open-source network for carbon strategies, has been partnering with chocolate producer Barry Callebaut to trial the production of biochar on cocoa farms using agricultural residues. Around 100 "champion farmers" in Ghana and Indonesia are making biochar using technology developed by Ithaka, and are also being taught to build their own efficient pyrolysis units out of earth.

Geza Toth, an independent consultant at the Ithaka Institute, estimates that by 2025 tens of thousands of cocoa farmers could be participating. But, he says "you need to have the farmers buy in gradually and you need to make sure that you incentivise the farmers". ›

IN NUMBERS

HUSK is using just **8%** of avialable rice husks to create **600 tonnes** of biochar a year.

Certified biochar credits for Husk began selling for **$30 a tonne** in 2019 and recently sold for **$200**.

An ECHO2 module operating around the clock has capacity to remove **5,000 tonnes** of CO_2e per year



ILYA NAYMUSHIN/REUTERS

The common practice of burning post-harvest wheat straw and other agricultural residues adds to global CO_2 emissions.



BARRY CALLEBAUT

The biochar being produced by farmers in Ithaka's trials has been awarded EBC certification. "These certificates are trading today at a very high price because these are permanent carbon sinks," says Toth. "And the farmers in our model get all the benefits."

Toth says these "carbon farmers" could make an extra $150 a hectare a year from the credits, a significant sum when Fairtrade estimates the average cocoa farmer earns less than $1 a day.

The farmers are further benefiting from increased yields from biochar application. Toth says cocoa farmers in Ghana report increased average yields of 30%, a substantial figure in a country where deforestation has wreaked havoc on soil quality. "In a well-managed plantation you can get up to two or three tonnes of cocoa per hectare, but in Ghana it is half a tonne," says Toth.

Toth warns biochar is not a panacea, and needs to be part of an integrated agroforestry system. "You need to have biomass, you need to plant trees."

The application of biochar at farm level can help to reduce agrochemical inputs and improve soil quality and cocoa yield.

And because of variations in pH levels, not all biochar is suitable for all soils. Moreover, if misapplied or badly produced, the benefits of biochar can be lost.

Ultimately, though, Toth sees biochar as a potential disruptor. "For hundreds of years, farmers in west Africa had no say in how they wanted to do things, but this is changing. And if they want to produce even their own fertilisers, then tomorrow they may decide who they sell their cocoa to. They might even determine the price of cocoa... This is a disruptor."



Karen Luckhurst is sub-editor for The Ethical Corporation and The Sustainable Business Review and has written for the Observer and Independent.

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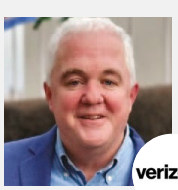
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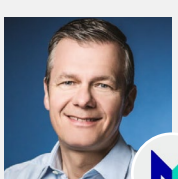
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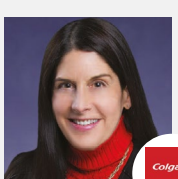
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Attendees	Expert Speakers	Sessions	Days of Networking



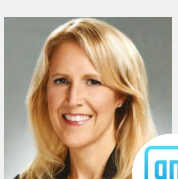
JAMES GOWEN
Senior Vice President, Global Supply Chain / Chief Sustainability Officer
Verizon



CLAUS AAGAARD
CFO
Mars



ANN TRACY
Chief Sustainability Officer
Colgate-Palmolive



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Can sustainable soya come fast enough to save the Cerrado?

Retailers, big brands and commodity traders are all backing initiatives to reduce deforestation risk from the crop, but progress is thin on the ground, reports Mark Hillsdon



JOSE ROBERTO GOMES/REUTERS

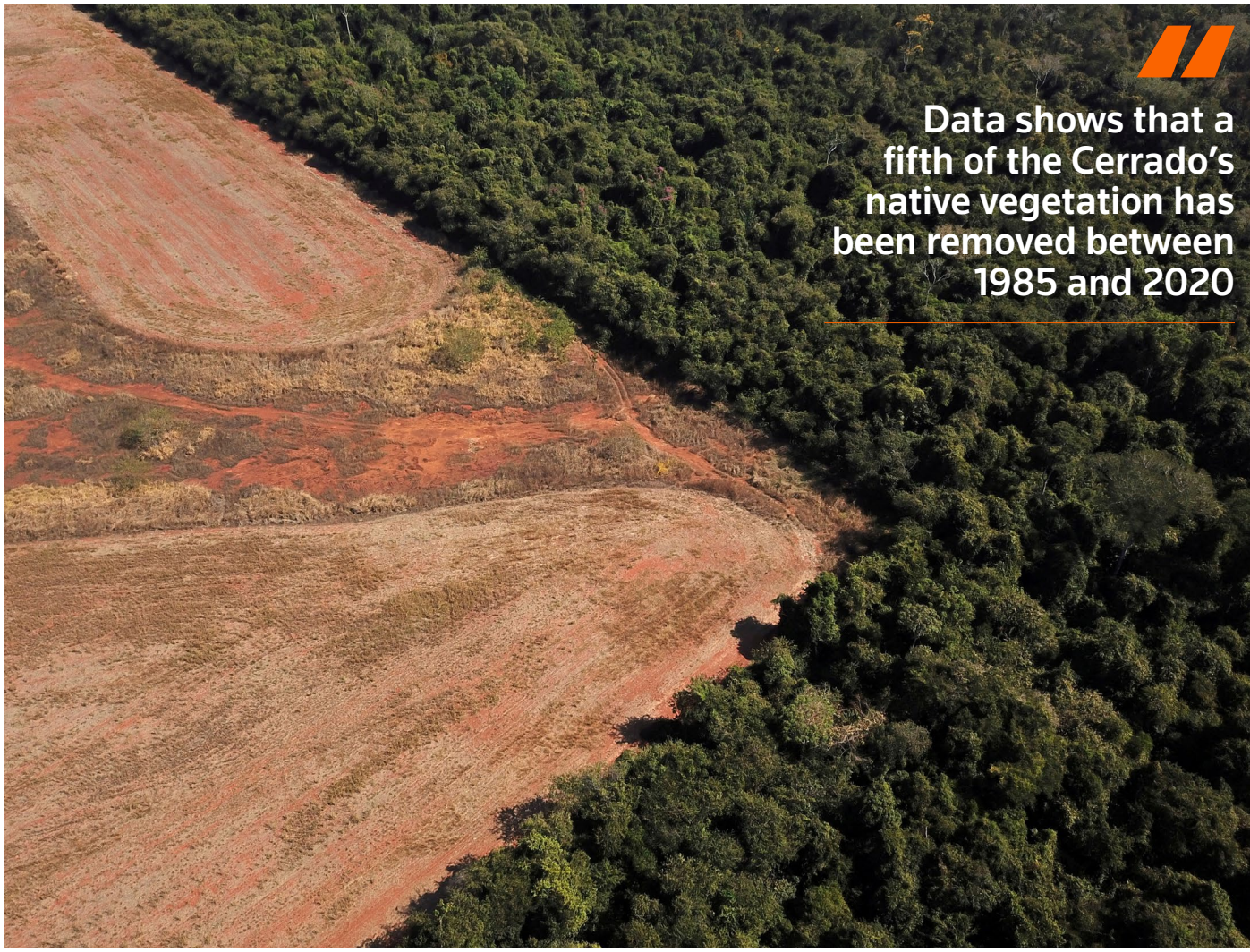
VIEW ONLINE

Soy is a simple crop, relatively easy to grow and undemanding once it's in the soil. The supply chain behind it, however, is more complex, with a cast of farmers, buyers and traders that has failed to find a way to deliver soy that is deforestation-free.

In 2019, the Responsible Commodities Forum (RCF) was set to launch on the London Stock Exchange. Based on a green bond, it was worth $300 million and would be used to incentivise soy farmers on the Brazilian Cerrado, the world's most biodiverse savanna, to use existing degraded land to grow their crops, rather than clear new areas of vegetation something that they are legally allowed to do.

Satellite data shows that a fifth of the Cerrado's native vegetation has been removed between 1985-2020, and there is significant risk that this vast carbon sink could go the same way as the Amazon, and become a carbon emitter.

However, following the election of Jair Bolsonaro, ›



AMANDA PEROBELLI/REUTERS

An aerial view shows deforestation on the border between Amazonia and Cerrado in Nova Xavantina, Mato Grosso, Brazil.

the project stalled. Over the following months environmental policies were ripped up, budgets slashed and scientists sacked, many of them personal friends of Pedro Moura Costa, the driving force behind RCF and chief executive of Sustainable Investment Management, which runs it.

Bolsonaro manged to incite the whole sector, which became very antagonistic towards the soy traders, explains Costa. Farmers became negative about giving up their rights to legally convert their land to soy, he explains, while traders, who were to play an integral role as monitors for the RCF programme, got cold feet, fearing for their market share. The project was shelved.

Costa is now back with a pared down version of the project, worth just $11 million, with the money invested by three UK supermarkets: Tesco, Sainsbury's and Waitrose.

In the first phase, launched to coincide with this year's growing season, low-interest loans, up to 25% cheaper than those offered by the banks, have been made available to 36 farms in the Cerrado, which between them produce 75,000 tons of soy per year.

Each year, farmers take out loans to buy seeds, repaying it once the crop has been harvested, explains Costa. "Crop finance is a key part of soy farmers' business models and there is a huge appetite and market for green finance," he explains. In return, the farmers must commit to zero deforestation of native vegetation.

This new flow of green finance can support soy production while rewarding the voluntary conservation of native vegetation, says Costa. But crucially, it is reconciling the objective of conservation with that of economic production, so that one complements the other.

Tesco has supported the fund as part of its commitment to only sourcing soy from areas verified as deforestation-free from 2025, explains group responsible sourcing manager, Steven Ripley. It's a message consistent with the UK Soy Manifesto, which now covers 60% of the soy coming into the UK.

RCF 2.0 has drawn criticism for its lack of ambition, and the fact it is looking to conserve just 11,000 hectares, when the Cerrado covers 1.9 million square kilometres. ›

PROOF OF CONCEPT

But the first phase is a trial, says Ripley, designed to create a proof of concept to show that the mechanism works, before professional investors are given the opportunity to develop a much bigger fund for next year's growing season.

"RCF is important because for a long time a lot of the traders have gone with the line that we need to incentivise farmers if we are going to place these restrictions on them," says Ripley.

Unlocking green investment means this can now happen, he adds, by supporting sustainable agriculture and protecting forests in a financially sustainable way that rewards farmers.

Ripley is hopeful that the clean credentials of all soy that arrives in Europe is now inevitable, especially with new UK due diligence legislation, and tough EU new anti-deforestation rules both on the horizon. (See Here's how the EU's new rules could finally turn the tide on tropical forest loss)

> **Traders realise the game's up, that many stakeholders in Europe and the UK will no longer accept the status quo**
>
> **STEVEN RIPLEY,** Tesco

"Some of the largest traders are starting to come forward with framework proposals on how they are going to deliver deforestation-free soy to the UK," says Ripley. "(And) it's clear why they're doing that: they realise the game's up, they realise that so many stakeholders in Europe and the UK will no longer accept the status quo."

Alex Wijeratna, senior director of the global protein campaign at Mighty Earth, doesn't share Ripley's optimism. He recently edited the NGO's latest report into soy, Promises, Promises!, which revealed that 27,000 ha of deforestation had occurred on 10 farms post-2020 Brazil – all linked to global soy traders.

In 2000, Brazil produced 42 million tons of soy a year; today the figure is 124 million tons, 35% of the global total, with exports destined largely for China and Europe. The industry is dominated by a cabal of huge commodities businesses, such as Cargill and Bunge. And ultimately it is the involvement of these traders in screening out "bad soy" on which any sustainable soy scheme succeeds or fails.

As part of the report, Mighty Earth wrote to members of the Retail Soy Group (RSG), which includes all the major British supermarkets, urging ›



PAUL CHILDS/REUTERS

Tesco is one of the British supermarkets to have invested in the RCF, which incentivises farmers to grow deforestation-free soy.



MARCELO TEIXEIRA/REUTERS

The RCF programme was originally worth $300m, but stalled after Jair Bolsonaro was elected president.



RANDALL HILL/REUTERS

them to threaten to find alternative suppliers if the soy traders don't stamp out deforestation-linked soy.

The Retail Soy Group's roadmap commits members to deforestation-free soy with a cut-off-date of August 2020, but soy traders aren't following these guidelines, says Wijeratna.

SOFT COMMODITIES FORUM

In June, however, six of the world's largest food and agribusiness companies – Cargill, Archer Daniels Midland Company (ADM), Bunge, COFCO International, Louis Dreyfus Company and Viterra – announced new measures to eliminate deforestation and native vegetation conversion in the Cerrado.

The six companies, members of the World Business Council for Sustainable Development's (WBCSD) Soft Commodities Forum (SCF), were part of a group of 10 agricultural commodity companies that signed a "corporate statement of purpose" at COP26 in Glasgow committing to eliminate commodity-driven deforestation in line with the Paris Agreement. They promised to produce a "shared roadmap" of how they could do so by COP27 this year.

Yann Vuillerod, global sustainable sourcing lead for cereals and soy at Nestle, says the greatest pressure on traders to fulfil those commitments will come from the big brands and animal feed companies that have direct commercial relations with them.

> **The greatest pressure on traders will come from big brands and animal feed companies that have direct commercial relations with them**
>
> **YANN VUILLEROD, Nestle**

He said Nestle is working closely with SCF as co-chair of the soy working group of the Consumer Goods Forum's (CGF) Forest Positive coalition, which was launched in 2020 by 21 manufacturers and retailers to achieve what earlier commitments failed to do in ending commodity-driven deforestation.

With 60% of the world's soya going to China, where there is less regulatory or investor pressure to end deforestation, one commitment of the Forest Positive coalition is to preferentially source from trading companies that are acting to remove deforestation across their entire supply base, not just for Europe-based clients.

Asked in an interview how many of the big agricultural traders are able to comply with that ›



NICOLAS MISCULIN /REUTERS

Trucks unload soy beans at a Louis Dreyfus processing plant in Argentina.

requirement, Vuillerod says: "Some of them are on their way (towards that). It's just not the critical mass yet."

But even among those that have set a target for becoming deforestation-free, he said, buyers and traders need to be aligned in terms of objectives, tools, monitoring and, most critically, rules of the game, so if a key supplier like Cargill claims it has deforestation-free soy across its supply chain, Nestle can make the same claim to its customers, confident it shares the same definition.

Such alignment will be critical to unleashing the millions of dollars of investment that will be required to scale up pilot projects such as incentivising farmers in Mato Grosso to forgo their rights to legally convert their land to soy, because the costs of compliance will need to be shared between buyers, traders and other stakeholders, Vuillerod said.

Each company will need to map out and quantify its deforestation footprint, from direct soy purchasing to the embedded soy in meat and dairy supply chains.

"It's a very difficult exercise to align all the companies to agree on this .... But at least if everyone knows their share of the overall industry or coalition footprint, we know what investment is needed to deal with the problem."

Another sticking point is around acceptable cut-off dates from when a landscape should have been deforestation-free, "a clear area where we (consumer goods companies) are struggling to align with traders".

Nevertheless, he is hopeful for progress. "Even though everyone agrees that we're not going fast enough, we did see momentum and pace changing in the last two years, (towards) aligning an objectives, aligning on tools, aligning on rules of the game, so that we really speak the same language across the value chain, which today is not complete – and it's hindering progress."

But Costa at Sustainable Investment Management describes the pledges to end deforestation by the Soft Commodities Forum as little more than an exercise in headline grabbing.

Instead, he is pinning his hopes on the ballot box, and a new figure in the presidential palace after October's elections. "A change of government would have a transformational effect on the Brazilian rural landscape," he says. ●

Terry Slavin contributed to this article

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COMMENT

How the EU's new rules could finally turn the tide on tropical forest loss

Matthew Spencer of IDH says if Europe works with producer countries and commodity companies to implement deforestation-free rules, the results could be transformative

VIEW ONLINE



RICARDO MORAES/REUTERS

Cattle graze near a fire burning a tract of the Amazon forest.

As the economic storms of food and fuel price inflation gather pace, deforestation has disappeared from the international headlines. But behind the scenes, there is frenetic activity by international commodity companies and regulators to prepare for one of the biggest shifts in supply chain rules for decades: the new European Union regulation on deforestation-free products.

This relatively low-profile agreement will shift Europe from a voluntary to a regulatory approach to reducing the deforestation footprint of commodities such as palm oil, soya and cocoa. It reflects widespread frustration that after decades of concerted effort to support forest protection and agricultural certification, deforestation remains stubbornly high, particularly in tropical forest areas, where over 3 million hectares of primary forest were lost last year. The heat is on to find new tools to exert market pressure because this forest clearance is linked chiefly to agricultural expansion, and Europe remains the second biggest importer of agricultural products linked to deforestation after China.

The new deforestation regulation, which is part of the European Green Deal, is an attempt to side-step the sovereignty arguments that have dominated international negotiations on forest loss. It sets trade standards for EU imports and requires commodity importing companies to work out which of their sourcing areas can meet the standards of traceability and verification of zero deforestation. The regulation will probably not come into force until 2024, but it has already unleashed a huge wave of activity from traders and buyers to map their production to farm-plot level and improve their traceability systems.

Inevitably this means that the small number of satellite-monitoring companies are being paid many times for deforestation data from the same areas, but in countries where national monitoring ›

COMMENT



NYANCHO NWANRI/REUTERS

systems are not yet mature enough, companies feel they have little choice.

The campaigners who have made traceability their lodestar have high hopes that it will end the blame-shifting between companies and governments. There are, however, grounds for caution in assuming that these huge investments in mapping will resolve the issues of accountability for deforestation.

Satellite monitoring without extensive ground truthing is unreliable, it does not provide information on deforestation drivers, and laundering of products across farm boundaries is common in beef, cocoa and palm sourcing areas.

The reason it is hard for companies to get to zero deforestation using mapping and verification alone is that the link between commodity imports and deforestation is nearly always indirect. It is now less common for forests to be cleared for plantations or giant ranches, and it is usually land-grabbing by criminal enterprises or encroachment by impoverished smallholders that degrade and destroy the forests of the Amazon, west Africa and the Congo basin.

But many of these areas are just over the boundaries of the farms where international companies are sourcing, and yesterday's illegal deforestation is often today's sourcing area.

The link between commodity imports and deforestation in regions like West Africa is 'nearly always indirect'.

The answer to this challenge for both commodity companies and the EU is to make sure they balance their farm mapping investments and traceability requirements with partnership to slow and stop forest loss on the ground in the many production areas that are trying to enforce forest law and offer smallholders routes to sustainable production.

There are encouraging signs that commodity buyers are willing to do this. Jurisdictional and landscape approaches to sustainable sourcing have won new backing from the Consumer Goods Forum, and members of its Forest Positive Coalition have committed to matching their sourcing footprint with landscape commitments.

There are well over 50 landscape initiatives in Asia, Africa and Latin America that already allow farmers and commodity buyers to produce better, and many have backing from international buyers. They allow companies to contribute to wider landscape efforts to strengthen sustainable land use and reduce the risk that their monitoring system is showing zero deforestation in their source farms whilst it is occurring all around them.

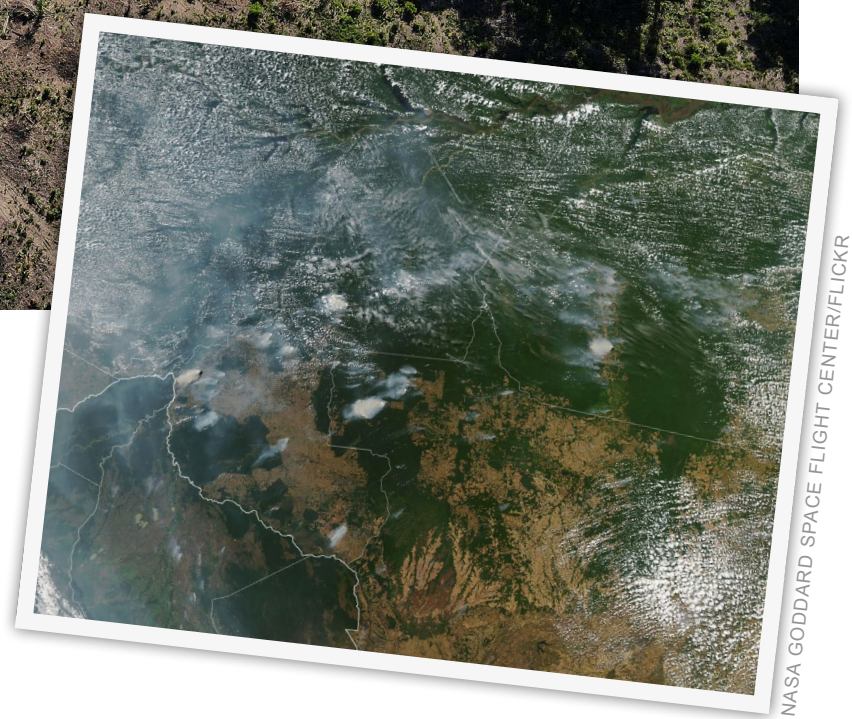
It also offers the prospect of capturing some ›

COMMENT



An aerial view of a deforested plot in the Amazon – over 3 million hectares of primary forest were lost globally last year.

BRUNO KELLY/REUTERS



NASA GODDARD SPACE FLIGHT CENTER/FLICKR

A satellite image of the Amazon.

bigger carbon and nature value in their supply chains because it can integrate environmental benefits from better agriculture with much bigger gains from forest protection. Indeed, COP26 saw the launch of the largest ever public-private effort to protect tropical forests, and it takes an explicitly jurisdiction approach to carbon finance. The LEAF Coalition has generated forward commitments to buy more than $1 billion of high-integrity forest carbon credits from the jurisdictions that successfully achieve zero deforestation.

Whether this big pulse of corporate action reduces deforestation will depend on how the EU implements its regulation, as well as how producer governments implement their forest laws. If the EU regulation is applied with a heavy hand, it will make companies more risk-averse, and they will move to "safe" sourcing areas that have been deforested decades ago. In parallel, producer governments will encourage exporters to supply growing demand in Asia, where there are no import restrictions.

But if the EU engages producer governments in their own plans to get to zero deforestation and uses the regulation as part of efforts to incentivise company investment in hotspot landscapes, then it will help turn the tide in production areas bordering our last great forests.

It would allow companies to go beyond "cleaning" EU supply to positively influencing entire forest- risk supply chains. Amidst the current grim economic and climate outlook, that would be a remarkable achievement.



Matthew Spencer is global director, landscapes at IDH - The Sustainable Trade Initiative, overseeing a business unit that includes regional landscape teams in Asia, Africa, Latin America, a landscape finance team and a markets team. He previously worked as strategy director for Oxfam and director of Green Alliance.

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