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How AI can link cows to capital markets

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Huge potential for tech to make nature more investable

The use of artificial intelligence in financial markets raises a host of ethical, legal and operational problems. What may prove a fruitful avenue is AI supporting scientific processes that bring assets to the market and verify their integrity.

An intriguing example is being developed in the field of land regeneration — a kind of activity that capital markets find very difficult to finance.

Projects are necessarily bespoke, take a long time and require detailed, onsite due diligence by specialists.

But the need is immense. An estimated 54% of the world's land surface is degraded. Biodiversity shrivels, land loses its ability to retain moisture and carbon, soil can be eroded, economic yields fall.

The problem is likely to get much worse with climate change and population growth, risking disasters such as the American dust bowl of the 1930s.

In a remote area of Coahuila state in northern Mexico, a family that has owned a 21,000 hectare cattle ranch for generations has over the past two years received $235,000 to restore the land (*pictured above*).

The money came from a US family office — but it has now sold the investment to a UK institutional investor.

All the participants stand to make money, while improving this sensitive semi-wild ecosystem. Two household name US tech companies have contracted to buy carbon credits created by the project.

Connecting the participants and designing and managing the transaction is the work of Cultivo, a company founded in 2019 by Manuel Piñuela and James Clifton.

They are serial entrepreneurs who had worked together at a clinical AI company called Sensyne Health.

Cultivo's role is a complex one, combining the traditional function of an investment bank — connecting capital raisers with sources of capital — with acting as a scientific adviser and verifier and an industrial consultant.

Concerned, but stuck

Shocked by seeing degraded land while on holiday in England's Peak District and Lake District in 2018, Piñuela started talking to landowners in the UK, US and Mexico.

"It is not lost on land stewards that the land is degraded," he said. "But they don't know how degraded it is. They face three questions: they don't know if it can bounce back, what it would take to do that, and where the money would come from."

Talking to contacts at banks and pension funds, Piñuela found "they already had strategies to deploy capital [in nature investments] but were not finding enough scale. And they didn't want to spend $1m or $2m on due diligence, then invest, and then have to think: where is the next investment?"

Piñuela and Clifton sensed an opportunity to apply their AI knowledge to this conundrum.

"We saw a very similar problem in the health space to the land space," said Clifton. "The sick patient is the land. We wanted to come up with a technology that could help identify where to start — particularly for investors, if they are looking at lots of projects. How to know where has the highest natural capital potential and where to put their investment dollars."

They started using data from satellite imaging, but combined this with information from physical tests on the ground. "Then you can calibrate the algorithms and have better predictability," said Piñuela. "It allows you to forecast 'when I invest here, how am I going to get returns?' with a lot more certainty."

To register the carbon credits produced by its projects, Cultivo uses Verra, the largest registry of voluntary carbon credits. It prescribes standards for different kinds of project, such as sustainable grassland management.

Some rainforest carbon sequestration projects registered at Verra have been severely criticised in the media as "worthless", and in general voluntary carbon markets suffer from problems of credibility, opacity, illiquidity and inefficiency, as a recent study by the World Federation of Exchanges highlighted.

So there is a high premium in the market on trustworthiness.

Serious credit purchasers conduct their own careful due diligence. Finding reliable partners to work with is important to them.

Landowners also need reliable counterparties. Projects need to last at least 40 years to achieve full regeneration of land.

Pumas and bears

The Coahuila project began in 2021 when one of Cultivo's shareholders introduced the firm to the landowning family.

The rough, hilly grassland, which also includes forest and mountain, supports 600 to 800 cattle. It had become degraded through over-grazing over more than a century.

"The family had always had this idea of regenerating the landscape, especially the newer generation," said Piñuela. "As they were thinking about it, they went to this original question that prompted us to form Cultivo: they wanted to do it but didn't know how to make the land bounce back."

The first stage, which took the rest of 2021, was Cultivo investigating the site: its biodiversity, water resources, carbon stocks and socio-economic life.

Cultivo's platform analysed the ranch using satellite remote sensing. Then its team with partners visited the site to take biopsies of the soil and leave camera traps to detect wildlife.

The number of soil samples required depends on the different types of soil the terrain has. A first phase of sampling is done to check and fine-tune the predictions from satellite imaging — then a second, which can involve hundreds or low thousands of samples.

"This is a significant endeavour," said Piñuela. "You are in rocky terrain, and it does have rattlesnakes — so you need special boots."

The AI system blends the satellite and local data, while teaching the system how to evaluate other sites better.

"This tells the auditors and the registry that this is the baseline: this is a snapshot of how the ranch was before Cultivo and partners started to change it," Piñuela said. "That baseline served as the due diligence that the US family office saw prior to their investment."

Moving around

The firm then developed a plan for how the family could change the management of the grassland.

"A lot of what we have to do is free, prior and informed consent," said Piñuela, referring to the principle enshrined in the UN Declaration on the Rights of Indigenous Peoples in 2007, which is

widely followed in international development and project finance.

“We had to check that not only the head of the family wanted to do this, but that everyone in the family and everyone in the ranch is supportive — and also neighbouring ranches,” said Piñuela. “At a cultural level we need to make sure we are not changing practices to strategies that are completely alien to this community. This is a typical bucolic rancher and range rider style — you move the cattle when they [need to be moved].”

The traditional grazing method is to have a large, stationary herd in one part of the ranch. When the grass becomes exhausted, it is moved to another part of the valley.

“It starts to erode the soils, and this starts to increase,” said Piñuela. “The region has received a lot of drought, and then it has intense rain so there is even more erosion. So it was this continuous cycle of traditional practices plus erosion from climatic events, and it was just accelerating.”

The family has kept the same number of cattle on the land. The main remedy is to change the grazing pattern. The herd is kept closer together, but moved much more often.

“The biggest mental jump, for the landowners and staff, is they are going to be doing a lot of work,” said Piñuela. “They are shifting them every week.”

Based on the soil samples and health of the grass, the team managing the land create paddocks, ideally without fences, to move the cows between.

Another important investment is water infrastructure: tanks and troughs to gather rainwater and make it available to the animals.

The vegetation is becoming healthier and the soil is being regenerated. As that happens, wildlife has become more numerous: there are about 200 elk, as well as pumas (*pictured*), coyotes and black bears.

“Ranchers are starting to see a benefit they were not expecting,” said Piñuela. “They don’t need to supplement the cattle’s feed. They are healthier: stationary cattle tend to get stressed with heat, and it can get to 42° to 46°.”

Most of the investment goes on the hydraulic infrastructure, fencing, hiring and training staff — mostly range riders — and all the costs of monitoring and verifying the project and paying service providers, including Cultivo.

Samples are analysed by a lab in Coahuila whose methodologies and equipment meet international standards.

Finding the money

In 2022 Cultivo devised a financial model for the project, structured it as a special purpose vehicle and found the US family office that wanted to invest.

The investor already knew about the landowner, but had never made a regeneration investment before. “They are impact-focused, and very good at alternative assets, infrastructure-type investment,” said Piñuela. “They have a good due diligence team that is able to see a deal even if it’s difficult. They were looking for something that is uncorrelated and a convex investment opportunity. When you are working on a distressed asset, in this case a degraded natural asset, it has already absorbed a lot of loss, so when

you invest there is a lot of upside."

The original $235,000 was meant to get the project through its first two years of life. The project would start to produce carbon credits in 2025, referencing carbon locked up in 2022, and begin to break even between years four and six.

The family office had planned to stay invested for eight to 12 years, but was surprised to get an offer for the asset after a little over two years.

Having sold its interest in the SPV for $600,000, the family office has received an internal rate of return of nearly 45%, and this could rise when the project begins to issue carbon credits.

Legally, Cultivo structures projects so that the landowner retains full ownership and the land is unencumbered.

An SPV is created to which the landowner contractually grants the rights to the natural capital produced on the land, defined as the carbon it can capture, the biodiversity it can restore, and the water it can capture. The investor buys equity in the SPV.

Although this appears complex and innovative, in fact such arrangements to separate the ownership of land from the benefits of its exploitation have existed for centuries in forestry and agriculture, so they are not legally difficult to structure.

The landowner typically receives a 20% to 60% share of the SPV's profits, incentivising it to support the project. The investment also improves the value of the land, which benefits the landowner again.

"One very important thing is that there are no clawbacks where a carbon project could go and slowly crawl to use the land or take it over," said Piñuela (*pictured*). "This is good practice for any landowner, but when you are engaging with a community organisation it can be a very touchy topic."

Project developers must avoid any suggestion that they are being high-handed or colonialist.

The UK asset manager is a bigger player, which manages third party money in natural capital investments.

Its interest was piqued because the Coahuila SPV had signed offtake agreements with two US tech companies. Each will take the credits the land produces for a five year period, one after the other.

They pay when the credits arrive — the investors essentially provide working capital to produce the risk, and take the risk of the project failing.

The offtake agreements were due diligenced and signed even before the land has begun to issue credits.

"What the UK [investor] was acquiring was an SPV that already has this long term future contract, so they can forecast the performance of the asset," Piñuela said. "The risk massively changes once the infrastructure is deployed and you have a series of revenues already confirmed." As well as the acquisition cost, the new owner has committed to putting capital into the project.

Cultivo uses its platform to provide data on its projects to investors and offtakers: not just on their carbon performance, but on co-benefits such as to wildlife, water resources and the local community.

These co-benefits can raise the value of carbon credits. The instruments vary widely in price, even though all of them convey the same core benefit: allowing the owner to say that it has reduced by one tonne of CO2 equivalent the greenhouse gases in the atmosphere.

The first vintage of carbon removals produced by the Coahuila project in 2022 was priced at $25 a tonne. The prices will rise by around 4% to 6% a year to reflect the fact that carbon emissions ought to be falling.

That compares with about $35 for comparable voluntary projects in the US in 2022, though they are now closer to $55. Projects in emerging markets are seen as carrying higher risk of non-performance, so are sold more cheaply.

Prices in compliance carbon markets are higher. The carbon price in the largest market, the EU Emissions Trading System, is now about €70 a tonne.

From acorns to oaks?

The Coahuila project, which was Cultivo's second, is small, but Piñuela said it had captured interest from landowners across northern Mexico, where it now has projects on 11 ranches.

Globally, Cultivo now has seven projects operating, and another 20 it is working on with investment capital secured. Some are as big as $20m, and it is putting together portfolios worth $60m.

“Investment banks were not involved in this project, but they have for the last two years been getting more and more involved in our projects,” said Piñuela. “They are arranging capital to be deployed towards this asset class, and they are also providing capital for offtakers. A lot of the buyers of carbon credits are customers of the banks, and banks are seeing an opportunity to accelerate their ability to acquire high quality credits. So banks are becoming a distribution channel to Cultivo and presenting opportunities to us.”

Some carbon credit buyers needed to buy millions of tonnes of credits a year, he said, so were investing tens of millions of dollars, and were using a variety of banking products to finance it.

Cultivo’s ambition is eye-popping: to regenerate 1% of the Earth’s land surface, or 150m hectares — twice the area of Texas. More surprising still, it now wants to do that by 2030.

Cultivo already has land access to 250m hectares in its pipeline. Creating projects is another matter.

Asked how Cultivo, a company of 33 people, could possibly scale up to achieve anything like that, Piñuela said: “Through technology. We are using AI right from the beginning to streamline all of this process and have been able to automate many of the steps. You have to have a bespoke treatment of each of these landscapes. But using AI we can speed through this.”

The first drafts of contracts, insights or analysis are produced by Cultivo’s AI. They are always reviewed by an expert, but this is much faster than the expert doing the work from scratch.

“What excites me is how really carefully gathered data streams, connected with AI, have a tremendous impact,” said Piñuela. “I really don’t think we would ever be close to achieving that purpose if we were not leveraging AI.”

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