

Measuring Biodiversity

Technology and MRV to support biodiversity
monitoring and nature credits in the agri-food sector

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You cannot report, manage or finance what you cannot measure

Carbon has one unit. Biodiversity has dozens of indicators that all have to be taken into account — which is why measurement was the bottleneck.

1

HETEROGENEITY

No single unit. Biodiversity is taxa, habitat and function, and it changes with every landscape and season.

2

COST

Expert field surveys do not scale to thousands of farms and suppliers — the measurement can outweigh the payment.

3

TIME

Any claim needs a credible baseline and evidence of change over years, not a one-off survey in a good week of May.



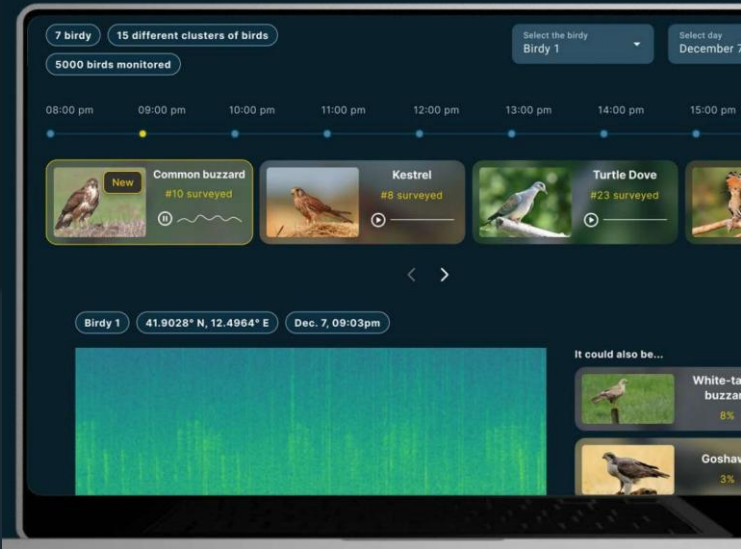
OUR OWN CAMERA TRAP · 22.09.2025, 22:28

One platform, multiple data sources

Remote sources give the baseline and the history. On-field sources give what actually lives there.

REMOTE / DESK	 REMOTE SENSING	● Satellite-based data (1) * ● Public datasets (1) *
ON-FIELD	 SENSORS	● Bioacoustics — pollinators, birds, bats (2) ● Camera traps (2) ● Beehive biomonitoring (2) ● Air quality, PM 2.5–10 — PollyX (2)
	 ON-FIELD SURVEY	● Flora and invasive species — Biodiversa (3) ● Field survey with AI classification (3)
	 LAB ANALYSIS**	● Pollutants and heavy metals (3) ● eDNA (3)

THE PLATFORM — SPECIES DETECTED, BY DATE



- Single species or cluster
- Ecosystem quality

* Based on public datasets (e.g. ENCORE, WDPA) ** On multiple matrices: water, soil, apiary products
(1) Fully remote (2) Data collection over 4G connection (3) Requires data collection on site

3Bee | XNatura — nature intelligence, built on physical evidence

An Italian climate-tech company measuring and regenerating biodiversity with proprietary IoT sensors, satellite observation and AI.

Founded 2017, 40+ professionals, two EIC grants.



10,000+

IoT sensors
deployed



17,000+

sites monitored
in 25 countries



1M+ ha

mapped by
satellite



115+

Oasi regenerated

Where our nature-credit work already sits

- UNI/PdR 179:2025 — Italy's national reference practice on biodiversity footprint and credits, with 3Bee as project leader alongside Federico II, UniTo and CREA.
- Our CEO sits in the European Commission's Nature Credits Expert Group, one of a small number of individual experts.

What has to sit under a credit before it means anything

A credit is one destination. The same measurement already serves ESRS E4 and TNFD reporting, site decisions and supply-chain risk — which is why it pays for itself before a credit market exists.

SIGNAL

Wingbeat audio, bird song, images, radar and optical reflectance — collected continuously, not on a survey day.

INDICATOR

Mean Species Abundance, pollinator abundance, species richness, nectar potential — per site, per season.

CLAIM

Change against a measured baseline and a control area, with uncertainty attached — the same evidence base for ESRS E4, TNFD, site decisions and credits.

THE MRV ARCHITECTURE TAKING SHAPE — SATELLITE PLUS SENSORS

Satellite

Wall-to-wall coverage, a retrospective baseline and the history of every hectare — including the ones nobody visits.

Sensors and field survey

Species-level evidence, continuous, exactly where the claim is being made.

Shared indicators

One comparable set, with uncertainty attached, so a site in Sicily can be read against one in Chile.

The framework is coming. The technology is already here.

JUL 2025



Roadmap towards Nature Credits

The Commission sets the direction and opens the pilot phase to 2027.

NOV 2025



UNI/PdR 179:2025

Italy's national reference practice on biodiversity footprint and credits. 3Bee project leader.

DEC 2025



Nature Credits Expert Group

Our CEO appointed as one of the Commission's individual experts.

2026 → 2027



Criteria, then governance

Methodologies mid-2026; governance and certification framework due 2027.

Still missing

- A registry — and nobody has settled whether it is national or European.
- An approved certification framework: due 2027.
- One agreed indicator set, so two sites can be compared.

Not missing

The technology. It is already running on agri-food land today — measuring what regenerative practice actually does, and moving value from the brand down to the farmer who does the work.

So the invitation is not to wait for the framework. The brands already working with us did not wait — and that is the only reason there is anything to certify when the framework arrives.

Spectrum: the main sensor used in regenerative projects

How does it work?

- It provides quantitative data on pollinator presence by counting the buzzes detected — 12 minutes during the day and 4 minutes at night.
- Machine learning and pattern recognition identify pollinators at various taxonomic levels, from specific frequency patterns (Hz).

Why it matters for regenerative agriculture

It provides continuous, objective data on one of the most important indicators of ecosystem health: pollinator activity — measured on the field, not modelled from a desk.

2000 sensors deployed · 19 diverse clusters



Regenerative efficiency is assessed through multiple KPIs

Clear KPIs are essential to evaluate whether regenerative agriculture practices are truly delivering ecological improvement and long-term resilience — and to give stakeholders a benchmark they can check.

LAND USE

- Impermeable land share
- NDVI
- Carbon stock

MICROCLIMATE

- Rain
- Precipitation in recent years
- Historical climate trend
- Evapotranspiration
- Aridity index

BIODIVERSITY

- Mean Species Abundance (MSA)
- Relative abundance of pollinators
- Nesting sites
- Floral availability

RISKS

- Hydrogeological risk
- Water risk
- River discharge trend
- Soil temperature

SENSOR MEASUREMENT (DIRECT)

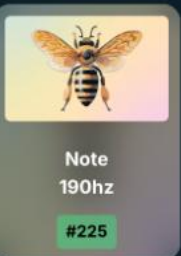
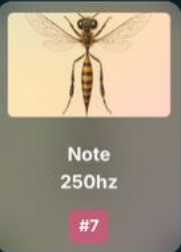
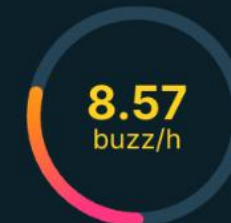
🔊 Sensor measurement (direct)

Reference period: April 1 - October 1 2025

5966 monitored pollinators (normalized)

19 diverse clusters of pollinators

6 spectrum

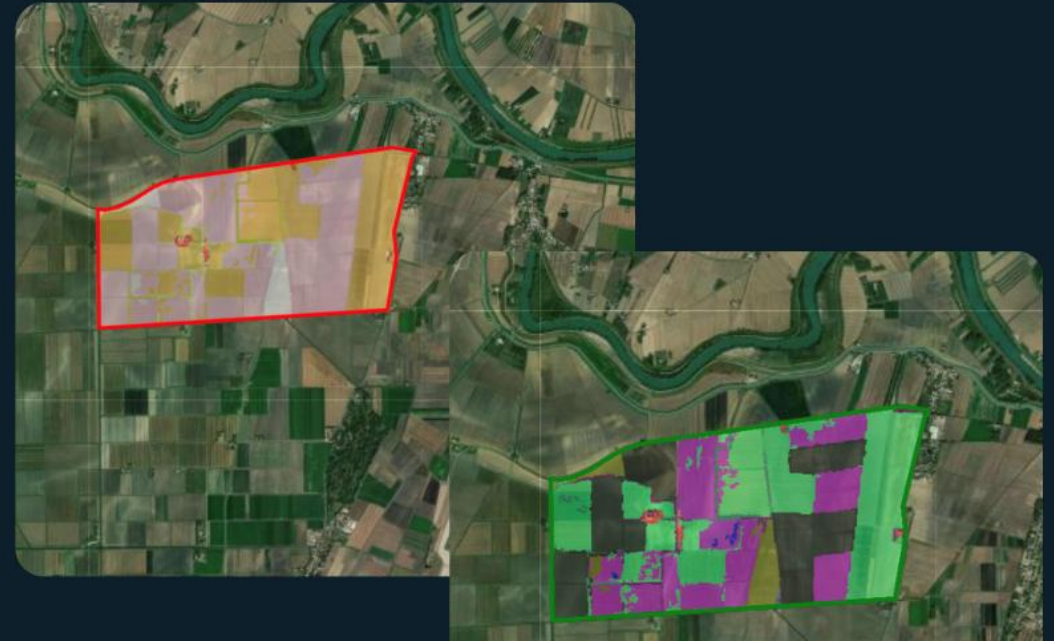


Scenario analysis predicts how effective regeneration will be

Scenario analysis is a critical tool for evaluating the effectiveness of regenerative agriculture practices before they are paid for.

By simulating different land-management options, scenario analysis lets farmers and stakeholders anticipate outcomes and optimise decision-making — on the same indicator set the claim will later be made on.

Ex ante and ex post on the same indicator set — which is what turns a prediction into something anyone can hold you to.



Same landscape, two management scenarios — modelled before a single hectare is committed.

The agri-food footprint we measure on today

Agri-food projects only — not the company totals. Working farmland and supply-chain land under active monitoring.

60+

agri-food
companies

22,500

hectares
monitored

10

countries with
agri projects

17

crop systems
under monitoring

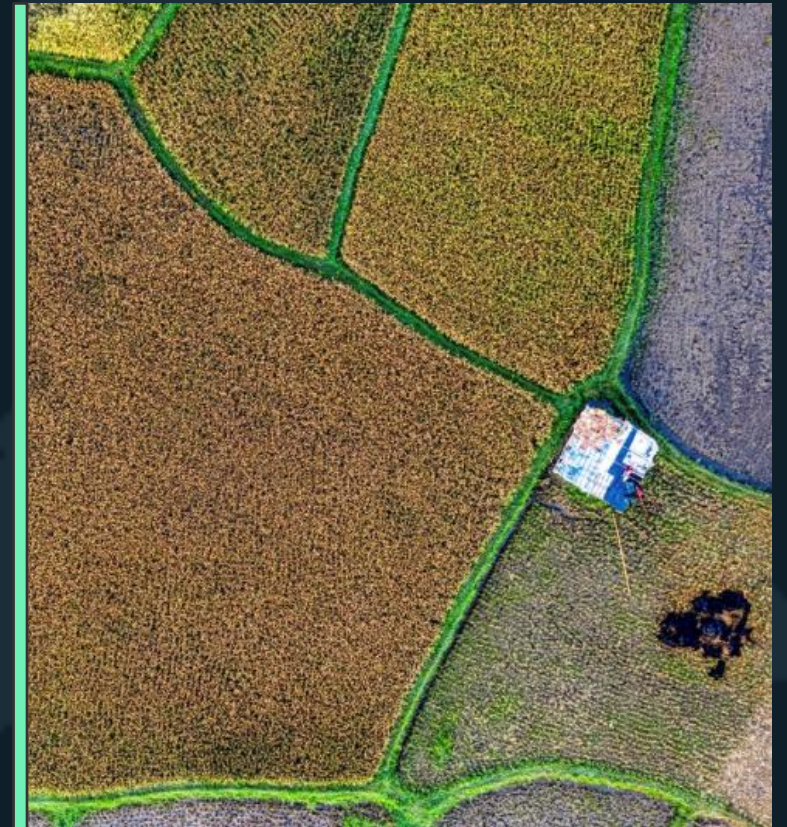
Where

Italy · Spain · Germany · France · United Kingdom · Romania · Chile · Peru · Brazil · Colombia

Some of our crops

Blueberries · hazelnuts · avocado · coffee · cereals · vegetables · wine · olive oil · tomato

Ferrero · Mutti · Findus · Sammontana · Nestlé · Alce Nero · Aboca · Davines · Le Tenute del Leone Alato



Four agri-food projects, four different jobs

Leone Alato · Generali Holding

Nature Strategy for the agri company · 28 estates, Italy and Romania

One TNFD LEAP assessment over the whole portfolio — around 14,000 cultivated hectares of vines, hazelnut, cereals and rice — so restoration is set as a group target, not a single good farm: 3,741 hectares to restore under GBF Target 2.

Findus

Vegetable supply chain · 27 farms in Abruzzo, Lazio and Puglia

969 hectares of spinach and chard measured with 35 IoT sensors and satellite, each farm against its own control area. 864 hectares came back degraded. What makes it work is the growers: each of the 27 sees his own field's data, and a monitored Oasis sits inside the chain.

Sammontana

Amando almond supply chain · Sicily

A 44-hectare experimental almond orchard in 9 polygons, 4 Spectrum sensors, 8,051 pollinators and 17 species clusters. Nectar potential is higher inside the orchard than around it — the evidence base under the Almond Charter, signed by the whole chain.

Alce Nero

Organic supply chain · 8 sites, Emilia-Romagna to Puglia

1,200 hectares and 24 Spectrum across two climates, each site read against its own control. Over 14,000 pollinators and 19 clusters — the test of whether organic practice actually delivers measurable biodiversity, across crops and seasons.



ONE THING TO TAKE AWAY

Biodiversity is measurable continuously, comparably, at supply-chain scale.

The framework is still being written.

The measurement does not have to wait for it.

Thank you — happy to continue over the break.

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