Department
for Environment
Food & Rural Affairs

Final Report

Impact Investment Fund, Biodiversity Study

26 July 2022

PEGASYS
CHANGING LIVES CHANGING WORLDS

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LIST OF ABBREVIATIONS

ART-TREES	Architecture for REDD+ Transactions - The REDD+ Environmental Excellence Standard
BIP	Biodiversity Indicators Partnership
BISI	Biodiversity Indicators for Site-based Impacts
CBD	Convention on Biological Diversity
CCAFS	Climate Change, Agriculture and Food Security
CDP	Carbon Disclosure Project
CDSB	Climate Disclosures Standards Board
CGIAR	Consultative Group for International Agriculture Research
DEFRA	Department for Environment, Food & Rural Affairs
E&S	Environmental and Social
eDNA	Environmental DNA
ENCORE	Exploring Natural Capital Opportunities, Risks and Exposure
ESG	Environmental, Social, and Governance
EU	European Union
FACT	Forest, Agriculture and Commodity Trade
FAO	Food and Agriculture Organisation
FBI	Farmland Birds Index
FCDO	Foreign, Commonwealth & Development Office
GHG	Greenhouse Gas
GIIN	Global Impact Investing Network
GIS	Geographic Information System
GRI	Global Reporting Initiative
HCV	High Conservation Value
HIPSO	The Harmonised Indicators for Private Sector Operations
HMT	HM Treasury
IBAT	Integrated Biodiversity Assessment Tool
ICF	International Climate Finance
IIF	Impact Investment Fund
IPBES	Intergovernmental Science-Policy Platform on Biodiversity and Ecosystem Services
IPCC	Intergovernmental Panel on Climate Change
IUCN	International Union for Conservation of Nature
JNCC	Joint Nature Conservation Committee
KBA	Key Biodiversity Area
KPI	Key Performance Indicator
NGO	Non-Governmental Organisation
ODA	Official Development Assistance
OP2B	One Planet Business for Biodiversity
PBAF	Partnership for Biodiversity Accounting Financials
SASB	Sustainability Accounting Standards Board
SDGs	Sustainable Development Goals

SOC	Soil Organic Carbon
STAR	Species Threat Abatement and Recovery
TCFD	Task Force for Climate-related Financial Disclosures
TLFF	Tropical Landscape Finance Facility
TNFD	Taskforce on Nature-related Financial Disclosures
UN	United Nations
UNEP-WCMC	United Nations Environment Programme - World Conservation Monitoring Centre
WBCSD	World Business Council for Sustainable Development

This report has been produced in a collaboration between Pegasys and UNEP-WCMC.

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1 Background to, and purpose of, this report

In December 2021, Defra tasked our team (Pegasys and UNEP-WCMC) with conducting **The Impact Investment Fund – Biodiversity Study** (referred to as "this Study" hereafter), which focuses on helping to understand ways to measure biodiversity within impact investments associated with agricultural lending.

There are inherent links between biodiversity, climate, natural ecosystems, agriculture and livelihoods through the ecosystem services they provide to society. However, for the purposes of this Study, we have focussed on identifying and assessing biodiversity measurement approaches[1], such as indicators[2], metrics[3] and frameworks[4] that are relevant to the measurement of impacts and outcomes of agriculture on biodiversity only. Due to the proliferation of biodiversity measurement approaches in response to a growing momentum of corporate and financial biodiversity measurement and disclosure, the scope of the Study encompasses indicators that must meet the following components for inclusion:

- Focus on biodiversity impact measurement
- Focus on impact funds
- Focus on agricultural lending
- Can be measured at the project level and be aggregated to the portfolio level

The Study therefore seeks to:

- Identify an appropriate set of metrics and/or indicators and methods that can be utilized by impact investment funds to measure the impact of their investments in the agriculture sector on biodiversity; and
- Explore the practical implications of implementing these indicators and methods at a fund level – including aspects linked to additionality and leakage offsite.

To achieve this, we have broken down the Study into four primary delivery Tasks (excluding Inception), each of which comprises several sub-tasks. The figure below presents a snapshot of these Tasks.

[1] A **measurement approach** encompass developed metrics, data/models, tools and frameworks, which can be used to assess biodiversity impacts and dependencies (The Biodiversity Consultancy during Webinar 3: Case studies on supply chain level biodiversity measurement approaches for business, EU Business @ Biodiversity Platform)
[2] **An indicator** is a quantitative or qualitative factor or variable that provides a simple and reliable means to measure achievement, to reflect changes connected to an intervention, or to help assess the performance of an organization.
[3] **A metric** is a calculated or composite measure that can be used to assess, track, or compare performance.
[4] A **framework** are criteria and guidance for decision-making (e.g. BIP) (The Biodiversity Consultancy during Webinar 3: Case studies on supply chain level biodiversity measurement approaches for business, EU Business @ Biodiversity Platform)

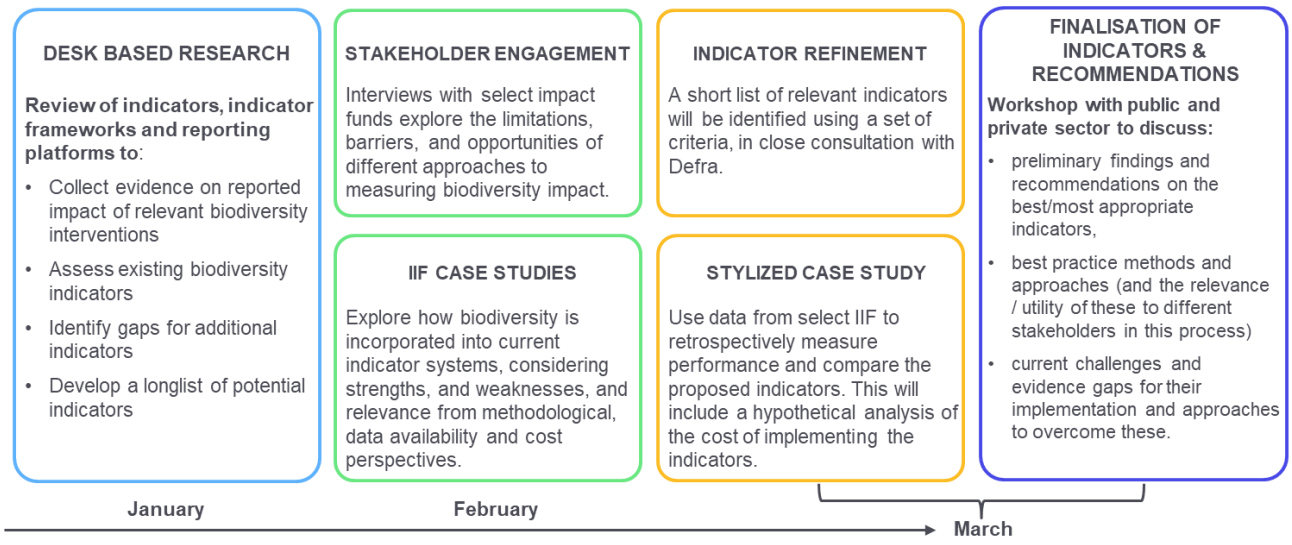

Figure 1 – Phasing and timing of the Study

This **Final Report** presents the culmination of work carried out between January and March 2022. It is complemented by several supporting, interim deliverables that have been submitted over the course of the assignment – including:

- A **Literature Review** that focused on four categories of resources (Indicator Frameworks; Biodiversity Indicators used within existing impact funds; Disclosure / Reporting Platforms; and other relevant guidance). The key findings from the Literature Review are also summarised in PowerPoint format.
- A **Meeting Memo Report**, which synthesises the outcomes of discussions and interviews with stakeholders from 23 impact funds, impact framework developers and technical experts. The intention of these engagements was to understand good practice approaches currently in use, emerging approaches under development, as well as some of the considerations and practical challenges in relation to, for example, data availability, leakage, and attribution/additionality.
- Two **Case Studies** were then elaborated (in PowerPoint format). The case studies provide an in depth understanding of the positives/negatives/challenges faced by two organisations in implementing or exploring the measurement of biodiversity impacts of their investments.
  Emerging themes and key considerations of relevance to this Study were also captured in this PowerPoint, as a basis for discussion with Defra.
- Drawing on information from the Literature Review and Stakeholder Engagement processes, an excel-based **Longlist of Indicators** was developed.
- In consultation with Defra, the team then developed a proposed **Shortlist of Indicators** (also in excel-format) which is complemented by a **Report** that describes the shortlisting approach, structure and proposed set of indicators, as well as a hypothetical case study of how the shortlist could be applied in practice.

These deliverables collectively informed the content and structure of a virtual **Stakeholder Workshop** held on 17th March 2022).

This **Final Report** comprises five Sections, including this Introduction. Section 2 presents a succinct overview of the key findings and learnings from the Literature Review and Stakeholder Engagement processes. Section 3 follows with a description of the purpose and structure of the Workshop (supported by relevant appendices). Section 4 then presents the revised shortlist of indicators, including key considerations and changes that were made to the original shortlist based on feedback from the Workshop. The Report concludes with Section 5, which recommends further work that Defra could explore, after this Study concludes.

1 Learnings from the Literature Review and Stakeholder Interviews

1.1 LITERATURE REVIEW

As described above, the Literature Review focussed on synthesising relevant information from six publicly available indicator frameworks (as well as related reviews and reports), fourteen funds / facilities, five disclosure and reporting platforms, and an array of other relevant, recent guidance and literature. To ensure that we assessed the most up-to-date biodiversity measurement approaches, the search was limited to literature within the past ten years, utilizing both grey literature (e.g. sustainability reports which include biodiversity measurement and research on current biodiversity indicators used within impact funds) and academic literature (to provide a scientific understanding on biodiversity measurement). Key messages gleaned from each of these categories of resources are captured below.

1.1.1 INDICATOR FRAMEWORKS

The publicly available indicator frameworks reviewed include: the Biodiversity Indicators Partnership (BIP), IRIS+, the Land-Use Financing Positive Impact Indicators Directory, One Planet Business for Biodiversity (OP2B), LandScale, and The Harmonized Indicators for Private Sector Operations (HIPSO). The key findings of the review are as follows:

- There is little publicly available information regarding the use of these frameworks within impact funds. The public reporting and disclosing of biodiversity metrics in relation to indicator frameworks should be considered to ensure credibility and knowledge exchange within sustainable land use management activities.
- There is limited mention of additionality and leakage in the indicator frameworks that were accessible for review other than high-level statements on what additionality means in the context of investing in funds linked to Mirova. This mirrors the findings of the JNCC Biodiversity Indicator Framework Review (M. Harris et al 2021) which found that many indicators did not take into account potential displacement effects, and many did not define the baseline or timescale necessary to measure additionality of interventions. This may, at least in part, be because most impacts tend to happen after the end of a funded intervention (which typically lasts two to three years) so capturing these longer-term impacts is difficult and can be costly.
- There is a lack of biodiversity indicators assessing impacts at the landscape scale, with only one framework specifically looking across a wider area. Public information on applying indicators at the landscape scale would be an area for improvement.

1.1.2 BIODIVERSITY INDICATORS USED WITHIN IMPACT FUNDS

The table below presents a snapshot of findings from the fourteen funds and facilities investigated[5], with additional reflections provided thereafter:

Table 1 - Summary of Biodiversity Indicator availability across target funds and facilities

Fund or Facility Name	Publicly available indicator information?	Relevant Biodiversity Indicators available?	Public impact reporting on indicators?
12Tree	Yes – see their Impact page	Yes	Yes – see page 23 of the 12Tree Sustainability Report May 2021
AGRI3	Yes – see their Impacts and E&S framework	Yes	No
Arbaro Advisors	No	No	No
AXA Impact Fund – Climate & Biodiversity	Yes – see here	Yes	Yes
Eco.business Fund	Yes – see their Impact Framework here.	Yes – Annual Impact reports report on biodiversity relevant indicators	Yes – see Annual Impact reports here.
EcoEnterprises Fund	Yes	Yes – see their Impact Metrics	Yes
Ecosystem Integrity Fund	Yes – see Our Impact	No – agricultural impacts are focused on energy savings	Yes
EcoTierra	Yes	No	Yes
&Green	No – but states on their website each transaction should generate environmental return and monitor its achievement through suitable set of transparent KPIs	No – investments must adhere to safeguard ESG standards such as IFC PS, Environmental and Social Action Plan, NDPE, project area and all adjacent HCV and HCS forests and peatlands	No
Land Degradation Neutrality Fund	Yes, as per the latest Impact Report.	Yes	Yes
Mirova	Yes - Mirova have different focuses and therefore different indicators for each of their funds – but have 6 overarching aims which they all contribute to.	Somewhat – broad indicators covering 'healthy ecosystems' and 'resource security'	No
Nature+ Accelerator Fund	No – yet to have deals	No	No
Root Capital	Yes – see 'Our Impact' on website	Somewhat – biodiversity is not a core aim	Yes
Tropical Landscapes Finance Facility (TLFF)	Yes – see the Impact Management Policy, January 2021	Yes	Yes – but only for one project, RLU, in 2019 - here

[5] 1. This includes EcoTierra, a project developer, as they are one of the two partners of the Restoration Seed Capital Facility (RSCF).

- Only some of the indicator frameworks used by impact funds are in the public domain. Eleven of the organisations investigated had made their E&S frameworks public while some others made reference to KPIs or impact metrics on their websites without disclosing their format.
- There is an apparent disconnect between metrics for biodiversity and agricultural impacts. Of the publicly available impact fund indicators, few directly link biodiversity impacts to interventions in agricultural systems. The indicators related to biodiversity and agriculture tend to take two forms: they either cover the extent of protected / natural habitat / forest / High Conservation Area protected or restored through the investment or intervention, or they are a measure of improvements to agricultural practices that either sustainably increase yields or provide sustainable livelihoods benefits.

1.2 DISCLOSURE AND REPORTING PLATFORMS

The five platforms reviewed include: the Sustainability Accounting Standards Board (SASB), CDP, Global Reporting Initiative (GRI), IIRC's International <IR> Framework, and the Climate Disclosure Standards Board (CDSB). The key findings from this review are that:

- There is a growing ecosystem of ESG disclosure standards and frameworks that are utilized by a wide range of constituencies (investors, companies, policy makers, regulators, NGOs, and civil society) to report on and inform organisational and / or project-level decision-making on investments in a structured (comparable, consistent, and reliable) format.
- Some of the leading organizations are now starting to come together to develop standards that provide a comprehensive global baseline of sustainability disclosures focused on the needs of investors and the financial markets. For example, the International Sustainable Standards Board, launched in 2021, brings together existing investor-focused reporting initiatives—including the Climate Disclosure Standards Board, the Task Force for Climate-related Financial Disclosures (TCFD), the Value Reporting Foundation's Integrated Reporting Framework and SASB Standards, and the World Economic Forum's Stakeholder Capitalism Metrics, with the intention of becoming the global standard-setter for sustainability disclosures for the financial markets.
- At a corporate / organisational reporting level, most frameworks include a disclosure / principle / KPI that is broadly relevant to the land use / forestry sector (within which agriculture falls), focused on the protection and / or restoration of habitats. It is worth noting that "protection" and "restoration" are generally subsumed into a single standard, despite the fact that these practices differ vastly in terms of the need for such practice, the baseline situation, and the desired outcome.

1.2.1 OTHER RELEVANT GUIDANCE

- There is a plethora of standards, frameworks, tools and metrics that have been developed for measuring organisations' impacts and dependencies on biodiversity and the associated risks and opportunities. These vary in their coverage, both in terms of level of detail and spatial scale at which they apply.

- There are a number of ongoing efforts to aggregate and harmonise existing metrics and indicators for measuring impacts and dependencies on biodiversity. These are cognisant of the need for monitoring and measurement approaches that are rigorous and robust while being practicable, proportionate (drawing on readily available data as far as possible), and repeatable such that measurements can be undertaken at regular intervals.
- The project-level frameworks and standards reviewed (Verra, the Gold Standard and ART-TREES) all provide pragmatic approaches for identifying and quantifying leakage and additionality within the context of GHG emission reductions. While not directly applicable to biodiversity impact within the context of agricultural activities, the same basic questions on land use change apply. Moreover, while there are processes in place for verifying such calculations, there is no clear guidance on who should be carrying out these assessments, and the likely cost of such – both of which are important considerations for organisations.
- A number of the assessment frameworks and principles reviewed tend to focus on process (i.e. what successful ecosystem restoration entails) rather than specifically how to measure impacts on and outcomes for biodiversity.
- Many of the standards, tools and guidance are designed to support organisations in identifying and assessing natural capital and biodiversity risks and opportunities associated with potential investments, rather than monitoring and measuring their actual performance.
- There are few references to metrics and indicators specifically designed for use in agricultural systems or that explicitly link the impacts of agricultural interventions to changes in biodiversity and vice versa.

1.3 STAKEHOLDER INTERVIEWS

During the month of February 2022, we conducted 23 interviews with impact funds, fund managers and advisors, as well as organisations involved in the development and implementation of impact frameworks and measurement systems, and other technical advisory entities. Annexure A includes a list of these organisations. Through these discussions, several key learnings emerged and can be categorised under several broad themes as follows:

There is growing interest and momentum in monitoring the impacts of investments on biodiversity but many of the frameworks and indicators for doing so are still under development

There is increasing pressure from investors to track impacts on biodiversity, which may be linked with the growing momentum that is building behind regulatory attempts to transform nature-risk awareness into concrete impact in financial markets through, for example, the TNFD. While many of the Funds have mechanisms for tracking their impacts on biodiversity in some form, these are in their early days and few systematically track and link the impacts of sustainability interventions *in agricultural systems* on biodiversity directly. Rather, biodiversity impacts tend to be inferred from other KPIs around land use change (e.g. areas of forest under protection, areas reforested, changes in agricultural production systems such as areas under organic production, reduction in agrochemical use, etc) as these are easier to measure.

While most Funds are developing and testing their own approaches to measuring biodiversity impacts, there are some commonalities between them

It is widely agreed that there is no silver bullet for biodiversity measurement. The complex nature of biodiversity means that there is no single indicator that can neatly capture all its components and aspects or that is applicable across the range of geographies, biomes and other circumstances within which the Funds operate.

The Funds have drawn inspiration from a variety of frameworks, guidance and tools in developing their approaches to monitoring and evaluating biodiversity impacts, and while there are no obvious frontrunners, one of the frameworks that was repeatedly mentioned in the interviews was the Land Use Finance Positive Impacts Indicators Directory which was developed under UNEP's Land Use Finance Programme specifically to promote greater standardisation of indicators in the context of land use finance.

As noted above, most Funds use proxies rather than direct indicators of biodiversity impact and often focus on input, activity and output metrics rather than outcome and impact metrics. This was usually due to limitations on costs and resources available to carry out impact measurement as direct measures of biodiversity are generally more expensive and time consuming to measure.

The frequency with which impacts are monitored depends on both the Fund and the indicator. There is also no rule of thumb in terms of who bears the cost of monitoring. Four of the funds interviewed cover these costs themselves, while four others expected their investees to cover the costs.

There is a growing move towards use of remote sensing technologies (e.g. satellite imagery, drones and camera traps), particularly for investments covering large areas that are difficult to access. However, the current limitations of these technologies, and the need to combine them with in-field measurements, is acknowledged. There is also a growing interest in the use of eDNA techniques as these can be helpful for the compilation of baselines, they capture a wider range of data points and are not sensitive to times of day or year.

Several of the Funds interviewed noted that at present they mainly consider biodiversity impacts from a risk perspective and at the point that investment decisions are made. This is largely because of the absence of reliable methods for directly measuring the performance of investments in terms of positive impacts on biodiversity. However, many funds commented that they would like to be able to directly measure positive impacts on biodiversity if they could identify cost effective and reliable methods of doing so.

Approaches to dealing with additionality and leakage vary

Additionality is a fundamental consideration for most impact investment funds and systems; it tends to be a prerequisite for investment as most funds are seeking transformational change but is not routinely monitored and measured using indicators over the life of an investment; rather it is monitored through inspection of the Theory of Change that describes the relationships between inputs, activities, outputs, outcomes and impact.

Leakage is widely recognised as an issue but approaches to dealing with it vary across the Funds interviewed. Some do not consider it at all while others are applying landscape-scale approaches or considering impacts through the supply chain.

There are a number of common challenges in measuring biodiversity impacts

There are a number of common challenges to establishing and implementing frameworks and indicators for monitoring biodiversity impacts. These include:

- A lack of harmonised standards, comprehensive guidance and tools specifically designed for measuring biodiversity impacts.
- A lack of readily available decision-grade information (e.g. on ecological significance of impacts) to support the development of more meaningful impact indicators (although this is an area of focus for TNFD).
- The effort and costs required to undertake measurement on an individual project basis, particularly for investments covering large areas, in areas that are often difficult to access and where datasets are often highly fragmented.
- The difficulties in translating biodiversity data into quantitative KPIs. For this reason, many funds tend to focus more on process-based assessment.
- The lack of synchronicity between the realisation of impacts of investments or project interventions on biodiversity and the life of a typical investment. Changes in biodiversity are generally slow which means that for short-term projects, the greatest biodiversity effects may only take place after the end of the project. This necessitates the use of indicators that are sensitive to change on a timescale that matches the project, and/or a need for post-project monitoring in order to capture relevant effects. Post-project monitoring is a challenge in itself as at this stage investees no longer have a contractual obligation to report back and it can be difficult to access sites after the end of the project.

2 Stakeholder workshop

On 17th March 2022, our team – under the auspices of Defra – convened a virtual workshop with over fifty participants from impact funds, government, technical and advisory bodies, and development partners. This workshop provided a platform for stakeholders to exchange knowledge, experiences, and recommendations on the topic of biodiversity impact indicators within the context of agricultural systems. Specifically, it sought to bring together this growing community of practice to:

i. Discuss the emerging findings gleaned from stakeholder interviews, and deliberate on how current, common challenges and information gaps can be overcome.
ii. Share feedback on the shortlist of promising indicators that has been developed.
iii. Agree on useful next steps – including areas for further engagement and research – that could potentially be spearheaded by Defra and other interested parties.

In an effort to maximize engagement, our agenda included two rounds of breakout discussions where participants were split into smaller groups to discuss i) the proposed shortlist of indicators; and ii) the identified challenges (and potential solutions) associated with biodiversity impact measurement. Key points raised during these discussions have been captured in Appendix D of this report. This stakeholder feedback has informed this Report in the form of i) changes to the shortlist of indicators (described in Section 3.1.3 below); and ii) recommendations for future work that Defra could explore (captured in Section 4).

The agenda and full list of participant organisations is included in Appendix B.

3 Revised indicator shortlist

3.1 APPROACH

3.1.1 DEVELOPMENT OF THE LONGLIST

This shortlist of indicators has been developed following discussions and interviews with stakeholders from 26 impact funds, impact framework developers and technical experts. This shortlist should be seen as a starting point for discussion, and the culmination of three months of work. Many of the funds we spoke with had developed their own indicator frameworks over the course of one to two years, and many rounds of refinement.

Following our conversations with impact funds, we pooled all the indicators which we had access to into a longlist, and categorised each indicator according to two categories from JNCC (M. Harris et al 2021):

- Direct / Proxy / Modelled[6]
- Response / State / Pressure[7]

You can find a full discussion of these two categories in the literature review (Pegasys & UNEP-WCMC 2022).

Using this categorisation, and working from the many conversations we had with impact funds and other experts in this space, we decided that this shortlist would be best structured by scale of impact, We were inspired by the categorisation of Field, Farm, Landscape and Territory that IUCN presented during our interview with them, in reference to their new Agriculture and Land Health Initiative, and have taken from that the framing of two tiers of indicators: *Farm* and *Landscape*.

The indicator shortlist discussed herein focuses on biodiversity indicators for agricultural interventions. Indicators covering carbon sequestration, livelihoods, or economic benefits are out of scope for this Study.

3.1.2 FROM LONGLIST TO SHORTLIST

The process of refining the longlist of indicators into the shortlist described below was informed by a series of principles and criteria, both technical and practical, which were drawn from our interviews with stakeholders, discussions with Defra, and the relevant literature. Specific sources of published guidance included:

- The Biodiversity Indicator Partnership's Guidance for National Biodiversity Indicator Development and Use (Biodiversity Indicators Partnership 2011);

[6] 1.**Direct** indicators measure the relevant aspects of species or ecosystems directly 2.**Proxy** indicators make use of a factor that is likely to be linked to biodiversity to infer a correlation 3.**Modelled** indicators are based on the modelling aspects of biodiversity by combining multiple data types

[7] 1.**State** indicators measure and describe how the components of biodiversity (ecosystems, species, genes) are changing. 2. **Pressure** indicators measure and describe how human impacts on biodiversity are changing. 3. **Response based** indicators are those which measure factors relating to actions people have taken to improve biodiversity.

- The Biodiversity Indicators for Site-based Impacts – BISI methodology guidance, developed by UNEP-WCMC, Conservation International and Fauna & Flora International for the development of biodiversity performance indicators (UNEP-WCMC, Conservational International, and Fauna & Flora International 2020);
- The Biodiversity Indicators Review conducted by JNCC which identified a number of factors that are particularly important for an International Climate Finance (ICF) Key Performance Indicator (KPI) to capture or address (M. Harris et al 2021).

The **technical principles and criteria** used to guide indicator selection are as follows:

- They should be scientifically valid – there should be an accepted theory of the relationship between the indicator, its purpose and the aspect of biodiversity it is measuring, and it should be based on reliable and verifiable data;
- They should be responsive – able to pick up on changes within the variable of interest, within the timeframe of the project;
- They should be meaningful and easy to understand, both conceptually and in terms of presentation and interpretation;
- They should have a defined baseline or way in which to distinguish between impacts that have occurred as a result of the investment (project interventions) and those that would have happened anyway in the absence of the project (additionality).

These technical criteria were complemented by a set of practical considerations around both the measurement and use of individual indicators, as well as the coverage of the package of indicators in relation to its ability to address the complex nature of biodiversity and to operate in a variety of settings and at various scales. The **practical principles and criteria** used to guide indicator selection are as follows:

Individual indicators

- Should be, where possible, easy and inexpensive to measure
- Should be based on data that are readily available or feasible to collect over a period of time so that the indicator can be measured in a repeatable manner.

The package of indicators

- Should contain at least some direct measures of biodiversity (as opposed to proxy or modelled indicators)
- Should consider the different scales at which impacts may occur, e.g. field, farm, landscape, taking into account potential displacement effects.
- Should work over different timescales – so that they work for both short, yearlong projects (where gradual changes might not be seen) as well as longer term investments of five to ten years.
- Should be cognisant of the various components or aspects of biodiversity such as genes, species richness, species abundance, and ecosystems.
- Should contain a mix of state, pressure and response indicators.

- Should have the potential to aggregate from project scale to portfolio level by identifying a set of core indicators which are universally applicable and must be measured for every project, and optional secondary indicators which may or may not be applied depending on their relevance to the project context and the availability of resources to measure them.
- Should, where possible, be aligned with the relevant Sustainable Development Goals (SDGs) and the draft Post-2020 Global Biodiversity Framework, and be developed with an awareness of the draft EU Taxonomy technical screening criteria (for animal and crop production, and conservation and restoration of ecosystems)[8], the Forest, Agriculture and Commodity Trade (FACT) Dialogue and the wider nature finance agenda.

After assessing the indicators in the longlist against the criteria above, and prioritising indicators chosen by multiple impact funds, we developed a preliminary shortlist of indicators that can be seen in Appendix C. This preliminary shortlist was then discussed with participants at the workshop to gather feedback.

3.1.3 POST-WORKSHOP REVISIONS

As you can see in the notes from the workshop in the Appendix D, we received much insightful feedback from participants at the workshop. Overall, this feedback was positive regarding the farm and landscape framing of the proposed shortlist. It has also informed further revisions to the categorisation of core and secondary indicators, and to the wording of some individual indicators. Below we outline the key changes which we made to the indicator shortlist based on feedback from the workshop, and why.

→ Broaden crop yield indicator from food and feed to include timber and fibre crops

In regard to the crop yield indicator (*'Tonnes of food and/or feed sustainably produced from invested projects'*), it was rightly pointed out that 'food and feed' does not cover all saleable products that could be produced from an agricultural system – timber and fibre crops such as cotton are left out, despite being valuable products. We also felt the phrasing of the indicator was getting a bit convoluted, so have instead followed the phrasing from AGRI3 to rename the indicator as *'Sustainable yield increased (tonnes/hectare or hectares of verified standard)'*. The addition of 'per hectare' ensures that the indicator is relative and therefore comparable across different sized projects – however this data should still only be collected, presented and compared on a crop by crop basis (not, for example, combining the weight of a timber crop with a cocoa crop).

On this indicator we also received comments that we would need to define what we mean by sustainable production, which had already been provided in the detailed description: 'We would suggest aligning with Pretty et al's definition of sustainable production, defined as '*agricultural yields […] increased without adverse environmental impact and without the conversion of additional non-agricultural land'* (J. Pretty & Z. Bharucha

[8] Platform On Sustainable Finance: Technical Working Group. Part B – Annex: Full list of Technical Screening Criteria. August 2021 https://ec.europa.eu/info/sites/default/files/business_economy_euro/banking_and_finance/documents/210803-sustainable-finance-platform-report-technical-screening-criteria-taxonomy-annex_en.pdf

2014). However, this may also need a tighter definition of the 'adverse environmental impacts' to be defined on a case by case basis for product and geography.

→ Change the selection of core indicators: add crop yield, remove crop diversity

Workshop discussions have emphasised the importance of crop yield as an indicator to ensure that projects are not optimised for positive biodiversity impacts at the expense of yield. It was also commented that this is an easy indicator to measure, with data being readily available to the farm manager, and easy to understand – higher sustainable yield is better. Conversely, it was suggested that the crop diversity indicator was not that well suited to being a core, headline KPI as it is not immediately clear what 'good' is (is more always better?), and not all agricultural systems are suited to growing a wide diversity of crops in parallel. Therefore, we have decided to swap these two indicators around, with *'Sustainable yield increased (tonnes per hectare or hectares of verified standard)'* now moving to be a core indicator, and *'Number of different crop varieties, and livestock breeds, on farm over the course of a year'* as a secondary indicator.

→ Add emphasis to native and climate resilient crops in indicator on *'Number of different crop varieties, and livestock breeds, on farm over the course of a year'*

Native and climate resilient crops are particularly important to assess in the context of crop diversity on farm, with the former being most well suited to the local conditions (and co-evolved with local fauna) and the latter having better resilience to climate extremes such as drought and flooding. Therefore, we have added a note that these might be particularly important to track in this indicator.

→ Broaden *Soil Organic Carbon* indicator to include other measures of soil health

It was discussed that whilst soil organic carbon is an important measure in itself, it does not directly reflect soil biodiversity and wider health. Therefore, we have broadened the indicator to include the suggestion of other measurements of soil health, such as a visual assessment of soil structure, and potentially an assessment of soil respiration to monitor microbial activity. It has been renamed *'Soil organic carbon (and other measures of soil health)*'.

→ Make clear that *'Area of project land under protection as natural habitat'* is not referring only to officially recognised Protected Areas

There was some concern that this indicator was only measuring land protected in officially designated Protected Areas. This was not our intention – rather, it is meant to refer to land that the land manager has made a decision to set aside and protect from production or interference. We have rephrased this to make this distinction clearer and the wording simpler, and the indicator is now renamed *'Area of natural habitat protected, within project'*.

→ Clarify Chemical Usage as referring to pesticides only, and not chemical fertilisers

We have clarified the wording around the indicator that was previously *'Chemical usage on farm (litres of pesticide and herbicide per hectare)'* and renamed it as *'Pesticide use on farm (kilograms of pesticide per hectare)'*. Kilograms is a more accurate measure of active product used than litres, as it avoids dilution issues. The work 'pesticide' is commonly used as an umbrella term that includes herbicides and fungicides, and so we have reflected this in both the indicator name and description text.

3.2 STRUCTURE OF THE SHORTLIST

As noted previously, we have organised the indicator framework into two levels – *Farm* and *Landscape* - reflecting different scales at which impact is felt on biodiversity from the project, and recognising that in the context of biodiversity, both farm and landscape level measures of biodiversity are important and interlinked. The structure of the framework, and the revised shortlist of indicators, are shown in Figure 2.

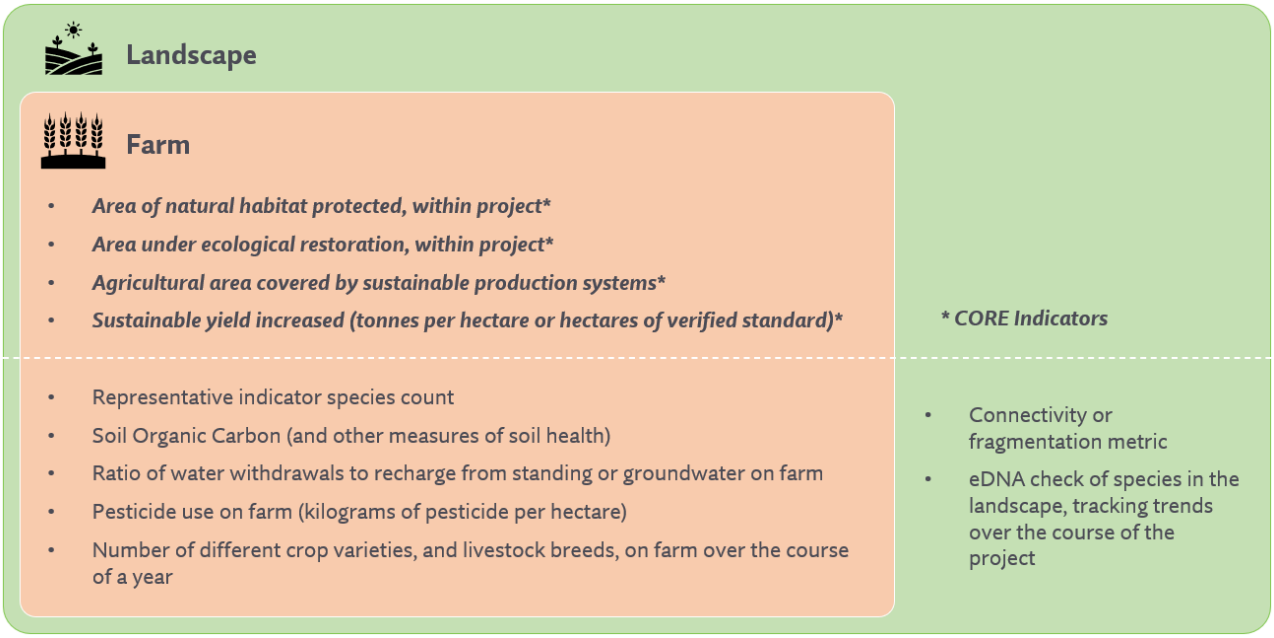

Figure 2 - Our revised indicator shortlist has been designed to work at two scales, Farm and Landscape. The four core indicators should be applied to all projects, as well as at least one indicator from the Landscape category.

This structure has been chosen to help frame users' thinking when selecting indicators from the framework. We recommend that core indicators at the *Farm* level are assessed for every project, alongside at least one indicator from the *Landscape* level, and a subset of the secondary indicators. This is to ensure that positive impacts are tracked across both farm and landscape, and not just focused, for example, purely on farm, whilst wider landscape benefits are not considered.

This structure also helps to put the project impacts in a broader landscape perspective by asking users to consider positive spill over effect beyond farm boundaries. By proposing that users consider impact both farm and landscape level, this means that the project itself cannot be considered in isolation, and potential non-beneficial impacts elsewhere should be considered. Leakage will be context dependent and a consideration to have in mind when assessing project additionality, e.g., during the due diligence process. If leakage is a matter of concern, this can be considered in the form of a discount applied to measured positive impacts, being likely impossible though to establish a one-size-fits-all discount. The landscape indicators are both quite preliminary, as will be discussed below, and would benefit from further follow on research.

3.3 REVISED INDICATOR SHORTLIST

Below we discuss why each proposed indicator was chosen, including revisions as discussed above based on feedback and suggestions from the workshop. As we will discuss further in Section 4, we appreciate that for these indicators to be rolled out, more detailed guidance would need to be given regarding definitions of key words and phrases, as well as measurement methodologies. This is in itself a large project and is out of scope of the current work.

3.3.1 FARM-LEVEL INDICATORS

These indicators reflect the biodiversity impact at the farm or project level. They are split into Core indicators which should be measured for every project, and Secondary indicators that can be selected based on which are the best fit for the project and fund aims.

Core indicators

Indicator	Area of natural habitat protected, within project
Scale at which applied	Farm
Type of indicator	Proxy
Type of indicator	Response
Core vs Secondary Indicator	Core
Rationale for inclusion	Extent of natural habitat[9] under protection was a common proxy measure used by many of the impact funds interviewed. Whilst it does not directly measure biodiversity, it is easy to measure (the information should be in the project plan) and can be a leading indicator for biodiversity recovery in set-aside land. Ideally, the indicator should include an additional measure of state/importance of the ecosystem being protected, allowing the extent of habitat protected to be weighted by its ecological importance. This would ensure that more weight is given to the protection of more ecologically important areas. This qualifier metric could not be identified conclusively during the short timeframe of this study, but as a start we would suggest either calculating the Species Threat Abatement and Recovery (STAR)[10] value of the land under protection, or using the ecosystem integrity risk from ENCORE[11], to score the project site. Other potential ways to qualify the area of natural habitat being protected include looking at Key Biodiversity Areas - KBAs, High Conservation Value - HCV, Critical Habitats (as per IFC PS6), and others.
How is it measured?	**Unit of measurement: hectares** Information on how much of the project area is set aside land, protected from any interventions, should be readily available from the project plan in the first instance, and could be calibrated against a remote sensing analysis of actual land use on farm. Where these figures do not match, further conversations should be carried out with the project manager to understand the source of the discrepancy.

[9] Natural habitat is defined as 'Areas composed of viable assemblages of plant and/or animal species of largely native origin and/or where human activity had not essentially modified an area's primary ecological functions and species composition' by the IFC (2012). This would include intact forest, as well as other intact landscapes. https://biodiversitya-z.org/content/natural-habitats

[10] The Species Threat Abatement Restoration (STAR) metric uses IUCN Red List of Threatened Species data to estimate the potential reduction in species extinction risk that could be achieved at a site, across a corporate footprint, or within a country. For more information https://www.iucnredlist.org/assessment/star

[11] See *How to use the ENCORE biodiversity module*, page 9, for an explanation of this metric. Available at: https://s3.eu-west-2.amazonaws.com/ncfa.documents/resources/ENCORE+Guide+to+Biodiversity+Module.pdf

	If STAR is used to qualify the areas being protected, data layers should be extracted an assessed through the Integrated Biodiversity Assessment Tool (IBAT)[12].
Monitoring frequency and applicability to shorter- vs longer-term projects	**Annual.** Even in short term projects this is a helpful indicator – although there should be steps taken to ensure that the land set aside for protection is kept protected after the end of the project and not returned to e.g. agricultural use.
Geographical applicability	This indicator is applicable globally. 'Natural habitat'[13] is a purposely non-geographically specific term: what constitutes 'Natural habitat' will vary geographically, but the term is applicable globally.
Cost / resources required	Low – Medium. As discussed above, some remote sensing and GIS expertise may be needed to corroborate change in set-aside area over time and ensure that it matches what has been promised in the project plan.
Potential to aggregate to portfolio level	Can be aggregated
Alignment to SDGs	Indicator 15.1.1 - Forest area as a proportion of total land area
Alignment to post-2020 Global Biodiversity Framework Targets	2
Source / inclusion in other frameworks	• Land Use Finance Positive Impact Indicators Directory: 'Area of critical habitat under management for protection', 'Area of on-site natural habitat under management for protection', and 'Area of avoided conversion of natural habitat'. • AGRI3: 'Area of HCV/HCS natural forest protected' • EcoTierra: 'Hectares of forest under conservation' • TLFF: 'Retained canopy cover: Area of High Conservation Value (HCV) or High Carbon Stock (HCS) forest conserved, or Area of Critical Habitat conserved'

Indicator	**Area under ecological restoration, within project**
Scale at which applied	Farm
Type of indicator	Proxy
Type of indicator	Response
Core vs Secondary indicator	Core
Rationale for inclusion	This was a common proxy measure used by many of the impact funds interviewed. Whilst this indicator does not directly measure biodiversity, it is easy to measure (the information should be in the project plan) and can be a leading indicator for biodiversity recovery in restored areas. It also draws a clear alignment with the UN's global Decade on Ecosystem Restoration[14]. Ideally, the indicator should include an additional measure of state/importance of the ecosystem being restored, allowing the extent of habitat being restored to be weighted by its ecological importance. This would ensure that more weight is given to the restoration of more ecologically important areas. This qualifier metric could not be identified conclusively during the short timeframe of this study, but as a start we would suggest either calculating the Species Threat Abatement and Recovery (STAR)[15] value of the land under protection, or using the ecosystem

[12] Accessed here: https://www.ibat-alliance.org/star
[13] See defintion of 'Natural Habitats', Biodiversity A-Z. https://biodiversitya-z.org/content/natural-habitats
[14] Accessed here: https://www.decadeonrestoration.org/
[15] The Species Threat Abatement Restoration (STAR) metric uses IUCN Red List of Threatened Species data to estimate the potential reduction in species extinction risk that could be achieved at a site, across a corporate footprint, or within a country. For more information https://www.iucnredlist.org/assessment/star

	integrity risk from ENCORE[16], to score the project site. Other potential ways to qualify the area of natural habitat being protected include looking at Key Biodiversity Areas - KBAs, High Conservation Value - HCV, Critical Habitats (as per IFC PS6), and others.
How is it measured?	**Unit of measurement: hectares** This information should be readily available from the project plan in the first instance and could be calibrated against a remote sensing-based analysis of actual land use and restoration on farm. Where these figures do not match, further conversations should be carried out with the project manager to understand the source of the discrepancy. It is important to highlight that there should be no double counting between this indicator and the *'Area of natural habitat protected'* indicator. This indicator refers to areas that are in the process of returning to a natural state. If within the project lifetime some areas are fully restored, or restored enough to be classified as natural habitat, they should then be counted towards the *'Area of natural habitat protected'* indicator, and not on the restoration one. As restoration is a continuum, this might not always be straightforward, but the important point is not to count the same area twice: it is either an area under ecological restoration or it is a natural habitat under protection. If STAR is used to qualify the areas being protected, data layers should be extracted an assessed through the Integrated Biodiversity Assessment Tool (IBAT)[17].
Monitoring frequency and applicability to shorter- vs longer-term projects	**Annual.** Even in a short-term project this is a helpful indicator – although there should be steps taken to ensure that the land set aside for restoration is kept on its restoration journey after the end of the project and not returned to e.g. agricultural use.
Geographical applicability	This indicator is applicable globally. The term 'Ecological restoration' is a purposely broad term, aligning with Principle 3 of the Decade of Ecosystem Restoration, *'ecological restoration, which aims to remove degradation and assists in recovering an ecosystem to the trajectory it would be on if degradation had not occurred, accounting for environmental change'*. (FAO 2021)
Cost / resources required	Low – Medium. As discussed above, some remote sensing and GIS expertise may be needed to corroborate change in set-aside area over time and ensure that it matches what has been promised in the project plan.
Potential to aggregate to portfolio level	Can be aggregated.
Alignment to SDGs	15.3.1
Alignment to post-2020 Global Biodiversity Framework Targets	Goal A; 1
Source / inclusion in other frameworks	• Landscale have an indicator for 'Total area under restoration', as well as 'Area (ha) & percentage (%) of land under restoration within areas identified as important for biodiversity'. • The Land Use Finance Positive Impact Indicators Directory has an indicator for 'Area of modified habitat under management for restoration', 'Forest under management for restoration objectives', and 'Forest under management for conservation, restoration, or sustainable use'. • AGRI3 includes an indicator for 'Natural forest under active management for replanting and/or restoration'.

[16] See *How to use the ENCORE biodiversity module*, page 9, for an explanation of this metric. Available at: https://s3.eu-west-2.amazonaws.com/ncfa.documents/resources/ENCORE+Guide+to+Biodiversity+Module.pdf

[17] Accessed hereL https://www.ibat-alliance.org/star

Indicator	**Agricultural area covered by sustainable production systems** (Hectares under agroforestry, silvopasture, or organic production)
Scale at which applied	Farm
Type of indicator	Proxy
Type of indicator	Response
Core vs Secondary Indicator	Core
Rationale for inclusion	This was a common indicator amongst the impact funds interviewed. It is an easy to measure proxy for biodiversity – based on the assumption that the production systems in focus have a positive impact on biodiversity. Actual impact on species is not captured here.
How is it measured?	A sustainable production system (or systems) of interest should be identified by Defra or the fund in question – e.g. agroforestry, or organic production – and clearly defined. Then projects should be able to report at low cost the area of land under the farming system of interest. Remote sensing or field visits could be used to corroborate reported area, and, if relevant and applicable, certification systems could also be used to ensure high standards are maintained and provide third party verification. Measured annually, against a pre-project baseline.
Monitoring frequency and applicability to shorter- vs longer-term projects	**Annual.** Applicable to any project so long as it is at least a year long.
Geographical applicability	Should be able to be applied globally, However, bear in mind that certain crops and geographical regions lend themselves better to agroforestry systems than others. For example, coffee and cocoa in tropical areas are often already grown in agroforest systems, whereas this is much rarer for row crops in Western Europe.
Cost / resources required	Low cost. Easily measured on farm by project team. Could be verified by remote sensing or certification if required.
Potential to aggregate to portfolio level	Can be aggregated, but by production system type.
Alignment to SDGs	2.4.1; 15.3.1
Alignment to post-2020 Global Biodiversity Framework Targets	9
Source / inclusion in other frameworks	• AGRI3 include an indicator 'Agricultural land under sustainable management' • TLFF include an indicator for 'Agricultural area covered by sustainable production systems (to be defined per project)' • EcoBusiness include 'indicators for ha of land where low or no-till practices are supported, and Area under agroforestry supported'

Indicator	**Sustainable yield increased (tonnes per hectare or hectares of verified standard**)
Scale at which applied	Farm
Type of indicator	Proxy
Type of indicator	Response
Core vs Secondary Indicator	Core

Rationale for inclusion	This metric, whilst not directly linked to biodiversity impacts, goes some way towards capturing the importance of both on-site biodiversity and on-site yield when considering project impacts on global biodiversity levels. If a project solely optimises a farm for biodiversity, at the expense of yield, then it runs the risk of generating leakage effects where the demand for that yield in the food chain is met elsewhere in the globe, possibly at greater ecological cost. We would suggest aligning with Pretty et al's definition of sustainable production, defined as '*agricultural yields […] increased without adverse environmental impact and without the conversion of additional non-agricultural land*' (J. Pretty & Z. Bharucha 2014). We would suggest tracking the trend in sustainably produced yield over the course of the project – as it is noted that if projects encompass a transition from conventional agriculture to, for example, agroecological principles, there may be an initial yield dip as the farm restores soils and pivots away from artificial fertilisers and pesticides.
How is it measured?	**Unit of measurement: tonnes** This data should be readily available from the farm's records. If certification schemes are used on farm, then a ratio of certified to non-certified produce could also be developed. This data should only be collected, presented and compared on a crop by crop basis (not, for example, combining the weight of a timber crop with a cocoa crop). *Track against a pre-investment baseline.*
Monitoring frequency and applicability to shorter- vs longer-term projects	**Annual**. Suitable for any length of project.
Geographical applicability	Applicable globally
Cost / resources required	Low cost. Data should already be available on farm.
Potential to aggregate to portfolio level	Can be aggregated
Alignment to SDGs	2.3.1; 2.4.1
Alignment to post-2020 Global Biodiversity Framework Targets	9
Source / inclusion in other frameworks	• AGRI3 include an indicator 'Sustainable yield increased (tonnes or ha verified standard).' • Global Farm Metric include an indicator on 'Crops grown marketable yield exported.'

Secondary indicators

Indicator	Representative indicator species count
Scale at which applied	Farm
Type of indicator	Direct
Type of indicator	State
Core vs Secondary Indicator	Secondary
Rationale for inclusion	A direct measure of biodiversity, but one which also acts as a proxy to some extent as the representative species (eg, a skylark in a UK farming system) represents not just itself, but also ecosystem health more widely. This species could be agreed at a country or regional scale. Some examples would include earthworms (a proxy for soil health for most of Europe) and representative butterflies (a good proxy for the health of grassland systems in Western Europe). The Farmland Birds Index[18], developed and used by the EU, could be a good source of representative bird species for the European context, but in order to manage the cost and time associated with measurement of this indicator we would suggest focusing on two or three key species for each region, rather than measuring the full 39 in the FBI.
How is it measured?	**Unit of measurement: Number** The 'representative species' should be agreed with the project and identified due to its relevance to the country and habitat in question. Where possible, the same species should be used across all relevant projects in a region or country, to allow comparability. The selection of species as a biodiversity feature to be monitored should follow the set of six criteria proposed by the Biodiversity Indicators for Site-based Impacts - BISI methodology (UNEP-WCMC, Conservational International, and Fauna & Flora International 2020). They are: 1. Present at site; 2. Impacted by company-induced pressures; 3. Feasibly monitored; 4. Responsive to change; 5. Representative of the effect on wider biodiversity; and 6. Threatened or important. An on-farm species count should be carried out at least once a year, and repeated at regular, agreed, intervals. Farm managers could be trained to do this count themselves or may already have the knowledge required to do so. Species abundance should be compared over time to the baseline at the project start.
Monitoring frequency and applicability to shorter- vs longer-term projects	**Annual**. Better for longer term projects where trends can be tracked over time, and ecosystems have time to recover.
Geographical applicability	As discussed above, relevant species will need to be agreed for different regions and geographies.
Cost / resources required	Low. A count of the representative species on farm should be relatively low cost. Consideration to the ease of spotting and counting the species should inform the choice of which indicator species to use. Ideally non-specialists on farm should be able to carry out this count, with a little prior training.
Potential to aggregate to portfolio level	Given that the species of interest will vary between regions, this indicator is not possible to aggregate across the whole portfolio.
Alignment to SDGs	2.4.1; 15
Alignment to post-2020 Global Biodiversity Framework Targets	3

[18] Accessed here: https://agridata.ec.europa.eu/Qlik_Downloads/InfoSheetEnvironmental/infoC35.html

Source / inclusion in other frameworks	Indicators for earthworm numbers, as well as bird count and butterfly count, are used by Global Farm Metric.

Indicator	**Soil organic carbon (and other measures of soil health)**
Scale at which applied	Farm
Type of indicator	Proxy
Type of indicator	State
Core vs Secondary Indicator	Secondary
Rationale for inclusion	Soil organic carbon is an easy measure of soil health, and carbon sequestration, which can be measured with a simple lab analysis after soil samples are collected on farm. There are a variety of different types of lab analyses for soil organic carbon – further research is needed to identify the most suitable test to recommend here, that would be comparable globally. Higher soil organic carbon indicates a healthier soil ecosystem, which is vital for sustainable yields in the long term. Alongside SOC measurement, other measures of soil health, such as an assessment of soil structure (visual assessment) and microbial activity (assessed via monitoring soil respiration over 24 hours) could be recommended, for a more holistic measurement of soil health.
How is it measured?	**Unit of measurement: tonnes of carbon per hectare** Take soil samples on site (at appropriate intensity/density) and send these to a lab for analysis of soil carbon content and bulk density. Statistical analysis is then used to inform predictive soil mapping.
Monitoring frequency and applicability to shorter- vs longer-term projects	**Annual.** More relevant for projects running over several years, where there is time for an increase in soil organic carbon to develop and be measured.
Geographical applicability	Can be applied globally.
Cost / resources required	Requires access to a lab for analysis, with associated costs of both the analysis and travel, labour, sampling etc.
Potential to aggregate to portfolio level	Can be aggregated at portfolio level.
Alignment to SDGs	2.4.1; 15.3.1
Alignment to post-2020 Global Biodiversity Framework Targets	9
Source / inclusion in other frameworks	• LDN Fund have an indicator for 'Soil Organic Carbon' • Global Farm Metric have indicators for 'Soil Organic Matter', as well as 'Soil Structure'. • IRIS+ have an indicator for 'Soil Conservation Practice's (Designed to capture the sustainable agriculture practices the organization employs to minimize soil erosion, avoid land degradation of agricultural lands, and support healthy ecosystems) • One Planet Business for Biodiversity have an indicator for 'Soil organic carbon content'

Indicator	**Ratio of water withdrawals to recharge from standing or groundwater on farm**
Scale at which applied	Farm
Type of indicator	Proxy

Type of indicator	State
Core vs Secondary Indicator	Secondary
Rationale for inclusion	Water usage is an easy to measure proxy for the farm's impact on its wider environment, and for whether it is exploiting natural resources sustainably. Water withdrawals should be easy data to access from the farm manager. Water recharge could be harder to assess – and would potentially require a hydrological model to be drawn up. However, a low-cost alternative to calculating recharge rates would be to qualify water withdrawals against water scarcity data for the region, for instance using WWF's free Water Risk Filter[19].
How is it measured?	Data on water withdrawal should be easy to access from the farm manager – and if it is not, we recommend that it would be good practice (and low cost) to introduce the measurement of this. Water recharge through rainfall can be calculated using a rainwater gauge at low cost. However, more accurate recharge models would require hydrological modelling, and so would be more costly to calculate. A low-cost alternative to calculating recharge rates would be to qualify water withdrawals against water scarcity data for the region, for instance using WWF's free Water Risk Filter. The trend over the course of the project should be compared to the pre-project baseline.
Monitoring frequency and applicability to shorter- vs longer-term projects	**Annual**
Geographical applicability	This indicator would be applicable globally, but rainfall and water availability will vary considerably across different geographies. Calculating a ratio of withdrawals to recharge provides come comparability.
Cost / resources required	Low to medium cost. If recharge rates are to be calculated then specialist hydrological expertise will be needed. If water scarcity from the WWF Water Risk Filter is to be used a qualifier, then GIS skills will be required.
Potential to aggregate to portfolio level	Not suitable to aggregate
Alignment to SDGs	6.4.2; 6.6.1
Alignment to post-2020 Global Biodiversity Framework Targets	10
Source / inclusion in other frameworks	• 'Percentage of water from mains/abstracted/stored rainwater/recycled water' is used by Global Farm Metric. • One Planet Business for Biodiversity include an indicator on 'Blue water withdrawals'.

[19] Water Risk Filter – free maps are available here: https://waterriskfilter.org/explore/map , and you can create a free account and analyse areas of interest here: https://waterriskfilter.org/assess

Indicator	**Pesticide use on farm (kilograms of pesticide per hectare)**
Scale at which applied	Farm
Type of indicator	Proxy
Type of indicator	Pressure
Core vs Secondary Indicator	Secondary
Rationale for inclusion	This is another easy to measure proxy for the farm's impact on its on-farm biodiversity. Where possible, farms should be striving to make use of non-chemical pest control measures, that have a less potent effect on the farm's flora and fauna, and fewer off-target affects. A reduction in the use of chemical pesticides and herbicides is called for in both the EU Biodiversity Strategy, and the EU's Farm to Fork Strategy, both of which have influenced the EU Taxonomy. Other jurisdictions are likely to follow this approach. It supports sounds pesticide management in agriculture, as promoted by FAO (FAO 2019) and others.
How is it measured?	**Unit of measurement: kilograms of pesticide per hectare** Pesticides here should be taken to include insecticides, fungicides, herbicides and molluscicides. Data on chemical usage should be easy to access from the farm manager – and if it is not, we recommend that it would be good practice (and low cost) to introduce the measurement of this. Trends should be tracked against a pre-investment baseline.
Monitoring frequency and applicability to shorter- vs longer-term projects	**Annual.** Suitable for short and longer term investments.
Geographical applicability	Applicable globally. Note that legality of certain herbicides and pesticides will vary between countries.
Cost / resources required	Low cost. Measurement on farm from existing data.
Potential to aggregate to portfolio level	Could track trends in pesticide use over time across whole portfolio.
Alignment to SDGs	2.4.1; 3.9.3; 12.4
Alignment to post-2020 Global Biodiversity Framework Targets	6
Source / inclusion in other frameworks	• IRIS+ include an indicator on 'Pesticide use (Amount of pesticides used during the reporting period on land area directly controlled by the organization)' • 'Pesticide usage – Environmental Impact Quotient' is used by One Planet Business for Biodiversity.

Indicator	**Number of different crop varieties, and livestock breeds, on farm over the course of a year**
Scale at which applied	Farm
Type of indicator	Direct
Type of indicator	State
Core vs Secondary Indicator	Secondary
Rationale for inclusion	This was a common indicator amongst the impact funds interviewed, as well as being mentioned in the draft EU Taxonomy technical screening criteria for agriculture (The Platform on Sustainable Finance 2021), and captures cultivated biodiversity. As a rule of thumb, more diversity of crop plants makes for a healthier farming system, as it reduces build-up of pests and diseases that can be seen in a monoculture. Maintaining crop and livestock breed diversity on farm is also important to protect the broad genetic variety that has been developed in these species and varieties over time, which provide important pest and disease resistant traits, a broad range of environmental adaptation, and also represent an irreplaceable aspect of farming culture.
How is it measured?	**Unit of measurement: Number of species** This indicator should be easily measured on farm, as it is information which the farm manager should know from their cropping plans. We recommend it should be compiled on a yearly basis, so as to reflect temporal variation and crop rotation, and well as spatial. Should be compared to a baseline from before the project intervention. It may also be helpful to collect data specifically on the number of native species grown, and the number of climate resilient crops.
Monitoring frequency and applicability to shorter- vs longer-term projects	**Annual**. Applicable to any project so long as it is at least a year long.
Geographical applicability	Able to be measured globally. However, it should be remembered that there is considerable variation in the diversity of cropping systems globally, and so direct comparison across very different regions and farming systems is not advised. Not all farming systems are suited to growing a variety of crops. Instead, trends over time at a project level should be considered.
Cost / resources required	Low cost. Measured on farm.
Potential to aggregate to portfolio level	Not advised, as discussed above.
Alignment to SDGs	2.5
Alignment to post-2020 Global Biodiversity Framework Targets	3
Source / inclusion in other frameworks	• Global Farm Metric include indicators for 'Diversity of crop and grasses in rotation', and 'Number of crop species and varieties'. • Biodiversity Indicators Partnership have an indicator for 'Total number of crop material from the Multilateral System of the International Treaty received in a country'. • One Planet Business for Biodiversity include an indicator on 'Number of crops per ha per crop cycle'.

3.3.2 LANDSCAPE-LEVEL

These indicators reflect the biodiversity impact at the landscape or jurisdictional level. At least one of these indicators should be used for each project assessment.

In addition to measuring landscape scale impact with one of the indicators below, project developers should also consider their alignment with wider landscape and national level biodiversity and conservation plans, for example NBSAPs. This alignment (or lack of) should be assessed by investors at the due diligence stage, prior to investment, to ensure that maximal impact is created at a landscape stage. We would also recommend that alignment with local or national plans is periodically checked throughout the investment lifetime, in case new plans are developed that affect the project site.

Indicator	**Connectivity or fragmentation metric** – *to be further investigated*
Scale at which applied	Landscape
Type of indicator	Proxy
Type of indicator	Response
Core vs Secondary Indicator	Secondary
Rationale for inclusion	Project or farm level biodiversity cannot be considered in isolation. For an investment to have true impact on biodiversity, it should consider how it can contribute to wider landscape biodiversity, through adding to or creating wildlife corridors to allow species to migrate and not become genetically isolated. A simple connectivity metric, such as the length of project boundary touching other protected areas, can help incentivise project to ensure they are thinking about how their interventions are positioned so best align with neighbouring schemes. We do not have the time or scope within this project to fully analyse the most relevant metric to use here, but some examples include: • From TLFF: 'Connectivity preserved: Area of ecologically viable connected forest increased' • From IRIS+: 'Area of adjacent protected land - Area of protected land that shares a boundary with the organization's protected land as of the end of the reporting period' • Many other potential metrics are listed in the journal *Connectivity metrics for conservation planning and monitoring* written by *Keeley, Beier and Jenness* in 2021[20] and a helpful wider discussion is found in the WBCSD report, *Landscape Connectivity: A call to action* (2017)[21]
How is it measured?	*Dependant on metric chosen.*
Monitoring frequency and applicability to shorter- vs longer-term projects	**Annual.** Would be better suited to longer term projects, where increased landscape connectivity might be seen over time.
Geographical applicability	Identifying a metric should take into account global applicability, as far as possible.
Cost / resources required	*Dependant on metric chosen.* Ideally low to medium cost, but may require GIS analysis skills.

[20] For further information: https://www.sciencedirect.com/science/article/pii/S0006320721000604#f0010
[21] For further information: https://www.wbcsd.org/Programs/Food-and-Nature/Food-Land-Use/Scaling-Positive-Agriculture/Resources/Landscape-Connectivity-A-call-to-action

Potential to aggregate to portfolio level	*Dependant on metric chosen.*
Alignment to SDGs	2.4.1; 15.3.1
Alignment to post-2020 Global Biodiversity Framework Targets	Goal A; 1
Source / inclusion in other frameworks	• 'Connectivity preserved: Area of ecologically viable connected forest increased' is used by TLFF. • Landscale include an indicator on 'User-defined metrics of connectivity and/or fragmentation appropriate to the types and patterns of natural ecosystems.'

Indicator	**eDNA check of species in the landscape, tracking trends over the course of the project**
Scale at which applied	Landscape
Type of indicator	Direct
Type of indicator	State
Core vs Secondary Indicator	Secondary
Rationale for inclusion	If an eDNA survey of biodiversity was to be carried out in the landscape in area around the project area, it could capture rarer or migratory species that move through the project area briefly. Changes in this landscape level biodiversity should be tracked over the course of the project.
How is it measured?	**Unit of measurement: number of species** Environmental DNA (eDNA) is found in water sources and soils, and represents a good cross section of species found in a landscape (often capturing the presence of more species than found by traditional ecological surveys). Samples from water or soil can be taken in the field by a non-specialist but need to be analysed in a lab by specialists. Trends over time should be measured against a pre-investment baseline.
Monitoring frequency and applicability to shorter- vs longer-term projects	**Annual.** More relevant for longer term projects where changes over time can be tracked.
Geographical applicability	Applicable globally
Cost / resources required	Medium to high cost. Would require the services of an external provider.
Potential to aggregate to portfolio level	Not suitable to aggregate
Alignment to SDGs	15.5; 15.9
Alignment to post-2020 Global Biodiversity Framework Targets	3 9 13
Source / inclusion in other frameworks	N/A

4 Recommendations for future work

The suite of indicators presented in Section 3.3 were developed over a relatively short period of time and on the basis of a desk-based review of the relevant literature and discussions with a number of stakeholders representing the impact investment, policy and academic communities. Following feedback received during the workshop and further reflection by our team, a number of areas meriting further work have been identified. Each of these is described under the headings below.

Further develop and refine selected indicators

The shortlist of indicators proposed as part of this work provides a solid basis for the discussion about how impact funds can measure their biodiversity impacts linked to agricultural investments. It should not, however, be seen as a definitive list. There is scope for further investigation and refining, and this Study has already flagged some key aspects in this sense (see below). Testing the indicators in real-world cases, potentially in collaboration with impacts funds, would also bring better insights into the practical use of the proposed indicators, likely unearthing additional challenges to be considered. This was not within the scope of this work but is a highly recommended next step.

Key points for further investigation are discussed in the table below.

Table 2 - Key points for further investigation

Indicator	Further investigation needed
Connectivity and fragmentation metric	There is a wealth of academic research in this area[22], with a great deal of research having been focused on identifying effective and non-biased indicators for fragmentation and connectivity of landscapes. Indicators have been developed for a wide range of uses – including for National Ecosystem Assessments and reporting to the Convention on Biological Diversity – and therefore not all of the literature is pertinent to the scale and needs of impact fund investments. More investigation is needed to fully assess which of these metrics would be most suitable, and this would warrant further attention in future work.
Soil organic carbon and soil health	There are many different ways to measure soil organic carbon, with varying levels of accuracy. We would recommend further research into which lab analysis would be best suited to use for this indicator – it should be one that is affordable but can also be compared across different sorts of soils globally. Additionally, workshop participants highlighted that it would be helpful to have some broader measures of soil health included in this metric too – as a start we would suggest a visual assessment of soil structure (to consider issues of compaction) and a soil respiration test to capture microbial activity.

[22] Some good overviews include: Connectivity metrics for conservation planning and monitoring (Keeley et al, 2021); C2. Habitat Connectivity (JNCC, 2021); Landscape Connectivity: A call to action (WBCSD, 2017)

Crop diversity indicator	There were thoughtful comments on this indicator during the workshop, and it was flagged that currently it is not straightforward to interpret. Are more species always better? What does good look like? Further thought and consultation with funds and expert organisations would help strengthen this indicator.
Qualifier metric for *Area of project land under protection as natural habitat*, and *Area of project land under ecological restoration*	As discussed in the indicator outlines above, we suggest adding a qualifier metric for the quality of the ecosystem protected which aligns the extent of habitat protected or restored with its ecological importance, to ensure that more weight is given to the protection or restoration of more ecologically important areas. This qualifier metric could not be identified conclusively during the short timeframe of this study, but as a start we would suggest either calculating the STAR[23] value of the land under protection, or using the ecosystem integrity risk from ENCORE[24], to score the project site. This would merit further investigation.

Develop detailed guidance on indicator use

It is recommended that more detailed guidance is developed to accompany the selected suite of indicators. This would be useful for:

- those responsible for monitoring and reporting impacts who may want to understand the relevance of each indicator, how indicators are measured and verified, and how they should be interpreted; and
- those responsible for measuring impacts who may benefit from more detailed information on the approaches and methodologies for measurement and potential sources of data.

More specifically, it is recommended that the guidance includes:

- A description of the insights that each indicator provides in relation to the specific aspect(s) of biodiversity that it covers and what is expected in terms of target biodiversity conditions or outcomes. Alongside this, information should be provided on the strength of evidence that exists for each of the indicators in terms of their ability to measure improvements (or deteriorations) in biodiversity.
- Detailed definitions and measurement methodologies for each indicator. This would support consistency in measurements across projects and over time, and would help ensure that the indicators are ecologically meaningful, thereby mitigating the risk of perverse incentives and unintended adverse outcomes. Consideration will need to be given to how the definitions and methodologies can be made applicable across the range of geographies and agricultural systems in which the funds operate, while safeguarding against inappropriate use.

[23] The Species Threat Abatement Restoration (STAR) metric uses IUCN Red List of Threatened Species data to estimate the potential reduction in species extinction risk that could be achieved at a site, across a corporate footprint, or within a country. For more information https://www.iucnredlist.org/assessment/star

[24] See *How to use the ENCORE biodiversity module*, page 9, for an explanation of this metric. Available at: https://s3.eu-west-2.amazonaws.com/ncfa.documents/resources/ENCORE+Guide+to+Biodiversity+Module.pdf

- Information on potential sources of reliable baseline and ongoing monitoring data, particularly for cases where it is not possible to obtain primary data, and on the costs associated with different data collection and measurement approaches.
- Advice on approaches for verifying measurements.
- Practical examples to illustrate how the indicators may be applied in a range of circumstances.

Road-test the shortlisted indicators with a wider range of relevant stakeholders

It is recommended that the shortlisted indicators be tested with a wider range of stakeholders and on a suitably representative range of investments in order to confirm the feasibility of their use, the extent to which they are both suitably flexible and robust, and to identify where further refinements may be necessary.

In particular, it is recommended that further engagement is held with land managers (and/or organisations that work directly with farmers) and those likely to be responsible for data collection and conducting field measurements to ascertain some of the practicalities around data collection and measurement, the associated costs and what technical support and training may be needed. This could potentially be done through piloting the indicators with a range of land managers representing different farming enterprises (e.g. food, feed, fibre) and different intensities and scales of production in different geographical contexts. It may also be worth engaging land managers (or their representatives) engaged in regenerative agriculture and rewilding initiatives, and regenerative agriculture certification bodies such as 3LM and Land to Market who are themselves developing, tracking and verifying indicators of regeneration and ecological outcomes and may be able to offer further advice. At the same time, Defra could investigate ways for providing technical assistance to Funds and farmers to support farm-based monitoring and measurement.

Broaden the indicator set to include wider environmental, social and economic considerations

While the focus of this Study was explicitly on developing indicators for measuring biodiversity impacts, it is recommended that Defra gives consideration to the inclusion of indicators that can be used to measure the wider environmental, social and economic impacts of investments and the nature and significance of any synergies and trade-offs that may arise, e.g., where measures to promote positive outcomes for biodiversity also contribute to improved health outcomes amongst farm workers.

Monitor advances in technologies capable of supporting ecological monitoring

The capabilities of earth observation and other technologies that can be used for the purposes of ecological monitoring are continually and rapidly evolving. It is recommended that Defra keeps a watching brief on these technologies, and that the indicator measurement approaches are reviewed and refined, as appropriate, over time, to take account of these advances.

APPENDIX A Stakeholder Interviews

The following organisations were engaged as part of the stakeholder engagement process carried out during February 2022:

- AGRI3
- Ecotierra
- eco.business Fund
- EIB and HIPSO
- IDH – the Sustainable Trade Initiative
- IUCN
- Mirova
- Palladium (NBS Platform for Impact Investing)
- PlanetFirst Partners
- SAIL Ventures
- Tropical Landscapes Finance Facility
- Arcadis (who supported the development of the IRIS+ Biodiversity theme)
- GIIN (developers of IRIS+)
- Global Farm Metric
- Gold Standard
- LandScale
- NatureMetrics
- OP2B – Regenerative Agriculture Framework
- Defra's Environmental Land Management Schemes
- The Intergovernmental Science-Policy Platform On Biodiversity and Ecosystem Services (IPBES) Scoping Study On Business And Biodiversity
- University of Greenwich
- CDC Group
- Crop Trust

APPENDIX B Workshop agenda and participant list

B 1. AGENDA

Time	Session	Facilitator
10.00 – 10.10	Welcome and opening remarks	Tom Kelly, UK Ambassador and Permanent Representative to the UN FAO in Rome
10.10 – 10.20	Overview of the study: aims, objectives and desired outcomes	Alice Brown, Defra
10.20 – 10.30	Round of introductions	Consulting team to facilitate using Menti.com *(see note on following page)*
10.30 – 10.55	Presentation on emerging findings & shortlist of indicators	Consulting team
10.55 – 11.10	Tea break	
11.10 – 11.40	BREAKOUT SESSION 1: Reflections on the shortlist of promising indicators	All *Specific questions will be provided to each group, to guide the discussion.*
11.40 – 11.55	Plenary feedback session	Breakout group facilitators
11.55 – 12.20	BREAKOUT SESSION 2: Approaches to overcome existing challenges identified as part of the emerging findings	All *Specific questions will be provided to each group, to guide the discussion.*
12.20 – 12.35	Plenary feedback session	Breakout group facilitators
12.35 – 12.45	Written feedback on suggested next steps	Consulting team to facilitate using Menti.com
12.45 – 13.00	Concluding remarks and vote of thanks	Consulting team and Defra

B 2. LIST OF PARTICIPATING ORGANISATIONS

Organisation
SAIL Ventures
Defra
Defra
IDH
Mercer
Pegasys
UNEP TLFF
Pegasys
Pegasys
Pelican AG
MercyCorps Afrifin

Finance in Motion
Defra
JNCC
Defra
UNEP-WCMC
IUCN
UNEP
The Gold Standard Foundation
Defra
Defra
UNEP-WCMC
Defra
Crop Trust
NRI University of Greenwich
AGRI3
UNEP-WCMC
Prospero
Mirova
Defra
Ecotierra
JNCC
60 Decibels
CDC Group
CGIAR Excellence in Agronomy
JNCC
Pegasys
SAIL Ventures
UK Representative FAO
NRI University of Greenwich
60 Decibels
Pegsays
Defra
UNEP-WCMC
Finance in Motion
Planet First Partners
IUCN
Pelican AG
Global Farm Metric / Sustainable Food Trust
Pegasys
IDH
UK Ambassador FAO
MercyCorps Afrifin
Mirova
CDC Group

APPENDIX C Original proposed shortlist of indicators

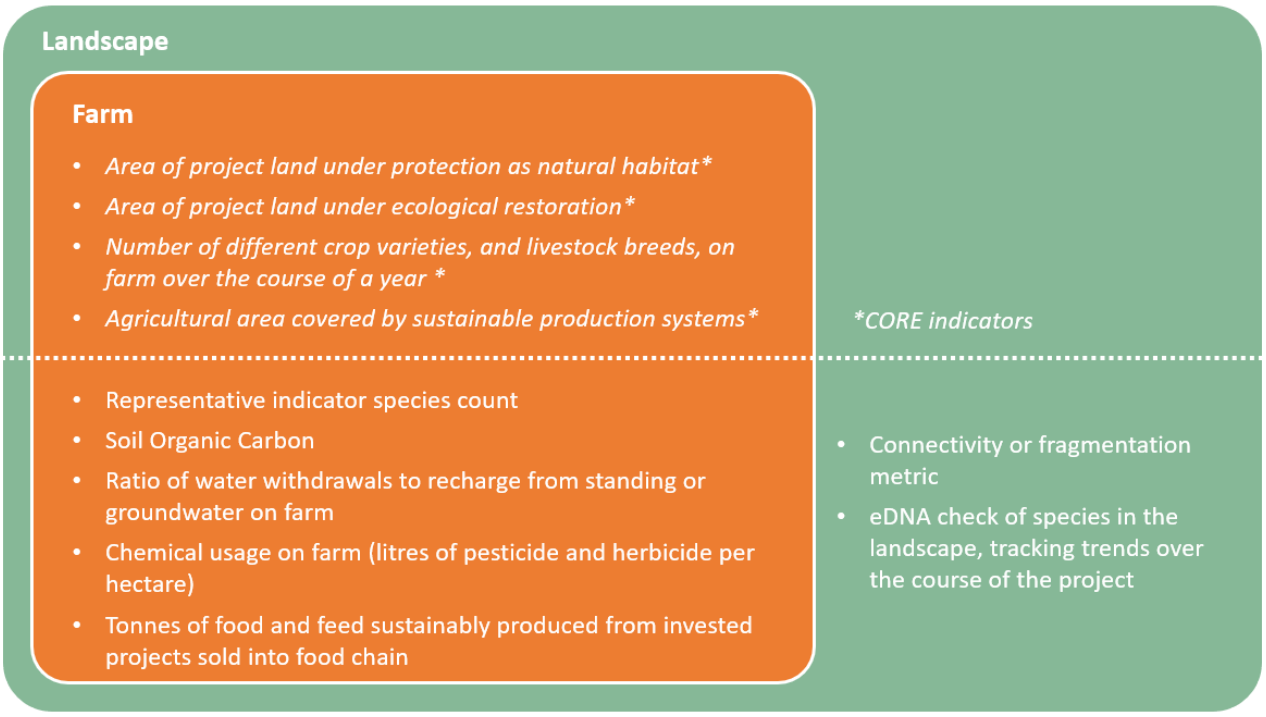

Figure 3 - Our original proposed indicator shortlist

C 1. FARM-LEVEL

These indicators reflect the biodiversity impact at the farm or project level. Core indicators are marked with a star (*), the rest are secondary indicators and can be selected based on which are the best fit for the project and fund aims.

*** Area of project land under protection as natural habitat**

Extent of natural habitat[25] under protection was a very common proxy measure used by many of the impact funds interviewed. Whilst it does not directly measure biodiversity, it is easy to measure (the information should be in the project plan) and can be a leading indicator for biodiversity recovery in set-aside land. We would, however, suggest adding a qualifier metric for the quality of the ecosystem protected which aligns the extent of habitat protected with its ecological importance, to ensure that more weight is given to the protection of more ecologically important areas. This qualifier metric could not be identified conclusively during the short

[25] Natural habitat is defined as 'Areas composed of viable assemblages of plant and/or animal species of largely native origin and/or where human activity had not essentially modified an area's primary ecological functions and species composition' by the IFC (2012). This would include intact forest, as well as other intact landscapes. https://biodiversitya-z.org/content/natural-habitats

timeframe of this Study, but as a start we would suggest either calculating the STAR[26] value of the land under protection, or using the ecosystem integrity risk from ENCORE[27], to score the project site.

*** Area of project land under ecological restoration**

This was a very common proxy measure used by many of the impact funds interviewed. Whilst this indicator does not directly measure biodiversity, it is easy to measure (the information should be in the project plan) and can be a leading indicator for biodiversity recovery in restored areas. It also draws a clear alignment with the UN's Global Decade on Ecosystem Restoration[28]. We would, as above, suggest adding a qualifier metric for the quality of the ecosystem restored, which aligns the extent of habitat protected with its ecological importance, to ensure that more weight is given to the protection of more ecologically important areas.

*** Number of different crop varieties, and livestock breeds, on farm over the course of a year**

Direct indicator. This was a common indicator amongst the impact funds interviewed, as well as being mentioned in the draft EU Taxonomy technical criteria for agriculture (The Platform on Sustainable Finance 2021), and captures cultivated biodiversity. As a rule of thumb, more diversity of crop plants makes for a healthier farming system, as it reduces build up of pests and diseases that can be seen in a monoculture. Maintaining crop and livestock breed diversity on a farm is also important to protect the broad genetic variety that has been developed in these species and varieties over time, which provide important pest and disease resistant traits, a broad range of environmental adaptation, and also represent an irreplaceable aspect of global culture.

*** Agricultural area covered by sustainable production systems**

– eg. Hectares under agroforestry, silvopasture, or organic production within the project area

This was a common indicator amongst the impact funds interviewed. It is an easy to measure proxy for biodiversity – based on the assumption that the production systems in focus have a positive impact on biodiversity. Actual impact on species is not captured here, but rather is presumed. The production system in focus could be defined based on the aims and interests of the fund.

Representative indicator species count

Direct indicator. A direct measure of biodiversity, but one which also acts as a proxy to some extent as the representative species (eg, a skylark in a UK farming system) represents not just itself, but also ecosystem health more widely. This species could be agreed at a country or regional scale. Some examples would include earthworms (a proxy for soil health for most of Europe) and representative butterflies (a good proxy for the

[26] The Species Threat Abatement Restoration (STAR) metric uses IUCN Red List of Threatened Species data to estimate the potential reduction in species extinction risk that could be achieved at a site, across a corporate footprint, or within a country. For more information https://www.iucnredlist.org/assessment/star

[27] See *How to use the ENCORE biodiversity module*, page 9, for an explanation of this metric. Available at: https://s3.eu-west-2.amazonaws.com/ncfa.documents/resources/ENCORE+Guide+to+Biodiversity+Module.pdf

[28] https://www.decadeonrestoration.org/

health of grassland systems in Western Europe). The Farmland Birds Index[29], developed and used by the EU, could be a good source of representative bird species for the European context, but in order to manage the cost and time associated with measurement of this indicator we would suggest focusing on two or three key species for each region, rather than measuring the full 39 in the FBI.

Soil organic carbon

This is an easy measure indicator of soil health, and carbon sequestration, which can be measured with a simple lab analysis after soil samples are collected on farm. Higher soil organic carbon indicates a healthier soil ecosystem, which is vital for sustainable yields in the long term. If lab analysis is not possible, the Global Farm Metric suggests an alternative assessment method looking at *soil structure*, in a visual test that can be carried out on farm[30] – but this would result in qualitative data, and the soil structure assessment may not work across all soil types globally.

Ratio of water withdrawals to recharge from standing or groundwater on farm

Water usage is an easy to measure proxy for the farm's impact on its wider environment, and for whether it is exploiting natural resources sustainably. Water withdrawals should be easy data to access from the farm manager. Water recharge could be harder to assess – and would potentially require a hydrological model to be drawn up. However, a low-cost alternative to calculating recharge rates would be to qualify water withdrawals against water scarcity data for the region, for instance using WWF's free Water Risk Filter[31].

Chemical usage on farm (litres of pesticide and herbicide per hectare)

Another easy to measure proxy for the farm's impact on its on-farm biodiversity. Where possible, farms should be striving to make use of non-chemical pest control measures, that have a less potent effect on the farm's flora and fauna, and fewer off-target affects. A reduction in the use of chemical pesticides and herbicides is called for in both the EU Biodiversity Strategy, and the EU's Farm to Fork Strategy, both of which have influenced the EU Taxonomy. Other jurisdictions are likely to follow this approach.

Tonnes of food and feed sustainably produced from invested projects

This metric, whilst not directly linked to biodiversity impacts, goes some way towards capturing the importance of both on-site biodiversity and on-site yield when considering project impacts on global biodiversity levels. If a project solely optimises a farm for biodiversity, at the expense of yield, then it runs the risk of generating leakage effects where the demand for that yield in the food chain is met elsewhere in the globe, possibly at greater ecological cost. We would suggest aligning with Pretty's definition of sustainable yield increase, 'agricultural yields […] increased without adverse environmental impact and without the conversion of additional non-agricultural land' (J. Pretty & Z. Bharucha 2014). The trends in sustainably produced yield

[29] For further information https://agridata.ec.europa.eu/Qlik_Downloads/InfoSheetEnvironmental/infoC35.html

[30] For further information, see the Visual Evaluation of Soil Structure, 2012. https://sustainablefoodtrust.org/wp-content/uploads/2013/04/VESS_score_chart.pdf

[31] Water Risk Filter – free maps are available here: https://waterriskfilter.org/explore/map , and you can create a free account and analyse areas of interest here: https://waterriskfilter.org/assess

should be tracked over the course of the project as it is noted that if projects encompass a transition from conventional agriculture to, for example, agroecological principles, there may be an initial yield dip as the farm restores soils and pivots away from artificial fertilisers and pesticides.

C 2. LANDSCAPE-LEVEL

These indicators reflect the biodiversity impact at the landscape or jurisdictional level. At least one of these indicators should be used for each project assessment.

In addition to measuring landscape scale impact with one of the indicators below, project developers should also consider their alignment with wider landscape and national level biodiversity and conservation plans, for example NBSAPs. This alignment (or lack of) should be assessed by investors at the due diligence stage, prior to investment, to ensure that maximal impact is created at a landscape stage. We would also recommend that alignment with local or national plans is periodically checked throughout the investment lifetime, in case new plans are developed that affect the project site.

Connectivity and fragmentation metric – *To be further investigated*

Project or farm level biodiversity cannot be considered in isolation. For an investment to have true impact on biodiversity, it should consider how it can contribute to wider landscape biodiversity, through adding to or creating wildlife corridors to allow species to migrate and not become genetically isolated. A simple connectivity metric can help incentivise projects to ensure that they are thinking about how their interventions are positioned to best align with neighbouring schemes. We do not have the time or scope within this Study to fully analyse the most relevant metric to use here, but some examples include:

- From TLFF: 'Connectivity preserved: Area of ecologically viable connected forest increased'
- From IRIS+: 'Area of adjacent protected land - Area of protected land that shares a boundary with the organization's protected land as of the end of the reporting period'
- Many other potential metrics are listed in the journal *Connectivity metrics for conservation planning and monitoring* written by *Keeley, Beier and Jenness* in 2021[32] and a helpful wider discussion is found in the WBCSD report, *Landscape Connectivity: A call to action* (2017)[33]

eDNA check of species in the landscape, tracking trends over the course of the project

Direct indicator. If an eDNA survey of biodiversity was to be carried out in the landscape in and around the project area, it could capture rarer or migratory species that move through the project area briefly. Changes in this landscape level biodiversity should be tracked over the course of the project.

[32] For further information https://www.sciencedirect.com/science/article/pii/S0006320721000604#f0010
[33]For further information https://www.wbcsd.org/Programs/Food-and-Nature/Food-Land-Use/Scaling-Positive-Agriculture/Resources/Landscape-Connectivity-A-call-to-action

APPENDIX D Stakeholder Workshop: Breakout Discussion Feedback

Department
for Environment
Food & Rural Affairs

IMPACT INVESTMENT FUND, BIODIVERSITY STUDY

Stakeholder Workshop: Breakout Discussion Feedback

28 March 2022

PEGASYS
CHANGING LIVES CHANGING WORLDS

Purpose of PowerPoint

On 17th March 2022, the consulting team – under the auspices of Defra – facilitated a virtual Stakeholder Workshop with 52 participants from impact funds, government, technical and advisory bodies, and development partners. **The Workshop aimed to provide a platform for stakeholders to exchange knowledge, experiences, and recommendations on the topic of biodiversity impact indicators within the context of agricultural systems.**

To achieve this, two rounds of breakout discussions were facilitated, where participants deliberated on i) the **proposed shortlist of indicators**; and ii) **the identified challenges** (and potential solutions) associated with biodiversity impact measurement.

This slide-deck presents a summary of the discussion points that were raised during the eight breakout discussions. The contents therefore predominantly reflects the views of participants (as opposed to reflections from the consulting team in terms of the relevance and validity of comments within the context of this specific study[1]). This stakeholder feedback has informed the Final Report, in the form of i) changes to the shortlist of indicators; and ii) recommendations for future work that Defra could explore.

1 1. In instances where the consulting team has deemed it necessary to provide a reflection on a comment made, this has been indicated below the comment, in italics as "Consultant comment"

PEGASYS

Breakout session 1

Topic: Reflections on the shortlist of promising indicators

Discussion points:

- What are the overall responses to the shortlist?
- Is there anything that funds might look to incorporate into their own frameworks going forward?
- Is there anything missing / not considered?
- Are there any practical considerations when it comes to using the indicators?

Group 1 (1/2)

Attendees

- DEFRA
- International Institute of Tropical Agriculture (CGIAR)
- JNCC
- Mercer
- IDH
- eco.business
- Finance in Motion
- Prosperity Ltd

Feedback

Specific indicators

- It will be important to define what classifies as land 'under protection'. If it is classified as a recognised 'Protected Area' this may lead to efforts being concentrated in land close to already protected areas.

  Consultant comment: *We are not referring to officially protected land, but rather land that has been 'set aside' or 'protected' by the land manager. We have revised the indicator wording to make this clearer.*

- It will be important to define what classifies as land under 'sustainable production systems'.

  Consultant comment: *We have reflected this in the indicator description - this will need to be defined by Defra or the relevant fund to reflect their aims and the farming systems of particular interest.*

  - The indicator is currently too binary and it may be helpful to introduce grades of protection / sustainable management.
  - The indicator will need to be defined in a way that can be measured / verified.

Group 1 (2/2)

Feedback (cont.)

Contextualisation

- It would be useful to provide context on who will use the information, why, and how to incorporate the relevant information into baselines.
- It would be helpful to provide clients with guidance on what each of these indicators means for biodiversity, why they are important, and what an expected successful outcome is.
- Explaining how biodiversity benefits relate to climate change benefits would be useful for clients.
- A case study would be helpful.

  Consultant comment: *We have developed a stylized case study – Defra to determine whether it is appropriate to share more widely.*

Measurement

- Clients / investees may require technical assistance to be able to conduct the measurements.
- It would be helpful to provide proxies for instances when the necessary data is not available or would be too expensive to collect.

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Group 2 (1/2)

Attendees

- DEFRA
- IUCN
- JNCC
- 60 Decibels
- University of Greenwich
- Global Farm Metric
- Pelican Ag
- UNEP
- Mirova
- Defra

Feedback

General feedback on indicators

- The indicators need to be more outcome-focused, rather than just practice-focused. This would allow for systems to be measured. The outcome is more important than the process as the process will vary depending on the context.
  - Consultant comment: *The bias towards practice-focused indicators has arisen due to these being easier and cheaper to measure - which were important considerations set out by Defra.*
- There should be a differentiation between long-term and short-term measurement protocols.
- The indicators should be refined to ensure all ecosystem processes and functions are considered (e.g. water cycle, mineral cycle, community dynamics and energy flow). Connectivity is a key issue.
- The practicality of the indicators needs to be assessed.
- It should be clear what impacts we are trying to measure.
- The climate resilience of native species could be considered.
  - Consultant comment: *This has now been reflected in the text of the indicator description.*

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Group 2 (2/2)

Feedback (cont.)

Feedback on specific indicators

- The representative indicator species count should consider native species.

Other areas for consideration

- Baseline monitoring is a prerequisite for addressing additionality and attribution. At the landscape level, different bioregions will have different contextually relevant factors (e.g. species composition, water infiltration rates and SOC rates) so establishing baselines will be key.
  - Consultant comment: *We have already included the need for baselines in our indicator descriptions.*
- The holistic context is crucial, biodiversity needs to be considered in the context of social and economic impacts.
  - Consultant comment: *Noted, but outside the scope of the project.*
- There needs to be a more general discussion about what good and sustainable agriculture looks like. This will help identify areas for collaboration and attractive funding opportunities.
  - Consultant comment: *Noted, but outside the scope of the project.*
- This is an example of a good agricultural impact measurement protocol: https://savory.global/land-to-market/eov/

Measurement

- It will be important to think about practical cost-effective measurement techniques. Measuring ecological processes can be expensive.

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Group 3 (1/2)

Attendees

- DEFRA
- DEFRA
- DEFRA
- ICUN
- Crop Trust
- IDG
- SAIL Ventures
- Ecotierra
- JNCC

Feedback

Specific indicators

- The indicator measuring tonnes of food and feed produced should be broadened to include non-food products.
  - Consultant comment: *Actioned.*
- The indicator measuring tonnes of food and feed produced should be a core indicator.
  - Consultant comment: *Actioned.*
- The quality of the product produced should be considered in addition to quantity.
  - Consultant comment: *Good point, but this could be hard to practically carry out.*
- It will be important to consider the costs of measuring the eDNA indicator.
- The indicator measuring number of crop varieties and livestock breeds may create perverse incentives as it is not always ecologically advantageous to have more varieties/species.
  - Consultant comment: *We will make this a non-core indicator, to be used where relevant.*
- For the indicators measuring land under protection and ecological restoration, it will be important to also measure the total land in the project so the proportion can be calculated.

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Group 3 (2/2)

Feedback (cont.)

General

- It would be good if some of the core indicators were direct indicators.
  - Consultant comment: *The reason there are no direct core indicators is because direct indicators are generally more expensive to measure and so not practical to have enforced on every project.*
- The criteria / details that sit behind each indicator will be crucial to ensuring there are no perverse incentives and that the interventions are genuinely ecologically meaningful.
  - For example, the connectivity indicator needs to consider what is ecologically meaningful to the specific area (e.g. encouraging forest planting isn't appropriate in areas of peat).
    - Consultant comment: *Agree. Detailed definitions are outside the scope of the project but will be needed before the indicators are used.*
- The landscape indicators are all long-term measures so the current list may risk missing short-term negative spillover effects. We could consider the definition of area of influence to understand the landscape that the project affects. A solution would be to apply the farm-level indicators at the landscape level as well.
  - Consultant comment: *This would be difficult to do practically.*
- It could be interesting to measure genetic diversity within a crop.
  - Consultant comment: *This would be difficult to do practically.*
- We could look into certification schemes and their role in adding legitimacy to some of the measures.
  - Consultant comment: *Agree, however we haven't explicitly mentioned certification as not all cropping systems have relevant or applicable certification schemes, and they also entail additional cost.*

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Group 4 (1/2)

Attendees

- DEFRA
- DEFRA ELMS
- Agri 3 Fund
- Gold Standard
- Ecotierra
- Pelican Ag
- 60 Decibels
- CDC Group
- University of Greenwich
- SAIL Ventures

Feedback

Specific indicators

- Soil organic carbon may not be the best measure for biodiversity because it can take 5 years to assess.
- Regarding the indicator measuring the number of different crop varieties or livestock breeds, there could also be specification of the varieties/breeds themselves.
- For the indicator species count, it could be worthwhile to measure species which are normally negatively impacted by agricultural practices.

Potential additional indicators

- At a landscape level, the area of land developed for agricultural purposes could be an indicator.
- An indicator to measure cumulative impacts could be added.
- It will be important to measure as much of a system as possible, for example measuring actual diversity in soil rather than just soil organic carbon.
  - Consultant comment: *We have broadened the soil organic carbon indicator to reflect this*
- ICF indicators have a list of sustainable management types / sustainable practices which could be helpful.

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Group 4 (2/2)

Feedback (cont.)

General

- Definitions will be important, for example defining whether production is sustainable or not. There may need to be indicators with their own metrics for each category of production. It will also be important to consider quality factors when measuring the land under protection or ecological restoration.
  - Consultant comment: *Agree. Detailed definitions are outside the scope of the project but will be needed before the indicators can be used.*
- It is very difficult to provide globally applicable detailed definitions. Individual funds could develop their own definitions specific to their projects.
- It would be helpful to provide information on the strength of evidence for the relationship between the indicator and improvements in biodiversity.
- It will be important to discuss the indicators with project participants themselves.
  - Consultant comment: *Agree. Out of scope of this project, but it will be important to consult on these indicators more fully before rolling them out.*

Measurement

- Baselines will be needed to assess the indicators against.
- Some of the indicators may be hard to measure e.g. the ratio of water withdrawal, connectivity and fragmentation.
- It will be important to check the accuracy of self-reported data, for example using remote sensing.

Breakout session 2

Topic: Approaches to overcome existing challenges identified as part of the emerging findings (including further work)

Key challenges to discuss:

- There is no single indicator that can capture the complex nature of biodiversity.
- Some indicators can be costly and/or complex to measure.
- Direct impacts on biodiversity are hard to track at a distance.
- Additionality and leakage are hard to evaluate.

Additional discussion points:

- Are there any innovative or novel approaches that could be applied / have been successfully applied to support more cost-effective and efficient data collection and ongoing monitoring efforts, e.g. community-based monitoring?
- If these indicators were to be more widely adopted by impact funds, what would be needed to support their uptake (e.g. detailed guidance on measurement approaches, including data sources etc.)?
- What would be particularly helpful to consider in follow-up work?

Group 5 (1/2)

Attendees

- Defra
- Defra
- Ecotierra
- Pelican Ag
- Planet First Partners
- CDC Group
- University of Greenwich
- Global Farm Metric

Feedback

General

- It is impossible to have a set list of indicators that can be applied to all situations. You could instead have a list of non-negotiable principles.

Time lag between investment and impacts

- Funding could be allocated to post-project evaluation.
- Direction of travel could be used to indicate whether the outcomes are moving in the right direction.

Group 5 (2/2)

Feedback (cont.)

Measurement

- Technical Assistance Facilities sometimes focus on compliance and not behavioural change. On small projects it may not be possible to measure some of the indicators and a different solution may be required to measure impact, rather than relying on investees.
- Remote sensing is efficient and scalable, and it provides an independent means of verification. The technology is becoming more precise. However, on-site sampling will still be important for verification.
- To scale up measurement on-site, the techniques will have to be easy to use and easy to teach.
  - Consultant comment: *Agree - this informed our thinking on the selection of indicators.*

Other considerations

- Listening to farmers will be important to ensure their perspectives are reflected and to motivate them. Organisations on the front line working directly with farmers should also be consulted.
  - Consultant comment: *Agree. This was out of scope of this work, but we would recommend it for follow up work, and before the indicators are rolled out.*

Group 6 (1/2)

Attendees

- Pegasys
- JNCC
- IUCN
- Agri 3 Fund
- Gold Standard
- Mercer
- SAIL Ventures

Feedback

Measurement techniques

- Remote sensing is an option to conduct measurements at a larger scale and lower cost.
  - The AGRI3 Fund is currently testing the viability of remote sensing and thinks it will be beneficial for forest protection and restoration, but will likely be more difficult for agriculture. Measuring restoration of degraded land is also likely to be difficult.
  - On-site reporting will be needed as well to ensure credible reporting.
- The investee should be responsible for on-site measurements, but with an independent auditor. Biodiversity and land use consultants can also do on-site measurements.

Measurement timeframes

- The lag between interventions and benefits becoming visible isn't necessarily a problem because if we know when we expect the impacts to become apparent, this can be built into monitoring plans. Impacts can also be measured after exit, which should be specified in the monitoring plan.
- Where indicators will take a long time to measure, proxies can be used in the interim, using set plots from which samples can be taken and extrapolated.
  - One participant notes that you can't make claims based on proxy measures.

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Group 6 (2/2)

Feedback (cont.)

Additionality and leakage

- A landscape approach, with a defined area of scope, can be used to measure leakage.
- It is important to recognise the limitations to measurement and attribution at a landscape level, given all the other influencing factors, which make it difficult to draw conclusions.

General

- Impact funds typically measure carbon and social impacts alongside biodiversity. Therefore, the range of indicators can't be too broad to keep the costs manageable.
- The link between the indicator selection and the claims we want to make needs to be clearer. The indicators selected will depend on the claim we are trying to make.

Next steps

- We should specify the impacts on biodiversity, and which are significant for each stakeholder group. We should then justify why certain indicators and aspects of biodiversity have been selected.
- Definitions are critical. While a case study may help, it would only be useful if a broad range of geographies were included, as no one case can be representative.
- Guidance on each of the indicators would be helpful, but it should be guidance rather than a prescription to allow flexibility, given the diversity of locations.
- It may be helpful for a Technical Assistance Facility to establish a platform to support impact funds with monitoring, covering protocols, best practice approaches, accepted datasets etc.

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Group 7 (1/2)

Attendees

- DEFRA
- Pelican Ag
- IUCN
- JNCC
- IDH
- CDC Group
- Sustainable Food Trust / Global Farm Metric

Feedback

Measurement techniques

- It can be helpful to distinguish between long-term and short-term indicators.
  - Measuring long-term indicators can be difficult and expensive, but could be conducted every 5 years, for example.
  - There are lots of measurements that are easy for farmers and range scientists to do themselves in the short term, for example using set squares.
    - These include bare soil analysis, soil capping, wind erosion, water erosion, water infiltration, litter abundance, litter composition, quantity of contextually desirable species, canopy abundance and invertebrate life in the soil. These indicators can be used for both forest and pasture systems, but not for aquatic systems.
    - The measurements would have to take farmers no more than 1-2 days per year to be practical.
- A number of new technologies are being developed which could make measurements at a large scale more practical and cost-effective. There are a number of start-ups trying to address this issue.

Group 7 (2/2)

Feedback (cont.)

Who will conduct the measurements?

- There are case studies in which farmers have been taught measurement techniques in 2 days. After 3 years, the standard deviation when aggregating and analysing for accuracy was 10: the error rate was lower than expected.
- Technical assistance could be provided to farmers in conjunction with other projects.
- Other parties may question the validity of the data when it is self-assessed. Audits will be important.
- Funds can use private sector teams who partner on the projects to collect the data or commission third-party evaluations.

Additionality and leakage

- The accuracy of measurements on the additionality side will depend on the quality of data for baselines.
- For leakage, JNCC has developed a global impacts consumption indicator which looks at the footprint of consumption across the world. It assesses the corollary impacts of reducing output in one country on another country.

General

- Where a fund has a large number of investments, it can be difficult to measure everything and bring all aspects of monitoring into one holistic picture. Getting farmers to measure everything in a standardised way could be a solution.

Group 8 (1/2)

Attendees

- DEFRA
- DEFRA ELMS
- IUCN
- International Institute of Tropical Agriculture
- Prospero
- JNCC
- Crop Trust
- 60 Decibels
- University of Greenwich
- eco.business/Finance in Motion
- SAIL Ventures

Feedback

General

- Biodiversity is complex and it is not possible to find one single indicator.

Paying for measurements

- When deciding who pays, you need to consider: i) what you are developing ii) who it is for iii) how and where the standard will be implemented iv) who benefits from the measurements.
- 5-10% of project budgets can be allocated to assessment. For example, DEFRA has a monitoring and assessment budget.

Measurement techniques

- Primary data collection is expensive and difficult to scale. There should be guidance on how the indicators could be measured using secondary data.

Group 8 (2/2)

Feedback (cont.)

Additional reflections on indicators

- eDNA has promise as an indicator but is not currently a proven technology. We need to consider whether we should use existing technology that we already know works, or invest in new technology that has the potential to have a greater impact in the long run.
- STAR could be included as an indicator.
  - Consultant comment: *STAR is used as a qualifier for the area under protection and under ecological restoration indicators. However, it is not relevant as an indicator itself as it does not update quickly enough to be able to show a trend over time.*

Next steps

- The indicators need to be defined.
  - Consultant comment: *Detailed definitions are outside the scope of the project but will be needed before the indicators can be used.*

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