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Investing in rural people

IFAD Strategy on Biodiversity 2022-2025

Note to Executive Board representatives

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Contents

Abbreviations and acronyms

BES	biodiversity and ecosystem services
CBD	Convention on Biological Diversity
COP	Conference of the Parties
DFI	development finance institution
FAO	Food and Agriculture Organization of the United Nations
SDGs	Sustainable Development Goals
SECAP	Social, Environmental and Climate Assessment Procedures

Recommendation for approval

The Executive Board is invited to approve the IFAD Strategy on Biodiversity 2022–2025, as set out in the present document.

IFAD Strategy on Biodiversity 2022–2025

I. Why a biodiversity strategy?

1. Biodiversity is essential to sustaining life. It is defined by the Convention on Biological Diversity (CBD) as, "the variability among living organisms from all sources including, inter alia, terrestrial, marine and other aquatic ecosystems and the ecological complexes of which they are part; this includes diversity within species, between species, and of ecosystems."

2. Diversity in agriculture[1] and food systems is a key element in building resilience for rural families and their livelihoods. Biodiversity at every level (genetic, species and ecosystem) is a foundational pillar for life-sustaining ecosystem services leading to multiple benefits. They include long-term productivity, climate change adaptation and mitigation, food security and improved nutrition. Biodiversity loss is affecting small-scale producers worldwide, jeopardizing their livelihoods and local rural production and consumption systems. Ensuring biodiversity protection and its sustainable use and management is therefore fundamental to IFAD's work.

3. A biodiversity strategy will be an important tool to step up and guide IFAD's operations in the coming years. The purpose of this strategy is to facilitate a more systematic, organized and generalized integration of the protection, sustainable use and promotion of biodiversity in IFAD operations. This builds on and complements the IFAD Strategy and Action Plan on Environment and Climate Change 2019–2025,[2] and also responds to IFAD's commitments under the Twelfth Replenishment of IFAD's Resources. The biodiversity strategy covers the period 2022–2025 to align with IFAD's environment and climate change strategy, into which biodiversity will be integrated after 2025.

II. Who is the strategy for?

4. While the strategy aims to be accessible to a range of IFAD stakeholders, its main audience and expected users include IFAD country partners, IFAD Management, technical and operational staff, and IFAD Board members and partners, including other United Nations agencies especially the Rome-based agencies, multilateral financial institutions, global funds, donors, research institutions, civil society organizations and private sector collaborators.

III. Biodiversity in the IFAD context

A. The global policy context

5. The CBD is the main United Nations vehicle for developing global biodiversity agreements and collective objectives, with the Food and Agriculture Organization of the United Nations (FAO) acting as a biodiversity mainstreaming platform across the agricultural sectors following a call from the thirteenth meeting of the Conference of the Parties (COP13) to the CBD (December 2016). Through the CBD's Strategic Plan for Biodiversity 2011–2020, the 20 so-called Aichi biodiversity targets[3] formed an ambitious set of goals, most of them linked closely to the agriculture sector. From the fifth edition of the Global Biodiversity Outlook[4] it is

[1] This includes crop and livestock production, forestry, fisheries and aquaculture.
[2] https://www.ifad.org/en/document-detail/asset/39434396.
[3] https://www.cbd.int/sp/targets/.
[4] Secretariat of the Convention on Biological Diversity (2020), Global Biodiversity Outlook 5. Montreal.

now known that none of these targets were fully met, although six were partially achieved. Based on an analysis of why that happened, a post-2020 global biodiversity framework is being developed and is due to be adopted at COP15 to the CBD. The agriculture sector is central to meeting most of the new proposed targets,[5] and IFAD, through its work with the most disadvantaged farmers, fishers, pastoralists, indigenous peoples and others engaged in agriculture, is well-positioned to contribute through its programme of work. In particular, the Fund can ensure the protection and sustainable use of biodiversity, and support countries to fulfil their commitments.

6. With less than a decade left to achieve the 17 Sustainable Development Goals (SDGs) of the 2030 Agenda for Sustainable Development,[6] the 2019 SDGs Report[7] shows there is progress in achieving these, but not to the extent hoped for. SDGs 14 (life below water) and 15 (life on land), which directly address biodiversity, have seen the least progress to date. Of the 17 SDGs, the achievement of 14 directly depends on biodiversity. IFAD plays a central role in achieving the first and second SDGs (no poverty and zero hunger, respectively) by: (i) promoting sustainable forms of agriculture that preserve and restore the natural resource base; and (ii) increasing the resilience of farming and non-farming systems in rural areas to a changing climate. IFAD contributes to most of the SDGs relevant to biodiversity.

7. The International Treaty on Plant Genetic Resources for Food and Agriculture,[8] which came into force in 2004, reflects the commitment of governments to ensuring the conservation and sustainable use of plant genetic resources for food and agriculture, and the fair and equitable sharing of the benefits arising out of their use for sustainable agriculture and food security. The Second Global Plan of Action for Plant Genetic Resources for Food and Agriculture,[9] adopted by the FAO Council in 2011, supports the implementation of the treaty. The Commission on Genetic Resources for Food and Agriculture, convened by FAO, is a permanent forum for governments to discuss and negotiate matters specifically relevant to biological diversity for food and agriculture.

8. Over the next decade, a series of events focused on biodiversity will be convened by the United Nations system.[10] These critical global leadership events, as well as the Decade on Ecosystem Restoration, the Decade of Action on SDGs and the Decade of Ocean Science for Sustainable Development, aim to build momentum for biodiversity-related actions within the United Nations system and among its partners.

9. The Food Systems Summit in September 2021 sought to develop innovative solutions that reduced pressure on biodiversity by promoting a shift to sustainable consumption and optimizing environmental resource use in food production, processing and distribution.

10. Overall, the United Nations is mobilizing its agencies to demonstrate joint action through its convening power and leveraging of expertise from across the system. The Strategy for Sustainability Management in the United Nations System 2020–2030[11] seeks to avoid adverse impacts on biodiversity from United Nations facilities, operations and activities.

[5] https://www.cbd.int/doc/c/3064/749a/0f65ac7f9def86707f4eaefa/post2020-prep-02-01-en.pdf.
[6] https://sdgs.un.org/2030agenda.
[7] https://unstats.un.org/sdgs/report/2019/.
[8] http://www.fao.org/plant-treaty/en/.
[9] http://www.fao.org/3/i2624e/i2624e00.pdf.
[10] For example, the Ocean Conference in Portugal, the United Nations Summit on Biodiversity in New York, COP15 to the CBD in China, the Climate Conference in the United Kingdom, and the fifteenth session of the Conference on Trade and Development in Barbados.
[11] https://unemg.org/wp-content/uploads/2019/09/INF_3_Strategy-for-Sustainability-Management-in-the-UN-System.pdf.

IV. IFAD's approach to biodiversity

A. Goal

11. The goal is to enhance IFAD's ability to support countries to protect, restore and promote biodiversity and its sustainable use in rural systems, ensuring multiple benefits for both nature and the livelihoods of rural people.

B. Policy coherence

12. To ensure internal coherence and avoid unnecessarily burdening operations, this strategy builds on, and takes advantage of, synergies with other IFAD policies, strategies and guidelines that are most relevant to biodiversity. There is significant potential for biodiversity protection and enhancement to contribute to the achievement of their aims (see appendix I for a detailed analysis).

13. Mobilizing biodiversity and related approaches to increase the resilience and productive capacities of small-scale producers and consumers, and for them to access market opportunities for biodiverse, and environmentally and socially sustainable produce will contribute to the three strategic objectives of the IFAD Strategic Framework 2016–2025.[12]

14. IFAD's updated Social, Environmental and Climate Assessment Procedures (SECAP) includes biodiversity conservation as the first of nine mandatory operational social, environmental and climate standards. These provide detailed guidance for identifying and assessing risks to biodiversity, including impacts on habitats, ecosystems and ecosystem services, and identifying measures to mitigate those risks.

15. This strategy is also aligned with IFAD's other policies, strategies and action plans, particularly those linked to its mainstreaming themes and other priority areas. In view of its integration into the IFAD Strategy and Action Plan on Environment and Climate Change 2019-2025, this biodiversity strategy promotes integrated approaches at landscape and farm level that mobilize biodiversity for the mitigation of, and adaptation, to climate change.

16. Furthermore, there is not only a great deal of overlap with IFAD's mainstreaming themes – nutrition,[13] gender,[14] youth[15] and environment and climate change – there are also excellent opportunities for additional benefits in the work with indigenous peoples,[16] land tenure security[17], the private sector,[18] and information and communications technology for development.[19]

17. Implementation of the strategy will be in line with IFAD's procedural strategies and policies, including the knowledge management, innovation and partnership strategies, as well as the new Regular Grants Policy and resource mobilization strategy. The need for knowledge development and innovation is to be addressed, including through strategic partnerships for joint action and co-financing.

C. Lessons learned

18. A number of lessons learned from IFAD's experience and other sources were identified and informed this strategy.[20]

[12] (i) Increase poor rural people's productive capacities; (ii) Increase poor rural people's benefits from market participation; (iii) Strengthen the environmental sustainability and climate resilience of poor rural people's economic activities. https://www.ifad.org/en/web/knowledge/publication/asset/39369820
[13] IFAD Action Plan Nutrition 2019–2025.
[14] IFAD Gender Equality and Women's Empowerment Policy.
[15] IFAD Rural Youth Action Plan 2019–2021.
[16] IFAD Policy on Engagement with Indigenous Peoples.
[17] IFAD Policy on Improving Access to Land and Tenure Security.
[18] IFAD Private Sector Engagement Strategy 2019–2024.
[19] Information and Communication Technology for Development (ICT4D) Strategy.
[20] These lessons learned are based on IFAD's agroecology stocktake, biodiversity stocktake, consultations with IFAD staff and external partners, a global evidence review undertaken for the strategy and other IFAD evaluations.

Findings from analytical stocktakes on IFAD's portfolio

19. **IFAD has long experience with supporting rural communities to restore and manage their natural resources, with important benefits for biodiversity conservation and sustainable use.** The average rating of performance in environment and natural resources management for the 86 IFAD projects completed between 2018 and 2020 was 4.2, which is above moderately satisfactory. An agroecology stocktake on IFAD's portfolio of 207 projects completed or to be completed between 2018 and 2023 showed that 48 per cent of these supported an increase in the diversity of crops and animals used in integrated farming systems; 44 per cent supported land and water management, including conservation and rehabilitation of catchments; and 29 per cent supported community rangeland and forest rehabilitation and management. A stocktake on biodiversity found that 74 per cent of projects had components or activities linked to it (see appendix III).

20. **There is a significant positive correlation between projects promoting integrated and holistic approaches such as agroecology, and the sustainable use of agrobiodiversity.** The agroecology stocktake found that 60 per cent of IFAD projects promote agroecological practices, often cofinanced by the Adaptation for Smallholder Agriculture Programme or the Global Environment Facility. Within these projects, 81 per cent supported increased diversity in integrated farming systems. However, the study also found there is particular potential for increasing IFAD's support for community seed systems as a key activity in promoting agrobiodiversity.[21]

21. **Mainstreaming of climate change and nutrition has further strengthened IFAD's support for the sustainable use and conservation of biodiversity by small-scale producers.** Projects promoting agroecology as a biodiversity-friendly approach identified in the agroecology stocktake stand out as early adopters.[22] Among those projects, 79 per cent had mainstreamed climate change and 65 per cent had mainstreamed nutrition, compared to only 18 per cent and 20 per cent respectively of the projects not promoting agroecology.

22. **Demand for integration of biodiversity at the country level needs to be increased through enhanced awareness of the multiple benefits of biodiversity.**[23] Strong policy engagement is needed at the country level to overcome traditional approaches and siloed attitudes towards agriculture and natural resources. Furthermore, more evidence and understanding of the multiple ways in which biodiversity can enhance livelihoods and increase sustainability – both within IFAD and among partners – needs to be developed through tangible results.

Insights from IFAD staff

23. To increase and improve IFAD's support for holistic approaches that provide significant benefits to rural communities and small-scale producers from sustainably using biodiversity, key areas of action were highlighted in consultations with IFAD staff: (i) the need to develop evidence of the multiple benefits of biodiversity; (ii) capacity-building and guidelines in best practices need to be included in project design and implementation; (iii) the importance of partnerships both at country and global level; and (iv) the need for tools that measure the benefits from, and impacts of, projects on biodiversity.

[21] Only 7 per cent of the projects promoting agroecological practices included support for community seed systems and none of the projects not promoting agroecology included this activity.
[22] Note that the projects in this sample were designed before nutrition and climate change mainstreaming targets were set for the IFAD portfolio.
[23] These findings are based on a biodiversity stocktake, an evaluation synthesis report on environment and natural resource management by the Independent Office of Evaluation of IFAD, and interviews with IFAD staff.

Lessons from other development agencies

24. Among IFAD's peer development finance institutions (DFIs), activities around biodiversity protection and promotion are generally based on compliance with the introduction of biodiversity standards and safeguards. Highly active DFIs such as the KfW Development Bank, Inter-American Development Bank and Asian Development Bank have all integrated biodiversity into their programmes of work and operations. There are some key lessons here for IFAD on mainstreaming biodiversity. They include:

- **Strategic integration.** Many of the DFIs have meaningfully included biodiversity into their environmental, social and governance standards. This allows for operationalization of biodiversity considerations throughout the investment cycle. In some cases (e.g. Proparco/Agence Francaise de Développement), a focused strategy on climate change and environment places a strong focus on integrating biodiversity conservation into investments. But the majority of DFIs mainstream biodiversity issues into their screening and assessment processes.
- **Pooled finance.** Several DFIs have identified common funds under which they can channel resources for biodiversity operations. These funds include the eco.business Fund, the Africa Forestry Fund II and the Asia Impact Investment Fund II, among others. IFAD is uniquely positioned to administer a fund directly concerned with biodiversity protection and promotion among small-scale producers and their communities.

V. IFAD's contribution to sustainable use and conservation of biodiversity

25. IFAD's target groups play an important role as guardians of biodiversity, while facing numerous challenges related to the environment they depend on (see appendix II for more on the rationale for investing in biodiversity). IFAD is therefore uniquely placed to support small-scale producers and other stakeholders in protecting and enhancing biodiversity in rural systems while ensuring improved livelihoods, resilience and empowerment.

26. **First, in rural areas, IFAD can play a crucial role in promoting integrated production and landscape approaches, and management practices that help diversify, protect and enhance biodiverse ecosystems and their services.** IFAD can further assist in capturing multiple other benefits, such as: ecosystem restoration and provision of ecosystems services; biodiversity conservation; poverty alleviation; social and economic sustainability; improved food and nutrition security; women's empowerment; improved natural resource management; and increased resilience to climate change and other shocks.[24, 25, 26]

27. **A second area that IFAD is well positioned to support is promoting and enabling the access of biodiverse and nutritious produce from small-scale farmers to local, national and international markets.** While markets can pose a challenge to biodiverse produce, governments can support biodiversity-friendly production systems through market regulation and certification,[27] and by

[24] Dudley, Nigel, and Sasha Alexander. 2017. "Agriculture and Biodiversity: a Review." *Biodiversity* 18 (2–3): pp. 45–49.
[25] FAO. 2019. The State of the World's Biodiversity for Food and Agriculture, J. Bélanger & D. Pilling (eds.). FAO Commission on Genetic Resources for Food and Agriculture Assessments. Rome, p. 572.
[26] Sustainable management practices and production approaches include organic agriculture, agroecology, pollination management, integrated pest management, integrated plant nutrient management, conservation agriculture, management practices to preserve and enhance soil biodiversity, low external input agriculture, regenerative agriculture, agroforestry, pasture management and sustainable grazing, permaculture, reduced-impact logging, integrated and polyculture aquaculture, ecosystems-based and landscape approaches, and ecosystem restoration.
[27] For example, organic farming, Fairtrade, the Rainforest Alliance, the Participatory Guarantee Systems, welfare-friendly animal products, shorter supply chains, and sustainable forestry and fishing practices.

promoting products with distinctive regional or local characteristics.[28] By identifying and promoting innovative marketing opportunities for biodiverse and sustainable produce from small-scale producers, IFAD can increase their incomes and contribute to healthier and more sustainable consumption patterns.

28. **Third, through its policy engagement, IFAD is well placed to contribute to creating an enabling policy environment for rural systems that conserve, protect and enhance biodiversity by promoting sustainable food production, processing, marketing and consumption.** This will need a determined awareness-raising among decision makers and other stakeholders on the importance of biodiversity for resilience, ecological intensification, livelihoods and nutrition. The transition to sustainable and just rural systems will require the adoption of a wide array of coherent and mutually supportive soft and hard policy interventions. It will also need increased recognition of, and rewards for, the role that small-scale producers, particularly indigenous peoples and their traditions, play in the conservation of biodiversity. Through its policy engagement, IFAD can provide evidence-based recommendations to promote participatory, integrated and coherent policymaking that provides holistic solutions to an array of global challenges while at the same time improving the livelihoods of small-scale producers.

29. **Finally, IFAD can contribute to knowledge development, dissemination and awareness-raising on successful approaches and practices that conserve and enhance biodiversity through rural food and non-food systems while improving the livelihoods of small-scale producers.** There is significant potential for IFAD to work more closely with local communities, research institutes and other partners to better integrate traditional knowledge, analyse the linkages between biodiversity and enhanced livelihoods, and identify approaches that work best in specific contexts. IFAD can share its experiences and knowledge in its national and international engagement with a wide array of stakeholders and scale up successful approaches through its large programme of loans and grants.

VI. Expected outcomes and theory of change

30. Grounded in a theory of change (summarized in figure 1), IFAD has identified three expected outcomes that will together contribute to the achievement of the strategy's goal. The first outcome seeks to intensify support to governments and small-scale farmers, pastoralists, fishers, indigenous peoples and local communities to conserve biodiversity and sustainably use it through integrated approaches that benefit small-scale producers and the rural poor. The second and third outcomes will contribute to achieving the first by: (i) promoting an enabling policy environment with the help of key partnerships; and (ii) enhancing knowledge generation and management in developing, testing and scaling up successful biodiversity tools and approaches.

[28] FAO. 2019. The State of the World's Biodiversity for Food and Agriculture, J. Bélanger & D. Pilling (eds.). FAO Commission on Genetic Resources for Food and Agriculture Assessments. Rome. p. 572.

Figure 1
Theory of change

31. **Outcome 1: Governments and small-scale farmers, pastoralists, fishers, indigenous peoples and local communities are supported in conserving and sustainably using biodiversity throughout IFAD's interventions, using evidence-based and integrated approaches to small-scale farming systems and landscapes.** A consistent approach across sectors will enhance natural assets including agrobiodiversity, ecosystem services and related global public goods that make the livelihoods of poor rural people more prosperous, resilient and environmentally, socially and economically sustainable. Such an approach builds not only on scientific research but also on traditional knowledge, particularly of indigenous peoples and women.

32. **Outcome 2: Drawing on partnerships, IFAD supports the enhancement of national, regional and international policies and development strategies to create an enabling environment for biodiversity associated with rural production and consumption systems.** This will recognize and increase the active participation of the role played, in particular by women and indigenous peoples, in the conservation and sustainable use of biodiversity. It will ensure they are heard in policy processes, will strengthen their resilience, enhance their access to animal and plant genetic resources and boost the availability, accessibility and utilization of a diversity of food and livelihood opportunities in local, national and regional rural systems.

33. **Outcome 3. IFAD is a recognized and well-established partner in generating and applying new knowledge and approaches for the conservation and sustainable use of biodiversity in small-scale farming systems, landscapes and markets.** IFAD is at the global forefront in generating, testing, disseminating and applying new knowledge and lessons learned on integrating biodiversity into small-scale farming systems, landscapes and markets. In so doing, it achieves multiple benefits for the rural poor in terms of increased resilience to climate change and other shocks, more diverse and nutritious diets, increased productivity, and the restoration of degraded ecosystems and their services.

VII. Strategic directions

34. These outcomes will be pursued by orienting IFAD's work in line with the following strategic directions:[29]

- **Strategic direction 1: Integrating biodiversity into the design and implementation of programmes and projects.** IFAD will more systematically integrate biodiversity aspects into programme and project design, implementation, supervision and monitoring. It will do so in order to identify, incorporate and scale up innovative and holistic approaches that achieve multiple benefits and recognize the role small-scale farmers play in conserving and sustainably using biodiversity. Moreover, IFAD will systematically explore and exploit synergies between biodiversity and IFAD's work with indigenous peoples as well as its mainstreaming themes, in particular gender.
- **Strategic direction 2: Investing in learning and knowledge management.** By investing in analysing past experiences, emerging trends, dialogue and dissemination of knowledge, IFAD will generate and share new knowledge and lessons learned from its operations regarding biodiversity in small-scale rural systems. It will thereby enhance the capacity for adaptive management and continuous improvement in IFAD, among its partners and in borrowing countries.
- **Strategic direction 3: Testing and demonstrating innovative approaches for biodiversity.** Science, technology and innovation are key accelerators for biodiversity and IFAD will create opportunities through, for example, supplementary funding, grants and other means of engagement to pilot and demonstrate novel solutions for biodiversity-friendly rural systems that generate environmental, climate and social benefits.
- **Strategic direction 4. Strengthening partnerships.** IFAD will build strategic partnerships for increased reach, impact and leveraging of IFAD's operations while also developing tools and methods, and engaging in policy dialogue – either through expanding ongoing partnerships or forming new ones. This will allow IFAD to add value beyond its mandate and capacity. Enhanced collaboration globally, regionally and nationally with other United Nations organizations (e.g. FAO), as well as international financial institutions, research institutions, NGOs, small-scale producers and other organizations with complementary mandates and biodiversity expertise, will allow IFAD to better address the many needs of small-scale farmers and other rural poor.

VIII. Action areas

35. Six key action areas will guide IFAD's work on biodiversity. These are complemented by expected outputs that are shown in table 1. Both represent the basis for IFAD's work on biodiversity for the duration of the strategy and beyond. The action areas and outputs will support empowering those in states of highest vulnerability, particularly women, indigenous peoples and youth, as well as enhanced climate adaptation and nutrition.

A. Action area 1: Strengthening the quality of biodiversity interventions and associated impacts across IFAD's portfolio

36. IFAD will systematically strengthen the quality of biodiversity interventions by enhancing the integration of biodiversity in the quality assurance process. In particular, quality reviews of how the designs address climate change and nutrition

[29] These are in line with four out of the five strategic directions in IFAD's environment and climate change strategy www.ifad.org/en/document-detail/asset/39434396.

will pay attention to the enabling of the short- and long-term role of biodiversity in supporting these two IFAD priorities. Likewise, the review will also assess if potential synergies between gender, youth and biodiversity have been incorporated in the design of projects. Project design and implementation teams will be supported in identifying biodiversity and ecosystem services (BES) and opportunities to enhance them,[30] as well as monitoring the results using tools like the Bioversity International's Agrobiodiversity Index or the Biodiversity Integrated Assessment and Computation Tool. The focus will be on BES that contribute to building resilience among small-scale producers and their communities and improve the availability and consumption of a diversity of nutritious food, including neglected and underutilized species.[31] As part of the project's theory of change and mainstreaming priorities, IFAD will develop practical guidance for project design and implementation teams on how to capture contributions, including through tools and approaches from BES such as:

- Incorporating BES variables in project resilience indices;
- Articulating BES contributions in nutrition outcomes and impacts;
- Incorporating farm- and landscape-level and broader public goods costs and benefits derived from BES activities into the project's economic and financial analysis;
- Acknowledging and building on the asset of indigenous peoples' cultural distinctiveness, and supporting them in taking full advantage of their traditional knowledge, culture, governance systems and natural resources;
- Using digital technologies and remote sensing to monitor BES benefits; and
- Visualizing BES contributions (or missed opportunities) to project results and impacts in midterm and completion reports.

B. Action area 2: Continuous refinement of the SECAP, its application and complementary tools

37. The SECAP revision in 2021 included an upgrading of the biodiversity conservation standard 1 and the resource efficiency and pollution prevention standard 2 (with benefits for biodiversity) and related guidance notes. Screening questions for project classification and safeguard requirements have been developed for the biodiversity standard. Additionally, linkages to tools that can support project design and implementation teams in doing a proper analysis and identifying adequate safeguard measures have also been developed. IFAD will ensure the effective implementation of these standards and monitor results through, for example, training, knowledge exchange and reviews.

C. Action area 3: Capacity development and continuous improvement

38. In order to increase the development impact of biodiversity-related interventions, IFAD will develop the capacities of its staff, implementing partners and beneficiaries on biodiversity, including agrobiodiversity and neglected and underutilized species. It will also raise awareness of the ecosystem services provided by biodiversity and their potential benefits to the livelihood and well-being of rural people. Particular focus will be placed on identifying successful approaches in support of enhanced climate adaptation, nutrition and empowerment of women.

[30] Focus will be on at the four main levels of intervention of IFAD projects and programmes, i.e. farming systems; landscape/territory; market access and commercialization; policies and enabling services.
[31] See framework and five "how to do" notes on neglected and underutilized species https://www.ifad.org/en/web/knowledge/-/publication/supporting-nutrition-sensitive-agriculture-through-neglected-and-underutilized-species, IFAD, and the Alliance of Bioversity International and the International Center for Tropical Agriculture.

Close attention will be paid to promoting the value of the knowledge and practices of indigenous peoples and empowering youth.

D. Action area 4: Knowledge management and horizon scanning

39. IFAD will enhance its investment in knowledge management related to biodiversity. Linking knowledge and communication, IFAD will ensure that its knowledge comes from a diversity of sources including practitioners, small-scale producers, indigenous peoples and local communities, research institutes and other thought leaders. Attention will also be paid to aggregating and synthesizing this knowledge into usable products, and linking them with learning processes.

E. Action area 5: Outreach and engagement

40. By integrating biodiversity more systematically in its operations, IFAD will be able to effectively communicate and advocate for the recognition of the role rural populations, particularly women and indigenous peoples, play in conserving and sustainably using biodiversity. It will also be able to better raise awareness of the importance of BES in improving the resilience and nutrition of rural small-scale producers and their communities. IFAD will increase its visibility and disseminate lessons learned in its work on biodiversity to promote awareness and ensure biodiversity is prioritized among its development partners in both national- and global-level policy dialogue. By supporting and participating in biodiversity-related initiatives and partnerships, IFAD will support the creation of an enabling environment and demand for biodiversity interventions in rural development. In so doing, it will be able to identify successful partners, approaches and tools that increase the effectiveness and impact of its operations.

F. Action area 6: Resource mobilization

41. To achieve part of this strategy, IFAD will need to mobilize resources to innovate, learn and scale up approaches for the sustainable use of biodiversity by small-scale producers and their communities. In order to do so, it will explore a variety of options including supplementary financing, grant funding and the private sector.[32]

Table 1
Action area outputs

Action area outputs	*Associated action areas*
1) Develop and disseminate knowledge on the sustainable use of biodiversity gained from the experience of IFAD and its partners, including, for example, lessons learned and successful approaches.	1, 2, 3, 4, 5
2) Strengthen the quality of biodiversity interventions through, for example, an increase in human resources, the provision of operational support and the development of an indicator to monitor biodiversity.	1, 2, 3
3) Organize capacity development and peer learning opportunities, including South-South and Triangular Cooperation, to enhance the biodiversity expertise of project designers and implementers.	1, 2, 3, 4, 5
4) Establish within IFAD a cross-divisional biodiversity community of practice, including headquarters and field staff "biodiversity champions", where knowledge and lessons learned are periodically exchanged regarding biodiversity in IFAD operations.	1, 2, 3
5) Strengthen partnerships with a wide range of actors for increased resource mobilization, capacity-building and training, knowledge exchange and operations related to biodiversity.	1, 3, 5, 6
6) Enhance communication and awareness-raising both at the national and international level on the importance of biodiversity for enhancing the livelihoods of small-scale rural producers, particularly women and indigenous peoples.	5, 6

[32] A number of initiatives IFAD could join in are being developed to mobilize resources for biodiversity from the private sector. The International Union for Conservation of Nature has been developing blending finance instruments, such as the Subnational Climate Finance initiative – a global funding instrument to mitigate climate change and strengthen community resilience projects together with the Green Climate Fund and the Nature+ Accelerator Fund. The latter is a scalable market strategy for nature-based solutions and for the private sector that is a crucial part of bridging the conservation finance funding gap. The Partnership for Biodiversity Accounting Financials also seeks to bring together the private sector, DFIs and other stakeholders to increase resource mobilization and integration of biodiversity into organizations' operations.

IX. Monitoring and evaluation

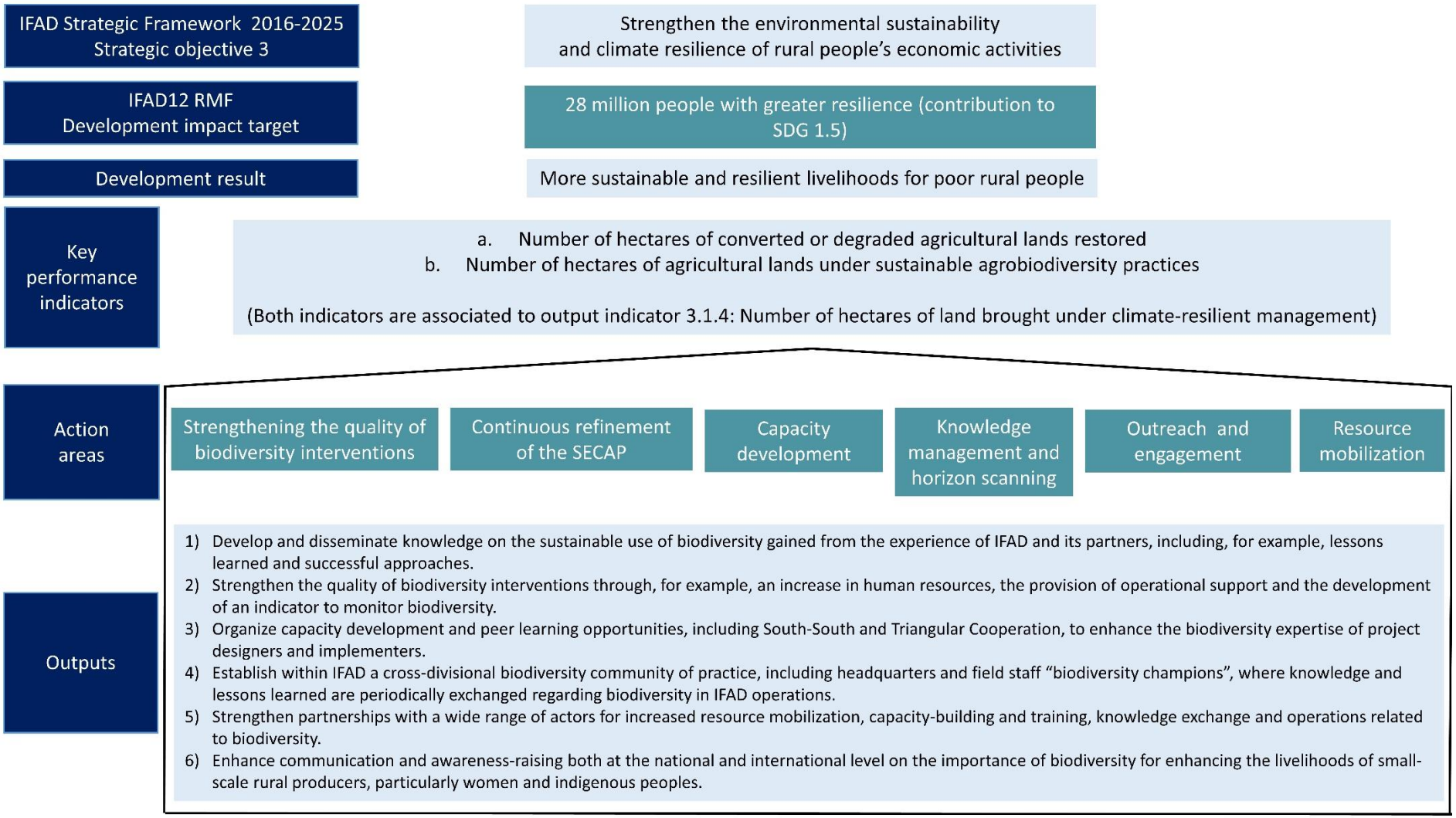
42. Monitoring and evaluation (M&E) is an integral element of this strategy. IFAD will provide updates on the implementation of the biodiversity strategy through existing corporate reports, including the Report on IFAD's Development Effectiveness and the Climate Action Report. Governed by IFAD's project implementation guidelines, project-level results data on the new biodiversity-related core indicator, once finalized, will follow the IFAD reporting calendar (annual for output-level indicators and at project baseline, midline and endline for outcome-level indicators). Results data received will be consolidated in IFAD's Operational Results Management System to permit corporate portfolio-level reporting.

43. The knowledge derived from M&E will feed into learning activities, inform outreach and communications, and support innovation and continuous improvement. Furthermore, an evaluation of the strategy will be performed at the end of its time frame to inform the next cycle and build on lessons learned.

44. The Results Management Framework (RMF) (see annex) only shows the outcomes and possible indicators developed specifically for the biodiversity strategy and these will be fully integrated into the RMF of the environment and climate change strategy. This is IFAD's first biodiversity strategy and all indicators will be measured starting from the time the strategy becomes effective (2022 in all likelihood). By December 2022, targets to be achieved by end-2025 will be set; the level of ambition will depend on available resources and in-house capacities. The core indicators will be aligned with the post-2020 global biodiversity framework to be adopted at COP15 to the CBD in 2022.

X. Results framework

Figure 2
Results framework



XI. Governance and implementation arrangements

45. The Environment, Climate, Gender and Social Inclusion Division is responsible for coordinating the execution of the strategy. It will collaborate closely with relevant departments and divisions, particularly the Strategy and Knowledge Department and Programme Management Department, in implementing the action areas to ensure the achievement of the strategy's goals and outcomes.

46. A full-time biodiversity specialist is needed to coordinate the implementation of the strategy and IFAD has initiated the process for obtaining a fixed position dedicated to biodiversity starting from 2022.

47. Financial resources will also be required for the strategy's implementation. As this is a new area of work, there will be resource implications for IFAD in the coming years, in particular as regards the development of tools and knowledge products, as well as capacity-building. Some provisions have been made to enhance IFAD's internal capacity in this area but further resource implications will be identified by 2023. Any additional expertise and investment requirements will be addressed through the regular budget and other corporate processes that are in place to enhance IFAD's resource capacity.

Results Management Framework

Outcomes	*Indicators*
Governments and small-scale farmers, pastoralists, fishers, indigenous peoples and local communities are supported in conserving and sustainably using biodiversity throughout IFAD's interventions, using evidence-based and integrated approaches to small-scale farming systems and landscapes	Ratio of climate finance supporting nature-based solutions that serve to improve the sustainable use and conservation of biodiversity
Drawing on partnerships, IFAD supports the enhancement of national, regional and international policies and development strategies to create an enabling environment for biodiversity associated with rural production and consumption systems	Number of global policy dialogue events IFAD has actively participated in
IFAD is a recognized and well-established partner in generating and applying new knowledge and approaches for the conservation and sustainable use of biodiversity in small-scale farming systems, landscapes and markets	Number of new partnerships – with actors that complement IFAD in expertise, reach and/or mandate – for biodiversity innovations, knowledge, implementation and/or policy dialogue
Outputs	*Indicators*
Develop and disseminate knowledge on the sustainable use of biodiversity gained from the experience of IFAD and its partners, including, for example, lessons learned and successful approaches	Number of biodiversity-related knowledge products created and disseminated
Strengthen the quality of biodiversity interventions through, for example, an increase in human resources, the provision of operational support and the development of an indicator to monitor biodiversity	Number of staff with biodiversity competence A core indicator in biodiversity adopted
Organize capacity development and peer learning opportunities, including South-South and Triangular Cooperation, to enhance the biodiversity expertise of project designers and implementers	Number of capacity development events serving to enhance knowledge of, and ability to work with, biodiversity
Establish within IFAD a cross-divisional biodiversity community of practice, including headquarters and field staff "biodiversity champions", where knowledge and lessons learned are periodically exchanged regarding biodiversity in IFAD operations	Number of meetings and exchanges per year Number of staff actively involved in the community of practice Number of knowledge products produced by the practice (or individual members)
Strengthen partnerships with a wide range of actors for increased resource mobilization, capacity-building and training, knowledge exchange and operations related to biodiversity	Increased number of partners involved in the work on biodiversity Mobilization and leveraging of resources for biodiversity Number of joint events for capacity-building, knowledge exchange and operations.
Enhance communication and awareness-raising both at the national and international level on the importance of biodiversity for enhancing the livelihoods of small-scale rural producers, particularly women and indigenous peoples	Number of events where IFAD has been actively involved in raising awareness of the importance of biodiversity.

Analysis of synergies with other IFAD strategies and policies

A number of IFAD strategies and policies make reference to biodiversity. This Strategy seeks to build on and strengthen the role biodiversity plays in achieving those identified opportunities for multiple benefits.

The **IFAD Strategic Framework 2016-2025** has three strategic objectives: 1) Increase poor rural people's productive capacities, 2) Increase poor rural people's benefits from market participation, 3) Strengthen the environmental sustainability and climate resilience of poor rural people's economic activities. Although all three of IFAD's strategic objectives could both positively and negatively impact and be impacted by biodiversity, the connections are strongest in the first and the third objectives. IFAD's first strategic objective aims to, amongst other things, improve rural people's access and control over natural resources and enhance their resilience through sustainable and efficient management. Furthermore, IFAD promotes the sustainable intensification of production to increase productivity through good agricultural practices that do not compromise the natural resource base. Lastly, IFAD promotes the availability, accessibility, affordability and consumption of diverse, nutritious food leading to better health of both producers and consumers. IFAD's third strategic objective seeks to increase productivity, sustainability and resilience of small-scale production systems through multi-benefit approaches that address resource degradation, pollution, natural hazards, and loss of natural habitat and biodiversity, whilst at the same time contributing to poverty reduction. In particular, IFAD seeks to support the restoration and sustainable management and use of ecosystems and related services, including those linked to Indigenous Peoples' ways of life, through policy engagement, partnership-building and the development of capacities and incentives for rural people.

The **IFAD Strategy and Action Plan on Environment and Climate Change 2019-2025** recognises rural people and small-scale farmers' knowledge of the environment they live in and the importance of their participation in policy and decision-making to enhance the resilience, sustainability and productivity of smallholder agriculture. The Strategy recognises that although IFAD has made progress on addressing climate change, it must draw on scientific data demonstrating the impacts of agricultural practices on the other planetary boundaries, such as biodiversity. In order to more holistically contribute to the transition to more sustainable agri-food and rural systems, the Strategy seeks to promote integrated approaches, including by undertaking pilots through the GEF-funded Integrated Approach Pilot on Sustainable and Resilient Food Security. It is foreseen that the Biodiversity and Environment and Climate Change strategies will be merged after 2025.

The **Gender Equality and Women's Empowerment Policy** recognises the fundamental role that women play in biodiversity conservation and, linked to that, environmental sustainability and climate change mitigation and adaptation. The Policy therefore seeks to support and promote women's rights to land and government recognition of women's rights to the benefits from and control over natural resources; understanding of sustainable natural resource management in a local context, how it affects women as compared with men, as the basis of project identification, design and implementation; integration of gender-differentiated knowledge systems and management of natural resources through inclusive approaches such as participatory mapping, decision-making and governance; equal access to new technologies, training and credit facilities for enhanced conservation and use of animal/plant genetic resources and food production for both women and men; and reduction in gender inequalities in community-based users' groups through training and positive actions.

The **IFAD Policy on Engagement with Indigenous Peoples** highlights the central role Indigenous Peoples play as they traditionally own, use or occupy a quarter of the global land area that holds 80% of the world's biodiversity. The Policy contributes to the

conservation and enhancement of biodiversity through principles of engagement, such as assisting communities in taking full advantage of their traditional knowledge, culture, governance systems and natural resources; promoting equitable access to land and territories by Indigenous Peoples and enhancing their tenure security; valuing Indigenous Peoples' knowledge and practices in investment projects by supporting research that blends traditional knowledge and practices with modern scientific approaches; and, lastly, by supporting Indigenous Peoples in enhancing the resilience of the ecosystems in which they live and in developing innovative adaptation measures.

The **IFAD Action Plan Nutrition 2019 - 2025** seeks to explore and promote the synergies and win-win linkages between environment, climate and nutrition. In line with this, it promotes low-input, sustainable agricultural practices, supports the diversification of production systems and explores the potential of non-timber forest products and neglected and under-utilized species that hold potential for nutrition and are climate resistant[33] as key to ensuring increased availability and accessibility of a wide array of nutrient-dense foods.

The **IFAD Action Plan Rural Youth 2019 - 2021** recognises the challenges to securing a decent living that rural youth face, including lack of access to assets, goods and services and a lack of opportunities to acquire new skills. Young women in particular face difficulties earning a living due to gender-specific disadvantages both within the household and job market. The challenges faced by young people are compounded by climate change, environmental degradation and biodiversity loss that negatively affect the natural resource base and ecosystems services smallholders depend on for agricultural production. IFAD therefore seeks to support young women's and men's economic empowerment through helping them produce and market more nutritious foods based on crops, fish and livestock grown in a way that minimizes greenhouse emissions and environmental impacts thus contributing to a greener economy.

The **Environment and Natural Resource Management Policy** promotes multiple-benefit approaches to sustainable agriculture that reduce risk and build climate resilience through more diversified landscapes, while at the same time reducing poverty, enhancing ecosystems and biodiversity, increasing yields and reducing greenhouse gas emissions. These approaches include balanced-input agriculture, sustainable land management, organic conservation agriculture, agroforestry, forest management, landscape approaches, watershed management, integrated pest management, integrated plant nutrient management, organic agriculture, rangeland management and, more broadly, integrated food energy systems. With particular regard to biodiversity, it aims to support and promote: i) reduction in agricultural land conversion and negative environmental externalities associated with agricultural production; ii) complementarities with national and international initiatives for biodiversity conservation; iii) introduction of an ecosystem approach; iv) restoration and development of protected areas; v) incentives for conservation and use of local agrobiodiversity through value chains; vi) agricultural systems that are more resilient to extreme and changing climatic events; and vii) avoidance of the depletion of micro-organisms, animals and plant genetic resources.

The **Policy on Improving Access to Land and Tenure Security** highlights that secure land tenure impacts the extent to which farmers are prepared to invest in improvements in production, sustainable management, and adoption of new technologies and promising innovations. Without secure land tenure, producers will be unwilling to adopt long-term practices such as agroforestry that enhance adaptation and mitigation of climate change whilst also providing livelihood benefits through diversification. In addition, unequal distribution of land, population growth and the acquisition of land by public and private corporations, as well as foreign governments in Africa, Asia and Latin America is increasing landlessness of the poorest and resulting in smaller farm sizes. Large-scale

[33] See the guideline Supporting nutrition-sensitive agriculture through neglected and underutilized species: Operational framework and related How-to-do Notes https://www.ifad.org/en/web/knowledge/publication/asset/41245090

conversion of forests into commercial plantations is threatening both the ecosystems and the livelihoods of poor women and men dependent on their products and use for grazing. Through policy dialogue, partnerships, project design, supervision, monitoring and evaluation, as well as knowledge sharing, learning and innovation, IFAD aims to promote equitable access to land by poor rural people and enhance their land tenure security for more sustainable and equitable development outcomes.

The **IFAD Private Sector Engagement Strategy 2019-2024** aims to mobilize private funding and investments in rural micro, small and medium-sized enterprises (MSMEs) and small-scale agriculture, as well as to expand markets, and increase income and job opportunities for IFAD's target groups. This will include support for increased farmer investment and production capacities, as well as the integration of smallholder farmers and rural men and women into global, regional, and domestic value chains. In its private sector engagement, IFAD will implement high environmental, social and governance standards.

The **Information and Communication Technology for Development (ICT4D) Strategy** has four action areas: (i) promote scalable uptake of ICT4D solutions; (ii) strengthen ICT4D partnerships; (iii) enhance ICT4D knowledge management and sharing; and (iv) build internal ICT4D awareness, capacity and leadership. In particular the scaling up of geospatial data could be of interest for the monitoring of biodiversity in IFAD projects.

The Biodiversity Strategy will support diversified, low-agrochemical-input production systems that improve **nutrition** through the provision of a wide array of nutritious and safe food for people living in both rural and urban areas. By recognising **women's** and **Indigenous Peoples'** unique knowledge of biodiversity and ensuring their access to and control over wild and cultivated animal and plant genetic resources, as well as their active involvement in decision-making and management of biodiversity at all levels, the Biodiversity Strategy seeks to support social inclusion and empowerment. In addition, the Strategy's promotion of innovative business models in both production and marketing of biodiversity-friendly produce will support green job opportunities for **youth**. The Biodiversity Strategy will also strengthen IFAD's work on **natural resources management** by reinforcing the consideration of biodiversity as an essential component of natural resources, and providing additional impetus to adopt approaches that restore ecosystem services and conserve agrobiodiversity. As the willingness and ability of rural small-scale producers to make long-term investments depend on secure access to and control over their lands, territories and resources and biodiversity-friendly solutions may require significant and profound changes in production, the Strategy will promote synergies with IFAD's work on **tenure security**. The Strategy will tap into IFAD's work on the **private sector** to mobilise additional resources for biodiversity and enable the private sector to transition towards more biodiversity-friendly production and markets. Potential mechanisms include Payment for Ecosystems Services, government subsidies and incentives, true cost accounting, as well as certification schemes. Finally, it will build on **information and communication technologies** as an innovative approach for protecting biodiversity.

Global evidence review – Investing in biodiversity in small-scale farming systems

This annex forms the basis for the proposed outcomes, strategic directions and theory of change of the IFAD Biodiversity Strategy. It is based on a global evidence and benchmarking review undertaken during the development of the Strategy.[34]

Introduction

Investments in biodiversity is highly relevant in the development context in that biodiversity contributes to fulfilling most of the SDGs (sustainable development goals). Biodiversity is the variability that exists among living organisms (from genes to species) and the ecosystems of which they are a part[35]. It is essential to maintaining life on earth and the resilience of ecosystems, economies and social processes[36]. The two main links between the protection and promotion of biodiversity and IFAD's programme of work are i) agriculture and agri-food systems have been widely recognised as a key driver of biodiversity loss and are therefore an essential part of the solution, and ii) investment in rural development and livelihoods can have various indirect benefits for biodiversity.

Biodiversity has been declining at an alarming rate, mainly due to human-induced changes in land and water use and management, pollution, overexploitation and overharvesting, climate change, population growth and urbanization[37]. Failure thus far to address the underlying causes of biodiversity loss in agriculture calls for transformative and holistic changes to safeguard global food security, support sustainable and nutritious diets, and protect the ecological infrastructure that supplies vital ecosystem services[38].

More than half of the world's gross domestic product (US$44 trillion) is moderately or highly dependent on nature and its services – including the provision of food, fibre and fuel – and the unprecedented loss of biodiversity places this value at risk[39]. Still the financing for biodiversity conservation is far behind the amounts invested in climate change and there is a financing gap for biodiversity. This refers to the difference between the current total annual capital flows toward global biodiversity conservation and the total amount of funds needed to sustainably manage biodiversity and maintain ecosystems integrity. As of 2019, the global spending on biodiversity conservation is between $124 and $143 billion per year, while the total estimated biodiversity protection needs are between $722 and $967 billion per year. This leaves a biodiversity financing gap of between US$ 598 billion and US$ 824 billion per year[40].

How to close this gap is generating considerable attention in the preparations of the Post-2020 Global Biodiversity Framework. The CBD's three reports on resource mobilisation set out a three-pronged approach as an integral part of the Post-2020 Global Biodiversity Framework and central for transformative change, including: 1) reduce or redirect resources causing harm to biodiversity, 2) generate additional

[34] See Annex I for a description of these reviews.
[35] Global Youth Biodiversity Network (2016) CBD in a Nutshell. Global Youth Biodiversity Network. Germany, 204 pages.
Slow Food (2020) Position Paper on Biodiversity
[36] Benton, T and Bieg, C et al (2021) Food systems impacts on biodiversity loss: Three levers for food systems transformation in support of nature. Energy, Environment and Resource Programme. Chatham House
[37] Convention on Biodiversity (2020) Global Biodiversity Outlook 5
[38] Ibid.
[39] World Economic Forum, 2020. Nature risk rising: Why the crisis engulfing nature matters to business and the economy. http://www3.weforum.org/docs/WEF_New_Nature_Economy_Report_2020.pdf
[40] Deutz, A., Heal, G. M., Niu, R., Swanson, E., Townshend, T., Zhu, L., Delmar, A., Meghji, A., Sethi, S. A., and Tobinde la Puente, J. 2020. Financing Nature: Closing the global biodiversity financing gap. The Paulson Institute, The Nature Conservancy, and the Cornell Atkinson Center for Sustainability. https://www.paulsoninstitute.org/key-initiatives/financing-nature-report/

resources from all sources to achieve the three objectives of the Convention[41], including domestic and international sources, private and public and 3) enhance the effectiveness and efficiency of resource use through the creation of partnerships, platforms and effective monitoring and reporting[42].

Investing in rural people, livelihoods, and enterprises is a key strategy for the protection and promotion of biodiversity. Rural communities are often the custodians of natural resource capital, acting as knowledge centres on indigenous, customary and traditional practices that protect and promote biodiversity[43]. In addition, investment in rural areas disincentives the kind of rural-urban migration caused by climate change-induced extreme weather events and changes to biodiversity in the ecosystems which form the basis of rural livelihood strategies, customary practices and other social capital.

Biodiversity is closely linked to development. Out of the 17 Sustainable Development Goals of the 2030 Agenda for Sustainable Development, the achievement of 14 of them directly depends on biodiversity. With less than a decade left to achieve the SDGs, the 2019 SDGs Report paints a daunting picture. Although there is progress, it is not to the extent the world had hoped. SDGs 14 (Life below water) and 15 (Life on land), which directly address biodiversity, are among those SDGs that have seen the least progress to date. There is a need for urgent action to address biodiversity losses as a result of agri-food systems if targets set out in the Post-2020 Global Biodiversity Framework are to be achieved.

Linking rural livelihoods, ecosystems and biodiversity

Understanding the relationship between biodiversity, ecosystems functioning and the impacts of biodiversity loss on the lives and livelihoods of rural people is key to developing approaches that both protect and enhance biodiversity whilst enhancing rural livelihoods. The natural resource dependent livelihood strategies of small-scale producers make them particularly vulnerable to biodiversity loss and the degradation of natural resources.

Biodiversity loss reduces the efficiency by which ecological communities capture biologically essential resources, produce biomass, decompose and recycle biologically essential nutrients. This has profound impacts on the operations of small-scale producers by potentially reducing natural, on-site agricultural inputs and processes such as the fertility of soils, nutrient cycling, pollination, rain-fed and water extraction for irrigation and native soil (micro) biota and pest controlling species that they often rely on.

Biodiversity increases the stability of ecosystem functions over time.[44] This has a particular impact on the medium and long-term sustainability of agricultural systems and practices that rely on on-site natural resource inputs as it makes use of the diverse communities and less invasive agricultural practices. Several studies have shown that total resource capture[45] (the ability of plant and animal species to access nutrients, light, and water) and biomass production[46] are generally more stable in more diverse communities over time. This means that more diverse communities lead to higher

[41] Biodiversity conservation, sustainable use and equitable sharing of benefits from genetic resources.
[42] Büge, M., Meijer, K. and H. Wittmer, 2015. International financial instruments for biodiversity conservation in developing countries – financial mechanisms and enabling policies for forest biodiversity - Background paper for the European Report on Development.
[43] Kelles-Viitanen, A. Custodians of culture and biodiversity. IFAD and Government of Finland.
[44] Ibid.
[45] Cottingham, K. L., Brown, B. L. & Lennon, J. T. Biodiversity may regulate the temporal variability of ecological systems. Ecology Letters 4, 72-85, (2001).
[46] Campbell, V., Murphy, G. & Romanuk, T. N. Experimental design and the outcome and interpretation of diversity-stability relations. *Oikos* **120**, 399-408, (2011).

resilience of ecosystems, which suggests that ecosystems with more diverse communities have a higher level of functioning over time.[47]

The impact of biodiversity loss on any single ecosystem process accelerates as biodiversity loss increases. This indicates that initial losses of biodiversity in diverse ecosystems have relatively small impacts on ecosystem functions, but increasing losses lead to accelerating rates of change. This has important implications for biodiversity offset interventions as higher-diversity species combinations will likely result in more stable ecosystems and higher yields over time.

Diverse ecological communities are more productive because (a) they contain key species that have a large influence on productivity, and (b) differences in functional traits among organisms increase total resource capture. This is particularly relevant in advocating for smallholder agricultural food production systems. Biodiverse ecosystems are not only necessary for producing the agricultural inputs of farmers, but are also key in understanding the resilience of ecosystems in the face of particular farming practices. IFAD's commitment to helping "farmers and fishers become more resilient to the impact of climate change"[48] is inextricably linked to the promotion and protection of biodiversity as more diverse ecosystems promote increased resilience of ecosystems and the communities that rely on the services that these ecosystems offer. Evidence shows that smaller farms, on average, have higher yields and harbour greater crop and non-crop biodiversity at the farm and landscape scales than do larger farms[49]. Diversity is essential to the selection of desirable traits, and can increase resilience to crop damage caused by pests, climate change extreme weather events and disease.[50]

Loss of diversity across trophic levels has the potential to influence ecosystem functions even more strongly than diversity loss within trophic levels. It is a well-established fact that food web interactions are key mediators of ecosystem functioning, and that loss of higher consumers can cascade through a food web to influence plant biomass. Loss of one species within a food web can therefore result in further secondary loss, due to bottom-up effects that can be even more intense and less predictable than the direct effects of disturbance[51]. This has important implications for pest control in smallholder agriculture practices where the loss of predators or pollinators can increase pest populations.

Assessing functional traits can produce predictive knowledge of impacts on ecosystem functions and can be used to create agricultural management strategies that increase ecosystem services and the overall productivity and resilience of an ecosystem.[52] Functional traits of organisms have large impacts on the magnitude of ecosystem functions, which give rise to a wide range of plausible impacts of extinction on ecosystem function. The extent to which ecological functions change after extinction depends greatly on the kind of biological trait. In order to predict the consequences of

[47] Tilman, D., P. B. Reich, J. Knops, D. Wedin, T. Mielke, and C. Lehman. 2001. “Diversity and Productivity in a Long-Term Grassland Experiment.” Science. https://doi.org/10.1126/science.1060391.
[48] IFAD (2020) Ensuring environmental sustainability and building resilience to climate change
[49] Ricciardi, V., Mehrabi, Z., Wittman, H., James, D. and N. Ramankutty. Higher yields and more biodiversity on smaller farms. Nature Sustainability 25 March 2021. https://www.nature.com/articles/s41893-021-00699-2
[50] Cardinale, B. J.; Duffy, E.; Gonzalez, A.; Hooper, D.U.; Perrings, C.; Venail, P.; Narwani, A.; Mace, G.M:; Tilman, D.; Wardle, D.A.; Kinzig, A.P.; Daily, G.C.; Loreau, M.; Grace, J.B.; Larigauderie, A.; Srivastava, D. and Naeem, S. (2012) Biodiversity loss and its impact on humanity. Nature. Volume: 486, Number: 7401, pp 59-67. http://dx.doi.org/doi:10.1038/nature11148
[51] Calizza, Edoardo, M. Letizia Costantini, and Loreto Rossi. 2015. “Effect of Multiple Disturbances on Food Web Vulnerability to Biodiversity Loss in Detritus-Based Systems.” Ecosphere. https://doi.org/10.1890/ES14-00489.1.
[52] Wood, Stephen A., Daniel S. Karp, Fabrice DeClerck, Claire Kremen, Shahid Naeem, and Cheryl A. Palm. 2015. “Functional Traits in Agriculture: Agrobiodiversity and Ecosystem Services.” Trends in Ecology and Evolution. https://doi.org/10.1016/j.tree.2015.06.013.

any particular scenario of extinction, it is necessary to determine which life forms have greatest extinction risk, and how the traits of those organisms influence function.

What are the drivers of biodiversity loss?

Land-use change, climate change, overexploitation, pollution, alien invasive species constitute the principal drivers of biodiversity loss. The recently released Chatham House report on Food System Impacts on Biodiversity Loss identifies our global agri-food systems as the primary driver of biodiversity loss due to the so-called "cheaper food paradigm"[53], with agriculture being the single largest cause of land-use change and habitat destruction, accounting for 80 per cent of all land-use change globally. Land-use change from natural to managed habitats results in habitat loss for wild animals, plants and (micro)organisms such as fungi and therefore reduces the local terrestrial biodiversity - a very high concern given their importance for many ecosystem functions and services[54]. In sites associated with high land-use intensity, the number of species has declined by nearly three-quarters over the last 200 years[55]. Rapid further losses are predicted under a business-as-usual land-use scenario and within-sample richness are projected to fall by a further 3.4% globally by 2100[56]. In the tropical and subtropical regions the destruction of natural vegetation for crops is particularly devastating with an average of 5 million acres of tropical forest being lost annually to industrial-scale agriculture 2001 - 2015. Experts predict that there will be no substantial stands of tropical forest remaining by the end of this century[57].

Underlying the drivers of biodiversity loss are social, economic and political factors.[58] Global shifts to unsustainable and unhealthy diets and consumption patterns linked to population growth, urbanisation, new agricultural and processing technologies and increased average per capita incomes are putting increased pressure on biodiversity and the provision of essential ecosystem services through land-use change and the overexploitation of both aquatic and terrestrial natural resources.[59] [60] Unsustainable intensification and expansion of agricultural practices based on high-input monocultures has led to the loss of biodiversity due to the simplification of landscapes, the degradation of soils and the overuse of agrochemicals.[61] [62] [63] These agricultural practices have focused on high yields to the detriment of nutritional value, resulting in the replacement of a genetically diverse array of traditional crops and associated knowledge and practices

[53] From the 2021 Chatham House Report – a global belief that we must "produce more food and do so at lower cost if we are to support the global population and drive economic growth – have taken primacy over the goals of delivering human and planetary health and well-being, with increasingly problematic side-effects"
[54] IUCN Common Ground report 2020
[55] Newbold, T., Hudson, L., Hill, S. et al. Global effects of land use on local terrestrial biodiversity. Nature 520, 45–50 (2015). https://doi.org/10.1038/nature14324
[56] Ibid.
[57] Ibid.
[58] IPBES (2019): Summary for policymakers of the global assessment report on biodiversity and ecosystem services of the Intergovernmental Science-Policy Platform on Biodiversity and Ecosystem Services. S. Díaz, J. Settele, E. S. Brondízio E.S., H. T. Ngo, M. Guèze, J. Agard, A. Arneth, P. Balvanera, K. A. Brauman, S. H. M. Butchart, K. M. A. Chan, L. A. Garibaldi, K. Ichii, J. Liu, S. M. Subramanian, G. F. Midgley, P. Miloslavich, Z. Molnár, D. Obura, A. Pfaff, S. Polasky, A. Purvis, J. Razzaque, B. Reyers, R. Roy Chowdhury, Y. J. Shin,
I. J. Visseren-Hamakers, K. J. Willis, and C. N. Zayas (eds.). IPBES secretariat, Bonn, Germany. 56 pages.
[59] IPCC, 2019: Summary for Policymakers. In: Climate Change and Land: an IPCC special report on climate change, desertification, land degradation, sustainable land management, food security, and greenhouse gas fluxes in terrestrial ecosystems [P.R. Shukla, J. Skea, E. Calvo Buendia, V. Masson-Delmotte, H.- O. Pörtner, D. C. Roberts, P. Zhai, R. Slade, S. Connors, R. van Diemen, M. Ferrat, E. Haughey, S. Luz, S. Neogi, M. Pathak, J. Petzold, J. Portugal Pereira, P. Vyas, E. Huntley, K. Kissick, M. Belkacemi, J. Malley, (eds.)]. In press.
[60] FAO. 2019. The State of the World's Biodiversity for Food and Agriculture, J. Bélanger & D. Pilling (eds.). FAO Commission on Genetic Resources for Food and Agriculture Assessments. Rome. 572 pp.
[61] Raven, Peter H, and David L Wagner. 2021. "Agricultural Intensification and Climate Change Are Rapidly Decreasing Insect Biodiversity." *Proceedings of the National Academy of Sciences of the United States of America*.
[62] Kremen, Claire, Alastair Iles, and Christopher Bacon. 2012. "Diversified Farming Systems: An Agroecological, Systems-Based Alternative to Modern Industrial Agriculture." *Ecology and Society* 17 (4).
[63] Kazemi, Hossein, Hermann Klug, and Behnam Kamkar. 2018. "New Services and Roles of Biodiversity in Modern Agroecosystems: A Review." *Ecological Indicators*. Elsevier B.V.

with a few, genetically homogeneous modern varieties and animal breeds.[64] [65] Currently only 30 crops (cereals, legumes, tubers and roots) provide 95% of the calories people obtain from food, while four crops (maize, rice, wheat and potatoes) supply over 60%.[66] Food waste and loss is an additional factor pushing demand for food, exacerbating the drivers of biodiversity loss. Whereas in the Global North food waste is associated with household-level consumption, in the Global South food loss results mainly from post-harvest losses due to limited and inefficient storage capacities. Energy and transportation are also increasingly contributing to biodiversity loss due to their effects on climate change and direct impacts resulting from infrastructure development.[67]

Despite global recognition amongst policymakers of the importance of biodiversity for meeting basic human needs at present and in the future, the negative trends continue. Policies supporting food production and consumption practices that cause harm to biodiversity, insufficient investment in biodiversity, policy incoherence at the international, national and local levels, lack of accountability, weak law enforcement capacity, corruption and non-transparent and non-participatory decision-making processes collectively hamper efforts to conserve and enhance biodiversity.[68] As highlighted by the Dasgupta Review, significant policy changes are required to reorient our societies around the understanding that the economy is embedded in nature and must manage it as an asset.[69]

Environmental drivers from climate change (changes in rainfall and temperature) and natural disasters[70] (droughts, cyclones/hurricanes, floods, fires, frosts), pests, diseases, overexploitation of species and invasive alien species are both the result of biodiversity loss and key drivers of its loss. As mentioned above, scientific consensus on the acceleration of biodiversity loss draws a link between key biodiversity loss outcomes and the further acceleration of loss. The response of food production systems to a growing global population and unsustainable dietary practices has led to extraction practices that drive biodiversity loss. This includes overfishing that has drastically reduced marine life and the ecosystems in many of the world's lakes and rivers[71], logging for timber and deforestation for livestock, oil palms and other resources[72] and threatening the world's largest repository of terrestrial biodiversity[73]. Furthermore, the use of pollutants and external inputs, such as fertilizers and pesticides, as well as excessive use of antibiotics

[64] Murphy, Kevin M., Philip G. Reeves, and Stephen S. Jones. 2008. "Relationship between Yield and Mineral Nutrient Concentrations in Historical and Modern Spring Wheat Cultivars." *Euphytica* 163 (3): 381–90.
[65] Kazemi, Hossein, Hermann Klug, and Behnam Kamkar. 2018. "New Services and Roles of Biodiversity in Modern Agroecosystems: A Review." *Ecological Indicators*. Elsevier B.V.
[66] FAO, IFAD, UNICEF, WFP and WHO. 2020. The State of Food Security and Nutrition in the World 2020. Transforming food systems for affordable healthy diets. Rome, FAO.
[67] Kok, Marcel T J, Rob Alkemade, Michel Bakkenes, Martha van Eerdt, Jan Janse, Maryia Mandryk, Tom Kram, et al. 2018. "Pathways for Agriculture and Forestry to Contribute to Terrestrial Biodiversity Conservation: A Global Scenario-Study." *Biological Conservation* 221.
[68] HLPE. 2017. Sustainable forestry for food security and nutrition. A report by the High Level Panel of Experts on Food Security and Nutrition of the Committee on World Food Security, Rome.
[69] Dasgupta, P. (2021), The Economics of Biodiversity: The Dasgupta Review. Abridged Version. (London: HM Treasury).
[70] Ortiz, Andrea Monica D., Charlotte L. Outhwaite, Carole Dalin, and Tim Newbold. 2021. "A Review of the Interactions between Biodiversity, Agriculture, Climate Change, and International Trade: Research and Policy Priorities." *One Earth*. https://doi.org/10.1016/j.oneear.2020.12.008.
[71] The State of World Fisheries and Aquaculture 2018 – Meeting the sustainable development goals. Rome. (available at http://www.fao.org/3/i9540en/ I9540EN.pdf).
[72] The State of the World's Forests 2018 – Forest pathways to sustainable development. Rome. (available at http://www.fao.org/state-of-forests/en/).
[73] FAO. 2019. The State of the World's Biodiversity for Food and Agriculture, J. Bélanger & D. Pilling.

or hormones represent a big driver of water and soil biodiversity loss in terrestrial[74] and aquatic systems.[75] [76]

Effects of biodiversity loss on small-scale farmers

Increasing pressure on land and water resources presents a major challenge for small-scale producers, especially in developing countries due to land degradation, land use and natural resource pressures, and climate change.[77] Many small-scale producers must deal with low and unpredictable crop yields and incomes, as well as chronic food insecurity and malnutrition. These challenges are particularly acute in Sub-Saharan Africa's drylands, where land degradation, depleted soil fertility and water stress contribute to low crop yields and associated poverty and hunger[78].

As food, feed, wood and bioenergy production will need to increase significantly to respond to a growing population and the multiple crises we face, it will be necessary to ensure that increases do not come at the expense of further loss of biodiversity and the ecosystems services small-scale food producers depend on.[79] [80] [81] Due to their limited access to external inputs, small-scale producers depend heavily on ecosystems services for production. Biodiversity is directly linked to the provision of ecosystems services as richness and total abundance of service-providing organisms positively influences the delivery of pollination and biological pest control. Land simplification has an indirect negative impact on pollination and pest control by reducing richness of pollinators and natural pest enemies. Reduced pollination and pest control is in turn shown to result in decreased crop production.[82]

Despite the crucial role small-scale farmers, pastoralists, fisherfolk, Indigenous Peoples and local communities play as guardians of biodiversity, they face numerous challenges, including environmental degradation, desertification and pollution leading to the loss of ecosystem resilience, function and ecosystems services at landscape and farm-level that they depend on for their livelihoods; limited access to and tenure rights over productive assets including land, territories, water and natural resources; lacking recognition and loss of traditional production practices and knowledge that contribute to the public good of conserving biodiversity; loss of agrobiodiversity through the weakening of gene pools of various plants and animal breeds and the loss of informal seed and animal breed systems; insufficient investment in research on sustainable production practices and plant and animal breeding that conserve biodiversity; limited access to technologies, extension services and information; hunger and malnutrition that holds producers back from achieving their full potential; limited access to markets and limited demand for biodiverse produce; policies that promote production practices harmful to biodiversity leading producers to abandon diversified and biodiversity-friendly production practices for high-input monocropping, limited understanding and awareness on the importance of

[74] decline in owls, kites, pollinators, changing soil biota, etc.
[75] affecting the composition and abundance of aquatic microorganism, benthic communities, changes in the physiology and behaviour of fish and amphibians, eutrophication of water bodies and changes in the structure of riparian communities
[76] Ibid.
[77] Winterbottom, Robert, Chris Reij, Dennis Garrity, Jerry Glover, Debbie Hellums, Mike McGahuey, and Sarah Scherr. 2013. "Improving Land and Water Management." World Resources Institute.
[78] Ibid.
[79] It is estimated that food production will need to increase by between 25 to 70 per cent by 2050 to meet increased demand and wood and fibre demand will double between 2005 and 2030. HLPE. 2017. Sustainable forestry for food security and nutrition. A report by the High Level Panel of Experts on Food Security and Nutrition of the Committee on World Food Security, Rome.
[80] González-Chang, Mauricio, Stephen D Wratten, Morgan W Shields, Robert Costanza, Matteo Dainese, Geoff M Gurr, Janine Johnson, et al. 2020. "Understanding the Pathways from Biodiversity to Agro-Ecological Outcomes: A New, Interactive Approach." Agriculture, Ecosystems and Environment 301.
[81] Altieri, Miguel A, Clara I Nicholls, Alejandro Henao, and Marcos A Lana. 2015. "Agroecology and the Design of Climate Change-Resilient Farming Systems." Agronomy for Sustainable Development. Springer-Verlag France.
[82] Dainese, Matteo, Emily A Martin, Marcelo A Aizen, Matthias Albrecht, Ignasi Bartomeus, Riccardo Bommarco, Luisa G Carvalheiro, et al. 2019. "A Global Synthesis Reveals Biodiversity-Mediated Benefits for Crop Production," 1–14.

biodiversity conservation .[83] [84] [85] [86] Due to gender inequalities, women face even greater challenges in protecting biodiversity and are particularly affected by its loss. Indigenous Peoples traditionally own, use or occupy a quarter of the global land area that holds 80% of the world's biodiversity and their territories are degrading at a slower pace than others.[87]

One of the most serious consequences for food production is the decline in pollinators, which needs urgent address with more than 40% of invertebrate pollinators (bees, butterflies and midges) and 16.5% of vertebrate pollinators (such as bats and birds) at risk of becoming extinct.[88] This is primarily due to the overuse of pesticides, which threatens one of the most important ecosystem services for food production – pollination.[89] Smallholder famers often rely on wild pollination, their farms therefore playing an important role in broader ecosystems processes.

There are direct health aspects to loss of biodiversity. Approximately two thirds of known human infectious diseases are shared with animals, and the majority of recently emerging diseases are associated with wildlife. The current Covid19-crisis points to the linkages between climate change, biodiversity and human health. Up to 75% of emerging infectious deceases that affect humans are zoonotic, i.e. originating from animals, either domestic or wild.[90] Human activities are disturbing both the structure and functions of ecosystems and altering native biodiversity. Such disturbances reduce the abundance of some organisms, cause population growth in others, modify the interactions among organisms, and alter the interactions between organisms and their physical and chemical environments. Patterns of infectious diseases are sensitive to these disturbances. Major processes affecting infectious disease reservoirs and transmission include deforestation; land-use change; water management e.g. through dam construction, irrigation, uncontrolled urbanization or urban sprawl; resistance to pesticide chemicals used to control certain disease vectors; climate variability and change; migration and international travel and trade; and the accidental or intentional human introduction of pathogens.

Opportunities in protecting and enhancing biodiversity through small-scale farming

IFAD's target groups including small-scale farmers, pastoralists, fisherfolks, Indigenous Peoples and local communities, are the custodians of biodiversity in many regions of the world as they continue to conserve and maintain highly complex, biodiverse production systems, practices and natural habitats at both the territorial, field, landscape and

[83] Jackson, L E, U Pascual, and T Hodgkin. 2007. "Utilizing and Conserving Agrobiodiversity in Agricultural Landscapes." Agriculture, Ecosystems and Environment 121 (3): 196–210.
[84] Kremen, Claire, Alastair Iles, and Christopher Bacon. 2012. "Diversified Farming Systems: An Agroecological, Systems-Based Alternative to Modern Industrial Agriculture." Ecology and Society 17 (4).
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[87] IPBES (2019): Summary for policymakers of the global assessment report on biodiversity and ecosystem services of the Intergovernmental Science-Policy Platform on Biodiversity and Ecosystem Services. S. Díaz, J. Settele, E. S. Brondízio E.S., H. T. Ngo, M. Guèze, J. Agard, A. Arneth, P. Balvanera, K. A. Brauman, S. H. M. Butchart, K. M. A. Chan, L. A. Garibaldi, K. Ichii, J. Liu, S. M. Subramanian, G. F. Midgley, P. Miloslavich, Z. Molnár, D. Obura, A. Pfaff, S. Polasky, A. Purvis, J. Razzaque, B. Reyers, R. Roy Chowdhury, Y. J. Shin,
I. J. Visseren-Hamakers, K. J. Willis, and C. N. Zayas (eds.). IPBES secretariat, Bonn, Germany. 56 pages.
[88] IPBES (2016). The assessment report of the Intergovernmental Science-Policy Platform on Biodiversity and Ecosystem Services on pollinators, pollination and food production.
[89] Intergovernmental Science-Policy Platform on Biodiversity and Ecosystem Services (2018)
[90] Taylor, L.H., Latham, S.M. and Woolhouse, M.E.J. (2001). Risk factors for human disease emergence. Philos. Trans. R. Soc. Lond. B Biol. Sci., 356, 983–989. http://www.ncbi.nlm.nih.gov/pubmed/11516376

waterscape level.[91] [92] Due to their involvement in a wide array of activities such as home gardens, caring for livestock, seed saving, and gathering wild plants for food, medicinal use, fuelwood and other purposes, women have unique knowledge of local agrobiodiversity and its management, and play central roles in passing their knowledge and traditional practices to younger generations.[93] These are livelihoods systems that are adapted to the often-challenging environments in which they have been developed and are based on high levels of biodiversity that allow them to withstand a wide range of biotic and abiotic stresses.[94] The common denominator amongst these different traditional systems and practices, including intercropping, agroforestry and crop-livestock-fish integration, are high levels of agrobiodiversity. In diversified production systems, associations of a wide array of crops and animals are intentional, as they enhance ecosystem functioning, enable more intensive use of small areas of land, increase resource use efficiency by combining plants that utilize different niches (e.g. light, water, nutrients), distribute risk by numerous crops performing the same system functions, and ensure dietary diversity and food and nutrition security through the staggered availability of food.[95] [96] In addition to their importance within the system, many crops are selected for their multiple uses such as their nutritional and energetic contribution to diets, income, animal food, and fuel. Consequently, diversified production and livelihood systems act as an "insurance" or buffer against a wide array of production and conservation-related risk whilst at the same time aimed at ensuring food and nutritional security of producer households.[97]

This multitude of different practices and agroecosystems that effectively harness biodiversity - some of which have been refined over hundreds of years and are passed down from generation to generation - are based on intimate knowledge of the local context. Interactions of communities with different landscapes and ecosystems represent the basis of a wide array of cultures, and these in turn shape nature in an intricate web of interactions called biocultural diversity. Small-scale producers, particularly Indigenous Peoples and local communities, are the guardians of a large part of the world's agrobiodiversity as they have cultivated, bred and selected a wide array of nutritious crops and livestock that are adapted to extreme climates, pests and diseases for centuries.[98] This traditional knowledge and practices for the conservation and use of agrobiodiversity combined with scientific research can inform the development of more sustainable and resilient agri-food and rural systems.[99]

Biodiversity is a key instrument to adapt to and increase resilience to climate change. Ecosystem-based approaches that integrate high quality and connected natural habitats at the landscape level can reduce the risk of flooding, erosion, extreme heat, coastal

[91] Altieri, Miguel A, Clara I Nicholls, and Rene Montalba. 2017. "Technological Approaches to Sustainable Agriculture at a Crossroads: An Agroecological Perspective." *Sustainability (Switzerland)* 9 (3).
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[94] Altieri, Miguel A, Clara I Nicholls, Alejandro Henao, and Marcos A Lana. 2015. "Agroecology and the Design of Climate Change-Resilient Farming Systems." Agronomy for Sustainable Development. Springer-Verlag France.
[95] Bliss, Katie. 2017. "Cultivating Biodiversity: A Farmers View of the Role of Diversity in Agroecosystems." Biodiversity 18 (2–3).
[96] Jensen, Erik Steen, Laurent Bedoussac, Georg Carlsson, Etienne-Pascal Journet, Eric Justes, Henrik Hauggaard-Nielsen, and Erik Steen Jensen. 2015. "Enhancing Yields in Organic Crop Production by Eco-Functional Intensification." Sustainable Agricultural Research 4 (3): 42–50.
[97] Bliss, Katie. 2017. "Cultivating Biodiversity: A Farmers View of the Role of Diversity in Agroecosystems." Biodiversity 18 (2–3).
[98] FAO. (2019). The State of the World's Biodiversity for Food and Agriculture. Rome: FAO.
[99] Altieri, Miguel A, Clara I Nicholls, Alejandro Henao, and Marcos A Lana. 2015. "Agroecology and the Design of Climate Change-Resilient Farming Systems." *Agronomy for Sustainable Development*. Springer-Verlag France.

hazards, and provide important support to functional biodiversity on farms.[100] [101] Within farming systems, strategic choices of specific genotypes and combinations of plants, particularly the integration of trees, can perform multiple functions that protect against increased abiotic stresses induced by climate change including by creating microclimates.[102] [103] [104] As large numbers of traditional crops are resilient to abiotic and biotic stresses that will intensify and spread with climate change, their traits are crucial for the adaptation of agroecosystems to those effects.[105] [106] Biodiversity also plays an important role in mitigating climate change through the capture and storage of atmospheric carbon dioxide in particular through trees and soils with high abundance and diversity of microorganisms and organic matter.[107] A review of 172 case studies and project reports has shown that farms with greater levels of biodiversity are more resilient to climate change.[108] Furthermore, agroecological farms with higher agrobiodiversity have been observed to better withstand and recover from hurricanes than conventional counterparts.[109] [110] [111] Beyond the agricultural practices, the social organisation and network elements of an agroecological approach create safety nets, such as community seed banks, and are key components for conserving biodiversity and increasing collective resilience.[112] [113]

Evidence also suggests that production units with higher crop and animal diversity – both cultivated and wild – enhances food security and nutrition of producer households through both subsistence and income-generating pathways.[114] [115] A contributing factor is that farm-level biodiversity correlates with increased surrounding wild biodiversity and both on-farm and neighbouring biodiversity have benefits for agricultural production in

[100] Erisman, Jan Willem, Nick van Eekeren, Jan de Wit, Chris Koopmans, Willemijn Cuijpers, Natasja Oerlemans, and Ben J Koks. 2016. "Agriculture and Biodiversity: A Better Balance Benefits Both." AIMS Agriculture and Food 1 (2): 157–74.
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[114] Jones, Andrew D. 2017. "Critical Review of the Emerging Research Evidence on Agricultural Biodiversity, Diet Diversity, and Nutritional Status in Low- and Middle-Income Countries." *Nutrition Reviews* 75 (10).
[115] Bezner Kerr, Rachel, Sidney Madsen, Moritz Stuber, Jeffrey Liebert, Stephanie Enloe, Borghino Noelie, Phoebe Parros, Daniel Munyao Mutyambai, Marie Prudhon, and Alexander Wezel. 2021. "Can Agroecology Improve Food Security and Nutrition? A Review." *Global Food Security* 29 (April). https://doi.org/10.1016/j.gfs.2021.100540.

terms of enhanced ecosystems services, including more thorough and efficient pollination, healthier soils and reduced erosion, food and fodder production, as well as higher number and diversity of natural predators.[116] Local domesticated and wild biodiversity is an important source of micronutrients, energy and dietary diversification for rural communities, particularly those living in highly biodiverse areas.[117] [118] [119] Several traditional varieties are known to have a higher micronutrient content than modern varieties.[120] [121] [122] [123] The use of local plant and animal varieties is therefore instrumental for public health, food and nutrition security.[124] Because of their capacity to produce under marginal growing conditions and with little to no need for inputs, traditional crops provide a unique opportunity to empower vulnerable groups and especially women and Indigenous Peoples who are often those who maintain and use these crops today.[125] Due to the different roles women and men play in food production and gathering, as well as women's central roles as principal care takers in their households, they have unique knowledge on local biodiversity and may prioritise different crop and animal characteristics such as nutritional qualities and low care requirements over yields and marketability.[126] Worldwide, home gardens – a majority of which are tended by women - are in particular characterised by their high productivity and wealth of biodiverse and nutritious food that provide nutrition and income.[127]

Traditional crops, including neglected and underutilized species (NUS), face a number of challenges including low yields, difficult harvesting and processing, consumer appeal, low market prices, domestication and conservation of these species, which are threatened by habitat degradation and diminishing use on farm. Consumer demand for nutritious foods sourced from biodiverse systems can drive up production of these products among small-scale producers by increasing their profitability. Better marketing and consumer awareness on the health and environmental benefits associated with neglected and underutilized species can play a critical role in their sustainable promotion.[128] [129] With diets high in meat and dairy products representing one of the principle underlying causes driving biodiversity loss due to land use change, climate change and pollution, consumption changes towards plant-based diets could reduce agricultural greenhouse-

[116] Palomo-Campesino, Sara, José A González, and Marina García-Llorente. 2018. "Exploring the Connections between Agroecological Practices and Ecosystem Services: A Systematic Literature Review." *Sustainability (Switzerland)*.
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[126] FAO. 2019. The State of the World's Biodiversity for Food and Agriculture, J. Bélanger & D. Pilling (eds.). FAO Commission on Genetic Resources for Food and Agriculture Assessments. Rome. 572 pp. Pg. 384.
[127] FAO. 2019. The State of the World's Biodiversity for Food and Agriculture, J. Bélanger & D. Pilling (eds.). FAO Commission on Genetic Resources for Food and Agriculture Assessments. Rome. 572 pp. Pg. 229.
[128] IFAD five how to do notes on NUS https://www.ifad.org/en/web/knowledge/publication/asset/41245090
[129] Padulosi, Stefano, Donna Mareè Cawthorn, Gennifer Meldrum, Roberto Flore, Afton Halloran, and Federico Mattei. 2018. "Leveraging Neglected and Underutilized Plant, Fungi, and Animal Species for More Nutrition Sensitive and Sustainable Food Systems." In *Encyclopedia of Food Security and Sustainability*, 361–70. Elsevier.

gas emissions by up to 80%, substantially reducing pressure on biodiversity loss.[130] However, due to investments in high-yielding varieties being channelled mainly towards major staple crops, in order for dietary changes to result in a decrease in cropland, investments will need to be redirected towards increasing the yields and diversity of nutritionally important and environmentally more sustainable crops such as legumes and nuts.[131] Investment in participatory research and breeding of traditional crops and animal breeds could increase the productivity and marketability of these crops.

Well managed, agrobiodiverse production systems have been found to provide multiple ecosystems services, thus reducing the need for external inputs such as agrochemicals and, as a result, the negative impact of production on biodiversity. Compared with conventional farming systems, diversified low external input farming systems support substantially greater biodiversity, soil quality, carbon sequestration, water-holding capacity in surface soils, pollination services, energy-use efficiency, nutrient cycling, as well as enhancing control of weeds, diseases, and pests.[132] [133] [134]

Despite significantly lower research funding for diversified low-input farming systems compared to conventional counterparts, some studies show only slightly lower mean crop productivity with other studies even showing higher yields. Furthermore, research suggests they have the ability to achieve more stable yields over time, suffer smaller yield losses and recover quicker in the face of shocks such as extreme weather events (e.g. hurricanes and droughts).[135] [136] If managed well, these systems also have lower pest incidence and disease development leading to less crop damage and higher yields as compared with monocultures.[137] Other research suggests that even with lower yields, produce from regenerative farms can be more profitable than conventional produce due to diversification and healthier soils resulting in reduced need for costly inputs like pesticides and fertilizers, as well as higher revenues generated from diversified income streams, shortened supply chains and higher prices for the superior quality of the produce.[138]

Blue foods represent significant opportunities for protecting biodiversity whilst increasing food and nutrition security but have so far received little attention in global and national policy discussions.[139] 2,500 fish, invertebrate, algae and aquatic plants are caught or cultivated for food worldwide.[140] Marine and freshwater biodiversity is an indispensable source of nutrition, food security and livelihoods; small-scale fisheries in particular contribute to food security by providing local communities with affordable fish and a

[130] Willett, Walter, Johan Rockström, Brent Loken, Marco Springmann, Tim Lang, Sonja Vermeulen, Tara Garnett, et al. 2019. "Food in the Anthropocene: The EAT–Lancet Commission on Healthy Diets from Sustainable Food Systems." *The Lancet* 393 (10170): 447–92.
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[139] https://bluefood.earth/stories/bfa-at-the-unfss-pre-summit-building-an-alliance-for-blue-foods/
[140] https://bluefood.earth/

means of livelihood.[141] [142] In view of the absence of growth in capture fisheries, it is expected that aquaculture will be the main pathway to meet increasing demands for fish and other blue food.[143]

Key biodiversity friendly approaches

The transition to sustainable agri-food and rural systems that promote and protect biodiversity will require the adoption of a wide array of coherent and mutually supportive soft and hard policy interventions as well as increased recognition and compensation of the role that small-scale producers and their traditional practices and knowledge play in the conservation of biodiversity, including agrobiodiversity, as a public good. Incentives for management practices and approach include taxes and charges, prohibition of use, mandatory farm set-asides, subsidies, permits and quotas, green public procurement, marketing labels, payment for ecosystems services (PES), and responsible sourcing of agriculture products and services.[144] [145] [146] One of the key challenges to addressing biodiversity loss is the lack of clear responsibilities and cross-sectoral collaboration between government institutions, as well as a lack of participatory decision-making processes, in particular the involvement of small-scale producers, women and youth.

Markets can pose a challenge for biodiverse produce due to expectations of uniformity, timing and continuity of supply, as well as specific requirements for market entry (e.g. food safety) and the development of private food standards by supermarkets and other buyers. On the other hand, markets can also support biodiversity-friendly production systems by promoting circular and solidarity economies, support to cooperatives, labelling and certification, and promotion of products with distinctive characteristics associated with their origins and the cultural practices used to produce them (e.g. geographical indications and Slowfood's Presidia).[147] Approaches such as true-cost accounting that attempts to internalise external costs and Green Total Factor Productivity which seeks to "include negative outputs (such as pollution or biodiversity loss) and inputs based on natural resources (such as groundwater or biodiversity) valued for their societal contribution rather than at their (often lower or zero) market value" constitute promising approaches that more completely capture the impact of food production.[148] This is further supported by the Dasgupta Review that also identifies the importance of natural capital accounting for inclusive wealth as the sum of the accounting values of produced capital, human capital, and natural capital.[149]

Although the long-standing debate on the trade-offs between agriculture and biodiversity conservation and how these play out in the land-sparing and land-sharing scenarios

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[147] FAO. 2019. The State of the World's Biodiversity for Food and Agriculture, J. Bélanger & D. Pilling (eds.). FAO Commission on Genetic Resources for Food and Agriculture Assessments. Rome. 572 pp.
[148] Seppelt, R., Arndt, C., Beckmann, M., Martin, E. A., & Hertel, T. W. (2020). Deciphering the Biodiversity–Production Mutualism in the Global Food Security Debate. Trends in Ecology and Evolution, 35(11), 1011–1020. https://doi.org/10.1016/j.tree.2020.06.012
[149] Dasgupta, P. (2021), The Economics of Biodiversity: The Dasgupta Review. Abridged Version. (London: HM Treasury).

continues[150] [151], several approaches and agricultural practices that have been shown to have a positive impact on biodiversity and small-scale producers' livelihoods have been summarised by the FAO[152], HLPE[153], and the IUCN[154]. These include approaches at ecosystem, landscape, and seascape level such as sustainable forest management, land- and water-use management and planning, as well as ecosystem-based approaches. With particular regard to productions systems, biodiversity-friendly management practices and production approaches includes diversification (e.g. agroforestry, mixed farming, home gardens), organic agriculture, agroecology, regenerative agriculture, low external input agriculture, ecological intensification, permaculture, as well as integrated pest, pollination and plant nutrient management.

The business case for biodiversity in small-scale agriculture

The business case for integrating biodiversity considerations into development practice relates to both the cost of biodiversity-related ecosystem services (and cost related to loss) and the risks associated with this loss of these services. Recent trends in biodiversity governance have focused on the valuation of natural capital and the role of biodiversity loss in threatening this natural capital.

According to the OECD, the annual contribution of ecosystem services is valued at USD 125-140 trillion (US dollars) per year, while the losses associated with land-cover change are estimated at USD 4-20 trillion per year. The cost of land degradation is estimated at USD 6-11 trillion per year (based on "reduced crop yields and fish catches, increased economic losses from flooding and other disasters, and the loss of potential new sources of medicine").[155] Valuation of ecosystem services plays an important role in targeting development interventions, is the first step in understanding how much people are willing to pay for the ecosystem services that it supports[156], and is central to determining value for money during budgetary allocation processes at national government level.

Calculating the return on investments from biodiversity requires an initial valuation of the natural capital supporting its investments. There are three main types of valuation used to quantify the value of biodiversity and ecosystem services;

i) socio-cultural - relates to human perceptions around the (non-monetary) value of natural resources and ecosystem services. This includes perceptions around how biodiversity affects access to and affordability of food, health and health-care services, a safe environment, and livelihood options. It also includes customary and indigenous land rights and is affected by cultural biases and beliefs around nature.[157]

ii) biophysical - relates to the measurement of material properties of ecosystems using physical parameters. According to the Intergovernmental Science-Policy Platform on Biodiversity and Ecosystem Services (IPBES), "Biophysical

[150] Whereas land-sparing advocates for the intensification of agriculture on small areas to leave maximum space for biodiversity conservation, land-sharing seeks to integrate biodiversity conservation and agriculture within the same landscape and on farm.
[151] Dudley, N., & Alexander, S. (2017). Agriculture and biodiversity: a review. Biodiversity, 18(2–3), 45–49. https://doi.org/10.1080/14888386.2017.1351892
[152] FAO. 2019. The State of the World's Biodiversity for Food and Agriculture, J. Bélanger & D. Pilling.
[153] HLPE. 2019. Agroecological and other innovative approaches for sustainable agriculture and food systems that enhance food security and nutrition. A report by the High Level Panel of Experts on Food Security and Nutrition of the Committee on World Food Security, Rome.
[154] IUCN Common Ground report 2020: Restoring Land Health for Sustainable Agriculture
[155] OECD (2019) Biodiversity Finance and the economic and business case for action https://www.oecd-ilibrary.org/sites/45adbd0e-en/index.html?itemId=/content/component/45adbd0e-en
[156] Rapidel, B; DeClerck, F, Le Coq, J and Beer, J ed.(2011) Ecosystem Services from Agriculture and Agroforestry Measurement and Payment
[157] Maestre-Andrés, S., Calvet-Mir, L. & van den Bergh, J.C.J.M. Sociocultural valuation of ecosystem services to improve protected area management: a multi-method approach applied to Catalonia, Spain. Reg Environ Change 16, 717–731 (2016). https://doi.org/10.1007/s10113-015-0784-3

valuation methods have been used to calculate physical 'costs' (e.g. in time, energy, materials, land surface, etc.) and levels of pressure of human activity on ecosystems".[158]

iii) monetary - relates to the measurement, in monetary terms, of the value of obtaining/forgoing environmental gain or avoiding/allowing a loss. It may include the monetary value of biodiversity-related yield increases/losses, savings as a result of agro-biodiverse agricultural inputs etc.

In addition to the valuation of these ecosystem services and the cost associated with their loss, the business case for biodiversity protection and promotion also needs to take into account the risks and liabilities associated with biodiversity impacts and the global institutional response to these impacts. There are several business risks associated with biodiversity loss. This relates to both IFAD's business model as well as the sustainability of the rural livelihoods and/or agricultural enterprises it invests in. These include liability, regulatory, reputational and market, as well as financial risks.[159] [160]

[158] IPBES (n.d) The Biophysical Domain [ONLINE] https://ipbes.net/biophysical-domain

[159] Barker, Sarah, Ellie Mulholland, and Temitope Onifade. 2020. "The Emergence of Foreseeable Biodiversity-Related Liability Risks for Financial Institutions A Gathering Storm?" Commonwealth Climate and Law Initiative.

[160] OECD (2019) Biodiversity Finance and the economic and business case for action https://www.oecd.org/env/resources/biodiversity/biodiversity-finance-and-the-economic-and-business-case-for-action.htm

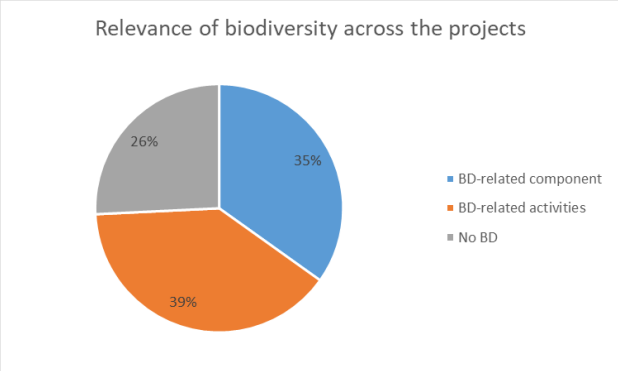
Stocktake of Biodiversity in IFAD projects

A. Rationale and methodology

The biodiversity stocktake was undertaken between July and September 2020 with the aim to provide an overview of IFAD's approach to biodiversity in view of the development of IFAD's biodiversity strategy. It builds on the agroecology stocktake undertaken by PMI between 2019-2020. The biodiversity stocktake consists of the analysis of the principle project documents – PDR, MTR or supervision reports, and PCR (if available) - of 66 IFAD projects with current completion dates between 2020 and 2021. To complement the analysis of project documents, semi-structured interviews on seven projects with significant or particularly innovative biodiversity interventions were held with country directors and country programme officers (CPOs) to gain additional insight into enabling factors, challenges, factors for success and needs to better implement biodiversity-related activities.

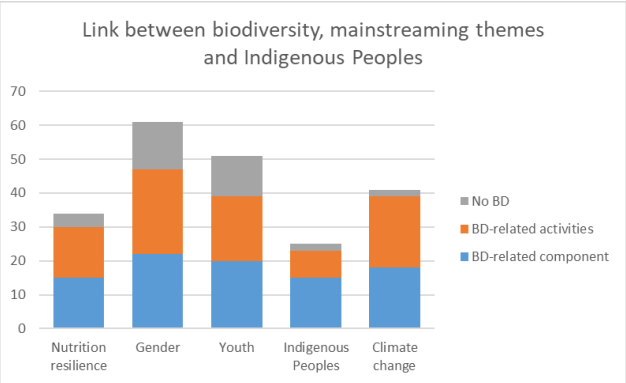
B. Main findings

Relevance of biodiversity



During the stocktake it became clear that the projects in the sample differed in terms of the relevance or extent to which biodiversity is included in their interventions. Whereas some projects have specific components related to biodiversity or an overall sustainable agricultural approach that promotes biodiversity, other projects only include biodiversity-related activities. As a result, the projects have been categorized according to whether they have a biodiversity-related component (including overall sustainable agricultural approach), biodiversity-related activities or no biodiversity. Out of a total of 66 projects, 35% have a component that is related to biodiversity, 39% have some activities linked to biodiversity and 26% of the projects do not promote any biodiversity-related interventions.

Biodiversity and mainstreaming themes



Our findings show that there are significant connections between biodiversity and IFAD's mainstreaming themes, as well as Indigenous Peoples. As shown in this graph, biodiversity is particularly linked to projects that are climate change-sensitive (95%), involve Indigenous Peoples (92%) and promote nutrition resilience (88%). Lastly, a significant proportion of gender (77%) and youth-sensitive (77%) projects also include biodiversity-related interventions.

Challenges

During the stocktake, significant challenges in the implementation of biodiversity-related interventions were identified. Of the 49 biodiversity-related projects, 41% mentioned in the project documents that they encountered problems during implementation of the biodiversity-related interventions. The challenges can be grouped into five overarching

categories; institutional and contextual issues, insufficient human resources and professional capacities, poor planning and implementation, lack of awareness and understanding of benefits of biodiversity, and dependence of biodiversity-related interventions on grant funding.

The **institutional and contextual issues** are principally linked to the unstable institutional environment and limited institutional capacities of the implementing partner, which can lead to significant delays in disbursements, employment of the project team, contractual issues and changes in project orientation. Furthermore, security issues in fragile contexts can hamper the identification of service providers, procurement processes and the realization of certain project activities such as environmental research, which require fieldwork.

With regard to **insufficient human resources and professional capacities**, the main issues are linked to limited number of project staff and a lack of technical and managerial expertise to ensure the successful implementation of biodiversity-related interventions. This is particularly important in the case of grant funding to ensure the adequate integration of grant activities into the wider project.

A further challenge is **poor planning and implementation**. Reasons for this include the lack of a clear strategy and unrealistic or overambitious targets that underestimate the challenges associated with the interventions. In a number of projects this resulted in a significant underachievement of project targets and a high rate of failure of activities such as reforestation. Often, poor planning and implementation is associated with the second challenge of insufficient human resources and professional capacities.

The fourth group of challenges is a **lack of awareness and understanding of the benefits of biodiversity** for enhancing livelihoods. As a result, governments do not prioritize biodiversity and are not willing to invest in it. In other cases, the stocktake found that projects had struggled with a lack of interest in and acceptance of biodiversity-related activities amongst the local communities. Principal difficulties mentioned are that the benefits of biodiversity are not often tangible, interventions are not socio-culturally acceptable and the lack of evidence that promoting biodiversity can be economically viable.

The fifth challenge is the **dependence of biodiversity-related interventions on grant funding** from sources such as GEF and ASAP. When this additional funding is not secured, the biodiversity-related interventions are often scrapped. Dependence on grant funding also poses a challenge for the alignment and integration of those activities into the main projects. The employment of a dedicated and experienced Project Management Unite (PMU) staff member to ensure coherence and integration was identified in numerous projects as an important factor for success.

In addition to the challenges of implementation, it was found that despite having biodiversity-related components or activities, very few projects define specific indicators or outcomes that monitor the impacts on biodiversity. As a result, many of the references to the impacts on biodiversity in the MTRs, supervision and project completion reports are anecdotal. Furthermore, a large number of supervision reports and MTRs failed to provide any feedback on the progress of the biodiversity-related activities mentioned in the PDRs. One of the reasons could be that many projects are demand-driven meaning that activities mentioned in the PDRs are only exemplary, leading to disparities between what is in the PDRs and what is actually implemented. Another explanation provided during the interviews is that reporting on biodiversity is not included in the ToRs of the supervision missions, resulting in an inadequate follow-up of the biodiversity-related interventions.

Factors for success

A number of factors for success based on the project documents and interviews can be identified. Interestingly, many are the other side of the coin of the challenges, showing

that lessons can be learnt from other projects to overcome many of the challenges of implementing biodiversity-related interventions faced.

Government recognition and prioritization of biodiversity is a key enabling factor and can determine the success of project interventions. This highlights the importance of engaging in policy dialogue and awareness-raising on biodiversity issues.

The presence of **technical expertise on biodiversity** in the PMU is an additional factor for success as this ensures consistent and continued consideration of biodiversity throughout implementation. Furthermore, as grant funding is often an entry-point for the inclusion of biodiversity, ensuring human resources dedicated to the integration of grant activities into projects has proven to be a determining factor for biodiversity mainstreaming to occur.

Particularly successful biodiversity projects have been able to visibly show the **benefits for livelihoods of promoting biodiversity**. For example in Tunisia, the promotion of agroforestry combats soil erosion and desertification, increases soil fertility and water retention, provides a barrier against sand storms and strong winds, and diversifies the sources of income. Cost is also an important consideration and interventions that support biodiversity are more likely to be accepted if they are the least costly. The development of community natural resource management plans is another factor for success of biodiversity interventions. The engagement of a wide array of stakeholders, including the communities and local governments in the identification of the problems and development of socially acceptable solutions, increases ownership and the likelihood of subsequent implementation.

Recommendations

- Include biodiversity considerations in key moments of project cycle (design, ToR supervision missions)
- Identify menu of options for integrating biodiversity into projects
- Provide evidence that biodiversity interventions are cost-effective and enhance livelihoods
- Develop a biodiversity indicator to better track implementation

Definitions

Agrobiodiversity: The variety and variability of animals, plants and Micro-organisms that are used directly or indirectly for food and agriculture, including crops, livestock, forestry and fisheries. It comprises the diversity of genetic resources (varieties, breeds) and species used for food, fodder, fibre, fuel and pharmaceuticals. It also includes the diversity of non-harvested species that support production (soil micro-organisms, predators, pollinators), and those in the wider environment that support agro-ecosystems (agricultural, pastoral, forest and aquatic) as well as the diversity of the agro-ecosystems.

Biodiversity: The variability among living organisms from all sources, including, inter alia, terrestrial, marine and other aquatic ecosystems and the ecological complexes of which they are part; this includes diversity within species, between species and of ecosystems (Convention on Biological Diversity, 1992).

Ecosystem: A dynamic complex of plant, animal and micro-organism communities and their non-living environment interacting as a functional unit (FAO, 2005).

Ecosystem approach: A strategy for the integrated management of land, water and living resources that promotes conservation and sustainable use in an equitable way (CBD, 2020).

Ecosystem services: The benefits that people derive from ecosystems. Ecosystem services may be organized into four types: (i) *provisioning services*, which provide people with the goods from ecosystems (i.e. food, freshwater, timber, fibers, medicinal plants); (ii) *regulating services*, which regulate ecosystem processes (e.g. surface water purification, carbon storage and sequestration, climate regulation protection from natural hazards); (iii) *cultural services*, which are the non-material benefits people obtain from ecosystems (e.g. sacred sites, areas of importance for recreation and aesthetic enjoyment); and (iv) *supporting services*, which are the natural processes that maintain the other services (e.g. soil formation, nutrient cycling, primary production).

Nature-based solutions: Actions to protect, sustainably manage, and restore natural or modified ecosystems, that address societal challenges effectively and adaptively, simultaneously providing human well-being and biodiversity benefits (IUCN, 2020).

Organic farming: Uses ecologically based pest controls and biological fertilizers derived largely from animal and plant wastes and nitrogen-fixing cover crops.

Resilience: According to Stockholm Resilience Centre resilience is the capacity of a system, be it an individual, a forest, a city or an economy, to deal with change and continue to develop. It is about how humans and nature can use shocks and disturbances like a financial crisis or climate change to spur renewal and innovative thinking.

Sustainable agriculture: FAO has defined sustainable agricultural development as "the management and conservation of the natural resource base, and the orientation of technological change in such a manner as to ensure the attainment of continued satisfaction of human needs for present and future generations. Sustainable agriculture conserves land, water, and plant and animal genetic resources, and is environmentally non-degrading, technically appropriate, economically viable and socially acceptable" (FAO, 1988).

Sustainable use of biodiversity: defined in the CBD as the "use of components of biological diversity in a way and at a rate that does not lead to the long-term decline of biological diversity, thereby maintaining its potential to meet the needs and aspirations of present and future generations" (Article 2).