Trees on Farms and agricultural landscapes in the Post-2020 Global Biodiversity Framework

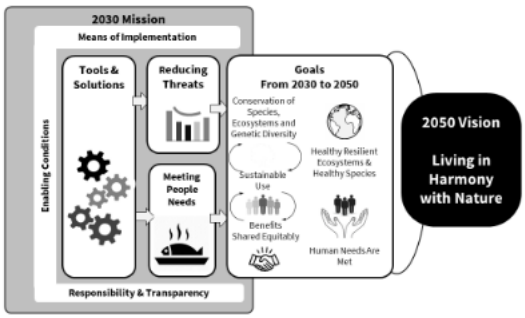
These inputs are a contribution to the post-2020 biodiversity framework debates, focusing on the zero draft and the preliminary draft monitoring framework for goals and targets. This submission responds to Notification 2019-108 and builds on a previous submission posted in December 2019.

The zero draft of the post-2020 biodiversity framework is a commendable effort to condense a complex set of issues into a text that can guide human action up to 2050. The overall logic is rational, but perhaps not optimally presented. There is a high degree of internal consistency, but this consistency breaks down in some places. Once this is dealt with, the structure of the document will follow a good logic, but the logic as expressed will raise some fundamental considerations. These issues are discussed in sections 1 to 3 of this document. Sections 4 and 5 describe specific proposals to improve the goals and targets focused on the contribution of trees on farms and agricultural landscapes for biodiversity, and presents a list of additional indicators that support more comprehensive monitoring of biodiversity gains in agricultural landscapes.

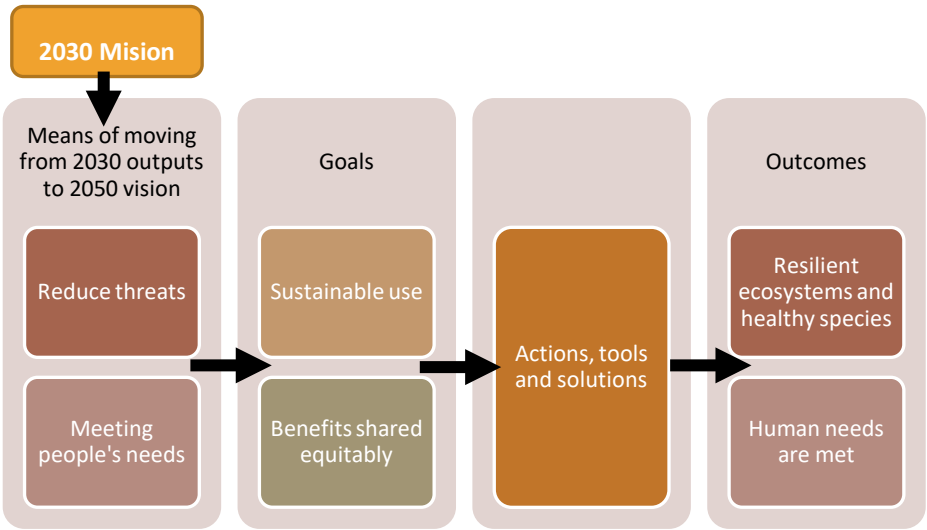
1. OVERALL LOGIC

The overall logic of the zero draft is contained in the Overarching Theory of Change (Section III).

P2020 Overarching Framework: Theory of Change



A more logical flow would be:



2. INTERNAL CONSISTENCY

If the above structure is adopted, then the Theory of Change becomes more consistent with the 2050 Goals that are listed in the order, by topic: "conservation of ecosystems," "species and genetics," followed by "nature meeting people's needs." This is then reflected in the Action Targets, which are grouped in the order "threats," "use and benefit-sharing" then "tools and solutions".

3. FUNDAMENTAL CONSIDERATIONS

Once this logical order is agreed, it will be essential to consider the implications of the grouping of goals and activities. The logical grouping found in policy documents of this sort can lead to illogical separation of issues and actions in the interest of achieving a linear path from left to right of a schematic. In fact, there are in practice crossings-over of issues and feedback loops among activities. In this case, there is a danger that the "(a) reducing threats to biodiversity" actions will create a box for protected natural areas and that the "(b) meeting people's needs" actions will become the repository for actions in productive landscapes. This implies a vision of a world where protected areas are relied upon as havens for biodiversity (land sparing) rather than recognizing the reality of the value of vast mosaic landscapes where conservation of biodiversity in productive landscapes can complement conservation in protected areas, and *vice-versa*. Thus words like "ecosystem" should not be restricted in meaning to natural ecosystems but should extend into managed habitats. On the other hand, "agriculture" must include concepts like species conservation, connectivity, and corridors. This is catered for to some extent in the current structure (e.g., reducing agricultural pollution is found under a) while using nature to ensure water supply is listed under b). However, in developing this framework and subsequently developing action plans, it will be important to avoid false and damaging dichotomies.

4. PROPOSED CHANGES IN THE CURRENT WORDING OF GOALS AND TARGETS

It is critical to have agricultural land recognized for its contribution to biodiversity:

- as habitat for species and varieties cultivated, or otherwise used, by mankind (agrobiodiversity)
- as habitat for wild biodiversity, for those species that use agricultural landscapes to fulfill all or part of their niche requirements, as well as strictly forest-dependent species that nevertheless must use the agricultural matrix to disperse between forest fragments (connectivity)
- for ecosystem services provided to support food production (eco-system services)

The following changes to the existing text will make some progress towards these ends. This submission reiterates that care will be needed throughout the formulation of the text to ensure that landscapes and habitats recognize the presence and importance of agriculture. Text in bold orange are the additions.

B. 2030 - 2050 Goals

Original text	Proposed text
(c) Genetic diversity is maintained or enhanced on average by 2030, and for [90%] of species by 2050;	(c) Genetic diversity of **wild and domestic species in natural and other landscapes** is maintained or enhanced on average by 2030, and for [90%] of species by 2050;
(d) Nature provides benefits to people contributing to:	(d) Nature provides benefits to people contributing to:

(i) Improvements in nutrition for at least [X million] people by 2030 and [Y million] by 2050;	(i) Improvements in nutrition from **sustainable, biodiverse agriculture, forests and resilient food systems** for at least [X million] people by 2030 and [Y million] by 2050;

D. 2030 – action targets

Original text	Proposed text
(a) Reducing threats to biodiversity **1. Retain and restore freshwater, marine, and terrestrial ecosystems, increasing by at least [50%] the land and sea area under comprehensive spatial planning addressing land/sea use change, achieving by 2030 a net increase in area, connectivity and integrity and retaining existing intact areas and wilderness.**	(a) Reducing threats to biodiversity 1. Retain and restore freshwater, marine, and terrestrial ecosystems, increasing by at least [50%] the land and sea area ~~under comprehensive spatial planning~~ **through landscape approaches** addressing land/sea use change, achieving by 2030 a net increase in area, connectivity and integrity and retaining existing intact areas and wilderness.
(a) Reducing threats to biodiversity **2. Protect sites of particular importance for biodiversity through protected areas and other effective area-based conservation measures, by 2030 covering at least [60%] of such sites and at least [30%] of land and sea areas with at least [10%] under strict protection.**	(a) Reducing threats to biodiversity 2. ~~Protect~~ **Manage** sites of particular importance for biodiversity through protected areas, biodiverse agricultural landscapes and other effective area-based conservation measures **including in agricultural and other productive landscapes**, by 2030 covering at least [60%] of such sites and at least [30%] of land and sea areas with at least [10%] under strict protection.
(b) Meeting people's needs through sustainable use and benefit-sharing **8. Conserve and enhance the sustainable use of biodiversity in agricultural and other managed ecosystems to support the productivity, sustainability and resilience of such systems, reducing by 2030 related productivity gaps by at least [50%].**	(b) Meeting people's needs through sustainable use and benefit-sharing 8. Conserve and enhance the sustainable use of biodiversity in agricultural and other managed ecosystems to support the productivity, sustainability and resilience of such systems, ~~reducing by 2030 related productivity gaps~~ **increasing by 2030 the area under agroecological practices** by at least [50%].
(c) Tools and solutions for implementation and mainstreaming **14. Reform economic sectors towards sustainable practices, including along their national and transnational supply chains, achieving by 2030 a reduction of at least [50%] in negative impacts on biodiversity.**	(c) Tools and solutions for implementation and mainstreaming 14. Reform economic sectors towards sustainable practices, **including by internalising biodiversity costs and benefits** along their national and transnational supply chains, achieving by 2030 a reduction of at least [50%] in negative impacts on biodiversity

5. PROPOSED INDICATORS TO MEASURE TREES ON FARMS' CONTRIBUTION TO BIODIVERSITY

Previously included in a submission to the CBD in December 2019, these indicators are offered to measure the three dimensions of biodiversity that trees on farms contribute to: in situ conservation, landscape connectivity and ecosystem services. These indicators aim to measure the actual biodiversity gains from the *enhancement of sustainable use of biodiversity in agricultural and other managed ecosystems*, included in target 8 of the zero-draft.

Generic indicator	Trees on Farms (TonF)	Suggested specific indicators	Place in the Preliminary Draft monitoring framework for goals and targets	
			Draft 2050 Goals	**Suggested elements of the goals for monitoring**
In-situ conservation (of forest and farm adapted species)	composition	1. Cumulative basal area vs diameter 2. Rarefied species richness of trees (total and native) 3. Species of conservation concern (both farmland and forest species)	2. The percentage of species threatened with extinction is reduced by [X%] and the abundance of species has increased on average by [X%] by 2030 and by [X%] by 2050.	Number of extinctions. Change in conservation status. Change in species abundance.
Landscape connectivity	configuration	4. Tree cover (total and native) 5. Intactness index (trees and birds) 6. Trend in habitat connectivity (Frag Stat metrics)	1. No net loss by 2030 in the area and integrity of freshwater, marine and terrestrial ecosystems, and increases of at least [20%] by 2050, ensuring ecosystem resilience.	Change in conservation status. Change in species abundance.
			Draft 2030 Targets	**Suggested elements of the targets for monitoring**
			1. Retain and restore freshwater, marine and terrestrial ecosystems, increasing by at least [50%] the land and sea area under comprehensive spatial planning addressing land/sea use change, achieving by 2030 a net increase in area, connectivity and integrity and retaining existing intact areas and wilderness.	Land-use change for agriculture* Forest area as a proportion of total land area. Trends in forest extent (tree cover). Change in cropland extent.
			2. Protect sites of particular importance for biodiversity through protected areas and other effective area-based conservation measures, by 2030	Connectivity of protected areas

			covering at least [60%] of such sites and at least [30%] of land and sea areas with at least [10%] under strict protection.	
Ecosystem services	function	7. Above Ground Biomass (Total and Native) 8. Use diversity of trees, species per use (also contributes to AT13) 9. Insect abundance/biomass (Pollinators and natural enemies) 10. Soil health (Biomass and diversity)	8. Conserve and enhance the sustainable use of biodiversity in agricultural and other managed ecosystems to support the productivity, sustainability and resilience of such systems, reducing by 2030 related productivity gaps by at least [50%].	Change in the agricultural area under sustainable management.
			[Draft 205 goal] 4. i. Improvements in nutrition for at least [X million] people by 2030 and [Y million] by 2050;	

The description below explains the rationale for the selected indicators:

1. Large trees harbour more biodiversity than an equivalent measure of small trees. Large trees also tend to provide enhanced ecosystem services, such as shade. A plot of basal area proportion by diameter class can be used to determine the relative contribution of large trees

2. In forests, tree species diversity is strongly correlated with the number of arthropod species at both plot and landscape scales and is related to habitat provision for birds and mammals. In addition, studies have demonstrated a correlation between tree species diversity and the diversity of beneficial soil organisms. These relationships are also likely to hold for Trees on Farms , although until now this has rarely been tested

3. Species of conservation concern may be divided into forest species and farmland (or open habitat) species. Based on multi-species occupancy modelling, habitat suitability for each species can be mapped. The current research is focusing on bird species. Bird species of conservation concern are defined by the IUCN Red Lists and include all species in the categories near-threatened, vulnerable, endangered and critically endangered.

4. Tree cover and landscape configuration (native species of conservation concern) is an indicator of the suitability of the landscape for the maintenance of forest-dependent species.

5. The Intactness Index measures the degree to which community composition represents some desired reference. Hence, the Intactness Index of TonF will be measured against forest tree composition from the same site. This will provide information on the degree to which TonF, including forest fragments, provide habitat for forest-dependent species. Tree Intactness Index is calculated on a per ha basis.

6. In suitable ecosystems, trees in farms can contribute to connectivity between fragmented areas of habitat for forest-dependent species. Habitat suitability for forest-dependent species is being estimated using Multi-species Occupancy models

7. Above-ground biomass (AGB) is highly dependent on the number and size of trees. In addition to being an indicator of habitat availability for biodiversity, it is also critical to national reporting on greenhouse gas (GHG) emission reductions and climate change mitigation. In many regions, AGB has not been well characterised in agricultural land, as estimates are often based on forest cover with scant regard for TonF. Even where TonF have

been assessed, the remote sensing products used are usually not well suited to measuring TonF. Hence, tools specifically designed to assess AGB on agricultural land will are being developed and tested.

8. The diversity of tree uses, and tree species per use are measures of the socio-economic importance of trees for livelihoods. The variety of tree uses assesses the contribution of trees to different livelihood activities, such as supplying energy, food, and nutrition, and construction materials.

9. Arthropods (insects, spiders, mites) will be present in huge numbers and form a significant part of tree-based biodiversity. Total arthropod samples are sorted to identify the functional groups that are most important for crops: natural enemies and pollinators.

10. Below-ground soil biota is an essential indicator of soil health. Measurement can be difficult and expensive, so it is proposed to use high-throughput next-generation genetical sequencing approaches, which achieve greater taxonomic breadth and because so many soil organisms belong to poorly known taxa.

'This submission is informed by the ongoing project 'Harnessing the potential of trees-on-farms for meeting national and global biodiversity targets.' implemented in partnership with ICRAF (World Agroforestry), IUCN, CIFOR, CATIE, and Georg-August University of Gottingen. This project is part of the International Climate Initiative (IKI). The Federal Ministry for the Environment, Nature Conservation and Nuclear Safety (BMU) supports this initiative on the basis of a decision adopted by the German Bundestag.