Position on inclusion of agricultural lands

as contributing to conservation of biodiversity in the post-2020 biodiversity agenda

Agriculture has been identified by the CBD as one of the key drivers of biodiversity loss. The IPBES Global Assessment on Biodiversity and Ecosystem Services reports that since 1980, 55% of the increase in agriculture has been at the expense of "intact" forests, and 28% to the detriment of secondary (managed) forests. The IPBES report on Land Degradation and Restoration points to change in land-use intensity from extensively managed agricultural areas to intensively managed agricultural areas as a key contributor of further loss of biodiversity and ecosystem services. The significant ecological footprint of intensified agricultural production with the use of pesticides and chemicals as well as over exploitation of ecosystem services have deep impacts that are affecting the long-term sustainability of our food systems. The IPBES Global Assessment on pollinators, pollination and food production offers well established evidence of the pervasive direct effects of pesticides on the abundance, diversity and health of pollinators, and the provision of pollination services.

When carried out sustainably, under biodiversity-friendly approaches, agriculture contributes to biodiversity conservation through agricultural biodiversity (COP decision V/5, appendix). Beyond the components of biological diversity of relevance to food and agriculture production (agrobiodiversity), recognition should be given to agricultural lands as habitat for wild biodiversity, specifically for forest dependent species. The recent High Level Panel of Experts on Food Security and Nutrition (HLPE) report 14 "Agroecological and other innovative approaches for sustainable agriculture and food systems that enhance food security and nutrition" points out that multi-functional mosaic landscapes can provide a full suite of contributions to biodiversity through extensively managed agricultural lands under agroecological approaches. Farms contribute to multi-functional mosaic landscapes as they provide habitat for forest and farm species, and are integral parts of corridors that connect protected area networks.

Protected areas play a major role in biodiversity protection, but they cannot meet all of the world's needs for biodiversity conservation. It is vital that the post-2020 framework covers the above described three dimensions of biodiversity that agricultural landscapes can contribute: in situ conservation, landscape connectivity and ecosystem services. ICRAF calls parties to consider the following elements for the formulation of targets in the Post 2020 Biodiversity Framework, concerning habitats and land use change in relation to agriculture and biodiversity:

1. The post-2020 framework specifically continues to include the spirit and contents of Aichi Targets 7 and 13; with Aichi Target 7 pointing to reducing the ecological footprint of agriculture through sustainable and biodiversity friendly practices and Aichi Target 13 ensuring that parties recognise the importance of agrobiodiversity.

2. Any references to habitats or ecosystems should explicitly recognize that agriculture is included in those areas and constitutes elements of mosaic landscapes along with natural elements of the land area.

3. Land-use change as a direct driver of biodiversity loss should include not only conversion of natural habitat for agriculture, but also change in land-use intensity from extensive sustainably managed agricultural areas toward monocultures and intensive commodity production.

4. Any site-based measures targets should focus on the conservation of multifunctionality of agricultural landscapes. They should focus on agroecological farms to be conserved and/or the specific biodiversity features of sites, as well as management effectiveness. They could also address attributes at the landscape level including connectivity.

World Agroforestry

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TREES ON FARMS AS A NATURE-BASED SOLUTION FOR BIODIVERSITY CONSERVATION IN AGRICULTURAL LANDSCAPES

POLICY CONSIDERATIONS AND PROPOSED INDICATORS FOCUSED ON TREES ON FARMS FOR AN ENHANCED NEW AICHI BIODIVERSITY TARGET 7

SUMMARY & KEY MESSAGES

For the post-2020 global biodiversity framework, it will no longer be sufficient to seek to limit biodiversity loss through agriculture. Instead, agriculture must become an integral element of sustainable landscapes a force for conserving biodiversity and providing vital ecosystem services to local populations and securing livelihoods.

Trees on farms (TonF) play a critical role in contributing to biodiversity conservation in agricultural landscapes through in-situ conservation, by connecting fragmented wild habitats and providing stepping-stones between protected area networks and conserving soil biodiversity and agrobiodiversity. TonF are one of the key nature-based solutions to the conservation and food production challenges we face as they also play a critical role in achieving the Aichi Target 7. However, they are invisible in most National Biodiversity Strategies and Action Plans (NBSAPs). As NBSAPs will be a key instrument for the implementation of the Post-2020 biodiversity framework, we propose to the following actions be taken to incorporate TonF under agricultural biodiversity strategies in NBSAPs:

1. Recognise the benefits that TonF generate for biodiversity and expand the scope of strategies and actions related to the agricultural sector to include the range of opportunities they offer in the conversation in the post-2020 global biodiversity framework. For instance, orchards, woodlots, hedges, silvopastoral systems need to be promoted to enhance biodiversity outcomes.

2. NBSAPs are the main instruments to implement the post-2020 global biodiversity framework. To strengthen and accelerate their implementation to achieve, among other outcomes, a transformational change of the agricultural sector through the trees on farms, a proposed first step is that countries assess the readiness of their NBSAPs to deliver agricultural biodiversity targets in the Post-2020 framework.

3. This assessment can be carried out in three-step approach: i) identify and analyse activities selected for the implementation of biodiversity targets for agricultural biodiversity and trees on farms, ii) assess how well the NBSAPs address key components of the policy implementation process i.e., best practice options, monitoring, incentives, platforms, and knowledge management, and iii) evaluate the scope and specificity of the activities and their potential to guide implementation.

4. We carried out NBSAP assessments using this approach in the Honduras, Indonesia, Peru, Rwanda, and Uganda. The analysis shows that only 13% of the activities are related to implementation and impacts on the ground. This shows a gap in the level of ambition that countries have set out regarding agriculture-related targets but also represents an opportunity to ensure that all the different types of enabling activities are carried out in a way that maximises results on the ground.

5. Several of the current set of indicators to report progress on Aichi Target 7, adopted by Decision XIII/28, such as the area of land under organic farming and conservation agriculture, are proxies to biodiversity references. However, without any quantification, it is challenging to measure the actual biodiversity gains. Further, the IPBES global assessment report (2019) showed poor progress in implementing Aichi target 7 and strongly called for more specific and measurable indicators.

6. This brief proposes a set of indicators based on three dimensions of biodiversity conservation that trees on farms contribute to: in situ conservation, landscape connectivity and ecosystem services to help track progress, support national monitoring and reporting, and inform outcome-based policy-making for mainstreaming the contribution of trees on farms in biodiversity conservation. The table below summarises indicators proposed for the three dimensions of trees on farms.

Proposed set of indicators to measure trees on farms' contribution to biodiversity

Generic indicator	Specific indicators
In-situ conservation (of forest and farm adapted species)	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)
Landscape connectivity	4. Tree cover (total and native) 5. Intactness index (trees and birds) 6. Trend in habitat connectivity (Frag Stat metrics)
Ecosystem services	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)

Based on the information presented above, we urge Parties to integrate trees on farms in future NBSAPs as a priority strategy and action item to improve agriculture biodiversity. Parties can adopt indicators as applicable across all countries or recommend that they be to determined at the national level in the Post-2020 biodiversity framework.This will help measuring progress consistently and comprenhensively towards the new target on agriculture.

Start a conversation

on how trees on farms can contribute to more robust goals, targets and indicators for the Post-2020 Biodiversity Framework by reaching out to one of our focal points:

Trees on Farms for Biodiversity

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RATIONALE OF THIS BRIEF

Biodiversity in agricultural systems is the variety of life at the genetic, species, and ecosystem levels (FAO, 2019)[1]. Maintaining optimal biodiversity levels in agricultural lands ensures sustainable sources of food, livelihoods, and species existence. The Lancet EAT Commission report (2019)[2] points to the devastating effects of agriculture on biodiversity to the extent that the capacity of biodiversity to support food production, gene flow, and other ecosystem services has been severely affected. It also calls for a shift to biodiversity enhancing agriculture. Unsustainable agricultural production affects biodiversity along three dimensions: (a) land cover change whereby agriculture replaces natural ecosystems such as forests (agricultural expansion); (b) diminishing ecosystem services, including water, soil and climate; and, (c) intensification where monoculture replace mixed cropping systems. Yet, with over 35% of the world's area under agricultural management, it also provides great potential to restore biodiversity, specifically, through activities that help the survival of wildlife critical for farming ecosystems. It also promotes the conservation and sustainable use of soil biodiversity; the latter being an urgent action to be undertaken by 2020 to accelerate action on Aichi Target 7.

However, the IPBES global assessment report (2019)[3] points to poor advances in implementing the CBD's Aichi target 7 on sustainable agriculture and calls for a transformation of agriculture to contribute to biodiversity on the farm and beyond. The IPBES report also says that biodiversity is incorporated insufficiently in sustainable land-use strategies and into national accounting (failing on Aichi target 2) and efforts on fading out related harmful subsidies (Aichi targets 3) have been paltry (IPBES, 2019).

It is clear that in the post-2020 framework, "sustainable agricultural practices" have to be defined as that which (amongst other things) protects biodiversity. While the direct link is complex, the principle is clear: agricultural land must be managed in a way that will conserve biodiversity.

A key practice that enhances biodiversity aspects in agricultural lands is the integration of trees on farms. Trees on farms play a critical role in contributing to biodiversity conservation in agricultural landscapes through in-situ conservation, by connecting fragmented wild habitats and providing stepping stones between protected area networks and conserve soil biodiversity and agrobiodiversity. Trees on farms are the perfect negotiation tool to bridge the conservation and food production agenda. Although trees on farms play a critical role in achieving Aichi Target 7they are invisible in most National Biodiversity Strategies and Action Plans (NBSAPs).

This information note urges policymakers to mainstream trees on farms as a key strategy for biodiversity conservation in the agricultural landscape using a two-pronged approach. First, the entry points for supportive policies to be integrated in NBSAPs, using the examples of Honduras, Peru, Rwanda, Uganda, and Indonesia. Second, it recommends integrating trees on farms in the new target for agriculture, as well as specific indicators that can help to measure progress on the biodiversity outcomes generated by trees on farms.

WHAT ARE TREES ON FARMS FOR BIODIVERSITY?

Trees on farms describe any integration of trees with crops or with livestock on the same piece of land. In landscapes dominated by seasonal crops, they can be individual trees, such as fruit trees or shade trees on a pasture, patches such as woodlots and orchards or hedges. They can also be closely integrated with crops in agroforestry systems that aim at optimising synergy effects between trees, crops, and livestock, through nutrient cycling and micro-climate regulation. In forest landscapes, trees on farms will often be natural regenerated forest species that are found in fallows and traditional agroforestry gardens characterised by the diversity of plants in the proximity of houses and serving multiple purposes (see Figure 1). Trees on private land make up a significant percentage of forest cover: globally 45% of farms worldwide already have more than 10% tree cover.[4]

Farmers have trees on their farmland because they are useful and profitable: they provide timber and fuelwood, improve soil fertility and control water runoff, improve nutrition with fruit, nuts, and leaves, provide fodder for livestock, and provide habitat for animals and pollinators.

In sub-Saharan Africa, trees account for 17% of the total gross annual income of those households.[5] Trees contribute more than 75% of carbon sequestration in agricultural land, sequestering approximately 0.73 gig tonnes of carbon dioxide per year over the past decade (Zomer et al., 2016).[6] Importantly, trees on farms contribute to general biodiversity – ranging from the insects that provide food for birds and pollination services to biological pest control and significantly

increased the diversity of soil organisms. Trees on farms also increase biological connectivity in the landscape, ensuring the integrity of protected area networks. Increasing the cover and diversity of trees on farms can go a long way in meeting global targets for conserving and managing biodiversity.

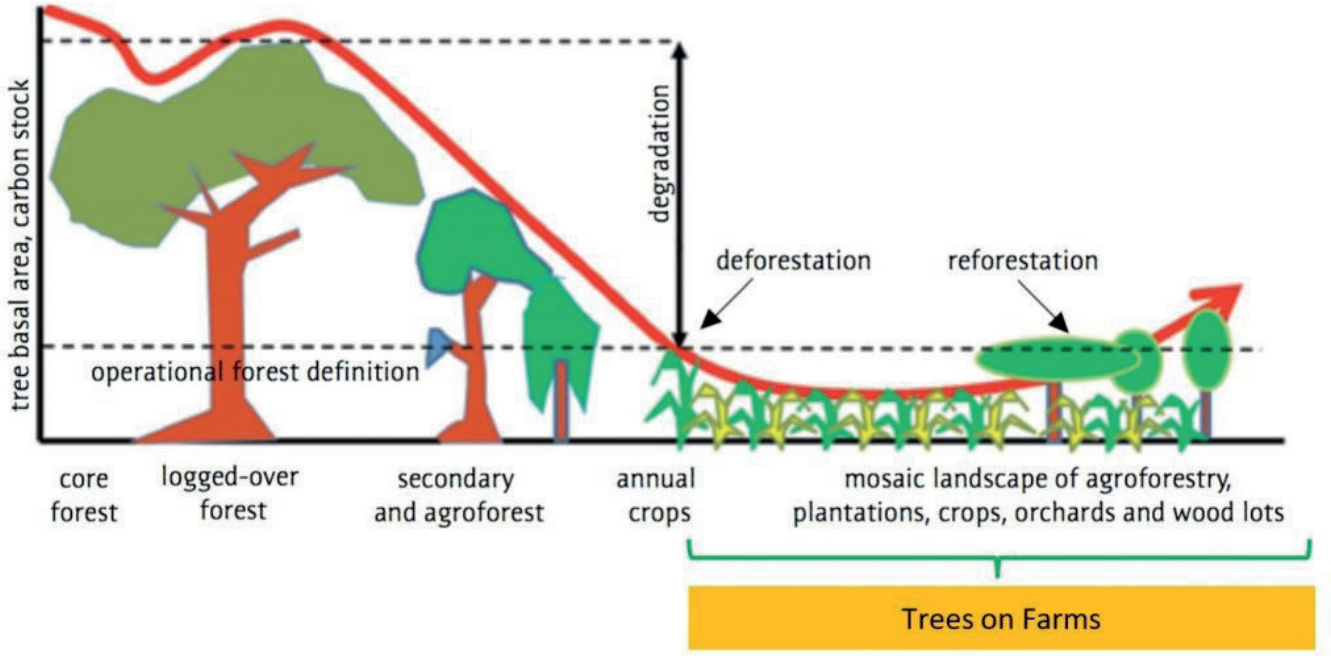

Figure 1: Trees on farms in a landscape. Adapted from: Van Noordwijk et. al (2013).[7]

At the national level, the definition of trees on farms varies per legal definition, local descriptions and differentiated meanings in the local languages. For instance, Table 1 list the different interpretations of trees on farms in the Honduras, Peru, Rwanda, Uganda, and Indonesia, which might have contributed to how comprehensive (or not) policies to promote TonF in agricultural landscapes are. Countries should consider the full range of practices that define trees on farms so that policies designed to promote improved biodiversity outcomes in these landscapes are broader and include measures to incentivise a wide variety of activities.

Table 1: Definition of Trees on Farms across tropical landscapes

	Legal definition of Trees on Farms	Local description	Local language
Uganda	No legal definition, but they follow Worldagroforestry definition (1993): integrating woody perennials in agri-cultural systems	Growing trees within agricultural systems	Kubyala bishalhe mubirime
Indonesia	"resource management that com-bines the forests or timber trees and the planting of short term agricultural crops" (forestry regulation No. P.8/ Menhut-II/2013)	Forest village devel-opment, forest people plantation, tree grower community	kebun campuran, wanatani, tembawang (west Kalimantan); TonF: menanam pohon di lahan pertanian (or masyarakat)
Honduras	"Agroforestry projects aimed at the protection and proper management of natural resources and the environment shall be encouraged" (forestry law, decree 982007, art. para 5) "small plots in forest areas with a com-bination of trees […] and annual or permanent agricultural crops (Agree-ment 010-2015, PESA)	Agroforestry systems, shaded coffee, cocoa plantation, silvopastoral systems, live fences	Agroforestería, sistemas agro-forestales, TonF arboles en fincas"

	Legal definition of Trees on Farms	Local description	Local language
Peru	"practices of integration, preservation and management of perennial woody species in annual or perennial agri-cultural production systems" (forestry Law L-29763) (same for silvopastoral systems)	… barbechos, purmas, unmanaged land, family agriculture, …	Agroforestería, sistema agro-forestal, silvopastoral, arboles en chacras
Rwanda	"a land use system that integrates trees on farms"	"Ibiti bivangwa n'imya-ka" meaning "Trees with crops"	Ibiti biteye mu mirima

IMPROVING POLICY FRAMEWORKS FOR ACHIEVING AGRICULTURE SUSTAINABILITY THROUGH TREES ON FARMS

As mentioned earlier, the IPBES global assessment report (2019) points to poor advances in the implementation of Aichi Targets 2, 3, and 7. Moreover, even though CBD parties are required to mainstreaming biodiversity into sectoral policies (CBD article 6b), the second generation of NBSAPs have not managed to integrate biodiversity conservation and sustainable use into regulatory frameworks (Pisupati & Prib, 2018).[8]

In the context of the Post-2020 biodiversity framework discussions (CBD/POST2020/PREP/1/INF/2), parties and non-parties have acknowledged that NBSAPs are the main instruments to implement the post-2020 global biodiversity framework; hence, they need to be strengthened, and the pace of implementation accelerated.

To strengthen NBSAPs to guide a transformational change of the agricultural sector, particularly of the trees on farms, a systematic review of these targets for the countries listed above is presented next. This review assesses their readiness and identifies opportunities for essential updates to align them with the post-2020 global biodiversity framework. The recommendations presented can be applied to any country with a vision of improving their future NBSAPS with more ambitious and achievable targets on agriculture.

READINESS OF NBSAPS TO MAINSTREAM SUSTAINABLE AGRICULTURE THROUGH TREES ON FARMS

To assess the readiness of the NBSAPs to achieve the new Aichi Biodiversity Targets 2, 3, and 7 via TonF in the Post-2020 Biodiversity framework, the following 3-step approach is proposed:

Step 1

Identify the activities selected for the implementation of biodiversity targets for agricultural biodiversity and trees on farms

Step 2

Assess how well the NBSAPs address the different dimensions of the policy support system for these activities. For simplicity, we distinguish the following five dimensions a) best practice options; b) monitoring, c) incentives, d) platforms, e) knowledge management (see below).

Step 3

Evaluate the scope and specificity of these activities corresponding to their potential to guide implementation

Step 1

Using the example of NBSAPs from the five countries above, we assess to what extent the NBSAPs address the different dimensions of the policy support system related to TonF by asking the following five questions:

1. **Best practice options:** Do NBSAPs provide guidance on the development and assessment of suitable practices fitting local economic, social, and ecological contexts to support trees on farms?

2. **Monitoring:** Do NBSAPs define (or at least strive for) indicators capable of assessing biodiversity impacts in agricultural landscapes to be able to monitor the progress of trees on farms' implementation?

3. **Incentives:** Do NBSAPs identify political frameworks and finance options that support sustainable agricultural practices, including trees on farms?

4. **Platforms:** Do NBSAPs refer to platforms and coalitions of political actors to mainstream trees on farms into existing policy frameworks and programs?

5. **Knowledge management:** Do NBSAPs refer to the need for producing and disemminating available knowledge and resources on options for biodiversity-friendly agricultural practices to inform farmers and supporting agencies?

Table 2: Assessing the readiness of NBSAPs to support mainstreaming of trees on farms as a key strategy to achieve AT 2, 3, and 7; using the example of Peru (2014), Honduras (2018), Uganda (2015) Indonesia (2015) and Rwanda (2016).

	Honduras	Peru	Uganda	Rwanda	Indonesia
Best practice (for integrating TonF into agriculture)	Develop best practice guidelines (T9, A2)	Validated methodology for sustainable, productive activities (A55)	Support tree planting and reforestation, promote agroforestry (A3.2.4, 3.6.1)	Promote integrated management of watersheds, implementation of plans for sustainable agriculture (T6)	Environmentally friendly agricultural products (A8), sustainable management of lands for agriculture and plantations (A16)
Monitoring	Improve inters-sectoral monitoring capacities (T4-A4)	Diagnostic study of agrobiodiversity conservation system (A28)	Improve taxonomic infrastructure and tools (A2.2)	Assessment of biodiversity status and ecosystem services (A-T18)	Improvement of biodiversity data (A3)
Incentives	Value and compensate for the provision of ecosystem services (T7-A3)	No information available	Develop a finance plan (7.1.3), seek funding from diverse sources (7.2.1); Put in place an enabling policy or legislative framework (A7.3.1)	Inventory of potential funds, develop innovative financing mechanisms (A-T19)	Development of laws. Regulation and organisation to encourage funding (A10)
Platforms	Reactivate biodiversity commission CONABIOH (T2-A3) strengthen intersectoral coordination (T2-A3)	Implement technical roundtable for the implementation of forestry incentives (A32)	Strengthen the capacity of the biodiversity coordination mechanism (A1.1.1)	Integrate biodiversity and ecosystem service valuation into economic planning (A-T2)	Setting up organisation of implementation (A2)
Knowledge management	Link information platforms to potential users (T7-A1)	Improve biodiversity information management (A 80)	Enhance national capacity in information management (A 2.1.6)	Strengthen communication and outreach tools (T1)	Improvement of biodiversity research dissemination (A6)

Step 2

The NBSAPs readiness assessment for Honduras, Peru, Uganda, Rwanda, Indonesia reveals that all five countries do address the five dimensions of the policy support system for sustainable agriculture, thus can be supportive of mainstreaming trees on farms. However, the activities remain general and do not clearly articulate country-specific realities and actionable items. Specifically, a clear definition of what sustainable agriculture means in the national biodiversity context is missing. Further, the assessment shows that:

- Countries highlight the need for sustainable production practices and ask for financial incentives to compensate their farmers; however, they do not define specific elements and guidelines for trees on farms.
- The development of a monitoring tool for farm biodiversity is only approached vaguely, reflecting the lack of a suitable monitoring scheme that is both reliable and practical. This can be attributed to limited institutional and financial capacities.
- All NBSAPs underscore the need for intersectoral coordination and structural action to facilitate implementation, however, they do not point to specific collaborative processes or platforms.
- Likewise, the accessibility and the dissemination of biodiversity information appear in all strategies. The low level of specificity and missing direct linkage to agricultural policy result in poor guidance for implementation.
- All countries envision a change of regulatory and incentive systems favouring more sustainable forms of agriculture. They do not, however, give a complete picture of how this sustainable agriculture should differ from current trajectories, nor do they explain how this transformative change should be accomplished. Instead, specific pilot projects and examples are highlighted.

Step3

In order to assess the NBSAPs' potential to guide implementation, we conducted a qualitative content analysis on all NBSAP activities, resulting in five categories: a) Studies and organising information; b) Planning processes and cooperation; c) Promotion, awareness raising and education; d) Institutional development, capacity building, and e) Implementation and impact. The distribution of the activities across these five groups is summarised in Table 3.

Table 3: Shows the distribution of NBSAP activities per country into five categories.

	Honduras	Peru	Uganda	Rwanda	Indonesia	Average across all countries
Number of activities in total	57	93	184	62	73	
a) Studies and organising information	23%	13%	43%	40%	20%	28%
b) Planning processes and cooperation	33%	19%	11%	10%	16%	18%
c) Promotion, awareness raising and education	7%	4%	13%	12%	24%	13%
d) Institutional development, capacity building	30%	17%	14%	13%	30%	28%
e) implementation and impact	7%	4%	19%	18%	9%	13%

Although all countries have activities in place that address all the five categories, it is noticeable that the activities related to **implementation and impacts** make up less than 20% of all activities described. These activities either call for stronger implementation and enforcement, e.g., "Strengthen the compliance with EIA for all hydrocarbon explorations and extractive industry" (Uganda); or they broadly envision an outcome, such as "Expansion of sustainable management of land for agriculture, plantations and animal husbandry" (Indonesia) or "we will have implemented interventions for the recuperation of ecosystems" (Peru). In all three cases, there is no clear indication of how this will be accomplished. It shows a gap in the level of ambition that countries have set out regarding agriculture-related targets but also represents an opportunity to ensure that different types of activities are carried out in a way that maximises the results on the ground.

About a third of the activities in national NBSAPs (28%) are targeted at **studies and organising information**, including research, collecting, and providing information. Activities, such as "analyse the state of wildlife species" (Honduras), or "assess resource requirements based on actual needs and action plan for NBSAP implementation" (Rwanda) show that countries perceive the need for a better information baseline before being able to initiate targeted regulation.

The need for **institutional development and capacity building** is also a priority for all countries, with also one-third of activities (28%). These activities include the design of new policies and instruments to govern biodiversity. Activities related to trees on farms are for instance "Support afforestation, tree planting and reforestation activities at all levels" (Uganda), "Elaborate incentive policy to encourage reuse of agronomic resources and development of an alternative technology" (Rwanda), "strengthen the implementation of laws" (Honduras" or "in the middle of 2020 there will be a validated methodology for the conservation of biodiversity in destinated areas and sustainable production areas in the Amazonia, zonas Andinas and/or the coast" (Peru). As in the awareness raising dimension, those activities highlight the intention of political action without referring to specific instruments.

Planning processes and cooperation to mobilise and organise stakeholders in biodiversity governance systems are regarded as less critical, with only 18% of the activities. Examples are "Regional governments will have updated or developed a biodiversity strategy" (Peru), "develop, update and implement integrated conservation plans" (Rwanda), "strengthen intersectoral coordination" (Honduras), or "develop a cooperation model between government and the community, especially the private sector, to increase people's welfare" (Indonesia). Activities in these two first categories sum up to almost half of the activities in the national NBSAP and reflect that countries call for more (and potentially more targeted) planning and coordination processes instead of defining and guiding measures for implementation.

Activities that support promotion, awareness raising and education only make up 13% across the five countries. Countries call for "Improving people's awareness about poverty reduction at the village level and development of biodiversity potential in left-behind areas" (Indonesia), "promote the respect for traditional knowledge" (Honduras), or "strengthen the dissemination and distribution of information on biodiversity" (Peru). These examples illustrate the general intention of awareness raising without pointing to specific capacity building or information on, e.g. trees on farms, nor how they shall be distributed to potential users of this information.
By supporting a stronger connection between the dimensions of activities and by indicating clear responsibilities and institutional settings for implementation, NBSAPs have the potential to provide much stronger guidance for policies to support trees on farms. A more robus vision for sustainable agriculture can improve the guidance for trees on farms and related support systems and also increase the accountability of relevant actors to implement them.

The five analysed NBSAPs show the interest of the countries in improving guidance on sustainable agriculture, monitoring, cooperative arrangements, and knowledge provision. Building on this achievement, the third generation of NBSAPs needs to go beyond acknowledging this need and should specify and operationalise mechanisms, indicators, and processes to advance these objectives. Without clear guidance, NBSAPs run the risks of further delaying action for biodiversity in agricultural landscapes. Initiatives working on TonF can provide practical, effective, and efficient solutions for this purpose, e.g. by providing best practice options for production or support schemes, by providing efficient and effective monitoring methodologies and providing related information.

Salvaleon de Higuey, Dominican Republic. Photo credit: Adriana Vidal

INDICATORS TO IMPROVE MEASUREMENT OF BIODIVERSITY OUTCOMES FROM INCREASED TREES ON FARMS IN AGRICULTURAL LANDS

As pointed out above, the IPBES global assessment report (2019) reports slim progress in implementing Aichi Target 7. Our analysis of the five countries' NBSAPs and National Reports corroborates minimal progress towards achieving AT7 and an uneven reporting on progress with not significant results. If the post-2020 agenda is to set the world on a path to achieving the CBD 2050 vision, it must produce a shift from preparation to action with credible monitoring of trends and changes.

The post-2020 biodiversity agenda should recognise the inherent threats to the biodiversity of today's predominant agricultural practices and set targets for the incorporation of trees into farming systems for multiple benefits, including the conservation of biodiversity. However, for this proposal to be credible as a global recommendation, it will be necessary to assess the changes in biodiversity through a robust monitoring system. It will require the development of indices of biodiversity on agricultural land. Currently, a significant challenge for monitoring the impacts of agriculture on biodiversity and the benefits of trees on farms and other eco agricultural approaches is the incomplete framework for defining targets and monitoring change.

There are two relevant Aichi targets, neither of which fully meet these needs.:Aichi Target 13 refers to the diversity of species, varieties, and cultivars of crops and their wild relatives and is "By 2020, the genetic diversity of cultivated plants and farmed and domesticated animals and of wild relatives, including other socio-economically as well as culturally valuable species, is maintained, and strategies have been developed and implemented for minimising genetic erosion and safeguarding their genetic diversity". Incorporating trees into farming systems for food, fodder, fiber, timber, and energy certainly increases the diversity of species on farms and might increase other associated biodiversity. A significant challenge remains the conservation of the general biodiversity on farms in the form of related plants, mammals, birds, arthropods and a wide variety of sub-surface flora and fauna.

As discussed above, Aichi Target 7 deals with agricultural biodiversity in the sense of all species associated with farming and is "By 2020 areas under agriculture, aquaculture and forestry are managed sustainably, ensuring the conservation of biodiversity". This target is binary, confounding sustainability and biodiversity and assumes that sustainability and biodiversity conservation are inherently linked. Unfortunately, a review of the many definitions of sustainable agriculture reveals little concerning the links between sustainability and biodiversity. The CBD's official guidance is that "managed sustainably" is achieved when the use of the components of biodiversity occurs in such a way and at a rate that does not lead to their long-term decline. This captures the biodiversity element of sustainability, but not the other aspects of sustainable agriculture. Overall, the case for maintaining or increasing biodiversity for sustainability is not clearly made. The post-2020 agenda should, therefore, separate general statements on sustainability and focus on sustainable practices that demonstrably conserve or increase biodiversity and should be associated with robust monitoring protocols and indicators that measure the success of the practices in protecting biodiversity.

This next section recommends a set of indicators to monitors and recognises the contribution of trees on farms in conserving biodiversity in the post-2020 agenda, particularly the progress on Aichi Target 7.

PROPOSED INDICATORS FOR MEASURING TREES ON FARMS' CONTRIBUTION TO BIODIVERSITY

The current indicators for Aichi Target 7 adopted in COP14 (Decision XIII/28), for measuring biodiversity components in sustainable agriculture (and forestry and aquaculture) systems are:

Table 4: Aichi Target 7 indicators for the Strategic Plan for Biodiversity 2011-2020 and the Aichi Biodiversity Targets

Generic indicator	Specific indicator	Source
Trends in proportion of area of agriculture under sustainable practices	• Areas of agricultural land under organic production	International Foundation for Organic Agriculture
	• Areas of agricultural land under conservation agriculture	FAO
	• Proportion of agricultural area under productive and sustainable agriculture (indicator for SDG target 2.4)	FAO
Trends in extinction risk and populations of agro-ecosystem associated species	• Wild Bird Index for farmland birds / Living Planet Index (farmland specialists)	BirdLife International / EBCCC/ WWF/ZSL
Trends in proportion of production of aquaculture under sustainable practices	• No specific indicators identified	
Trends in proportion of area of forest production under sustainable practices	• Area of forest under sustainable management certification	FSC/PEFC
	• Progress towards sustainable forest management (indicator for SDG target 15.2)	FAO
	• Wild Bird Index for specialist forest birds / Living Planet Index (forest specialists)	BirdLife International / EBCCC/ WWF/ZSL
Trends in extinction risk and populations of forest-specialist species in production forest	• No specific indicators identified	

Specific indicators of organic farming and conservation agriculture aim to be proxies to biodiversity references but without any quantification, it is challenging to measure the actual biodiversity gains from these practices. The only quantified direct indicator of biodiversity under Aichi Target 7 is the wild bird index which indicates a drastic negative trend. While this is undoubtedly valuable under circumstances where bird species have adapted to become inherently associated with agriculture, many other aspects of biodiversity are missed. The issues related to the lack of proper measurability of the expected biodiversity outcomes from the agriculture sector will transcend if an appropriate review of the indicators is not carried out as part of the process of the Post-2020 Biodiversity Framework.

World Agroforestry, IUCN, CIFOR and University of Göttingen are working to demonstrate the links between the prevalence of trees in agricultural landscapes and biodiversity in the form of the trees themselves and a range of indicator species. A comprehensive sampling protocol has been developed to permit comparative measurement of agricultural landscape attributes. The knowledge gained is expected to identify key elements of biodiversity sampling that should be incorporated into routine sampling for monitoring progress in implementing the post-2020 agenda.

The proposal is to use the three dimensions of biodiversity that trees on farms contribute to: in situ conservation, landscape connectivity and ecosystem services. In-situ conservation refers to the capacity of an agricultural area to conserve forest and grassland species as well as farm-adapted species. The table summarises indicators proposed for the three dimensions of the contribution of trees on farms, and the descript below the table explains the rationale for the selected indicators.

Table 5: Proposed set of indicators to measure trees on farms' contribution to biodiversity

Generic indicator	Specific indicators
In-situ conservation (of forest and farm adapted species)	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)
Landscape connectivity	4. Tree cover (total and native) 5. Intactness index (trees and birds) 6. Trend in habitat connectivity (Frag Stat metrics)
Ecosystem services	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)

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 TonF, 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 trees on farms. Even where trees on farms have been assessed, the remote sensing products used are usually not well suited to measuring it. 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 peruse 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) form 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.

WHAT IS THE PROTOCOL PROPOSING?

- Existing Aichi Target 7 indicators treat forest and agriculture as independent land-use systems; to assess the contribution of an agricultural area to biodiversity across the landscape integrated indicators are needed.
- Trends in genetic diversity of socio-economically and culturally valuable species can be measured through trees on farms.
- The assumption is that the relationship between trees on farms and the various biodiversity components is strong. The assumption is that remote sensing can model tree composition and therefore remote sensing can be used to estimate the various biodiversity components.
- There will always be situations where an indicator will not be applicable; indicators need to be used as relevant.

Based on the information presented above, we urge Parties to integrate trees on farms in future NBSAPs as a priority strategy and action item to improve agriculture biodiversity. Whether parties decide to adopt indicators to be applicable across all countries or they are rather determined at the national level in the Post-2020 biodiversity framework, we encourage parties to examine and use the proposed indicators to track impacts of trees on farms for agricultural biodiversity. This will help with measuring progress consistently and comprenhensively towards the new target on agriculture.

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