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BIODIVERSITY IMPACT INDICATORS FOR COMMODITY PRODUCTION: A CBD INITIATIVE TO MAINSTREAM BIODIVERSITY INTO AGRICULTURAL PRACTICES AND POLICIES

Introduction

1. The Initiative for Biodiversity Impact Indicators for Commodity Production was launched in October 2014, during the twelfth meeting of the Conference of Parties to the Convention on Biological Diversity. The purpose of the initiative is to compile the major cross-cutting impacts on biodiversity caused by agricultural commodity production and to develop a set of impact indicators that can be widely used.

2. The work on impact indicators is one aspect of the Secretariat's work to engage the business community. At COP 12, the Conference of the Parties adopted decision XII/10, which significantly strengthened the call for more effective business engagement. The decision requested the Executive Secretary to undertake a number of activities, including to pursue "cooperation and synergies with other forums regarding issues that are relevant for biodiversity and business engagement with respect to, inter alia, commodity indicators" (decision XII/10, para. 3(e)).

3. The initiative has been led by the CBD Secretariat, with support and guidance from an informal multi-stakeholder advisory committee. The committee includes representatives from partner organizations[1] such as WWF, UNEP-WCMC and UNDP.

Rationale

4. While agriculture can contribute to conservation and sustainable use of biodiversity, it is also a major driver of biodiversity loss. According to the fourth edition of the *Global Biodiversity Outlook* (GBO-4), agriculture accounts for 70 per cent of the projected loss of terrestrial biodiversity. Addressing adverse impacts on biodiversity from agriculture and food systems will therefore be a crucial component required for the success of the Strategic Plan for Biodiversity 2011–2020.

* UNEP/CBD/SBI/1/1Rev.1.

[1] World Wildlife Fund, UNEP-WCMC, IUCN, Rainforest Alliance, UNDP, World Business Council for Sustainable Development, OneWorldStandards, Earthmind.

5. Over the past 30 years, a large number of programmes have been developed to address the impacts of food and other commodity production through the development of voluntary, third-party certified standards for specific goods. The most credible of these programmes are science-based and involve multi-stakeholder groups, generally with a focus on a single commodity (e.g. the various commodity roundtables for coffee, soy, sugarcane, etc.). These roundtables build awareness and consensus about the impacts of a given commodity and how these can be addressed to achieve more sustainable production methods, mostly through the use of standards, criteria, and indicators. As supply chains adopt these standards, markets gradually moves to more sustainable practice.

6. While some progress has been made, the concern with this commodity-by-commodity type approach is that it may not be fast enough to tackle impacts from the hundreds of major commodities being produced. There also tends to be a great deal of variability across different standards and certification schemes for the various commodities, but little benchmarking between them. Additionally, approaches focusing on single commodity lines can miss larger holistic issues and cumulative impacts.

7. Another issue is that these processes often only reach those stakeholders that are already committed to undertaking sustainable actions. There remains a vast number of companies and producers that are not aware of how better practices benefit their own operations. In order to be truly effective, there must be a concerted effort to engage actors that are not yet involved in sustainability processes. While the 25 per cent of food producers whose practices are least sustainable produce only 10 per cent of the product, they are responsible for about 50 per cent of the environmental impacts.[2] It is important to ensure that these companies and producers are made aware of their impacts and encouraged to undertake actions to reduce negative impacts on biodiversity.

8. From the work to date by existing programmes, it is known that there are a relatively small number of key impacts that cut across most agricultural commodities and that represent the majority of negative impacts (such as biodiversity loss, including deforestation, soil health, water uptake and effluent, input use efficiency, toxicity). These represent about 70 per cent or more of the impacts of producing any agricultural commodities.[3]

9. The objective of the initiative was to identify these key impacts, to translate them into a set of generic impact indicators, and thus to fill the gap of the commodity-by-commodity approach used thus far. Such a cross-cutting set of indicators may be helpful to governments and local authorities in evaluating the status of biodiversity in a specific area (i.e. landscape) and taking steps to reduce potential adverse impacts. The set of indicators could also be used to raise awareness among laggard companies and poor performers of the importance of biodiversity, and of actions that can be taken to reduce adverse impacts.

Progress of work

10. The first phase of the work programme was carried out by a consultant. The work included identification of common impacts, gaps in existing approaches, and determination of the best approaches for measurement.[4] The report contains an analysis of the main threats to biodiversity from cultivation and processing of major agricultural commodities. It also analyses the indicators used for monitoring the effectiveness of various certification schemes.

[2] Jason Clay (2014), *World Wildlife Magazine*, Fall 2014. Retrieved from https://www.worldwildlife.org/magazine/issues/fall-2014/articles/what-i-ve-learned-about-food-and-sustainability.

[3] Secretariat of the Convention on Biological Diversity (2014). *Global Biodiversity Outlook 4*. Montreal, Canada, 155 pp.

[4] The full consultant report is available at https://www.cbd.int/business/Report%20on%20Biodiversity%20Impact%20Indicators%20for%20Commodity%20Production%2013-10-2015.pdf.

11. Each indicator reviewed was classified according to the general thematic area it addresses. The use of different indicators by various certification standards was also reviewed. Eight thematic areas were identified: 1. Ecosystems; 2. Wildlife; 3. Water use; 4. Water quality; 5. Agrochemicals; 6. Soil; 7. Waste and pollution; 8. Energy use and greenhouse gas emissions. Each indicator was further categorized as being a measure of state, pressure or response. This was to provide a second means of structuring the entire indicator set. For example, the indicator "expansion of cultivation into natural habitats" was common to many of the standards analysed. It was therefore included into the overall set of indicators under the thematic area "Ecosystems" and further categorized as a pressure indicator. Once all indicators were classified according to their thematic area and categorized as measures of state, pressure or response, they were condensed into a generic set of 93 indicators. This set includes generalized versions of all indicators except those which are specific to a single crop, or which fall outside of the thematic areas. These generalized indicators cut across sectors and are therefore assumed to be applicable to most commodities.

12. The report found that there are many common indicators used in standards and that it is therefore feasible to reduce the set to no more than a dozen indicators which would form a core set. Such a core set, while not comprehensive, could be used to measure and monitor most of the major impacts on biodiversity. The report suggested the following criteria for selecting indicators to be included in the core set:

- Indicators should cover the core thematic areas: land cover/ecosystems; wildlife/species; water use and quality; soil; agrochemicals/pollution; energy/carbon.
- Data should be easy to collect, and the cost of data collection should not be prohibitive.
- Indicators should be applicable to different kinds of crops and farms.
- Indicators should include measures of the state of biodiversity and pressures on biodiversity, not just interventions, actions or responses.
- State indicators should be measurable over the longer term and wider spatial scale.
- Pressure indicators should be measurable over the medium term and spatial scale.
- Response indicators should be measurable over the short term and local (farm) scale.

13. The generic set of indicators identified in the report was the subject of a workshop held in November 2015 in Helsinki on the margins of the 2015 CBD Business and Biodiversity Forum. The objectives of the workshop were the following:

(a) To review the generic set with regard to comprehensiveness and gaps;

(b) To assess effectiveness of indicators;

(c) To identify criteria to refine the set of generic indicators;

(d) To apply criteria and refine the generic set of indicators in order to produce a core set of indicators;

(e) To discuss the next steps for the initiative.

14. The participants undertook an exercise to select indicators from the generic set of indicators that were presented in the consultant report. Participants were asked to identify the indicators that represent the most important and cross-cutting impacts on biodiversity in each thematic area based on the selection criteria presented in the report. The selected indicators would then represent the core set of cross-cutting and key impacts on biodiversity from agricultural commodity production. The group exercise revealed good common ground in determining which impact indicators should be included in the core set. There was common agreement that the indicator set should represent a baseline and should be able to track change over time in a defined area. It was further decided that the indicators should address impacts on a landscape level, rather than the farm level – or a combination of both. The following set of thematic themes and corresponding indicators were selected:

	Thematic area		Indicator	Units	Spatial scale	Temporal scale	Notes
A	Ecosystems/Habitats and Species/Wildlife Indicators	1	Percent farm area in land classes of different habitat quality	% in each class, or weighted index score	Landscape or farm	3-5 years	-Pressure - HCV, tree density, species diversity - Percent of farm area in defined conservation value classes (eg. protected, HCV, restoration or habitat quality) Percent in each class, or weighted index score Micro-habitats (% or area)
		2	Conversion/loss of natural habitat cover (land use change over time)	ha/yr or km^2/yr	Region and landscape	5 - 10 years	- Pressure - Remote sensing
		3	Area-based conservation management	% of certified land area (ha or km^2)	Landscape	3-5 years	- Response - Proxy measure for aspects to which it is hard to assign a single, meaningful measure of impact. - Adoption of a sustainability certification scheme
B	Water Use Indicator	4	Water use per unit product**	m^3/tonne**	Farm and landscape	1-3 years	- State and pressure - Water availability plus water use per unit of yield - To be combined with the local/regional water availability on landscape level
C	Water Quality Indicators	5	Pesticide and inorganic fertilizer use per unit area or unit product**.	kg/ha/yr or kg/tonne**	Landscape and farm	Annual	- Pressure - Active ingredient or P-equivalent - Should be combined with an index for very harmful pesticides (e.g for aquatic species and insects), in cooperation with PAN (International List of Highly Hazardous Pesticides) and/or Greenpeace (The Black List of highly hazardous pesticides)
		6	Biological oxygen demand at sampling sites	BOD5 (mg O_2/L over 5 days)	Landscape	1-3 years	Pressure
D	Soil Health Indicator	7	Soil organic matter	Organic carbon content (%) of top soil	Landscape and farm	1-3 years	State
E	Energy Use and Carbon Emission Indicators	8	Fossil fuel use per unit area or unit product**	kg C/ha/yr or kg C/tonne**	Farm	1-3 years	Pressure
		9	Carbon footprint of product and land use	kg C/ha/yr or kg C/tonne**	Farm and landscape	1-3 years	Pressure

** or per value of product (measuring against value rather than volume of product will help allow compare values across crops, as well as allowing for differences related to value-added processing on-site)

15. Nine biodiversity impact indicators were delineated to address five thematic areas. For each indicator, the type of measurement, the spatial scale, and the temporal scale were defined. The indicators are grouped by thematic areas which constitute the main impact categories that will have to be addressed when assessing the status of or pressure on biodiversity in a given landscape. The corresponding indicators are therefore suggestions of how the impact categories (thematic areas) can be assessed and measured. A detailed description and explanation for each of the thematic areas and indicators can be found in Annex I to this document.

16. The workshop subsequently produced the above set of core indicators for biodiversity impacts of agricultural commodity production. This core set represents the most important (in terms of impact) and cross-cutting impacts on biodiversity. It will be used to feed biodiversity criteria into existing initiatives, processes, and policies.[5]

17. One of the challenges identified during the workshop was that the indicators should not only be applicable to major commodities but to different regions in the world. While some indicators might therefore be useful in some regions, for example water usage, it might not be a useful indicator in other regions because water scarcity is not a matter of concern. It was therefore pointed out that different indicators will be of varying importance to regions, depending on their ecological conditions.

Next steps

18. As a next step, the indicator set will be used to gather feedback from a wider set of potential users (governments, standard bodies, commodity round tables, etc.) in terms of usability and applicability. Given that the aim of the initiative is to produce a cross-cutting approach to addressing biodiversity impacts from agriculture, this work can thus easily feed into other initiatives by providing a core set of indicators that is applicable across commodities and addresses the most important and harmful

[5] The full workshop report is available at https://www.cbd.int/business/Report_Commodity%20Workshop_13%20Nov.%202015,%20Helsinki.pdf.

impacts on biodiversity. A guidance document will be developed in order to explain and disseminate the indicator set.

19. The dissemination of the indicator set will focus on those actors that are able to help in mainstreaming activities, such as governments, local authorities, and global or regional initiatives working on commodity standards. It is hoped that these entities will make use of the indicator set as a starting point for assessing impacts on biodiversity and addressing the impacts through targeted policies and other instruments that are based on those key impacts identified. The indicator set constitutes a starting point for considering and integrating biodiversity criteria in agricultural commodity production in the wider landscape and particularly in policies and standards already existing or to be developed. Specifically, the following groups may utilize the indicator set:

(a) *Governments (national/regional/local)*: the cross-cutting set of indicators may help governments and local authorities in evaluating the status of biodiversity in a specific area, i.e. landscape, and in addressing those impacts in a more targeted approach when formulating policies to improve performance of commodity producers. The indicator set represents the most pressing and major impacts on biodiversity from agricultural commodity production. Based on this set, governments will be able to focus policies or incentives to address the major impacts on biodiversity, and raise performance in agricultural commodity production. Governments could also integrate the use of these indicators in their own practices (e.g. public procurement), and to promote their use by other standard bodies and commodity producers;

(b) *Commodity producers*: Companies could be encouraged to make use of the guidance in order to reduce their impacts on biodiversity through sustainable practices;

(c) *Other actors throughout the food supply chain:* Supply chain actors, such as food retail companies, could use the indicators to further engage commodity producers in their supply chain as well as to develop targeted policies for their own procurement;

(d) *Standard and certification bodies*: Standard and certification bodies could use the impact indicators to integrate biodiversity criteria into standards and certificates;

(e) *Financial institutions*: Financial institutions that could potentially use the indicators as a benchmark in determining the biodiversity-related impacts of investment and in making lending decisions in their portfolios.

Annex

Explanation for each thematic area and impact indicator

Nine biodiversity impact indicators have been suggested to address the five thematic areas. For each indicator the type of measurement, spatial scale, and the temporal scale were defined. The indicators are grouped by thematic areas which constitute the main impact categories that will have to be addressed when assessing the status of or pressure on biodiversity in a given landscape. The corresponding indicators are therefore suggestions of how the impact categories (thematic areas) can be addressed and measured.

The following criteria were used when selecting each indicator:

- Data should be easy to collect, and the cost of data collection should not be prohibitive.
- Indicators should be applicable to different kinds of crops and farms.
- Indicators should include measures of the state of biodiversity and pressures on biodiversity, not just interventions, actions or responses.

Thematic area A – Ecosystems/Habitats and Species/Wildlife Indicators

This thematic area encompasses direct impacts on biodiversity, including conversion of natural ecosystems to croplands or grazing lands, degradation of (semi-natural) agro-ecosystems as well as indirect impacts such as habitat fragmentation, introduction or spread of alien invasive species, and decline of wild species populations.

1. Percentage of farm area in land classes of different habitat quality

Reduced farmland quality, in the form of micro-habitat loss, is a significant contributor to global biodiversity loss. This indicator provides a snapshot of the state of farmland quality by determining the *percentage of farm area in each land class, or by calculating a weighted index score of micro-habitats*. Land classes of different habitat quality should be standardized and could be defined according to tree species density, protected areas, restoration area and/or HCV. HCV (high conservation value) is a concept initially developed by the Forest Stewardship Council and is now widely applied. It defines six types of high conservation value that may exist in a given area, related to: landscape-level ecosystem mosaics; rare, threatened or endangered species or ecosystems; ecosystem services; community needs; and cultural values. This indicator can be measured on the landscape or farm scale every 3-5 years.

2. Conversion/loss of natural habitat cover (land use change over time)

The greatest cause of terrestrial biodiversity loss in the last 50 years has been land cover change, predominantly in the form of agricultural expansion. Conversion of natural habitat cover over time can be calculated as *hectares (or km^2) of land converted per year*, using remote-sensing data. This indicator can be measured on the region and landscape-scale since remote sensing is a macro-scale monitoring technique. Due to the cost of remote sensing, a longer time scale was selected (5-10 years).

3. Area-based conservation management

This is a response indicator involving the adoption of a sustainability certification scheme to achieve "no net loss" or a net positive impact on biodiversity. It is quantified as the *percentage of certified land area (ha or km^2)*. Being in a formal, recognized "sustainability standards scheme" constitutes a proxy measure for biodiversity aspects to which it is hard to assign a single, meaningful measure of impact. This

indicator should be evaluated on the landscape scale every 3-5 years, since most certification schemes are valid for this length of time.

Thematic area B – Water Use Indicator

This thematic area focuses on water abstraction and diversion for irrigation and processing. Agriculture currently takes approximately 70% of all water used by people (roughly 1 L per calorie). Effective water management requires a water use indicator that can be measured and improved over time by individual farms as part of a larger landscape-level water management effort.

4. Water use per unit product

This indicator measures water use in *cubic metres per ton of product*. This is a simple indicator that can be quantified on the farm scale to evaluate individual producer performance. It is also important to analyse water usage at the landscape (watershed) level since this is a pressure indicator related to water availability. Water usage can be evaluated every one to three years, since pressure indicators are typically evaluated over the medium term.

Thematic area C – Water Quality Indicators

Agricultural production results in sediment and chemical runoff, which can have significant impacts on water quality. The suggested indicators allow for monitoring of water suitability for wildlife and domestic use. Water quality is linked to water usage and availability; therefore, these indicators need to be managed in concert to achieve effective water management.

5. Pesticide and inorganic fertilizer use per unit area or unit product

Fertilizers that enter surface water bodies increase the nutrient levels in aquatic ecosystems and can result in eutrophication, which in turn leads to biodiversity loss. In addition, agrochemicals, ingested through drinking water, can have adverse human health effects. This indicator is an indirect measure of water quality, which can be measured in *kilograms of active ingredient or P-equivalent per hectare per year (or kg/ton of product)* at the farm and landscape-scale, annually.

6. Biological oxygen demand at sampling sites

The second water quality indicator selected was biological oxygen demand, measured as *BOD5* (*milligrams of O_2 per litre over 5 days*). BOD is the amount of dissolved oxygen needed by aerobic organisms to break down organic matter in a water sample at a given temperature over a specific time period. BOD reflects the degree of organic pollution in water, which can result from sediment and agrochemical runoff. Riparian zones help prevent pollutants from reaching streams; therefore, riparian quality is also reflected in this indicator. This indicator can be measured at the landscape (watershed) scale, every 1-3 years.

Thematic area D – Soil Health Indicator

Conversion of natural vegetation to agricultural land increases the susceptibility of topsoil to erosion due to the loss of anchoring root systems and tillage. Soils form over thousands of years and, once they are removed by wind and water, their structure and composition is no longer preserved, resulting in the loss of arable land. Therefore, soil condition is fundamental to agricultural sustainability. In addition, soil erosion leads to sedimentation and agrochemical pollution of water bodies, which negatively impacts aquatic biodiversity.

7. Soil organic matter

Soil organic matter, measured as *organic carbon content (%) of top soil*, was chosen to measure soil erosion and degradation. Soil carbon relates to overall soil health and is important for the global carbon cycle. This indicator can be measured at the landscape and farm scale every one to three years.

Thematic area E – Energy Use and Carbon Emission Indicators

This thematic area focuses on climate change, an indirect yet significant pressure on biodiversity. Climate change impacts, including sea level rise, ocean acidification, and desertification pose significant risks to global biodiversity. The cumulative carbon emissions from land conversion and fossil fuel use on farms are globally significant and pose an indirect threat to biodiversity. Two indicators have been suggested to monitor progress in the energy use and carbon emissions thematic area. Effective energy use along with the use of low-carbon energy sources will help to reduce global carbon emissions.

8. Fossil fuel use per unit area or unit product

Fossil fuel use can be measured as *kilograms of carbon per hectare per year (or kg C/ton of product)*. This is a farm-scale indicator, which can be measured every one to three years and is one of the inputs for the carbon footprint measurement below.

9. Carbon footprint of product and land use

The carbon footprint of an agricultural product and land use can be measured as *kilograms of carbon per hectare per year (or kg C/ton of product)*. It is a more complex energy use and carbon emission indicator that and can be measured every one to three years on the farm and landscape scale.