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STRATEGIC SCIENTIFIC AND TECHNICAL ISSUES RELATED TO THE IMPLEMENTATION OF THE STRATEGIC PLAN FOR BIODIVERSITY 2011-2020

BIODIVERSITY, FOOD SYSTEMS AND AGRICULTURE

I. INTRODUCTION

1. The Conference of the Parties, in decision XII/1, requested the Subsidiary Body on Scientific, Technical and Technological Advice to review the main implications and findings of the fourth edition of the *Global Biodiversity Outlook* (GBO-4) and its underlying technical reports as well as additional information from fifth national reports (5NRs) and other submissions. The Subsidiary Body was requested to identify, for consideration by the Conference of the Parties at its thirteenth meeting, further opportunities and additional key actions for the achievement of the Strategic Plan for Biodiversity 2011-2020 and the Aichi Biodiversity Targets, and other actions for the targets where there has been the least progress at the global level (decision XII/1, paragraph 18). In its multi-year programme of work (decision XII/31), the Conference of the Parties decided, inter alia, to consider at its thirteenth meeting the implications of the findings of GBO-4 and strategic actions to enhance national implementation, in particular through mainstreaming and the integration of biodiversity across relevant sectors, including agriculture, forests and fisheries. This document also takes into account a related request by the Conference of the Parties concerning the Executive Secretary and the Food and Agriculture Organization of the United Nations strengthening their collaboration on relevant matters (decision XII/6, para. 17).

2. Section II of this document describes the issue regarding food systems and agriculture based mainly on the findings of GBO-4. Section III describes the identified outcomes required for food systems and agriculture. Section IV provides an overview of additional relevant information from national reports received since GBO-4 was compiled. Section V summarizes what tools and guidance are required to overcome barriers and section VI presents some conclusions.

3. The present note is complimented by several other information documents.The Executive Secretary has provided information note UNEP/CBD/SBSTTA/20/INF/55 on some key tools and guidance on mainstreaming in food and agriculture. The Food and Agriculture Organization of the United

* UNEP/CBD/SBSTTA/20/1/Rev.1.

Nations (FAO) has provided an information note on guidance for the achievement of Aichi Biodiversity Target 7 for food and agriculture (UNEP/CBD/SBSTTA/20/INF/53) and guidance on building a common vision for sustainable food and agriculture (UNEP/CBD/SBSTTA/20/INF/54).

4. Except where otherwise noted, information or conclusions in this note are derived from GBO-4, including its supporting documents.[1] Throughout this document, unless otherwise stated, "agriculture" includes the production of all agricultural goods (including food, fibres, relevant bioenergy and biomaterials, oils and cosmetics), livestock, rangelands, pastoral and, as relevant, agro-forestry.

5. An earlier draft of this note was posted for peer review and comments were received from five Parties and three organizations.

II. WHAT IS THE ISSUE? - KEY IMPLICATIONS OF FOOD SYSTEMS AND AGRICULTURE FOR THE STATEGIC PLAN FOR BIODIVERSITY 2011–2020

A. Context and challenge

6. **Agriculture delivers substantial benefits**, including underpinning food security and nutrition and poverty reduction, as well as contributing to biodiversity conservation. In particular in developing countries, the sector remains the chief source of livelihood in most rural areas and is widely regarded as a route out of poverty. The contribution of indigenous peoples and local communities, and other farmers to maintaining agro-biodiversity is significant. The benefits of farming to biodiversity conservation beyond agro-biodiversity can also be significant. For example, the cumulative area under the Conservation Reserves Program[2] of the United States Department of Agriculture exceeds the total area of National Parks in the country, excluding Alaska, and many Parties have similar programmes. The current expenditure on positive incentive measures for biodiversity through agriculture, although dwarfed in value compared to perverse incentives, is already probably among the largest sources of biodiversity financing and among the largest sources of potential financing through switching negative incentives to positive , in a manner that is consistent and in harmony with the Convention and other relevant international obligations, taking into account national socio economic conditions, as per Aichi Biodiversity Target 3. Because of human activities over millennia, farming systems and landscapes can also support unique biodiversity and provide ecosystem services which, in contrast to natural systems, are manageable.

7. There is, however, consensus that modern agricultural development, overall, has resulted in significant natural resource use, environmental externalities, biodiversity loss and adverse impacts on ecosystem services, and that this trend is no longer sustainable. The loss of biodiversity is a major threat to agricultural productivity. Nevertheless, significantly increased production and better quality of food and other commodities is required to meet projected demand. Clearly, agriculture must produce a lot more, and with better quality, with more efficient use of resources (which includes land, water, energy and chemicals), while limiting expansion into natural areas in order to reduce pressures on the environment and avoid negative impacts on biodiversity.

8. The consumption of food influences demand for production. For example, the trend in meat consumption is one of the most influential variables determining projected outcomes for terrestrial

[1] These are: (1) PBL Netherlands Environmental Assessment Agency. 2014. How Sectors can Contribute to Sustainable Use and Conservation of Biodiversity. Secretariat of the Convention on Biological Diversity, Montreal, Canada. Technical Series No. 79; and (2) Leadley, P.W., Krug, C.B., Alkemade, R., Pereira, H.M., Sumaila U.R., Walpole, M., Marques, A., Newbold, T., Teh, L.S.L, van Kolck, J., Bellard, C., Januchowski-Hartley, S.R. and Mumby, P.J. (2014). Progress towards the Aichi Biodiversity Targets: An Assessment of Biodiversity Trends, Policy Scenarios and Key Actions. Secretariat of the Convention on Biological Diversity, Montreal, Canada. Technical Series No. 78.

[2] http://www.fsa.usda.gov/programs-and-services/conservation-programs/conservation-reserve-program/index.

biodiversity by 2050 (GBO-4 and Technical Series 793). Further overall, there remain significant issues of food quality, including its nutritional value and the presence of chemical contaminants. In addition between 30-40% of food produced is also lost or wasted. Given these multiple issues, strategic actions for to bring about more sustainable and biodiversity friendly agriculture need to consider all processes and infrastructure involved in the preparation of food. This not only includes production issues but also issues associated with consumption patterns, transportation, food processing and agricultural inputs among other things. The term "food system" had been used to describe these various issues.

B. General implications of current trends

9. Under business as usual, the drivers linked to food production are projected to account for between 60 to 70% of terrestrial biodiversity loss and 50% of loss freshwater biodiversity loss by 2050.[4] Land use change through expansion of area devoted to agriculture (cropping and grazing) is the single largest direct cause of biodiversity loss. Today, agriculture is mainly expanding in the tropics, mostly replacing forests, woodlands and natural grasslands, leading to biodiversity loss and further greenhouse gas emissions. Ecosystem degradation and fragmentation and the abstraction of water can also change habitats and the ecosystem services they provide. Even while water consumption varies considerably among countries, water for food production currently accounts for the majority of water consumption globally, though there are differences between countries. Further global water requirements for food production are projected to drive future increases in global water demand. The improper use of pesticides, fertilizers and other agro-chemicals, largely associated with agricultural intensification, is also an important cause of biodiversity loss. While farmers over millennia have enhanced the genetic diversity of many crops and livestock, simplification of cropping systems, due to many reasons, is leading to the loss of this diversity, through declining use and habitat loss and simplification, and decreasing diversity of food systems.[5] This compromises the productivity, stability, ecosystem services and resilience of agricultural ecosystems as well as nutrition and health outcomes.

10. Globally, the impacts of drivers associated with food systems and agriculture are greater than the projected impacts of climate change on biodiversity by 2050 (at least for terrestrial and freshwater ecosystems).[6] Further, at least in the short to medium term, the impacts of food systems on biodiversity are likely to be more easily addressed. In addition, options to mitigate climate change have significant implications for demands made on agricultural systems, and hence on biodiversity. Further, there are also feedbacks between agriculture and climate change, one increasing the impacts of the other and vice versa.

11. **Future projections for 2050 based on current trends ("business as usual") demonstrate unsustainable outcomes**: increased *demand for fertile land* from agriculture, including bioenergy, result in increased pressure on natural terrestrial habitats and large declines in biodiversity; collapse of *many wild fisheries,* and their replacement by aquaculture, with potential consequent increased pollution and demand for high protein feed and therefore further competition for land; *climate change leading to biodiversity loss, ecosystem change and disruption of food production systems,* and *increased water scarcity in many regions*, resulting in reduced water flow for vulnerable freshwater ecosystems. At local farm and landscape scales, declines in biodiversity are already undermining agricultural productivity

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3 The modeling approach underpinning this assessment is the Netherlands Environmental Assessment Agency's (PBL) integrated assessment model framework IMAGE/GLOBIO.

4 See Technical Series 79 (How sectors can contribute to Sustainableuse and conservation of biodiversity) one of the studies underpinning the fourth edition of the *Global Biodiversity Outlook*. Here biodiversity loss is measured as 'Mean Species Abundance". MSA is an indicator for intactness of ecosystems and is defined as the mean species abundance of originally occurring species relative to their abundance in undisturbed ecosystems.

5 See Khoury, C.K., Bjorkman, A.D., Dempewolf, H., Ramirez-Villegas, J., Guarino, L., Jarvis, A., Rieseberg, L.H., Struik, P.C. (2014) Increasing homogeneity in global food supplies and the implications for food security. Proc. Natl. Acad. Sci. USA 111, 4001–4006 and Remans, R., Wood, S., Anderman, T.L., Saha, N., DeFries, R. (2014) Measuring nutritional diversity of national food supplies. Global food security. DOI: 10.1016/j.gfs.2014.07.001.

6 See Figure 21.5 of GBO-4 (page 137, English version) and Figure 4.16 (page 82) of CBD Technical Series No. 78 - *Progress towards the Aichi Biodiversity Targets: An Assessment of Biodiversity Trends, Policy Scenarios and Key Actions.*

(most notably regarding soil health). At regional scales, c*ombinations of drivers could push some ecosystems beyond tipping points.*

12. **Agriculture depends on biodiversity in various ways and at multiple scales.** Biodiversity is the source of the c*omponents of production* (crops, livestock, farmed fish, harvested wild biodiversity), and the genetic diversity within these that allows for *adaptation* to current needs and *adaptability* to future ones. A diversity of species, varieties and breeds, as well as wild sources (fish, plants, bush-meat, insects and fungi) underpins dietary diversity and good nutrition. Biodiversity is also essential for *agricultural production systems,* underpinning ecosystem services such as pollination, pest and disease regulation and water and nutrient cycling and these can be substituted for only partially. At the *landscape level and larger continental scales* biodiversity underpins ecosystem services such as soil formation, erosion regulation and water supply. Decision IX/1 agreed that the programme of work on agricultural biodiversity, with its main elements of assessment, adaptive management, capacity building and mainstreaming, including its three international initiatives on pollinators, soil biodiversity and biodiversity for food and nutrition, continues to provide a relevant framework to achieve the objectives of the Convention.

13. **Safeguarding and monitoring biodiversity and reversing biodiversity loss is crucial for sustainable food and agriculture.** Ecosystem services that are being degraded are often needed to address future challenges in agriculture and other societal goals. However, projections for future agricultural demand and supply based on current models generally do not account for potential negative feedbacks on biodiversity from the loss of biodiversity and ecosystem services.

14. Approaches that are integral to sustainable food systems can simultaneously deliver on multiple goals of the 2030 Agenda for Sustainable Development including issues associated with food, energy, water, and the environment as well as contribute to poverty reduction while remaining within the agreed limits to global warming. This subject also provides a clear intersection between the strategies of multiple multi-lateral environment agreements including the CBD, UNFCCC, UNCCD and Ramsar Convention. The strategies for transformational change that are identified in GBO-4 are very much in-line with similar strategies developed through other forums; for example, the IAASTD (2009), the OECD green growth strategy for agriculture, FAO's current approach to sustainability (see later) and Bioversity International's Strategy 2014 - 2024. This is unsurprising since reducing the impacts of agriculture on biodiversity is already implicitly a core objective of these approaches, although not always necessarily referenced as such.

15. **Food systems are relevant to, and have significant implications for, all of the Aichi Biodiversity Targets.** In addition to targets 7 and 13, food systems are particular influential on the targets that depend on land area and its condition and pollution (Targets 5, 11, 7, 8, 11, 14 and 15). The sustainable agriculture element of Target 7 is key for success of the Strategic Plan for Biodiversity 2011 – 2020. Agriculture accounts for about 60% to 80% [7] of the current world deforestation (forest element of Target 7). As noted in the United Kingdom case study,[8] species and habitat conservation priorities (e.g. Targets 5 and 11) are often outcomes of ecosystem management (e.g. Target 7) rather than inputs to it. Addressing incentive measures (in line with Aichi Biodiversity Target 3), and other ongoing investments, in agriculture represent a major means to mobilise biodiversity related financing (Target 20). OECD countries alone transferred an annual payment (2012 – 2014) to agricultural producers that is approximately one thousand five hundred times the current average annual GEF total allocation for biodiversity[9]. Food systems and agriculture is the dominant consideration under sustainable production

[7] CBD Technical Series No. 78 notes 60% while a figure of 80% is given by Boucher, D. et al. (2011) The Root of the Problem: What's Driving Deforestation Today? Union of Concerned Scientists and Kissinger, G. et al. (2012) Drivers of Deforestation and Degradation: A Synthesis Report for REDD+ PolicyMakers. Lexeme Consulting.

[8] CBD Technical Series 78.

[9] Data from Agricultural Policy Monitoring and Evaluation: Highlights 2015. OECD Paris. http://www.oecd.org/tad/agricultural-policies/monitoring-evaluation-2015-highlights-july-2015.pdf : compared to GEF-6 allocations for biodiversity of approximately 350 million USD per year

and consumption (Target 4) and a source of reactive nitrogen and phosphorous pollution (Target 8). Agriculture remains an important source of introductions of invasive alien species (Target 9). There is strong justification for paying particular attention to the importance of food systems in national biodiversity strategies and action plans (NBSAPs; Target 17) and explicit guidance is not captured in decision IX/8, paragraph 8 (referring to NBSAP revision).

16. One of the actions identified in GBO-4 to enhance progress towards Target 13 refers to integrating the conservation of crop (and livestock) wild relatives into protected area networks (Target 11). The Executive Secretary, in collaboration with the Secretariats of the Commission on Genetic Resources for Food and Agriculture, the International Treaty on Plant Genetic Resources for Food and Agriculture and Bioversity International, has issued notification 2015-092[10] that provides further details on this topic and alerts Parties to relevant needs and opportunities. This also represents a good example, among many, of the convergence of interests between "conservation" (e.g. Target 11) and agriculture (Targets 7 and 13) and how the two interests can strengthen their interaction for their mutual benefit.[11] Knowledge of agriculture biodiversity has advanced tremendously in the past 20 years, and Parties are on track to meet the knowledge provision element of target 19. **Optimize synergies requires knowledge and innovative technologies** underpinned by science-based evidence and complemented by traditional knowledge to produce more and at the same time preserve biodiversity.

III. WHAT OUTCOMES FOR FOOD SYSTEMS AND AGRICULTURE ARE NEEDED?

17. **Solutions for achieving sustainability exist.** The consensus is that three mutually reinforcing outcomes - ecological intensification of production that also improves the nutritional value of food, improved diversity in farming systems, and landscapes and sustainable consumption - are critical for the reshaping of food systems towards greater productivity and sustainability. All Parties need to focus on all three outcomes, but specific opportunities vary among them. Opportunities exists at all scales of farming – from highly intensive ("modern") practices through to smallholder farms, although the latter present the greatest opportunities and needs due to their dominance in food security and nutrition and opportunities for biodiversity and livelihood benefits. All three outcomes are prominent on the agendas and actions of a number of national, regional and global forums and organizations. Although there is progress in all these areas, it is at insufficient scale and receives too little government and private sector support.

A. Ecological intensification of production

18. Ecosystem services provide the key solution at production level to simultaneously deliver improved resource use efficiency, improved nutritional value of food, reduced externalities, biodiversity conservation and sustainable use and improved and more sustainable social and economic benefits. For high input intensively farmed systems this involves the rehabilitation of the ecological foundation of farming, including retrofitting landscape diversity, which, overall, can often at least sustain overall production and in some cases increase it even further; for example, GBO-4 cites the rapid uptake of "conservation" or low tillage agriculture in this regard. In areas where there are significant yield gaps, particularly in developing countries, similar principles underpin the now widely promoted approach of "ecological intensification" of crop and livestock production,[12] a knowledge-intensive process that requires optimal management of nature's ecological functions and biodiversity to improve agricultural system performance, efficiency and farmers' livelihoods.

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[10] https://www.cbd.int/doc/notifications/2015/ntf-2015-092-gspc-en.pdf.

[11] See for example the Bridging Agriculture and Conservation Initiative: https://www.cbd.int/doc/notifications/2013/ntf-2013-070-agri-en.pdf.

[12] For example, FAO's *Save and Grow*: http://www.fao.org/ag/save-and-grow/ ; https://www.bioversityinternational.org/fileadmin/user_upload/research/BVIs/BVI_B_-_Productive_and_resilient_farms_and_forests/Productive_resilient_farms_forests_factsheet.pdf; and, http://www.fao.org/agriculture/crops/thematic-sitemap/theme/biodiversity/ecological-intensification/en.

19. Whereas "sustainable intensification" is generally loosely defined, ecological intensification proposes landscape approaches[13] that make smart use of the natural functionalities that ecosystems offer. Landscape approaches emphasize adaptive management, stakeholder involvement and multiple objectives.

B. Biodiversity maintained in production landscapes

20. Production landscapes need to have (or maintain) a richer mix of species, habitats and landscape diversity. Biodiversity in agricultural landscapes is necessary for the sustainability of agriculture itself, to ensure that intensification does not lead to unsustainable increases in inputs, and also as a significant supplement to other conservation efforts focusing on protecting natural habitats. Maintained diversity of genetic resources for food and agriculture in farming systems and landscapes is an integral outcome of these approaches. The contribution of indigenous and local communities and other farmers to the conservation and sustainable use of genetic resources for food and agriculture, including through Globally Important Agricultural Heritage Systems[14], and the priority strategy for the conservation of these resources should be based on *in situ* measures, complemented by *ex situ* measures, in accordance with Articles 8 and 9 of the Convention. Improving resilience of agriculture, and landscapes, is an important benefit of maintaining or restoring this biodiversity. Greater productivity, greater carbon sequestration, greater retention of nutrients, and greater ability to resist and recover from various forms of stress, including herbivorous pests, diseases, droughts, and floods, are among the effects of increased biological diversity in agricultural systems noted in a recent review.[15] A recent study of highly simplified and intensive mono-cropping systems demonstrates that landscape diversification not only delivers biodiversity benefits but also improved water, nutrient and soil management as well as simultaneously increasing crop production.[16]

C. Sustainable consumption – reduced food waste and sustainable diets

21. Achieving sustainable consumption moderates increasing pressures on production systems to meet rising demand. In the region of 40% of current food production is wasted through losses post-production. That is, in theory, roughly 30% of the total projected loss of terrestrial biodiversity by 2050 can be avoided just by eliminating food waste, through meeting much of the future increased demand for food. Food waste reduced to sustainable limits is therefore a priority outcome to reduce biodiversity loss and it is important to embed this in biodiversity strategies. However, the challenges to reducing waste vary significantly between country groupings and socioeconomic classes and depend on the specific conditions and local situation in a given country or culture. Few poor people deliberately waste food and in developing countries major losses arise through poor infrastructure throughout the supply chain. In developed countries, infrastructure related losses tend to be lower and most waste occurs at the level of retailers and consumers.

22. Ecological intensification approaches can also significantly reduce pre-harvest food losses while reducing the need for damaging external inputs as demonstrated by ongoing work in China, Ecuador, Morocco and Uganda to determine how planting different varieties of the same crop in mixtures, can reduce pest and disease damage.[17]

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[13] Ten principles for a landscape approach to reconciling agriculture, conservation and other competing land uses http://www.pnas.org/content/110/21/8349

14 Koohafkan, P. & Altieri, M. 2011. *Globally Important Agricultural Heritage Systems A Legacy for the Future.* FAO

[15] Cardinale BJ, Duffy JE, Gonzalez A, Hooper DU, Perrings C, et al. 2012. Biodiversity loss and its impact on humanity. *Nature*. doi: 10.1038/nature11148.

[16] Liebman, M, Schulte, L. A. 2015. Enhancing agroecosystem performance and resilience through increased diversification of landscapes and cropping systems. Elementa: Science of the Anthropocene. 3: 000041. doi: 10.12952/journal.elementa.000041. elementascience.org

[17] http://www.bioversityinternational.org/research-portfolio/agricultural-ecosystems/pests-and-diseases/

23. Although achieving sustainable diets may be particularly challenging, as it requires significant consumer behavioural change, it also has the potential to be particularly effective. Significant allies in this area are public health interests because unsustainable diets, generally characterized by low diversity of foods with high proportions of meat and processed foods, are also unhealthy and projected impacts on national public health expenditures in treating impacts are huge, running into trillions of dollars.[18] Ways and means to achieve sustainable diets primarily involve influencing supply chains and consumer choice, including through promoting traditional local, or national, food cultures that are often more sustainable and healthy. The importance of biodiversity to food and nutrition and its role in the human health agenda including as led by the World Health Organisation as highlighted in the publication *Connecting Global Priorities: Biodiversity and Health*19

24. Reducing excess (waste) agricultural inputs (e.g. water, fertilisers, chemicals) involves improving resource use efficiency and is very much part of the ecological intensification approach captured in sub-section A above.

IV. WHAT TOOLS AND GUIDANCE ARE NEEDED TO OVERCOME BARRIERS?

25. Tools and guidance are required across many relevant areas. Enabling tools are at the centre of the process of transition towards improved sustainability and include: guidance, standards, regulations, institutional rules and frameworks, and incentives needed to help producers move towards sustainable practices. There are extensive tools and guidance already available, including through the Convention itself, but particularly through partners actively working in this area. GBO-4 itself does not highlight any significant gaps. Information notes UNEP/CBD/SBSTTA/20/INF/53 and UNEP/CBD/SBSTTA/20/INF/54 provide further guidance and a summary of some key tools and guidance for mainstreaming biodiversity into food and agriculture is provided in UNEP/CBD/SBSTTA/20/INF/55. Bioversity International's Strategic Plan 2014-2024 and supporting initiatives also make available significant resources, decision-making tools and guidance that address many relevant aspects, as does the Platform for Agrobiodiversity Research.

26. Land use planning is one of the most relevant tools at the landscape scale. Most Parties have been using land use planning tools for a considerable period of time, often for millennia, and in practice it can be very challenging, especially where capacity is weak (as mentioned for example in Ethiopia's 5NR), due to conflicting demands on land. Building a consensus or vision for objectives and addressing trade-offs and incentives among stakeholders, as part of an inclusive and participatory land-use planning process, have been central to most examples of successful implementation.

27. One major barrier is the very large number of actors that need to be working collectively towards a common goal in order to achieve the required level of success. Effective approaches will require the engagement of all stakeholders. Tools to alleviate this problem include awareness raising, consensus building across stakeholders and effective participation and dialogue in policy development. There are four broad categories of stakeholders where behavioural change is required – producers, consumers, and the private and public sectors.

28. Given an appropriate enabling environment, *producers* can manage the immediate direct impacts of agriculture and, therefore, behavioural change by producers is a key outcome for transforming agriculture. A key tool should therefore be the identification, and removal, of constraints to positive behavioural change by producers. Approaches need to identify where the economic costs are incurred, and by whom, and explore opportunities to transfer expenditures on dealing with the costs at end point to reducing the problem at source (that is, internalizing external costs). The on-going study of The

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[18] See *Connecting global priorities: Biodiversity and Human Health – A state of Knowledge Review.* Secretariat of the CBD and WHO. 2015. https://www.cbd.int/health/SOK-biodiversity-en.pdf

19 WHO.2015. *Connecting Global Priorities: Biodiversity and Health*. Geneva, World Health Organization and Convention on Biological Diversity. ISBN 978 92 4 150853 7

Economics of Ecosystems and Biodiversity (TEEB) for Agriculture and Food[20] is providing further insights into the enormous external economic costs involved with agriculture and opportunities to realign incentives. Payments for ecosystem services can be an effective tool but is not applied widely enough. There are now emerging examples of such incentive mechanisms being applied to agrobiodiversity, with strong government uptake in Peru and pilot project implementation in Ecuador and Guatemala.[21] There are many examples of rapid uptake of improved practice, often led by farmers themselves, usually prompted by the reinforcing links between improved sustainability and farm profitability. However, ill-defined or non-existent land tenure rights remain a significant barrier to investments in sustainability by many farmers in some countries. Land and other resource tenure, or stewardship, relevant to agriculture should where necessary be reviewed and relevant arrangements strengthened so as to encourage longer-term investments in sustainability by farmers and pastoralists, including by indigenous peoples and local communities through customary systems of biodiversity use, taking into account *The Voluntary Guidelines on the Responsible Governance of Tenure of Land, Fisheries and Forests in the Context of National Food Security* endorsed by the Committee on World Food Security on 11 May 2012[22], the implementation of which is encouraged by the United Nations General Assembly[23].

29. The GEF *A review of indicators used to assess the sustainability of commodity agricultural production*[24] and on-going work of the Food and Agriculture Organization of the United Nations and other partners in this area suggest that it might be opportune for the Subsidiary Body on Scientific, Technical and Technological Advice to review work on relevant indicators for sustainable food systems at a meeting prior to the Fourteenth Meeting of the Conference of the Parties. *The Economics of Ecosystems and Biodiversity (TEEB) for Agriculture and Food*[25] will provide Parties with further guidance to address the external economic costs involved with agriculture and opportunities to realign incentives.

30. *Consumers* create the demand for agricultural products. There may be additional opportunities for leveraging the power of consumer choice by emphasizing food security, health, biodiversity, cost and sustainability benefits of choices consumers make. However, the challenges in creating the level of behavioural change needed should not be underestimated. *The private sector* will be instrumental in contributing to behavioural change in production and consumption patterns and waste reduction. Major food marketing chains in particular can be very influential as they are few in number compared to producers and consumers. The main barriers regarding the agricultural input industry are the conflicts of interest between seed, pesticide, fertilizer and machinery producing and marketing companies and biodiversity objectives. From an economics perspective, these arise where private and public costs/benefits are not aligned. *The public sector* remains indispensable in creating an enabling environment through an appropriate mix of regulations and incentives. Many policy and non-policy tools are in the hand of Governments and can contribute to improvement of the enabling conditions for sustainable food systems and agriculture. These may relate to incentive measures such as better targeting of subsidies, abolishment of distorting subsidies and import tariffs[26] and investments in research and knowledge infrastructure and capacity building.

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20 http://www.teebweb.org/agriculture-and-food/ the interim report is available - http://img.teebweb.org/wp-content/uploads/2015/12/TEEBAgFood_Interim_Report_2015_web.pdf

21 https://www.bioversityinternational.org/news/detail/incentives-to-conserve-agricultural-biodiversity-peru-at-the-forefront.

22 Countries adopt global guidelines on tenure of land, forests, fisheries http://www.fao.org/news/story/en/item/142587/icode/

23 Resolution adopted by the General Assembly on 21 December 2012. 67/228. Agriculture development and food security. http://www.un.org/en/ga/search/view_doc.asp?symbol=A/RES/67/228

24 https://www.thegef.org/gef/sites/thegef.org/files/documents/EN_GEF.STAP_.C.48.Inf_.01.Rev_.01_STAP_Chair_Report_0.pdf

25 http://www.teebweb.org/agriculture-and-food/

26 Modalities for the full operationalisation of Aichi Biodiversity Target 3 (incentives and subsidies) were considered further at SBSTTA-18 and by the fifth meeting of the Working Group on Review of Implementation (documents UNEP/CBD/SBSTTA/18/11 and UNPE/CBD/WGRI/5/4/Add.1).

31. Engagement with the private sector is an important tool for funding biodiversity outcomes. Corporate social responsibility programmes and the increasing recognition that business sustainability depends on a range of biodiversity-relevant ecosystem services means that at least some business models have reduced conflicts between profitability and biodiversity conservation; for example, a protocol has been developed and applied on a pilot basis in Bolivia for identifying and mapping potential private/public sector agrobiodiversity-related ecosystem service beneficiaries and purchasers.[27] Public sector entities (such as municipalities, as well as public procurement and distribution programmes) can also be usefully mapped using this approach. Public food programmes could be better oriented towards creating sustainable demand for food products that come from biodiversity-rich production systems (a good case study is provided from Brazil in GBO-4). Further, the growing concerns of consumers about food production approaches and the demand for environmentally friendly approaches that provide adequate rewards for rural communities and safe food provide important entry points for exploring the contributions that biodiversity can make to these wider social goals.[28]

32. Agricultural commodities – and in particular palm oil, sugar, soy, rice, wheat and meat – are key components of the national development plans of many developing countries. These are among the fastest growing commodities in the market. Governments are concerned with both supporting commodity production and reducing deforestation. Deforestation in some regions (for example South-East Asia) is mainly attributed to large-scale agro-industry, especially oil palm plantations, while in most developing countries increased demand for land for local food production continues to be a major driver of habitat loss. There is significant progress in using sustainability criteria and standards and certification schemes through supply chains for some major commodities, including with regards to biodiversity, notably for soy, palm oil and biofuels,[29] although these still do not cover the majority of production in each commodity. Bearing in mind Aichi Biodiversity Target 3, in some countries these may provide a useful model and could be expanded to for a broader set of commodities and supply chains.

33. Globalization, trade and displacement effects remain weakly covered in strategies. Progress in improved sustainability at national level can be offset (globally) through increasing external footprints arising through increasing reliance on imported commodities: for example, the increasing dependency of domestic livestock production on imported feedstock (notably soy) in some countries. Attention to sustainability measures in supply chains for major commodities will go some way to addressing this problem.

34. A significant barrier is the ongoing debate regarding the appropriate agriculture "paradigm": for example, high input,low diversity,industrial scale "western" agriculture *versus* high diversity, low input, smaller-scale farming systems ("traditional" farming) and related debates about "land sparing" *versus* "land sharing" approaches.[30] This debate, however, tends to ignore the efficiency gains available even in high input systems through ecological intensification. It is also often over-simplified involving unrealistic assumptions, ignoring the realities and rights of indigenous peoples and local communities, and which all too often overlooks the contribution of biodiversity to food, nutrition, ecosystem functions and

[27] Martinez-de La Cruz, D, Drucker, A.G, Cadima, X., Neves, B. and Gatto, P. 2015. Assessing public and private sector current and potential involvement in the conservation and use of agrobiodiversity: A Bolivian Case Study. Bioversity International.

[28] See Chapter 5 Agricultural biodiversity, food security and human health: *Connecting global priorities: Biodiversity and Human Health – A state of Knowledge Review.* Secretariat of the CBD and WHO. 2015 https://www.cbd.int/en/health/stateofknowledge.

[29] Roundtable on sustainable biomaterials: http://rsb.org; the Global Bioenergy Partnership http://www.globalbioenergy.org; the Round Table for Sustainable Soy http://www.responsiblesoy.org/en/; Roundtable for Sustainable Palm Oil http://www.rspo.org/about; European Food Sustainable Consumption and Production Roundtable: http://www.food-scp.eu; Progress in this regard for biofuels was considered at SBSTTA-16 leading to recommendation XVI/13, and background information provided for this is summarized in CBT Technical Series 65: https://www.cbd.int/doc/publications/cbd-ts-65-en.pdf.

[30] See for example: Phalan, B., Onial, M., Balmford, A. & Green, R.E. (2011). Reconciling Food Production and Biodiversity Conservation: Land Sharing and Land Sparing Compared. *Science* 333, 1289-1291.

resilience.[31] Developing and applying common criteria for sustainability, including utilising enhanced ecosystem services to achieve it, no matter what the scale or mode of production, can help reduce polarised discussion.

35. Agriculture needs to be allowed to develop under country appropriate policy frameworks. In particular, in most developing countries sustainable increases in smallholder productivity is the primary need. Imposing western "modern" style high input large-scale approaches to agricultural intensification in these systems is neither sustainable nor appropriate. Nevertheless, despite the environmental and social costs of the "western" farming model being well established, its widespread promotion as the solution for developing countries, supported via damaging subsidies and incentives and often driven by corporate interests, remains a very significant barrier to uptake of country appropriate strategies.

36. Lack of consensus on definitions of sustainable agriculture is a further barrier identifiable from 5NRs. For example, Sweden (5NR), despite reported success in mainstreaming across the sectors, notes that the concept of sustainable use has not been given an operational definition within the sectors: it is still not clear what specific action is needed to achieve sustainability, or how it is measured and monitored. It is also common for sustainability to be defined within sectors but not across them. However, the FAO Council in 1988 usefully defined sustainable agricultural development more broadly 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"*. This definition provides a useful tool by capturing not only the end point (satisfaction of human needs) but also the means to achieve it (conservation of resources, non-degrading etc.). In practice the end point of "sustainability" in food and agriculture is probably difficult, if not impossible, to define – but an operational approach is to identify whether development pathways are leading towards or away from sustainability. Further guidance on operational criteria, indicators and monitoring for this might be useful.

37. Efforts to increase diet quality and sustainability should focus on increasing the production and consumption of unrefined (raw or minimally processed) nutrient-rich foods such as fruits, vegetables, beans, nuts and seeds. Nutrition-sensitive landscape approaches which focus on building diversity into landscapes and food systems to improve food diversity at the production level, including multiple sources of nutrients as well as supporting vital ecosystem services, are tools to influence supply chains, as are nutrition-sensitive value chains, to increase access to, affordability of, and demand for nutritious foods sourced from sustainable production and food systems.[32] Many of these food resources can also be promoted within a local food system context where traditional fruits, vegetables, legumes, nuts and seeds are adapted to the local climatic conditions and are also culturally appropriate to local populations. Utilizing a combination of push-pull or supply-demand tools to increase production and consumption of local nutrient-rich foods has proven effective in numerous contexts.[33] Many country examples and case studies promoting traditional local, or national, food cultures that are often more sustainable and healthy have been documented.[34]

38. An important tool is strengthening the mainstreaming of agriculture into the biodiversity community. There are identifiable needs, for example: gaps in coverage of GBO-4 (and many 5NRs) regarding agriculture in targets 2, 5, 14 and 15; and, the limited or lack of attention to food systems in

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[31] See Land Sparing and Land Sharing: Perspectives of Indigenous Peoples and Rural Communities. Platform for Agrobiodiversity Research http://agrobiodiversityplatform.org/files/2013/11/PAR-Land-sparingsharing1.pdf.

[32] Nutrition-sensitive landscapes http://www.bioversityinternational.org/research-portfolio/diet-diversity/nutrition-sensitive-landscapes/ and Nutrition-sensitive value chains http://www.ifpri.org/blog/identifying-opportunities-nutrition-sensitive-value-chain-interventions.

[33] See Diversifying Food and Diets (2013) http://www.bioversityinternational.org/e-library/publications/detail/diversifying-food-and-diets/ and FAO, 2011 Combating micronutrient deficiencies: Food-based approaches http://www.fao.org/docrep/013/am027e/am027e.pdf.

[34] http://www.b4fn.org/case-studies/african-leafy-vegetables-alvs/.

many 5NRs. Biofuels is the only relevant area given prominent attention at the more recent meetings of the Conference of the Parties to the CBD, and at SBSTTA, creating the opportunity to address possible imbalances in attention to food systems leading up to COP-13. Mainstreaming biodiversity in food and agriculture requires biodiversity specialists to better recognize the importance of doing so and to better understand the challenges, approaches, policy tools and terminology of the food and agriculture sectors in order to identify the most effective intervention points to support the biodiversity agenda in this domain.

39. The Strategic Plan for Biodiversity 2011–2020 (and Aichi Biodiversity Targets) is one of the most significant and influential tools – and in particular for engaging through a common platform on biodiversity across a broad spectrum of stakeholders. The Aichi Biodiversity Targets already cover the main aspects of food and agriculture, including relevant drivers, desired outcomes, and responses, and, collectively, they provide the required cross-sectoral and holistic approach. For this tool to be more effectively used there needs to be much stronger recognition of the inter-dependency between it and food systems.

40. The Reviewed Strategic Framework 2010-2019 of the Food and Agriculture Organisation of the United Nations (FAO) adopted by the 38th Session of the FAO Conference in June 2013 in its decision C 2013/7[35], is an agreed pathway towards improved sustainability, and in particular its Strategic Objective 2 that highlights the critical role of biodiversity and ecosystem services in the achievement of the objectives of this framework including to take advantage of the potential of bio-economy to increase the contributions of agriculture, forestry and fisheries to economic development, while generating income and employment and providing livelihood opportunities for family farms and more generally the population in rural areas and that production systems must meet this challenge through innovations that increase agricultural productivity and efficiency in a context of sustainable use of natural resources, reduced contamination, cleaner energy utilization and increased mitigation of, and adaptation to climatic change, as well as the delivery of environmental services. The need is to fully support the implementation of this framework at national level and by the Food and Agriculture Organization of the United Nations, including as an important contribution to achieving the objectives of the Strategic Plan for Biodiversity 2011 – 2020 and the 2030 Agenda for Sustainable Development, and, when assisting developing countries, to support agricultural development models that are consistent with this framework and to implement the principles for responsible investments in agriculture and food systems approved by the Committee on World Food Security in October 2014[36], and especially principles 6 and 7. There is a need to analyse actions and public policies in the countries of origin/diversity of crops with importance for humanity because they are the source adapted to new environmental conditions for the generation of new varieties genes.

41. Particularly useful is the voluntary guidance on *Building a Common Vision for Sustainable Food and Agriculture* [37], and its principles and approaches, developed by the Food and Agriculture Organization of the United Nations to support implementation of its Strategic Objective 2 that requires integration across sectors, including crop production, livestock, forestry, aquaculture and fisheries and of social, economic and environmental considerations, with particular focus on increasing resource use efficiency, to achieve higher productivity with reduced levels of inputs, while minimizing negative externalities, managing ecological, social and economic risks associated with agricultural sector production systems, including pests, diseases and climate change, identifying and enhancing the role of ecosystem services, particularly in terms of their effects on resource use efficiency and response to risks, as well as their contribution to environmental conservation, and facilitating access to needed information and technologies, *notes* that these key conclusions and recommendations, *inter alia*, were reviewed by the

35 http://www.fao.org/docrep/meeting/027/mg015e.pdf

36 http://www.fao.org/fileadmin/templates/cfs/Docs1314/CFS41/FinalReport/CFS41_Final_Report_EN.pdf

37 UNEP/CBD/SBSTTA/20/INF/54

24th Session of the Committee on Agriculture in 2014[38] and endorsed by the 39th Session of the Conference of the FAO[39] in 2015. This voluntary guidance should be used and further developed.

42. The Intergovernmental Science-Policy Platform on Biodiversity and Ecosystem Services thematic assessment on pollination and pollinators associated with food production provides a strengthened science base to reinforce the rationale for the International Initiative on the Conservation and Sustainable Use of Pollinators (decision V/5 section II) and to strengthen the implementation of its Plan of Action (decision VI/5, Annex II). The key findings of the assessment reinforce the general findings of the fourth edition of the *Global Biodiversity Outlook* with regards to food and agriculture, including the critical need for transformational change in food systems. The findings of the assessment can guide efforts towards achieving sustainable food and agriculture, including through the conservation and sustainable use of biodiversity, including pollinators, in agricultural landscapes. The Food and Agriculture Organization of the United Nations has been leading efforts to implement the International Initiative on the Conservation and Sustainable Use of Pollinators.

43. A recent evaluation notes that resilience to climate change is a significant gap in agricultural policies, recommending that an over-arching aim of policy makers should be to "future-proof" the sector, to help it face multiple challenges.[40] The modelling underpinning GBO-4 did not factor in the implications of climate change for natural resource requirements for agriculture. Integrating resilience into food and agriculture and enabling agriculture to contribute optimally to climate change mitigation and adaptation are key components of sustainability. Some practical tools and guidance are already available on the topic.[41] The Scientific and Technical Advisory Panel of the GEF has also commissioned work on a resilience, adaptation and transformation framework that seeks to develop a tool to move the topic from theory to practice.[42] The CGIAR Research Programme on Climate Change, Agriculture and Food Security (CCAFS) also has a major focus on embedding resilience into food and agriculture and facilitating agriculture to contribute to climate change mitigation and adaptation and provides considerable enabling policy guidance on this.[43] CCAFS and the Platform for Agrobiodiversity Research (PAR) recently collaborated with the FAO Commission on Genetic Resources for Food and Agriculture to develop the *Voluntary Guidelines to Support the Integration of Genetic Diversity into National Climate Change Adaptation Planning*[44] which was endorsed by the Commission which invited the CGRFA Secretary to transmit those *Guidelines* to UNFCCC and other relevant international bodies.[45] One method that could be used to promote climate-smart agricultural practices, noting that the concept of climate smart agriculture is not necessiarly recognised by all countries, is to include them in the National Adaptation Plans that countries are developing under UNFCCC. Guidance on this issue is available,[46] as is guidance

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[38] http://www.fao.org/3/a-ML895e.pdf

[39] http://www.fao.org/3/a-mo153e.pdf

[40] Agricultural Policy Monitoring and Evaluation: Highlights 2015. OECD Paris. http://www.oecd.org/tad/agricultural-policies/monitoring-evaluation-2015-highlights-july-2015.pdf.

[41] For example: FAO-Adapt www.fao.org/docrep/014/i2316e/i2316e00.pdf ; Climate-Smart Agriculture: Policies, Practices and Financing for Food Security, Adaptation and Mitigation www.fao.org/docrep/013/i1881e/i1881e00.htm ; Climate-Smart Agriculture (CSA) sourcebook www.fao.org/docrep/018/i3325e/i3325e.pdf; Developing a Climate-Smart Agriculture at the country level lessons from recent experience: www.fao.org/docrep/016/ap401e/ap401e.pdf.

[42] O'Connell, D., Walker, B., Abel, N., Grigg, N. (2015) The Resilience, Adaptation and Transformation Assessment Framework: From Theory to Application. CSIRO, Australia. http://www.stapgef.org/the-resilience-adaptation-and-transformation-assessment-framework/.

[43] https://ccafs.cgiar.org/.

[44] Voluntary Guidelines to Support the Integration of Genetic Diversity into National Climate Change Adaptation Planning. In: Report of the Fifteenth Regular Session of the Commission on Genetic Resources for Food and Agriculture. Appendix D. http://www.fao.org/3/a-mm660e.pdf.

[45] http://agrobiodiversityplatform.org/par/2015/01/20/cgrfa-15-regular-session-updates/; https://ccafs.cgiar.org/publications/agricultural-biodiversity-climate-change-adaptation-planning-analysis-national#.VbuHOfn5U3l.

[46] http://www.bioversityinternational.org/news/detail/promoting-genetic-diversity-in-agriculture-through-national-adaptation-plans/.

on the role and importance of genetic resources and agricultural biodiversity in coping with climate change.[47]

44. Knowledge regarding policy coherence and alignment beyond the agriculture and biodiversity sectors is a major gap. This includes regarding differentiated public policies that are necessary among holders of agricultural biodiversity and those responsible for food production for food security, with complementary and comprehensive strategies to conserve and sustainably use genetic resources. Also, significant knowledge gaps in relation to the optimum use and deployment of agricultural biodiversity in production systems remain (as mentioned in some 5NRs e.g. Turkey). The ways in which agricultural biodiversity can improve ecosystem-regulating and-supporting services is still poorly understood in terms of how to achieve real benefits in different production systems. This will involve a substantial programme of integrated trans-disciplinary research, which fully involves producers, and links the production of improved crop and livestock materials to the adoption of agronomic practices that support biological functions in production systems.

V. ADDITIONAL INFORMATION FROM FIFTH NATIONAL REPORTS

A. Status of agricultural impacts on biodiversity

45. Agricultural development in general was highlighted as one of the major causes of loss of biodiversity in the fifth national reportss. Recent trends in agricultural development such as agricultural expansion, changing from manual to mechanized farming, the shift from traditional mixed cropping systems to monoculture, changing from organic (non-chemical) to chemical inorganic fertilizers, and shifting cultivation with shorter fallow periods are the major causes of loss of agricultural biodiversity and impacts on ecosystems.

B. Cross-sectoral policy frameworks that incorporate a land-use perspective

46. About 60% of the fifth national reports (5NRs) recognize the value of, or need to incorporate, a broader landscape perspective but less than half of these report progress in incorporating this into a land use policy framework. A number of Parties, in their fifth national reports, recognize the need for a synergistic and dynamic biodiversity coordination mechanism and process (e.g., Mauritius, Turkey). The absence of an umbrella policy mechanism to coordinate cross-sectoral needs remains a significant constraint in many countries: for example, Georgia notes in its fifth national report that there is no strategy for sustainable development, which would be an essential tool for environmental policy integration.

47. Brazil (already cited in GBO-4 and its fifth national report) remains the most widely cited example in the literature of effective landscape scale, cross-sectoral policy reform. The broader principles of the approach would be applicable to many other Parties but the specifics may not necessarily be easily transferred to Parties with different capacity, environment and socioeconomic settings (in particular high population density, food deficient, low-income countries with rapid population growth). In addition to Brazil, more comprehensively reported examples of mainstreaming biodiversity in land use planning include South Africa (fifth national report) where an assessment concluded that conservation of just 75% of plant diversity was not achievable through a formal protected area approach and that targets could only be met by integrating conservation efforts into production areas. The South Africa approach has three essential elements: (i) working beyond the boundaries of protected areas; (ii) focusing conservation efforts on biodiversity priority areas within the landscape; and (iii) using a range of tools in these priority areas to expand protected areas, mainstream biodiversity priorities in land-use planning and decision-making, and engage with production sectors to encourage biodiversity-compatible production practices. Implementation is supported by: national biodiversity policy and planning tools; tools for mainstreaming

[47] http://www.fao.org/publications/card/en/c/0099d145-f240-4e61-b30e-3d210972ceb8/ and http://agrobiodiversityplatform.org/blog/wp-content/uploads/2010/05/PAR-Synthesis_low_FINAL.pdf.[48] A Path Towards Zero Deforestation Cattle http://www.zerodeforestationcattle.org/index.html

in land-use planning and decision-making; tools for biodiversity stewardship; tools for working in production landscapes; environmental public works programmes; and, creating partnerships for implementation.

48. Although a majority of Parties do not explicitly refer to well developed, relevant, holistic and integrated landscape approaches a suite of measures may nevertheless be in place, or being developed, as is the case, for example, in some individual European Party 5NRs. The suite of policies in place in the European Union, collectively, cover a broad attempt at an integrated policy agenda – although some European Parties (5NRs) note the need for further reform, particularly with regard to the Common Agriculture Policy.

C. Policy measures for sustainable productivity gains

49. About half of Parties in their fifth national reports report on policy measures that support sustainable productivity gains in agriculture and many refer to projects doing the same. However, few report on progress being achieved. The government of the United Kingdom of Great Britain and Northern Ireland Foresight Global Food and Farming project commissioned assessments of 40 projects and programmes in 20 countries where sustainable intensification was developed during the 1990s-2000s and included a comprehensive analysis of initiatives that addressed crop improvement, soil conservation, conservation agriculture, agroforestry, integrated pest management, horticulture, livestock and fodder crops, aquaculture and novel enabling environments. This project concluded that by early 2010 the projects in question had demonstrated benefits for almost 10.4 million farmers and their families and improvements on about 12.75 million hectares.

D. Supply chains and certification schemes

50. A number of Parties report that supply chain considerations, and in particular setting up standards and certification by countries that import their produce, is providing significant impetus for the adoption of sustainability approaches at national level. Examples include the Clean Production Accords for the fruit sector in Chile, Belize's shrimp farming industry, Costa Rica for pineapple, rice, palm oil and sugar cane that are major threats to its biodiversity. Other examples include the Sustainable Palm Oil standard launched by Indonesian and the Malaysian Good Agricultural Practices initiative launched in 2013. Brazil has provided a good case study of supply-chain solutions for zero-deforestation from cattle.[48] On the other hand, the fragmentation of the certification landscape is an ongoing concern, in particular for small and medium-sized enterprises in developing countries, and more efforts are needed to achieve convergence or harmonization of approaches and methodologies.

E. Sustainable consumption

51. No Parties report on efforts to reduce food waste. The reporting on waste, where present, revolves around domestic non-food waste, solid waste and wastewater. This does not necessarily mean that efforts are not underway among Parties to reduce food waste but does illustrate that the relevance of such measures for the Strategic Plan for Biodiversity 2011–2020 may not be fully recognized.

52. Although about half of 5NRs refer to efforts towards "sustainable consumption" very few explicitly refer to sustainable diets. There are notable exceptions: for example, Brazil's 5NR contains an extensive section on this, and related, areas including how the National Plan on Agro-ecology and Organic Production, the Minimum Price Policy for Sociobiodiversity-based Products, the federal Food Acquisition Program, and the National Program for School Nutrition, are among measures contributing to Aichi Biodiversity Target 7. The same report also provides information on a project mainstreaming biodiversity conservation and sustainable use for improved human nutrition and well-being, together with Kenya, Sri Lanka and Turkey. India reports major efforts to promote the nutritional and other beneficial attributes of local millets including new income opportunities for women with demonstrated health benefits. Oman reports implementing workshops on the role of women in improving the consumption

[48] A Path Towards Zero Deforestation Cattle http://www.zerodeforestationcattle.org/index.html

pattern of the family, including the preservation of the environment. At a global level such initiatives are further supported by the recent endorsement of a set of 'voluntary guidelines for mainstreaming biodiversity into policies, programmes and national and regional plans of action on nutrition'.[49]

53. Very few Parties are factoring in the external footprints of their food and agriculture sectors in their biodiversity plans (in 5NRs).

F. Financing/subsidies/incentives as they relate to agriculture

54. About one third of Parties reported on information related to positive or harmful financing, subsidies and incentives as related to the impacts of agriculture on biodiversity. Examples of harmful incentives include: in Sierra Leone policies have favoured the large-scale clearance of land; Belize's current political climate promotes land clearance for agriculture through reduced land taxes, and subsidised fuel and pesticides; and in Tonga, the use of agricultural land as mortgage security or on long-term lease arrangement has resulted in the abuse of farming system to maximize profit, resulting in the promoting of continuous short-term mono cropping in favour of long term mixed cropping. Examples of positive measures include: India is taking steps to encourage balanced fertilizer use so as to maintain soil biodiversity; in Croatia, support for agriculture is now linked with environmentally friendly agricultural practice rather than overall agricultural production that favoured intensive rather than sustainable agriculture.

G. Organic Farming

55. Over half of Parties report the development of an organic farming sector, sometimes rapidly (e.g. Slovakia 5NR), although it remains a small proportion of total production and still very much a niche market. Kiribati has developed a national target whose objective is to integrate biodiversity conservation into organic farming. Other measures to reduce chemical use are widespread, whether classed "organic" or not, and usually part of recognised criteria for sustainable production. However, few Parties have assessed whether organic farming is increasing overall production efficiency (particularly regarding land-use requirements).

H. Evaluation of impact of policies

56. Although a majority of countries have shown that they are devoting resources to sustainable agricultural actions and initiatives, no country has reported (in 5NRs) any form of structured programme to evaluate the overall impacts of such policies on the sectors as a whole (with the notable exception of Brazil). Assessments of impacts of projects (as opposed to policies) are more commonly reported.

VI: CONCLUSIONS

57. The growing demand for food and agricultural commodities, associated with projections of population growth, increasing wealth and shifts in consumption patterns, highlight the need for increased agricultural productivity while limiting expansion into natural areas in order to reduce pressures on the environment and avoid negative impacts on biodiversity. An unacceptably high proportion of food is currently wasted and reducing this loss will have a major benefits including reducing pressures on resources. In addition, restoring a significant amount of currently degraded lands can significantly increase food production and restore biodiversity and ecosystem services important for agriculture.

58. The fourth edition of the *Global Biodiversity Outlook*, and its supporting assessments, concludes that the drivers of biodiversity loss associated with food systems are dominant in determining the success of the Strategic Plan for Biodiversity 2011 – 2020 and for the achievement of most of the Aichi Biodiversity Targets, and therefore that urgent action to achieve sustainable food systems is needed. The conclusions of the Food and Agriculture Organization of the United Nations are that food and agriculture is facing significant challenges including growing competition, diminishing quality and quantity of natural resources and loss of ecosystem services at the global scale. Agriculture needs to transform to

[49] See http://www.fao.org/3/a-mm464e.pdf.

produce more food with improved nutritional value whilst simultaneously contributing to poverty reduction, becoming more resilient to climate change and natural disasters, and reducing its negative impacts, including on biodiversity and disaster risk.[50] There are opportunities and needs to simultaneously achieve all these goals and that these are inter-dependent and mutually supportive goals under the 2030 Agenda for Sustainable Development. The 2030 Agenda for Sustainable Development is a framework to champion this transformational change, whereby biodiversity and its role in maintaining healthy ecosystems and productive landscapes is monitored, assessed and reported, and integrated into national planning processes.

59. A considerable amount of agricultural varieties of plants and animals have been lost through the expansion of commercial agriculture, which relies largely on less diversity and requires special external inputs and environmental alterations to prosper. Biodiversity loss includes the reduced distribution and abundance of populations of species, species loss (local) and extinctions (global), loss of genetic diversity, and the loss of unique habitats. The loss of species and habitats, and of the interactions among species in ecosystems, can undermine ecosystem functioning and resilience at various scales and lead to a decline in regulating, supporting and cultural ecosystem services. As consequence, a decline in many ecosystem services threatens to undermine the productivity and sustainability of agriculture, among other negative impacts on human well-being, including food security, nutrition and health.

60. The health, vitality and extent of biodiversity in soils and landscapes is essential to achieving sustainable increases in the production of food, improvements in its nutritional quality, assisting climate change mitigation and adaptation, and improved resilience, through its role in underpinning ecosystem services that support and rebuild a regenerative ecological infrastructure to support agriculture, such as pollination, pest and disease regulation, and nutrient, carbon and water cycling, and as the source of genetic resources that allow agriculture to develop and adapt including to climate change, and that many of these ecosystem services can also simultaneously help reduce the external impacts of agriculture on biodiversity including through helping to achieve necessary resource use efficiency gains to enable agriculture to become more sustainable.

61. Efforts towards ecological intensification and nutritional gains in the agriculture sectors are a critical contribution to reducing the drivers of biodiversity loss beyond agricultural systems. There is also a need to recognize agricultural biodiversity [51] as a natural resource that needs to be managed and sustained alongside other natural resources such as land and water to support sustainable food and agriculture. Biodiversity in managed landscapes, and in particular in agricultural landscapes, is important and there is a need for strengthened attention to the role of biodiversity and ecosystem services in agricultural landscapes in the achievement of Aichi Biodiversity Targets 5, 8, 11, 12, 14 and 15 in addition to targets 7 and 13. Realigning incentive policies as foreseen by Aichi biodiversity Target 3 could also play an important role. The upcoming report of the international initiative of the Economics and Ecosystem Services (TEEB) on food and agriculture seeks to include all significant dependencies and impacts from biodiversity-agriculture linkages, as critical elements in understanding the economics of ecosystems and biodiversity, and will provide further useful analysis and guidance once finalized.[52]

62. Transformational change in food systems, addressing sustainability of both production and consumption, is required at the global scale in order to meet agreed sustainable development objectives. An improved understanding of the concept of "sustainability" in food and agriculture will assist Parties in

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[50] FAO's Reviewed Strategic Framework, FAO Conference June 2013 Document C 2013/7

[51] Agricultural biodiversity is a broad term that includes all components of biological diversity of relevance to food and agriculture, and all components of biological diversity that constitute the agro-ecosystem: the variety and variability of animals, plants and micro-organisms, at the genetic, species and ecosystem levels, which are necessary to sustain key functions of the agro-ecosystem, its structure and processes, in accordance with annex I of decision III/11 of the Conference of the Parties to the Convention on Biological Diversity (decision V/5, annex).

[52] See http://www.teebweb.org/agriculture-and-food/ .for further information and an interim report.

their identification and implementation of appropriate policies and the importance of strengthening indicators in this regard. There are on-going efforts by Parties, other Governments, relevant organisations, farmers, pastoralists, indigenous peoples and local communities and the business sector to promote and implement solutions for sustainable production and consumption and nutritional gains in food and agriculture. It is important to recognise the need to address sustainable consumption of food, including sustainable and healthy diets and reducing food losses and waste, to the objectives of the Convention and immediate opportunities to influence biodiversity and nutrition outcomes through public food procurement policies and longer-term needs to mainstream biodiversity and nutrition into private sector food procurement as well as positively influencing consumer choice noting Resolution XX[53] of the United Nations Environment Assembly on Wasted Food Reduction, Rescue and Diversion that also recognises the efforts of the United Nations Environment Programme and the Food and Agriculture Organization of the United Nations, under the *10-Year Framework of Programmes on Sustainable Consumption and Production*, in reducing food waste.

63. A key need is coherence between policies under a common national vision, including food, agriculture, crops, livestock, rangelands and pastoralism, forestry, inland fisheries, aquaculture, protected areas and other land uses, including management of hydrologic systems that underpin much of agriculture and which have such an influence on biodiversity, and other land uses and human health and that, inter alia, the mainstreaming of biodiversity across all relevant scales through supply chains, from producers to consumers, mobilizing action by all relevant players is key to success. A priority is to develop or strengthen a common national vision for sustainable food systems and agriculture and the conservation and sustainable use of biodiversity, consistent with agreed international goals, supported by implementation of innovative and transformational policies, an appropriate blend of regulations and incentives based on a holistic approach that recognizes the inter-dependency among relevant sectors, including agriculture, forests and fisheries, and the opportunities to build synergies through common interests that can strengthen their interaction for their mutual benefit, while increase productivity as well as resource use efficiency.

64. Improvements in the agriculture–rangeland-forestry-water-biodiversity and other synergies in the landscape are required to enhance food security and nutrition, alleviate poverty and conserve biodiversity and harness ecosystem services, by implementing integrated landscape management to optimize the roles of agriculture, forests, rangelands, protected areas and other land uses, including enabling indigenous peoples and local communities and family smallholders to realize their potential contributions, to facilitate production systems that build regenerative ecological infrastructure by encouraging access to markets, inputs and technologies and by encouraging voluntary corporate efforts to decouple commodity production from biodiversity loss. It is necessary to integrate conservation efforts into diverse production landscapes, as conservation targets cannot be met through a formal protected area approach alone, using a range of tools to mainstream biodiversity priorities in land-use planning and decision-making, and engage with production sectors to encourage biodiversity-compatible production practices. One of the most significant ways to mobilise additional financial resources to implement the Strategic Plan for Biodiversity 2011 – 2020 is investing in biodiversity conservation within farming systems, and supporting broader efforts towards agricultural sustainability, including transforming, phasing out, reforming or eliminating subsidies harmful to biodiversity.

65. There is an urgent need to restore, maintain or build the ecological basis of food production, including through the conservation and restoration of biodiversity and ecosystem services in agricultural landscapes, including genetic resources for food and agriculture and their landraces and wild relatives,[54]

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[53] Currently a draft/proposed resolution

[54] Guidance on Strengthening the *in situ* conservation of Plant Genetic Resources for Food and Agriculture through incorporation of Crop Wild Relatives under areas important for diversity in Protected Area Networks and other effective area-based conservation measures is provided in notification 2015-092 issued jointly by the Executive Secretary, Bioversity International and the secretariats of the International Treaty for Plant Genetic Resources for Food and Agriculture and the Commission on Genetic Resources for Food and Agriculture. https://www.cbd.int/doc/notifications/2015/ntf-2015-092-gspc-en.pdf

as the key pathway to achieve sustainable productivity and nutritional gains and to use opportunities to further promote this approach that are available at all scales of agricultural production but noting in particular the importance of small-scale family farming and pastoralism in view of its dominance in terms of food security and nutrition, poverty reduction, social equity in farming and biodiversity conservation efforts. Efforts to mainstream biodiversity into the food and agriculture sectors at all levels and scales need to be strengthened, targeting all stakeholders including producers, agricultural input providers and food consumers throughout supply chains, using, as appropriate, the substantial existing guidance available under the Convention and through relevant forums, international organisations and other organisations and partners.[55]

[55] A summary of some of this available guidance is provided in document UNEP/CBD/SBSTTA/20/INF/55.