Submission from Environmental Defense Fund (EDF) to UNFCCC SBSTA 44 on issues related to agriculture in response to mandates contained in the document FCCC/SBSTA/2014/2, paragraph 87 relating to the following elements:

- Identification of adaptation measures, taking into account the diversity of the agricultural systems, indigenous knowledge systems and the differences in scale as well as possible co-benefits and sharing experiences in research and development and on the ground activities, including socioeconomic, environmental and gender aspects;
- Identification and assessment of agricultural practices and technologies to enhance productivity in a sustainable manner, food security and resilience, considering the differences in agro-ecological zones and farming systems, such as different grassland and cropland practices and systems.

In response to the mandates above, EDF recommends that Parties consider ways to:

1. **Encourage efficient use of agricultural resources and elimination of wastes**
2. **Promote landscape-level approaches, forest protection, and restoration of degraded lands in order to grow more food on existing farms and simultaneously increase adaptation, resiliency, and mitigation in the agriculture sector**
3. **Support further research and data collection on adaptation, mitigation, and other objectives simultaneously, especially in developing countries**
4. **Channel finance to accelerate deployment of climate smart agriculture**

Introduction

Environmental Defense Fund (EDF) respectfully presents this submission on issues related to agriculture. EDF is a one million member non-profit, non-governmental, non-partisan, accredited observer organization that has participated in the climate treaty talks since their inception. EDF experts work with small and large scale farmers in India, Vietnam, China and the United States to address issues such as fertilizer pollution, preservation of grasslands, and irrigation efficiency and water management.

We would like to frame this submission in the context of the Paris Agreement. Under the post-Paris bottom-up world, countries can decide how to include agriculture in their nationally determined contributions in a way that reflects highest possible ambition and their national priorities. Accordingly, a majority of Parties included agriculture in their Intended Nationally Determined Contributions in sections on mitigation and adaptation.[1]

Many countries are using landscape management to simultaneously achieve multiple objectives, including food security, improved farmer livelihoods, sustainable increases in agricultural productivity, food systems that are resilient and able to adapt to climate change, reduced food losses and waste, and the

[1] Richards, M., Gregersen, L., Kuntze, V., Madsen, S., Oldvig, M., Campbell, B., Vasileiou, I. 2015. Agriculture's prominence in INDCs. CCAFS Info Note. Retrieved from: https://cgspace.cgiar.org/bitstream/handle/10568/68990/CCAFS_Agriculture_INDCs_COP21.pdf?sequence=5

reduction and removal of greenhouse gas emissions, where possible.[2] Actions in the land sector must also protect and benefit smallholder farmers, women and indigenous peoples who are the most vulnerable to climate change, while ensuring ecosystem integrity and the protection of biodiversity.

Climate change threatens food security gains. A recent study showed that climate change will reduce anticipated improvements in food availability by about a third and avoided deaths associated with improved food availability by 28% between 2010 and 2050[3]. Adaptation, mitigation, and food security goals are going to be a priority for many countries and often these goals are mutually reinforcing. Gains for one objective produce co-benefits for others. For example, climate smart agriculture practices[4] often involve more efficient use of resources such as fertilizer, water, and energy, while maintaining or even increasing yields, enhancing drought resilience and reducing emissions.

To achieve objectives for food security, adaptation and mitigation in the agricultural sector, there is a need to increase access to financial resources from public, private, domestic, bilateral and multilateral sources. Parties should also discuss how climate smart agriculture and farmer incomes can be supported by the two voluntary market pathways in Article 6 in the Paris Agreement—bottom-up "cooperative approaches" (Art 6.1 & 6.2) and a newly established "mechanism to contribute to the mitigation of greenhouse gas emissions and support sustainable development" (Art 6.4).

We are thankful for the opportunity to submit our views to the secretariat, and we look forward to participating in the SBSTA 44 workshops.

Recommendations:

1. **Encourage efficient use of agricultural resources and elimination of wastes**

We recommend a strong focus on resource use efficiency across landscapes. This can serve both the national and the farmer interest which are often the drivers of change. Many climate smart agriculture practices involve more efficient use of resources such as fertilizer, water and energy – producing multiple benefits for farmers, ecosystems, and the climate. With climate smart agriculture practices, farmers can often reduce inputs and associated costs per unit yield while maintaining or even increasing yields, resulting in higher profits. Efficient water use can enhance drought resilience and lessen stress on nearby ecosystems. Optimum nutrient use and lower agro-chemical use can reduce water pollution, habitat degradation, and health risks for farmers and local communities. We recognize that farmers in developing countries might need to increase fertilizer use to achieve better yields and encourage the focus on

[2]Global Alliance for Climate-Smart Agriculture (GACSA). 2014. Framework Document. GACSA Series Document 1 (GACSA1). Retrieved from: http://www.fao.org/climate-smart-agriculture/41760-02b7c16db1b86fcb1e55efe8fa93ffdc5.pdf

[3] Springmann, M., Mason D'Croz, D., Robinson, S., Garnett, T., Godfray, H.C.J., Gollin, D.,…Scarborough, P. 2016. Global and regional health effects of future food production under climate change: a modelling study. The Lancet. doi: 10.1016/S0140-6736(15)01156-3

[4] As defined in Food and Agriculture Organization of the United Nations (FAO). 2013. Climate Smart Agriculture Sourcebook. Retrieved from: http://www.fao.org/docrep/018/i3325e/i3325e.pdf

fertilizer optimization as they seek to improve yields. Simultaneously, climate smart agriculture practices can lead to decreases in methane and nitrous oxide emissions and increases in soil organic carbon.

In addition, post farm gate, there is an urgent need to reduce food loss and waste, which account for around one third of global food produced, so that gains in productivity are not wasted. This has direct impacts on food security, livelihoods, and climate mitigation.

We offer the following case studies as examples of climate smart agricultural practices. We encourage Parties to share similar findings in the workshops.

Case Studies:

Climate-smart groundnut farming practices in India: High resolution (with sampling between 40-60% days in the season) field measurements done at a groundnut (also known as peanut) farm in one of the most arid regions in India show that integrated nutrient management led to a number of benefits in a drought-hit year, including a 40-60% reduction in total nitrogen fertilizer use, increased crop yield by 35-50%, and net profit by 70-120% – while decreasing GHG emission intensity (per unit yield) by 50%.[5]

Low carbon rice farming: The following case studies focus on methane emissions from rice farming. We note, however, that EDF and its Indian partners have performed high resolution measurements (with sampling between 40-60% days in the season) at Indian rice farms in three agro-ecological zones which show that rice farms can emit extremely high rates of nitrous oxide which become higher with alternate wetting and drying (AWD). We assert that net global warming potential of rice systems should be calculated by including contribution of methane, nitrous oxide as well as lost soil carbon. Additionally, we think that a region-specific approach to identifying rice management practices that can deliver multiple goals of climate smart farming (high yields, better profits, climate resilience and mitigation) is crucial.[6]

a) **Vietnam:** In An Giang and Kien Giang Provinces in Vietnam's Mekong Delta, The Vietnam Low-Carbon Rice Project (VLCRP)[7] trains rice farmers to use a package of practices known as "1 Must- 6 Reductions" (including reduced seeding density, reduced fertilizer and pesticide application, and alternative wetting and drying water management). VLCRP farmers reduced inputs (50% reduction in seed, 30% reduction in fertilizer, 40-50% reduction in water) and associate input costs and improved yields by 5-10%, leading to an increase in profits from 10% to as high as 60% per hectare. Preliminary results indicate that the 1 Must- 6 Reductions practices have led to approximately 40-65% reductions in greenhouse gas emissions, equivalent to 4 tons

[5] Kritee, K., Nair, D., Tiwari, R., Rudek, J., Ahuja, R., Adhya, T., ... & Dava, O. (2015). Groundnut cultivation in semi-arid peninsular India for yield scaled nitrous oxide emission reduction. Nutrient Cycling in Agroecosystems, 103(1), 115-129.

[6] Kritee, K., Tiwari, R., Nair, D., Loecke, T.D., Adhya, T.K., Rudek, J., Ahuja, R., Hamburg, S. 2014. Poster: Greenhouse gas emissions from rice, peanut and millet farms in peninsular India: Effects of water and nitrogen management. Environmental Defense Fund. Retrieved from: http://www.edf.org/sites/default/files/agu_poster-final.pdf

[7] A partnership between Environmental Defense Fund (EDF), Mekong Delta Development Research Institute (MDI), the Departments of Agriculture & Rural Development of An Giang and Kien Giang Provinces (AGDARD and KGDARD), and the Advanced Lab of Can Tho University.

of CO_2e/ha/yr in An Giang and orders of magnitude higher in Kien Giang. By rigorously quantifying GHG emissions reductions and coupling them with strong standards that are well recognized and received by global markets, VLCRP also has the potential to generate carbon credits that can then be sold to offset GHG emissions and increase incomes of participating farmers.

b) **United States:** Rice Growers in the Midsouth region of the U.S. have proven that they can reduce both methane generation and water use by draining a field three to four times during the growing cycle. This practice disrupts the methanogens responsible for methane generation. While implementing this practice requires a modest investment, it yields substantial co-benefits of up to a 30% decrease in water use.

Crop rotation and cover crops: Compared to continuous cropping, crop rotation helps maintain or improve productivity with lower nitrogen fertilizer application, producing lower nitrous oxide emissions.[8,9] In addition, cover crops in rotation can prevent nutrient loss, soil degradation, and erosion in times of flooding, and hold in moisture in times of drought. Cover crops also increase organic matter in the soil.

2. **Promote landscape-level approaches, forest protection, and restoration of degraded lands in order to grow more food on existing farms and simultaneously increase adaptation, resiliency, and mitigation in the agriculture sector**

In order to meet the demand of 9 billion people by 2050, it is important to improve agricultural productivity. However, countries should ensure that increased agricultural productivity does not cause increased deforestation and undermine objectives under REDD+. Increased deforestation may compromise agricultural productivity and food supplies. Forests provide important ecosystem services that support food security and agricultural resilience, including weather and rainfall regulation, water quality and availability, and habitat for pollinators.[10]

Although in theory intensification could discourage crop land expansion by fulfilling market needs with current crop land, it could also have adverse effect on forests at a local level if forest protection policies are not in place. For example, a rise of agricultural returns may encourage land owners to clear more forest to gain higher short-term income.[11] Therefore, agricultural initiatives should be accompanied by strong policies and economic incentives to protect forests.

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[8] Meyer-Aurich, A., A. Weersink, K. Janovicek, B. Deen. 2006. Cost efficient rotation and tillage options to sequester carbon and mitigate GHG emissions from agriculture in eastern Canada. Agric. Ecosyst. Environ. 117, 119–127.

[9] Berzsenyi, Z., B. Gyorffy, D. Lap. 2000. Effect of crop rotation and fertilisation on maize and wheat yields and yield stability in a long term experiment. Eur. J. Agron. 13, 225–244

[10] Seymour, F., & Busch, J. 2014. "Why Forests? Why Now? A Preview of the Science, Economics, and Politics of Tropical Forests and Climate Change." Center for Global Development. http://www.cgdev.org/publication/ft/why-forests-why-now-preview-science-economics-politics-tropical-forests-climate-change

[11] Byerlee, D., Stevenson, J., & Villoria, N. (2014). Does intensification slow crop land expansion or encourage deforestation?. Global food security, 3(2), 92-98.

Case studies

"Decoupling" deforestation and soy production in Mato Grosso, Brazil:
In Mato Grosso, Brazil, deforestation was reduced by 70% below its historical average from 1996-2005, while soy and cattle production increased. Yield increases accounted for 22% of soy production increases, while the remainder was primarily due to expansion on land previously cleared for cattle pasture. Cattle yield also increased over this period due to improved pasture management, measures to reduce hoof and mouth disease, and new production systems. This "decoupling" of deforestation and agricultural production was accompanied by enforcement initiatives by national and state government and by the soy and beef industries through moratoria on commodities linked to deforestation.[12,13] To sustain decreases in deforestation, many argue that positive incentives are needed as well.[14]

Indigenous knowledge, culture and territories in the Xingu, Brazil:
With climate change and deforestation, indigenous peoples in the Xingu are using their traditional knowledge structures to observe changes in rainfall regimes, degradation of riparian forests and headwaters, and more destructive fire regimes that disrupt their traditional use of fire for subsistence agriculture. Indigenous traditional knowledge structures should be used to identify culturally correct adaptation measures not only for Indigenous Peoples, but also for the neighboring populations. Indigenous peoples in the Xingu have also engaged with non-governmental organizations to restore ecosystem services agriculture relies on through various actions such as implementing fire prevention and control projects, restoring degraded headwaters and riparian forests, and collecting and selling native tree species seeds for private and public restoration efforts.[15] Measures taken to address agricultural issues should include indigenous peoples because they are especially vulnerable to climate change, are strong protectors of ecosystem services, and they contribute careful observations of climate change including oral traditions spanning hundreds or thousands of years.

3. **Support further research and data collection on adaptation, mitigation, and other objectives simultaneously, especially in developing countries**

Given the lack of essential research and data around climate smart agriculture in developing countries, we encourage Parties to allocate resources to promote more research in developing countries, which are more vulnerable to climate change. Various multilateral fora outside of the UNFCCC are actively focused on researching and identifying actions to address food security, adaptation, and mitigation in agriculture.

[12] Macedo, M. N., DeFries, R. S., Morton, D. C., Stickler, C. M., Galford, G. L., & Shimabukuro, Y. E. (2012). Decoupling of deforestation and soy production in the southern Amazon during the late 2000s. Proceedings of the National Academy of Sciences, 109(4), 1341-1346.
[13] Gibbs, H. K., Rausch, L., Munger, J., Schelly, I., Morton, D. C., Noojipady, P., . . .Walker, N. F. (2015b). Brazil's soy moratorium. Science, 347, 377–378.
[14] Nepstad, D., McGrath, D., Stickler, C., Alencar, A., Azevedo, A., Swette, B., ... & Armijo, E. (2014). Slowing Amazon deforestation through public policy and interventions in beef and soy supply chains. Science, 344(6188), 1118-1123.
[15] Schwartzman, S., Boas, A. V., Ono, K. Y., Fonseca, M. G., Doblas, J., Zimmerman, B., ... & Torres, M. (2013). The natural and social history of the indigenous lands and protected areas corridor of the Xingu River basin. Philosophical Transactions of the Royal Society of London B: Biological Sciences, 368(1619), 20120164.

The UNFCCC Parties, collectively and individually, should encourage integrated collection of agricultural data on adaptation, productivity and mitigation outcomes simultaneously and provide a space for the parties and external experts to share findings and learn from each other in the process. As we gather this data, we need to develop an integrated and comprehensive vocabulary for encoding the data to leverage its utility by future researchers.

4. **Channel finance to accelerate deployment of climate smart agriculture**

Financial resources from public, private, domestic, bilateral and multilateral (e.g. the Green Climate Fund) sources should be channeled to promote food security through evidence based and locally appropriate low emission farming practices. Existing investments in agricultural infrastructure and science should be modified to incorporate adaptation, mitigation, and productivity considerations.

Finally, The Paris Agreement includes two different voluntary market pathways which could generate support for low carbon agriculture in Article 6—bottom-up "cooperative approaches" (Art 6.1 & 6.2) and a newly established "mechanism to contribute to the mitigation of greenhouse gas emissions and support sustainable development" (Art 6.4). Parties should feel comfortable discussing how agriculture could be integrated into these voluntary market pathways.

Conclusion:

In summary, we assert that relevant, reliable, and timely information augmented with resources and capacity are essential drivers for change at the national level.

We also strongly posit that the same applies for the farmer, the main actor on the ground, and it is important for Parties to keep her in mind as they deliberate actions. After all, it is the farmer who decides how best to manage her land and to change food production practices. Often, clearly presented and contextualized information on various elements of the production cycle, including environmental effects, and on markets can help promote better decisions. This is particularly relevant in the developing world where farmer's access to timely, reliable and useful information and access to markets is limited due to various reasons. Finance and capital are key ingredients for farmers to act on this information. Therefore, it will be critical to find ways to accelerate access to good information and finance for small scale farmers to enable them to successfully address their risk exposure to climate change.

We respectfully thank the Parties for taking our submission into consideration and look forward to working with them on this important subject over the coming years.

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