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The Environmental Defense Fund (EDF), an 800,000-member non-profit, non-governmental, non-partisan, UNFCCC- accredited observer organization that has participated in the climate treaty talks since their inception, respectfully presents its views on an agricultural work program for 2012 and beyond. Agriculture is essential for human well-being, and faces substantial challenges from a growing global population and climate change. Thus, it is vitally important that any work on agriculture in the UN successfully align the global goal of reducing climate change and promoting climate resilience with national goals for food security, sustainable resource use, trade, environment, poverty alleviation, and enhanced rural development. A work program can help the international community identify, prioritize, promote, and integrate solutions that meet these criteria.

In our view, the two vitally important goals of mitigation and adaptation cannot be separated in this framework – and a third, overarching goal of sustainable development must also be recognized. Fortunately, these goals can be pursued in synergy in the context of agriculture, and there should be no higher priority in a work program on agriculture than the scientific and technical contributions that can be made toward achieving such synergies.

As of 2005, the scale of emissions from agriculture globally is estimated to be 10-12% of total annual anthropogenic emissions, including 60% and 50% of global nitrous oxide and methane emissions, respectively.<sup>1</sup> This is sufficiently large that we cannot fail to account for and address emissions from agriculture as part of our larger efforts to address climate change. Developed countries can reduce emissions substantially, but we should also investigate the potential opportunities for mitigation activities in developing countries, because in many cases the activities that promote adaptation and resilience also contribute to mitigation, and should be incentivized. In many of these countries deforestation and other land-use emissions are the primary emissions sources, and these sources are closely linked to global agricultural drivers. In 2000, land-use change and forestry plus methane and nitrous oxide emissions, largely from agriculture, contributed about 60% of the emissions across developing countries (33%, 16% and 10%, respectively), compared to 17% in developed countries. Therefore, the global community should investigate the opportunities for reducing these emissions sustainably, while still achieving development goals.

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<sup>1</sup> Smith, P., D. Martino, Z. Cai, D. Gwary, H. Janzen, P. Kumar, B. McCarl, S. Ogle, F. O'Mara, C. Rice, B. Scholes, O. Sirotenko, 2007: Agriculture. In *Climate Change 2007: Mitigation. Contribution of Working Group III to the Fourth Assessment Report of the Intergovernmental Panel on Climate Change* [B. Metz, O.R. Davidson, P.R. Bosch, R. Dave, L.A. Meyer (eds)], Cambridge University Press, Cambridge, United Kingdom and New York, NY, USA.

Yet addressing emissions from agriculture does not imply that we must reduce emissions everywhere, in absolute terms. The potential for absolute reduction needs to be better catalogued and will often be geographically specific. But any attempt to reduce these emissions must be done carefully, so as to contribute to, rather than detract from, fundamental development goals.

Where there is substantial potential to reduce emissions, efforts to make these reductions should be implemented and incentivized, whenever we can do so in ways that enhance the livelihoods of food producers, contribute to rural development, enhance food security, and safeguard their rights to land resources. The challenges of reducing emissions from agriculture, deforestation, and other land-use activities -- while meeting the growing and changing demands for food from a growing and richer population under a changing climate -- will require major coordinated efforts to overcome technical challenges and implementation difficulties. As a guiding vision, we should aim to optimize emissions from agriculture in ways that meet these demands, by harnessing the global potential for mitigating greenhouse gas emissions from agriculture while supporting adaptation and national agendas for development.

Agriculture is an issue at the heart of many countries' economies, and of social welfare more broadly. It employs a very large segment of the working population in the developing world and consumes a large portion of the national economic and natural resource budgets. Agriculture also provides economic welfare to consumers on a scale that dwarfs the statistics in national accounts. Consequently, any policy intervention -- national and global -- has to ensure that economic development goals are not compromised. We see room to do so in practices that can improve the efficiency of agricultural production, including better use of fertilizer and water, and the reduction of waste on and off the farm. Furthermore, such improvements can have co-benefits, such as higher water quantity and quality, and improved soil quality.

Agriculture is also at the interface between people and their changing environment. The changing climate overall is expected to reduce crop yields in many of the existing global bread baskets, imposing new challenges on populations, particularly vulnerable groups like children already at risk of malnutrition in developing countries.<sup>2</sup> In the US, scientists have seen changes that point to substantial climate-driven reductions in the productivity of agricultural land, with potentially global implications in interlinked markets.<sup>3</sup> Research also suggests that changing monsoon rainfall patterns since 1950 have already reduced rice yields in India.<sup>4</sup> Therefore,

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<sup>2</sup> Gerald C. Nelson, Mark W. Rosegrant, Jawoo Koo, Richard Robertson, Timothy Sulser, Tingju Zhu, Claudia Ringler, Siwa Msangi, Amanda Palazzo, Miroslav Batka, Marilia Magalhaes, Rowena Valmonte-Santos, Mandy Ewing, and David Lee. 2009. *Climate Change: Impact on Agriculture and Costs of Adaptation*. International Food Policy Research Institute. Washington, DC.

<sup>3</sup> Field, C. B., L. D. Mortsch, M. Brklacich, D. L. Forbes, P. Kovacs, J. A. Patz, S. W. Running, and M. J. Scott. 2007. North America. Pages 617-652 in M. L. Parry, O. F. Canziani, J. P. Palutikof, P. J. v. d. Linden, and C. E. Hanson, editors. *Climate Change 2007: Impacts, Adaptation and Vulnerability*. Contribution of Working Group II to the Fourth Assessment Report of the Intergovernmental Panel on Climate Change. Cambridge University Press, Cambridge.

<sup>4</sup> For example, see: Auffhammer, Maximilian, V. Ramanathan, and Jeffrey R. Vincent. 2012. "Climate change, the monsoon, and rice yield in India." *Climatic Change* 111(2): 411-424.

mitigation alone is not enough. The global community needs technical and political progress to deliver solutions that can reduce food producers' exposure to the risks associated with a warmer, more volatile, and increasingly extreme climate, including indirect risks associated with the expansion of the ranges of diseases and pests, the disruption of formerly predictable climate patterns, and potential shifts in the abundance of beneficial species, such as pollinators.

Despite these daunting challenges, EDF is confident that know that efforts around the world can successfully and simultaneously achieve the three goals of adaptation, mitigation, and development. EDF and our partners have been pursuing these goals in recent years, and we have a promising list of successes that suggest new avenues for progress. With our partners in India, EDF is pioneering methods with nearly 200,000 rural households, most of them smallholder farmers, to clearly define pathways that can improve household incomes, support energy access, increase yields, improve health and livelihoods, and increase climate resilience, while simultaneously reducing greenhouse gas emissions and water pollution. Other researchers have shown similar results in Africa, where they have documented techniques that build soil carbon, enhance nutrient retention, improve yields, and support greater resilience for African farmers.<sup>5</sup> In livestock agriculture, EDF has seen advancements in the US and elsewhere toward reducing emissions through better rangeland and pasture management, maintenance of animal health, application of nitrogen inhibitors, manure management, and adjustments in feed. The Global Research Alliance on Agricultural Greenhouse Gases<sup>6</sup> is emerging as an important venue for prioritizing, sharing, and promoting these breakthroughs.

Technical analyses support the case that these preliminary successes could be scaled up to deliver globally significant mitigation. By 2100, one estimate suggests that agriculture could contribute reductions in the range of 62-209 Gt CO<sub>2</sub>-e.<sup>7</sup> The figure below shows the technical mitigation potential possible for all regions of the world, in Mt CO<sub>2</sub>-e, by 2030.<sup>8</sup>

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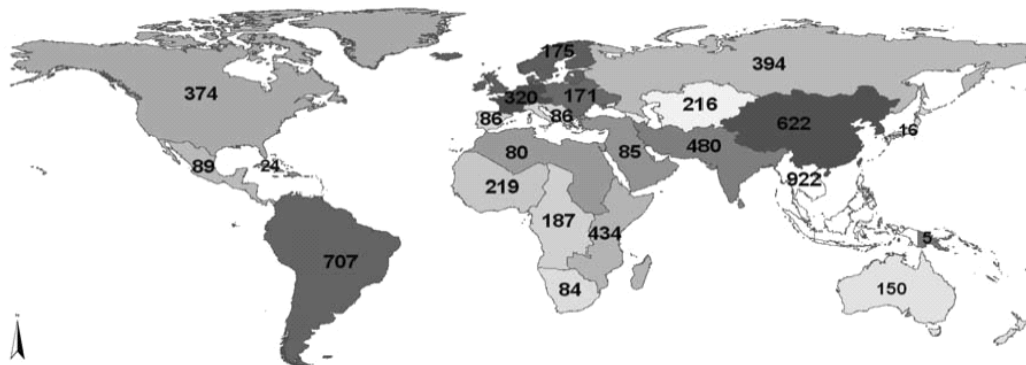
<sup>5</sup> For example, see: FAO. 2009. Food Security and Agricultural Mitigation in Developing Countries: Options for Capturing Synergies. Food and Agriculture Organization of the United Nations, Rome. Available at: <http://www.fao.org/docrep/012/i1318e/i1318e00.pdf>

<sup>6</sup> See: <http://www.globalresearchalliance.org/>

<sup>7</sup> Rose, S.K., et al. 2011. Land-based mitigation in climate stabilization. *Energy Econ.* doi:10.1016/j.eneco.2011.06.004

<sup>8</sup> IPCC, Agriculture, in *Climate Change 2007: Mitigation*. 2007, Working Group III Contribution to the Fourth Assessment Report of the Intergovernmental Panel on Climate Change. Cambridge University Press.

Figure 2.2: Technical mitigation (all practices, all GHGs: MtCO<sub>2</sub>eq/yr) by 2030



Source: IPCC 2007, figure 8.5

Within the context of a work program, scientific and technical efforts are needed to help policymakers identify interventions that can meet the following principles:

- Financial interventions and other incentives are delivered so that they equitably distribute the benefits, aiming to protect the most vulnerable groups and make them better off.
- Make efficient use of resources, so that the total provision of benefits from these resources can be maximized and negative impacts minimized.
- Promote and maintain the development of local capacities and resources and empower stakeholders to make policy interventions fit their local contexts and needs.
- Take into account the displacement (leakage) of emissions that may occur due to displaced or expanded agricultural production, or as a result of policy interventions, and minimize it.
- Reduce the loss of food and the creation of waste in supply chains.
- Improve transparency and access to information for all affected stakeholders.
- Investigate and take into account context-specific expectations about the impacts of future climate change, using the most up-to-date and rigorous scientific approaches available.

The UNFCCC has access to tremendous knowledge resources and a work program should utilize and build upon these resources. Compiling and assessing current knowledge and making it available in a central location would be a significant and useful contribution in itself. This task should be undertaken with an integrated approach in mind, supporting the issues of food security, mitigation, adaptation, enhanced rural livelihoods, and environmental co-benefits. Furthermore, the information should be made available in such a way that users can easily and quickly identify the elements that are most relevant to their particular context and agricultural system.

We recommend that a work program on agriculture should include the following elements:

- 1) Identifying ways to modify agricultural practices to enhance productivity, improve resilience, promote carbon sequestration, and reduce emissions from
  - i) livestock
  - ii) fertilizer use
  - iii) rice methane
  - iv) soil carbon
  - v) conversion of land, with integration into subnational and national REDD+ frameworks.
- 1) Finding less emissions intensive substitutions within the various steps of agricultural production and in agricultural supply chains.
- 2) Developing measurement and monitoring approaches that facilitate accounting for changes at landscape and larger scales.
- 3) Fully accounting for greenhouse gas implications of agricultural biofuels.
- 4) Developing and promoting approaches to reduce climate-related risks for agricultural producers, especially for smallholders.

The outcomes of the work program should be shared with stakeholders to the greatest extent possible, particularly with regard to cost-effective measurement and monitoring techniques, and on agricultural approaches that deliver both adaptation and mitigation benefits.

We recognize that the issues outlined in this submission do not address all of the myriad issues that will need to be discussed on the road to Qatar and beyond. But we thank the Parties and Observers and Secretariat for the opportunity to provide these initial thoughts on an agriculture work program.

Thank you for the opportunity to submit our views.

Sincerely,

Dr. Jason Funk  
Land Use and Climate Scientist  
Environmental Defense Fund  
[jfunk@edf.org](mailto:jfunk@edf.org)