

CCAFS

Low emissions development research



RESEARCH PROGRAM ON
Climate Change,
Agriculture and
Food Security



The **Low Emissions Development (LED)** flagship of the CGIAR Research Program on Climate Change, Agriculture and Food Security (CCAFS) seeks to improve the feasibility of reducing agricultural greenhouse gas emissions at large scales while ensuring food security in developing countries. The program achieves these aims by producing evidence and tools for:

- (1) Improved estimates of emissions from LED in smallholder farming (inc. validation of RUMINANT);
- (2) Priority setting and testing of LED technologies and impacts; and
- (3) Institutional arrangements and conditions for LED, including scaling up LED among smallholders, responsible finance for supply chain governance in agriculture-forest landscapes, and mitigation through reduced food loss and waste.

The primary beneficiaries of CCAFS' LED program are smallholder farmers, although research also benefits national policy-makers through better emissions estimates, capacity building and scientific support for policy. CCAFS focuses on high mitigation-impact practices relevant to smallholder development:

- Carbon sequestration in agricultural landscapes;
- Reducing methane from livestock and paddy rice;
- Reducing nitrous oxide from fertilizer use in cereal crops; and
- Reducing food loss.

Highlights are below, and more is available at: <https://ccafs.cgiar.org/themes/low-emissions-agriculture>

I. Improved estimates of emissions from LED in smallholder farming

Standard Assessment of Agricultural Mitigation Potential and Livelihoods (SAMPLES): Improving estimates of agricultural greenhouse gases across the globe, especially for smallholder farmers.

Provides guidelines for field measurements of agricultural greenhouse gases, site-specific emission factors, a directory of tools, and a selection of recent literature. <http://samples.ccafs.cgiar.org/>

The **Climate Food and Farming Research Network (CLIFF)** for PhD students and the **Latin America Greenhouse Gas Mitigation Network (LAMNET)** builds the capacity of young scientists, generates novel climate change research on smallholder farming systems, and facilitates South-South knowledge exchange <https://ccafs.cgiar.org/climate-food-and-farming-network-cliff>

Methods for measuring greenhouse gas balances and evaluating mitigation options in smallholder agriculture. Rosenstock TS, Rufino MC, Butterbach-Bahl K, Wollenberg E, Richards, MB, eds. Springer Open Access book. <http://www.springer.com/us/book/9783319297927>

Livestock development and climate change: The benefits of advanced greenhouse gas inventories. GRA, CCAFS. <http://hdl.handle.net/10568/76520>

Does conservation agriculture deliver climate change mitigation through soil carbon sequestration in tropical agro-ecosystems? Powlson D, Stirling C, Thierfelder C, White R, Jat ML. *Agriculture, Ecosystems and Environment*. <https://ccafs.cgiar.org/publications/does-conservation-agriculture-deliver-climate-change-mitigation-through-soil-carbon>

Global tree cover and biomass carbon on agricultural land: The contribution of agroforestry to global and national carbon budgets. Zomer RJ, Neufeldt H, Xu J, Ahrendts A, Bossio D, Trabucco A, van Noordwijk M, Wang M. 2016. *Scientific Reports*. <https://dx.doi.org/10.1038/srep29987>

Greenhouse gas mitigation potential in the livestock sector. Herrero M, Henderson B, Havlik P, Thornton PK, Conant RT, Smith P, Wiersenius S, et al. *Nature Climate Change*. <http://www.nature.com/nclimate/journal/v6/n5/full/nclimate2925.html>

Hotspots of gross emissions from the land use sector: patterns, uncertainties, and leading emission sources for the period 2000–2005 in the tropics. Roman-Cuesta RM, Rufino MC, Herold M, Butterbach-Bahl K, Rosenstock TS, Herrero M, Ogle S, et al. *Biogeosciences*. <https://dx.doi.org/10.5194/bg-13-4253-2016>

Methane and nitrous oxide emissions from cattle excreta on an East African grassland. Pelster DE, Gisore B, Goopy J, Korir D, Koske JK, Rufino MC, Butterbach-Bahl K. *Journal of Environmental Quality*. <http://dx.doi.org/10.2134/jeq2016.02.0050>

Smallholder African farms in western Kenya have limited greenhouse gas fluxes. Pelster DE, Rufino MC, Rosenstock T, Mango J, Saiz G, Diaz-Pines E, Baldi G, Butterbach-Bahl K, *Biogeosciences Discussions*. <http://dx.doi.org/10.5194/bgd-12-15301-2015>

II. Priority setting and testing of LED technologies and impacts

Agriculture's prominence in the INDCs: Analysis with data, maps, publications. Richards M, Bruun TB, Campbell BM, Gregersen LE, Huyer S, Kuntze V, Madsen STN, Oldvig MB, Vasileiou I. <https://ccafs.cgiar.org/agricultures-prominence-indcs-data-and-maps#.V1sHX1euWao>

CCAFS Mitigation Option Tool (CCAFS-MOT) estimates greenhouse gas emissions from crops and livestock production systems in different regions, providing policy-makers across the globe with reliable information to make informed decisions about emissions reductions within agriculture. <https://ccafs.cgiar.org/mitigation-option-tool-agriculture>

Climate-Determined Suitability of the Water Saving Technology "Alternate Wetting and Drying" in Rice Systems: A Scalable Methodology demonstrated for a Province in the Philippines. Nelson A, Wassmann R, Sander BO, Palao LK. *Plos One*. <http://dx.doi.org/10.1371/journal.pone.0145268>

Limits of agricultural greenhouse gas calculators to predict soil N₂O and CH₄ fluxes in tropical agriculture. Richards MB, Metzel R, Chirinda N, Ly P, Nyamadzawo G, Vu QD, de Neergaard A, et al. *Scientific Reports*. <http://dx.doi.org/10.1038/srep26279>

Reducing emissions from agriculture to meet the 2°C target. Wollenberg E, Richards M, Smith P, Havlík P, Obersteiner M, Tubiello FN, Herold M, et al. *Global Change Biology*. <http://dx.doi.org/10.1111/qcb.13340>

III. Institutional arrangements and conditions for LED

The **Small-Holder Agriculture Mitigation Benefits Assessment (SHAMBA) tool and methodology** allows projects to estimate credits from soil carbon and other agricultural sources using data specific to smallholders. <https://ccafs.cgiar.org/small-holder-agriculture-monitoring-and-baseline-assessment-tool>

Practice briefs on climate-smart agricultural practices and technologies. Topics include: alternate wetting and drying for paddy rice, conservation agriculture, nutrient management, gender, integrated soil fertility management, improved ruminant genetics. <https://ccafs.cgiar.org/publications/csa-practices-and-technologies>

Benefits and cost analyses of climate change mitigation technologies. Basak R. CCAFS.
Paddy rice: Focus on Bangladesh and Vietnam. <https://ccafs.cgiar.org/publications/benefits-and-costs-climate-change-mitigation-technologies-paddy-rice-focus-bangladesh>; **Nitrogen fertilizer management: Focus on India and Mexico.** <https://ccafs.cgiar.org/publications/benefits-and-costs-nitrogen-fertilizer-management-climate-change-mitigation-focus-india>; **Monitoring, reporting, and verification: Focus on Bangladesh, India, Mexico, and Vietnam.** <https://ccafs.cgiar.org/publications/monitoring-reporting-and-verification-requirements-and-implementation-costs-climate>; **Directory of finance sources.** <https://ccafs.cgiar.org/publications/directory-finance-sources-climate-change-mitigation-agriculture>

Building local institutional capacity to implement agricultural carbon projects: Participatory action research with Vi Agroforestry in Kenya and ECOTRUST in Uganda. Shames S, Heiner K, Kapukha M, Kigali L, Masina M, Nantongo Kalunda P, Ssempala A, Recha J, Wekesa A. 2016. *Agriculture and Food Security*. <https://dx.doi.org/10.1186/s40066-016-0060-x>

Transitioning to more sustainable, low-emissions agriculture in Brazil. Pinto LFG, Hajjar R, Newton P, Agrawal A, Adshead D, Bini D, Bogaerts M, et al. CCAFS Info Note. <https://cgspage.cgiar.org/rest/bitstreams/81164/retrieve>

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