

# Info Note

## Scaling up the use of low-emissions development (LED) research outputs in Vietnam

*Co-design of LED research priorities, outputs, and impact pathways for emissions reduction from the livestock sector*

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### Key messages

- Using a rational formulation tool (PC Dairy Software) with locally available feeds can increase productivity and income of dairy farmers and reduce methane emissions. This requires building the capacity of policymakers, extension officers, dairy farmers, and feed industries to facilitate the use of the livestock PC Dairy Software and the national feed database.
- Co-designing low-emissions development (LED) research priorities, outputs, and impact pathways with user input ensures relevant research and generates impact. This helps develop and refine research outputs, communication with stakeholders, and integration into LED policies and strategies.
- Promoting improved feed by using the national feed database and PC Dairy Software can contribute to achieving Vietnam's greenhouse gas (GHG) reduction targets set in the nationally determined contribution (NDC) and green growth strategy (GGS).

Agriculture is the second-largest source of GHG emissions after the energy sector in Vietnam. It contributes about 23% of the total GHG emissions of the country (FAO 2017). Major sources of agricultural GHG emissions are rice cultivation (45%), enteric fermentation (15%), manure management (10%), and synthetic fertilizer (16%). Cattle and buffalo account for approximately 90% of total livestock GHG emissions. GHG emissions from the agriculture sector are increasing with the gradual decarbonization of energy and other sectors.

The livestock sector is one of the fastest-growing sources of GHG emissions in Vietnam (Cassou et al. 2017). Low-emissions livestock production requires substantial improvement of livestock feed intake with a low-emissions diet. To support a low-emissions livestock development strategy in Vietnam, the United States Department of Agriculture's (USDA) Foreign Agricultural Service (FAS), with funding from the Department of State through the Enhancing Capacity for Low Emission Development Strategies (EC-LEDS) program, partnered with the Department of Livestock Production (DLP) and the National Center for Agriculture Extension (NAEC) in Vietnam, and the University of California-Davis to support improving livestock feed in the dairy sector. This partnership developed two key research outputs: a national feed database and a customized PC Dairy Software for Vietnam (Agrilinks. 2019).

The national feed database developed for the dairy sector in Vietnam provides information on livestock feed ration formulation. The database classifies feed into different categories – roughage, grains, agricultural by-products, concentrate, and minerals – and includes information on nutrient content and per-unit price. This database is ready to use in the PC Dairy software, which identifies the optimal combination of different feeds to achieve the target milk yield with minimal cost and GHG emissions. The PC Dairy Software optimizes the combination of feed based on quantity, quality, and prices suitable for a given level of milk production and lactation stage. This customized software for Vietnam is useful across scales, from smallholders to commercial dairy farms and in different regions of the country. Dairy farmers and feed suppliers can formulate nutritionally balanced rations for dairy animals based on available local feeds and season

to increase milk yield at a minimum cost with low GHG emissions.

The USDA EC-LEDS program provided support to enhance the impact of the research outputs by increasing their use in Vietnam. The CGIAR Research Program on Climate Change, Agriculture, and Food Security (CCAFS) Flagship for Low-Emissions Development, in collaboration with the DLP, the National Center for Agriculture Extension (NAEC), and the NDC updating team, jointly evaluated the research outputs and co-designed an impact pathway. The main objective of this work was to develop an action plan and implement activities to scale the use of the national feed database and PC Dairy Software in Vietnam.

## The need for upscaling the use of research outputs

Over the past ten years, the Government of Vietnam has responded strongly to climate change by pursuing progressive policy and institutional agenda that aims to address Vietnam's increasing climate vulnerability and promote its GGS. Vietnam's NDC intends to reduce GHG emissions by 25% by 2030 compared to the business-as-usual (BAU) scenario (MNRE 2014). Livestock is one of the agricultural sub-sectors identified as a potential area for GHG emissions reduction in the country's NDC (SRoV 2020) and GGS (LEDS 2014). There is considerable potential to reduce GHG emissions, especially methane (CH<sub>4</sub>), from livestock by improving feed management practices in different livestock production systems.

Livestock ration preparation using locally available feeds can increase dairy farmers' productivity and income and reduce the intensity of methane emissions and overall environmental impact (Agrilinks. 2019). Improving feed for dairy cattle with locally available fodder, agricultural by-products, and other feeds have a mitigation potential of 2.63 MtCO<sub>2</sub>eq y<sup>-1</sup> at a marginal cost of -US\$ 130.73/tCO<sub>2</sub>eq with a total benefit of US\$ 343 million y<sup>-1</sup> (Carbonari 2019). The PC Dairy Software includes a GHG emissions calculator, allowing emissions from various feed practices to be modeled and incorporated into the agriculture sector reporting under its mitigation targets. Improving livestock feed fits policy needs perfectly and can contribute to Vietnam's LED strategies outlined in the NDC and GGS.

## Implementation of key actions

Dairy farmers (mainly large-scale producers), dairy industries, and livestock feed suppliers are the main users of the feed database and PC Dairy Software. The impact pathway (Fig 1) to scale the outputs' use includes actions that generate mitigation outcomes in Vietnam's agriculture sector. Key actions were identified by assessing the research outputs' relevance,

communication, engagement, influence, and the progress to date along the impact pathway. An action plan was developed in consultation with the policymakers in the Department of Science Technology and Environment (DOSTE), the Department of Agriculture and Rural Development (DARRD), the Department of Livestock Production (DLP), and the NAEC. Capacity strengthening for the PC Dairy Software's use in the livestock sector, linking the research outputs with the NDC and other LED strategies, and open access to the feed database and Software were key actions identified as being needed to scale the use of the outputs in Vietnam.

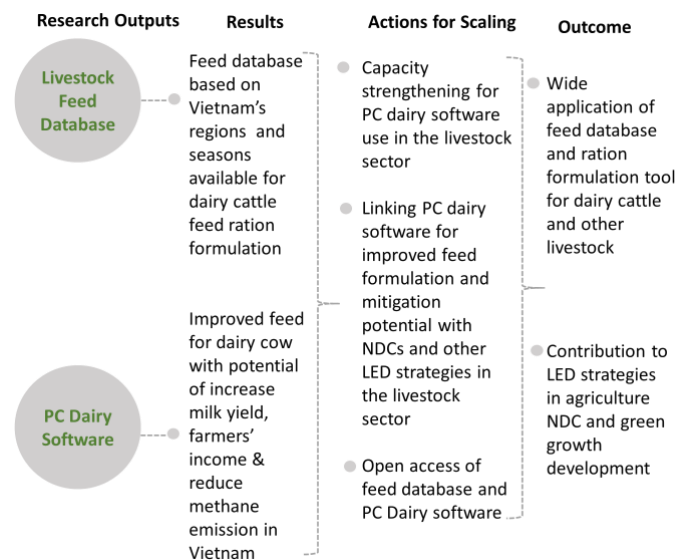


Figure 1. Impact pathway of scaling the use of research outputs to support LED in the livestock sector

The key actions implemented for scaling the use of research outputs in Vietnam include:

**Capacity strengthening:** A training workshop was conducted with 42 participants from different institutions, including agriculture policy policymakers from government departments, the NDC updating team, private sector representatives from dairy industries, and researchers from national institutions. Knowledge of the feed database and PC Dairy Software can support government planners, extension officers, farmers, and feed industries to select and promote locally relevant low-emission feed for livestock. This capacity-building training covered livestock nutrition, feed, raising practices, and how to use the database and software to formulate rations and manage feed for dairy animals. The training participants provided suggestions to continue strengthening the capacity of agriculture extension officers to use the database and software and expanding its use to beef cattle and other livestock in Vietnam.

**Linking with national LED strategy:** The EC-LEDS research outputs in Vietnam were tailored to support the national Low Carbon Development Strategy that identifies the actions necessary to achieve the emission reduction goal proposed in the NDC. Improved feed for dairy cattle

can generate multiple benefits, including improving milk and meat yields and production efficiency, and reducing GHG emission intensity from the dairy sector. The Ministry of Agriculture and Rural Development (MARD) helped develop the research outputs, including meetings and workshops with key actors in the livestock sector. Vietnam's submission to the Subsidiary Body of Scientific and Technological Advice (SBSTA) and NDC update recognize improved feed formulation for the low-emission feed management in the livestock sector.

**Open access to research outputs:** Making the feed database and PC Dairy Software open access can increase its adoption across the country. Dairy farmers, researchers, feed suppliers, and livestock extension officers can use the open-access database and software for various purposes. In addition, a comprehensive website or other effective communication platform that showcases LED best practices, data, guidelines, and tools can support experts and policymakers in the country. The EC-LEDS research outputs and other LED resources are included on the Department of Livestock Production's website.

## Key Outcome

**Agriculture sector inputs to SBSTA and Vietnam's NDC:** Vietnam's recent submission to SBSTA focuses on the improved livestock management system in the agriculture sector. The use of improved feed formulation is included in the document as an improved livestock feed management practice.

The EC-LEDS project team in Vietnam worked with the NDC review and update team. The MARD recognized the EC-LEDS research outputs and included them in their sub-sector NDC action and implementation plan. The updated NDC emphasizes improving animals' diets to enhance yield and reduce GHG emissions from the livestock sector (SRoV 2020).

## Conclusions and recommendations

Livestock feed improvement is one of the key focus areas of Vietnam's NDC. Using a ration formulation tool, like PC Dairy, with locally available feeds offers a large mitigation potential by enhancing milk and meat production and the use of low-emission feeds such as local fodder, grasses, and agricultural by-products. The capacity building of key stakeholders for the application of the feed database and PC Dairy Software and open access to these research outputs increase their use in the dairy sector.

Partnerships among governments and research organizations are crucial to develop and refine research outputs, communication to the stakeholders, and integration into the LED policies and strategies in Vietnam. In particular, the collaborative work with the MARD made it possible to integrate the outputs as an

input for SBSTA and the NDC update. Thus, co-designing LED research priorities, outputs, and impact pathways with users ensures that research is relevant and will generate impact.

The following actions are required to advance the impact pathway to achieve a large mitigation impact from the improved feed using the ration formulation tool:

Mitigation research, communication, and engagement in Vietnam's agriculture sector should work inclusively across user groups, including the MARD, MNRE, and NDC team, to identify the actions needed to link mitigation research to outcomes and impacts.

Vietnam needs to mainstream the research outputs, including other mitigation options in the national and subnational budgets and agricultural plans.

The DLP currently hosts the feed database and PC Dairy software on its website and makes it freely available to all users. The DLP can gradually update the feed database and PC Dairy Software by adding new feed data and continue capacity strengthening activities in the different regions of Vietnam.

## Further reading

- FAO. 2017. FAOSTAT: Agriculture emission by country. <http://www.fao.org/faostat/en/#data/EM>
- Cassou E, Jaffee SM, Ru J. 2017. The Challenge of Agricultural Pollution: Evidence from China, Vietnam and the Philippines; Directions in Development; World Bank: Washington, DC, USA.
- Agrilinks. 2019. Ration Formulation Software Enhances Farmer Productivity, Decreases Emission Intensity and Trains Nutritionists in Vietnam. Available online <https://www.agrilinks.org/post/ration-formulation-software-enhances-farmer-productivity-decreases-emission-intensity-and>
- MNRE. 2014. The initial biennial updated report of Vietnam to the United Nations Framework Convention on Climate Change. The Ministry of Natural Resources and Environment, Government of Vietnam. <https://unfccc.int/resource/docs/natc/vnmbur1.pdf>
- SRoV. 2020. Updated Nationally Determined Contribution (NDC). [https://www4.unfccc.int/sites/ndcstaging/PublishedDocuments/Viet%20Nam%20First/Viet%20Nam\\_NDC\\_2020\\_Eng.pdf](https://www4.unfccc.int/sites/ndcstaging/PublishedDocuments/Viet%20Nam%20First/Viet%20Nam_NDC_2020_Eng.pdf)
- LEDS. 2014. The Subnational integration of the Viet Nam Green Growth Strategy. <https://ledsgp.org/wp-content/uploads/2017/06/LEDSP-SNI-Viet-Nam-Final.pdf>



- Carbonari DE, Grosjean G, Laderach P, Nghia TD, Sander BO, McKinley J, Sebastian L, Tapasco J. 2019. Reviewing Vietnam's Nationally Determined Contributions: A New Perspectives Using the Marginal Cost of Abatement. *Frontier of Sustainable Food System*.  
<https://doi.org/10.3389/fsufs.2019.00014>

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