Towards a Robust Voluntary Carbon Market for Agriculture in India

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The Indian voluntary carbon market in agriculture must address the challenges faced by existing carbon-farming projects. Learnings from these can prevent low-quality credits, enhance credibility, and benefit farmers. This article offers insights and recommendations based on some of the published works at the International Maize and Wheat Improvement Center.

Imagine a marketplace where every sustainable farming practice translates into direct financial rewards for farmers. On 29 January 2024, the Indian government turned this vision into a reality with the introduction of the framework for a voluntary carbon market (VCM) in agriculture (PIB 2024). This initiative sets up a detailed process for agriculture carbon credit trading, encompassing project design, monitoring, third-party validation and verification, and the trading of credits. This new framework is modelled after established carbon crediting mechanisms like those of Verra, the leading certifying body in the global VCM. Its primary goal is to promote sustainable farming practices by enabling payment to farmers through the carbon market, thus driving market-led sustainable development. The introduction of this framework also brings up questions about whether India will develop its own standards and methodologies for agricultural carbon credits or adopt established ones like Verra's Verified Carbon Standard (VCS) and VM0042: Methodology for Improved Agricultural Land Management, v2.0 (Verra 2023) or Gold Standard's Soil Organic Carbon activity module for zero tillage. The chosen direction will significantly influence the framework's effectiveness and acceptance in the global market.

In agriculture, carbon credits can potentially increase the adoption of some sustainable practices and farmer profits. However, ensuring the credibility and quality of the initial carbon credits from this sector in the Indian VCM is crucial. Without this assurance, there is a risk that buyers might lose confidence in agricultural carbon credits, which could negatively impact the growth of the sector and the welfare of farmers. This concern is heightened by Verra's recent denial to register four Indian carbon-farming projects, which would have covered 1.7 million hectares and could have generated approximately 4.7 million carbon credits annually, which is equivalent to greenhouse gases (GHG) emissions from 11 billion miles driven by an average gasoline-powered passenger vehicle. The rejections were based on issues like poor-quality project documentation, non-compliance with VCS programme rules, and inadequate and incorrect details on critical aspects such as land tenure, ownership, measurement, additionality, and productivity leakage.

Despite extensive discussions about carbon markets, the experiences from the Indian fields where these markets are intended to make an impact often remain overlooked. Drawing from insights provided by case studies and surveys conducted by researchers at the International Maize and Wheat Improvement Center (CIMMYT) in Madhya Pradesh, Haryana, Telangana, Maharashtra, and Karnataka—covering 10 carbon-farming projects—and from interactions with project developers and stakeholders, key recommendations for the Indian VCM are presented (Khurana et al 2023; Cariappa and Birthal 2023; Cariappa et al 2024; Cariappa and Krishna 2024).

Transparency

Transparency issues plague the agricultural carbon credit market, from project documentation to the secrecy of locations and carbon credit sales and retirements. Under VCS, developers are expected to disclose project locations publicly unless such disclosure poses a significant risk. Several agriculture carbon credit project developers choose not to disclose the exact project location. An example that stems from CIMMYT's experience conducting surveys and case studies is the reluctance of project proponents and field teams to share details about the projects or allow interaction with the farmers involved. This secrecy, often justified by claims of the project being in its nascent stages or not yet registered, breeds suspicion and scepticism. The hesitance to engage with external researchers hints at potential irregularities or shortcomings within the projects.

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Such behaviour not only impedes research and due diligence but also casts a shadow over the entire initiative, suggesting that there might be aspects that stakeholders are not keen on disclosing. Therefore, the Indian VCM must ensure that the geo-coordinates of villages where the project operates should be disclosed once the project is established. This allows researchers, journalists, auditors, and other interested parties to easily locate project villages and will also prevent other projects from overlapping with the same villages.

Additionality

The question arises whether agricultural methodologies will adhere to Verra's "common practice" and "regulatory surplus" criteria for additionality, which mandates that the pre-adoption rate of project activities must be under 20% and that the practice should not be legally banned, respectively (Verra 2023). CIMMYT's findings indicate that significant polluting activities, like crop residue burning, fail to qualify for carbon projects because they exceed this threshold and are further disqualified by regulatory surplus conditions where state bans, such as those in Punjab and Haryana, make mitigation ineligible for carbon credits (Cariappa et al 2024). In 2020, according to a study led by Indian Institute of Science Education and Research (IISER) Bhopal, GHG emissions from crop residue burning surged to 10 million tonnes CO_2e in Madhya Pradesh, a 240% increase, and to 15 million tonnes CO_2e in Punjab, up by 46%, compared to 2011 levels (Deshpande et al 2023). Avoiding 30% of crop residue burning emissions in Madhya Pradesh and Punjab through carbon credit projects could conservatively yield ₹370 crore for farmers, assuming $10 per credit and 60% revenue share to farmers. Given that bans have not effectively reduced residue burning, there is a compelling case for exemptions within the "common practice" and "regulatory surplus" criteria for such heavily polluting practices. A minimum cut-off level of GHG emissions could be set to select practices for exemptions.

Measurement, Monitoring, Reporting, and Verification

Measurement, monitoring, reporting, and verification (MRV) is a crucial step where project developers monitor and measure the emissions reductions achieved by their projects, have these results audited by third-party auditors, and report them to carbon credit certifying bodies.

The Indian VCM for agriculture should integrate modern technologies such as remote sensing, satellite imagery, sensors, smartphones, blockchain, and automation, in addition to field visits, to make the process more efficient. Recent research has questioned the methodologies used for estimating emissions' reductions against baseline emissions, pointing out that reductions observed post-project might not solely be due to the project activities (West et al 2020, 2023). This raises the question of whether efforts will be made to include control sites—areas where project activities are not implemented—in addition to the baseline scenario to estimate emission reductions more robustly. The methodology for agriculture in India could benefit from incorporating elements from established methodologies, like those from Verra and the Gold Standard, which have been subjected to public consultation, as well as from newer methodologies like the ABACUS VCU label, which mandates the use of control sites.

Critics argue that soil carbon sequestration is slow, measurements are challenging, and the models used for estimating carbon sequestration or GHG emissions reduction are inaccurate, making it scientifically challenging to precisely estimate soil carbon or GHG emissions reduction. Recognising that science does not always perfectly translate into practice is crucial. Although the direct measurement of GHG emissions or soil carbon is costly and still improving for certain practices, a scalable model should be adopted in the Indian VCM. An example of such a model could be—Step 1: track adoption of practices (using remote sensing, crowdsourcing, digital tools, etc), Step 2: conduct direct measurements in small samples across the project area and use this as an emission factor to estimate emissions reduction or carbon storage in soil, Step 3: use the standard Intergovernmental Panel on Climate Change (IPCC) emissions reduction factor to estimate GHG/soil carbon, and Step 4: calculate carbon credits using the lower of the estimates from Steps 2 and 3. Recent estimations suggest that direct measure-and-remeasure approaches for soil organic carbon crediting can be economically viable if implemented at a scale (Potash et al 2025).

Auditors

Third-party auditors, also known as validation and verification bodies (VVBs), are crucial in ensuring that projects meet all the rules and requirements of the VCS programme. They verify that the implementation and emission calculations are both robust and accurate, providing buyers with the confidence that the carbon credits they purchase are credible and positively contribute to combating climate change.

However, the integrity of this system is compromised when VVBs receive their audit fees from the project developers themselves. This situation poses a potential conflict of interest that might compromise the transparency and reliability of carbon credit verification. The limited public access to details about the compensation paid by project developers to the auditors exacerbates the problem, casting doubts on the audit process's integrity. While VVBs provide a reasonable level of assurance, the absence of certainty regarding the robustness of their findings under independent scrutiny raises concerns about possible audit fraud. Three of the four projects for which Verra recently denied registration were associated with the same VVB. This means the VVB had validated that the projects complied with VCS rules and verified the GHG emissions reductions or carbon sequestration. However, Verra subsequently denied registration and verification, citing reasons such as incorrect or incomplete documentation, issues with measurement, additionality, among others. This situation indicates that both the project developers and the VVB may lack the technical expertise required to fully understand and

address the complexities involved in agriculture and the adoption of new technologies or practices.

Addressing these concerns requires a systemic rethinking of the auditing process within the agricultural carbon credit sector. To instil confidence in the carbon credits market, especially among buyers keen on contributing to climate change mitigation, it is imperative that Indian VCM for agriculture specify clear guidelines on the selection and operation of third-party auditors. The guidelines for the Indian VCM should mandate that auditors have a thorough understanding of agricultural practices or engage the expertise of agricultural scientists from Indian Council of Agricultural Research (ICAR) institutes and state agricultural universities. This is crucial to ensure that the audits are conducted with a deep and accurate knowledge base. Additionally, it is important that these auditors are capable of performing independent reviews, uncompromised by any financial dependencies on project developers. Such measures will bolster the integrity and credibility of the carbon verification process. Moreover, the audit process should be transparent, with full disclosures of audit findings and compensation details, to prevent any measure of bias or conflict of interest.

Process Efficiency

One of the challenges in the VCM is the extensive time required for due diligence. The process—from finding and contacting auditors, to having them validate, verify, and submit their reports, and finally for standards bodies to certify and issue carbon credits—can take between one and two years. For example, Verra's VM0042 methodology for improved agricultural land management, which has been active since October 2020, has not seen any of its projects registered or certified carbon credits issued. This lengthy time frame can hinder the effectiveness and appeal of agri-based carbon credit projects, particularly in smallholder agricultural settings.

The focus should be on reducing this process time by utilising modern digital technologies such as blockchain, remote sensing, satellite imagery, and the internet of things. A maximum time limit of, say, 15–30 days for auditors and 15–30 days for certifying mechanisms should be stipulated. The issuance and sales of carbon credits should be aligned with the farming seasons to ensure a higher and more sustained impact, allowing farmers to receive money when it is most needed.

Cross-border Trade

Sustainable agriculture projects can claim both carbon credits (for storing carbon or reducing GHG emissions) and green credits (for co-benefits such as water savings, biodiversity conservation, etc) in India. However, as the Indian VCM begins operations, questions arise: Can Indian projects participate in the global VCM through standards like Verra, Gold Standard, and Plan Vivo? What will happen to existing projects? How will it be ensured that the carbon credits generated are tracked and not traded simultaneously in both domestic and international markets? Clarity on these issues is expected.

Inclusion

CIMMYT's survey revealed that marginalised communities (Scheduled Caste and Scheduled Tribe) and small farmers are excluded from carbon-farming projects, with women's participation being less than 5% (Cariappa and Krishna 2024). Policies could implement differential pricing to encourage the participation of small farmers, women, and marginalised caste groups in carbon-farming projects. Projects that demonstrate greater gender and social inclusivity should receive higher prices. Efforts towards more inclusive carbon credit projects should be prioritised for inclusive development, embodying the ethos of "Sabka Saath, Sabka Vikas."

Affordability and Accessibility

To enhance the accessibility and affordability of the VCM for project developers, particularly those involving marginal and small farmers, there is a need to reduce the costs associated with listing, validation, verification, registration, and issuance. Stipulating "no minimum land requirements" to register a project will lower the barriers to entry, enabling broader participation and ensuring the equitable distribution of benefits across all land classes of farmers.

Payments and Farmers' Share

To protect farmers from exploitation and ensure they receive fair compensation, it is essential to stipulate a minimum share of the gross or net revenue from the sales of carbon credits. This should be done in consultation with project developers, farmer groups, and other relevant stakeholders. Although project developers claim that 70%–80% of the revenue goes to the farmer, this often refers to the net revenue after deducting expenses such as listing, validation, verification, registration, issuance charges, and brokerage fees. Consequently, what reaches the farmers may be less than 50% of the gross revenue.

Prices

Carbon credit prices are a crucial factor and could be the major driver of success for the Indian VCM. The High-Level Commission on Carbon Prices (2017), led by Joseph Stiglitz and Nicholas Stern, recommends setting carbon prices at \$40–\$80 per tonne of CO_2 by 2020 and \$50–\$100 by 2030 to meet the Paris Agreement targets. However, current prices are trading significantly lower at \$1–\$6 in marketplaces and less than \$40 in over-the-counter (OTC) deals. Our research indicates that prices should be at least higher than \$42 to incentivise practice changes by farmers (Cariappa et al 2024).

To address this, the Indian VCM could establish a protocol to add price premiums to projects that provide meaningful co-benefits. For example, projects contributing to women's empowerment could receive a price premium of \$5 per credit, social inclusion could also add \$5 per credit, and projects where more than 80% of participants are small and marginal farmers could receive a premium of \$10 per credit. Such a structure would allow interested buyers to purchase premium credits that include additional developmental co-benefits.

Additionally, opening the market to retail buyers could increase the demand for carbon credits. This would likely improve both the quality and the due diligence processes, thereby enhancing the credibility and overall quality of the Indian VCM.

In conclusion, the newly introduced framework for VCM in the agriculture sector in India seeks to enhance sustainable agricultural practices by integrating carbon credit trading. This initiative, while promising, faces challenges in ensuring the credibility and quality of agricultural carbon credits, which are essential for maintaining market confidence and supporting farmer welfare. Key issues identified include the need for increased transparency in project documentation and operations, adherence to rigorous standards for additionality and emissions measurement, the potential conflict of interest in the auditing process, and exclusion of marginalised sections of society. Recommendations for improving the framework encompass enforcing stringent transparency and auditing standards, incorporating modern technology in the MRV processes, reducing the time required for the certification of carbon credits, project developers and auditors seeking the technical expertise of subject-matter specialists, and creating an incentive structure for valuing the co-benefits of the project. Additionally, addressing the exclusion of marginalised communities and ensuring equitable benefits distribution is crucial for the inclusivity and success of the VCM. These improvements are vital not only for the effectiveness of the Indian VCM and acceptance of the VCM within global markets but also for the broader goal of sustainable development in the agricultural sector.

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