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Scaled-up crediting approaches

for high-integrity agricultural carbon markets

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Executive Summary

Scaled-up crediting approaches such as jurisdictional and policy-based mechanisms can offer a policy-aligned model for aggregating mitigation outcomes across agricultural landscapes and rewarding sector-wide performance. By positioning national or subnational governments as program proponents, jurisdictional agricultural carbon (JAC) models align climate mitigation with food security, land governance, and adaptation goals, while facilitating crediting against jurisdictional or sectoral baselines. Policy-based mechanisms further broaden the scope of eligible interventions by linking crediting to regulatory or incentive-driven reforms rather than isolated projects.

This document synthesizes the state of knowledge on scaled-up carbon crediting approaches in the agriculture sector, focusing on their typologies, institutional designs, integrity risks, and alignment with carbon market mechanisms, especially under Article 6 of the Paris Agreement. Drawing on evidence from early movers including Ghana, Vietnam, Guyana, and Acre (Brazil), we categorize emerging scaled-up approaches into four broad types: nested jurisdictional crediting, policy-based crediting, results-based sovereign finance, and cross-border mechanisms. These models differ in their institutional setups, MRV approaches, crediting mechanisms , and potential for engaging in Article 6, but share commonalities regarding aggregation, public oversight, and alignment with national climate commitments.

The paper argues that while jurisdictional crediting in agriculture remains nascent, with most scaled-up crediting to date concentrated in the forest sector, pilot experiences demonstrate both technical feasibility and strategic relevance for scaling carbon markets in the agriculture sector. Early initiatives in the agroforestry, rice and livestock sectors suggest that agricultural mitigation can be credibly aggregated, cost-effectively monitored, and nested within broader land-use frameworks, provided that robust legal, technical, and financial enabling conditions are met. Importantly, these jurisdictional efforts should also align with the broader architecture of the Paris Agreement, including national climate targets and reporting under the Enhanced Transparency Framework (ETF), Biennial Transparency Reports (BTR), and national greenhouse gas emissions inventories (NEI).

To unlock the potential of JAC across the Global South, targeted policy action is required. This includes putting in place legal and institutional frameworks to regulate voluntary and Article 6 carbon markets participation, establishing sectoral baselines in alignment with national transparency reporting, investing in cost-effective MRV and registry systems, and developing benefit-sharing mechanisms to ensure equitable inclusion of producers, particularly smallholders. Regional collaboration, public-private partnerships, and readiness support such as that provided by the Partnership for Agricultural Carbon (PAC) can further accelerate uptake and integrity.

This working paper is a product of the PAC Executive Secretariat. It forms part of PAC's broader commitment to promoting open access, integrity, and regional collaboration in advancing agricultural carbon market readiness. The papers carry the names of the authors and should be cited accordingly As a work in progress, this document aims to inform debate and accelerate learning across governments, experts, and stakeholders. All views expressed are those of the authors and do not necessarily reflect the positions of PAC's member institutions.

Note to Readers

This working paper was drafted by BIOCARBON acting as Partnership for Agricultural Carbon (PAC) Executive Secretariat. It has benefitted from the generous contribution of the Voluntary Carbon Markets Integrity Initiative (VCMI) and the institutional support of the Inter-American Institute for Cooperation on Agriculture (IICA). The views expressed in this information product are those of the authors and do not necessarily reflect the views or policies of PAC, IICA or VCMI.

It was prepared in close collaboration with the PAC Expert Group, members, and technical partners. It reflects a collective effort to distill emerging lessons and strategic options for scaling agricultural carbon approaches with integrity and inclusivity, in alignment with evolving Article 6 frameworks.

Scaled-up agricultural carbon crediting approaches offer a promising pathway to overcome long-standing limitations in agricultural carbon finance and mobilize mitigation at the pace and scale needed to achieve the goals of the Paris Agreement. They warrant immediate attention and investment from policymakers, donors, and carbon market actors seeking scalable, inclusive, and high-integrity climate solutions.

The document synthesizes input from early pilots, international standards, and national experiences across PAC partner countries. It serves as a working basis for discussion and knowledge-sharing within the PAC community and the wider carbon market ecosystem.

This version incorporates feedback received during the November 2025 public consultation process, including valuable comments from Klas Wetterberg, Donna Lee, Remo Filleti, and Ronny Cascante, submitted on a personal basis. Ciniro Costa Jr. contributed on behalf of the Alliance of Biodiversity International and CIAT. We gratefully acknowledge their insights, which have strengthened the draft.

While this version reflects consultation inputs, it retains its working and consultative status. Further feedback is warmly welcomed to help shape a revised submission to a peer-reviewed academic outlet in 2026. Our goal is to ensure that PAC's technical guidance remains open, evolving, and grounded in practical experience.

The PAC Secretariat welcomes comments and suggestions at: rlopez@biocarbon.com.ec

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Scaled-up Crediting Approaches for High-Integrity Agricultural Carbon Markets[1]

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1. Introduction: unlocking the potential of jurisdictional approaches in agriculture

1.1 Emissions-finance gap and the case for fit-for-purpose approaches in agriculture

Agrifood systems generate roughly one-third of global GHG emissions (Costa et al., 2022; Crippa et al., 2021), yet agriculture receives only a small share of climate finance and represents less than 1% of issued carbon credits (CLIC, 2025; Wollenberg et al., 2025). This emissions-finance gap persists despite the sector's potential to deliver up to a quarter of the mitigation needed for 1.5°C, particularly through soil-based interventions (Roe et al., 2021). Underinvestment stems from structural and technical barriers that heighten perceptions of low integrity and high risk: highly fragmented smallholder systems, heterogeneous agroecological conditions, unclear land tenure, weak institutional capacity, and high MRV costs (CNA, 2025; PAC, 2023; Siemons et al., 2022). Project-level carbon crediting models struggle in this context, as dispersed smallholder landscapes limit scalability, diverse farming systems complicate baselines and additionality, and insufficient spatial data undermines robust MRV (Rosenstock et al., 2016). These constraints contribute to leakage, non-permanence, and methodological mismatches between existing frameworks and the realities of tropical agriculture (Costa Junior et al., 2025; FAO, 2024; PAC, 2025).

In response, attention is shifting toward scaled-up approaches that aggregate mitigation outcomes and embed carbon strategies within public policy frameworks (Besley et al., 2017; Nepstad et al., 2013). Jurisdictional, sectoral, and policy-based carbon crediting models offer a more systemic alternative by enabling governments to align mitigation with food security, land-use planning, and climate commitments (Knoke et al., 2012). By leveraging economies of scale and coordinated oversight, these approaches reduce MRV costs, improve data quality, distribute implementation risks, and strengthen environmental integrity through nested baselines and multi-level verification (Costa Junior et al., 2025; Von Essen & Lambin, 2021). Crucially, they allow the development of locally adapted methodologies better suited to the complexities of tropical and smallholder-dominated systems, positioning jurisdictional and policy-aligned mechanisms as promising pathways to close the emissions-finance gap in agriculture (Wetterberg et al., 2025).

Table 1 summarizes these approaches and links them to typologies discussed in Section 2.

Table 1. Approaches to carbon crediting relevant to agriculture

Approach	Reference	Objective	Illustrative Examples
Project-based	Project-based (for contrast only)	Support mitigation at individual farm or site level	Reforestation, biodigesters, or AWD at farm level (methodologies under Verra, Gold Standard)
Programmatic	Typically precursor to scaled-up approaches	Aggregate small-scale projects under standardized frameworks	Household biogas, improved cookstoves (methodologies under CDM, Gold Standard PoAs)
Policy-based	Policy-Based Crediting	Credit mitigation outcomes from public policy implementation	Rice pilots (Ghana, Vietnam); sectoral emissions standards

Approach	Reference	Objective	Illustrative Examples
Jurisdictional	Nested approaches	Align crediting with subnational/national emissions baselines	Acre (Brazil), Guyana LCDS 2030, ART-TREES, LEAF Coalition – agroforestry removals (LEAF Coalition, 2022)
Sectoral	Cross-Sector or Cross-Border	Aggregate mitigation outcomes at sectoral level across jurisdictions	Power sector reforms (JETP, 2025); livestock methane tracking in national inventories

Box 1. Landscape Planning: a foundational lens for scaled-up agricultural carbon crediting

Why landscape planning matters
Carbon mitigation in agriculture is deeply intertwined with how land is managed across entire landscapes, not just individual farms or plots. Landscape planning provides a spatial and governance framework to balance climate goals with food production, biodiversity protection, water security, and rural livelihoods. It allows for strategic zoning of mitigation activities (e.g., forest conservation, agroforestry, silvopastoral intensification), enabling alignment between national climate targets and local land-use decisions (Knoke et al. 2012).

Core principles of landscape-level approaches
- ***Diversity of interventions:*** Jurisdictional or landscape programs support a mix of mitigation activities (e.g., pasture rehabilitation, manure management, reforestation) that reflect local agroecological and socioeconomic conditions.
- ***Spatial integration:*** Planning considers ecosystems and production areas as interconnected units, enabling coordinated action at scale (e.g., riparian buffers, forest frontiers, degraded grazing lands).
- ***Governance and aggregation:*** Public institutions, cooperatives, or producer alliances play a key role in aggregating smallholder mitigation and managing carbon programs across landscapes.

Co-benefits and carbon value creation
Well-designed landscape-level programs not only generate carbon credits but also deliver measurable social and ecological gains contributing to Sustainable Development Goals:
- Increased productivity and food security through improved land management and technical support.
- Biodiversity conservation via habitat connectivity and agroforestry corridors.
- Poverty reduction and inclusion as smallholders access finance, markets, and advisory services.

From pilots to programs
Emerging landscape-level pilots in Latin America, Southeast Asia, and Africa demonstrate the potential of integrating jurisdictional planning with Article 6-linked programs. Governments are increasingly acting as program managers or aggregators, linking carbon markets to development goals. While baseline setting, additionality, and monitoring pose challenges, landscape planning provides a coherent structure for scaling up agricultural mitigation with integrity (PAC, 2023).

1.2 Potential of scaled-up carbon crediting approaches for the agricultural sector

The limitations of project-based approaches have prompted a growing interest in carbon crediting models that operate at the scale of entire jurisdictions. Jurisdictional approaches (JAs) aim to align carbon finance with national or subnational climate goals, creating a pathway for large-scale mitigation efforts that are both inclusive and verifiable. Rooted in REDD+ experience (Negra & Wollenberg, 2011), JAs are now evolving beyond the forestry sector to encompass agriculture, offering promise in a sector where project models have often fallen short (PAC, 2023).

Jurisdictional crediting approaches are typically government-led initiatives that apply standardized MRV systems and policy-aligned incentives across an entire territory (Von Essen & Lambin, 2021). By aggregating emissions reductions across a defined area such as a province, region, or national boundary, these approaches help mitigate the risks of leakage and fragmentation that have long plagued project-based efforts (Anderegg et al., 2025; Boucher & Elias, 2013; Pan et al., 2020). Unlike discrete project interventions, jurisdictional agricultural carbon (JAC) enables integrated land-use planning, nested baselines (Cano et al., 2021), and coordinated benefit-sharing (Sienna Healy et al., 2023; Wong et al., 2019).

In agriculture, jurisdictional approaches include climate-smart livestock systems (Costa et al., 2025; Micol & Costa, 2023), agroforestry, and improved soil management initiatives (PAC, 2023). By embedding these practices within broader policy reforms such as public loans andsubsidies for climate-smart irrigation or fertilizer regulation, governments can mobilize a broader base of producers while also ensuring alignment with their Nationally Determined Contributions (NDCs) and subnational development plans (PAC, 2025). For farmers and producers, jurisdictional agricultural carbon (JAC) programs reduce individual transaction costs, ease MRV burdens, and improve smallholders' access to carbon markets. Jurisdictional approaches also enable policy-based crediting where incentives are tied to sector-wide shifts such as irrigation reform or livestock standards creating opportunities to drive structural change beyond individual projects. Jurisdictional programs can also be designed to bundle productivity-enhancing co-benefits such as land restoration or water access making participation more attractive and equitable (Costa Junior et al., 2025; Siemons et al., 2022). The involvement of public actors facilitates investments in infrastructure and data systems that are often out of reach for project developers or cooperatives operating alone.

Importantly, scaled-up crediting approaches are well positioned for integration with emerging international carbon market mechanisms and carbon pricing frameworks. Agricultural mitigation, when implemented through domestic programs or policy reforms, can be integrated into a country's NDC, offering a credible pathway for generating and transacting credits under Article 6.2. Models such as ART-TREES, originally developed for forest crediting, are also exploring ways to expand coverage to agriculture, offering further potential for integrated land-sector accounting (L. Lee & Ignaciuk, 2025).

2. Typologies, design features and integrity of scaled-up crediting approaches

2.1 Emerging approaches and structural variations

Scaled-up crediting initiatives encompass a spectrum of models that differ in institutional scope, sectoral reach, crediting structure, and alignment with national climate goals. These differences reflect both evolving market demands and contextual realities such as the level of decentralization, agricultural system complexity, and policy maturity.

Scaled-up crediting approaches vary first by scale, with efforts at the national level often grounded in formal climate targets (e.g., NDCs), while subnational programs tend to emerge

where regional governments have jurisdiction over agriculture, land-use planning, or environmental regulation. Subnational approaches often strike a balance between policy leverage and context-specific implementation. For instance, Acre's REDD+ nesting framework and Mato Grosso's Produce-Conserve-Include (PCI) strategy provide early examples of integrated land-use programs designed with agricultural dimensions in mind (Von Essen & Lambin, 2021).

Approaches also differ in sectoral scope. While some programs target a single commodity or production system (e.g., low-emissions livestock or sustainable cocoa), others take a multi-sector approach, simultaneously addressing restoration and emissions from crops, livestock, or soils. For instance, subnational initiatives such as the Antioquia Emission Reduction Program in Colombia are using result-based payment schemes to integrate sustainable livestock, reforestation, and coffee systems under jurisdictional frameworks (Gobernación de Antioquia & Grupo Banco Mundial, 2025). Similar multi-sectoral efforts include the Orinoquia Integrated Sustainable Landscapes Project and BioCarbon Fund programs in Ethiopia, Indonesia, Mexico, and Zambia (Biocarbon Fund, 2025). These integrated models are better positioned to align with broader development and food security priorities but often require more sophisticated coordination and MRV systems.

A third key axis of variation is the crediting framework. Scaled-up approaches can follow (see (OECD, 2025a; World Bank, 2025):

- a nested model, where individual projects are embedded within a jurisdictional baseline and accounting framework;
- a policy-based model, where crediting is linked to sectoral interventions, such as fertilizer regulation or shifts in irrigation practices; or
- results-based finance (RBF) models, where sovereign governments are paid for verified GHG reductions at the jurisdictional level.

These design choices affect not just how mitigation is measured and monetized, but also the integrity of credits issued. For example, policy-based programs may struggle with attribution regarding who gets credit for the reductions, while nested models raise questions of double counting and baseline alignment. Addressing these technical issues is essential to ensure that credits meet the different eligibility requirements of compliance systems and those of voluntary carbon markets (VCM), each of which applies distinct standards for additionality, permanence, and accounting rigor. The following diagram synthesizes key scaled-up crediting typologies and their directional implications for core elements of integrity including robust quantification, additionality, permanence, socio and environmental safeguards and MRV across time (as illustrated in Figure 1).

The figure synthesizes the expected performance of different scaled-up crediting models along three dimensions. The horizontal axis "Time" refers to the general evolution of program maturity and institutional readiness, acknowledging that some approaches tend to deliver more robust and verifiable outcomes only after systems and institutions strengthen over time. The vertical axis

“GHG emissions” points to level of mitigation outcomes. The vertical axis "Integrity" reflects the relative robustness of each approach with respect to jurisdictional baselines alignment, attribution clarity, MRV systems and safeguards. The curved line is conceptual and does not represent actual GHG emission levels or any quantitative performance benchmark. Instead, it functions similarly to a production possibility frontier: it illustrates an indicative boundary of how integrity and programmatic readiness may co-evolve over time under typical institutional conditions. Positions along the curve reflect commonly observed configurations in current scaled-up crediting models.

Integrity levels vary across models because some such as nested/jurisdictional approaches anchor crediting in government-led MRV and baselines, whereas others face greater attribution and oversight challenges. Importantly, positions beyond the curve should not be interpreted negatively. On the contrary, such positions may indicate emerging or innovative models that surpass existing configurations, whether due to exceptional institutional strength or novel program design. This diagram is intended to be directional, not evaluative, and is meant to stimulate discussion around how integrity might scale with supportive enabling conditions.

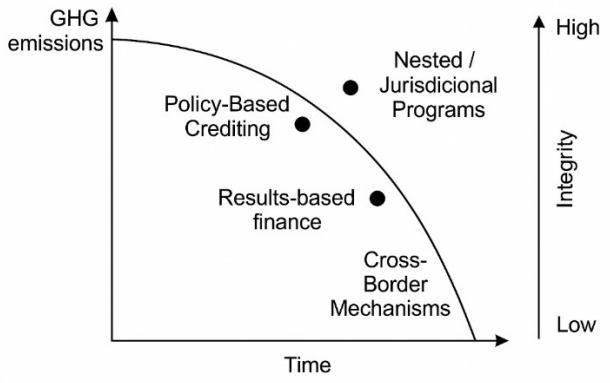

Figure 1. Typologies of scaled-up crediting approaches and implications for integrity. Source: In-house analysis based on OECD (2025) and World Bank (2025).

Figure 1 shows that while approaches differ in design, more integrated jurisdictional models tend to offer higher integrity when supported by strong institutional and policy frameworks. Please note that these typologies are not mutually exclusive. Hybrid approaches e.g., results-based programs using nested baselines are increasingly common as countries experiment with combinations suited to their institutional and technical capacities.

2.2 Key institutional and governance features that define scaled-up approaches

While scale sectoral scope, and crediting framework define the outer contours of scaled-up approaches, their effectiveness hinges critically on governance design. Public institutions are foundational actors in scaled-up crediting governance. As standard setters and coordinating entities, governments define policy baselines (UNFCCC, 2025a), enable cross-sectoral

collaboration, and often serve as the authorized proponents for jurisdictional crediting. Strong public-sector leadership enhances alignment with long-term climate goals, while also reinforcing permanence safeguards by embedding mitigation outcomes within regulatory frameworks (FAO, 2024; Macdonald et al., 2024; Streck, 2021; Von Essen & Lambin, 2021). In many cases, public agencies also facilitate access to international support and ensure compatibility with Article 6 modalities through national registry systems.

Equally important is the role of producers, especially smallholders, who ultimately implement on-the-ground mitigation activities. Inclusive governance arrangements are central to building local ownership and ensuring that crediting programs reflect the realities of diverse agricultural landscapes. Ideally, high-functioning scaled-up approaches can foster participatory structures that allow farmer organizations, civil society, and local authorities to shape program design, co-manage implementation, and influence benefit-sharing arrangements (PAC, 2023). This bottom-up engagement not only enhances program legitimacy but also supports adoption of sustainable practices through social learning and co-investment (Wong et al., 2019).

A final dimension of institutional design concerns the linkage between scaled-up approaches and national climate strategies. Integration with national MRV systems, GHG inventories, and NDC targets is increasingly a prerequisite for participation in international carbon markets, especially under the Paris Agreement's Article 6 framework. As shown in Table 2, the extent and nature of this integration vary across scaled-up crediting typologies. Nested programs often align with Article 6.2 and 6.4 mechanisms, whereas policy-based and results-based models may function as stepping stones toward full market engagement. Notably, some jurisdictions are exploring how agricultural mitigation can be incorporated into existing REDD+ architectures such as ART-TREES through nested accounting and joint registry infrastructure (J. Lee et al., 2015).

Ensuring environmental and accounting integrity in this context depends not only on technical architecture but also on institutional arrangements. State oversight plays a critical role in validating emission reductions, avoiding double counting, and enforcing crediting rules through domestic registries, transparency systems, and legal mechanisms. This underscores the value of public governance structures in scaled-up approaches to facilitate credible Article 6 participation. While design features take different forms, a common thread across successful scaled-up approaches is the alignment of incentives, policy frameworks, and MRV systems to deliver integrity and scalability. The next section explores how these approaches can uphold environmental integrity while ensuring equitable benefit-sharing.

Table 2. JAC Approaches crediting pathways and Art 6 integration

Type	Crediting Pathways	Integration with Art 6
Nested/Jurisdictional Programs	Compliance/voluntary market credits, nested under a jurisdictional baseline	Eligible under both Article 6.2 (ITMOs) and Article 6.4 (UN mechanism)
Policy-Based Crediting	Results-based payments for policy outcomes.	Designed for Article 6.2 bilateral approaches (TCAF, LEAF Coalition)

Results-Based Finance / Sovereign Incentives	Non-market results-based payments; some linked to Emission Reduction Purchase Agreements (ERPAs)	Typically non-market but can serve as precursors to Article 6 integration
Cross-Border Mechanisms	Domestic market established for mitigation outcomes that contribute to a block of country's NDC (e.g. EU).	Potential for 6.2 linkages if transboundary ITMOs are pursued

2.3 Ensuring integrity in scaled-up agricultural carbon crediting

Jurisdictional approaches offer a promising pathway to climate mitigation at scale, but they also operate in a context where social, environmental, and market integrity risks remain significant. In the agricultural sector, these risks include uncertain additionality, limited permanence, leakage across landscapes, challenges in accurately quantifying emissions, and fragmented land tenure, all of which complicate monitoring and enforcement (Antoniou et al., 2024; Boucher & Elias, 2013; FAO, 2024a; Filewod & McCarney, 2023, 2023; Ostwald & Henders, 2014; Pan et al., 2020). The diversity of production systems, seasonal variability, and socioeconomic heterogeneity further compound the complexity of ensuring robust mitigation outcomes. Moreover, weak institutional capacity in many jurisdictions can exacerbate risks of double counting or non-transparency.

Maintaining integrity in this context is essential to attract credible investment, support policy alignment, and ensure that mitigation outcomes are real and durable. A major advantage of scaled-up models lies in their capacity to proactively address these challenges through nested accounting, broader enforcement capacity, aggregated MRV systems, and alignment with national policy frameworks (Schwartzman et al., 2021). These features allow for better risk distribution and create enabling environments that enhance both the credibility and impact of agricultural mitigation efforts. In addition, scaled-up programs could further support permanence by signaling long-term policy commitments and providing stable enabling conditions that encourage continued adoption of climate-smart practices over time.

Jurisdictional approaches provide a standardized and locally adapted framework to address the heterogeneity of projects within a given jurisdiction. This enables the development of more credible baselines grounded in national or subnational data, along with nested MRV systems that track emissions outcomes across entire landscapes. Such approaches can also improve additionality assessments, especially when crediting is tied to policy shifts or government-led interventions (Siemons et al., 2022; Von Essen & Lambin, 2021).

Robust quantification in scaled-up approaches is enabled through nested baselines that link project-level data to jurisdictional or national reference levels, reducing uncertainty and improving comparability. Consistent MRV frameworks, harmonized protocols, and shared datasets, including Soil Organic Carbon, can provide standardized measurement across diverse production systems (Ceschia et al., 2025; Smith et al., 2012). Alignment with national MRV platforms further supports validation, avoids duplication, and strengthens the credibility of credited outcomes (Oldfield et al., 2022). However, the effective implementation of such systems

depends on adequate institutional capacity for enforcement, monitoring, and data management (Smith et al., 2012, 2020).

Scaled-up approaches also strengthen market integrity by consolidating crediting under unified baselines and registries, reducing project fragmentation. This supports greater alignment with Article 6 mechanisms (OECD, 2023), reduced transaction costs and demand aggregation. Programs like the BioCarbon Fund demonstrate how government-backed, results-based mechanisms can unlock finance where strong demand signals exist. Transparency can be further bolstered through the use of open data platforms and standardized methodologies (Baron & Ellis, 2006; McLaren et al., 2025; Ravikumar et al., 2015; Wetterberg et al., 2025; World Bank, 2025). Scaled-up approaches contribute to this by integrating with national or jurisdictional registries, allowing aggregated crediting to be tracked transparently, avoiding double counting, and remaining consistent with national MRV systems and Article 6 reporting. To ensure long-term credibility, MRV and registry systems, these approaches should also align with the broader Paris Agreement architecture, including the Enhanced Transparency Framework (ETF), Biennial Transparency Reports (BTR), and national GHG inventories (Falduto et al., 2021; Weikmans et al., 2021). This alignment facilitates consistency across reporting instruments (Kessler et al., 2021) and supports future eligibility under Article 6 (Falduto et al., 2021; Macinante, 2018). As summarized in Table 2, crediting approaches within scaled-up models vary in how and to what extent they integrate with Article 6 mechanisms which is an essential design consideration for ensuring future eligibility and market access.

Finally, by embedding policy safeguards, scaled-up approaches are well placed to advance equity and social integrity. Unlike fragmented project models that risk elite capture or exclusion of smallholders, jurisdictional approaches can institutionalize benefit-sharing mechanisms and participatory governance, ensuring that local producers, particularly smallholders, have a meaningful stake in the carbon value chain (Cubas-Baez et al., 2025; McLaren et al., 2025; Wong et al., 2019). Together, these institutional features make scaled-up approaches a uniquely robust framework for scaling mitigation while preserving environmental and social integrity.
To translate this potential into large-scale impact, jurisdictional approaches must navigate practical implementation challenges ranging from governance capacity to market design. The next section presents stylized insights from case studies representing each emerging typology, followed by a discussion in Section 4 of the key implementation challenges identified.

3. Case Studies: Stylized insights from early movers

Pioneering jurisdictions offer valuable insights into how agricultural mitigation can be integrated into jurisdictional crediting, either directly or through broader land-use strategies (see Wunder et al., 2020). The following case studies illustrate early efforts, focusing on institutional models, MRV approaches, crediting pathways, Article 6 linkages, and agricultural relevance (see Table 3).

3.1 Ghana and Vietnam: Policy-based crediting in the rice sector

Policy-based crediting is gaining traction as a viable approach to agricultural mitigation, especially in contexts where governments can steer sector-wide interventions. Ghana (UNDP, 2024b) and Vietnam (GS, 2024b, 2024a) offer two of the most advanced national-level pilots, both leveraging policy instruments to drive methane reductions in irrigated rice systems. These efforts are part of the country's NDC, and the outcomes should be reflected in the BTR and the NEI under the ETF of the Paris Agreement.

Jurisdiction and Policy Objective: Both Ghana and Vietnam have prioritized methane mitigation from rice cultivation as a key pillar of their agricultural climate strategies. These initiatives aim to reduce emissions by transitioning farmers from traditional continuous flooding to Alternate Wetting and Drying (AWD), a practice that has been demonstrated to significantly reduce methane emissions without compromising yields. The crediting approach focuses not on individual projects, but on the effectiveness of public policies to drive large-scale behavioral shifts.

Institutional Setup: Programs are nationally led, with central coordination by relevant line ministries. In Ghana, the Ministry of Food and Agriculture oversees implementation, supported by development partners and technical experts. In Vietnam, the Ministry of Natural Resources and Environment plays a similar coordinating role. This top-down institutional structure enables alignment with national development plans, climate targets, and the existing agricultural extension infrastructure.

MRV and Baseline Approach: Both countries have developed sectoral baselines that reflect historical irrigation practices (see Teo et al., 2023) and regional agroecological conditions. MRV frameworks are built on modeled emission factors and performance metrics, such as irrigation frequency and water use efficiency, rather than requiring direct plot-level measurements. This allows for a scalable and cost-effective approach to MRV in smallholder-dominated systems, while ensuring compatibility with IPCC Tier 2 methodologies.

Crediting Pathway and Article 6 Linkage: These programs are explicitly designed to generate credits compatible with Article 6.2 of the Paris Agreement, enabling bilateral government-to-government transactions. Credit issuance is based on verified achievement of policy milestones and emission reductions, rather than on project-based carbon accounting. This outcome-based structure facilitates integration with national inventories and reduces the risk of double counting, aligning with guidance from the ICVCM and Article 6.2 reporting requirements (ICVCM, 2024b; UNFCCC, 2025a, 2025b, 2025a, 2025b).

Agricultural Relevance: The pilots represent highly relevant examples of how jurisdictional crediting can work in practice in agriculture. By focusing on a single crop system with high mitigation potential (e.g, irrigated rice), the programs test a replicable model for other high-emitting value chains. Moreover, the AWD methodology illustrates how climate mitigation and agronomic benefits can be jointly delivered at scale, while overcoming typical barriers in

smallholder MRV (FAO, 2024). These examples reinforce the value of policy-based approaches in mobilizing climate finance for agricultural transitions.

Table 3: Stylized Jurisdictional Case Studies

Case	Scale	Institutional Setup	MRV & Baseline	Crediting Pathway	Article 6 Linkage	Agricultural Relevance
Ghana & Vietnam	National	Government-led with intl. support	Sectoral MRV (rice)	Policy-based crediting	Article 6.2-compatible	High – rice methane mitigation
Guyana	National	National gov't & bilateral support	ART-TREES (REDD+)	Jurisdictional	Potential 6.2/voluntary	Medium – ag benefits from REDD+
Acre (Brazil)	Subnational	State-led (SISA), nested projects	Statewide baseline, nested	Jurisdictional	Aligns with ART-TREES/6.2	High – ag integrated into land-use
EU	Regional	Regional institutions - EU	Internal crediting in progress (Carbon Farming Standard)	Cross-Border Mechanisms	TBD	High – livestock, soils, smallholders

3.2 Guyana: National JREDD+ with agricultural investment linkages

Guyana offers a compelling example of how jurisdictional REDD+ (JREDD+) frameworks can support agricultural transformation indirectly through public investment strategies. Rather than crediting agricultural mitigation per se, Guyana's model integrates forest-based mitigation with broader low-carbon development objectives, including sustainable agriculture (Office of the President, 2024).

Jurisdiction and Policy Objective: Guyana's national-scale REDD+ program is implemented under the Architecture for REDD+ Transactions (ART-TREES) framework and embedded within its Low Carbon Development Strategy 2030 (LCDS 2030). The strategy emphasizes maintaining the country's high forest cover while channeling climate finance into inclusive, low-emission growth, including investments in agriculture and food systems.

Institutional Setup: The program is government-led, coordinated by the Office of the President with operational support from the Guyana Forestry Commission. International partnerships have played a foundational role, most notably through the long-standing cooperation with Norway under the Guyana-Norway Agreement. The institutional architecture emphasizes sovereign leadership, integrated planning, and long-term sustainability, with carbon revenues managed through national budget processes and aligned with LCDS 2030 priorities.

MRV and Baseline Approach: Mitigation outcomes are tracked using a national Forest Reference Emission Level (FREL) consistent with ART-TREES guidance. This jurisdictional MRV-system incorporates satellite-based monitoring, land-use change analysis, and

deforestation rates. Importantly, ART-TREES allows for nesting of subnational or sectoral activities, opening the door for potential future integration of agriculture-related emission reductions under a unified baseline (L. Lee & Ignaciuk, 2025).

Crediting Pathway and Article 6 Linkage: Guyana has successfully issued credits under ART-TREES, and these are eligible for use under CORSIA (the aviation sector offset mechanism) (ICAO, 2025). However, they are not yet eligible under Article 6.2 or 6.4 of the Paris Agreement (ICVCM, 2024a). Instead, carbon finance flows primarily through bilateral agreements and results-based payments, which are reinvested in national development programs. This includes climate-smart agriculture, adaptation infrastructure, and support for rural livelihoods which are all elements aligned with Guyana's NDC.

Agricultural Relevance: While agriculture is not directly credited under the current ART-TREES structure, it is a central pillar of the LCDS 2030. REDD+ revenues are earmarked to fund agricultural resilience, enhance food security, and support climate-smart land use. For example, initiatives in sustainable rice and livestock, as well as agroforestry, are included in the national investment plan. This approach illustrates how jurisdictional forest crediting can indirectly catalyze agricultural mitigation and adaptation, even in the absence of explicit agri-carbon crediting (Macdonald et al., 2024).

3.3 Acre, Brazil: Nested jurisdictional REDD+ with agricultural interfaces

Acre's experience exemplifies the potential of subnational leadership in building scalable, high-integrity jurisdictional crediting systems. By embedding agriculture within its REDD+ architecture, Acre demonstrates how nested programs can align environmental objectives with rural development, leverage international finance, and prepare for future participation in Article 6 markets (IMC, 2024).

Jurisdiction & Policy Objective: The State of Acre in Brazil operates as a subnational jurisdiction implementing the Sistema de Incentivos a Serviços Ambientais (SISA), a legal and policy framework designed to reduce deforestation and reward ecosystem services. As one of the earliest adopters of jurisdictional REDD+ approaches globally, Acre aims to integrate sustainable land-use strategies including agriculture into a comprehensive, state-led climate program.

Institutional Setup: Acre's model is anchored in strong state leadership with multi-stakeholder participation. The IMC (Institute for Climate Change and Regulation of Environmental Services) leads the implementation, supported by an Environmental Services Commission that includes civil society, producers, and technical experts. Acre was a key participant in the REDD+ Early Movers program, receiving international support (notably from Germany) and building a legal framework that enables nesting of private and community-led projects under the jurisdictional umbrella.

MRV & Baseline Approach: Acre applies a jurisdiction-wide Forest Reference Emission Level (FREL), consistent with national REDD+ accounting and aligned with ART-TREES

methodology. MRV is spatially explicit and integrates remote sensing, land-use data, and safeguard monitoring. A dedicated state registry manages emissions reductions and ensures alignment between project-level data and jurisdictional baselines. The nesting structure allows for disaggregated crediting while preventing double counting and reinforcing additionality.

Crediting Pathway & Article 6 Linkage: Acre is eligible to generate jurisdictional-scale emissions reductions under ART-TREES, which are CORSIA-eligible. While Article 6.2 authorization has not yet been formally issued by Brazil's federal government, Acre has established the legal and technical infrastructure necessary for engagement, including provisions for international transfers and alignment with national MRV systems. Nested project proponents can access voluntary markets or future compliance pathways through this architecture.

Agricultural Relevance: Agriculture plays a central role in Acre's land-use and climate strategy. Through zoning instruments, extension services, and payments for environmental services, the state incentivizes climate-smart agriculture, especially in cattle ranching and agroforestry systems. These efforts are designed to reduce land-use pressure, enhance productivity, and contribute to jurisdictional mitigation outcomes. SISA's design explicitly recognizes the importance of integrating agricultural mitigation within broader ecosystem service frameworks and incorporates public incentives including agricultural extension programs, rural credit support, and payments for environmental services that help drive adoption of low-emission practices alongside its nested jurisdictional REDD+ framework.

3.4 Cross-Border Options

The European Union is pioneering a new generation of cross-border carbon farming frameworks that offer a regional, harmonized approach to agricultural mitigation. Unlike traditional project-based or jurisdiction-specific crediting systems, the EU's certification framework creates a shared regulatory and institutional architecture across Member States. While not yet integrated with Article 6 mechanisms, this model illustrates how supranational governance can support standardized baselines, robust MRV, and broad farmer participation. It provides a compelling prototype for cooperative mitigation approaches that link domestic agricultural policy with long-term climate goals particularly in regions where market fragmentation and verification costs limit the viability of project-scale interventions.

Jurisdiction & Policy Objective: The European Union (EU) is establishing a Union Certification Framework for permanent carbon removals, carbon farming, and carbon storage in products (Regulation of the European Parliament and of the Council Establishing a Union Certification Framework for Permanent Carbon Removals, Carbon Farming and Carbon Storage in Products, 2024). The objective is to incentivize high-quality, measurable, and additional carbon removals and soil emission reductions across Member States, contributing to the EU's climate neutrality goal by 2050 and generating net negative emissions thereafter.

Institutional Setup: The framework is coordinated by the European Commission and applies across all Member States. It integrates efforts under the Common Agricultural Policy (CAP), the

LULUCF Regulation, and climate targets under the European Climate Law. The governance includes voluntary participation by operators and third-party certification bodies. The framework accommodates national and regional actors, with Member States responsible for implementation and enforcement.

MRV & Baseline Approach: Carbon removals and soil emission reductions are quantified using standardized or activity-specific baselines. Standardized baselines are designed to reflect local regulatory and pedoclimatic conditions, ensuring additionality by excluding practices already common in a region. While under criticism, many methodologies for agricultural MRV are still under development or undergoing validation, particularly in the context of international carbon markets (see (Schneider et al., 2025; Stoefs, 2025) . MRV protocols emphasize conservative, transparent, and complete carbon accounting. Monitoring relies on a mix of digital tools (e.g., remote sensing, AI) and in-field verification, supported by systems like Copernicus.

Crediting Pathway & Article 6 Linkage: Although the Union Certification Framework is a domestic, voluntary system, it lays the groundwork for potential integration into international markets, including Article 6 of the Paris Agreement. However, to prevent double counting, credits certified under this framework currently count exclusively toward the EU's Nationally Determined Contribution (NDC). The framework does not yet allow the use of international credits and for EU units to be transferred internationally under Article 6 mechanisms (Bart & Martins-Barata, 2025). The regulatory approach to nesting, corporate claims, and double claiming is still evolving, with operational rules and linkages to national registries under active discussion

Agricultural Relevance: High. The framework explicitly promotes carbon farming practices such as improved soil management, peatland restoration, agroforestry, cover cropping, and reduced tillage. Smallholders and farmers are primary beneficiaries, with eligibility extended to cooperatives and producer organizations. These practices are recognized not only for their mitigation potential but also for delivering biodiversity co-benefits, improved soil health, and rural resilience. There are ongoing discussions regarding methodological integrity and the net effect on supporting smallholders that should inform design considerations in different jurisdictions. These case studies highlight the diversity of institutional arrangements, MRV approaches, and crediting strategies that can support jurisdictional agriculture carbon (JAC) models. However, challenges remain around integration, integrity, and implementation, which are examined in the next section.

4. Navigating implementation challenges and lessons from practice

The implementation of scaled-up crediting approaches faces significant technical, political, and institutional challenges. Yet, practical lessons from REDD+ and emerging agricultural pilots provide critical insights to support the evolution of scaled-up high integrity crediting approaches in the agriculture sector.

4.1 Overcoming systemic barriers to implementation

While scaled-up crediting approaches offer structural advantages over project-based models, they demand a higher degree of institutional coordination and capacity. Many of the challenges encountered mirror early experiences from REDD+ implementation, with new complexities introduced by the dispersed and diverse nature of agricultural production systems. Five interrelated barriers emerge consistently across jurisdictions piloting JAC programs: legal mandates, MRV integrity, institutional capacity, finance, and equity and benefit-sharing of participation. Table 4 summarizes these key implementation challenges and their implications for operationalizing JAC at scale.

Table 4. Implementation challenges in jurisdictional agricultural carbon (JAC) programs

Challenge	Supporting Point
1. Legal frameworks and authorizations	JAC implementation depends on formal government authorization to participate in international carbon markets under Article 6.2. Lack of clear legal mandates or registry systems risks undermining transparency and host country control.
2. Double counting and MRV alignment	Non-point-source emissions from agriculture (e.g., rice methane, livestock CH_4) complicate jurisdiction-wide aggregation and raise risks of overlapping credit claims. MRV must integrate policy, sectoral, and project data in consistent formats.
3. Data and institutional readiness	Many jurisdictions lack the agricultural emissions data, land-use maps, or institutional structures needed to establish baselines or enforce nested arrangements. Building the technical and institutional capacity to design and operate jurisdictional MRV and registry systems including the infrastructure needed for nesting is often a major bottleneck. Coordination across agriculture, environment, and finance ministries also remains limited in many settings, slowing readiness for scaled-up approaches.
4. Finance structuring	Jurisdictional programs often involve large upfront costs for MRV, safeguards, and aggregation. Without predictable finance, participation by farmers or subnational actors is unlikely. Transparency concerns in subnational approaches may be associated to absence of public bidding procedures for contracting due to need to access to upfront finance.
5. Equity, benefit-sharing and farmer engagement at scale	Smallholders face high barriers to participate directly in carbon markets due to low awareness, upfront costs, and limited access to technology or credit. Without safeguards and equitable revenue-sharing frameworks + participatory processes in jurisdictional regulation, JAC risks reproducing exclusion seen in early REDD+ programs.

These challenges are not insurmountable. Indeed, pilot initiatives in both forestry and agriculture such as Acre's nested SISA system or Ghana's AWD rice program demonstrate that structured legal, institutional, and financial support can enable jurisdictional programs to move from concept to execution. Also, recent international initiatives are beginning to address technical gaps, particularly for livestock methane. FAO's technical team is currently leading a global effort to develop harmonized guidelines for enteric methane measurement and mitigation within livestock carbon markets, offering a foundational reference for countries seeking to build credible, transparent MRV systems for the sector (FAO, 2025) .

The next section builds on these insights to identify actionable policy options for PAC and its partners to support JAC scale-up.

4.2 Lessons from REDD+, livestock, and rice sector pilots

The operationalization of jurisdictional agricultural carbon (JAC) programs is not occurring in a vacuum. Valuable precedents from REDD+, sectoral mitigation efforts, and emerging Article 6 pilots provide practical insights into the mechanics of scaling mitigation with environmental integrity and institutional feasibility. These experiences offer evidence on how to address structural bottlenecks that commonly constrain agricultural carbon programs ranging from MRV fragmentation to financing gaps and low farmer participation.

One of the clearest lessons emerges from nested REDD+ systems, such as Acre (Brazil) and Kalimantan (Indonesia). Both initiatives show that alignment between project- and jurisdiction-level baselines is critical to avoid leakage, double counting, and fragmented data systems. Legal authorization and strong subnational leadership played a decisive role in these cases, suggesting that enabling laws and institutional mandates are foundational for durable JAC frameworks (Cubas-Baez et al., 2025; McLaren et al., 2025; Ravikumar et al., 2015; RRI & McGill, 2024). Experience from low-emissions livestock programs in Brazil illustrates how results-based finance can be blended with private-sector incentives to drive adoption at scale. National concessional credit programs such as ABC+ and Plano Safra further complement these efforts by de-risking investments in improved cattle systems. Supply chain actors through purchasing requirements and traceability systems have served as powerful complements to jurisdictional incentives. However, issues of permanence, monitoring, and weak demand for livestock credits remain important cautionary flags (Micol & Costa, 2023).

The rice-sector Article 6.2 pilots in Ghana and Vietnam offer direct lessons for agricultural crediting. These programs demonstrate how government-led policy reforms such as the promotion of Alternate Wetting and Drying (AWD) can be translated into quantifiable emission reductions at national scale. By embedding mitigation in sector policy, these models allow for aggregation of dispersed farm-level changes, while also creating the enabling conditions for market linkage under Article 6 (OECD, 2024; TCAF, 2021).

More broadly, the integration of jurisdictional and private-sector incentives appears crucial. Combining national capacity-building investments or NDC-aligned policy signals with value chain compliance measures such as the EU Deforestation Regulation (EUDR) can both strengthen the business case and ensure that credits reflect high-integrity mitigation (OECD, 2023; PAC, 2025). In this regard, implementation at scale may also benefit from programmatic or "Program of Activities" (PoA) approaches, which allow aggregation of farm-level mitigation outcomes while preserving direct incentive structure and enhancing investor confidence. Such modular frameworks may offer a pragmatic pathway in agricultural contexts where spatial specificity and attribution are essential for integrity and financing.

Finally, regional cooperation and cross-border MRV harmonization are increasingly recognized as enablers of scaled participation, particularly for small countries or subnational jurisdictions with limited capacity. Emerging initiatives in the EU and Latin America show how shared platforms can lower entry costs and increase credibility through standardization. These insights

are summarized in Table 5, which synthesizes implementation lessons from diverse pilots and their relevance to the design of JAC systems.

Table 5. Lessons for JAC implementation from pilots and adjacent mechanisms

Mechanism / Pilot	Lesson for JAC	Source(s)
REDD+ nesting (Acre, Kalimantan)	Demonstrates the importance of aligning project- and jurisdiction-level MRV to prevent leakage and double counting. Early political leadership and legal frameworks are crucial.	Macdonald et al., 2024; Boucher & Elias, 2013
Low-emissions beef in Brazil	Shows how blended finance and supply-chain engagement can incentivize farmers to adopt low-carbon practices at scale. Highlights design risks in permanence, monitoring, and demand.	Micol & Costa Jr., 2024
Rice-sector A6.2 pilots (Ghana, Vietnam)	Policy-based crediting allows aggregation of mitigation outcomes from dispersed smallholders. Government leadership, sector reform, and technical support are key enablers.	TCAF, 2024; OECD, 2025
Public-private incentive mix	Combining jurisdictional incentives (e.g., NDC alignment, capacity funding) with supply chain requirements (e.g., EUDR compliance) increases both participation and integrity.	PAC, 2025; OECD, 2025
Regional cooperation	Shared MRV systems, economies of scale, and cross-border harmonization can reduce costs and support participation by smaller jurisdictions and economies.	EU, 2024; Bart and Martins Barata, 2025

These pilot experiences highlight that JAC implementation is not simply a technical endeavor. It is an institutional challenge that requires coherent policy design, multilevel coordination, and carefully sequenced finance. The next section explores actionable policy recommendations to help PAC and its partners enable jurisdictional approaches to flourish within Article 6 and agricultural development agendas.

5. Policy options and recommendations for PAC and Partners

To implement scaled-up high integrity crediting approaches in the agriculture sector, policy action must focus on enabling frameworks, MRV systems, cooperative architecture, and inclusive design. The Partnership for Agricultural Carbon (PAC) and its partners can play a catalytic role in preparing jurisdictions and aligning credible mitigation supply with emerging demand under Article 6 and through the voluntary market.

5.1 Enabling Jurisdictional Readiness

Building on the typologies and lessons explored in earlier sections, this final section outlines actionable policy priorities that can help operationalize JAC in developing country contexts. These recommendations address gaps in legal readiness, data infrastructure, institutional design, and crediting integration while emphasizing the role of PAC as a technical facilitator and neutral convener. A long-term vision is essential to ensure continuity beyond political cycles and promote sustained institutional capacity.

Operationalizing jurisdictional carbon frameworks in agriculture, particularly those intended for participation in international carbon markets, requires a deliberate sequencing of legal, technical, and institutional actions. While in some cases scaled-up approaches will be able to build on

existing REDD+ infrastructure, many of these elements are still underdeveloped in the agricultural sector compared to forestry or energy and will benefit from targeted support. Table 6 summarizes key areas for policy action and how PAC and its partners can support governments and stakeholders in closing these readiness gaps.

Table 6. Priority policy actions to enable high-integrity JAC under Article 6

Policy Focus	Recommendations for PAC and implementation partners
1. Role of PAC in enabling Article 6.2 frameworks	Help partner governments define sectoral contributions to NDCs and establish authorization pathways for agricultural mitigation under Article 6.2. Priority actions include facilitating structured dialogues with UNFCCC focal points and drafting authorization templates aligned with carbon asset transactions. PAC can also provide transaction support / deal structuring and policy advice on Global South countries Article 6 strategies.
2. Supporting MRV, registries, and policy integration	Invest in standardized MRV systems compatible with REDD+ and Article 6 requirements. Interoperable national or jurisdictional registries and sectoral GHG baselines are essential for consistency and transparency. Close coordination with agriculture ministries can ensure alignment with food security and adaptation goals. Collaboration with public research institutions can also help generate standardized, regionally adapted datasets such as soil, land-use, and production data, thereby strengthening jurisdictional baselines and reducing MRV costs and uncertainty.
3. Designing preconditions for sectoral crediting	JAC programs need preconditions such as conservative baselines, institutional mandates, safeguards, and benefit-sharing protocols. PAC and other partners can develop readiness checklists, sectoral guidelines, and offer TA for the overall design of the crediting mechanism including definition of jurisdictional boundaries and aggregation logic.

These enabling actions are not only technical but also strategic. They aim to reduce transaction costs, enhance environmental integrity, and align agricultural mitigation efforts with country priorities. Most importantly, they provide a roadmap for countries to position agricultural carbon as a credible mitigation pathway within the broader climate finance landscape. Beyond enabling conditions, the success of JAC also hinges on how cooperation is facilitated across borders and how equity is built into design. The next part of this section explores cross-border coordination, benefit-sharing, and local capacity building as complementary levers for impact.

5.2 Inclusive design and regional cooperation

While legal and technical frameworks are foundational, inclusive governance and cooperation mechanisms are equally critical to the success of jurisdictional agricultural carbon (JAC). Ensuring smallholder access, equitable benefit-sharing, and regional coordination can drive both integrity and legitimacy. As markets evolve, targeted support will also be needed to help governments identify and apply high-integrity methodologies tailored to local contexts. PAC can play a catalytic role by facilitating the design and piloting of regionally appropriate crediting approaches, supporting ministries in building project pipelines, and helping align transactions with Article 6 pathways through structured procurement or bilateral agreements. Table 7 outlines strategic policy actions that PAC and its partners can support to foster equity and cooperation in JAC implementation.

Table 7. Equity and cooperation levers to support inclusive JAC implementation

Policy Focus	Recommendations for PAC and implementing partners
4. Facilitating country cooperation for cross-border crediting	Support intergovernmental cooperation to enable transboundary JAC platforms and joint MRV. Examples like BCIE and CCAD in Central America suggest value in shared MRV tools and pooled legal/institutional infrastructure to reduce fragmentation and costs.
5. Promoting benefit-sharing models and capacity at local level	Farmer trust and engagement require clear revenue-sharing mechanisms. Lessons from REDD+ and low-emission beef pilots show the importance of co-developed benefit frameworks and early engagement. PAC and partners ccould promote model contracts, farmer cooperatives, and capacity-building packages.

Taken together, the policy options and institutional pathways outlined in this section provide a practical foundation for advancing JAC with both integrity and inclusion. As carbon markets mature and Article 6 frameworks operationalize, PAC and its partners are well positioned to play a catalytic role bridging the gap between local agricultural systems and global climate commitments.

By supporting early-stage readiness, strengthening MRV and registry infrastructure, and embedding fairness into crediting design, PAC can help catalyze a new generation of jurisdictional programs that deliver credible mitigation while supporting smallholder farmers and food system resilience.

5.3 Final takeaways

Jurisdictional agricultural carbon remains an emerging field where policy design, institutional capacity, and market integration are evolving in real time. While this brief synthesizes current evidence and early implementation lessons, several areas require deeper research to guide effective scale-up.

Future work should prioritize:

- Strengthening the empirical basis for agricultural baselines and MRV systems, particularly for smallholder-dominated systems and Soil Organic Carbon measurement.
- Evaluating the performance of different scaled-up crediting models over time, including their integrity outcomes, transaction costs, and equity impacts.
- Assessing enabling conditions for Article 6 participation in agriculture, especially around institutional mandates, registry readiness, and interministerial coordination.
- Understanding how blended public–private incentives can accelerate adoption of low-emission practices across diverse agricultural value chains.
- Exploring regional cooperation opportunities, such as shared MRV platforms, data harmonization, and cross-border aggregation for countries with limited capacity.

PAC will continue advancing this research agenda with partners and governments, generating the applied evidence needed to design high-integrity, scalable JAC programs. The next phase of

work will focus on translating these insights into practical tools, country-tailored guidance, and support for early implementation efforts under Article 6.

Annex: Key terms and definitions

Term	Definition used in this paper	Reference
ART TREES	The Architecture for REDD+ Transactions (ART) uses the TREES standard—an independent crediting framework for jurisdictional REDD+ programs. ART TREES is the standard endorsed by the LEAF Coalition, launched in 2021 to advance large-scale forest finance.	(ART Secretariat, 2021)
Additional/ Additionality	Demonstration that the emission reductions or carbon removals generated by a mitigation activity exceed those that would have occurred under the "business as usual" scenario and would not have taken place in the absence of the incentives provided by a carbon crediting mechanism.	(Michaelowa et al., 2019)
Agricultural Carbon Projects	Projects that focus on reducing emissions from agricultural activities in farmland and pasture. Projects can include: livestock methane mitigation, sustainable land management	(IPCC, 2003)
Article 6 of the Paris Agreement	Article 6 enables international cooperation to tackle climate change and to unlock financial support for developing countries, including through Market based approaches, as outlined in Articles 6.2 and 6.4. **Article 6.2:** Article 6.2 allows Paris Agreement Parties to voluntarily cooperate by transferring mitigation outcomes (ITMOs) toward their NDCs. These cooperative approaches offer flexibility in design but require robust accounting to prevent double counting, following guidance adopted under decisions 2/CMA.3, 6/CMA.4, and 4/CMA.6. **Article 6.4:** Article 6.4 creates a centralized UN-supervised mechanism for designing, validating, verifying, and issuing emission reductions from mitigation activities. These outcomes—Article 6.4 emission reductions—are generated under rules and oversight set by the Paris Agreement's governing body.	(UNFCCC, 2025c)
Baseline	The emissions level against which emission reductions or removals of a mitigation activity are determined	(Schneider et al., 2022)
Buffer pool	Refers to a portion of issued credits set aside into a buffer pool that acts as an insurance mechanism against potential reversal events across a portfolio of projects. Credits from this pool may be cancelled or retired following a verified reversal of GHG emission reductions or removals, as required by the crediting standard.	(Anderegg et al., 2025)
Carbon Credit	A carbon credit is a tradable, intangible instrument issued by a crediting mechanism that represents one metric ton of verified CO_2-equivalent reduced or removed from the atmosphere. These credits are generated by activities that prevent greenhouse gas emissions or sequester them, and can be bought and sold in carbon markets.	(Dyck et al., 2023)
Carbon credit markets	Markets involving the trade in carbon credits, which reward reductions or removals in emissions, in contrast to allowance markets, where emissions are priced. In the case of voluntary carbon markets, Private individual an organizations issue, buy, and sell carbon credits outside of regulated or mandatory carbon pricing instruments	(Dyck et al., 2023)

Carbon credit standard (or mechanisms	A carbon crediting mechanism refers to the full set of rules, procedures, and methodologies through which verified emission reductions or removals are quantified, certified, and issued as tradable credits. These mechanisms are developed and governed by standard-setting organizations—typically international NGOs—which establish the methodologies, monitoring requirements, and validation and verification processes. They include a standard-setting function, a regulatory or governance arm, and an accredited system of third-party validators and verifiers that oversee project performance.	(Dyck et al., 2023; Wetterberg et al., 2025)
Conservative baseline	In baseline-setting, conservativeness means applying data, assumptions, and methods that avoid overestimating emission reductions or underestimating removals. A conservative baseline accounts for uncertainties and ensures that reported mitigation outcomes are very unlikely to be overstated.	(UNFCCC, 2025a)
Corresponding adjustment	Corresponding adjustments act as a bookkeeping mechanism to prevent double counting of internationally transferred mitigation outcomes (ITMOs), ensuring that both the buyer and host countries do not claim the same mitigation. When mitigation outcomes are authorized for other international uses, only the host country applies the adjustment, effectively creating a single-entry system.	(Lo Re et al., 2022)
Ex-post adjustment	Adjustments to baselines for carbon crediting (upward or downward) done at the end of a crediting period based on data gathered during the latter.	(Rau et al., 2025)
Jurisdictional crediting	Jurisdictional carbon crediting refers to the quantification and issuance of carbon credits from climate mitigation activities across a designated area, usually delimited by the administrative boundaries of a national or subnational government.	(World Bank, 2025, p. 26)
High Integrity in carbon markets	Supply-side integrity requires that carbon credits reflect real, additional, and verifiable emission reductions or removals that align with the host country's NDC and support increasing ambition. It also depends on transparent institutional and financial systems, as well as strong social and environmental safeguards that prevent harm and promote measurable sustainable development benefits. On the demand side, integrity hinges on buyers selecting high-quality credits and demonstrating genuine commitments to reduce emissions within their own operations and value chains.	(UNDP, 2024a)
Leakage	The net change in GHG emissions or removals caused by a mitigation activity but occurring outside its project boundary, including indirect upstream or downstream effects and rebound impacts. It can also describe a shift in emissions from one country to another when companies move production to jurisdictions with weaker climate regulations in response to stricter policies at home.	(Schneider et al., 2022)
Measurement, reporting and verification (MRV) system	The system used to monitor a credit-generating activity's emissions, report them to an accredited third party, and verify the resulting mitigation outcomes. It includes ex-ante measurements to establish baselines, ex-post measurements to quantify impacts, and reporting that meets standard requirements, including uncertainty assessment. Third-party auditors validate projects before implementation and verify results afterward, also reviewing evidence on additionality and the application of environmental and social safeguards. It seeks to prove that an activity has actually avoided or removed harmful GHG emissions so that actions can be converted in credits.	(Dyck et al., 2023; OECD, 2025b)
Methodological framework	A methodological framework outlines the rules and procedures, usually in the form of a document, used by a carbon crediting mechanism to quantify a project's net emission reductions or	(Schneider et al., 2022)

	removals. It typically includes baseline and monitoring methodologies, along with supporting tools and protocols.	
Mitigation outcomes	Common term to refer for greenhouse gas emission reduction and/or removal, usually generated by a specific actions targeted at generating them.	
Nationally appropriate mitigation actions (NAMAs)	NAMAs are mitigation actions undertaken by developing countries under national government initiatives to reduce emissions. They may involve sector-specific policies driving transformational change or multi-sector programs with a broader national scope. Supported through technology, finance, and capacity-building, NAMAs aim to lower emissions compared with projected business-as-usual levels by 2020.	(UNFCCC, n.d.-a)
Nationally Determined Contribution (NDC)	Nationally Determined Contributions (NDCs) are countries' self-defined climate commitments under the Paris Agreement, outlining planned actions to limit warming to 1.5°C, strengthen adaptation, and mobilize finance. They serve as short- to medium-term plans and must be updated every five years, with each revision reflecting higher ambition in line with national capabilities.	(UNDP Climate Promise, 2023)
National greenhouse gas emissions inventories	Comprehensive listing, by source, of annual GHG emissions and removals resulting directly from human activities. An inventory may estimate emissions and removals for one year or a number of year.	(UNFCCC, 2009)
Nesting	Refers to aligning the accounting of GHG emission reductions and removals across scales. In REDD+, for example, by integrating accounting frameworks for different types, nesting harmonizes the climate benefits of activities implemented at different scales, helps manage leakage, and enforces environmental safeguards.	(Dyck et al., 2023)
Paris Agreement Crediting Mechanisms (PACM)	Article 6.4 of the Paris Agreement creates a centralized UN-supervised mechanism for designing, validating, verifying, and issuing emission reductions from mitigation projects, known as Article 6.4 emission reductions. This new Paris Agreement Crediting Mechanism will replace the Clean Development Mechanism (CDM), retaining some similarities but introducing additional requirements. These are set out in the Article 6.4 rules, modalities, and procedures (RMP) and further decisions adopted by the CMA, as well as guidance from the Article 6.4 Supervisory Body.	(UNFCCC & UNDP, 2023)
Permanence	The GHG emission reductions or removals from the mitigation activity shall be permanent or, where there is a risk of reversal, there shall be measures in place to address those risks and compensate reversals.	(ICVCM, 2023)
Policy-based crediting	Policy crediting can help developing countries achieve broader policy objectives, such as meeting their NDCs and sectoral priorities. This approach responds to the need for scaled-up and transformative mitigation actions that go beyond investment projects or programs.	(World Bank, 2025, p. 32)
REDD+	REDD stands for "Reducing Emissions from Deforestation and Forest Degradation" in developing countries, with the "+" referring to additional activities such as sustainable forest management and the conservation or enhancement of carbon stocks.	(UNFCCC, n.d.-b)
Reference period	In REDD+, it refers to the time period for which historical emissions and removals from carbon stocks changes from forests or select REDD+ activities are estimated to inform the reference level	(FCPF, 2020)
Results-based climate finance	Results-based payments are an approach under which a donor or buyer provides funds to a seller, conditional on the achievement and independent verification of agreed results, usually structured in the form of milestones, such as GHG emissions reduced or removed. The	(World Bank, 2025)

	milestones mark progress towards significant climate mitigation. As an example, Jurisdictional REDD+ credits have been monetized mainly through results-based payments.	
Safeguards	Safeguards are principles or measures (policies, guidelines) that aim to protect or to avoid risks, while promoting benefits in carbon projects. It includes climate mitigation benefits, as well as social and environmental benefits.	(UN-REDD PROGRAMME, n.d.)
Scaled-up crediting approaches	Scaled-up crediting refers to approaches that operate at broader levels—such as jurisdictions, sectors, or policies—rather than at individual project or program scales. These approaches typically use a collective baseline for a defined group of emission sources and allow diverse mitigation actions carried out by multiple actors responding to policy or market incentives.	(Besley et al., 2017)
Third Party audit	An accredited third-party entity conducts validation and verification audits for carbon crediting mechanisms. Validation involves an independent review of a mitigation activity before registration, while verification is the periodic ex-post assessment of a project's request to issue carbon credits. These validation and verification bodies are commonly referred to as auditors.	(ICVCM, 2024c)

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