
How Do Data and Payments Flow Through Ag Carbon Programs?

The article Ag Decision Maker File A1-76, [How to Grow and Sell Carbon in US Agriculture](http://www.extension.iastate.edu/agdm/crops/pdf/a1-76.pdf), www.extension.iastate.edu/agdm/crops/pdf/a1-76.pdf, compares 11 voluntary carbon programs across two-dozen characteristics in a tabular form, providing valuable details to help farmers identify the programs they could benefit from. The present article abstracts somewhat from the details and presents a simplified description of how data, payments, and methods flow in voluntary carbon programs. The goal of this article is to help farmers, policymakers, and ag stakeholders understand who will have access to data on farm practices, who is the most likely buyer of carbon credits for each carbon program, who controls the methodology that will be used to translate farm practices into carbon credits, and who issues payments to program participants (farmers, project developers, carbon program, verifiers, registries, soil labs, and data platforms). The analysis is presented in flowcharts, with arrows pointing in the direction that data, payments, methods, and carbon credits move within each carbon program.

The first of ten flowcharts describes a traditional carbon offset generation system, with the following nine showing voluntary carbon programs currently operating in the United States.¹ It is important to understand the workings of the existing markets for carbon offsets before exploring the newer carbon programs. Readers are advised to pay particular attention to the traditional carbon offset generation section before focusing on the carbon program(s) of their interest.

A major difference between the traditional carbon offsets and the carbon credits generated in the newer, voluntary carbon programs resides in the potential gap on their perceived qualities. A carbon offset is considered a top-quality token for one metric ton of

carbon dioxide-equivalent greenhouse gases (CO₂e) sequestered through practices that adhere to trusted protocols ensuring additionality and permanence, which are verified by an independent third party, certified, and registered with a unique serial number into a secure ledger called the “registry.” The registry is typically linked to a network of registries that serve as a clearinghouse of information on carbon credits (issued, unsold, sold, and retired) to avoid duplications and enhance transparency. When an owner of a carbon offset uses it to compensate for emissions of CO₂e somewhere else, the serial number is retired from the registry (and the transaction is transparent to the clearinghouse).

A carbon credit may or may not be perceived as being of comparable quality to a carbon offset. If carbon credits are perceived as being of lower quality than carbon offsets, then they would tend to attract lower market prices than offsets do. The perceived quality of carbon credits is expected to be higher when verification and issuance are external to the carbon project, and lower when those critical processes are internal to the carbon project. By illustrating whether verification and issuance are external or internal processes to the carbon program, the present analysis provides some basis to anticipate differences in the perceived qualities and resulting prices for agriculture carbon credits issued by different programs.

Traditional Carbon Offset Generation

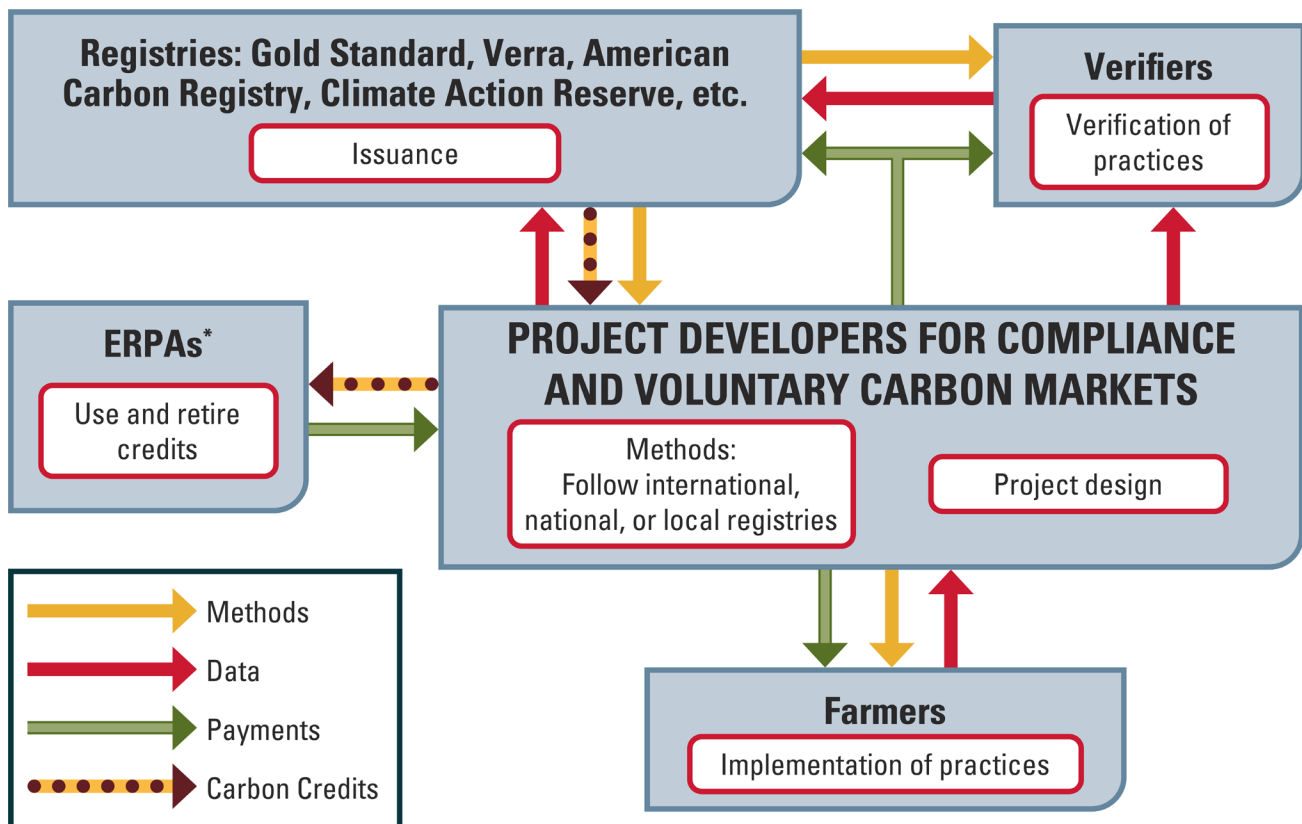
There are multiple registries in the world (such as Gold Standard, Verra, American Carbon Registry, and Climate Action Reserve) where US farmers could register, under unique serial numbers, carbon offsets generated via conservation practices implemented anywhere in the US. Once a farmer owns a serial number issued by a registry, they can sell the carbon offsets associated with that serial number to any potential buyer, including industries

¹ The carbon programs by Nutrien and TruTerra described in AgDM File A1-76 are in early stages of protocol development. This report will be updated when more information becomes available.

with regulated greenhouse gas (GHG) emissions targets and corporations committed to achieving net zero emissions. However, only top-quality carbon offsets will be of interest to regulated industries, requiring additionality, permanence, project design and implementation according to registry protocols, independent third-party verification, and in some cases additional approval by a regulatory body. The California Cap-and-Trade program and the Regional Greenhouse Gas Initiative (RGGI) in the northeastern US are two compliance markets where some top quality carbon offsets could be sold. It typically takes several years from project design to carbon offset issuance, and farmers usually enroll the collaboration of project developers to navigate the process. Due to the scale of the projects and the time lag between implementation of practices and issuance of offsets by registries, most projects are financed through emission reduction purchase agreements (ERPAs),

according to which an investor (usually a regulated company) purchases the right to own the serial number of the registered carbon offsets and makes front-loaded payments to project developers and farmers (see Figure 1). Given the risks involved in financing these projects, the cost to investors of carbon offsets financed through ERPAs is much lower than the price of (issued) carbon offsets in the spot market. The investing corporation uses in its GHG accounting system the serial number from the registry to compensate its emissions and “retires” the credit (making it no longer available for resell). The corporation will also communicate the reduction of its GHGs footprint to customers, owners, and stakeholders through its environmental, social, and corporate governance (ESG) reports. Farm production data is shared with project developers, independent verifiers, and registries. Payments are distributed over the life of the project.

Figure 1. Traditional Carbon Offset Generation

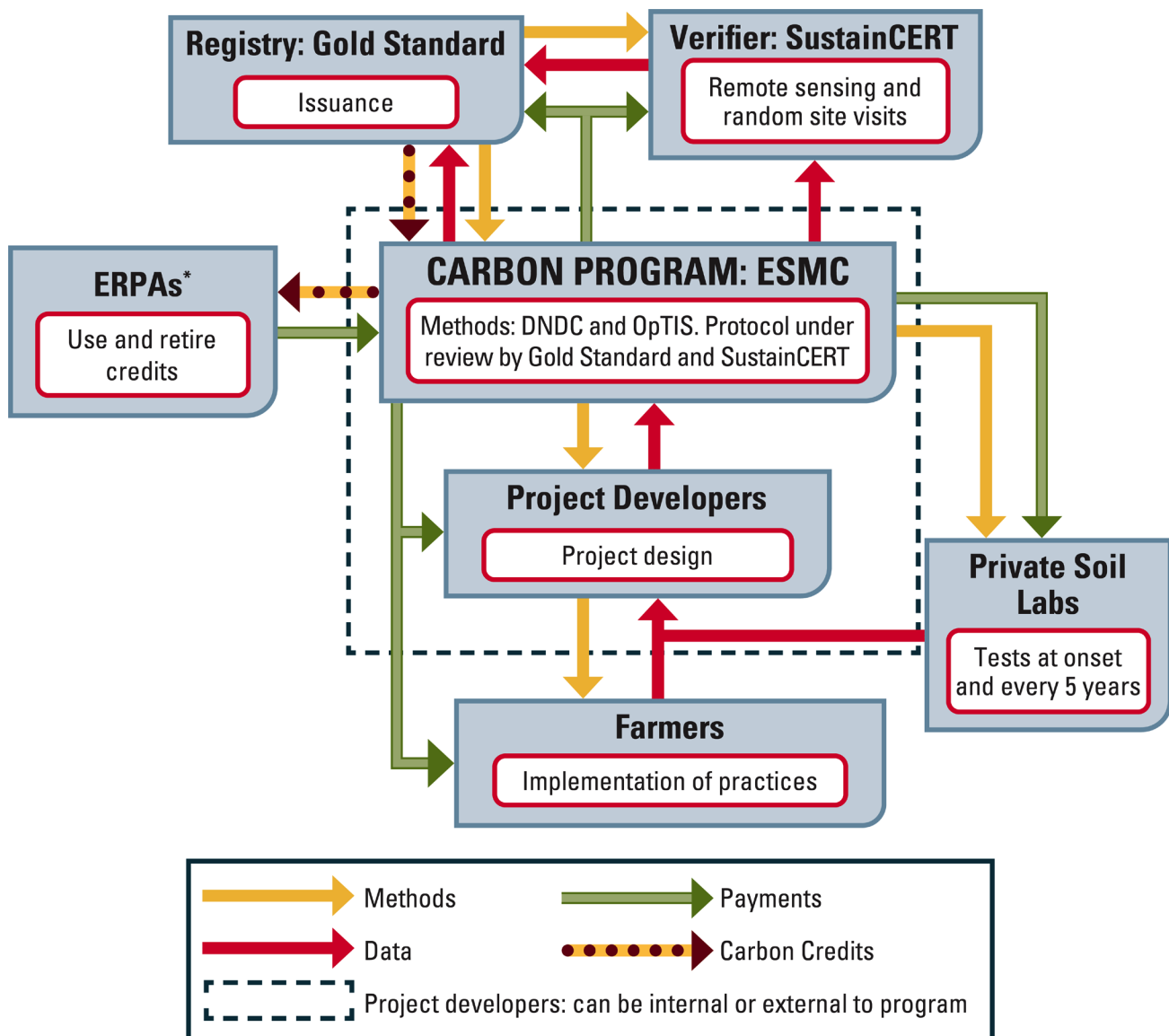


* ERPAs: Emission Reduction Purchase Agreements

Ecosystem Services Market Consortium (ESMC)

ESMC finds investors to finance projects through ERPAs. Its methodology to translate agricultural practices into carbon credits is based on the DeNitrification-DeComposition (DNDC) model and the Operational Tillage Information System (OpTIS) model, which are publicly available. ESMC’s methodology is under review by the Gold Standard registry and SustainCERT. Project developers can be internal or external to ESMC. Practices implemented by farmers are independently verified by SustainCERT. Soil tests are mandatory at onset and every five years. The Gold Standard registry issues serial numbers for carbon credits to ESMC, which in turn transfers them to investors. Farm production data is shared with project developers, ESMC, SustainCERT, and the Gold Standard registry. Payments to all actors in the process are distributed over the life of the project.

Figure 2. Carbon Credit Generation through Ecosystem Services Market Consortium (ESMC)

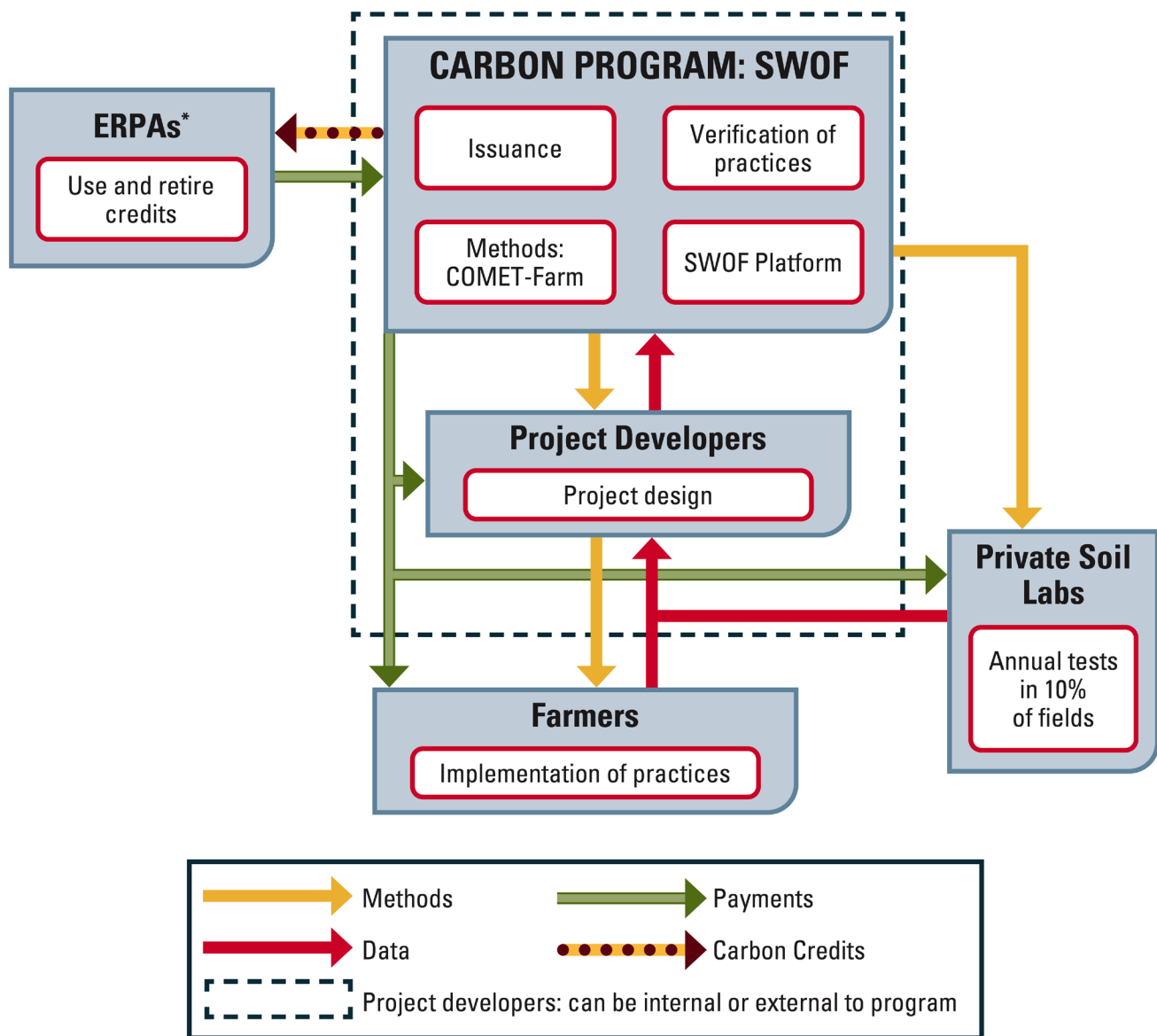


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Soil and Water Outcomes Fund (SWOF)

SWOF finds investors to finance projects through ERPAs and acts as its own registry. Its methodology to translate agricultural practices into carbon credits is based on the publicly available COMET-Farm model. Project developers can be internal or external to SWOF. Practices implemented by farmers are verified internally by SWOF, and soil tests are mandatory. SWOF issues the serial number for carbon credits generated in a project, transfers ownership of the serial number to the investor, and makes payments to all actors in the process. Farm production data is shared with project developers and collected through an online platform owned by SWOF. Payments are distributed over the life of the project.

Figure 3. Carbon Credit Generation through Soil and Water Outcomes Fund (SWOF)

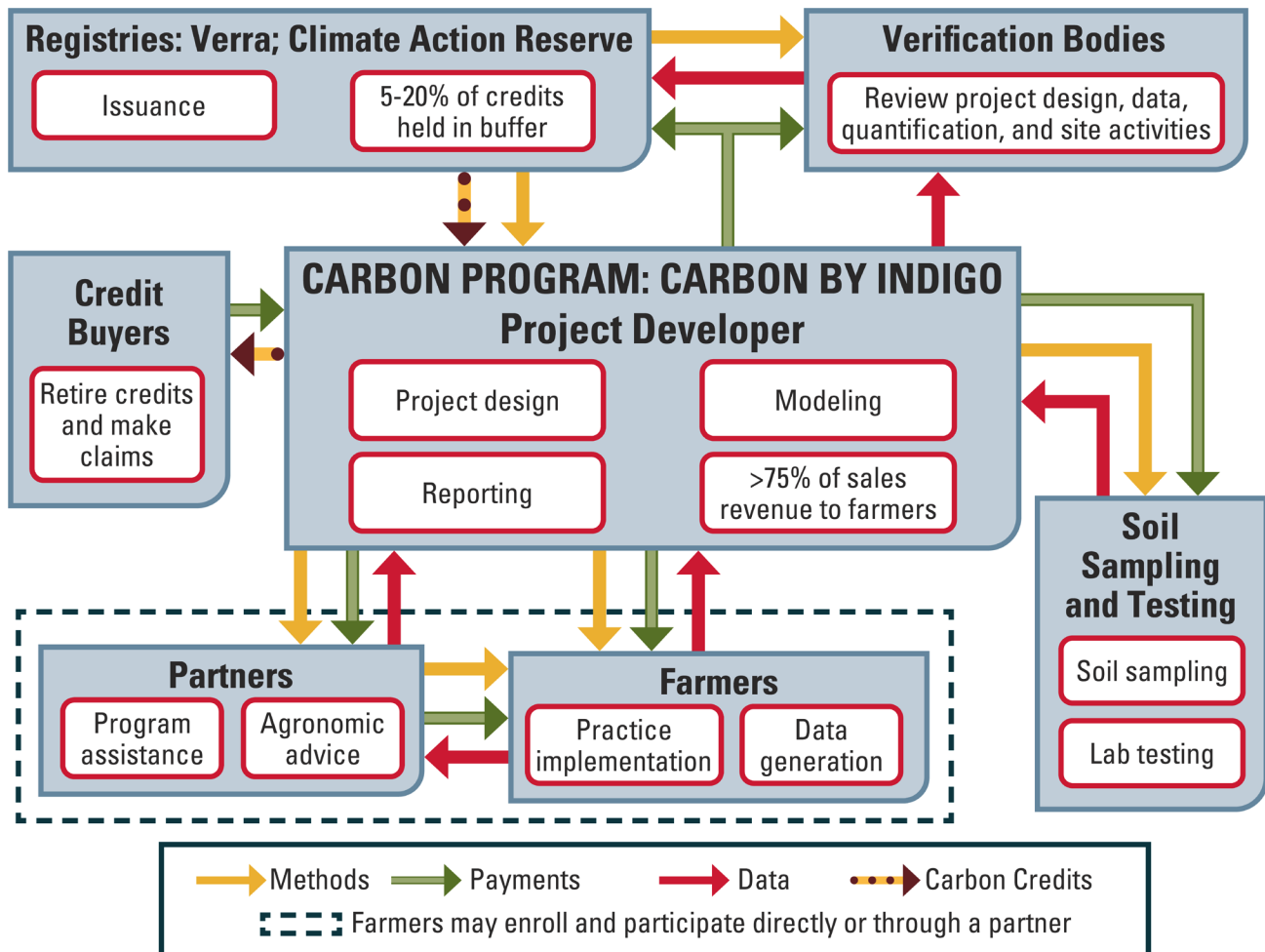


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Indigo

Indigo develops carbon projects under standards developed by independent, nonprofit standards organizations, with credits issued and tracked on public registries. They currently work with the Soil Enrichment Protocol, adopted by the Climate Action Reserve, and the Methodology for Improved Agricultural Land Management (VM0042), co-authored by Indigo and approved by Verra. Indigo works either directly with farmers or through partner organizations (e.g., Corteva) to enroll in the carbon project and adopt new practice changes. Management data collection occurs through a proprietary software platform, as well as through remote sensing, and farm management system (i.e., software used by farmers to manage data) integrations. Prior to each issuance by the registry, Indigo hires an independent, accredited verification body who conducts limited site visits and in-depth reviews of all documentation, reporting, and quantification. The program is certified Ag Data Transparent and farm data are not shared beyond the registry and verification body. A portion of credits (5-20%) are permanently held by the registry in a buffer pool to protect against future carbon releases. The balance of credits is issued to Indigo and then either transferred to or retired on behalf of the credit buyers. At least 75% of the proceeds from credit sales are paid directly to farmers. If an unavoidable reversal of stored carbon occurs, the registry uses an equivalent amount of credits from the buffer pool to compensate for the loss.

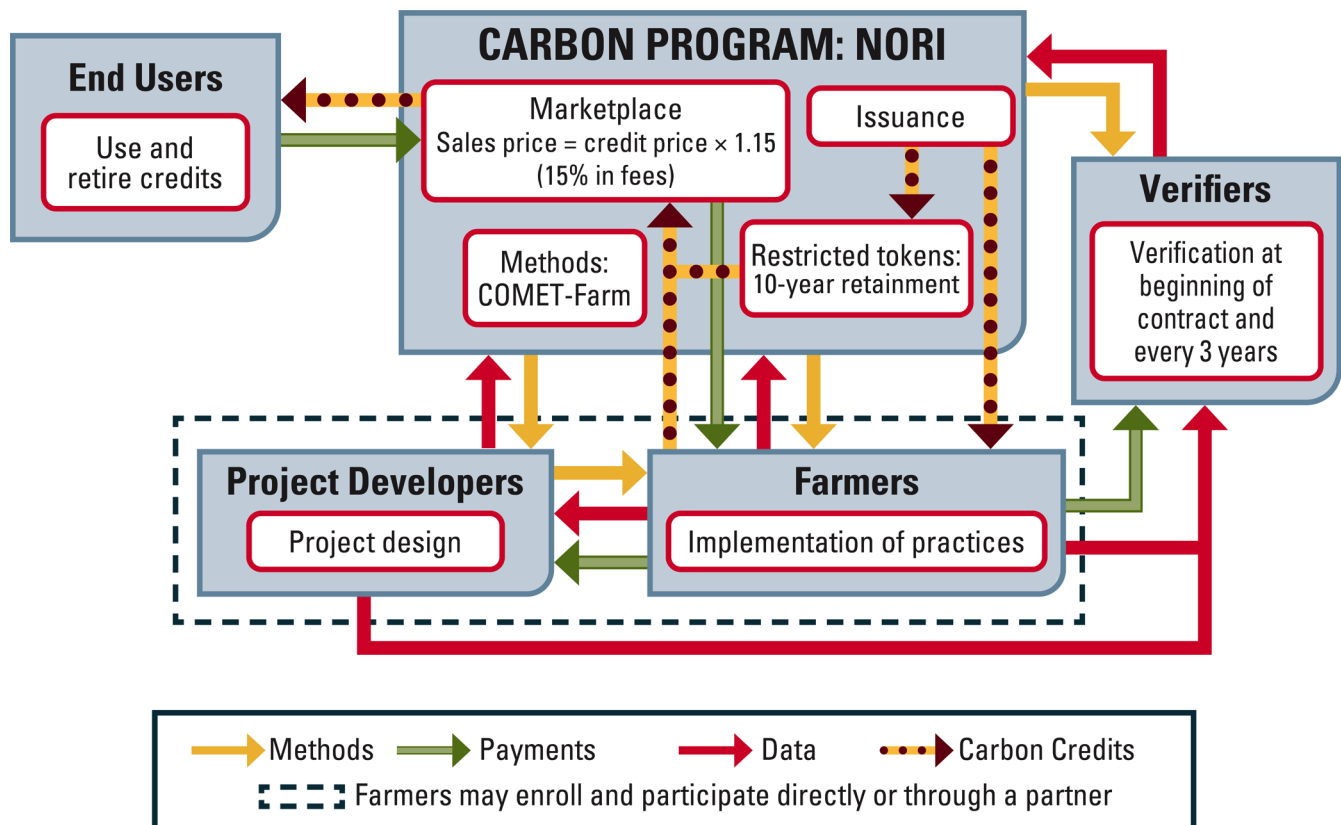
Figure 4. Carbon Credit Generation through Indigo



Nori

Nori is its own registry and marketplace, and its methodology to translate agricultural practices into carbon credits is based on the publicly available COMET-Farm model. Farmers can either enroll directly with Nori or through a project developer. Practices implemented by farmers are verified by independent third-parties. Farmers must pay out-of-pocket for the verification process at the beginning of the contract and at least every three years. Nori uses Blockchain technology to issue and track serial numbers for carbon credits that are sold to end-users. Nori adds 15% to the price of carbon credits as fees, from the buyer (not the supplier). In the pilot phase of the Nori program, each supplier will be issued Nori tokens equal to the number of carbon credits generated. Those tokens will be restricted over the life of the 10-year contract. If there are reversals during that time, Nori will use those tokens as insurance to purchase more recent carbon credits. After the pilot phase, Nori will have both their own insurance pool of tokens and will restrict a percentage of tokens from the supplier to use in case of reversals. If farmers avoid carbon reversals for 10 years following the sale of the tokens, Nori removes restrictions from the remainder of the farmer’s tokens. Nori claims that it will never own farmer data or use it for anything other than running the carbon model. Any data sharing agreements outside of Nori are made directly between the farmer and project developer or verifier. Payments start flowing into the system when a sale of (issued) carbon credits occurs.

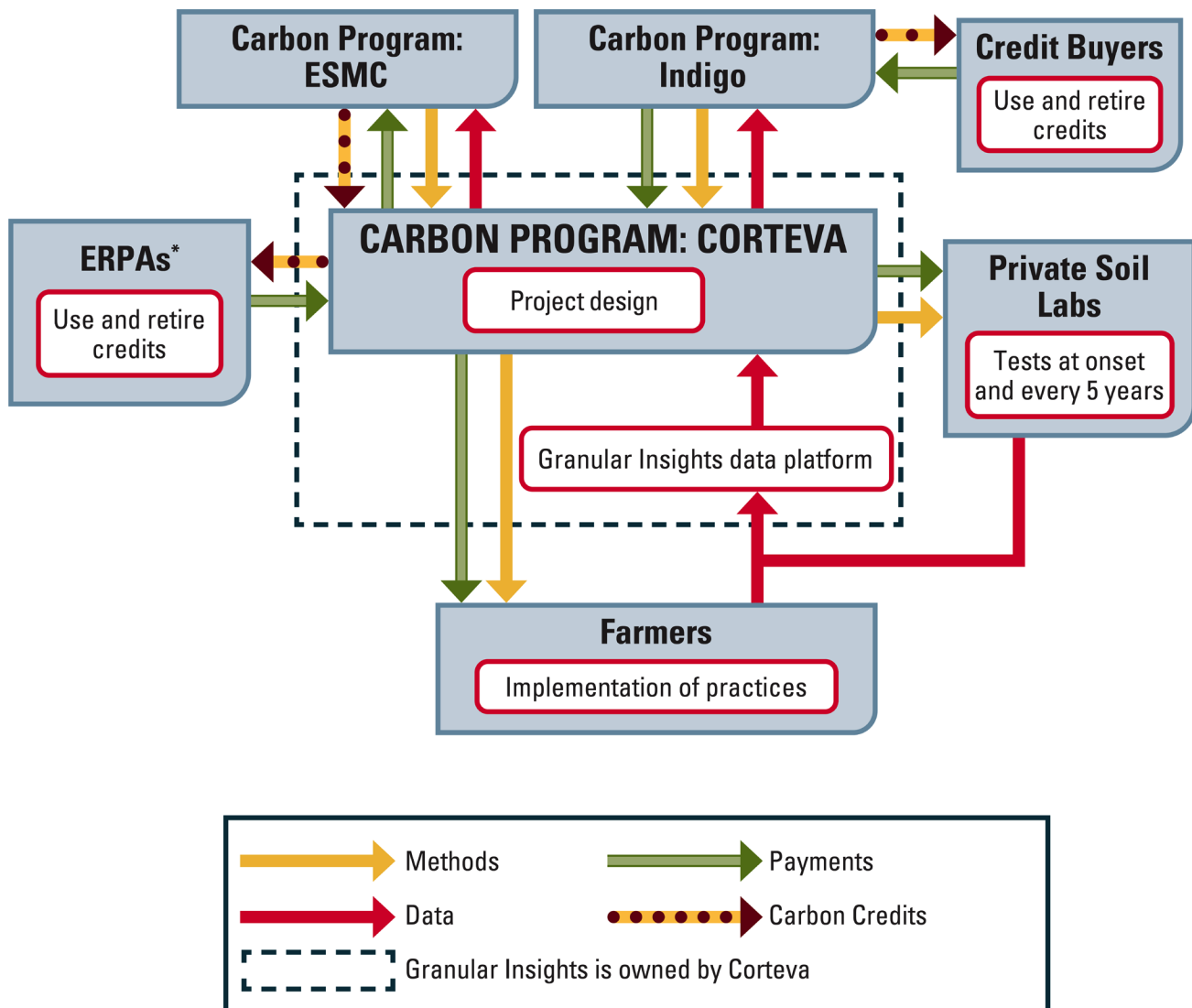
Figure 5. Carbon Credit Generation through Nori



Corteva

Corteva Agriscience contracts directly with farmers to produce carbon credits. Corteva partners with MRV (measuring, reporting, and verification) companies such as ESMC and Indigo Ag to quantify and certify carbon credits through registry-approved protocols including SustainCERT (ESMC) or Verra/CAR (Indigo). Farmers input their practices into Granular Insights, Corteva’s free digital tool. These practices are submitted to carbon registries for certification and are verified through remote sensing and random site visits. Soil tests are mandatory every five years. Verifiers issue carbon credits to ESMC and Indigo, who sell credits to investors. Corteva transfers 75% of carbon credit sale to farmers, and payments are distributed over the life of the project.

Figure 6. Carbon Credit Generation through Corteva

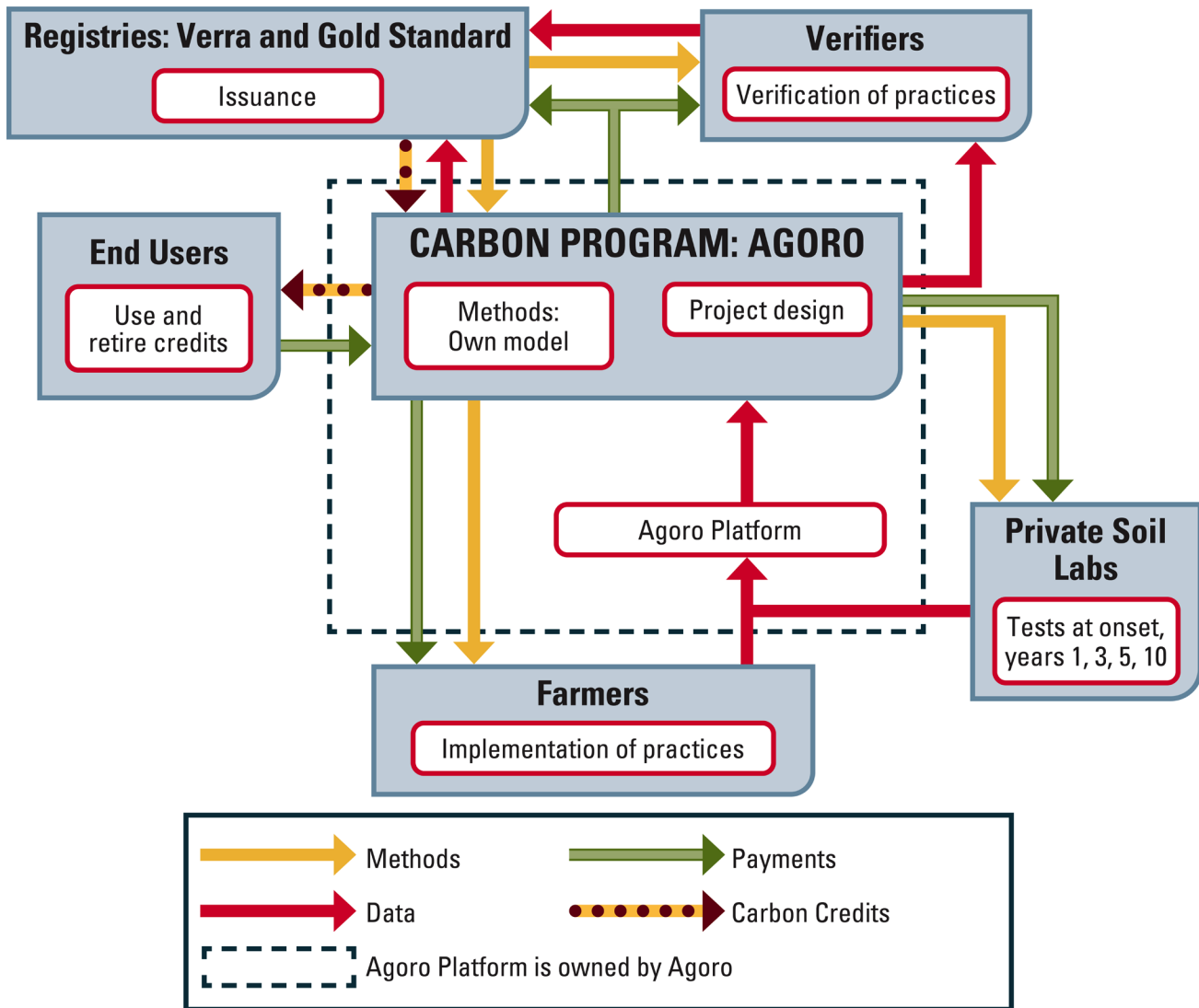


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Agoro

Agoro Carbon Alliance contracts and supports farmers directly to generate carbon credits through regenerative practices including reduced/no-till, planting cover crops, pastureland management, and nitrogen management with further methodologies under review. Its methodology to translate agricultural practices into carbon credits is based on protocols from the Verra and Gold Standard registries. Practices implemented by farmers are registered online in the Agoro Platform and independently checked by accredited verifiers. Soil tests are mandatory and paid for by Agoro Carbon. The associated registries will issue serial numbers for carbon credits to Agoro, which in turn transfers them to buyers post-sale. Farmers have two payment options; after verifications or annual forward payments based on estimates. Farm production data is shared with project developers, Agoro, verifiers, and the respective registry.

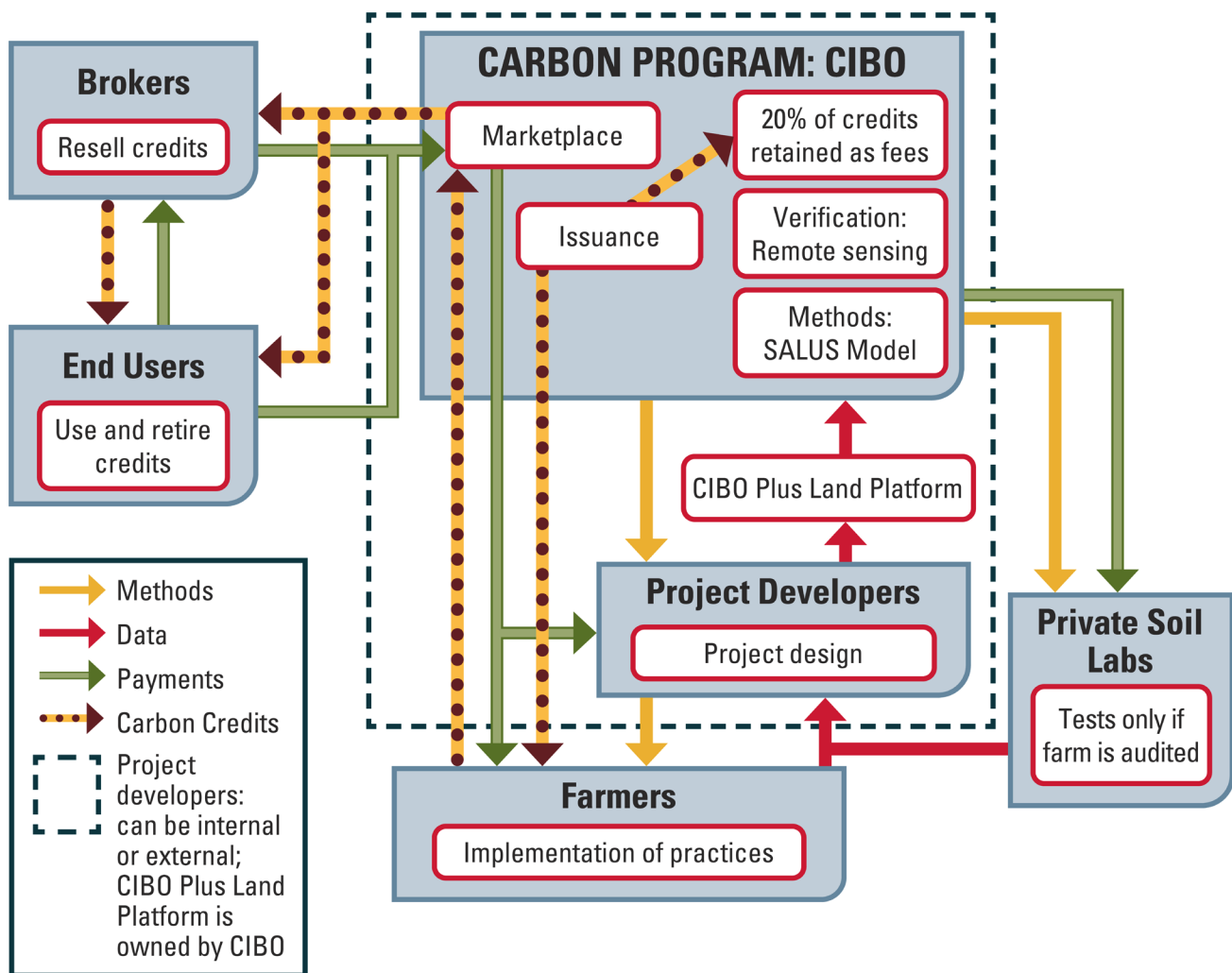
Figure 7. Carbon Credit Generation through Agoro



CIBO

CIBO is its own registry and marketplace, and its methodology to translate agricultural practices into carbon credits is based on the SALUS model (owned by Michigan State University). Project developers can be internal or external to CIBO. Practices implemented by farmers are registered online in the CIBO Plus Land Platform. Verification relies on remote sensing and is internal to CIBO. Soil tests are required only if the farm is audited, and CIBO issues the payments to soil labs. CIBO issues a serial number for carbon credits generated in a project and assigns 80% of the credits to the farmer and retains 20% of the credits as fees. Farmers sell their carbon credits through CIBO's online marketplace to end-users and brokers (who ultimately resell them to end users), and receive full monetary compensation from which fees to external project developers (if any) are paid. CIBO issues payments to soil labs. Farm production data is shared with project developers and CIBO. Payments start flowing into the system when a sale of (issued) carbon credits occurs.

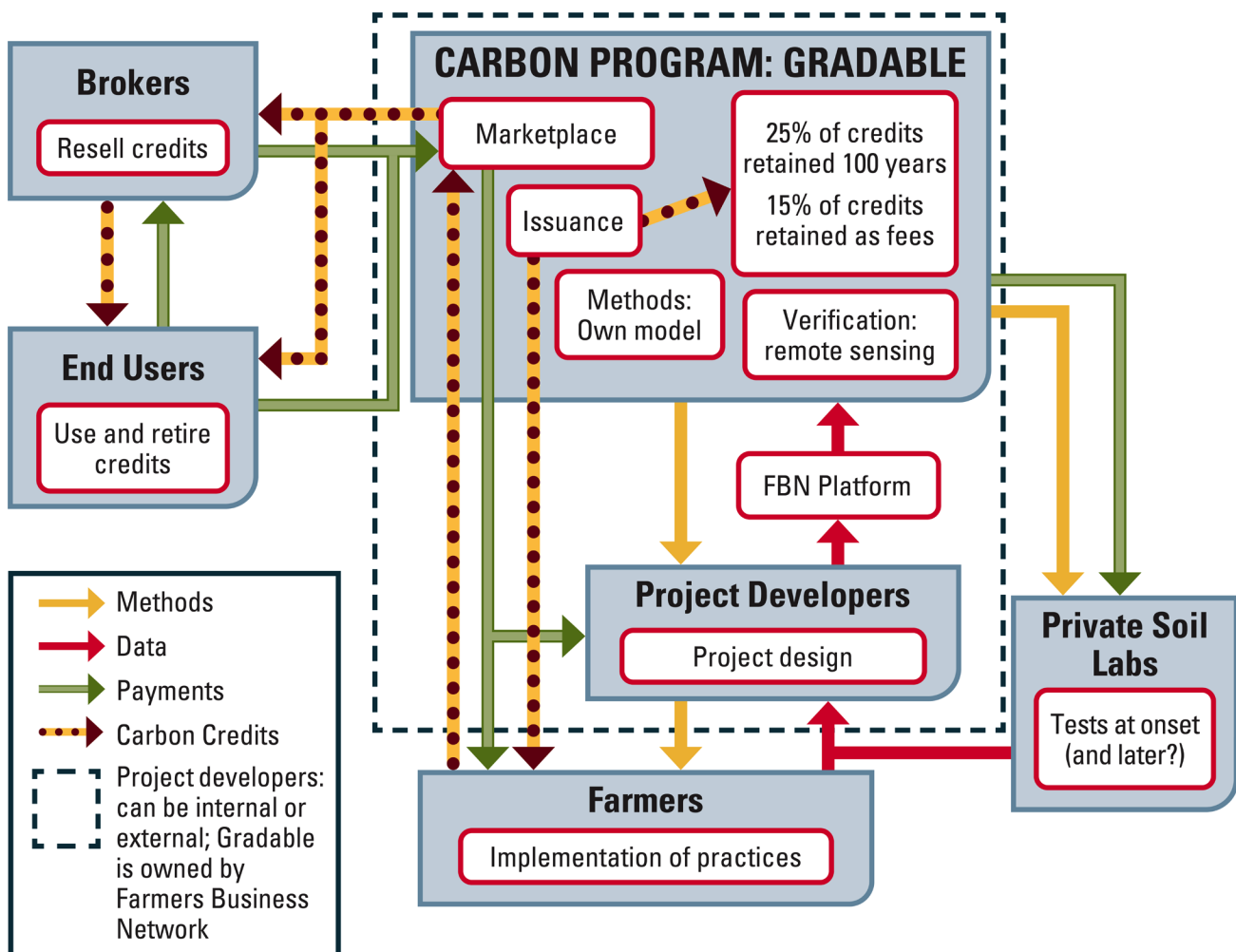
Figure 8. Carbon Credit Generation through CIBO



Gradable

Gradable is its own registry and marketplace, and it develops its own methodology to translate agricultural practices into carbon credits based on a **proprietary model**, <https://bit.ly/3cVpn2n>. Project developers can be internal or external to Gradable. Practices implemented by farmers are registered online in the Farmers Business Network (FBN) Platform. Verification relies on remote sensing and is internal to Gradable. Soil tests are required at project onset and possibly later. Gradable issues a serial number for carbon credits generated in a project and assigns 60% of the credits to the farmer, retaining the remaining 40%: 25% of the credits are retained to cover avoidable and unavoidable losses of carbon over a 100-year period and the remaining 15% are retained as fees. Farmers sell their carbon credits through Gradable’s online marketplace to end-users and brokers (who ultimately resell them to end users), and receive full monetary compensation from which fees to external project developers (if any) are paid. Gradable issues payments to soil labs. Farm production data is shared with project developers and Gradable. Payments start flowing into the system when a sale of (issued) carbon credits occurs.

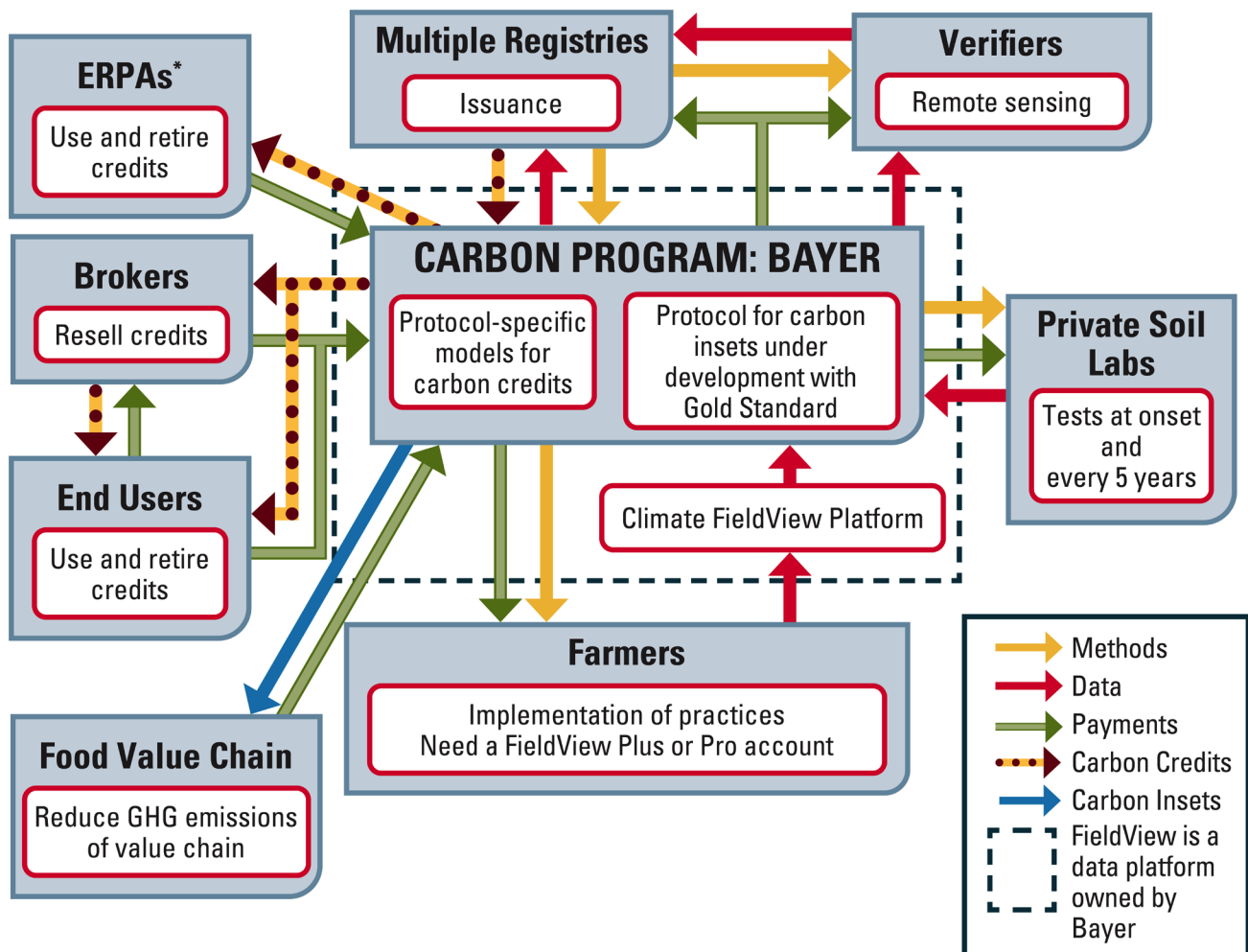
Figure 9. Carbon Credit Generation through Gradable



Bayer Carbon

Bayer Carbon finds investors to finance projects through ERPAs and pays farmers \$3 per acre per year to implement no-till/strip-till, \$6 per acre per year to plant cover crops, and \$9 per acre per year to implement both practices. Payments for implemented practices could increase (not decrease) depending on revenue obtained at credit sale. Bayer Carbon allows enrollment of practices that began as early as 2012, and offers up to five years of historic back pay after verification and validation. The methodology to quantify and issue carbon credits is under development, in collaboration with multiple registries. Farmers contract directly with Bayer Carbon and share their production data through the Climate FieldView Platform (owned by Bayer). Farmers must have a Climate FieldView PLUS subscription, which is available for free via BayerPLUS. Soil tests are mandatory at onset and every five years for the majority of the acres, and test costs are covered by Bayer Carbon. Depending on the final institutional arrangement for credit issuance and practice verification, production data may or may not be shared with actors external to Bayer Carbon only for purposes stated in the agreement, on a need-to-know basis. Payments are made on an annual basis after remote verification and validation, within one year of practice completion. Bayer Carbon offers participating farmers access to premium low-carbon grain markets.

Figure 10. Carbon Credit Generation through Bayer Carbon



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For further details on ag carbon programs see AgDM File A1-76, [How to Grow and Sell Carbon in US Agriculture](https://www.extension.iastate.edu/agdm/crops/pdf/a1-76.pdf), www.extension.iastate.edu/agdm/crops/pdf/a1-76.pdf, or the Carbon Market Information resources on the [Ag Decision Maker website](https://go.iastate.edu/BTGKOP), <https://go.iastate.edu/BTGKOP>.

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