

A photograph of a man with dark skin, curly hair, and a beard, wearing glasses and a light blue button-down shirt. He is holding a tablet computer and looking down at it. The background is a blurred green field under a bright sky, suggesting an outdoor agricultural setting.

What is an (M)MRV for Agriculture, and Why Do I Need One?

The acronym ‘MRV’ (sometimes ‘MMRV’ or ‘dMRV’) has emerged in agriculture-based climate solutions fairly recently. This is in part due to rising interest in regenerative and sustainable farming practices as climate mitigation strategies, and subsequent support for ecosystem markets in agriculture.

Reasons for acceleration toward climate commitments

For climate-smart farming practices to be implemented at scale, we must be able to support the business case for investing in climate-smart practices by understanding the impact they have on the environment. We need to monitor farmland to confirm that certain practices have been put in place, measure the impact of new practices, report that impact, and verify that both the practices and outcomes were achieved and the intended impact was realized.

MRV, MMRV and/or dMRV all refer to this process: the measurement, reporting and verification of ecosystem practices and outcomes on the farm.

- **MRV**
Monitoring / measurement, reporting, and verification
- **MMRV**
Monitoring and measurement, reporting, and verification
- **dMRV**
Digital monitoring and/or measurement, reporting, and verification

Our agriculture-based climate goals, such as emission reduction goals, net-zero goals and science-based targets (SBT's) require a clear framework: a way for those goals to be set, measured, reported and verified. The best goal-setting frameworks, such as the Objective and Key Results (OKR) framework, are widely used across industries and they focus on measuring both the activity that should lead to achievement of goals, and the outcomes of smaller sub-goals that ladder up to a larger objective. This idea can be applied to the MRV processes: the most achievable goals are those with frameworks that measure both activities and results; practices and outcomes. Thus, these are the core functions of a great MRV.

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Who cares about MRV?

Corporate leaders, government organizations, policymakers and climate researchers all care about MRV. The verification of ecosystem outcomes using MRV is often a requirement in corporate requests for proposals (RFPs), government grants and other programs in which we need to verify our environmental impact of climate mitigation strategies. For example, Greenhouse Gas Protocol is not requiring companies that report removals as part of their GHGp inventory to comply with strict MRV guidelines. Science Based Targets Initiative (SBTi) is also planning to release MRV guidelines in the coming year, and in the EU, the Carbon Removals Certification Framework (CRCF) is being created which sets a standard for ag-based MRV for removals.

But really, we should all care about MRV, as it is essential to accelerating the climate-forward transformation of the agriculture and food industry, and counteracting both greenwashing and greenhushing. The more a concept gains traction in this industry, the more it needs a clear definition to assure consistent use. MRV is about ensuring the validity of our efforts in land-based projects, so we must ensure that the term is well-understood and the processes are valid.



Let's break it down:

Ag MRV is all about ensuring climate action

MRV technology works to ensure that food producers, retailers and other stakeholders in the agrifood supply chain are implementing the sustainable practices they planned to implement, and that those practices are indeed having a positive effect on our climate trajectory.

How can we track, measure and monitor efforts in sustainability using an MRV?

Monitoring

Farming practices can be monitored using satellite imagery, integrations with farm management systems (FMS), and through other means of data collection. With satellite imagery, we can detect the use of cover crops, tillage levels, diversity of crop rotations, the use of hedge rows and buffer strips, etc. Farm management systems can provide information about changes in nutrient management (like fertilizer application) and other inputs. Finally, we can use additional information (like purchase receipts for inputs) to strengthen the case for some of these practices when satellite imagery or FMS data is insufficient or not available.

A well-established, transparent MRV will offer an evidence dashboard that clearly shows the status of evidence provided in an agricultural project. This evidence should be visible to both a project developer (often a company, investing into environmental outcomes or contracting the sustainable product) and the producer.

Measurement

We can measure the outcomes of agricultural practices — such as changes in GHG emissions, yield, water use quantity/quality and more — using direct sampling, outcomes modeling or both.

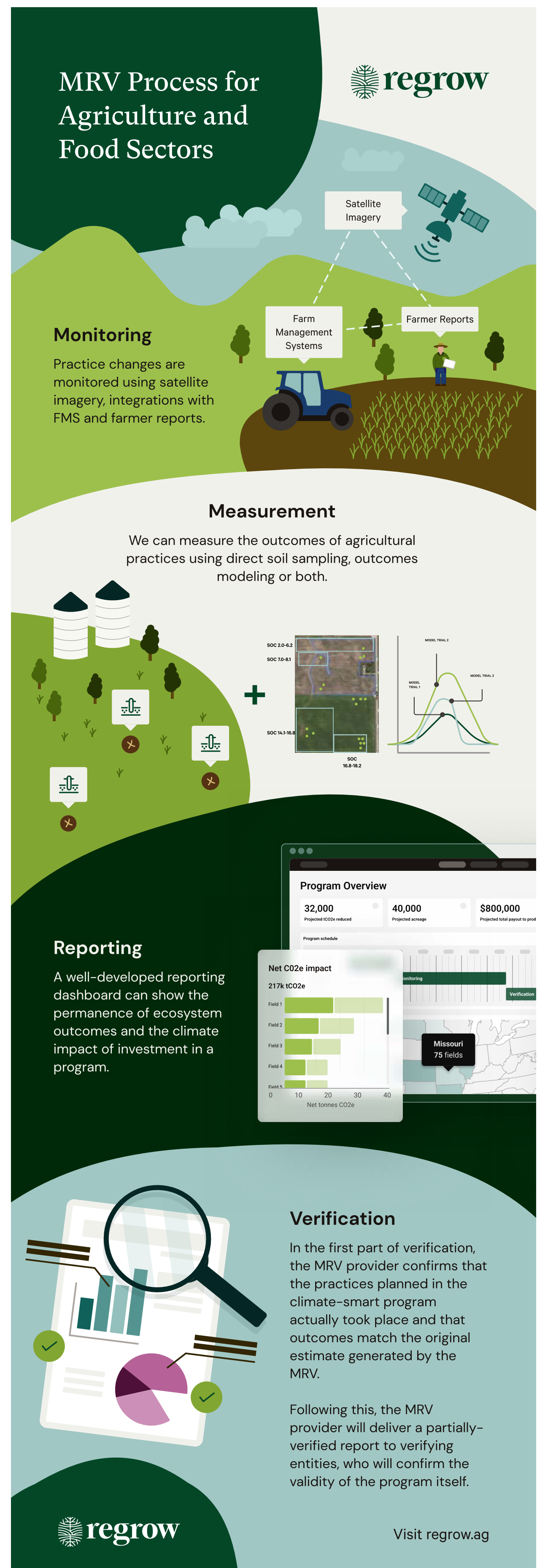
A scalable way to measure ecosystem outcomes is to combine a limited number of direct samples collected on the ground, e.g. soil samples with an ecosystem model, capable of producing detailed estimates of ecosystem outcomes and nutrient levels in soils. Regrow uses environmental models like DNDC, for example, estimates net GHG emissions (NO₂, NO_x, SoC, CH₄) on farms. It's important to note that measurement requires model estimates within known bounds of accuracy and uncertainty (based on the model calibration and validation process).

At Regrow, we have demonstrated that soil sampling, ecosystem modeling and satellite imagery can be combined to achieve the most scalable, cost-effective, yet accurate MRV functions. For more details on this, visit www.regrow.ag/mrv.

Reporting

An important part of building the case and financing environmental outcomes is the production of a report compliant with industry standards (such as GHG-Protocol or SBTi FLAG Guidance) to declare the positive impact of a climate-smart farming program.

A well-developed reporting dashboard can show the permanence of ecosystem outcomes and the climate impact of investment in a program. It can also show a percentage of acres and producers enrolled / re-enrolled in climate programs, growth in enrolled acres, evidence of practice verification and other metrics integral to ensuring valid ecosystem outcomes.





Verification

Verifiers that audit climate-smart agriculture programs need a Measurement & Reporting (MR) system that supports the verification process. This process is 2-fold — some of the responsibility lies with the MR provider, and some lies with the verifier.

In the first part of verification, the MR provider confirms that the practices planned in the climate-smart program actually took place (Regrow verifies practice implementation with remote sensing technology). The MR provider also confirms that end-of-program outcomes match the original estimate generated by the MR.

Following this, the MR provider will deliver a partially-verified report (confirming that the intended practice changes actually took place) to verifying entities, such as SustainCERT, who will confirm the validity of the program itself.

Regrow's MRV has been used in these ways by leaders in the agriculture and food industries to establish strong regenerative agriculture program around the world . [Learn more about how our MRV powers Cargill's RegenConnect program, supporting growers in the U.S., Canada and Europe.](#)



What makes a valid MRV?

Let's take a quiz

What constitutes a comprehensive MRV? Choose all that apply.

1. A farmer enrollment tool for nature-based programs — perhaps one that's connected to a Farm Management System (FMS) (such as Climate FieldView or MyJohnDeere)
2. An ecosystem outcome assessment tool that adheres to requirements of protocols, such as GHG-P, and provides farmers with an estimate of the potential ecosystem outcomes in connection to on-farm practice changes
3. Direct soil sampling or soil carbon mapping tools
4. Satellite imagery-based mapping for farming practices, like planting, tillage or cover cropping
5. An emission factors (EFs) platform or database
6. All of the above
7. None of the above

If you selected options 1-4, know that these options are all part of a comprehensive MRV.

Valid MRVs are comprehensive and compliant.

Comprehensive agricultural MRV workflows can be provided as a software platform with all the functions listed above and more. This simplifies workflows for companies looking to invest in ecosystem markets and/or positive environmental outcomes, as well as for farmers looking to enroll in those programs. Importantly, leveraging digital technologies provides the industry with the ability to reach its ambitious impact goals at scale, and to do so cost-effectively.

Whilst “MRV” as an acronym is quickly becoming synonymous with a new cloud-based software category, just like CRM once did, superseding more manual on-prem process and spreadsheets used for recording customer data, there are still presently considerations of the non-digital MRV methods in the industry.

Can a non-digital MRV be comprehensive? Perhaps — but it is less scalable and more resource-intensive than digital MRV platforms. Let’s consider the alternatives of an MRV platform:

- Direct soil sampling (as opposed to soil sampling plus model-based outcomes estimation): this is time- and resource-intensive and thus expensive and non-scalable.
- Managing farmer engagement on paper or in spreadsheets: this leads to challenges in scalability and adoption, as manual recording is time-intensive.
- Monitoring through self-reporting: if farmers report their own practices and fail to provide 3rd party proof of practice adoption and ecosystem outcome generation, the industry will likely see a degradation in the value of practice outcomes. Outcomes will be less trusted, which will diminish investment opportunities and slow adoption rates.

This is why the advent of digital MRV is a game-changer for our industry, and why MRV is gaining traction so quickly in agriculture.

Compliant agricultural MRV is a process that is aligned with industry standards, and likely to remain compliant as standards become more rigorous and as the science behind measurement, monitoring, reporting and verification advances. It’s important to consider compliance in terms of the MRV platform itself, as well as the quantification methods underpinning the platform (such as Regrow’s DNDC environmental model, which serves as the foundation for our MRV’s quantification module and has been granted first-ever generalized approval by leading standard Climate Action Reserve).

[Learn more.](#)



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Valid MRVs are offered by an independent third party.

A third party system ensures that no conflict of interest affects the outcomes of climate-smart farming projects.

If a project developer is offering an MRV that is not provided by an independent third party, there is an innate conflict of interest between the incentives of the project developer (achieving high impact and large volumes of ecosystem outcomes) and the true outcomes of the project.

It's also important to note that MRV is a nuanced system, which requires providers with specialized skill sets in outcome assessment and who follow the latest guidance from protocols and implement the latest scientific advancements. Developing an MRV is very different from enrolling farmers into programs or manufacturing seed coatings or growing crops.

Modern society favors specialization for a reason – with third parties that focus only on developing valid, scalable MRV components, MRV processes are bound to be more effective, more scalable and regarded with higher value.

We don't need to reiterate the necessity for fast, high-impact climate action. An independent MRV that is digitally-enabled and purpose-built has the best chance at scaling our positive climate impact and enhancing agriculture resilience.

Now that you know more about MRV, [explore Regrow's MRV platform](#) and see how we're using the latest science and tech to advance climate-smart agriculture.

Considering if you need an MRV for your programs?

How do you choose an MRV that's right for you?

Here are some questions to answer to make the choice of MRV that's right for your organization and scale of programs you are looking to implement.

When considering an MRV:

1. Is the scale of programs you are looking to run now or in the future larger than 5,000 acres / 2,000 hectares (can be translated into the number of growers you work with or the number of tons of product you source)?
2. Do you expect a need to demonstrate the credibility of the environmental impact of your programs, to obtain a third-party assurance/certification or to make public statements/claims about them?
3. Are you a publicly traded company with annual revenue over \$500M, headquartered in the European Union or the UK, or a company doing business with such entities?

If you answered “yes” to any of the above questions, there are compelling reasons based on the latest regulation, scalability needs and requirements for high-rigor outcomes to consider an MRV partner.

What type of MRV is right for you?

As discussed above, the MRV is a process, but also the systems that support MRV at scale are an emerging software category, worth keeping an eye on and incorporating into your programs. When it comes to scalable systems, their implementation usually follows the common wisdom “the sooner the better”. When you see a need for an MRV, it’s important to choose the one that will meet all the needs you have now and any needs that may arise in the future as regulation and standards continue to evolve. You must also pair this with consideration for the latest monitoring and quantification methods. Below are some questions to consider when procuring an MRV, issuing an RFP for an MRV, or considering upgrading your current processes for measuring and reporting environmental outcomes.

Does the MRV process or software you are considering meet the below criteria?

1. Is it comprehensive? Does it have the modules for:
 - a. configurable farmer enrollment incl. FMS integrations ,
 - b. capabilities for remote sensing of the farming practices,
 - c. outcomes estimation / quantification module aligned with the industry standards
2. Is it compliant?
3. Is it independent (or provided by a project developer directly, not a third-party)?
4. Has it been used to issue any certified assets?
5. Does it work with or has been audited by any standards and external VVBs?

Assessing your options is a difficult task, especially in such a nascent category and with quickly-evolving science.



Learn more about MRV
(and Regrow’s MRV
platform) at regrow.ag/mrv

