

ClieNFarms Practice Abstracts

Guidelines for Model Selection and Application: How to Choose and Use the Right Tools

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Selecting the appropriate model or tool for greenhouse gas emissions (GHGE) and soil organic carbon (SOC) assessments depends on purpose, scale, stakeholder, and especially the data availability and quality. ClieNFarms demonstrated that while a wide range of tools exists – from Tier 1–2 calculators to Tier 3 process-based models – there is no “one-size-fits-all” solution. To account for varying complexity of methodologies, the IPCC (Intergovernmental Panel on Climate Change) introduced a three-step tier- system, with Tier 1 indicating a basic method with an equation and default emissions factors, Tier 2 using the same equation but country- /region- specific emission factors, Tier 3 any more complex method, ranging from alternative equations to process-based models.

Data collection remains a central challenge. Tools vary widely in their data demands, and not all farms can provide field-specific, high-resolution inputs. ClieNFarms found that clear protocols and communication can facilitate data sharing, but farm-specific Tier 3 models often require measurements not readily available, such as bulk density, SOC fractions, and spatial calibration. In contrast, Tier 1-2 tools use simpler, standardised data, making them more applicable at large scales despite their lower accuracy.

Process complexity and model structure matter. While Tier 1-2 models can support trend identification and basic farm-level assessments, they are not reliable for precise, site-specific decisions like carbon certification or subsidy allocation. Tier 3 models provide more accurate simulations, especially for SOC dynamics, but are data-intensive and sensitive to errors in input or aggregation. Therefore, they should be complemented with direct measurements where possible.

Different stakeholders have different needs. For e.g., farmers require tools that balance usability and accuracy and data input. Tier 1–2 models can support management decisions, while robust certification would require Tier 3 models and expert use. In contrast, policymakers may use simpler models for regional strategy and trend analysis but would need more detailed approaches for farm-level assessments or Monitoring, Reporting, and Verification (MRV) systems. Overall generic tools are often sufficient, especially when aggregating across many farms.

In MRV systems, models should support and not replace measured data. Especially, bulk density cannot be derived without measurements in the field. The most important factor in model performance is data quality, not model complexity. Simplified models with good data often outperform complex models with poor data.

Ultimately, model choice must align with purpose, scale, and available data/resources—and should be part of a hybrid approach combining measurements, modelling, and expert interpretation.

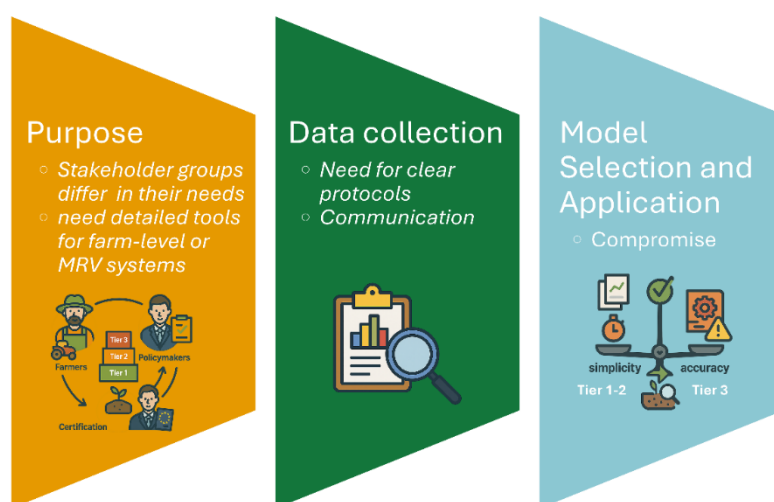


Figure 1 : Scheme of what to consider when choosing and using the right tools.



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