Introduction to Adoption of Sustainable Agricultural Land Management Methodology (VM0017)

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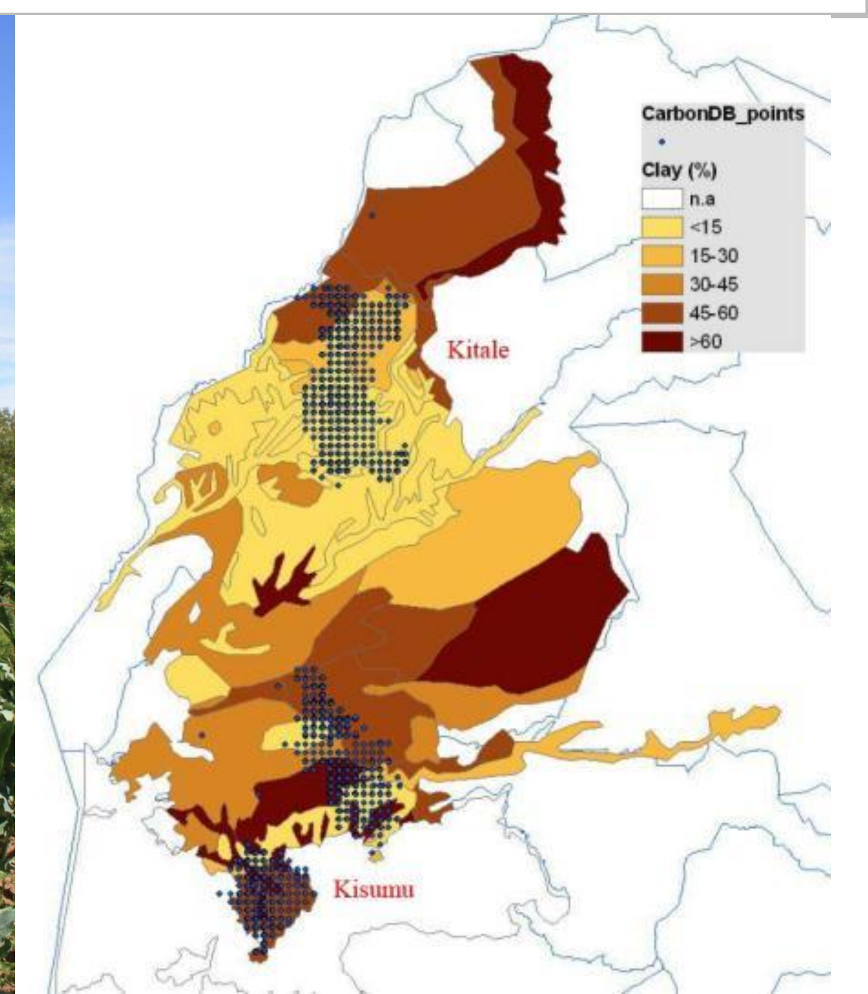
Monitoring Adoption of Sustainable Agriculture Land Management Practices

SALM practices:

- Residue management
- Composting
- Cover crops
- Reduced tillage
- Agroforestry



Bridging the Gap between 'Methodological Approaches' and on-the-ground reality

Project region characteristics (Kenya Agricultural Carbon Project)

- Subsistence production systems: 80% of population are farmers; 90% population use fuelwood/charcoal for cooking; 50% small holders live on < $1/day
- Low capacity on the ground: Farmers lack access to professional extension services in the region
- Limited data availability: Data are mainly collected in the framework of projects; farmers are not trained to collect and to use the data for monitoring of their own performance
- Large number of small holder farmers: 60,000 farmers (average farm size is 0.5-0.8 ha; mixed cropping systems (maize and beans); low yields 1 ton per ha/year

Challenge:

- No approved methodology for estimation of emission reductions from agricultural practices at farm level
- Existing approaches are 'far too complex' for applicability within smallholder farming systems.
- Given the situation on-the-ground, how do we deal with the protocol requirements?
- Monitoring approach 'top down' or 'bottom up'?

Two-fold innovation:

- Model-based approach that takes into account agricultural activities in quantifying changes in Soil C, rather than measure Soil C; i.e. use of validated models to assess change in Soil C over time)
- Bottom up monitoring framework - Farmer/community monitoring of sustainable agriculture practices

Guiding Design Principles of SALM Methodology

- Assist small-scale farmers to improve:
  - Productivity, food security, climate resilience
- Adapted to existing farming systems:
  - Small-scale agriculture (farm size)
  - Diversity of farming systems
- Cost effectiveness and minimize transaction costs:
  - Minimize transaction costs along (carbon) value chain
- Aligned with agricultural development concept:
  - Coherent with activity-based/production-based advisory systems
  - Effective advisory services
- Suitable given existing resources and capacity constraints
  - Acknowledge realities of national research systems
  - Data availability
  - Limited research funding and capacity constraints
  - Use of several existing CDM tools to estimate emissions

Methodology - Applicability Conditions

- Project can occur on land that is either cropland or grassland at the start of the project;
- Project does not occur on wetlands;
- Project land is degraded and will continue to be degraded or continue to degrade; (i.e. loss of soil C in absence of project)
- The area of land under cultivation in the region is constant or increasing in absence of the project;
- Forest land, as defined by the national CDM forest definition, in the region is constant or decreasing over time;
- Use of the Roth-C model is appropriate for project area:

  -Studies that demonstrate that the use of the Roth-C model is appropriate for:

  (a) the IPCC climatic regions of 2006 IPCC AFOLU guidelines, or

  (b) the agro-ecological zone in which the project is situated

Key Steps in Methodology Application

- Identify and delineate boundary (record geographic coordinates/GPS tracking)
- Identify **baseline scenario** and demonstrate **additionality**
- Estimate annual emissions from:
  - Use of synthetic fertilizers
  - N fixing species
  - Burning of agricultural residues
  - Use of fossil fuels in agricultural practices
- Estimate annual removals from existing woody perennials
- Estimate the soil organic carbon in the **baseline** (no changes in agricultural practices or inputs)
- **Project scenario**: Apply above steps except soil organic carbon estimated based on measured or estimated changes in agricultural practices or inputs
- **Leakage**: Increase in use of non-renewable biomass that occurs from displacement of biomass use for energy or agricultural inputs.
- **Permanence**: addressed using VCS risk buffer rating tool

Data

- Primary data collection at farm level such as:
  - Area of each crop
  - Productivity of each crop
  - Amount of fertilizer applied
  - Use of fossil fuels due to agricultural management
  - Existing crop residue management practices
  - Number of livestock per animal type
- Data collection vary with type of SALM practice. For example,

  if the project activity includes agro forestry, then, for use with the Roth-C model, the ABMS should record;
  - Area of agroforestry (ha)
  - Number and species of trees used
  - Diameter at breast height (DBH) of trees
  - Future numbers of trees that will be implemented with the project
- Flexibility in use of methodology; more practices can be included and list of monitored parameters can be revised as relevant

Monitoring

- **Bottom-up approach** with use of farmer groups for monitoring the adoption of agricultural practices
  - Use of *permanent sample fa*rmers/*reference group* in Activity Baseline and Monitoring Survey (ABMS) to establish SALM adoption rates in baseline and monitor changes in project
  - Farmer Group monitoring to assess the changes in practices over time
  - Farmer Group Monitoring verified by permanent sample/reference group farmers
  - ABMS inputs to the model Roth C

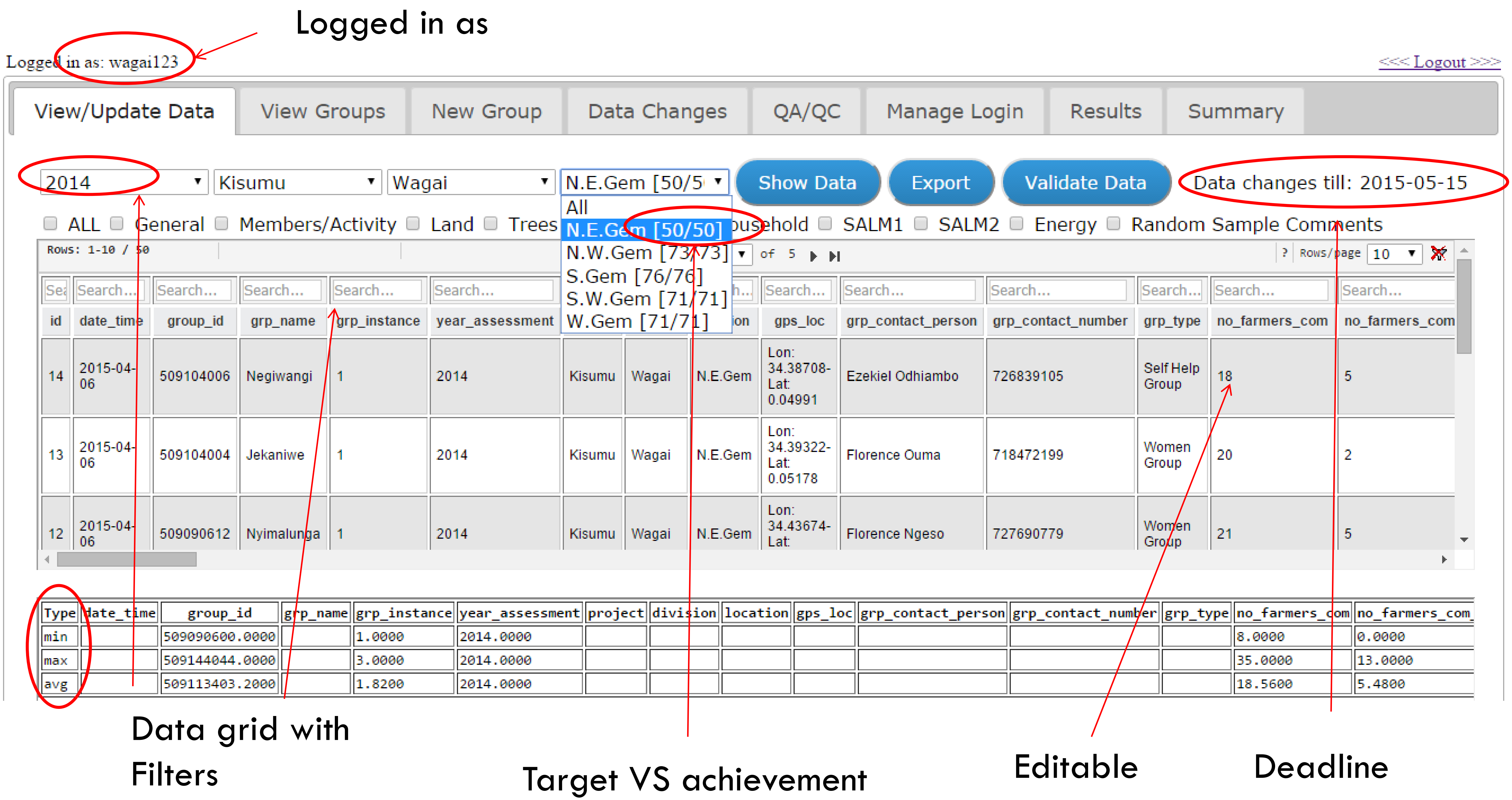
Activity Baseline and Monitoring Survey (ABMS)

Project requirements	ABMS	Examples	Synergies with project management & extension
Project boundaries	Identification of project areas (GPS farm tracking)	High residue crops areas, tillage areas,	Land use classification & prioritization
Baseline - activities	Identify the actual agricultural management practices	Residue management practices, tillage, manure management practices , crop area, existing trees	Training needs assessment, identification of primary fields for extension and training, sensitization
Project - activity monitoring	Identify adoption of SALM practices	Improved crop land management , mulching, composting…	Project impact assessment, farmer's commitment
Baseline - soil model input data	Organic matter inputs (biomass and manure); soil cover	Annual crop yields, rotational patterns, crop areas, livestock & grazing assessment	Livelihood assessment, Livestock management
Project - soil model input data	Organic matter inputs (biomass and manure); soil cover	Changes in crop productivity, manure management, crop areas	Food security monitoring

Management Information System to Organize Data

- Centralized online database
- Controlled data access and usage rights
- Web-based interface to monitor project activities
- Log of data modification to trace data updates
- Sampling system for QA/QC
- Data validation and checks
- Instant summaries and reports
- Data export for sharing
- Integration with data collection system such as web-based data entry/android/SMS

Web-Based User Interface of MIS in Kenya Agricultural Carbon project



Summary and Results

Logged in as: admin123 <<< Logout >>>

View/Update Data | View Groups | New Group | Data Changes | QA/QC | Manage Login | Results | Summary

2014 | Kisumu | Refresh

1. General information

Total number of groups	Total number of farms	Total area ha	Total_agricultural_land_ha
823	13838	12632.76	9087.32

2. SOC estimations - input parameters for RothC and implementation areas

2.1. Mulching (tC/ha per application)

crop	season	Area weighted mean tC/ha	Pmin tC/ha	Pmax tC/ha	SE %	% of Agri.Land
maize	Season 1	1.01	0.99	1.03	1	34.82
maize	Season 2	0.91	0.89	0.94	1	40.73
beans	Season 1	0.57	0.56	0.59	1	19.05
beans	Season 2	0.54	0.53	0.55	1	18.40
sorghum	Season 1	0.63	0.61	0.64	1	6.57
sorghum	Season 2	0.62	0.60	0.65	2	3.29
sw_potato	Season 1	0.44	0.44	0.45	0	1.31
sw_potato	Season 2	0.44	0.43	0.45	1	0.66
gnut	Season 1	0.54	0.52	0.55	1	3.94
gnut	Season 2	0.43	0.42	0.44	1	2.63

4. Other project emissions

Fertilizer use	1st season % of total agricultural land	2nd season % of total agricultural land
Fertilizer use	8.0	6.2
Burning biomass	0.0	0.0
Use of machinery	0.0	0.0

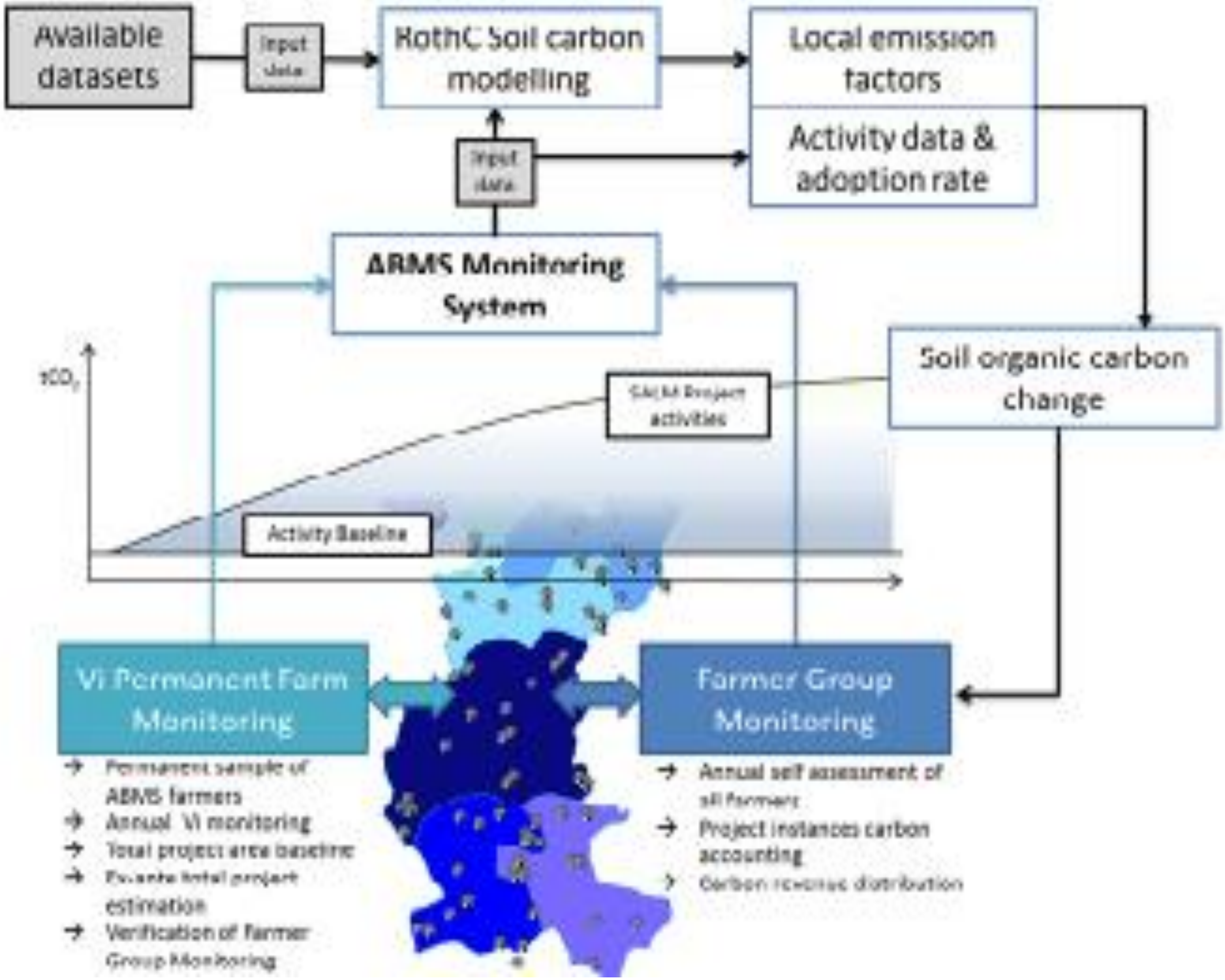
Model-Based Approach: Use of Roth-C

- Model inputs and outputs
- Local default SOC emission factors based on parameterized Roth-C model validated using research data applicable to the agro-ecological zone

<table>
<tr><th></th><th>Introduction of mulching (tCO2/ha/year)</th><th>Composted manure (tCO2/ha/year)</th><th>Cover crops (tCO2/ha/year)</th></tr>
<tr><td colspan="4">Example from the Kenya project</td></tr>
<tr><td>1st season</td><td>0.29</td><td>0.25</td><td rowspan="2">0.41</td></tr>
<tr><td>2nd season</td><td>0.20</td><td>0.27</td></tr>
</table>

- Model uncertainty
  - The project proponent should calculate the soil model response using the model input parameters with the upper and lower confidence levels. The range of model responses demonstrates the uncertainty of the soil modeling.
  - Adjustment of the soil carbon sequestration estimate based on model output uncertainty
    - < 15% (of the mean value) à no adjustment
    - 15 – 30% deduction of SOC estimate

Evolution of Bottom-Up Monitoring Framework: Micro to Meso Scale



Experience from Methodology Development and Application

- More than two years (Oct 2009 to Dec 2011) to finalize the methodology after the first draft was available
- Approved as methodology following double validation process; first assessment by Scientific Certification Systems (SCS); second assessment by Det Norske Veritas (DNV)
- Costs incurred in methodology development USD - 300K plus
- Technical expertise support for the process from scientific community and developing country stakeholder participants
- Public good available as approved VCS methodology VM0017
- Kenya Agricultural Carbon Project is implementing methodology in 45,000 ha covering 60,000 farmers and 3000 farmer groups; and is supported with 30 field officers that provide advisory services. First verification of the project has been completed; and second verification is underway
- Required training, capacity building and developing understanding of responsibilities of project teams and auditors
- Resulted in knowledge sharing sessions and e-learning modules

Considerations in Scaling Up

- With some adaptation, the methodology framework can be broadened to consider models that cover broad range of agricultural practices
- Current approach is low cost but requires support to establish community (farmer) based monitoring systems in the initial years.
- Remote sensed methods in combination with on-the ground data collection can help check the accuracy of activity data and can contribute to cost effective monitoring
- Systems for bottom up data management and analysis can help reduce monitoring costs (Management Information System has been developed for Kenya)
- Data management systems need to exist for each stage i.e. implementation, monitoring, reporting, checks and balances for data accuracy and error detection
- Strong demand-driven extension systems are prerequisite for successful implementation.
- Can facilitate engagement of multiple stakeholders (practitioners and policy makers in country) for implementation of policies and actions in landscape contexts
- To be cost effective methodologies and monitoring systems need to evolve and adapt to local contexts

For information on the Kenya Agriculture Project:
https://www.youtube.com/watch?v=DHVAgu7DCYM

For Methodology :
http://www.v-c-s.org/methodologies/VM0017

For information on Vi Agroforestry:
http://www.viagroforestry.org/

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