SAMPLES

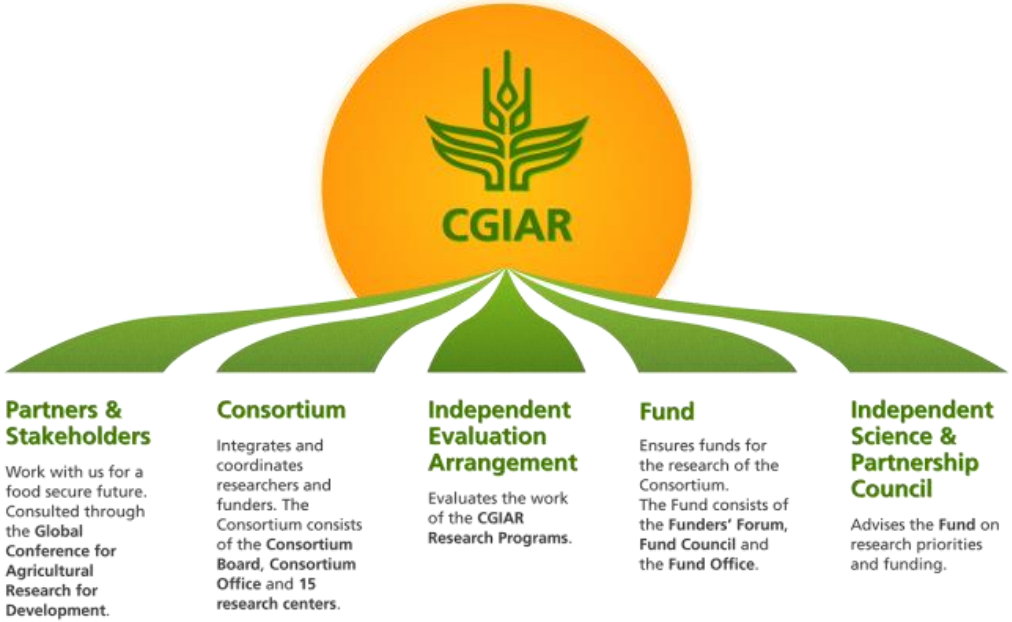
Standard Assessment of Mitigation Potential and Livelihoods in Smallholder Systems

Mariana Rufino, Klaus Butterbach-Bahl, Todd Rosenstock, David Stern, Eugenio Diaz-Pines et al

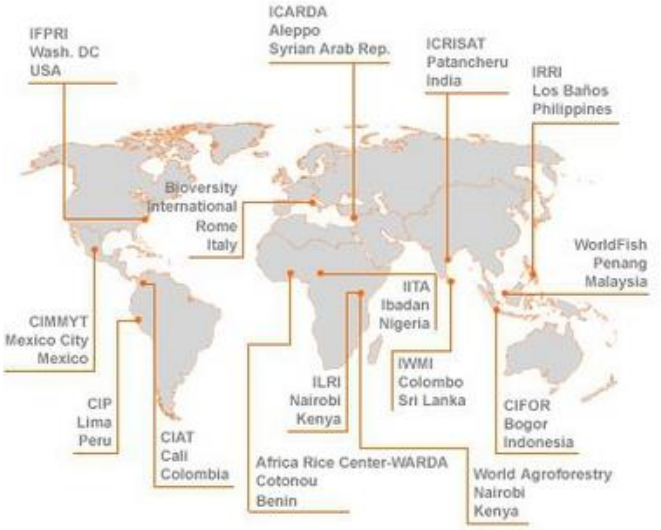
and at least another 20 people!

Consultative Group for International Agricultural Research

CGIAR
Science for a food secure future



Mission:
Food security and poverty Alleviation



15 centers, 70 regional offices

CCAFS

Climate Change Agriculture and Food Security Research Program of the CGIAR (CCAFS)- since Dec 2010

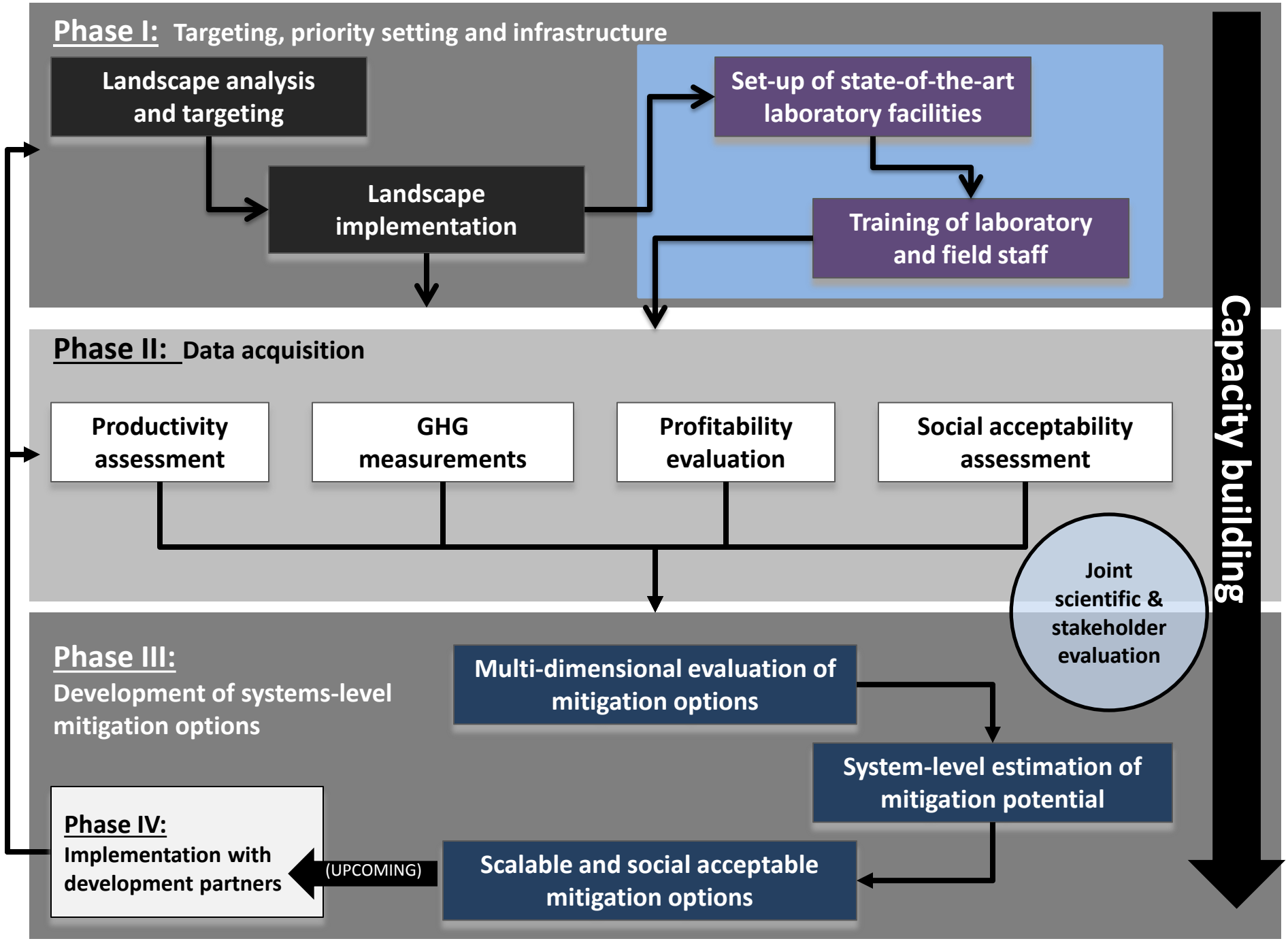
- Adaptation, risk management, mitigation and integrated decision making themes
- Partnership of the CGIAR (15 centers) and Future Earth
- Regional focus: E and W, Africa, S. Asia, SE Asia, Lat Am, action research sites

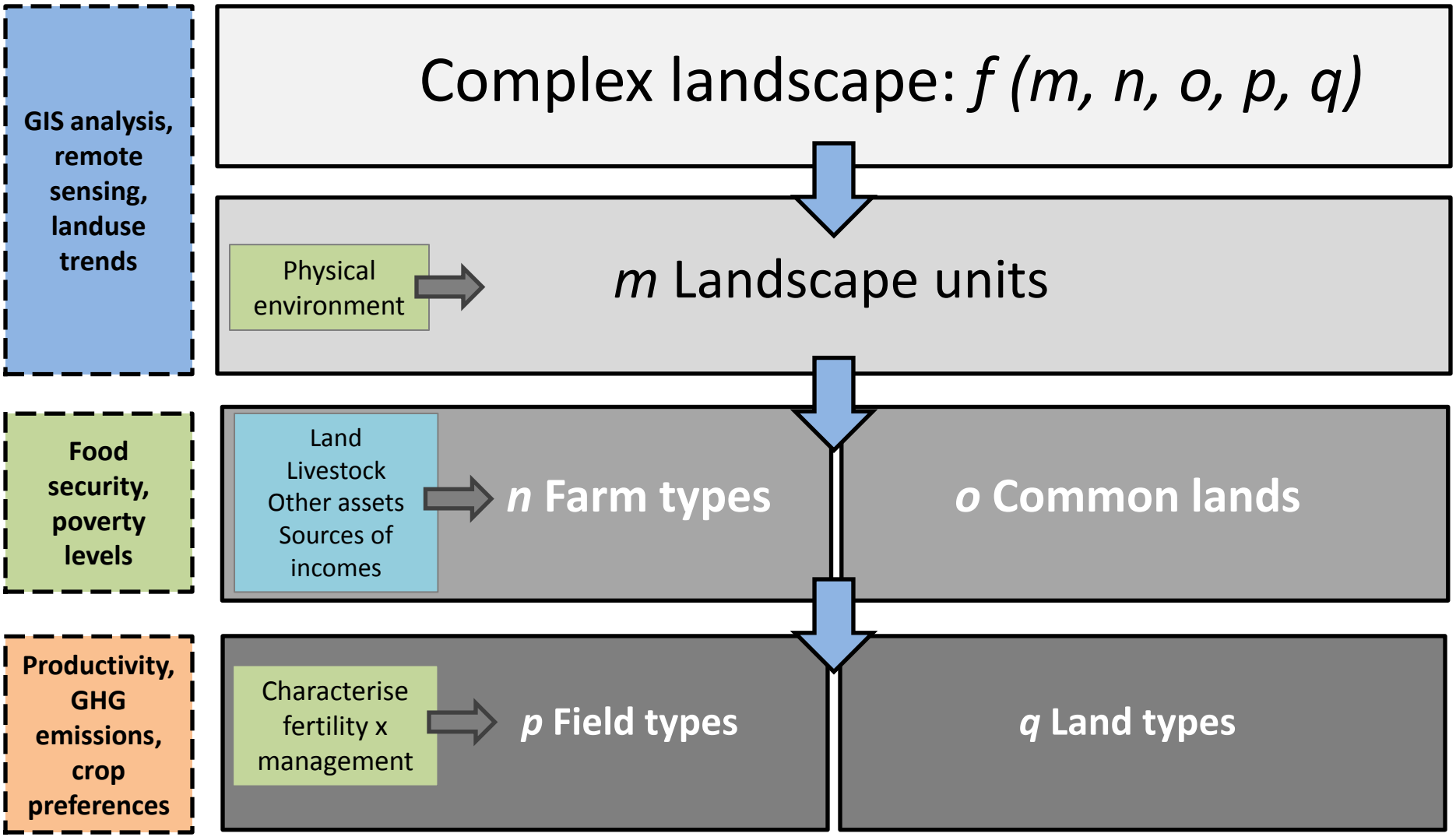
What SAMPLES addresses:

- Few data
- Diverse, complex crop-livestock systems
- Methods expensive
- Models not calibrated
- Metrics not linked to livelihoods

The goal

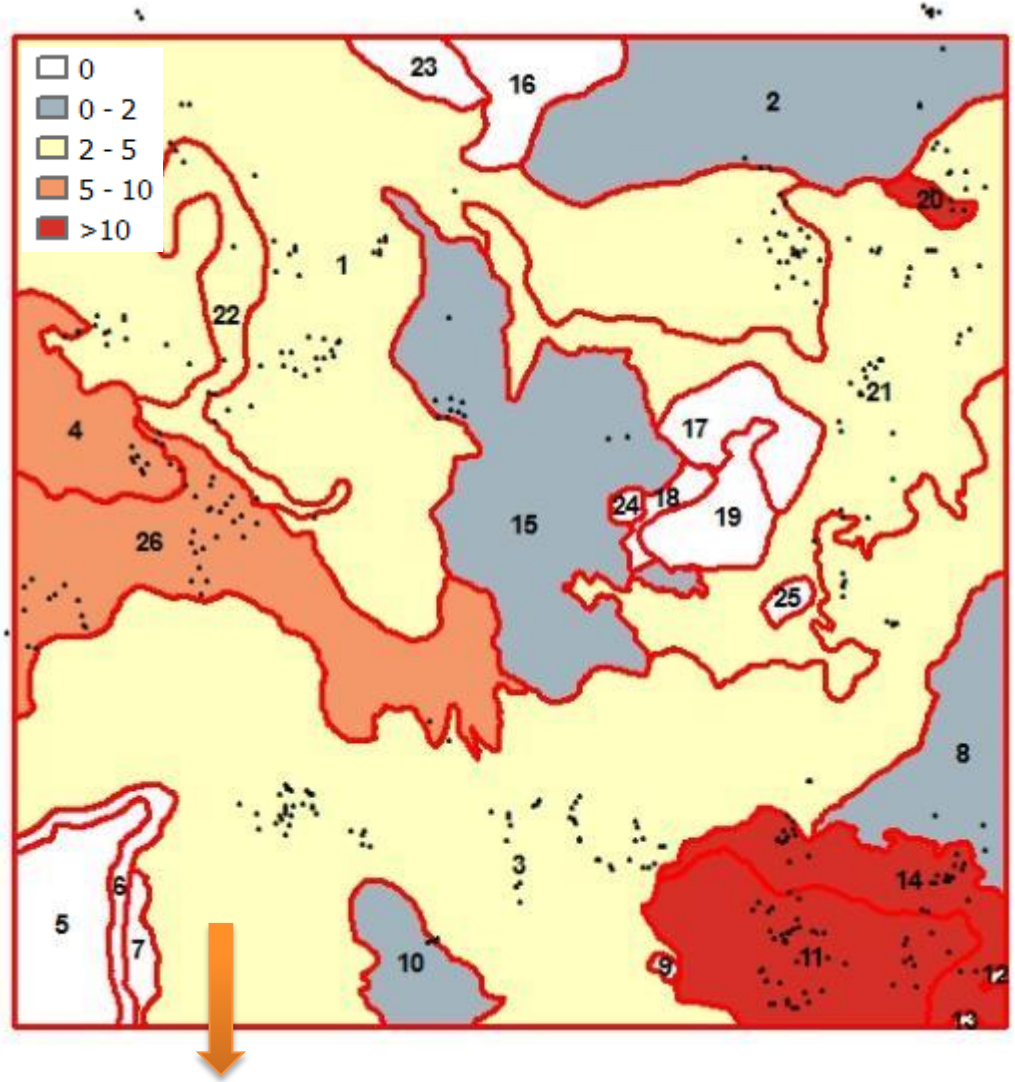
Develop a low-cost methods to quantify greenhouse gas emissions and to identify mitigation options for smallholders at whole-farm and landscape levels


Phase I: Targeting, priority setting and infrastructure
Landscape analysis and targeting
Landscape implementation
Set-up of state-of-the-art laboratory facilities
Training of laboratory and field staff
Phase II: Data acquisition
Productivity assessment
GHG measurements
Profitability evaluation
Social acceptability assessment
Joint scientific & stakeholder evaluation
Capacity building
Phase III:
Development of systems-level mitigation options
Multi-dimensional evaluation of mitigation options
System-level estimation of mitigation potential
Scalable and social acceptable mitigation options
Phase IV:
Implementation with development partners
(UPCOMING)

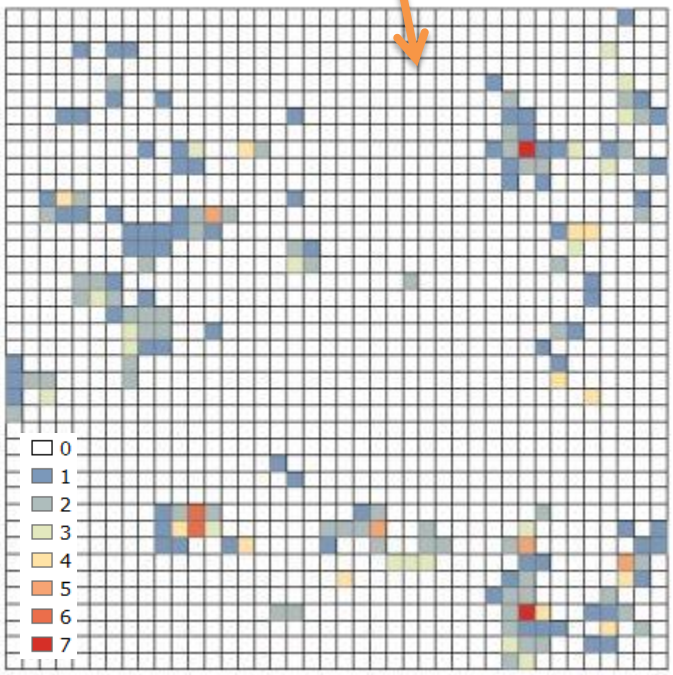

GIS analysis, remote sensing, landuse trends
Complex landscape: f (m, n, o, p, q)
Physical environment
m Landscape units
Food security, poverty levels
Land
Livestock
Other assets
Sources of incomes
n Farm types
o Common lands
Productivity, GHG emissions, crop preferences
Characterise fertility x management
p Field types
q Land types

Landscape units and land users

Sampling intensity (sites: area)

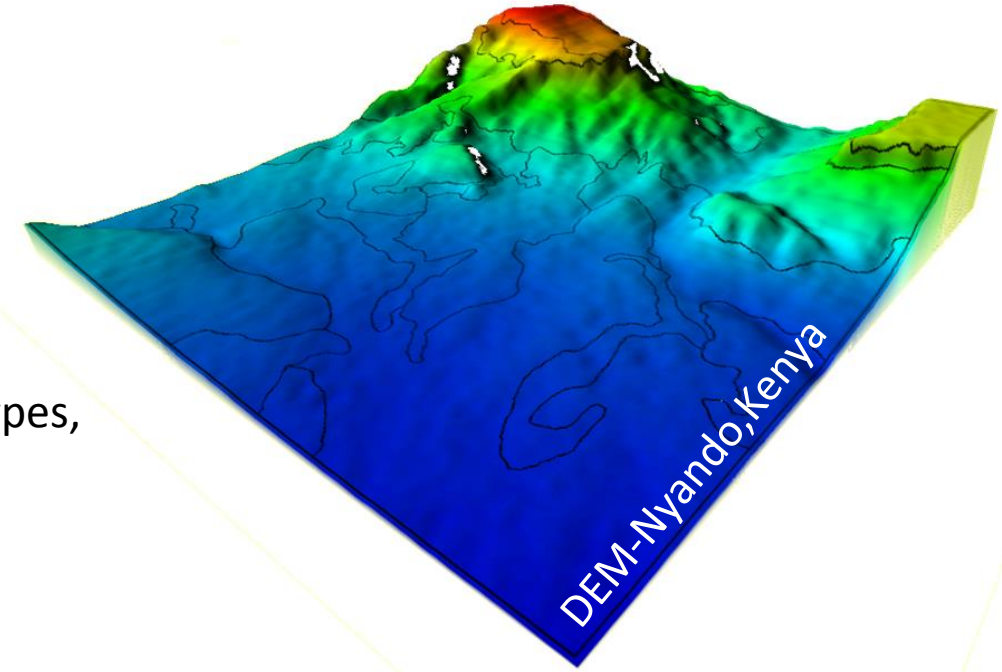


In terms of a 250 m square grid



class	sites	area (km2)	sites:area
cultivated (cash and subsistence)	28	2.74	10.23
cultivated (cash)	47	5.94	7.91
cultivated (grasslands and pastures)	47	12.69	3.70
cultivated (subsistence)	141	41.54	3.39
mixed	93	34.69	2.68
uncultivated vegetation	4	2.39	1.67

Step 1. Landscape analysis



Targeting:

- Landscape units, farm types, field types, soils
- Site selection

Step 2. Installing measurement stations

Site characterization:

- Soils, crops, biomass

Installation of chamber frames

Informing and interviewing farmers

Step 3. Measurements applying gas pooling

Field work:

- Overcoming spatial variability by gas pooling method

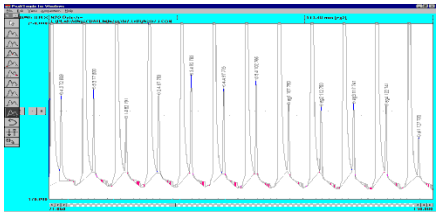
Gas sampling(closed chamber method)

Storage of gas samples in vials

Step 4. Lab analysis and flux calculations

Lab work:

- Analyzing gas samples
- Calculating concentrations and fluxes



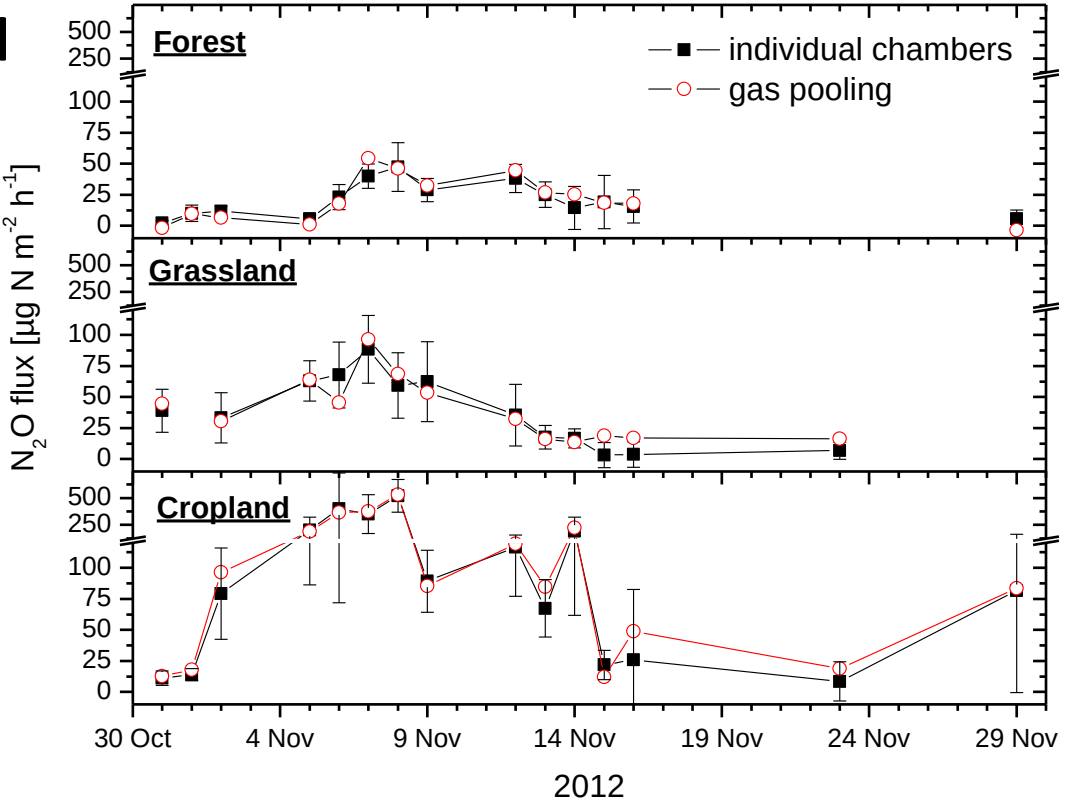
Determination of trace gas concentrations via gas chromatography

Flux calculation formula

$$F = \frac{b * Mw * V_{Ch} * 60 * 10^6}{A_{Ch} * V_m * 10^9}$$

Step 5. Intepretation and upscaling

Temporal variability of N_2O fluxes at three sites differing in land use at Maseno, Kenya.



Arias-Navarro et al., 20013 Soil Biol. Biochem.

Synthesis of GHG measurements: information useful to derive emission factors, empirical models, calibrating and validating of detailed models

Upscaling: using the targeting approach (assigning emissions to landscape elements) and/or of GIS coupled biogeochemical models

Multi-dimensional assessment of mitigation options

Farm type	Field type	Profit ($/ha)	Production (kg/ha)	Emissions (t CO2eq per ha)	Emissions (kg CO2 per kg product)	Social acceptability (ranking)
1	1	50	500	0.6	1.2	1
1	2	140	5000	3	0.6	2
1	3	120	2000	2	1.0	2
1	4	40	4500	3	0.7	1
2	1	30	800	0.7	0.9	3
2	3	180	8000	3	0.4	2
2	4	250	300	0.5	1.7	1
n	m	$V_{n,m}$	$W_{n,m}$	$X_{n,m}$	$Y_{n,m}$	$Z_{n,m}$

Trade-off analysis on multiple dimensions

SAMPLES 2014

- Inform mitigation decisions: methods and data
- 5 year program (started 2012)
- Leadership: Mariana Rufino (CIFOR), Klaus Butterbach-Bahl (ILRI-KIT), Todd Rosenstock (ICRAF), 5 CG centers + partners
- Expanding to other sites

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