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EcoSolutions

9B Mohr Road  
Tokai, 7945  
Cape Town  
South Africa  
T/F +27 (0)21 715 1560  
info@c4es.co.za  
www.c4es.co.za

# Carbon finance and accessibility by the agricultural sector in Africa

Challenges and opportunities  
James Reeler, C4 EcoSolutions

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# Principles

- Carbon finance depends on a virtual market, in which people can buy and sell carbon credits
- Carbon credits are standard units of 1 tonne of CO<sub>2</sub>e (roughly 1 m<sup>3</sup> of wood)
- No centralised carbon credit market
- No single standard or set of regulations to measure emissions
- Two principal markets: regulatory and

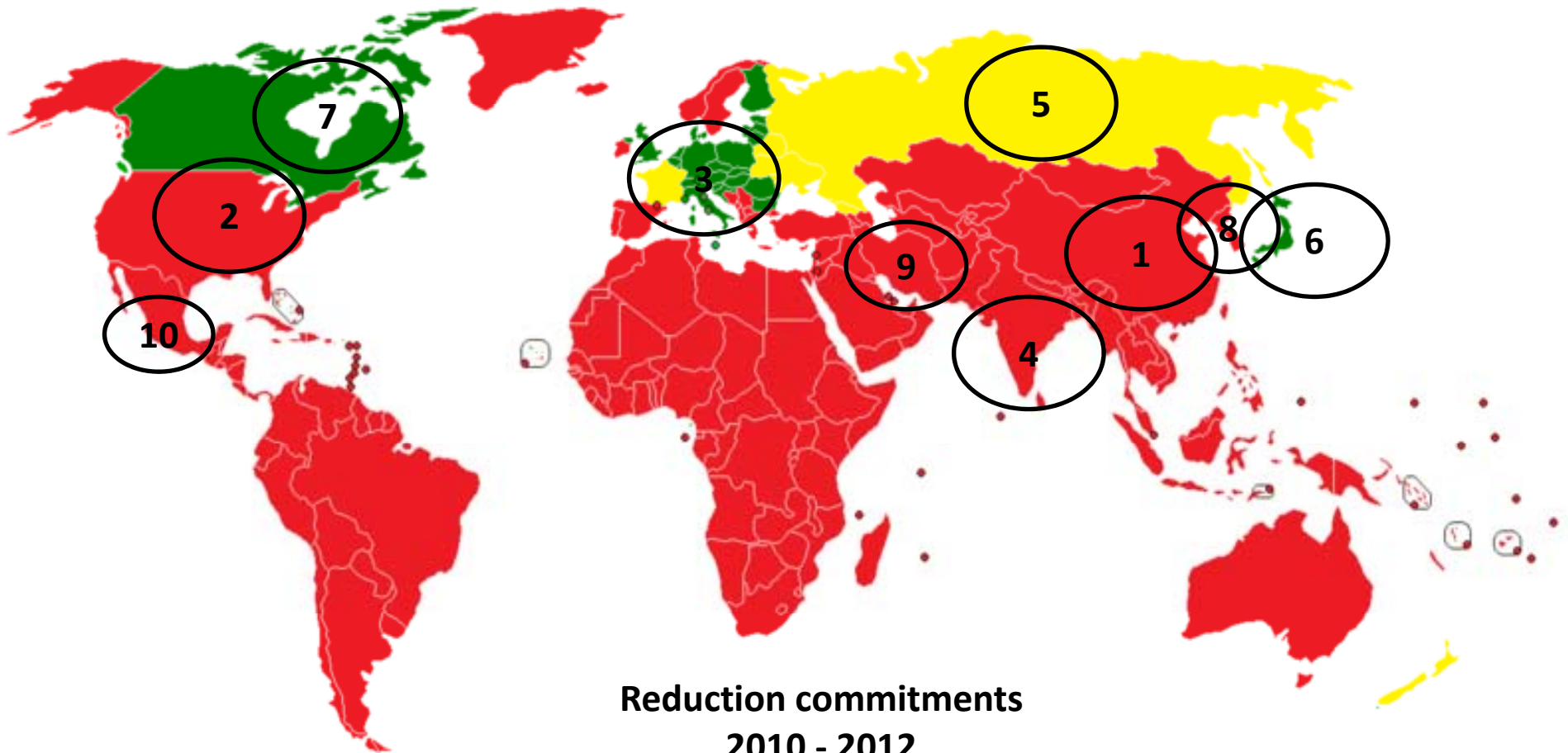
voluntary



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# Regulatory market



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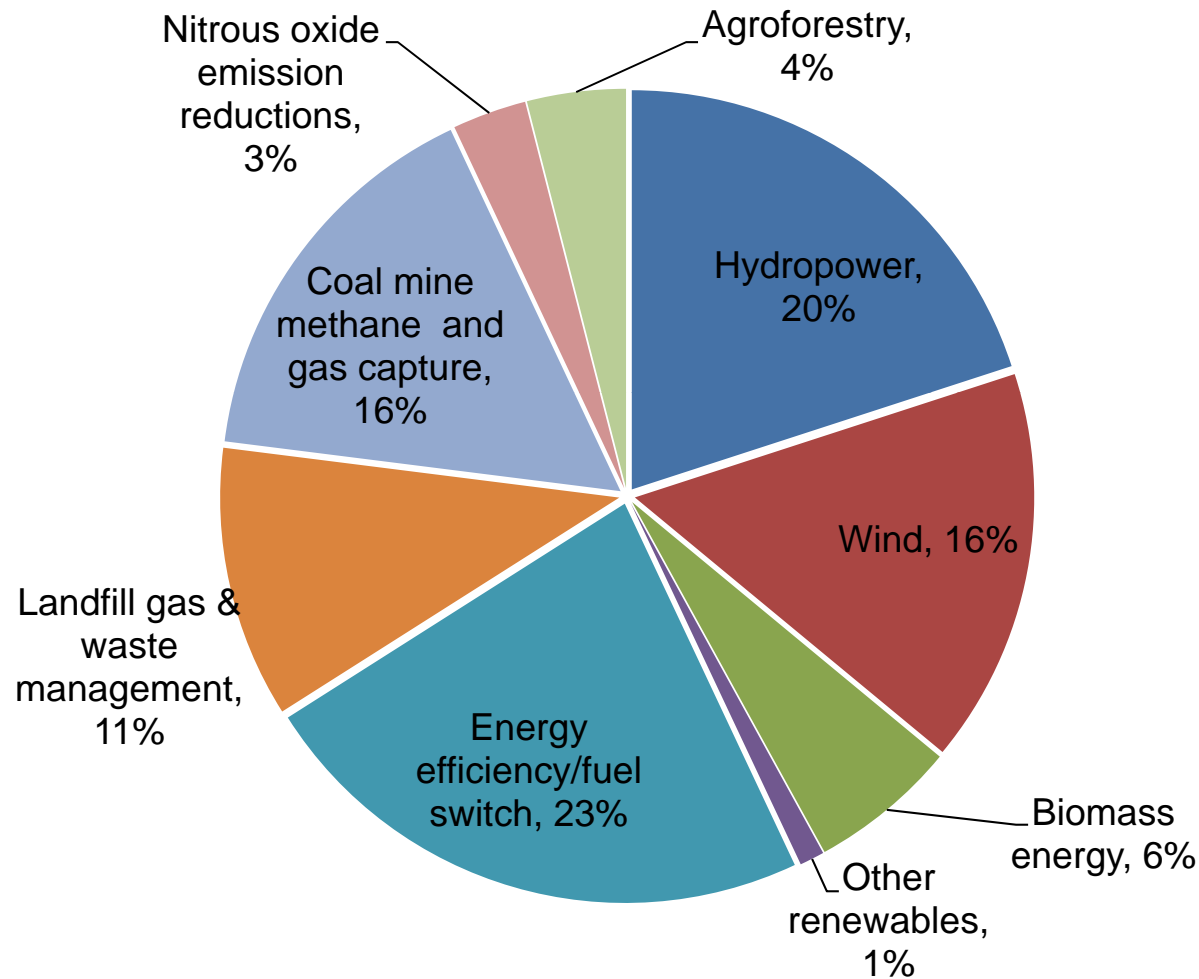
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# Principles

- Basic concept: Cap and trade (eg IET).
  - Cap: emissions limits set for a particular sector. Each member has an emissions “allowance”
  - Trade: those who are unable to meet obligations can purchase unused allowances from others
- Cap lowered periodically to reduce overall emissions
- Market driven economics (tested with US SO<sub>2</sub> emissions)
- Carbon credit type: certified emission reductions (CER)
- Credit value responds to market supply/demand
- Exclusive to compliance market



# Current CDM sectors



**CDM sectoral sources in 2009**  
[Source: World Bank]



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# Voluntary market

- No cap to emissions
- Driven by social responsibility (corporate, personal or municipal)
- Purchase of credits offsets emissions, makes products carbon neutral
- ADDITIONALITY – project must not have happened in the alternative case
- Current highest earners are principally renewable energies
- Credit type: Verified emission reductions (VERs)

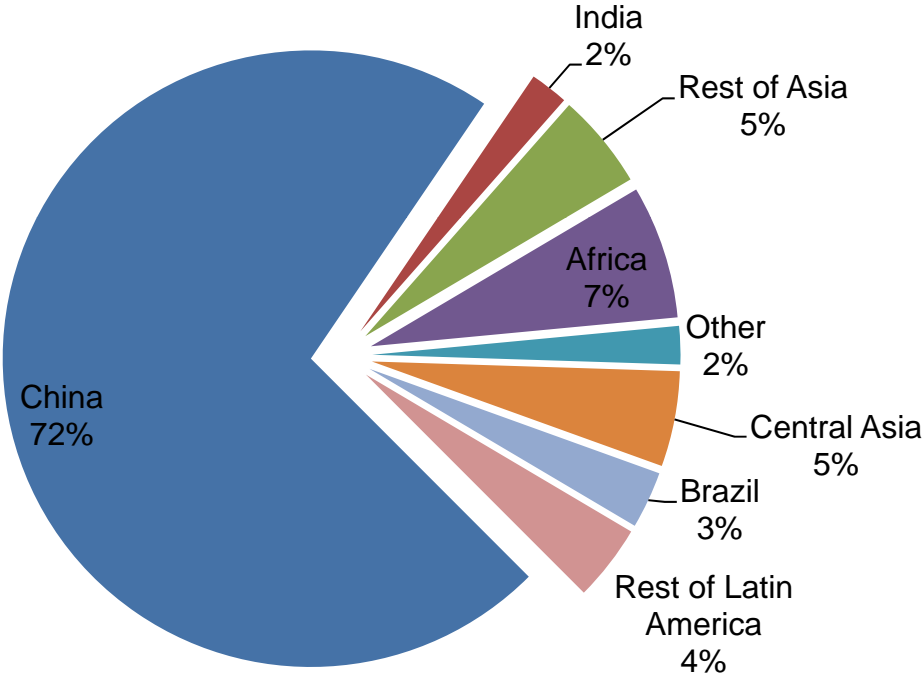


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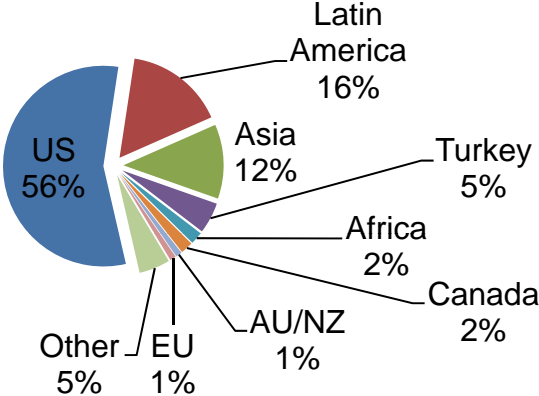
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# Market comparison

Regulatory market (\$143.9 billion)



Voluntary Market (\$ 387m)



Sources: *Ecosystem Marketplace, Bloomberg New Energy Finance, World Bank. (2009)*



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# Agriculture - adaptation

- Agriculture is set to be impacted significantly by climate change
  - Changing growing seasons
  - Increased temperature
  - Carbon enrichment
  - Changing patterns of plant diseases and pests
- Increasing food demand and decreasing productivity under CC
- Adaptation to changed environment essential
- Soil carbon sequestration is a simple means to this end (improved soil structure, water availability, nutrient storage)



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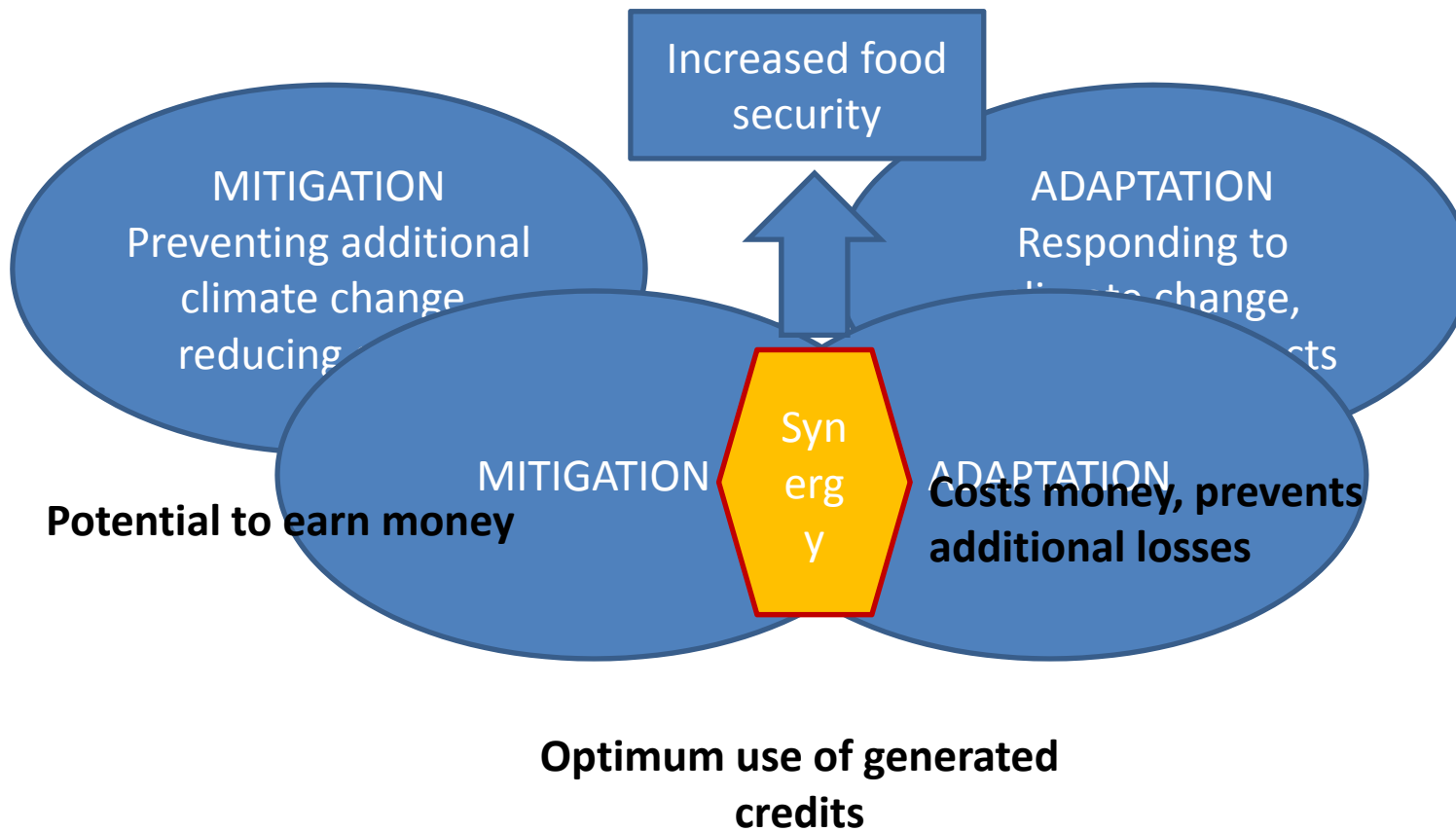
# Agriculture - mitigation

- Agriculture accounts for large anthropogenic emissions globally:
  - 52% of methane
  - 84% of nitrous oxide
- Soil carbon loss from agriculture also emits CO<sub>2</sub>
- Currently agricultural offsets account for a small percentage of all C finance projects
- Sub-Saharan Africa's economic mitigation potential is up to 265 Mt yr<sup>-1</sup> by 2030 (~\$ 2.65 billion yr<sup>-1</sup>)(IPCC, 2007)



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# Available methodologies

- Emission reductions (methane, nitrous oxide, CO<sub>2</sub>)
  - Improved methane management in feedlots/ pig farms (manure management systems)
  - Use of bacterial inoculant instead of nitrogen fertilisers
  - Methane recovery from agriculture at a household/farm level
- Agroforestry (increases C stock in biomass & soil)
  - reforestation/afforestation
  - silvicultural activities, and production for biomass projects
- Energy efficiency (fuel switch, biogas generation)
- Soil sequestration (25% productivity loss from soil degradation in SSA 1940 – 1990)
  - minimum tillage, composting, biochar, sustainable land use management)
- REDD/REDD+



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# Sustainable agricultural management

- New comprehensive methodology being validated under VCS
- Integrates soil management, conservation tillage, silvopastoral and methane reduction methodologies
- Works for both small-scale and commercial farms



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# Agroforestry

- Dual impact
  - increases C stock in standing biomass
  - increases soil C stock and fertility
- Several methodologies available under different standards for planting of trees (not specifically agroforestry)
  - reforestation/afforestation
  - silvicultural activities, and production for biomass projects
- Can be implemented as a primary activity, or alongside other agricultural activities



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# Examples: Soil sequestration

- Most current farming techniques reduce soil carbon (25% productivity loss from soil degradation in SSA 1940 – 1990)
- Raised SC increases water retention capacity and nutrient availability
- Restoration potential for agricultural cropland in sub-Saharan Africa is very large
- Techniques include:
  - Conservation/minimum tillage
  - Reintroduction of crop residue into soil (composting)
  - Restoration of degraded land

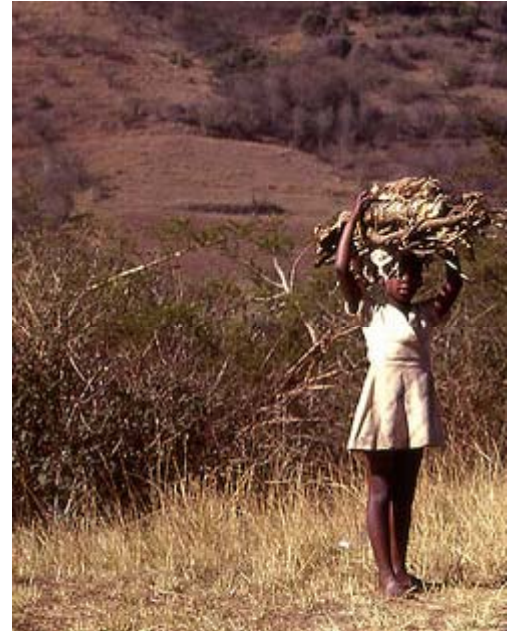


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# REDD/REDD+

- Reduction of Emissions from Deforestation and forest Degradation
- Decreased productivity and agricultural methods lead to increased land clearance and emissions
- Increased agricultural production essential
- New regulations may include reduced emissions from agriculture.
- Requires large MRV systems (leakage) and community, government involvement
- Few implemented projects, but many in the pipeline.



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# Current projects (1)



- Undergoing validation: 21 months to get to this point
- Sequestration potential: 19 Mt (~400t/ha)



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## Current projects (2)

- Community Markets for Conservation (COMACO), Zambia (30 year crediting period)
- Combines improved soil management with tree planting (*Faidherbia albida*) - agroforestry
- Increases carbon stock in both trees and soil
- Project currently underway, but not yet registered with a standard
- 51,000 households in the Luangwa Valley

# Current projects (3

- Kenya Agricultural Carbon Project (World Bank /BioCarbon Fund) – 30 yr period
- Sustainable land management practices to increase soil sequestration and agricultural production
- 45,000 ha (60,000 smallholding farms)
- Implemented through local farmer associations
- Expected earnings: 1.2 Mt CO<sub>2</sub>e (~1.4 tCO<sub>2</sub>e ha<sup>-1</sup>yr<sup>-1</sup>)



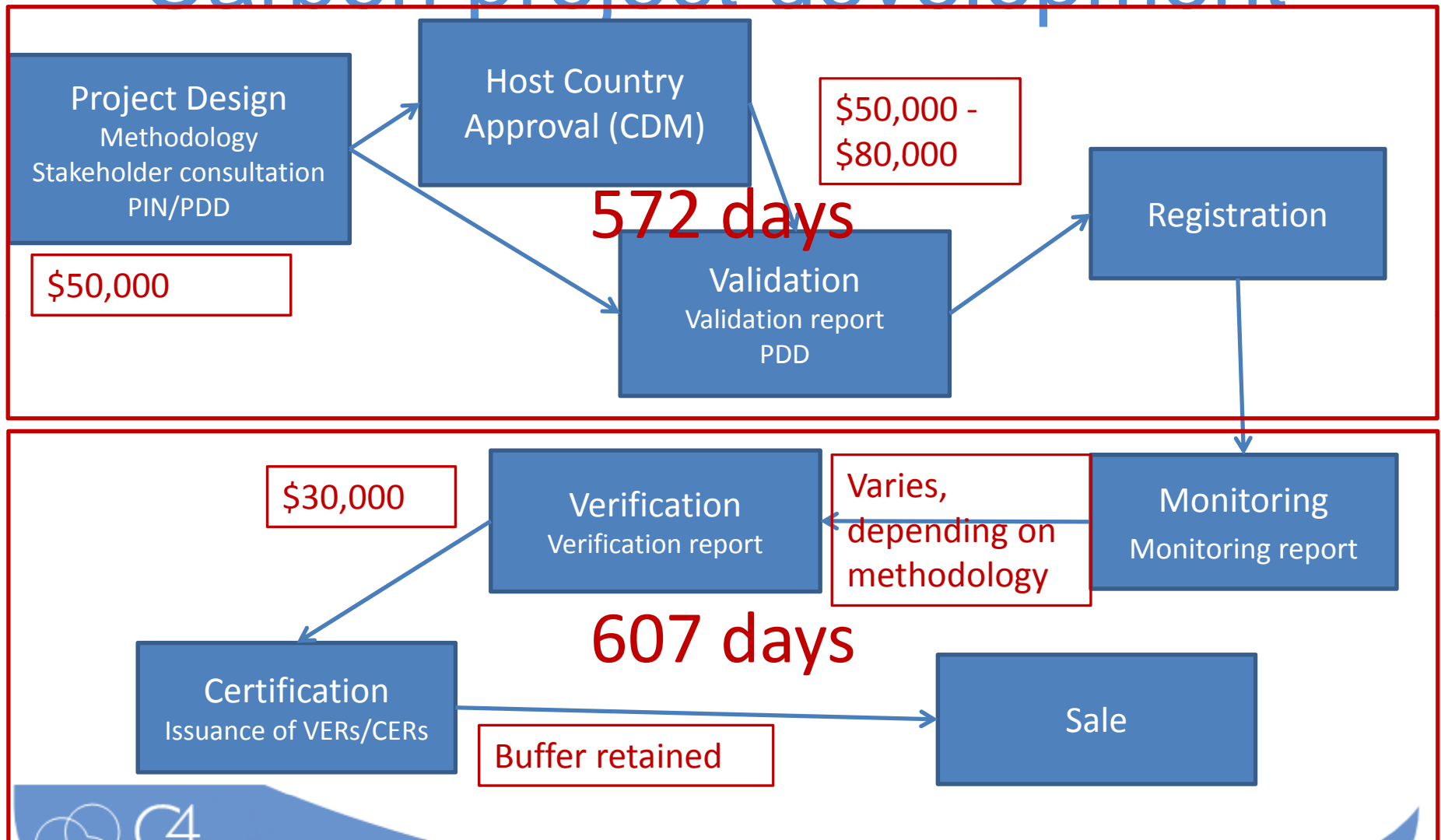
*Photo: Neil Palmer (CIAT)*



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# Carbon project development



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# Challenges

- High initial expenditures and capital outlays required
- Technical expertise for projects
  - Many pilots currently run on small scales
  - Expertise growing
- Scale needs to be large
  - Management and support structures for individual farmers (e.g. African Agricultural Carbon Facility)
  - Monitoring and reporting structures – ideally should be integrated into normal farm operations to reduce costs
  - Programmatic approach
- Time-to-market can render some projects

unviable



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# Summary

- Carbon finance can assist in the adaptation of the agricultural sector to the effects of climate change
- Large unrealised potential for carbon finance in Africa
- Accessible through voluntary or regulatory markets – difficult choice
- Project creation both expensive and time consuming
- Projects underway, and increasing demand and capacity for additional projects



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# Conclusion

- Economies of scale mean individual farmers could have difficulty accessing C finance
- Agricultural organisation and union structures are potentially great drivers of C finance projects
  - Coordination and management structures
  - Access to pooled finance
  - Ability to identify appropriate projects and methodologies



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THANK YOU



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# Economics of mitigation in SSA

	Package 1: No external inputs	Package 2: Medium External Inputs (seeds only)	Package 3: High external inputs (seeds and fertiliser)	Package 4: Agroforestry
C sequestration (tCO <sub>2</sub> ha <sup>-1</sup> yr <sup>-1</sup> )	0.5	1	1.5	4
Crop response (kg ha <sup>-1</sup> yr <sup>-1</sup> )	225	1500	3000	1500
Annual carbon payments	\$1.15	\$4.90	\$8.65	\$27.40
Annual revenue from improved yields	\$34	\$225	\$450	\$225
Total additional revenues	\$35	\$230	\$459	\$252
Net revenues	-\$10	\$162	\$309	\$177

Source: Tennigkeit, T.; Kahrl, F.; Wölcke, J.; Newcombe, K. 2009. Agricultural Carbon Sequestration in Sub-Saharan Africa: Economics and Institutions. Washington DC: World Bank.