Financing Opportunities for Projects in Agriculture Sector

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Outline

Advanced manure management system options

- Rules of thumb for estimation of emission reductions
- Case studies

Financing opportunities through:

- Clean Development Mechanism (CDM)
- World Bank Lending Programs

GHG emissions in agriculture sector

Animal manure: CH4 and N2O emissions

Current practice:
Manure storage methods:

Solid, dry, liquid, pits, deep litter, open anaerobic lagoon

CDM project :
Manure treatment system:
- Anaerobic treatment with methane recovery/utilization
- Combustion of manure
- Aerobic treatment

Transitions between these alternatives reduces CH4 and N2O emissions.

Potential projects under Clean Development Mechanism

- Anaerobic digester +flaring with or without power generation
- Covered anaerobic lagoons + flaring with or without utilization of biogas
- Aerobic treatment of animal manure (composting)
- Combustion of poultry litter +power generation

Approved CDM methodologies

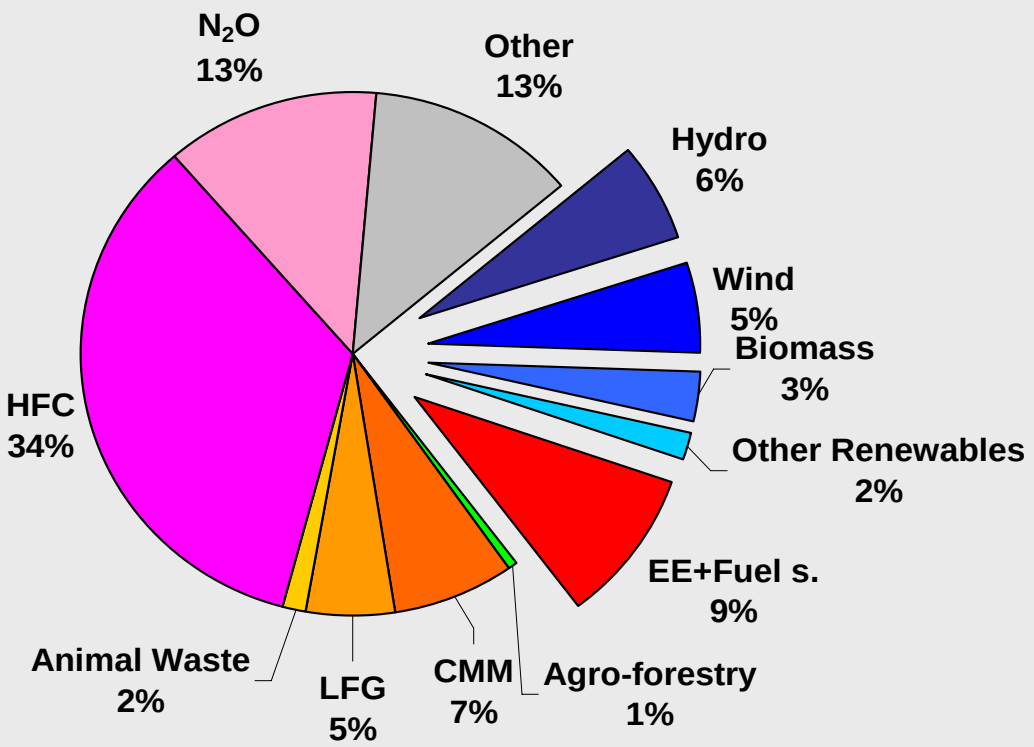
- ACM0010 – Methodology for GHG emission reductions from manure management systems

Project with emission reductions of less then 60kt/y:

- AMS.III.D – methane recovery in agricultural and agro industrial activities
- AMS III.E – avoidance of methane production from biomass decay through controlled combustion

All above methodologies follow 2006 IPCC Guidelines

Share of agriculture projects in CDM pipeline



Jan. 2006 to Dec. 2006

Source: State and Trends of the Carbon Market 2007

Rule of Thumb for ER Estimation

(Annual Average Temperature >= 10 C)

$$E_{CH4,y} = GWP_{CH4,y} * D_{CH4} * MCFj * B_{o,LT} * N * VS_{LT,y} * MS\%_{Bl,j}$$

Animal type / Parameter	Breeding Chicken	Broiler	Market Swine	Dairy Cow
GWP_{CH4}	21	21	21	21
D_{CH4} (t/m3)	0.00067	0.00067	0.00067	0.00067
MCF (%)	0.7	0.7	0.7	0.7
Uncertainty (%)	0.94	0.94	0.94	0.94
MS%	1	1	1	1
$N_{population}$ (head)	1	1	1	1
B_o (m3 CH4 /kg_dm)	0.39	0.36	0.29	0.24
$VS_{population}$ (kg-dm/animal/day)	0.02	0.01	0.30	5.4
$E_{CH4,y}$ (tCO2e/year)	0.026	0.012	0.29	4.38

World Bank Project: Minhe Poultry Manure to Power Project

- Total chicken population: 3.6 million broiler & 1.4 million breeder
- Daily fresh manure 500 tons with 20% of total solid
- Waste water of 1000 ton from flushing the chicken barn
- Current practice of manure management: uncovered lagoon
- Proposed project: Anaerobic Digester + Co-generation
- Total Investment: 5.2 million USD
  - O&M Cost: 715,000 USD
  - Revenue w/o carbon: 1 million USD
  - Revenue w/ carbon: 1.9 million USD

	Without Carbon	With carbon
IRR	2.38%	18%
NPV (discount rate=9%)	-2.3 million USD	4.3 million USD
Payback Period	20 year	5.6 year

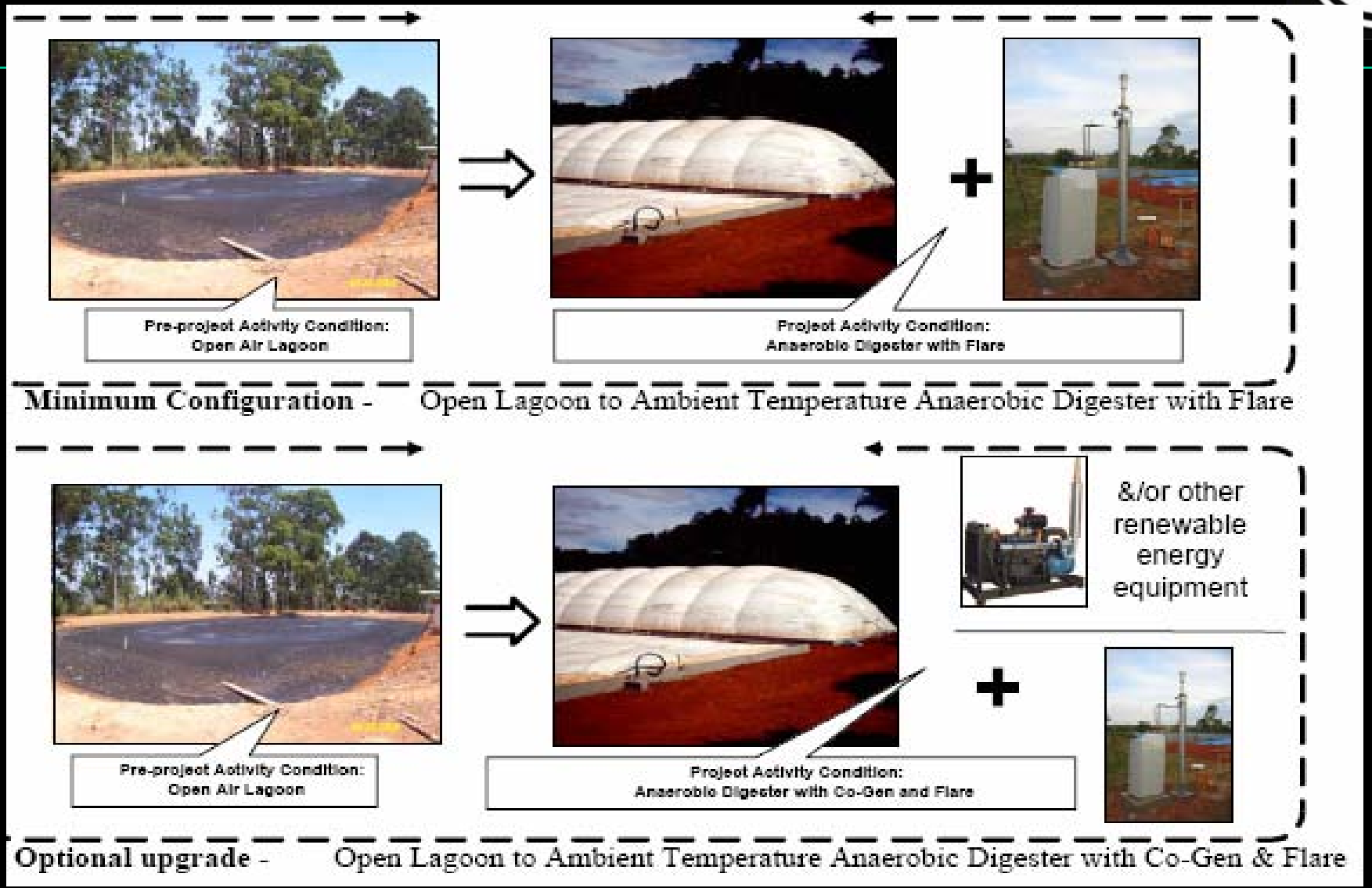
Case Study: Minhe Poultry Manure to Power Project

Pre-project activity condition : uncovered lagoon

Project activity condition: Biogas digester with co-generation and aerobic treatment of liquid residue

Methane recovery from covered anaerobic lagoons, Mexico

- Current practice: open anaerobic lagoon
- CDM project: lined covered lagoon with HDPE geomembrane
- Applicable methodologies: ACM10 & AMS.III.D
- Installed costs: USD 150,000 (without power generator)
- Operational costs: USD 2500
- Number of heads: 73,000 swine
- Estimated ERs: 61k tons of CO2e per annum



Source: AgCert

Other issues and benefits

Issues to consider:

- If arsenic is added to the feedstock, ensure that the level of arsenic or other heavy metals in the feedstock are within permissible limits
- Measure the arsenic content of slurry/compost before land application

Benefits:

- Source for renewable energy
- Improved quality of fertilizer
- Reduced odour problems

Financing opportunities

Through:

- Clean Development Mechanism (CDM)
- World Bank Lending Programs

World Bank Carbon Funds & Facilities

Total funds pledged = US$ 1.93 billion (13 governments, 62 companies)

- **Prototype Carbon Fund**. $180 million (closed). Multi-shareholder. Multi-purpose.

- **Netherlands Clean Development Mechanism Facility**. $170 million (closed). Netherlands Ministry of Environment. CDM energy, infrastructure and industry projects.

- **Community Development Carbon Fund**. $128.6 million (closed). Multi-shareholder. Small-scale CDM energy projects.

- **BioCarbon Fund**. $53.8 million (Tranche One closed). Multi-shareholder. CDM and JI LULUCF projects.

- **Italian Carbon Fund**. $45 million (open to Italian participation). Multi-shareholder (from Italy only). Multipurpose.

- **Netherlands European Carbon Facility**. $40 million managed jointly with IFC (closed). Netherlands Ministry of Economic affairs. JI projects.

- **Spanish Carbon Fund**. $220 million (open to Spanish participation). Multi-shareholder (for from Spain only). Multipurpose.

- **Danish Carbon Fund**. $75 million (open to Danish participation). Multi-shareholder (for from Denmark only). Multipurpose.

- **Umbrella Carbon Facility**. $930 million (Tranche One). 2 HFC-23 projects in China.
- **Carbon Fund for Europe** (recently launched)

Carbon Finance at WB under CDM

Project based ERs

- Types of project activities:
  - Stand alone projects
  - Bundling and programs through one project entity
  - Blended with lending programs
- WB buys ERs at market price with low risk levels (CERs/VERs, post-2012)
- WB finances the development of CDM documents
- WB supports development of new methodologies
- WB may advance up to 25% of ERPA, provided the required guarantees

Capacity Building

WB provides Technical Assistance to DNAs through the CF-Assist program

WB Group lending programs

IBRD: with governments

- Link with the CAS (Country Assistance Strategy)
- Through government agencies
- Timing (>12months)

IFC: with private sector

Contact WBG Country Offices for more information.

Thank you !

For information about World Bank CDM project portfolio please visit
www.carbonfinance.org
For information about World Bank lending programs please visit
www.worldbank.org
For information about IFC lending programs please visit
www.ifc.org

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Important factors determining emission reductions

Existing manure treatment system on livestock farms

	Methane Conversion Factor (MCF)
Pasture	1%-2%
Daily spread	0.1%-1.0%
Solid storage	2%-5%
Dry lot	1%-2%
Liquid/slurry	17%-80%
Uncovered anaerobic lagoon (depth>=1m2)	66%-80%
Pit storage under animal confinements	17%-80%
Anaerobic digester	0%-100%
Aerobic treatment	0%

Other issues on large scale biogas plant feasibility and operations

Economic Feasibility

- Economic value of biogas: access to grid and tariff for the electricity generated from biogas or fuel cost saving for heating/cooking
- Market value for biogas residue as organic fertilizer for land application
- Transportation distance in case of centralized biogas plants
- Security of long-term supply of mature

Useful References

General Websites on CDM and JI:

- Internal CFB website on CDM methodologies: Carbon Finance at the World Bank: Methodology (www.carbonfinance.org)
- Website of the UNFCCC: CDM: CDM-Home (http://cdm.unfccc.int/ and http://ji.unfccc.int/)
- Webiste of IPCC 2006: http://www.ipcc-nggip.iges.or.jp/public/2006gl/pdf/4_Volume4/V4_10_Ch10_Livestock.pdf
- Website on CDM (and JI) procedures (Ministry of the Environment Japan, Institute for Global Environmental Strategies): http://www.iges.or.jp/en/cdm/report01.html
- Website (UNEP, Risø Centre): CDM (and JI) pipeline overview

  http://cd4cdm.org/index.htm