Thailand Swine Farm Biogas Implementation Programs/Policies

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Agenda

- **Introduction** – Swine Farms in Thailand
- **Overview** – Biogas Programs
- **Implementation** – Bundling and Programmatic CDM
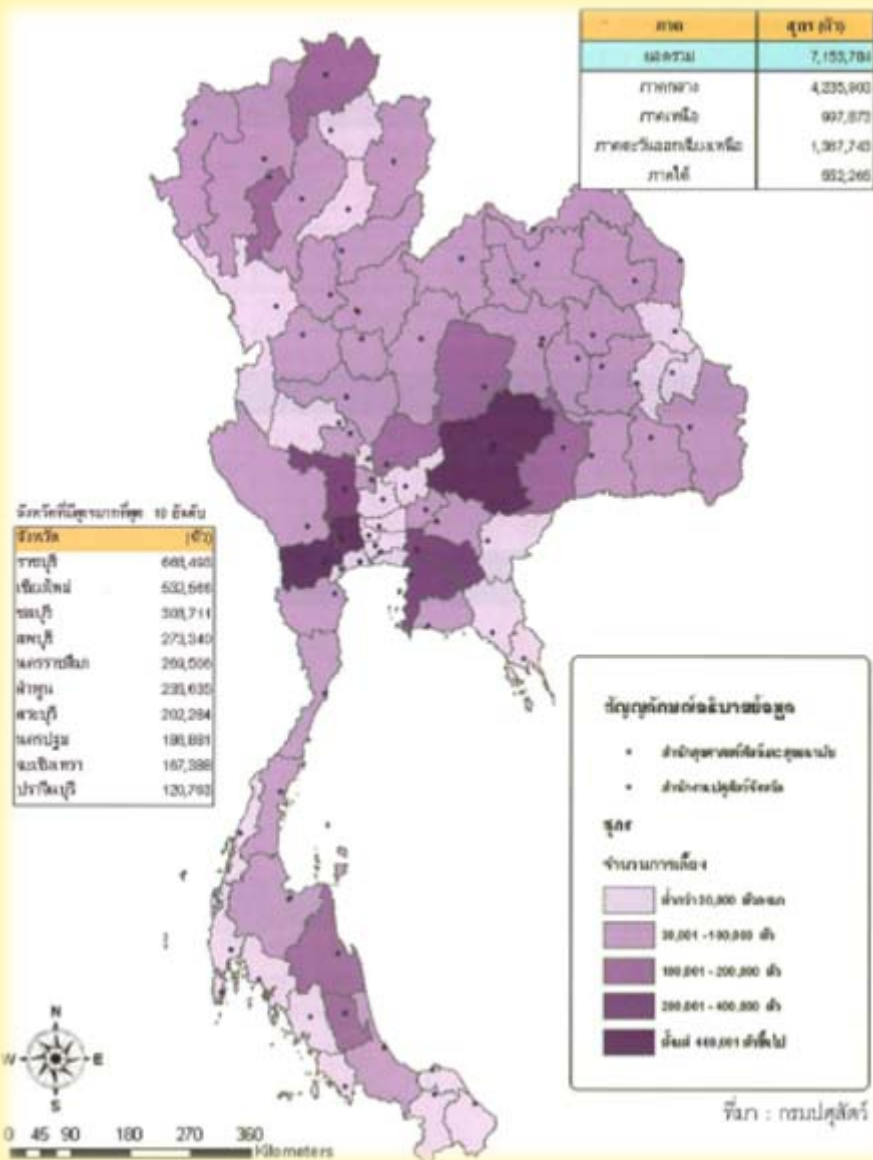- **Summary** – The New Opportunity

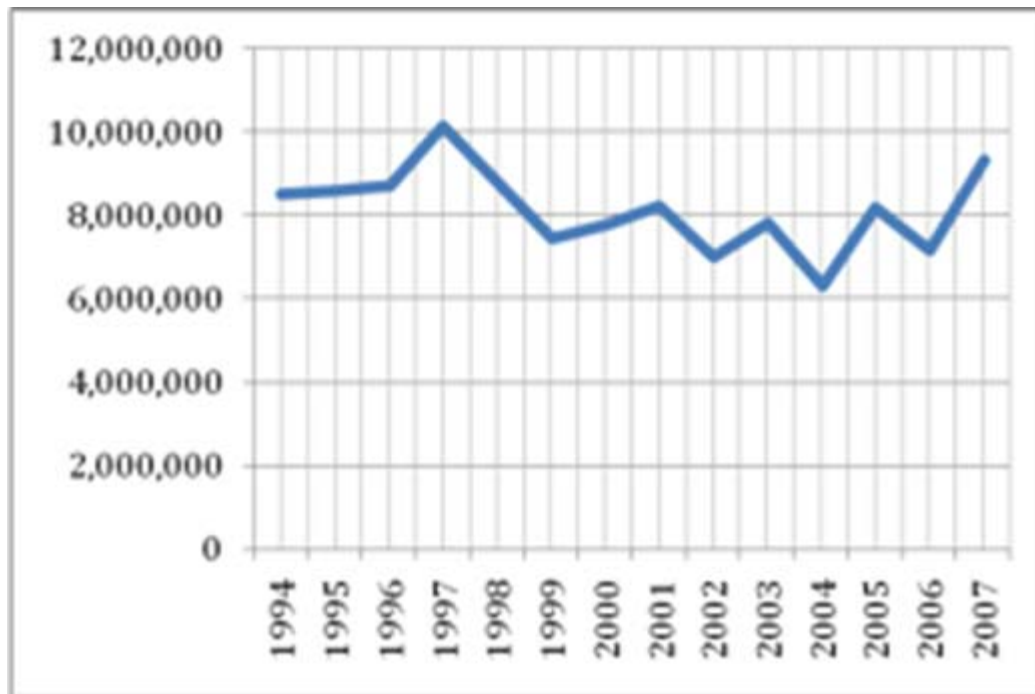# Thailand Swine Farms Situation

The Baseline

Swine in Thailand

ภาค	สุกร (ตัว)
ผลรวม	7,153,704
ภาคกลาง	4,235,900
ภาคเหนือ	997,873
ภาคตะวันออกเฉียงเหนือ	1,367,743
ภาคใต้	952,265

There are 7.15 million swine in Thailand

Farm Size	No. or pigs	No. of Farms	Total Pigs head (million)
Small	50-500	>200,000	3
Medium	500-5,000	1,309	1.36
Large	>5,000	186	2.78

Source: Department Livestock Development

Scope / Marketing Issues/Analysis

Annual number of swine in Thailand (animals)

Farm's Environment

Barn for Swine

- > 6 millions in Thailand
  - Open Lagoon Situation
    - Odors,
    - Fly,
    - Leakage,
    - Wastewater
    - CH4 Emission

Background of Biogas System
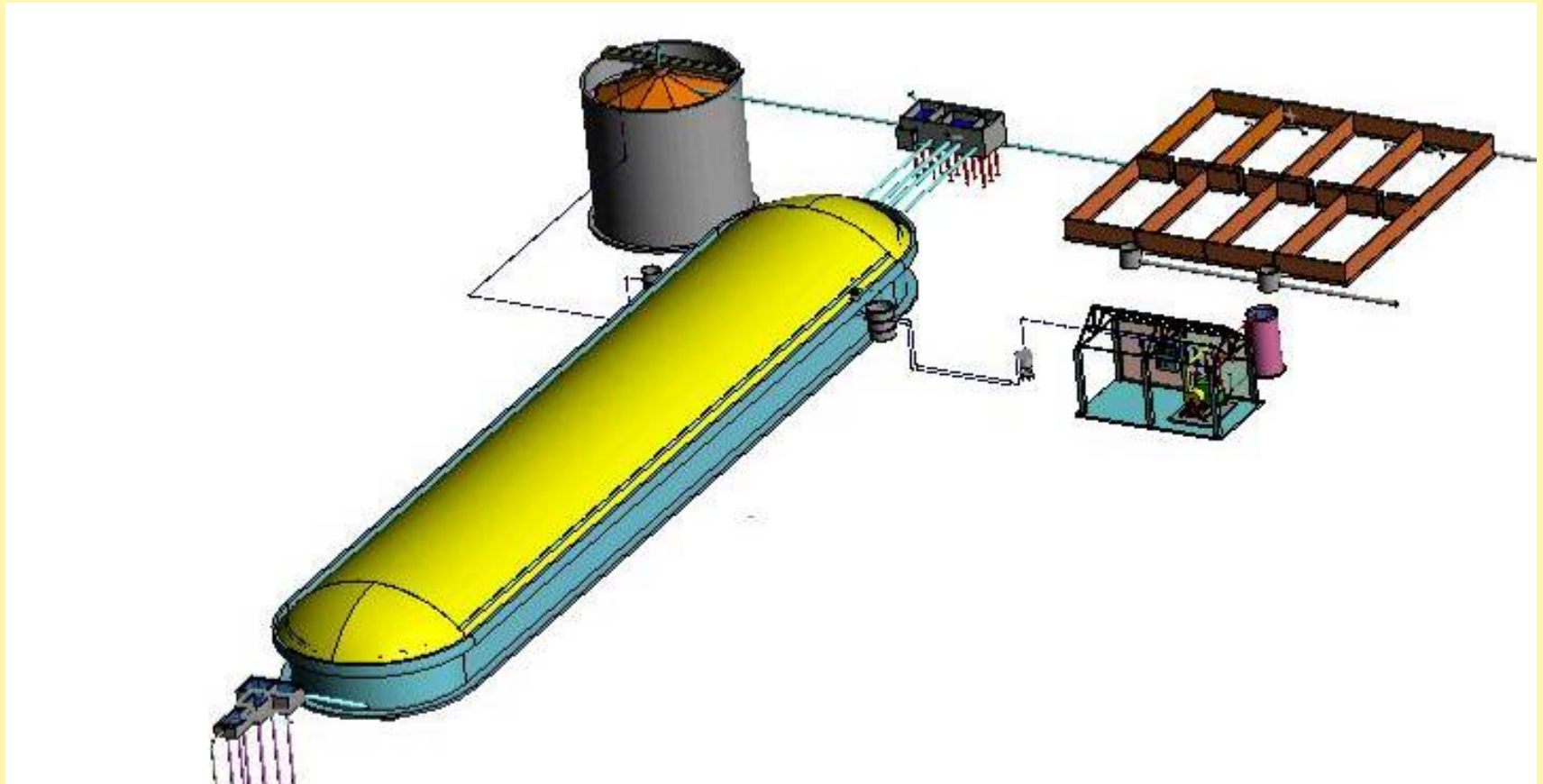
Biogas System in Thailand

Key Types of System

- **Fixed Dome:** Small Scale
- **Plastic Bag** System: Small Scale
- Cover Lagoon: Medium to Large Scale
- Chanel Digester: Medium to Large Scale
- CSTR: Medium to Large Scale

Cover Lagoon
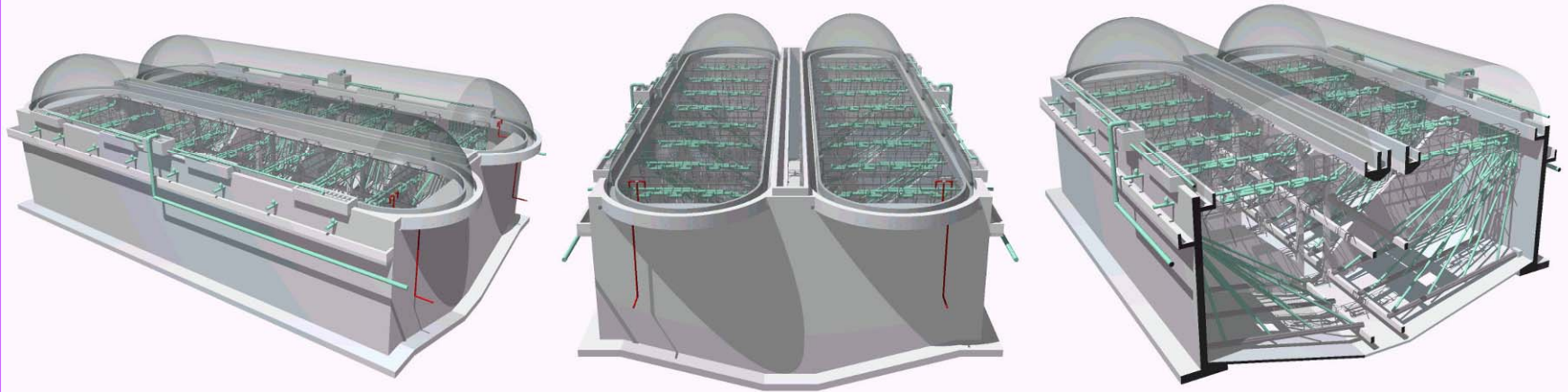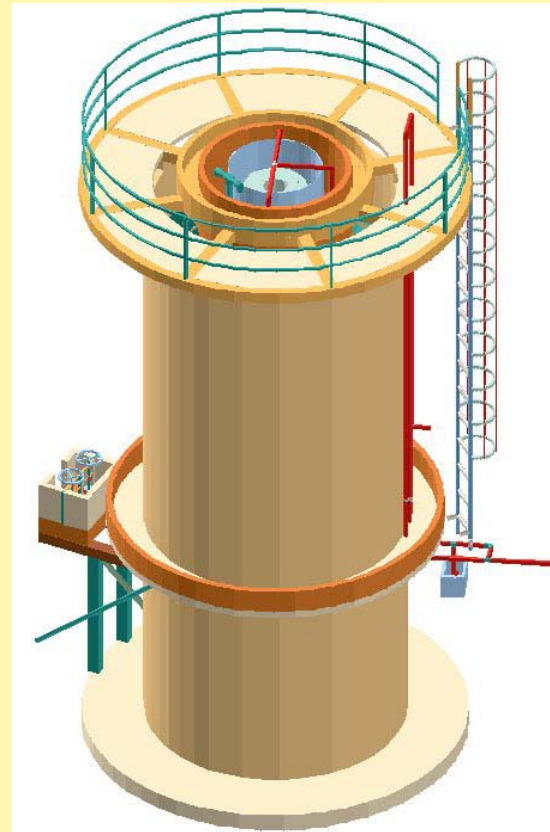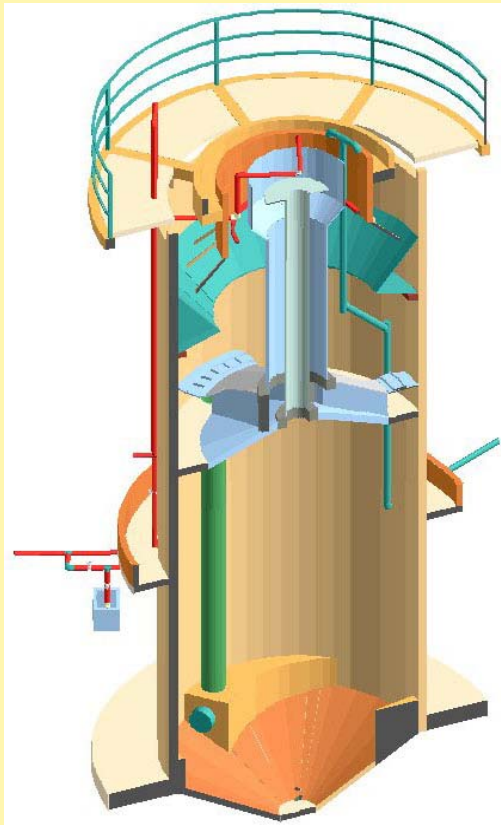
Cannel Digester

H-UASB

IC-UASB

Biogas System is introduced

- Pre-Treatment
- Bioreactor
- Post-Treatment
- Energy Utilization

Electrical/heat utilization in farm

Reused water

Piggery Farms

Pre-Treatment

Garbage/Large Aggregate Screen

Garbage/Large aggregate

Collecting Tank

Sand Trapping, Cyclone

Sand

Bioreactor

Biogas

Biogas Reactor

Effluence

Energy Utilization

Post-Treatment

Sludge

Post Treatment Pond

Gas Storage

Open Pond

Biogas Flare System

Gas Utilization System

Sludge Drying System

Water Reserved Pond

Energy

Fertilizer

Fertilizer

Selling out

Facts

- 1 LU = 500 kg = Average 8.3 pigs
- 37-40 liters/day
  - 10-12 kg of solid waste
  - 25-27 liters of urine
  - 185-190 liters/day of water/farming activity
- 0.9 cu.m./day (@ 0.55 biodegradable rate)
- 1 cu.m. of Biogas
  - 0.46 kg LPG
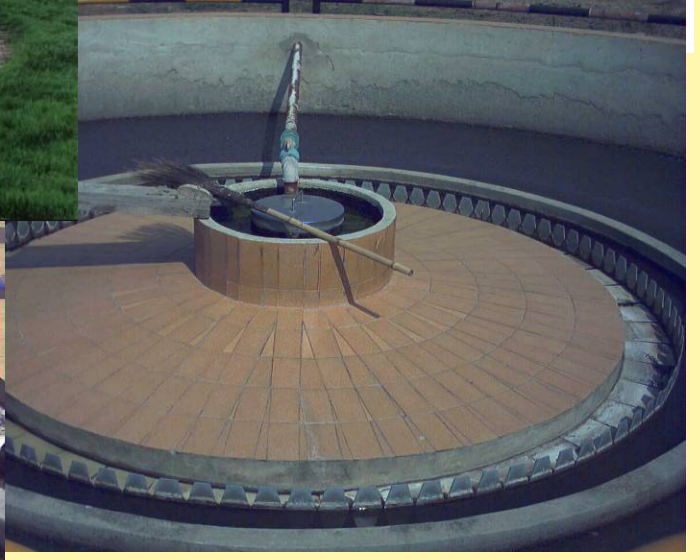 - 0.67 liters of gasoline
  - 1.2-1.4 kwh

Pre-Treatment: CT
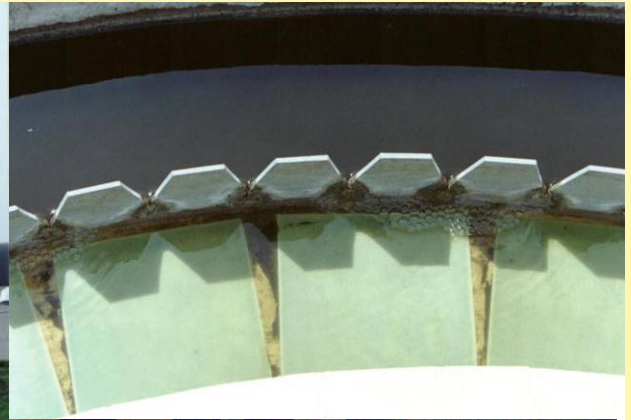
Reactor

Reactor

Waste Water
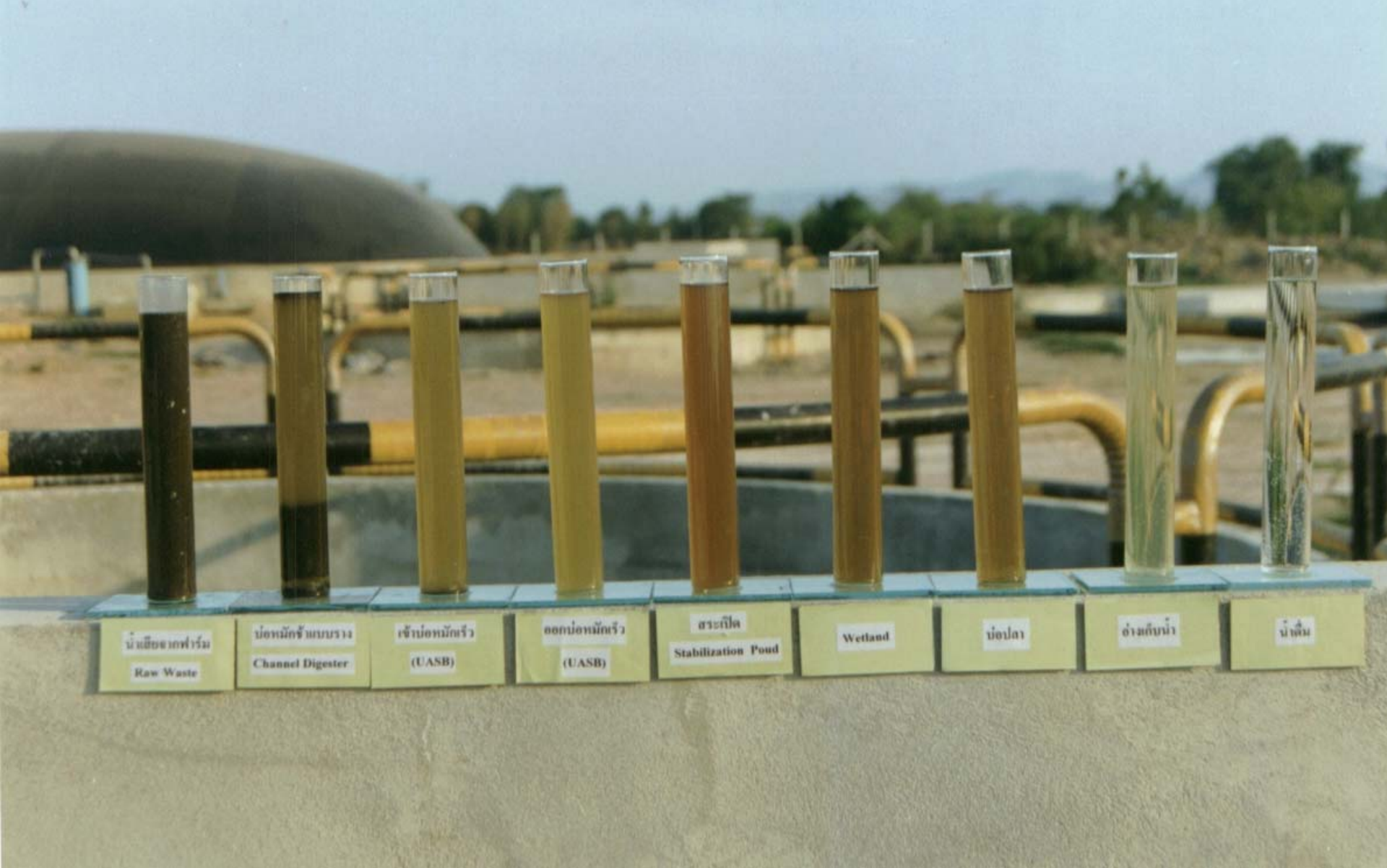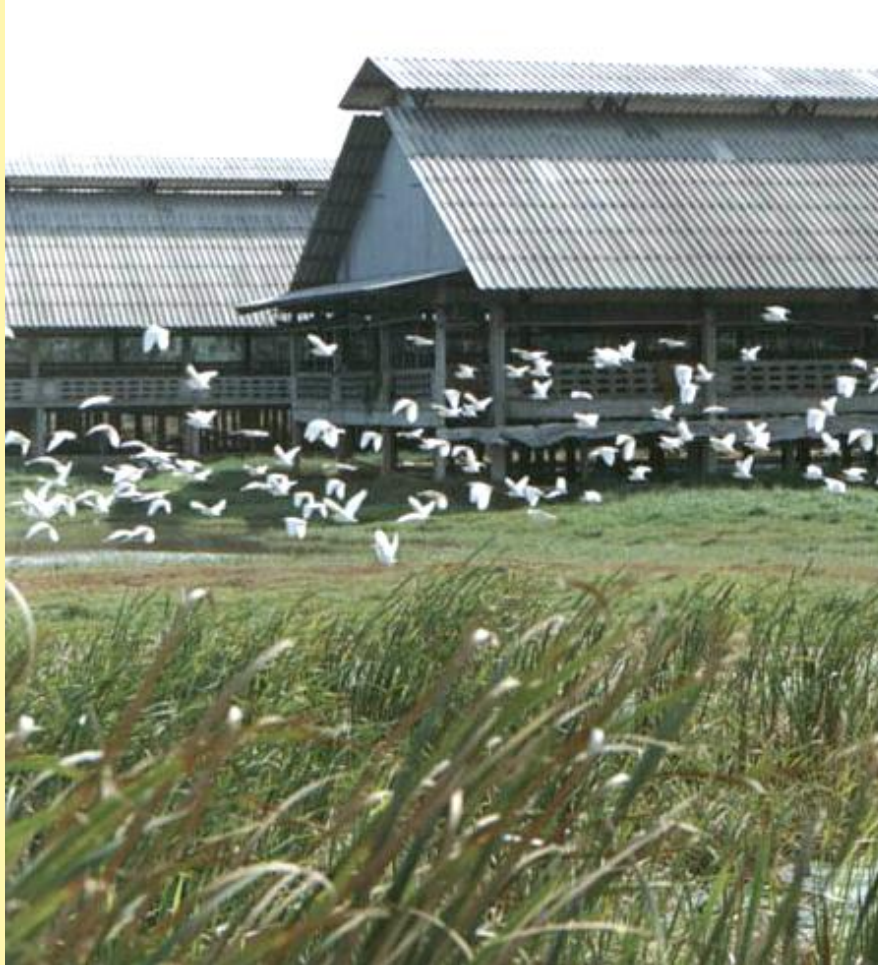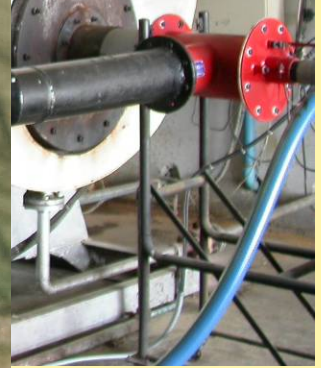
System Design

- Holistic View
- Simplified LCA
- Coping w/ Multiple Dimensions Problems

CDM Benefit

Fertilizer Benefit

Into natural stream

Wastewater management

Seepage into groundwater

Energy Production Benefit

Odor protection

Direct Benefits

Indirect Costs/ Benefits

Maintenance Cost

Direct Costs

Energy Cost

Land Cost

Worker Cost

O&M Cost

Capital Cost

Construction Cost

Nutrient/ Chemical Substance

Demolition Cost

Water
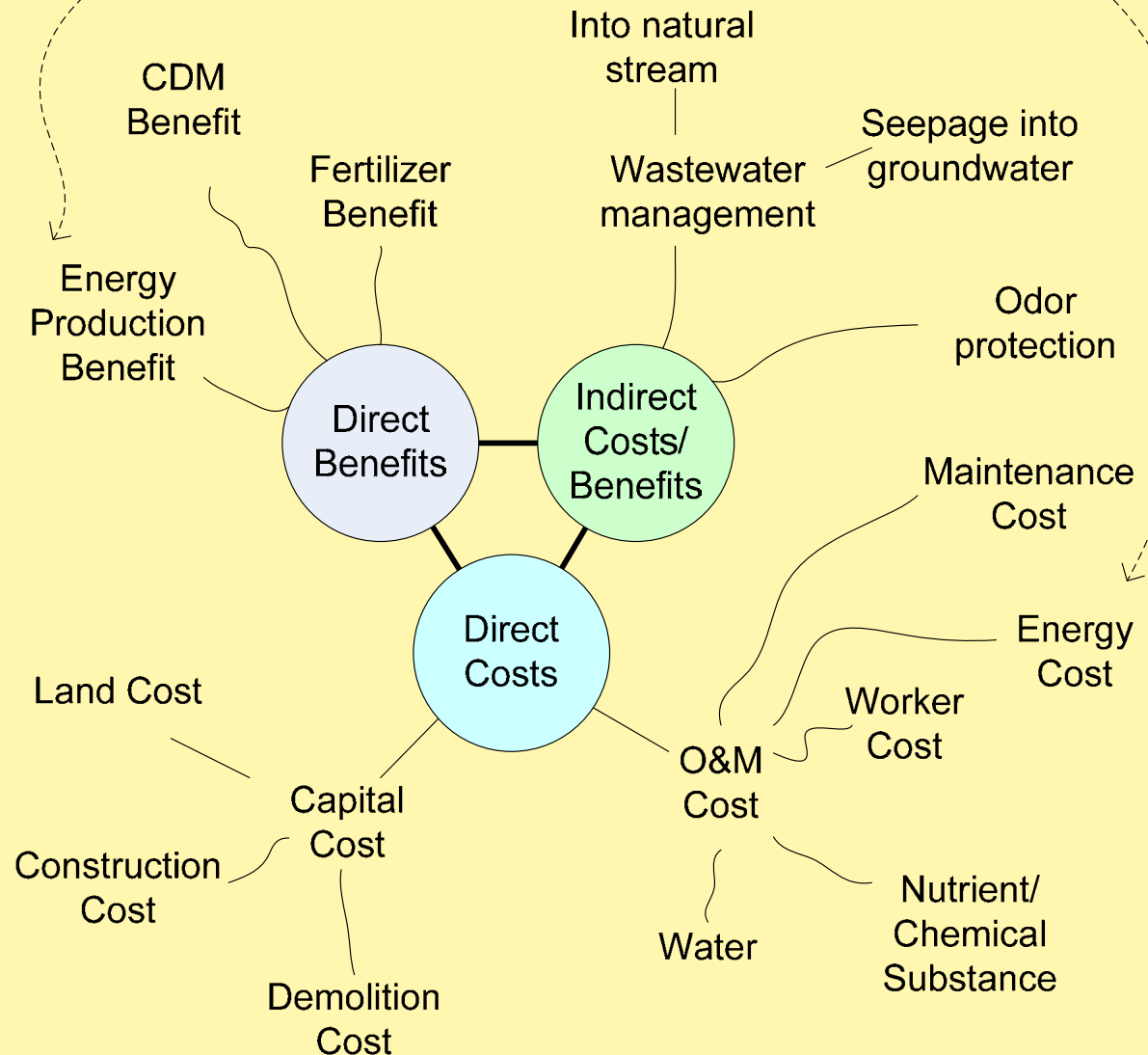
An Example Evaluation

Biogas System
Open Lagoon

182k bath/year
Energy benefit
1.0
0.8
0.6
0.4
0.2
0.0

Level 10
Water discharge

56k bath/year
CDM benefit

Level 10
Odor control

42k bath
Construction cost

O/M cost
44k bath/year

biogas system = 5.51
open lagoon = 0.47

Dimensions of Evaluation	Biogas System	Open Lagoon
1) Energy benefit, baths/year	182,500	0
2) CDM benefit, baths/ year	56,423	0
3) Construction cost, baths	44330	429,000
4) O/M cost, bath/year	886,600	85,800
5) Odor control, Level	10	2
6) Water discharge, Level	10	8

Biogas Programs and CDM Approaches

Current Biogas Market in Thailand

Technology is not Bottleneck

- Peculiarity
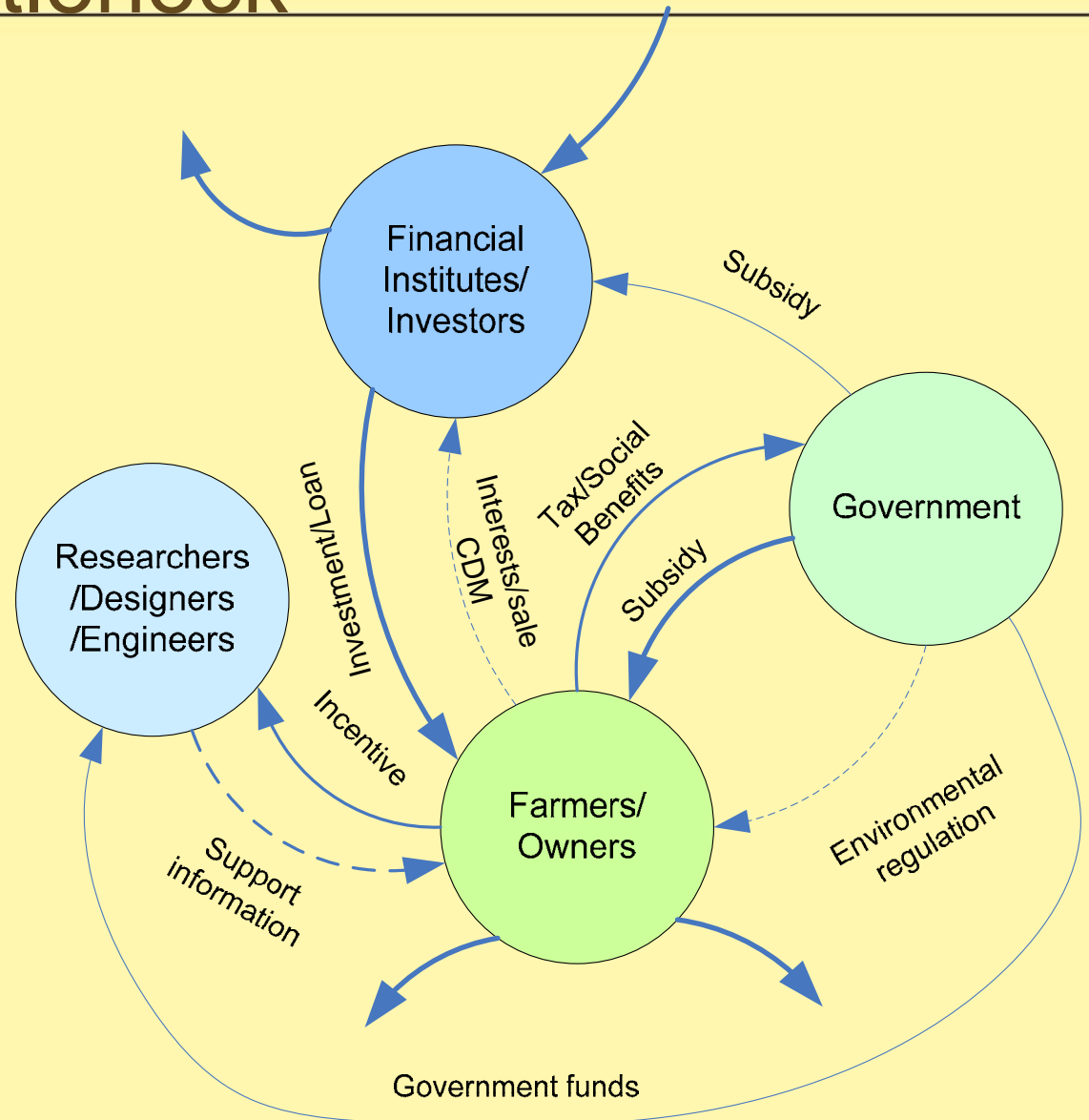
Join Funding or Subsidy Issues

- Small scale > Department of Agricultural Extension (DOAE)

- **Implemented by DOAE since 1996-2004**
- **Installed 1,655 fixed dome biogas unit**
- **Total digester volume is 75,000 m^3**
- **Government subsidized 45%**

- Medium-Large farms > Chiang Mai University

- **The technology modified from an imported prototype in 1984**
- **Installed 150 plants in medium-large swine farms**
- **Channel Digester + UASB, remove 80-90% COD**
- **Government subsidized: Phase I (1995-1998) 47%, Phase II (1997-2003) 33% and Phase III (2002-2008) 18%**

- **Financial : Energy Conservation Fund, Energy Policy and Planning Office (EPPO), Ministry of Energy**

CDM Situation

Source: ESMAP and CFU (2007)

RED/UNIT (y-axis)

Few large units

Long tail: large number of small end-use units owned by many owners

 # OF UNITS (x-axis)

Traditional CDM

Programs of activities
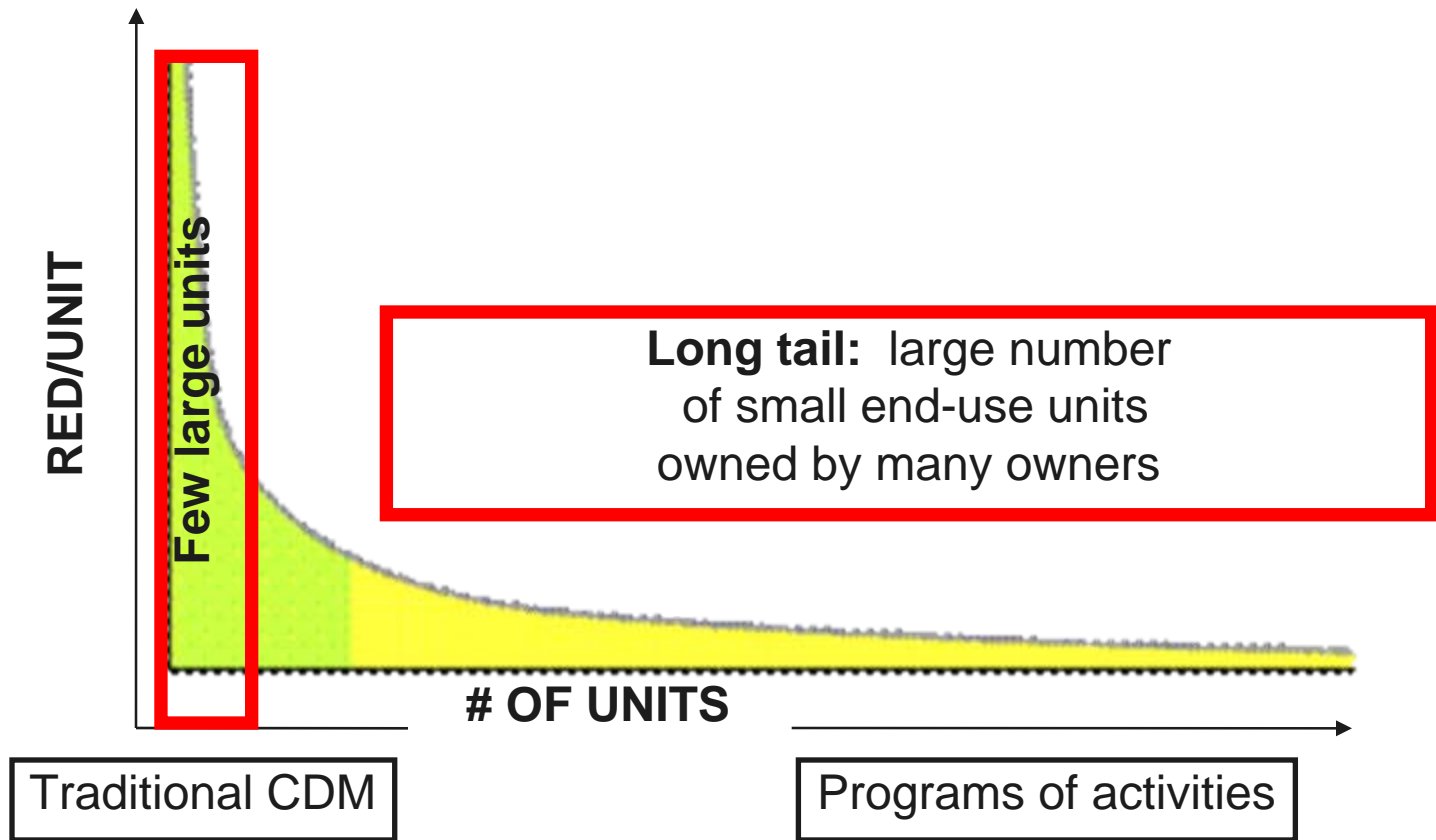
Bundled CDM project Boundary

- ## Benefit of Bundled CDM project
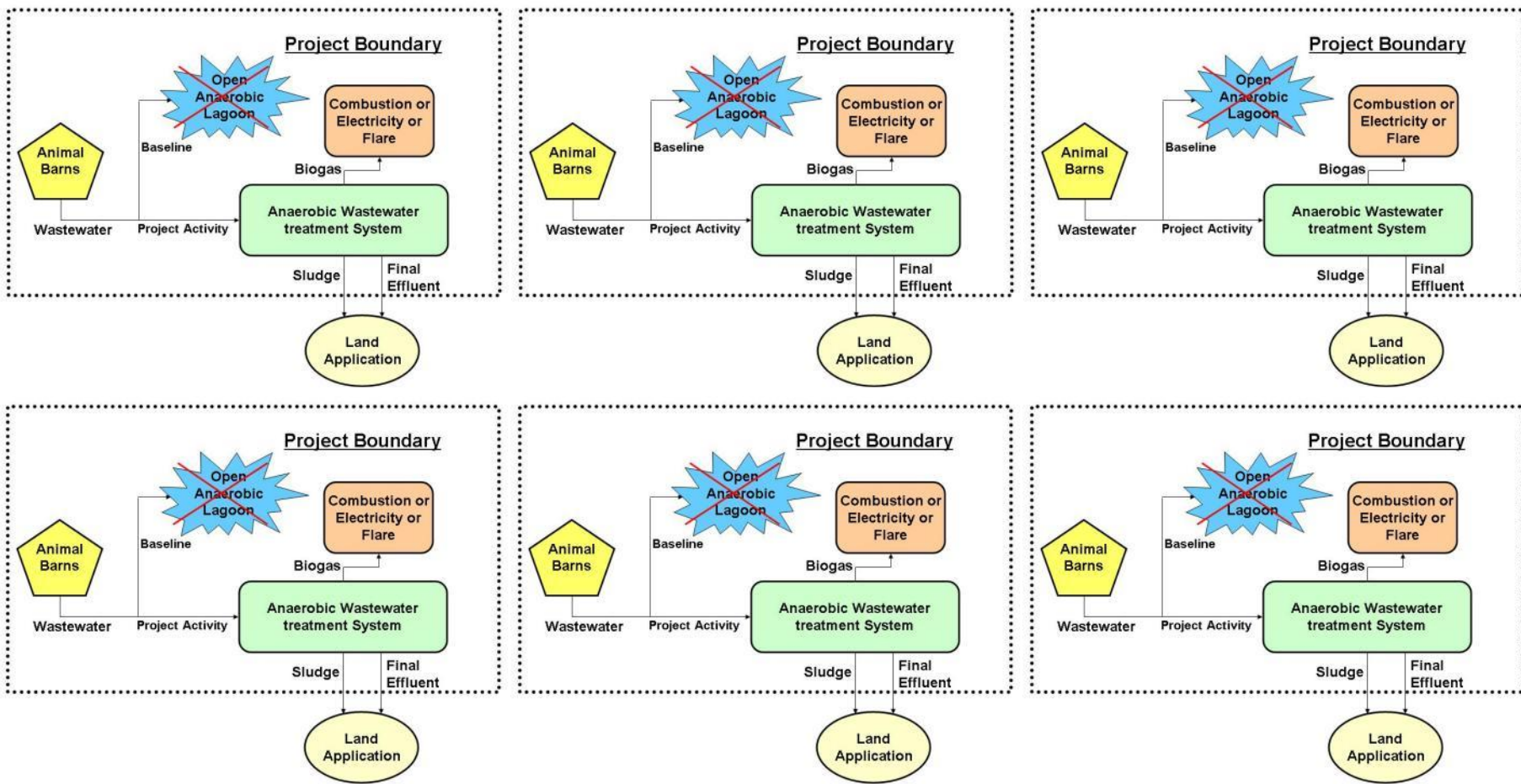
ระบบบำบัดน้ำเสีย ฟาร์มสุกร ภายใต้โครงการ การจัดการน้ำเสียในฟาร์มปศุสัตว์ในภาคพื้นเอเชียตะวันออก
Wastewater Treatment System Under Livestock Waste Management in East Asia Projetc.
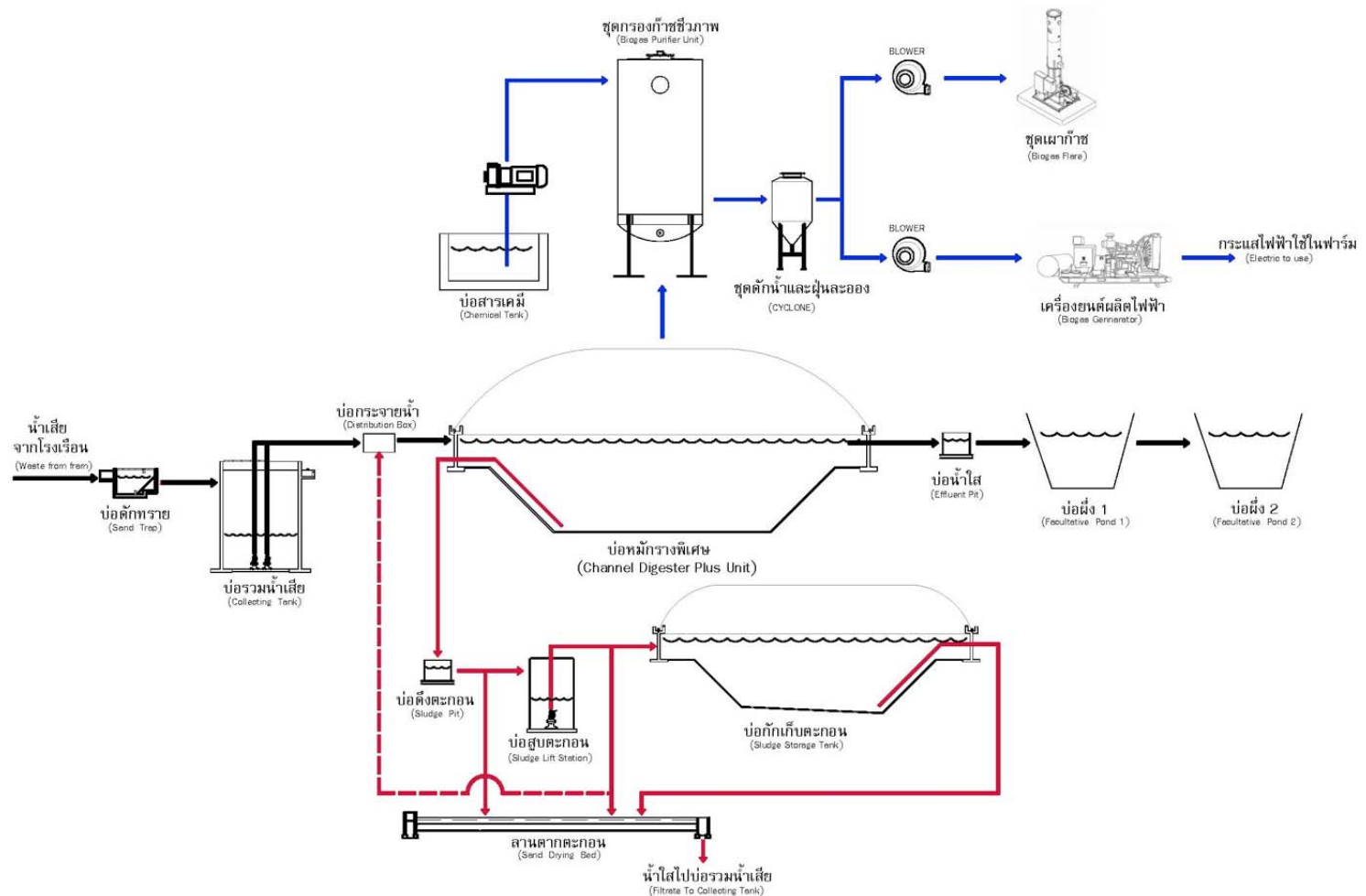
Programmatic CDM
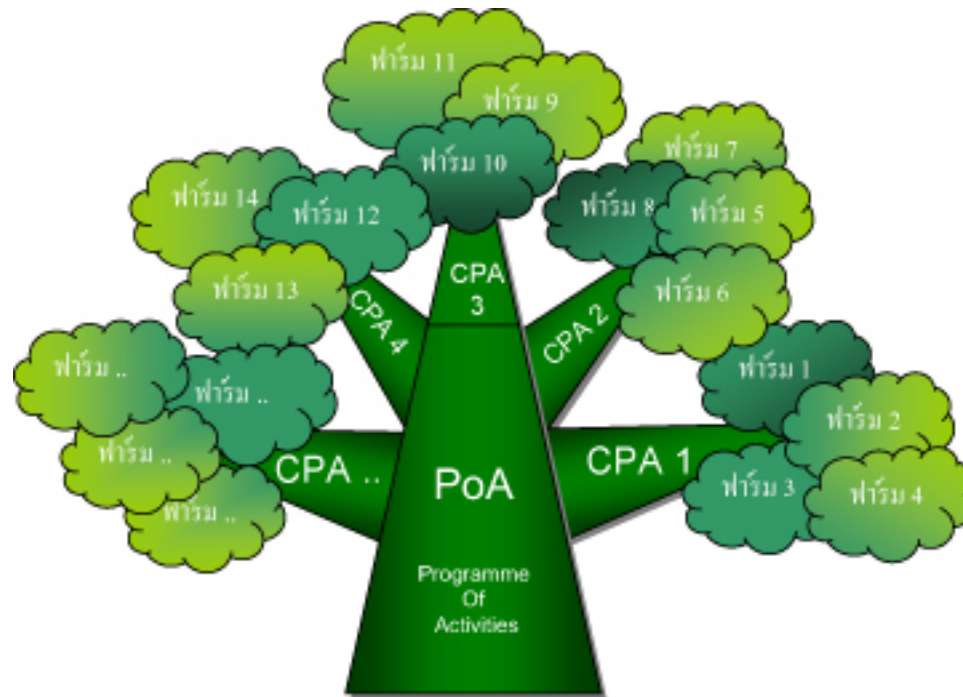
The program is expected to play an important role in demonstrating the use of market mechanisms such as the CDM to scale-up renewable energy projects through improved livestock waste management while reducing GHG emission as well as generating CERs. The program aims at small and medium size pig farms under ERDI sponsorship for their biogas program.

POA must address local/national/regional policies

Proposed/manage by coordinating/managing entity

Programme of Activities (POA)
28 years maxinum

CPA 1   CPA 2   CPA 3   CPA 4   CPA ...
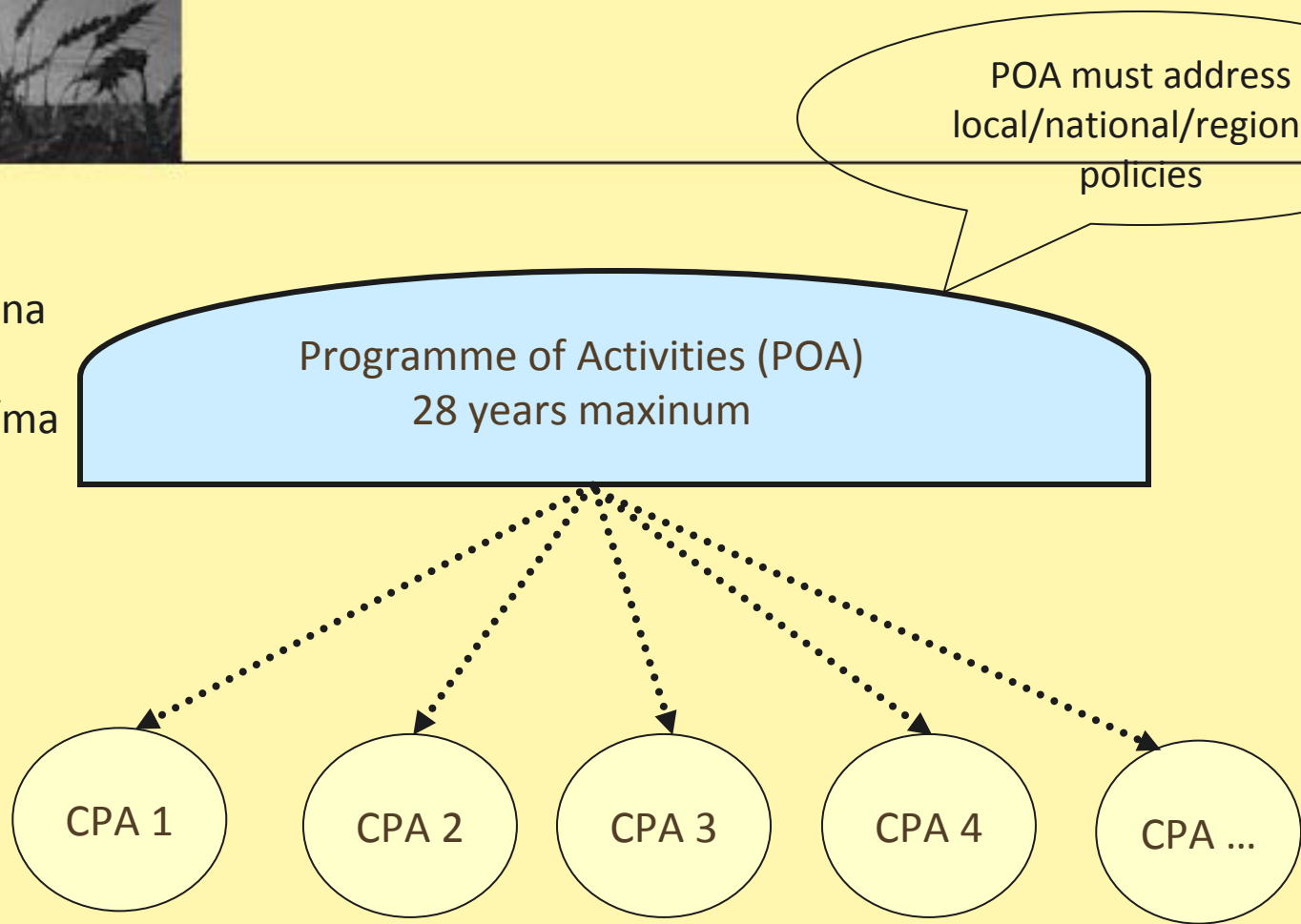
- All CDM Program of Activity (CPA) use the same technology as well as Baseline & Monitoring Methodology
- CPA may be added at anytime during the life of POA
- each CPA will have credit period of 7-10 years subject to the POA
- each CPA will comments by local stakeholders
- each CPA may consist a group of farms
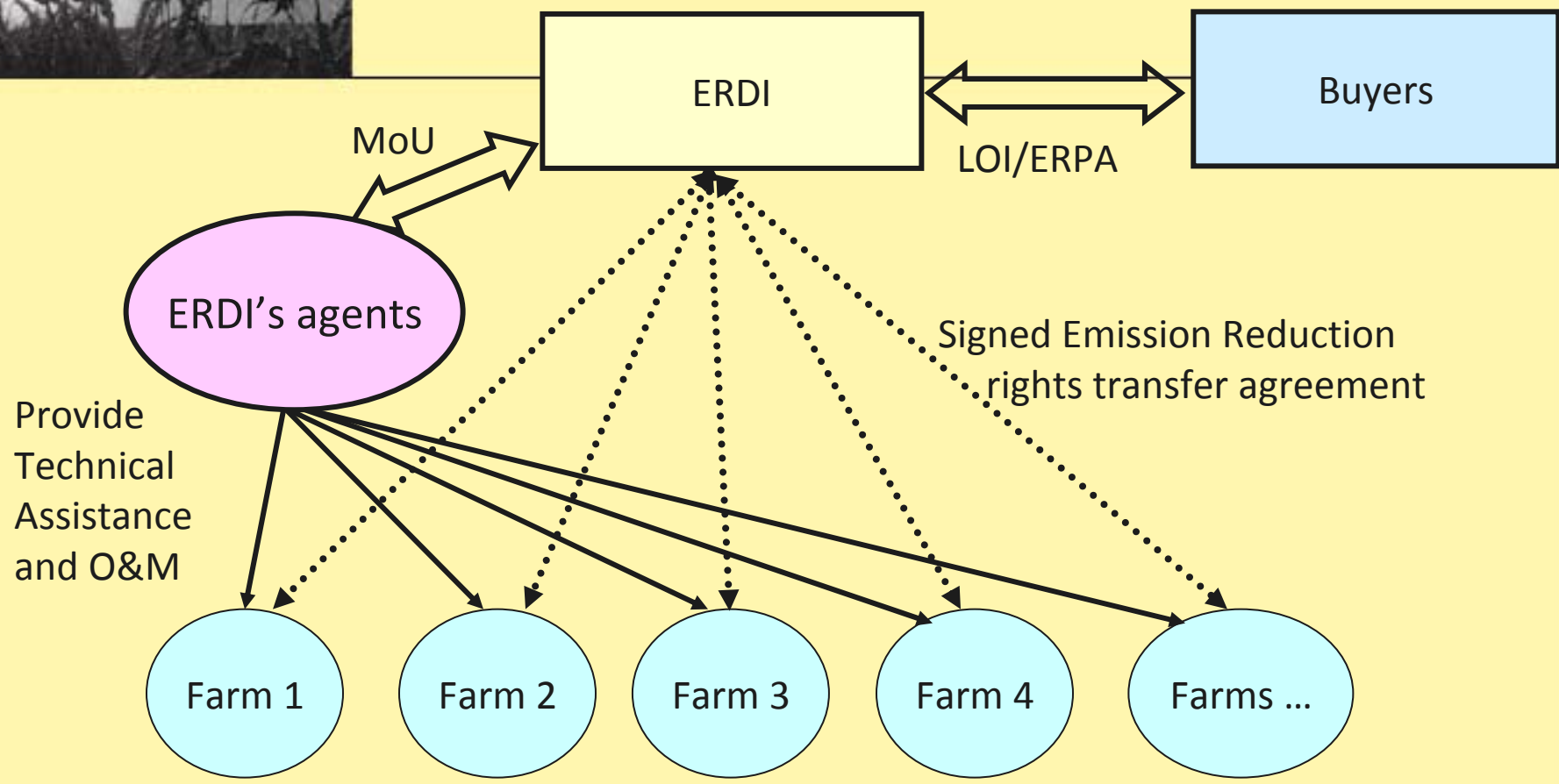
ERDI = Energy Research and Development Institute, Chiang Mai University
The World Bank = Assist in Project Development and Purchase Emission Reduction
MOU = Memorandum of Understanding
LOI = Letter of Intend
ERPA = Emission Reduction Purchase Agreement

PoA process

PIN : Project Ides Note

PIN prepared byERDI and WB

WB prepared POA-DD and 1st CDM Programme of Activity Desgin Document
ERDI
- Prepare Initial Environmental Impact Examination Report
- Organise stakeholder meetings

POA-DD & 1st CDM CPA-DD

ERDI submit documents to TGO

Request for Host country LoA from TGO

ERDI 's agen and farm
- Prepare information for the project documents
- Keep monitoring record
- Build biogas system

WB, ERDI and Farms prepare information/data for validator

Programme validation by DOE

Registration with UNFCCC CDM Executive Board

ERDI and WB

Programme development

. . . .

Programme implementation

Farm keep record of monitoring information and maintenance of monitoring equipment
ERDI prepare verification report

Operate the project and monitor project operation

ERDI

CPA verification by DOE

UNFCCC executive board issue CERs

Eligibility Criteria Process

1 — ERDI and WB prepared "Farm Eligibility Criteria Questionnaire

2 — ERDI's Agent fill in the questionnaire with information from farm

3 — Results Screening by ERDI's agent

Fail → Not Eligible for inclusion in the CPA

Pass

4 — Verified by ERDI

Fail → Not Eligible for inclusion in the CPA

Pass

Include in the CPA
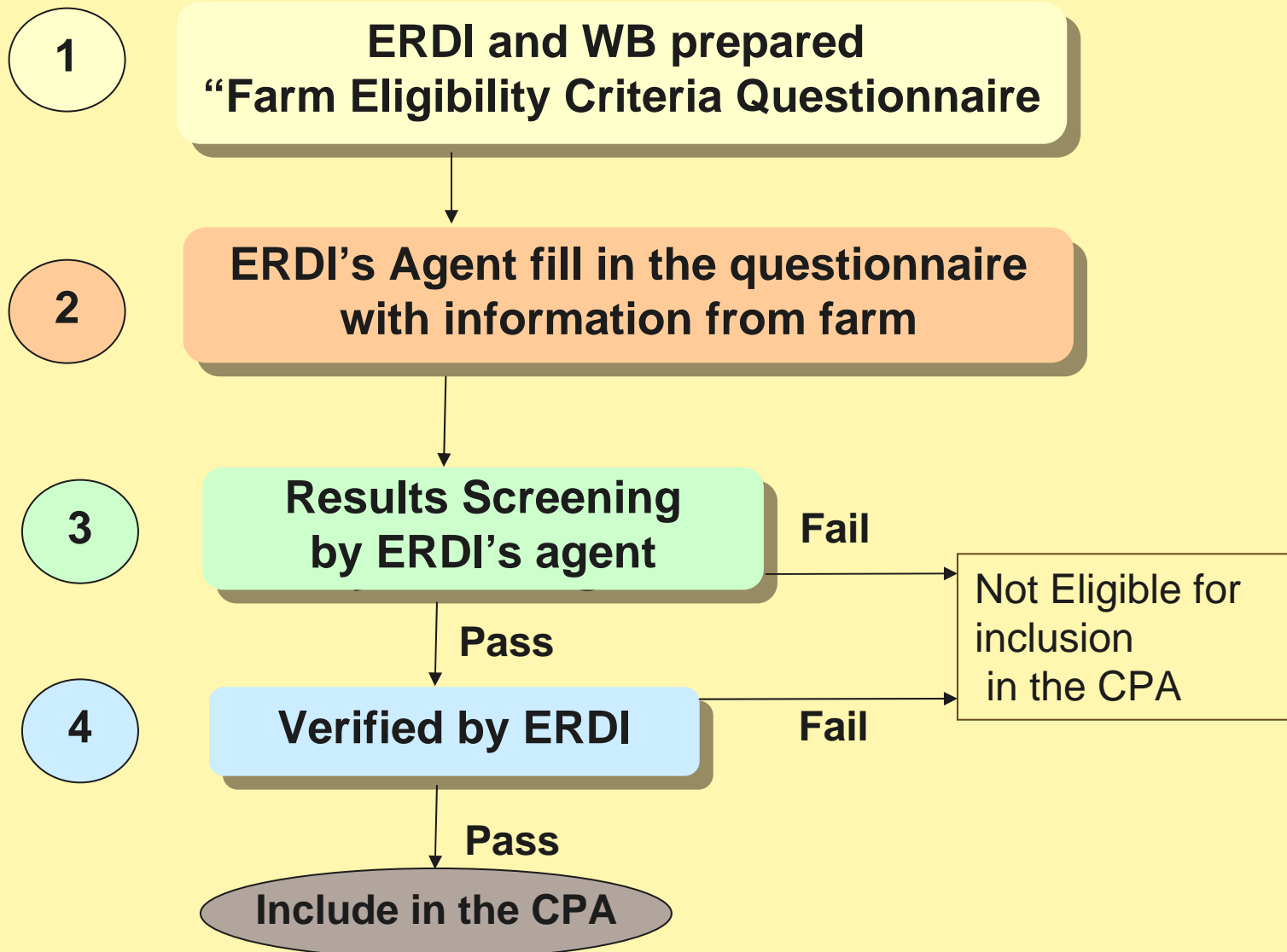
Management Concepts

- **Risk Identification:** Where is the Risk come from (e.g. Technology, Finance, and People)

- **Risk Analysis:** What is the impacts and probability of the events.

- **Risk Reduction:** Risk Reduction Strategies and Plans

Policy for CPA Management

- **Be Clean** – Clean Eligibility
- **Be Clear** – Transparent and Trustful
- **Be Communicate** – to Fill the gap of differentiation
- **Be Commune** - One for all and all for one

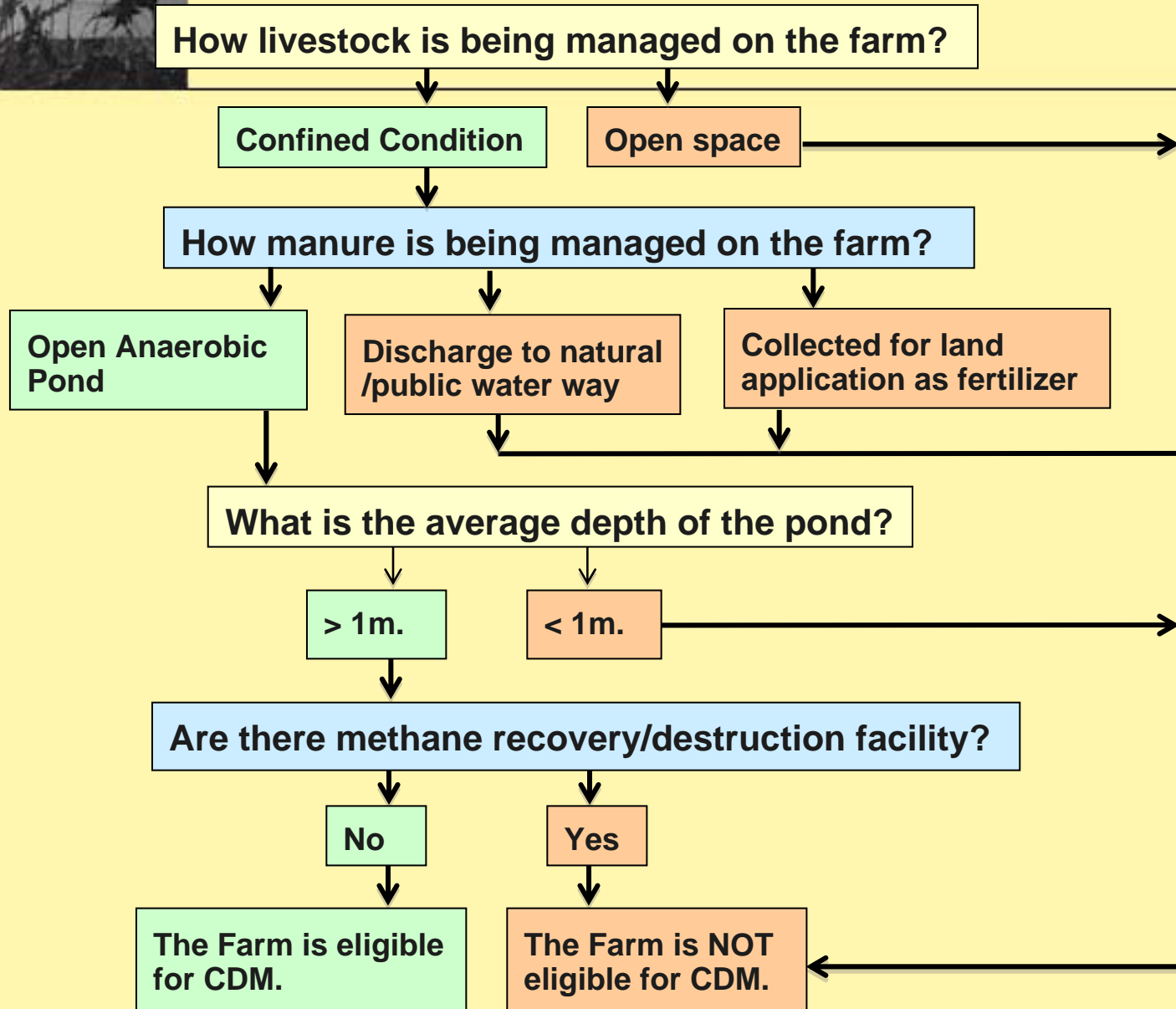# Project Component

Risk Treatment Strategies

- Standardization
    - Technology
    - Management
- Enhancing selecting process (client categorization)
- 3rd party verification and validation
- Enhance organization communication and problem solving system
- Retention fund
- Transparent
- Share risks and rev. among participants

How livestock is being managed on the farm?

Confined Condition

Open space

How manure is being managed on the farm?

Open Anaerobic Pond

Discharge to natural /public water way

Collected for land application as fertilizer

What is the average depth of the pond?

> 1m.

< 1m.

Are there methane recovery/destruction facility?

No

Yes

The Farm is eligible for CDM.

The Farm is NOT eligible for CDM.
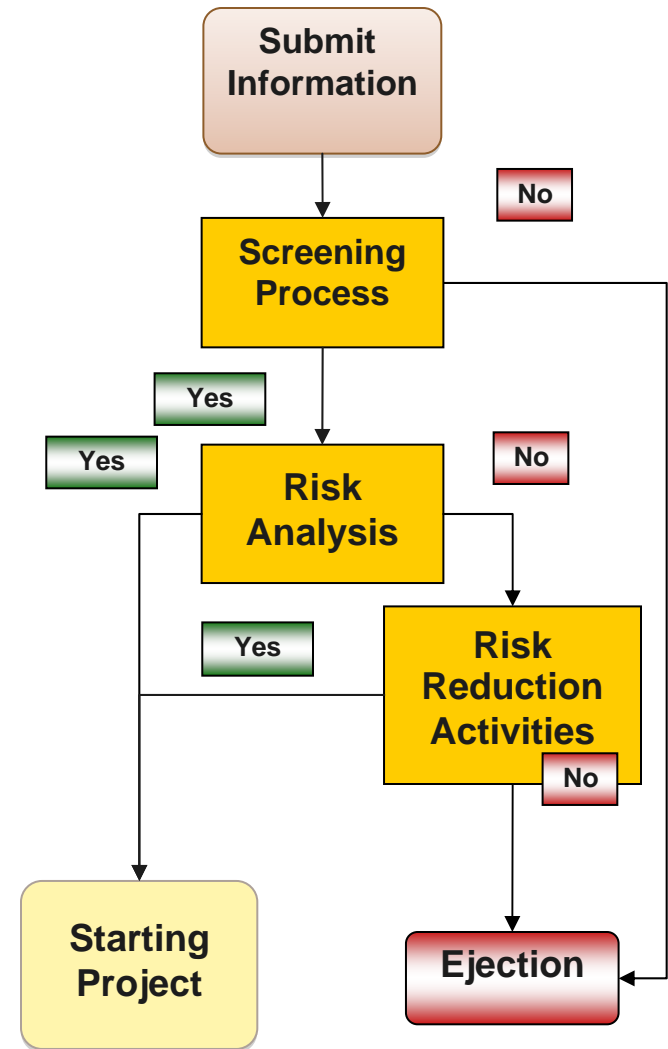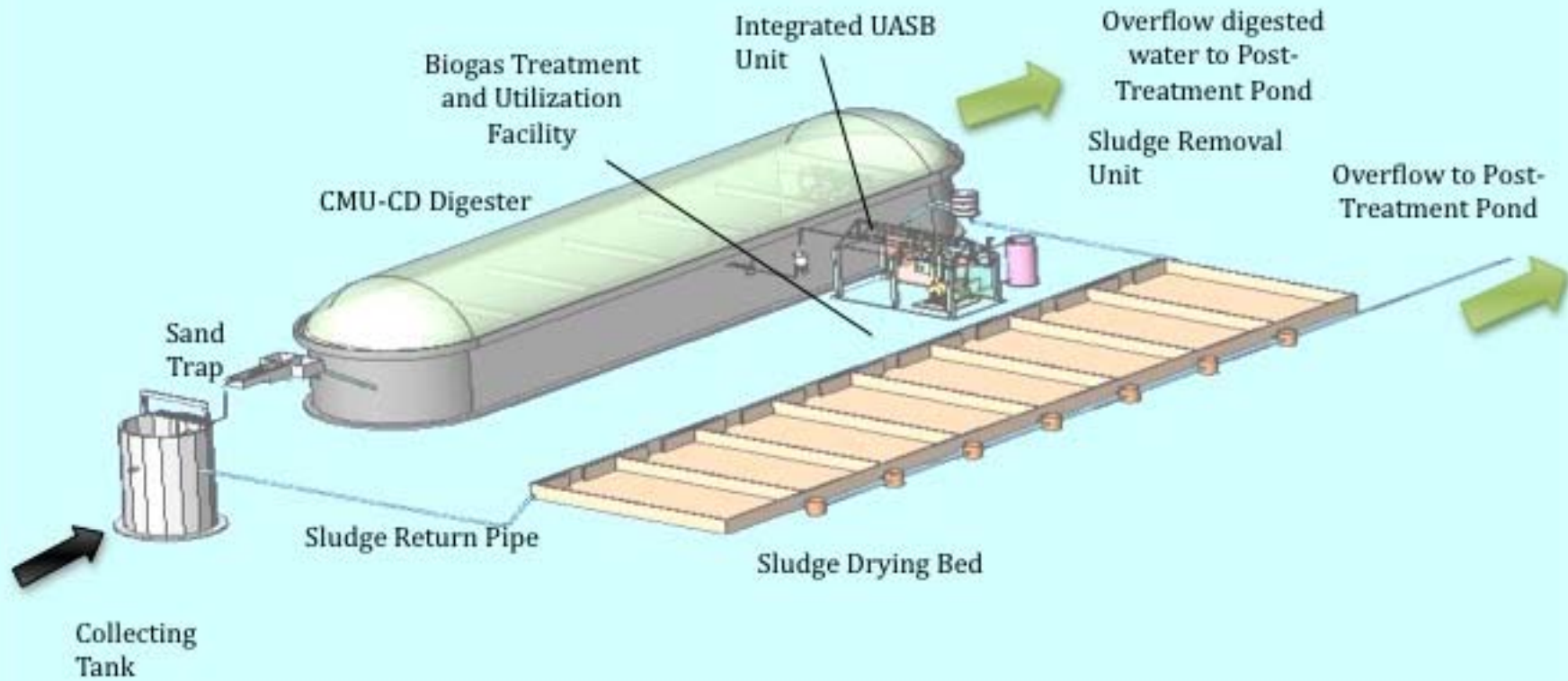
Risk Reduction

- Class A – Low Risk and High Return
- Class B – Medium Risk and High Return
- Class F – High Risk

Process of Selection

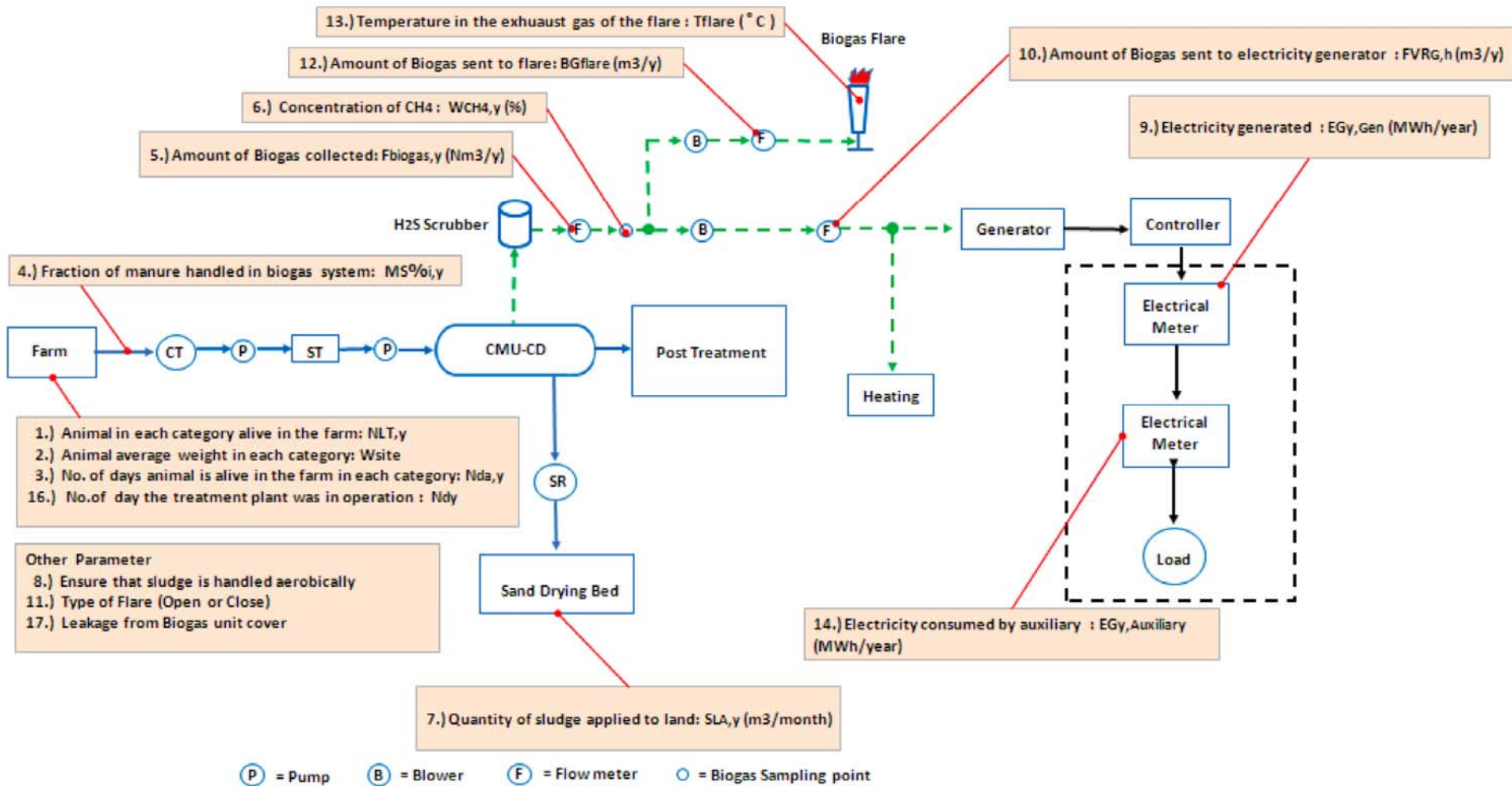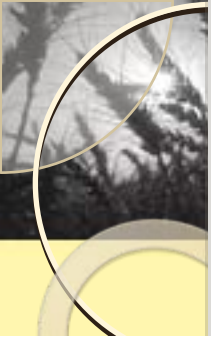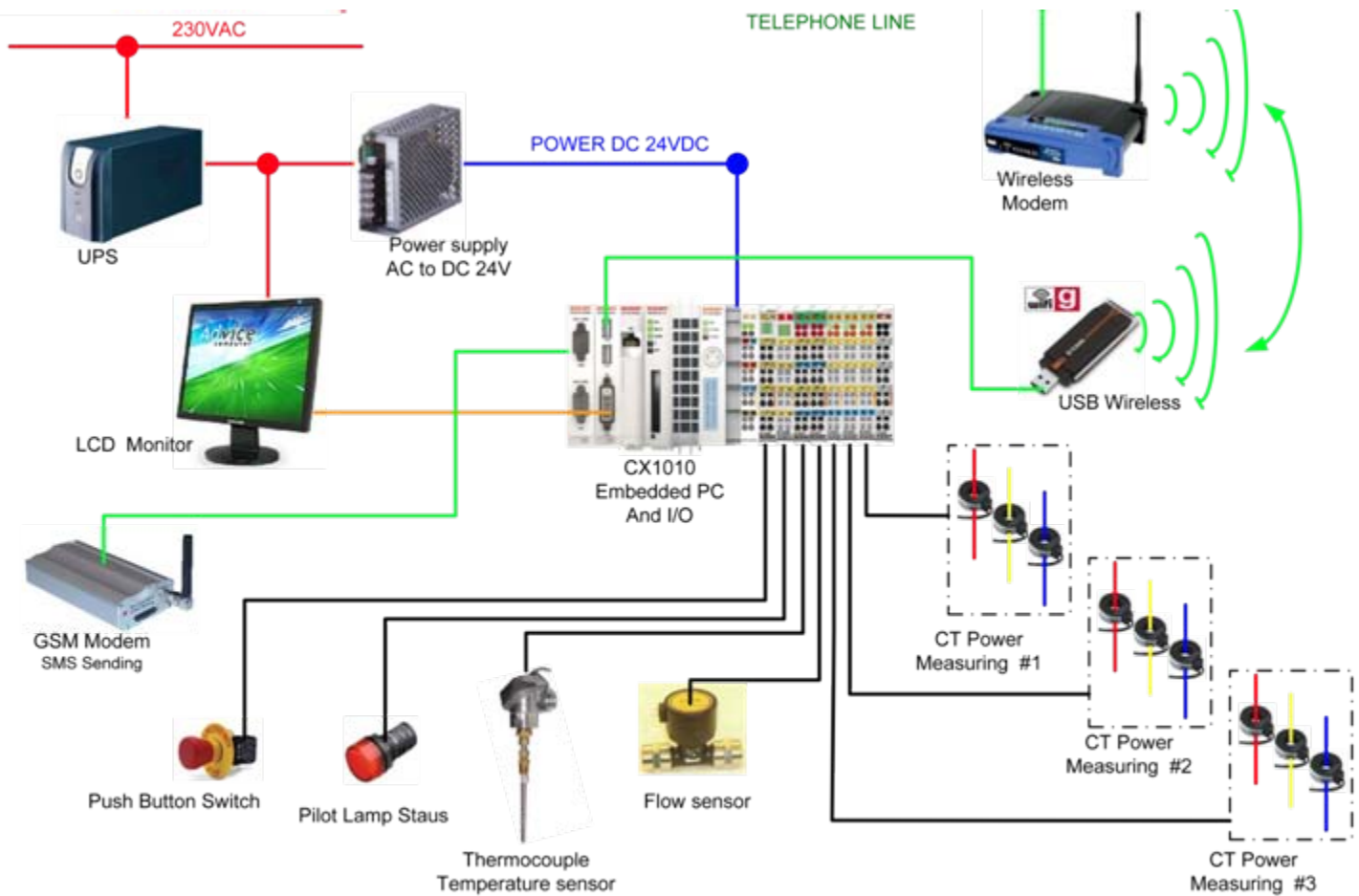Submit Information

Screening Process

No

Yes

Yes

Risk Analysis

No

Yes

Risk Reduction Activities

No

Starting Project

Ejection

Technology Selection

System Diagram for Monitoring

13.) Temperature in the exhuaust gas of the flare : Tflare ($^{\circ}$C)

12.) Amount of Biogas sent to flare: BGflare (m3/y)

6.) Concentration of CH4 : WCH4,y (%)

5.) Amount of Biogas collected: Fbiogas,y (Nm3/y)

Biogas Flare

10.) Amount of Biogas sent to electricity generator : FVRG,h (m3/y)

9.) Electricity generated : EGy,Gen (MWh/year)

H2S Scrubber

Generator

Controller

Electrical Meter

4.) Fraction of manure handled in biogas system: MS%i,y

Farm — CT — P — ST — P — CMU-CD — Post Treatment

Electrical Meter

Heating

1.) Animal in each category alive in the farm: NLT,y
2.) Animal average weight in each category: Wsite
3.) No. of days animal is alive in the farm in each category: Nda,y
16.) No. of day the treatment plant was in operation : Ndy

SR

Load

Other Parameter
8.) Ensure that sludge is handled aerobically
11.) Type of Flare (Open or Close)
17.) Leakage from Biogas unit cover

Sand Drying Bed

14.) Electricity consumed by auxiliary : EGy,Auxiliary (MWh/year)

7.) Quantity of sludge applied to land: SLA,y (m3/month)

P = Pump   B = Blower   F = Flow meter   O = Biogas Sampling point

Online Monitoring Diagram

What's Next

The New Era of Our Age

Doing PoA = Growing Trees

Lessons and Learns

- Segmented implementation
    - Different type of clients, different approaches
- Improvement throughout supply chain
- Appropriated Supports
    - Technical Side
    - Financial Side
    - Management Side
- Market mechanism: key to be sustainability

Questions and Answers