Situation and development trend of biodigester in Vietnam

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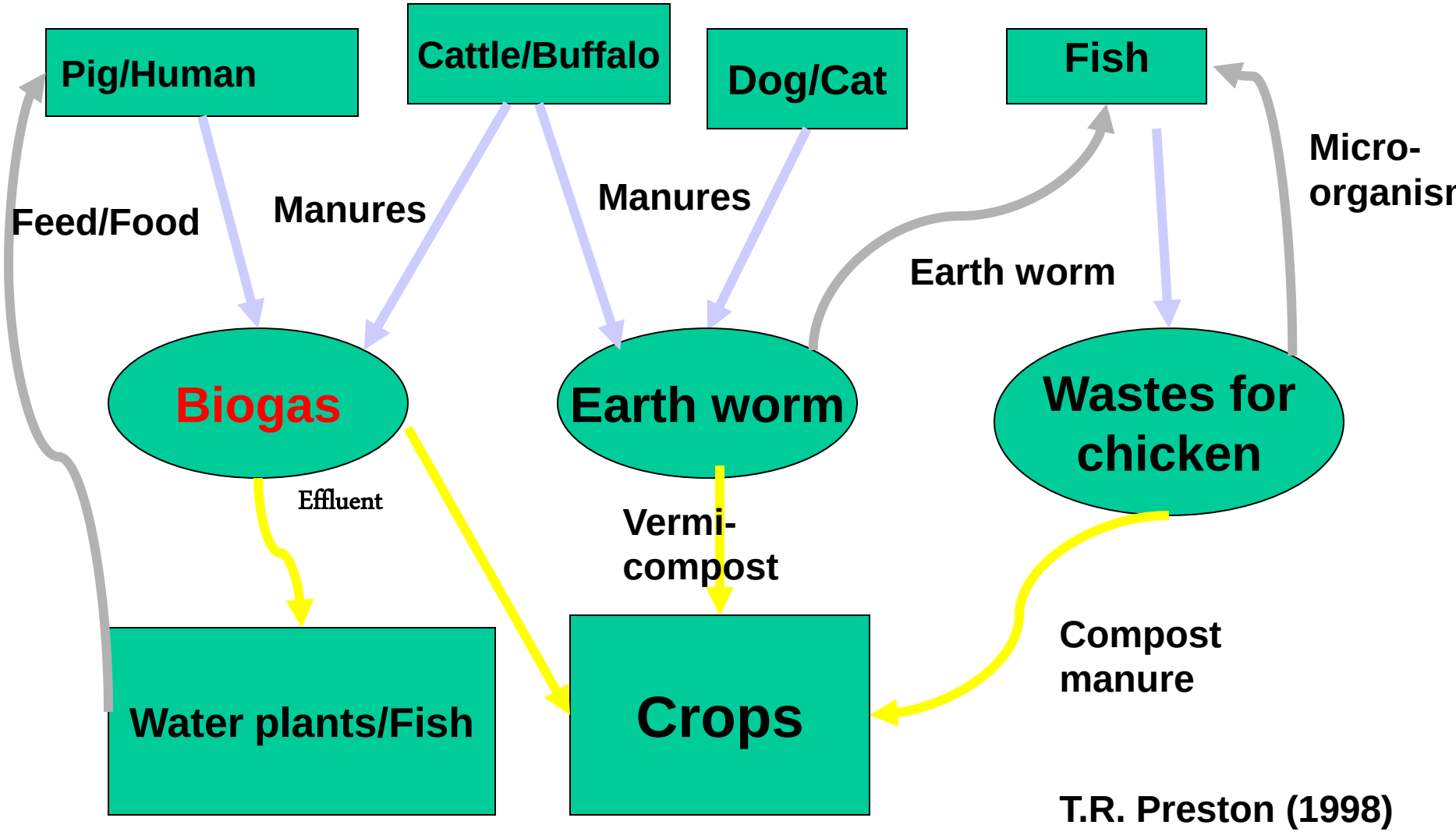
Introduction (1)

- **Oil price increased with increasing energy demand**
- **Looking for the new energy to replace fossil fuel, including:**
  - **+ Renewable energy: biogas**
  - **+ Energy water (hydro), wind (turbine fan), solar**
  - **+ Bio-energy (bio-fuel)**
  - **+ …**
- **There are the advantages/disadvantages for development and application**

Introduction (2)

- **Increase the number of livestock with increasing animal waste and polluting environment**
- **Good management on livestock waste:**
  - **+ stop polluting, animal diseases …**
  - **+ create renewable energy for production**
- **Biogas is the best solution**
- **Using biogas for cooking, electricity**
  - **+ Prevent global warm**
  - **+ Prevent climate change**
  - **+ Create the Clean development mechanism (CDM) CERs**

Ways for animal waste treating



Situation (1)

- **More than 70% population from agriculture**
- **50% working on animal production**
- **Livestock wastes caused pollution water, soil, air…**
- **Using biodigester**
  - **Prevent pollution, animal infection diseases in the farms (Doelle, 1997)**
  - **Use gas for cooking, light, electricity… (Piccinini et al., 1998; Lusk, 1998; Moog et al., 1998)**

Situation: Number of animals, 2008 (2)

Animal	Number
Cattle	6,720,000
Dairy	98,600
Buffalo	2,920,000
Goat, Sheep	1,770,000
Horse	103,480
Pig	26,600,000
Poultry	226,000,000

Situation: Manure and waste from animal/poultry, 2008 (3)

Animal	Manure/head (kg/day)
Cattle, buffalo	14
Pig	2.5

Animal	Manure total (tonnes)
Ruminant	40,000,000
Pig	28,000,000
Poultry	10,000,000

Situation: Gas production from animal waste (4)

Manure	Gas production (m^3/ tonnes of manure)	Percent of metan (% volume)
Cattle, Buffalo	260 - 280	50 - 60
Pig	561	

Biogas production from ruminant (buffalo and cattle) per day:

(3,000,000 + 6,800,000) x 14 x 0.36 = 4,939,200 m^3 biogas/day

(1 kg of ruminant manure will produce 0.036 m^3 biogas)

Biogas production from pig per day:

26,600,000 x 2.5 x 0.45 = 2,992,500 m^3 biogas/day,

(1 kg of pig manure will produce 0.045 m^3 biogas)

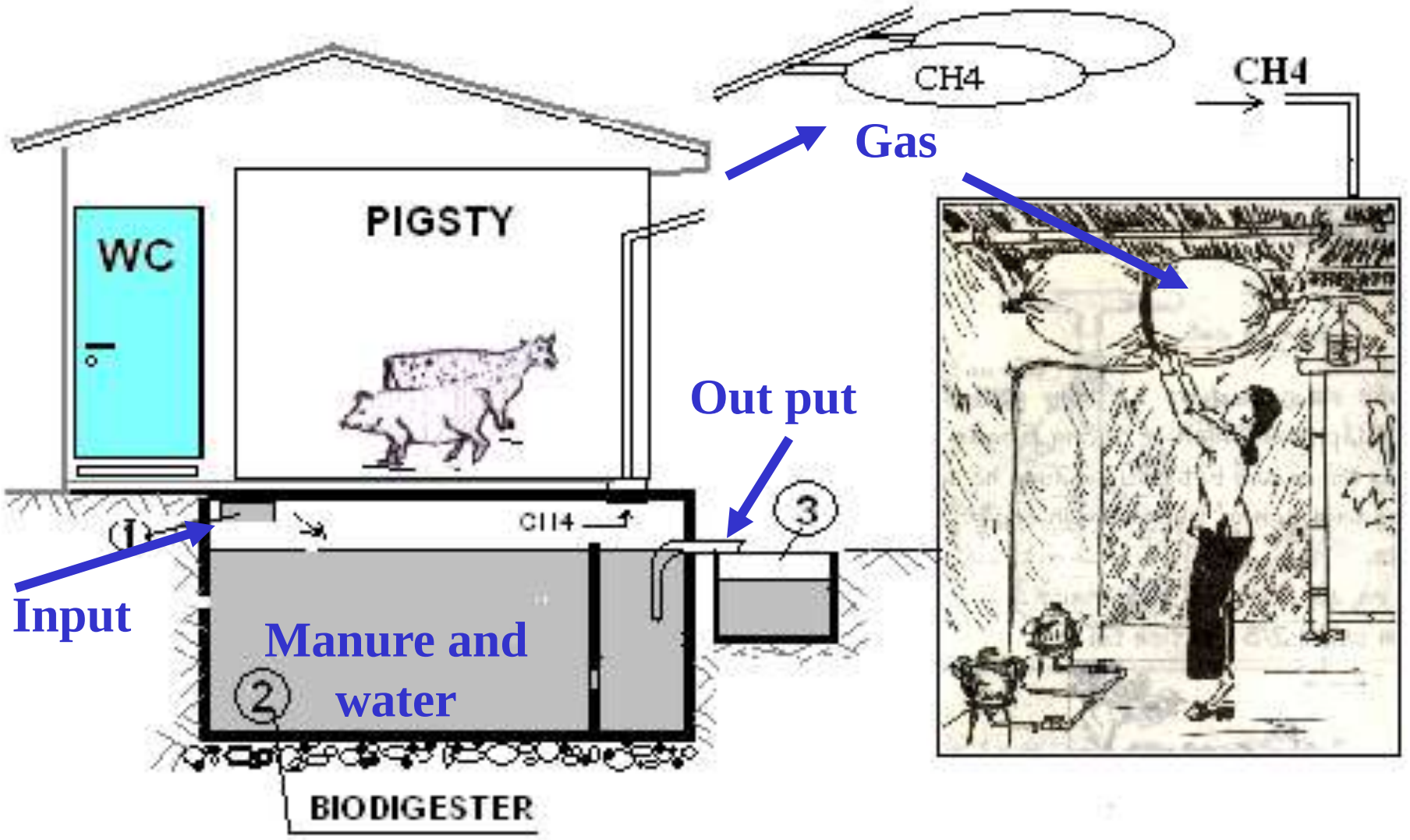
Total biogas per day: 4,939,200 + 2,992,400 = 7,931,700 m^3 biogas/day

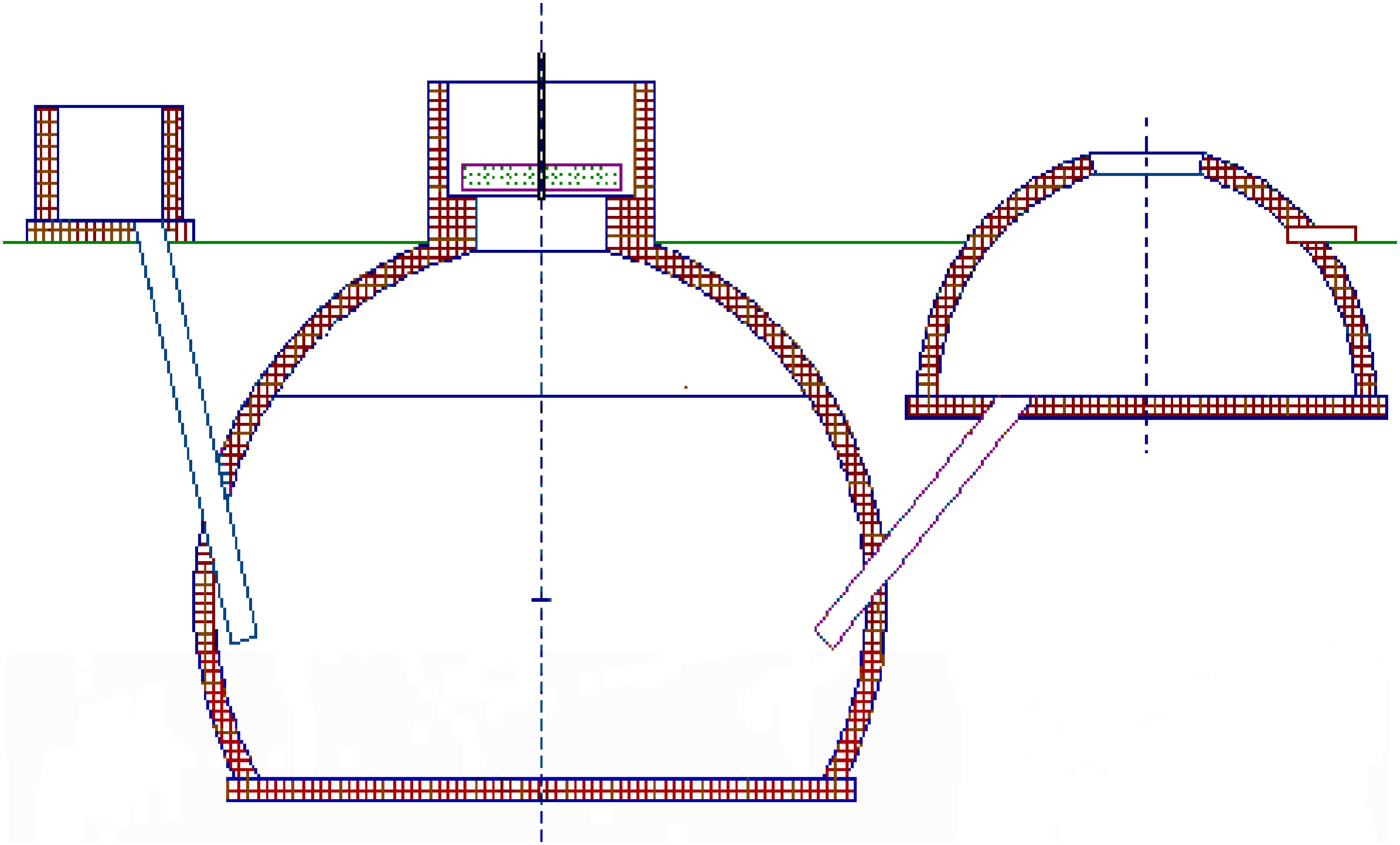
Change to gas petrol

1.15 x 7,931,700 = 9,121,455 litter gas petrol/day

Situation (5)

- **Small biodigester system can not treat the animal waste for cleaning to achieve B-level standard**
- **How to treat animal waste water to come the fresh water**


CH4
CH4
Gas
WC
PIGSTY
Out put
CH4
1
3
Input
Manure and
water
2
BIODIGESTER



Characteristics of in/output manures

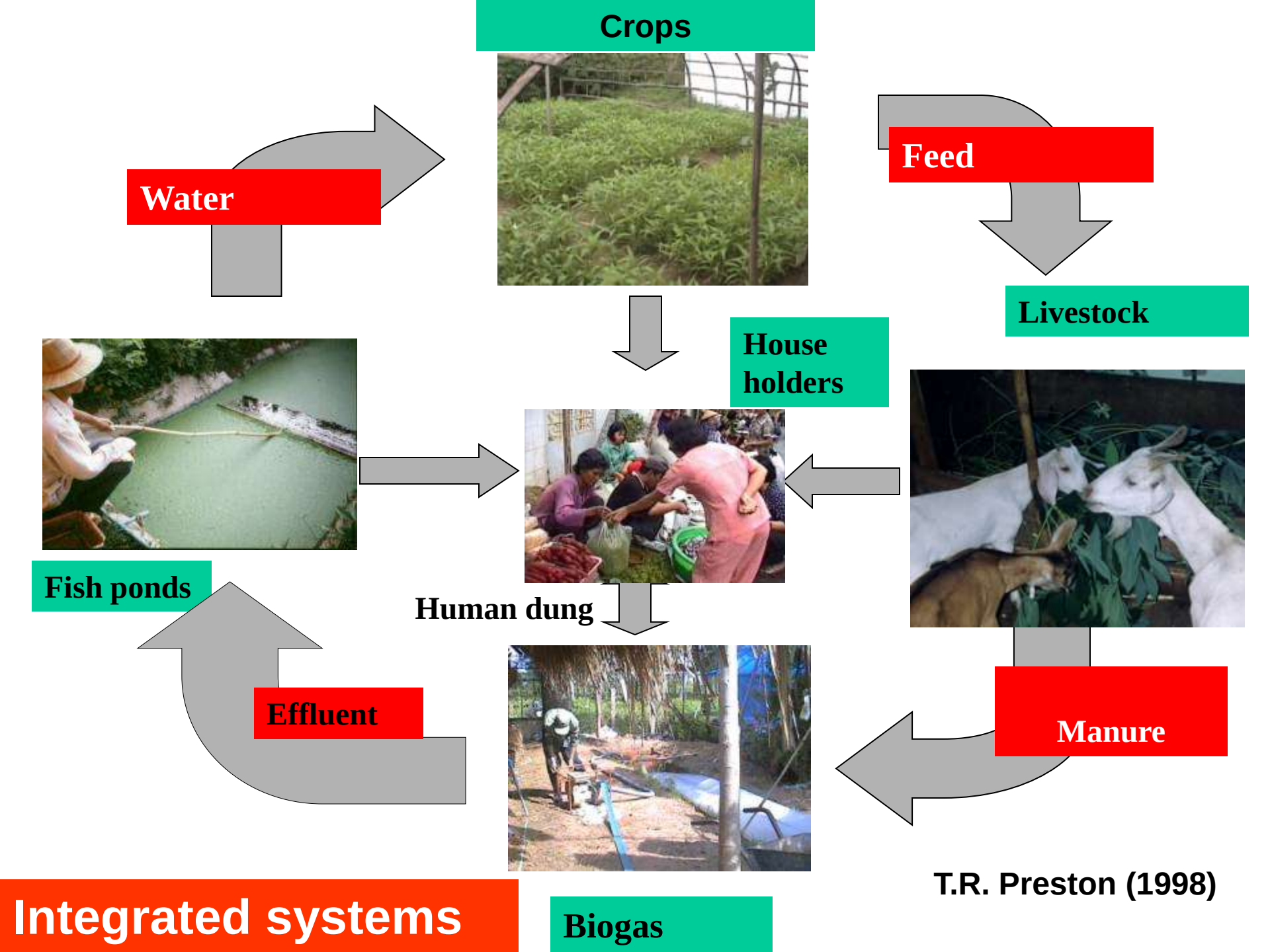
Parameters	Input manure	Output manure (Retention time (days) in biodigester)
COD (mg/l)	4.020	1.200 (20 days)
	2.450	640 (25 days)
	1.080	420 (30 days)
	640	170 (30 days)
E.coli (MNP/ml)	$52,89 \times 10^6$	$75,39 \times 10^3$ (30 days)
	$6,8 \times 10^5$	$7,3 \times 10^4$ (25 days)
	$28,3 \times 10^5$	$1,9 \times 10^5$ (20 days)
Coliform (MNP/ml)	$266,78 \times 10^6$	$236,1 \times 10^3$ (30 days)
	$46,3 \times 10^6$	$26,9 \times 10^5$ (25 days)
	$87,8 \times 10^5$	43×10^5 (20 days)

Situation (6)

- **There were many designs**
  - **Nylon (Duong Nguyen Khang and T.R. Preston, 1992)**
  - **China KT1, KT2 (SNV)**
- **Both designs set up for small scale**
- **Effluent (after biodigester) still pollution**
- **Big designs for treating effluent for environment**
- **HDPE biodigester introduced and applied**

Trend (1)

- **Biogas is important part for integrated agricultural system in small holders**
- **Reducing metan, global warm and climate change …**



Integrated systems

Trend (2)

Biodigester:

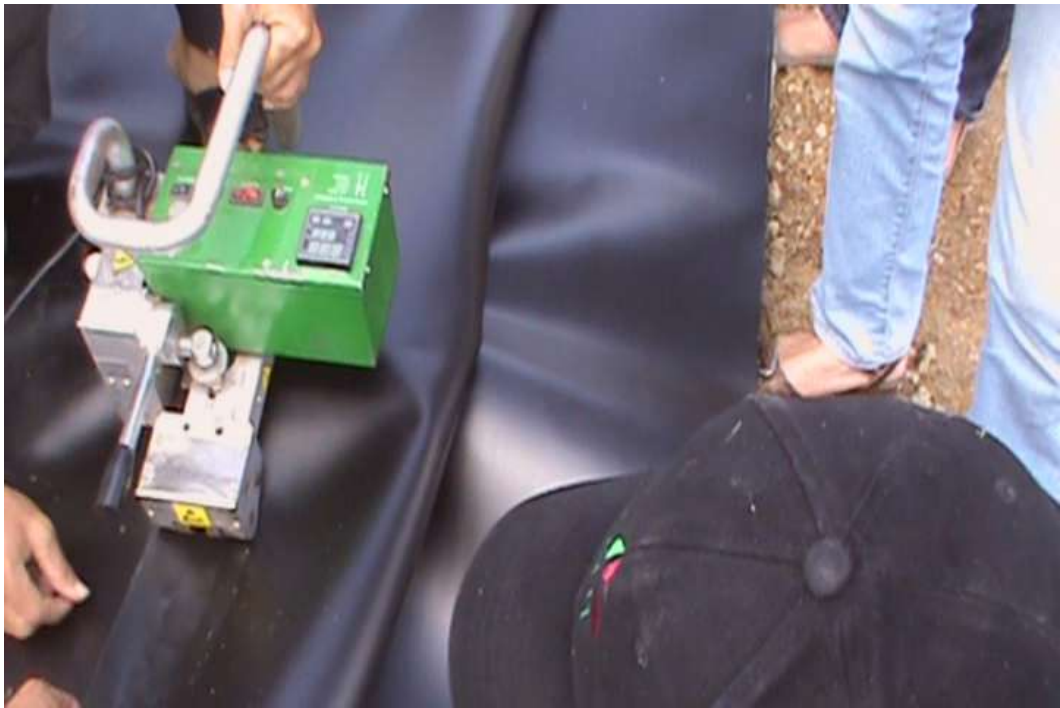
- **Plastic bag for small scale**
  - Easy to install, low cost
  - Simple action, less the operational costs
  - Easy to repair, do not need high technique
- **HDPE for small/bigger scale**
  - Low investment costs
  - Simple action
  - Easy to maintain
  - Easy repair
  - Provide the large amount of gas for generators

Solution: Biodigester system (1)

- **Increasing the small/midle system in small holders**
  - **Treating animal waste**
  - **Gas production for cooking, electricity… CDM CERs**
- **Calculation the biodigester volume for better animal waste treating**

Solution: Biodigester system (2)

- **HDPE biodigester:**
  - **Reduce pollution of the lager animal waste from the farms**
  - **Produce lager gas yield for generators**
- **Making the CDM CERs for selling…**



Results on HDPE biodigester with different retention time

Parameters	Retention time (days) 10	20	30	40	SE	P
Gas production (l/kg DM)	33.23	55.39	66.80	71.05	2.68	0.001
COD (mg/l)	690.14	437.47	205.37	113.67	5.60	0.001
Coliform (x10^4 MPN/g)	4.46	4.20	4.02	3.33	0.79	0.77
E. coli (x10^4 MPN/g)	2.09	0.64	0.57	0.22	0.37	0.01
pH	6.96	6.99	7.01	7.02	0.01	0.001
Temperature (^{0}C)	28.15	28.54	28.69	28.73	0.24	0.32

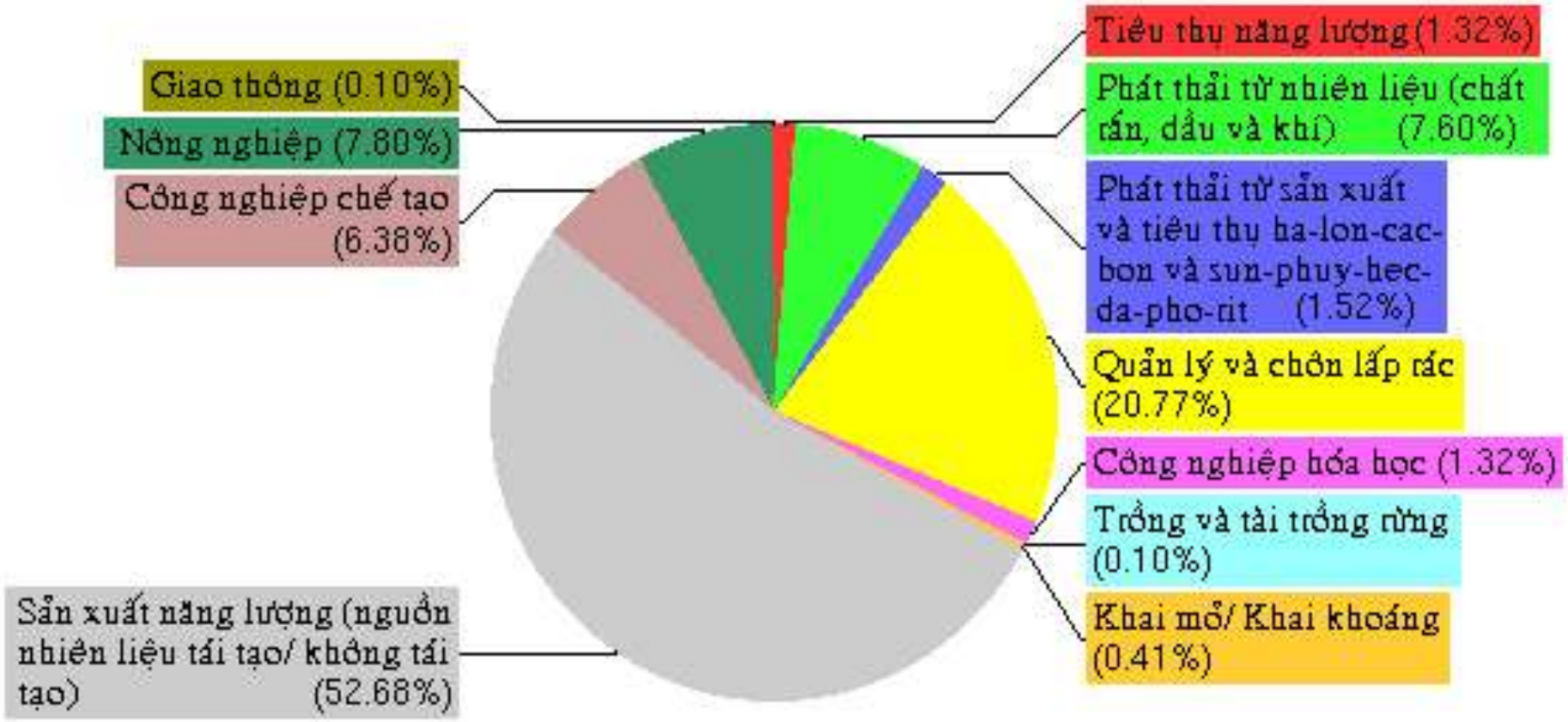
Solution: Clean the effluent (after biodigester) (3)

Solution: Clean development mechanism CDM (4)

Advantages from CDM

- **Developed countries**
  - **Received CERs form CDM with low cost**
  - **Good investments, development and cooperation with developing countries**
- **Developing countries**
  - **Received money for activities in their factories**
  - **More well-being**
  - **Improvement on their environmental protection, their techniques on treating the waste water…**

Solution: Where is CDM for selling? (5)



Conclutions

- **Biogas is most important part in the intergrated agricultural system for sustainable development and prevent climate change**
- **Biogas for animal waste treating, renewable energy, global warm prevention, CDM certification**
- **HDPE biogas system is better for treating animal waste, waste from cassava/sugar cane/fish factories to achieve the clean water and more clean energy for production**

Suggestions

- **Government and NGO's more supporting for developing on treating animal waste**
- **Developing on HDPE biodigester system for small holders in rural areas**
- **More research on how to optimize on HDPE biodigester system**

Thank you for your attention!