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Nitrous oxide, Methane and Ammonia mitigation trials in swine wastewater purification

Takashi OSADA Ph.D. and Yasuhiro YAMASHITA Ph.D.

Animal Environment and Waste Management Research Division
Institute of Livestock and Grassland Science, NARO

The aim of this presentation is ..

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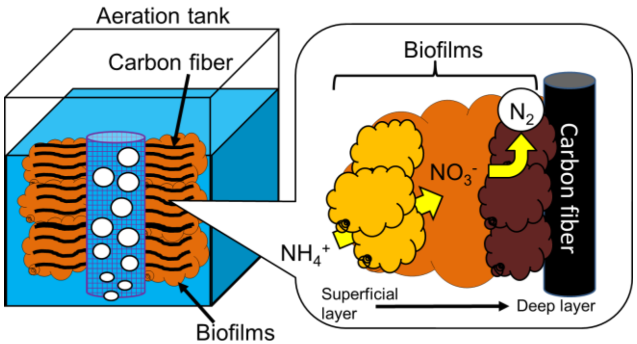
New wastewater treatment, carbon fiber reactor,

possibly reduce

GHG emission,

especially N2O

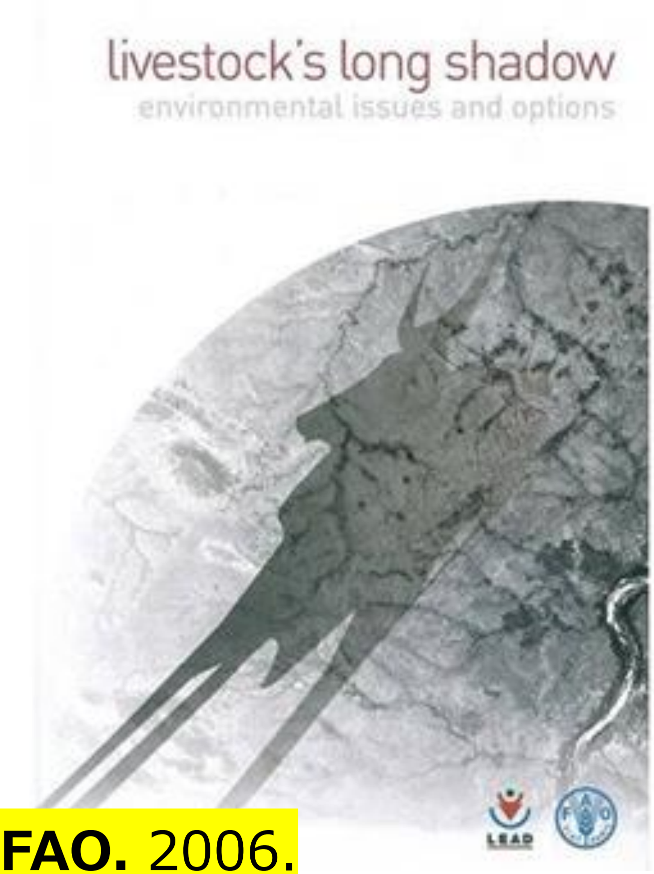


- GHG from Livestock farming
  - The livestock sector plays an important role in climate change.

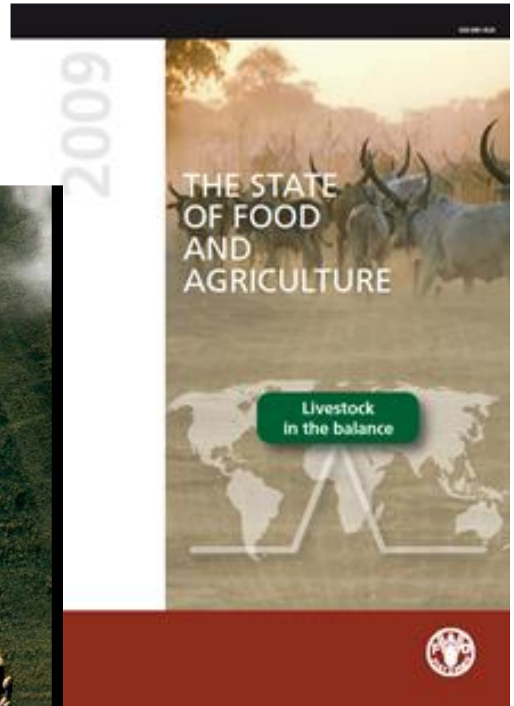
  and the **Manure-GHG** has mitigation potential.
  - Major manure management in Jp. (esp. wastewater)

- Field demonstration trials are currently going on in pig farm / (interim report)

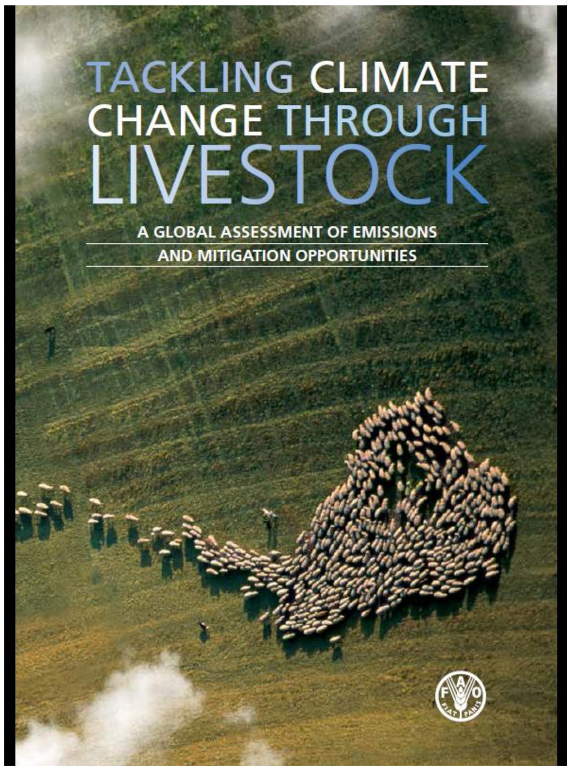
Livestock: a significant contributor to climate change



FAO. 2006.



FAO. 2009.



FAO. 2013.

With emissions estimated at 7.1 giga tones CO2-eq per annual, representing 14.5 percent of human-induced GHG emissions !

Manure management contribute a major source of GHG

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Emissions of greenhouse gases along the animal food chain and estimated relative contribution from major species

STEP IN ANIMAL FOOD CHAIN	ESTIMATED EMISSIONS[1]		ESTIMATED CONTRIBUTION BY SPECIES[2]			
			Cattle and buffaloes	Pigs	Poultry	Small ruminants
	(Gigatonnes)	*(Percentage of total livestock sector emissions)*				
Land use and land-use change	2.50	36	■■■	■	■	ns
Feed production[3]	0.40	7	■	■■	■■	ns
Animal production[4]	1.90	25	■■■■	■	■	■■
Manure management	2.20	31	■■	■■■	ns	ns
Processing and transport	0.03	1	■	■	■■■	ns

[1] Estimated quantity of emissions expressed as CO_2 equivalent.
[2] ■ = lowest to ■■■■ = highest.
[3] Excludes changes in soil and plant carbon stocks.
[4] Includes enteric methane, machinery and buildings.
Note: ns = not significant.
Source: Adapted from Steinfeld *et al.*, 2006.

Main GHG source of Agri.
above 4%of GHG share

This year's report of The State of Food and Agriculture (FAO 2009)

Present manure management really managed manure ?

Reduce the environmental impact for neighbor,

- Air quality (malodor, dust) ,
- Public water quality (N,P and pathogen pollution)…
- Reuse resources of manure as fertilizer

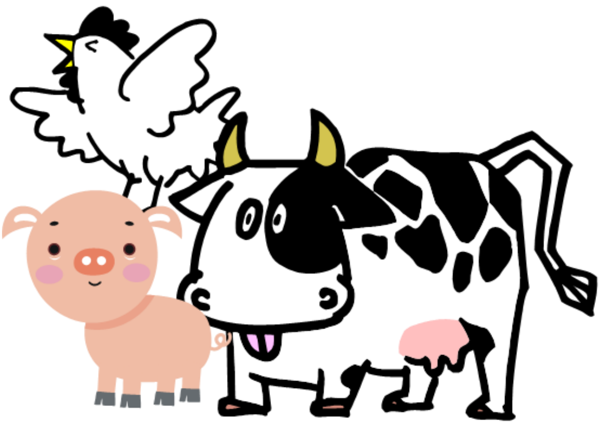
But not enough for GHG

...new issue.

Treatment of livestock waste in Japan (GHG)

(G = giga 10^9)

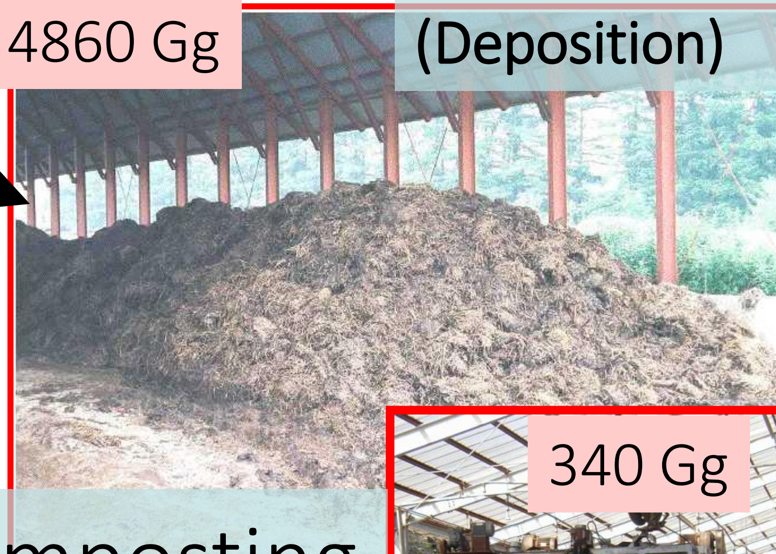
Livestock housing

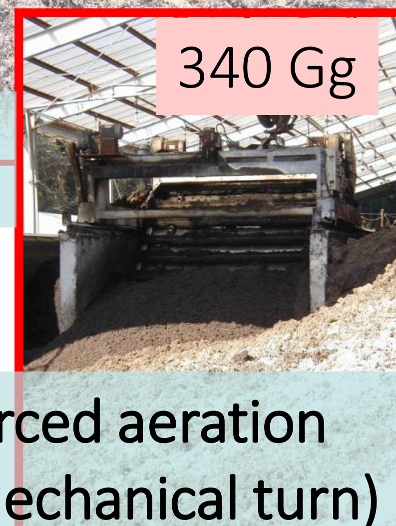


(Gg/y of CO2eq)

Solid part

Liquid part





Composting

(Dry, Incineration ….)

Evaluation of GHG emission from Wastewater purification plants (Swine)

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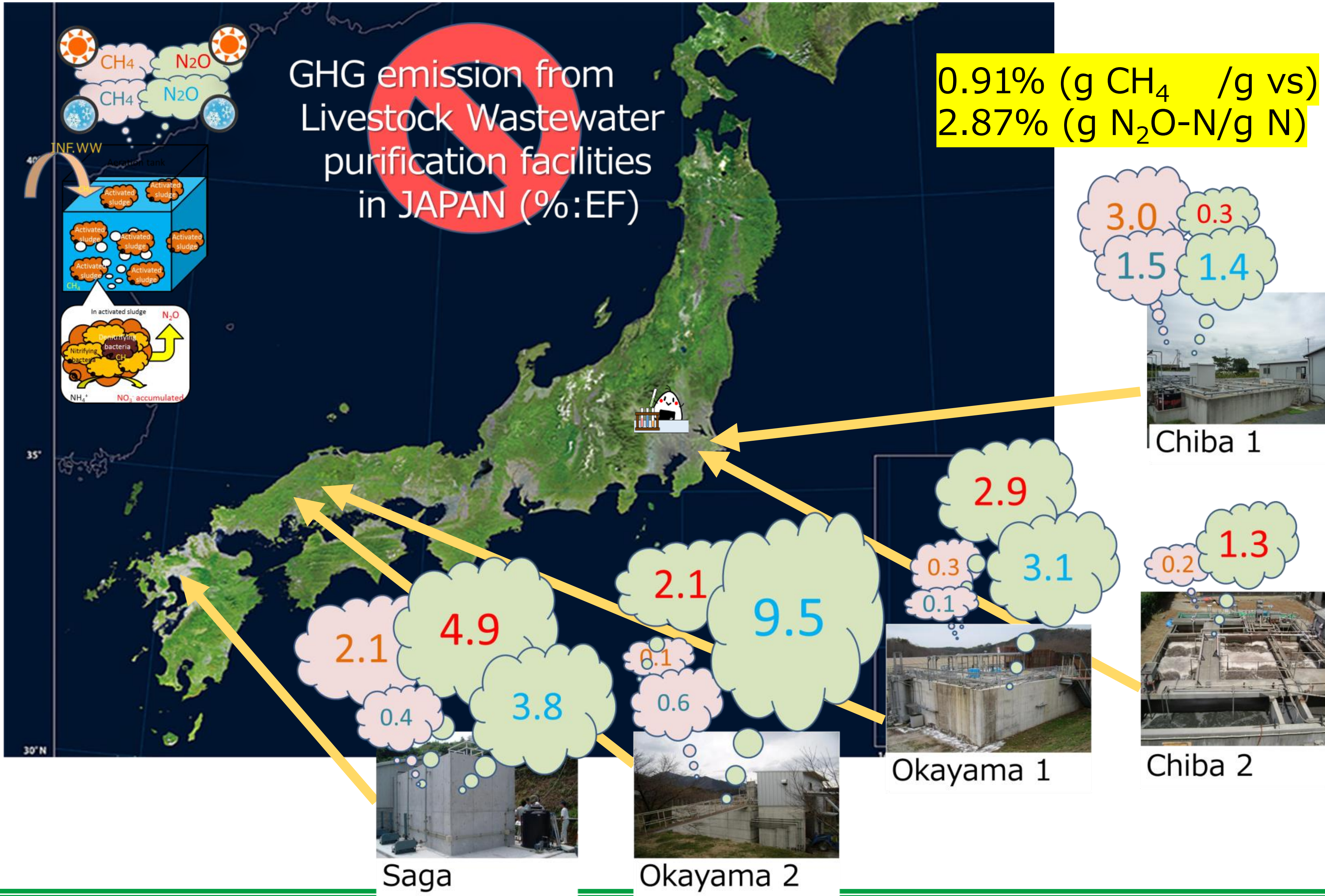
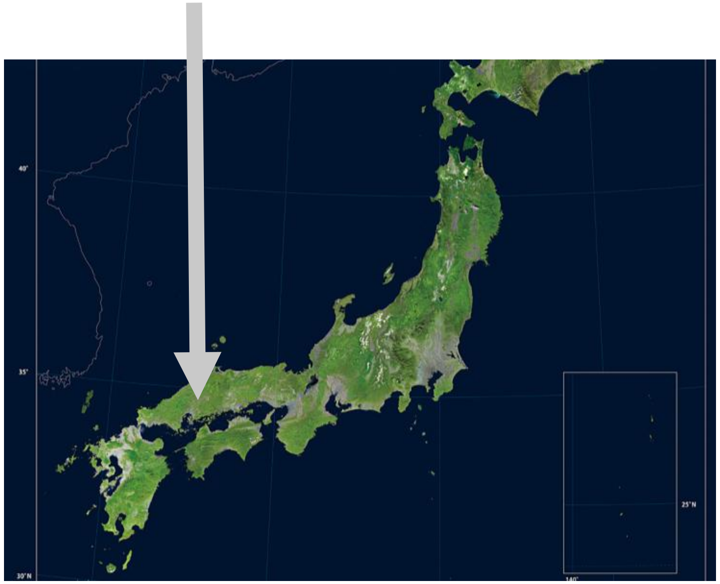
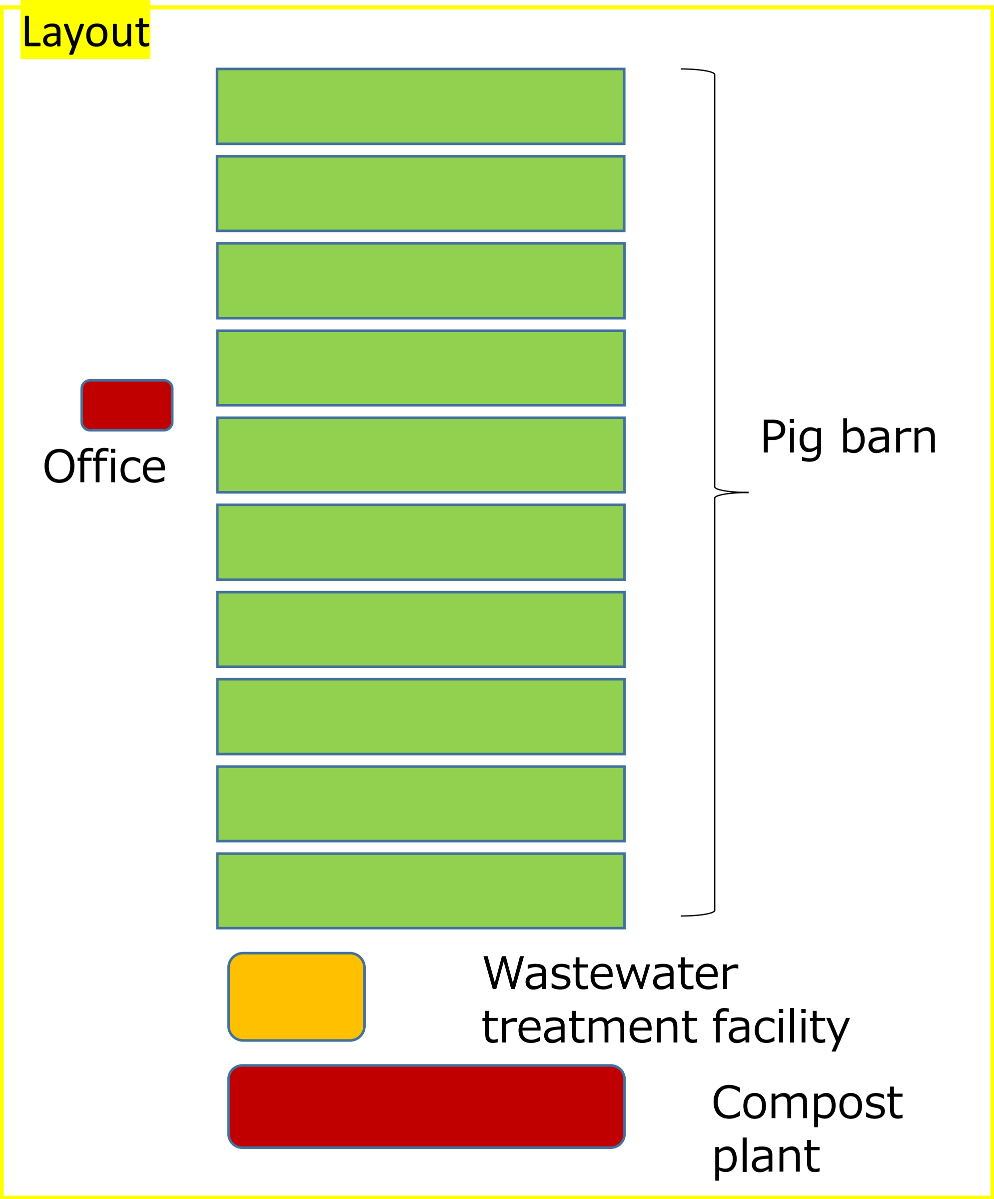
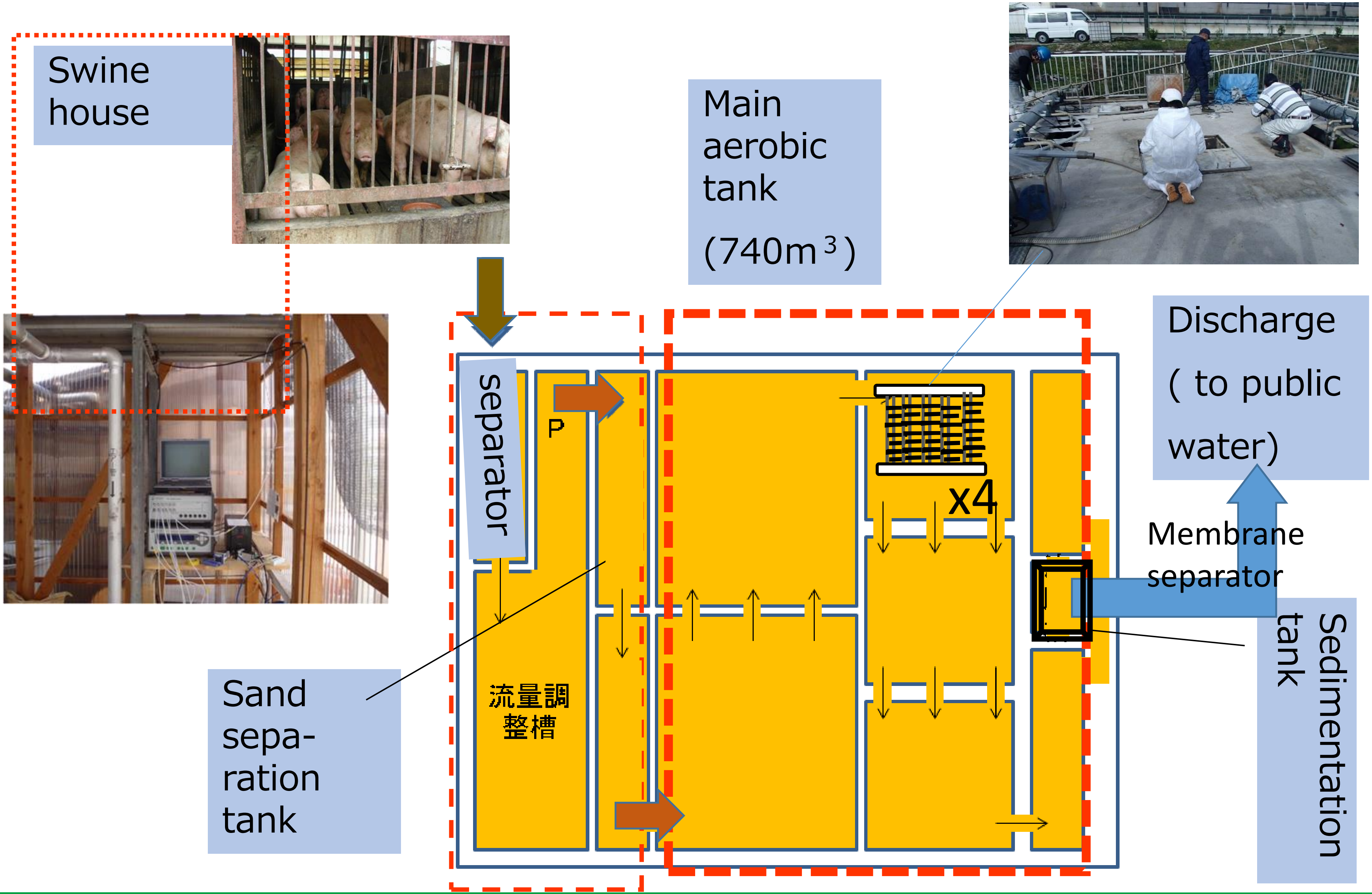


Okayama 1 wastewater treatment facility



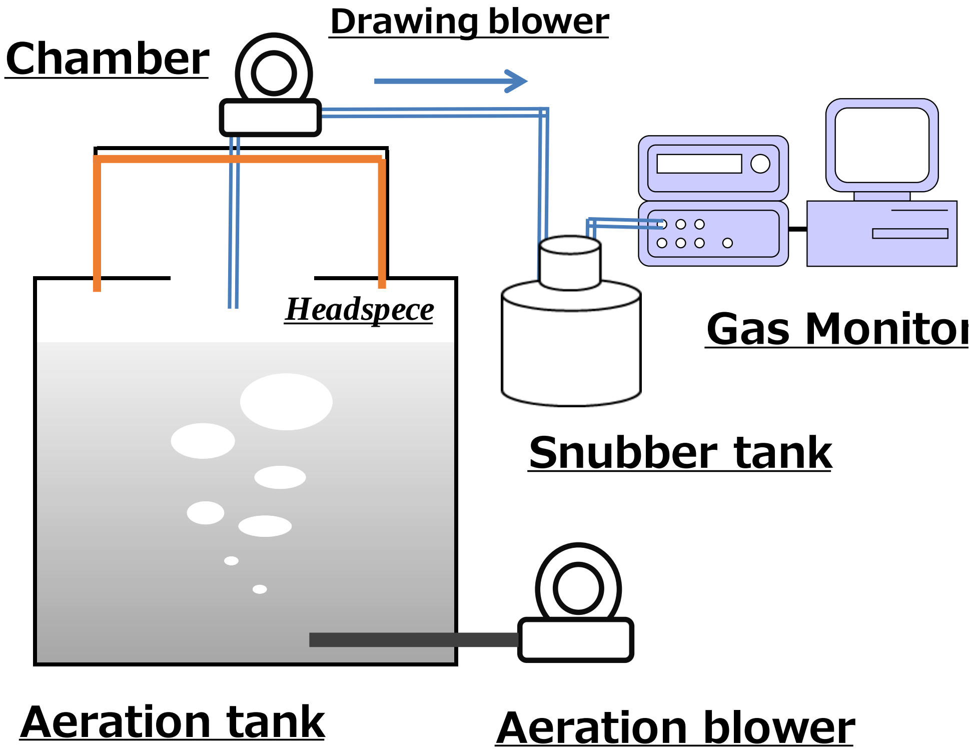


Okayama 1 CF reactor setting in the facility



Unit of CF reactor

Wastewater purification of livestock waste (Swine)



Gas evaluation

During the aeration periods:

Ea (mg/60 min.) = (Conc. of outlet air (mg/ m^3) - Conc. of inlet air (mg/m^3)) x Flow-rate (m^3/ hour)

Settled period (Sediment, not aeration):

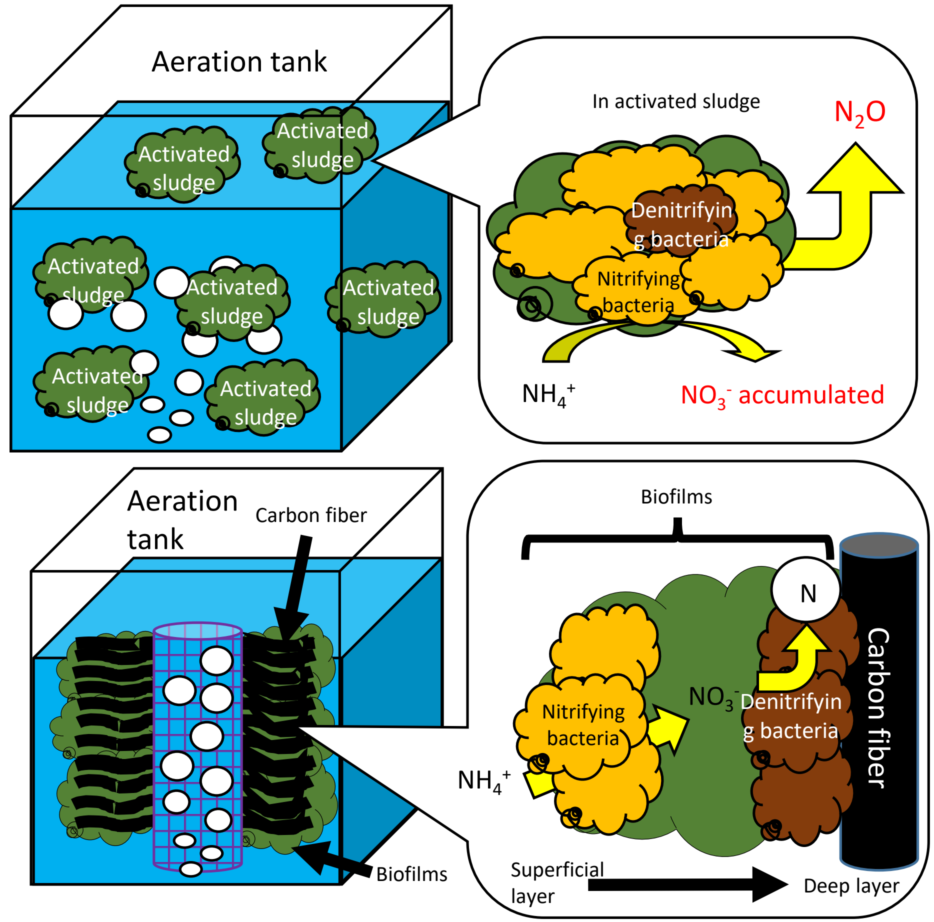
Es (mg/60 min.) = (Conc. of outlet air (mg/ m^3) - Conc. of inlet air (mg m^3)) x HS* (m^3)

HS: Average capacity of head space of reactor tank (m^3)

Reactions Inside the Treatment Tank

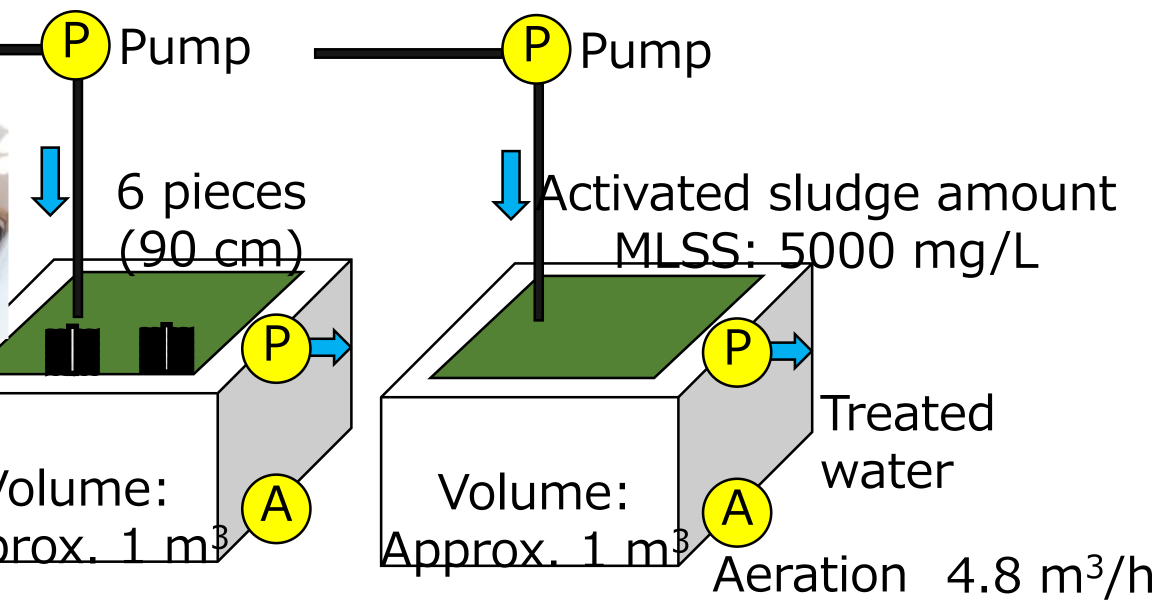
Activated sludge method
(conventional method)

Carbon fiber
method



Carbon Fiber Supply Experiment at the Actual Facility (pre evaluation)

Pig wastewater introduce



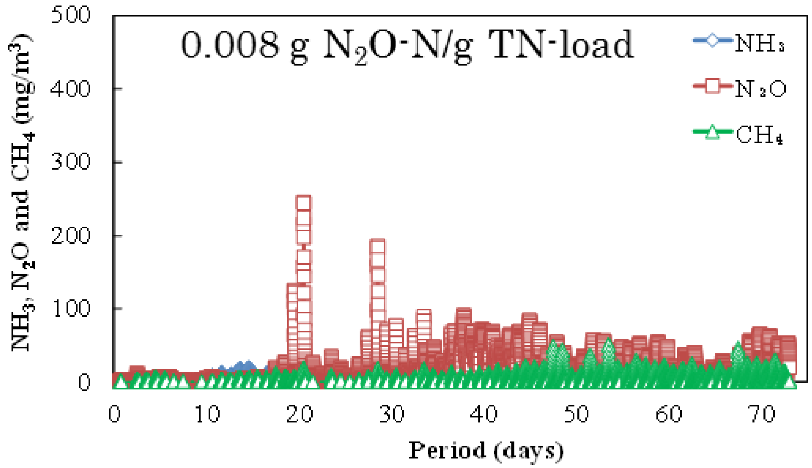
Area for testing with carbon fiber

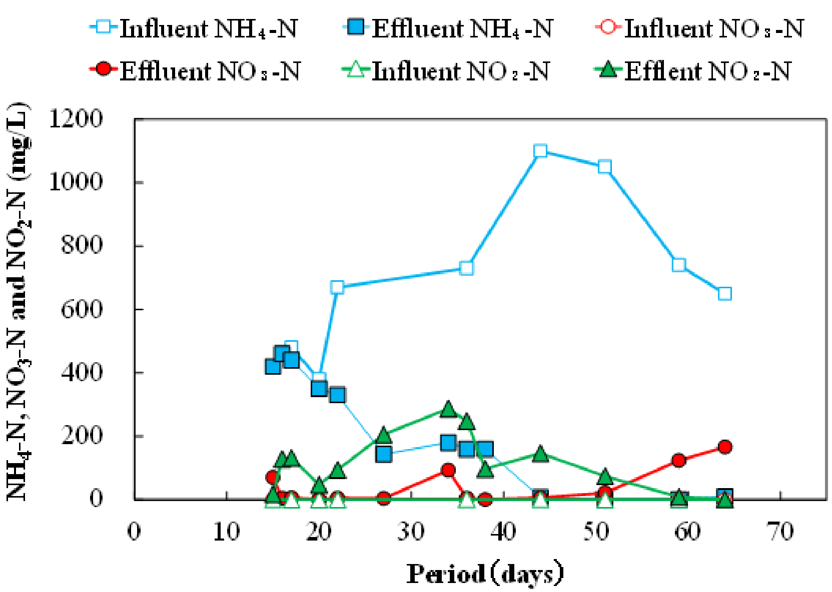
Area for comparison (no carbon fiber)

Partially supply water by bypass operation (BOD load: 0.3 kg/m^3/day)

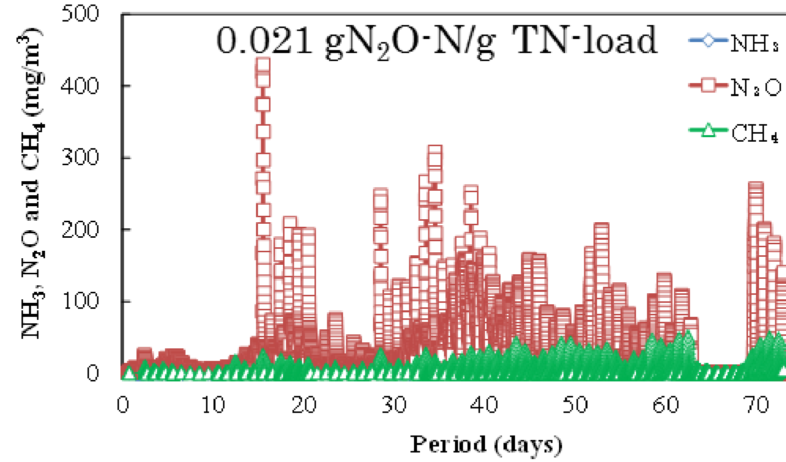
GHG and Water quality comparison

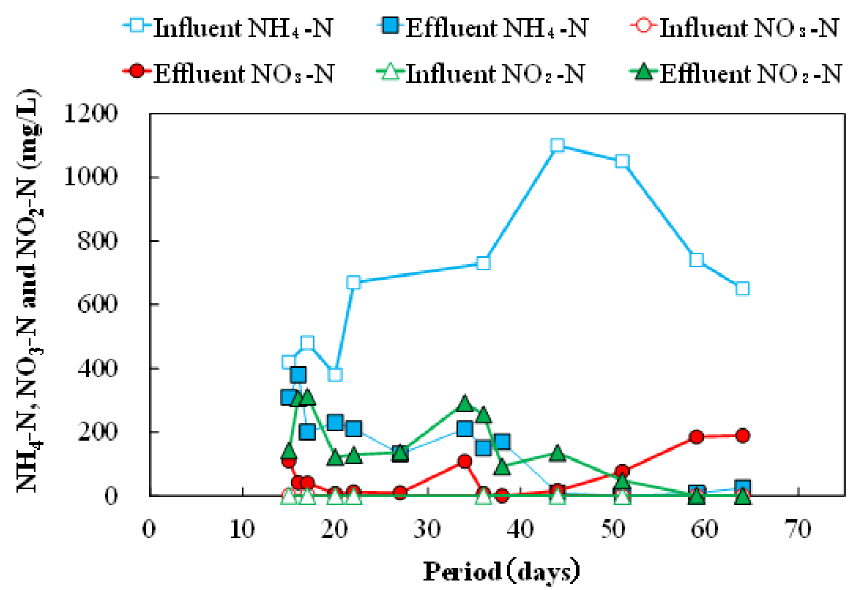
In the carbon fiber (CF) reactor





In the activated sludge (AS) reactor





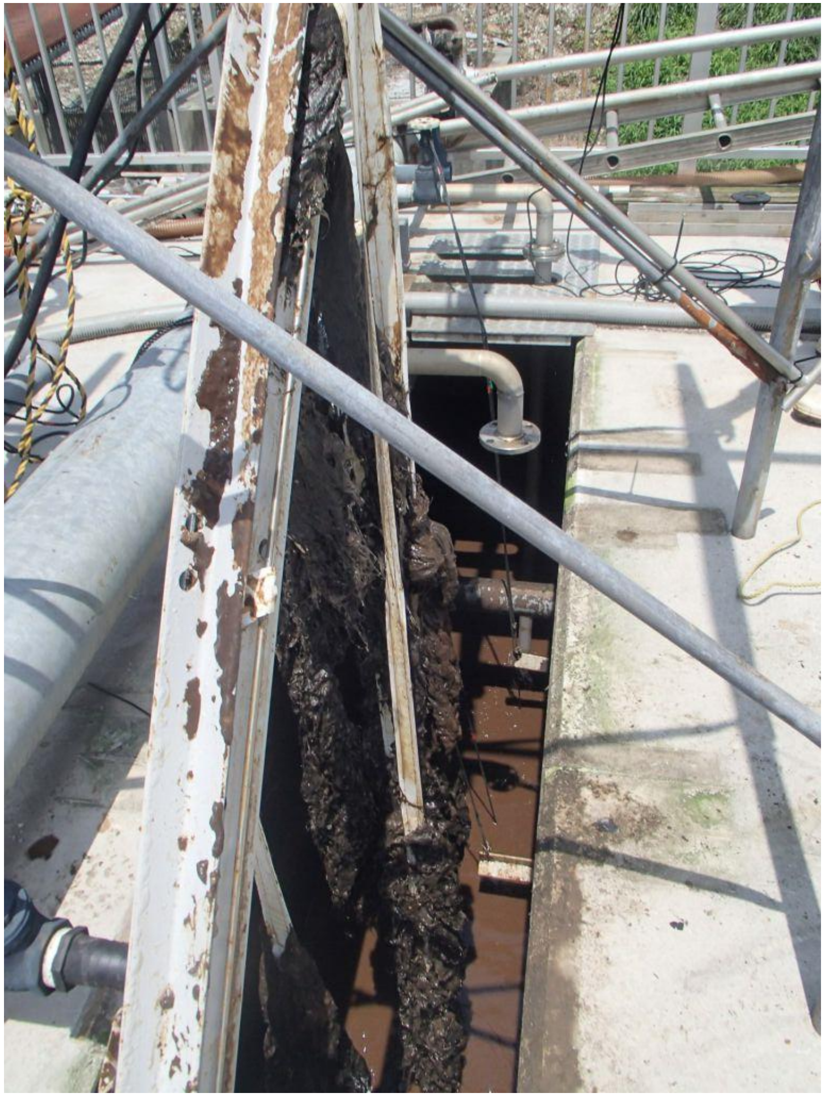
Okayama 1 CF reactor setting in the facility

CF reactor setting in the facility (1)

Nov.2016

Jul.2017

CF reactor setting in the facility (2)



At the end of my presentation.....

No conclusion, still now runnnnning..

CF reactor has a great possibility to mitigate, probably.

Both ordinary and CF reactor installed conditions, We need more longer periods of emission data.

We also need to evaluate at the other facilities.

Next chance of some meeting , I would like to present definite results concerning this I hope.

Thank you for your attention