

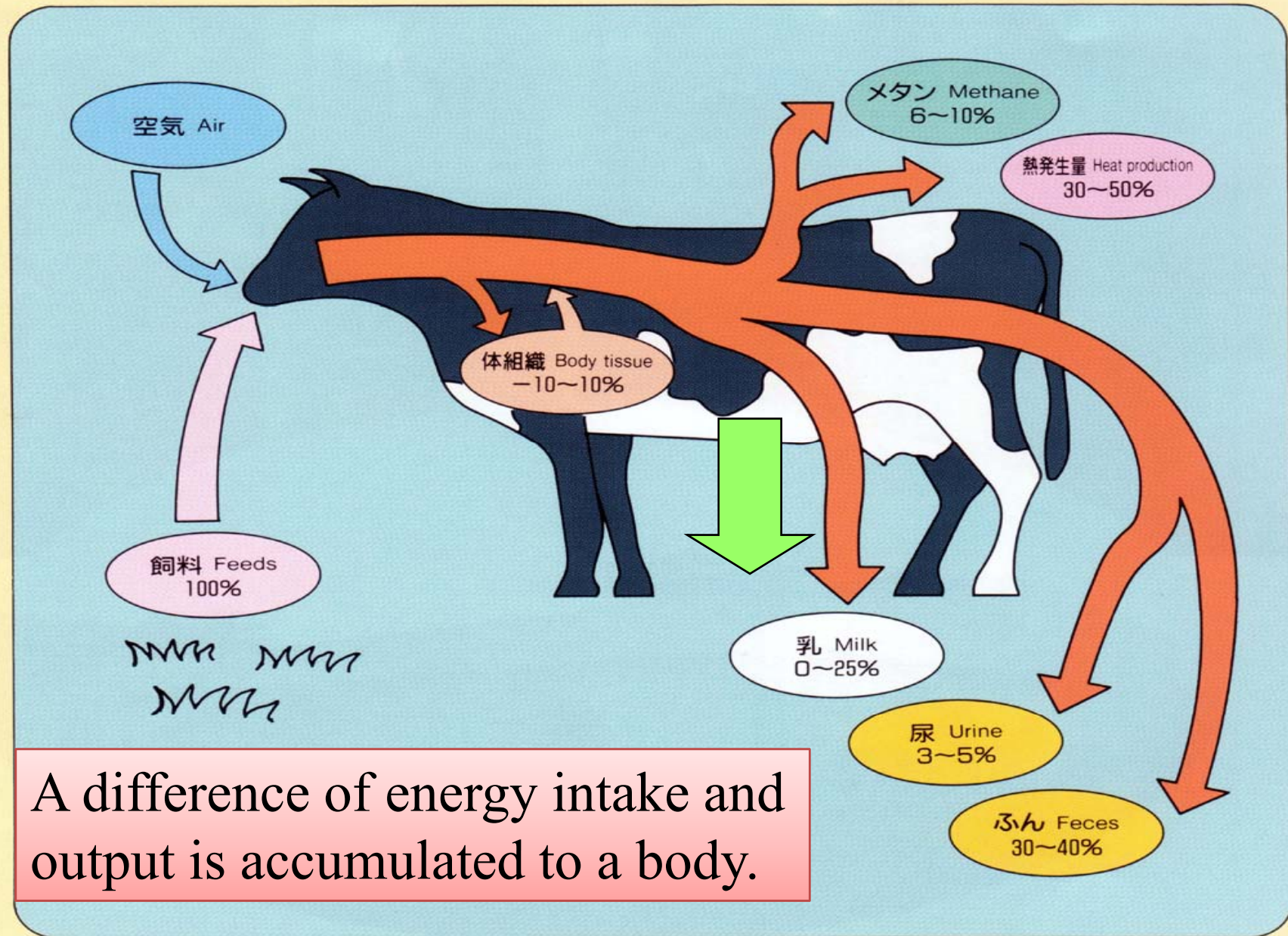
Measurement method of GHG emission from ruminants and manure management



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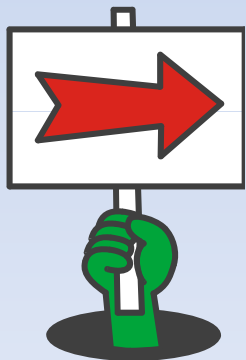
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エネルギー出納 Distribution of gross energy consumed



A difference of energy intake and output is accumulated to a body.

1. Measurement method of methane emission from ruminants .
2. Calculation method of methane emission from ruminant in Japan.



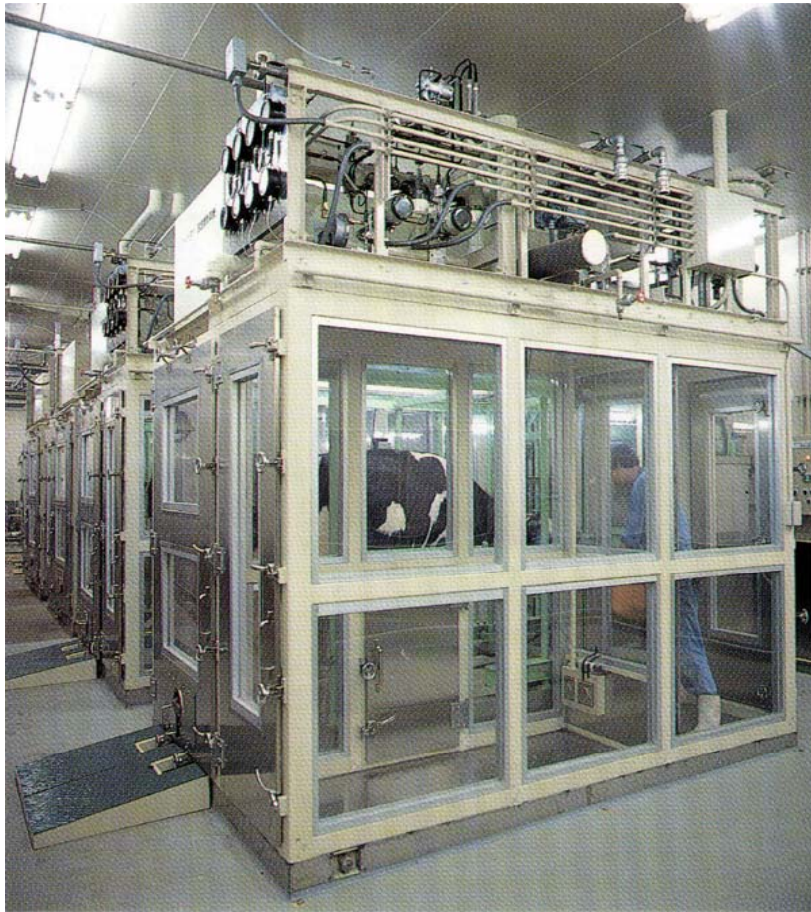
Many current inventories for enteric methane production are based on measurements of emission rates from ruminants in several methods.

Several methods are

1. Open circuit respiration chamber
2. Gas mask method
3. SF₆ method
4. *In vitro* method

Many current inventories for enteric CH₄ production are based on measurements of emission rates from animals in **open circuit respiration chamber** in strictly controlled environments.

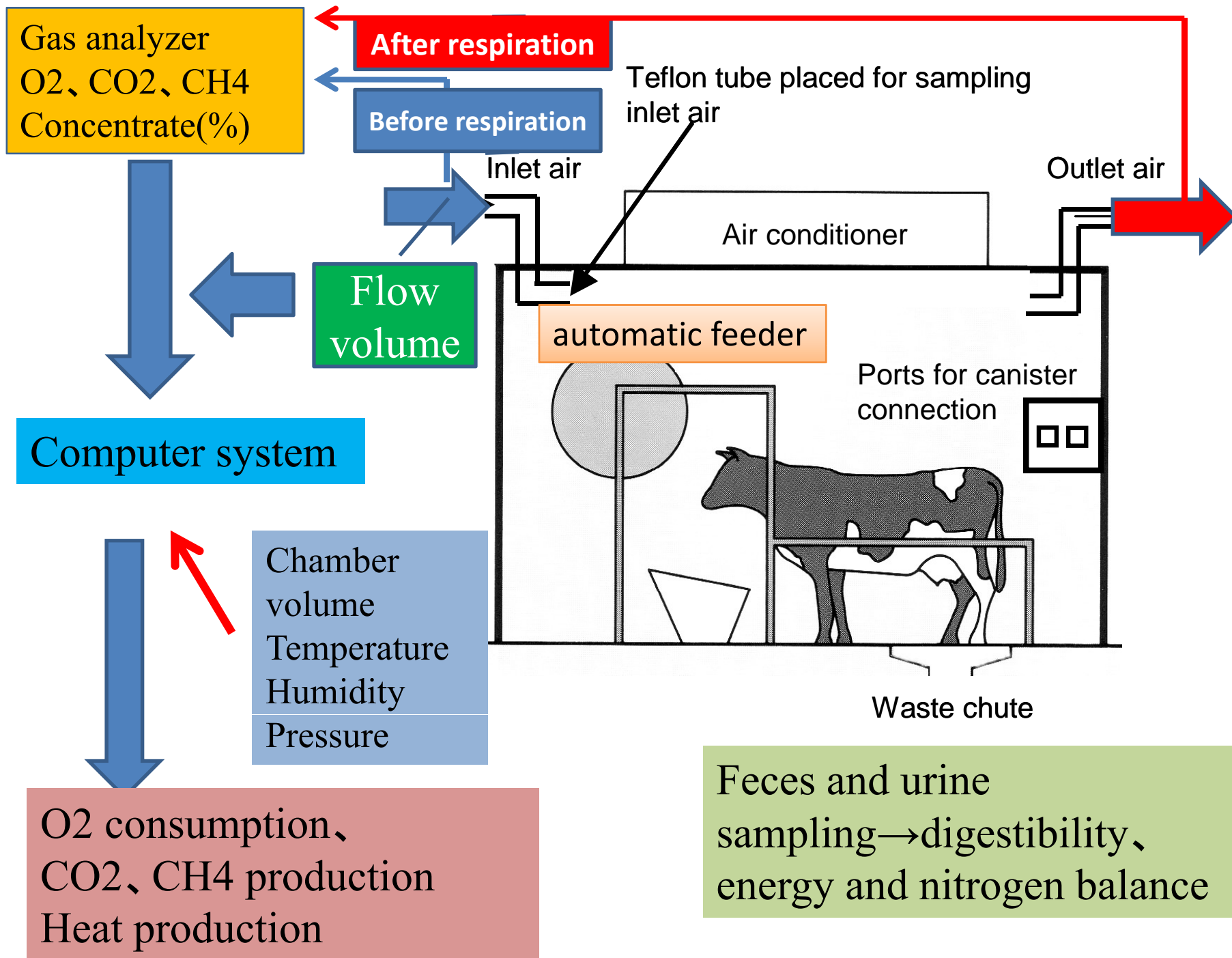
Open circuit respiration apparatus



For cattle



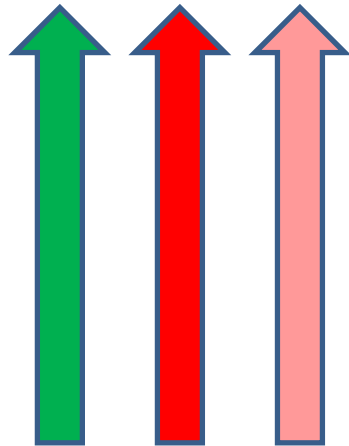
For goat and sheep



Gas analyzer
O₂、CO₂、CH₄
Concentrate(%)



It controls the respiration
trial of the chamber and
ventilated hood



Gas sampling

Chamber for
cattle, goat
and sheep.

Computer
system



Analysis of obtained data
was performed by computer
system.

O₂、CO₂、CH₄ production
Heat production

Method for Estimation Current Methane Emission

Methane emissions from livestock in Japan are estimated by:

1) Dividing animals into animal group and collecting population data

2) Collecting dry matter intake of each animal group

3) Estimate methane emission by Shibata's equation

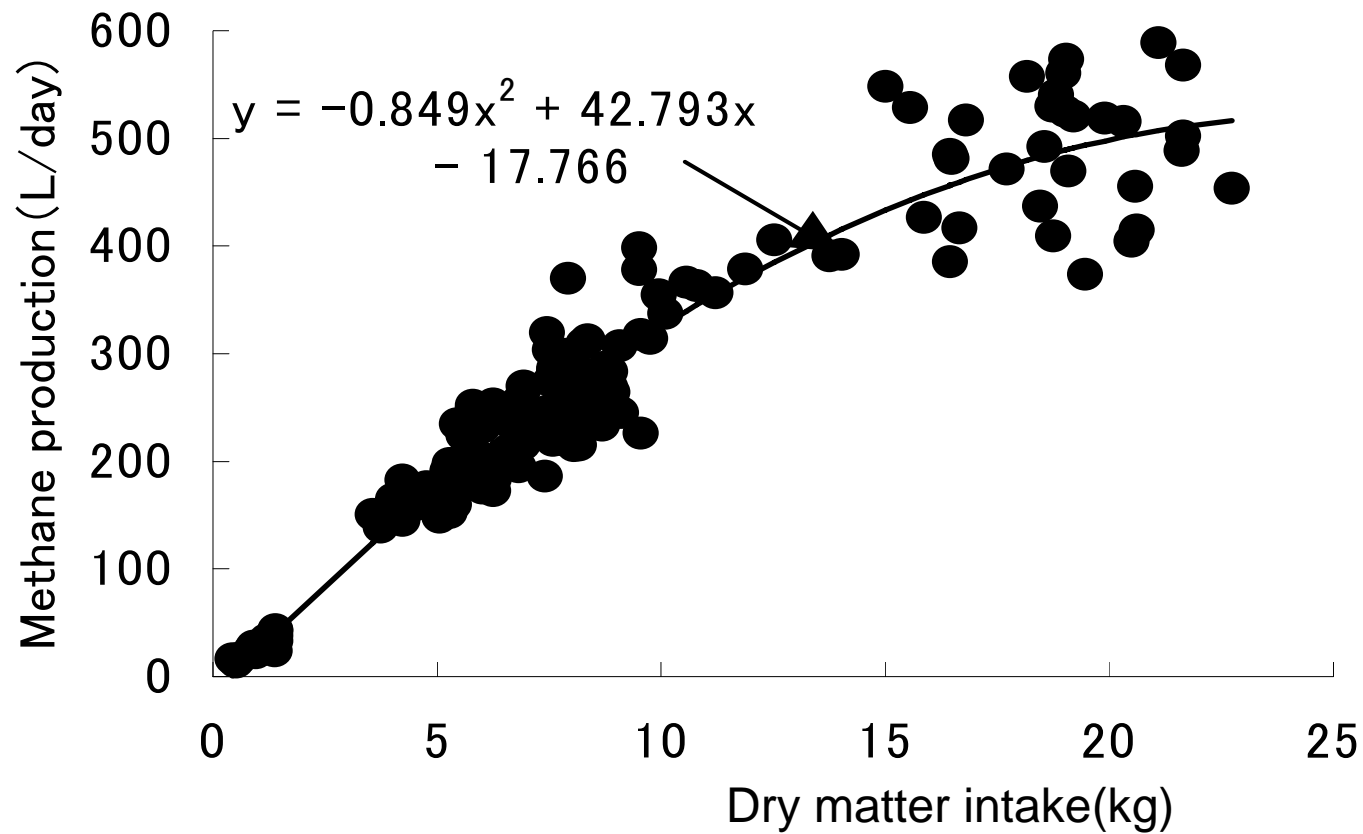
$$\text{(Methane production(L/day))} = -0.849 \times \text{DMI}^2 + 42.793 \times \text{DMI} - 17.766$$

DMI: Dry matter intake(kg/day)

4) Multiplying the population by estimate methane emission for each animal group

5) Summing emissions across animal group

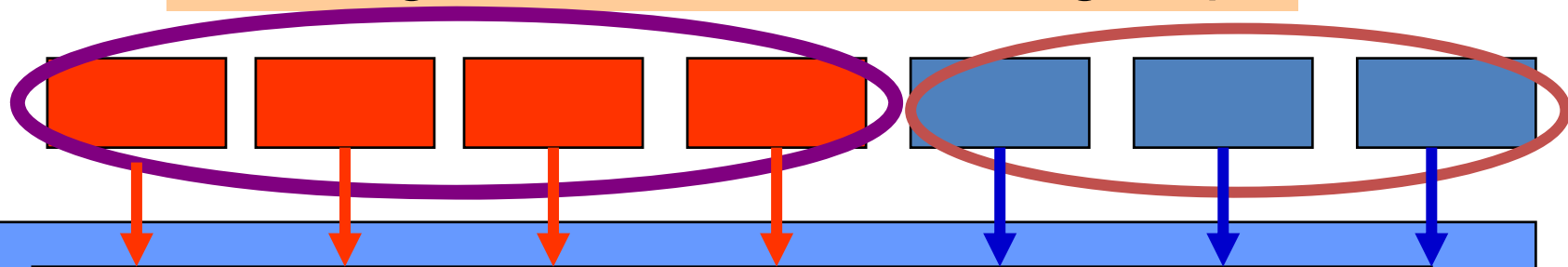
Prediction of methane emission from enteric fermentation in Japan



Shibata et al. (1993)

Method for Estimation Current Methane Emission

Dividing animals into animal group



Collecting dry matter intake (DMI) of each animal group

Estimate methane emission by Shibata's equation (Methane production(L/day) = $-0.849 \times \text{DMI}^2 + 42.793 \times \text{DMI} - 17.766$)

Multiplying the population by estimate methane emission for each animal group

Collecting population data

Summing emissions across animal group

For next step

- 1. It is important to develop the technology needed to estimate CH₄ emission accurately from ruminant and practically method to reduce the amounts of CH₄.**
- 2. Evaluation and a prediction of global warming impact on animal production.**

GHG emission from Manure management

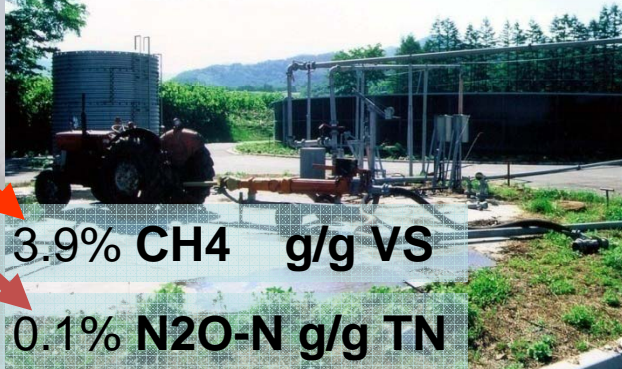
Manure is a source of organic fertilizer and unfortunately, a source of CH₄ and N₂O emission. Unsuitable management will offset the validity of resource circulation by an environmental impact called greenhouse-gases generating.

Measurement systems are important for the development of regulation technology.

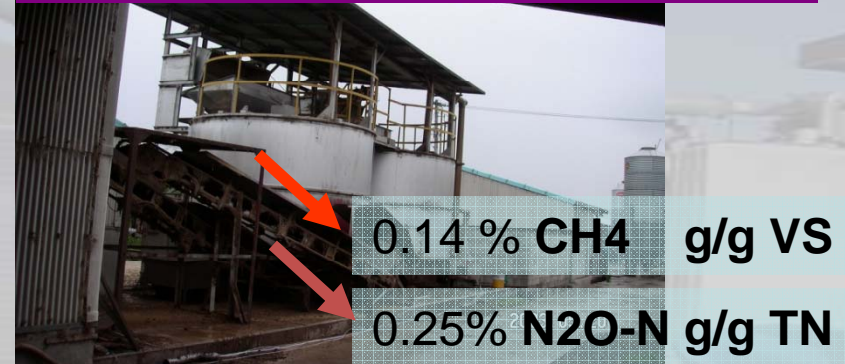
Not only that, It is useful also for your judgment which technology should be introduced for this issue resolution into your country.

GHG measurement systems for manure treatment

Pit Storage of daily cattle slurry



Composting (Forced) of hens feces



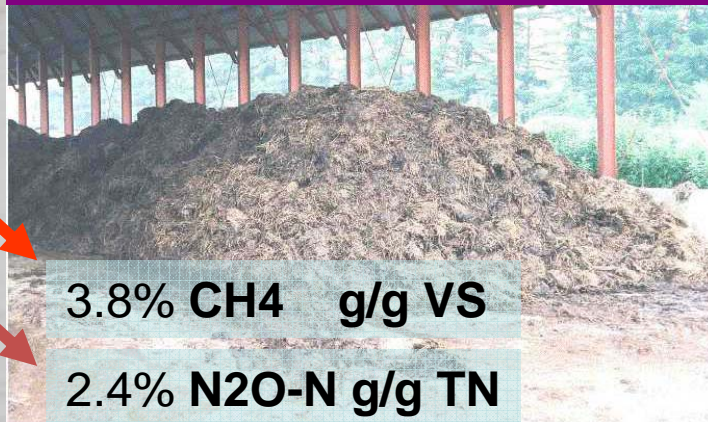
$$E = \sum(EF_n \times A_n)$$

E : Methane emissions from manure treatment (g-CH₄)

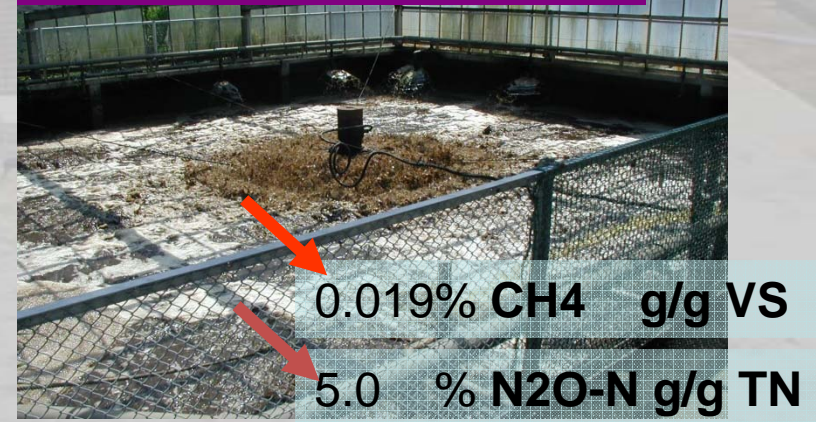
EF_n : Emission factor for treatment method n (g-CH₄/g-Organic matter);

A_n : Amount of organic matter in manure treated by method n (g-Organic matter).

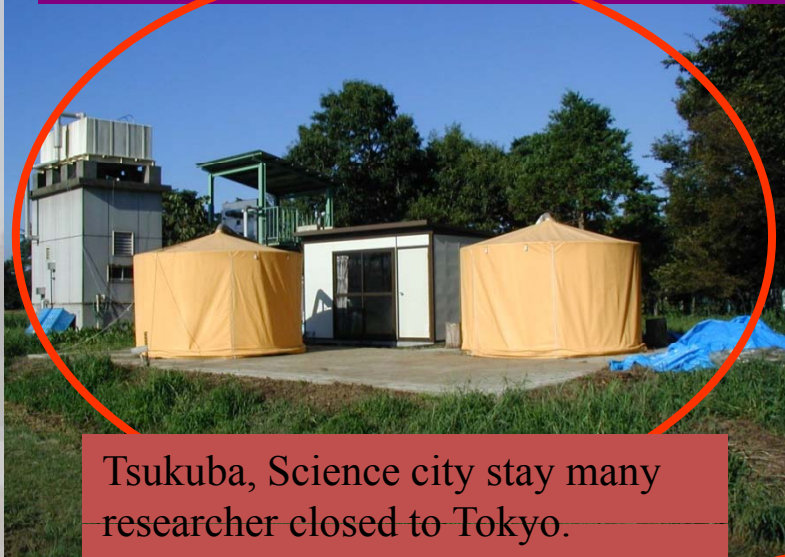
Composting (Depo.) of daily cattle feces



Wastewater M. of pig waste



we are going to measure GHG at several location of Japan with this system.



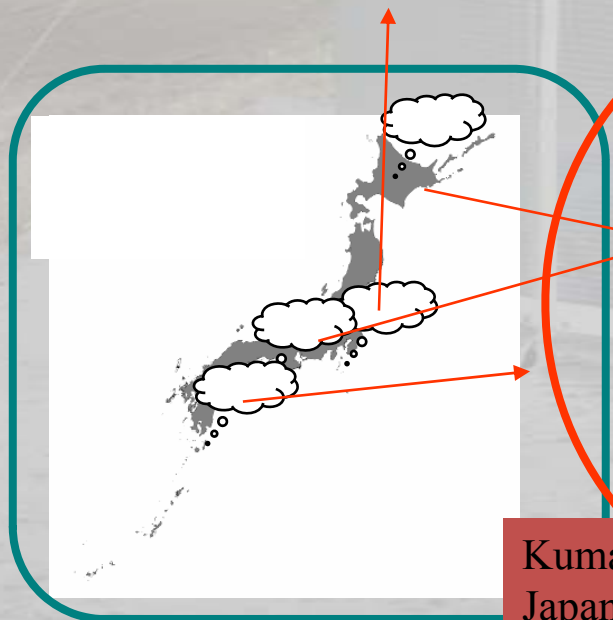
Tsukuba, Science city stay many researcher closed to Tokyo.

Manure of the four major livestock, dairy cattle, beef cattle, fattening pig and poultry, were collected and evaluated under the ordinarily moisture contents of piled manure on Japanese farms.



家畜ふん尿起源の
を減らすため、
と3つの研究機
です（温暖化イニシアチブ）。

Okayama prefecture, located western part and many beef cattle breed.

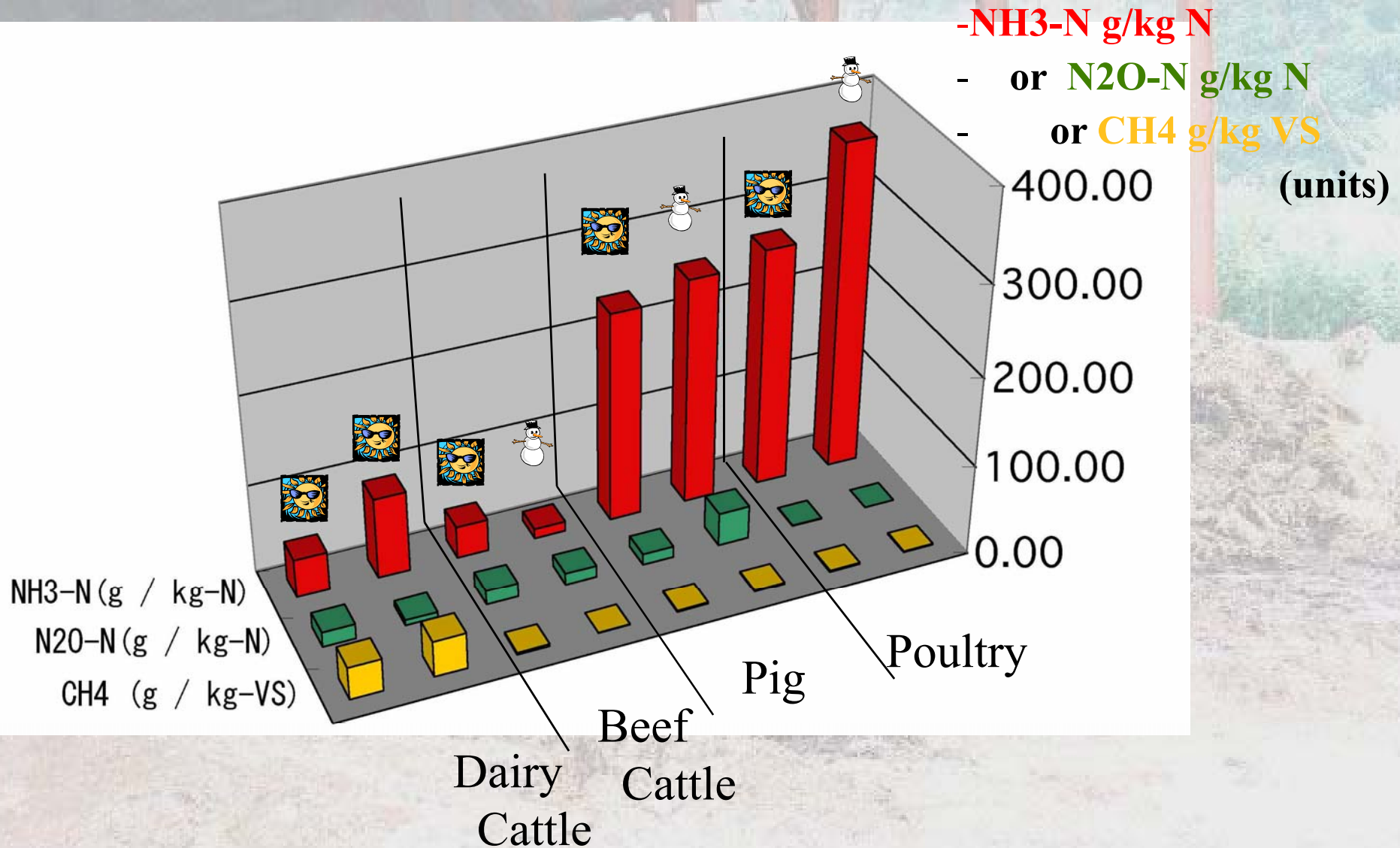


Kumamoto prefecture, southern part of Japan many chicken and cattle breed.



Hokkaido located northern part of Japan.

NH₃, N₂O and CH₄ emission during composting of each livestock manure **-result-**



Conclusion of manure management

We developed a system for the quantitative measurement of emissions from composting using a large dynamic chamber in an experiment.

Not only the compost, but the emission factor of each treatment system should be evaluated under each countries procedure and general conditions, because those factors might be widely varied.

It is important that each country has the measurement technique of GHG emission, not only for inventory data but for the development of greenhouse gas regulations and technologies. (Country-specific emission factor, please)