JA Akan

Demonstration Project on a Regional Independent System in a Dairy Farming Area using Livestock Manure-Derived Biogas Energy

Japan Agricultural Cooperatives Akan

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March 12, 2019 (Tue)

Business profile

JA Akan

● Japan Agricultural Cooperatives Akan (JA Akan)

- Established in 1949 & merged with JA in 2001.
- 76 employees; 150 full members; and sales of ¥7.79 billion (FY2017)

<Operations>

- Agriculture management guidance, credit business, sales & marketing, purchasing and mutual aid programs
- **Installation of shared agricultural facilities**

Conversion of centralized composting facility into biogas plant

[Concept]

Energy conservation

Local energy production for local consumption

Geographical relationship between the centralized composting facility and dairy farms

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Stall barn: Semisolid manure
Raising barn: Semisolid manure

Free-stall barn: Slurry
Stall barn: Urine

Background to the introduction of the biogas plant

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[Problems]

Dairy farm

Centralized composting facility
(Kushiro City Compost Utilization Center)

Production site & environment

・Increase in energy consumption
・Burden on dairy farm management

・Increase in maintenance/management costs
・FIT program not applicable

・Low-quality feed crop and milk
・Foul odor and groundwater contamination

[Issues]

① Energy conservation for dairy farms and the community

② Production of quality compost and liquid fertilizer, quality livestock feed and milk production

③ Reduction of foul odor and groundwater contamination

④ Reduction of financial burden on cooperative members with a reduction in animal waste treatment fees

⑤ Localized energy production and consumption, independent of the FIT program

Overview of the demonstration project for regional energy independent system for dairy farming

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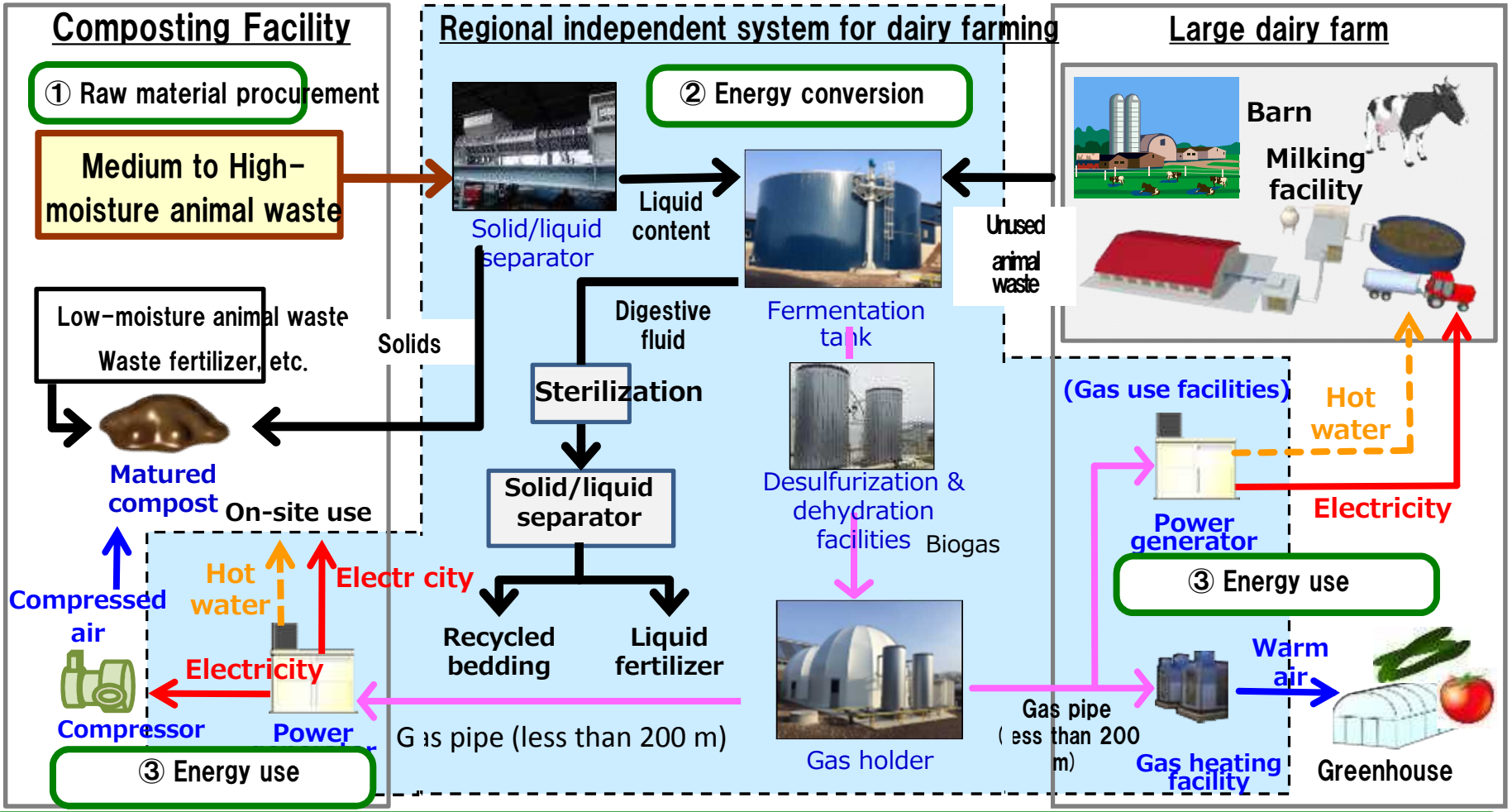
① Ideas in raw material procurement
・Collection and shipment system already in place
→ Stable supply of raw materials

② Ideas in energy conversion
・ Low-cost power generator & use of unused animal waste
→ Stability in energy supply and demand

③ Ideas in energy use
・ Inclined mixer & total gas supply via pipe
→ Energy conservation & total energy consumption



④ Ideas for the system as a whole
・Curb an increase of dairy farm cost & disease prevention → Stable management
・Use of existing facilities → Reduced construction cost
・24 dairy farms → Agreement reached on system implementation

Arrangement plan of the regional energy independent system (biogas plant) in the dairy farming area （as of May 2018）

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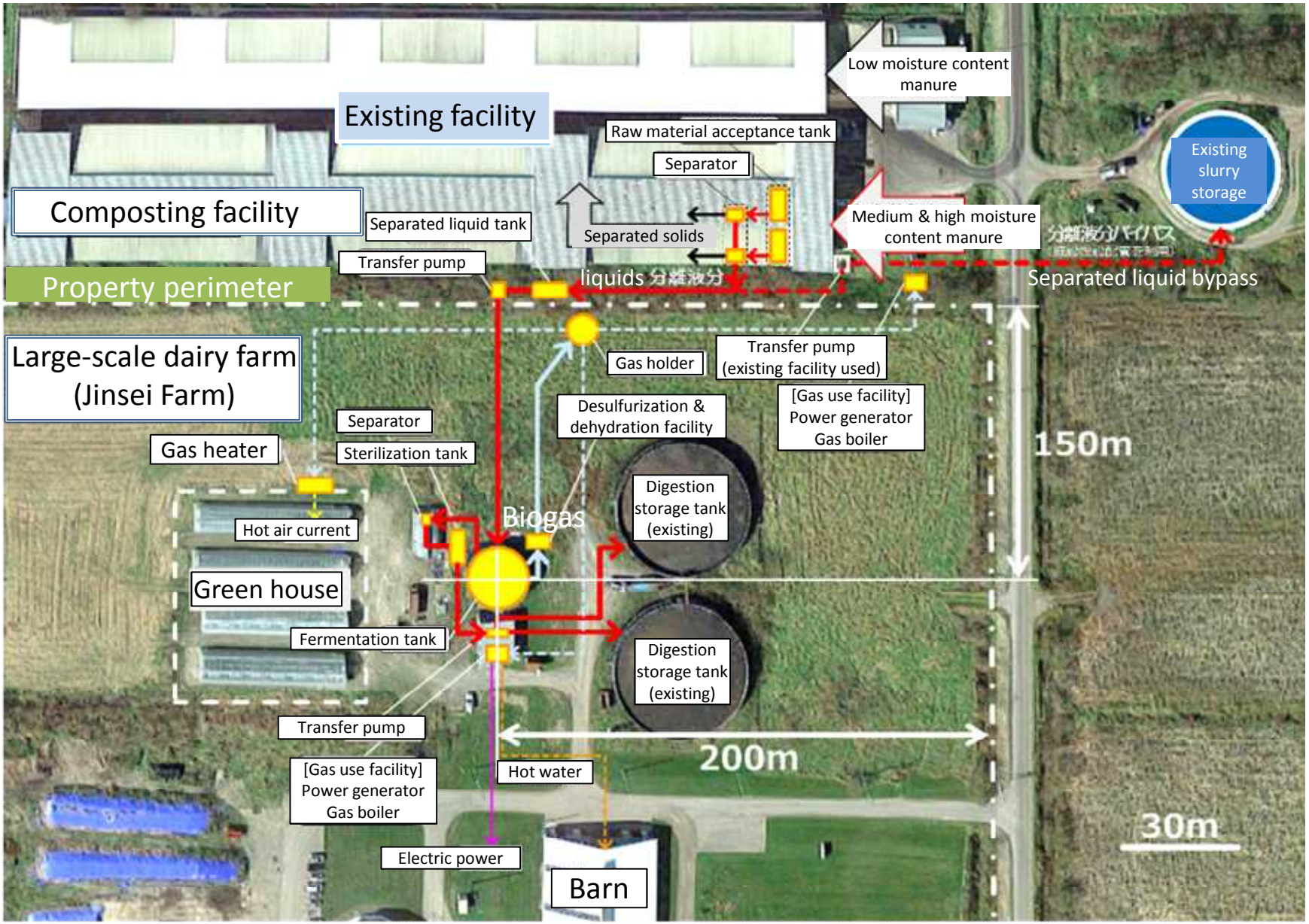

Advantages of JA Akan and this region

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① Mature collecting system is already formulated

To stably and surely obtain a raw material


Container vehicle


Tank lorry

② A large-scale dairy farm is located next to the composting facility

To feed biogas by using a piping


Composting facility

Within 200m

Enable to plumb


Large-scale dairy farm

③ Be available for the existing facilities

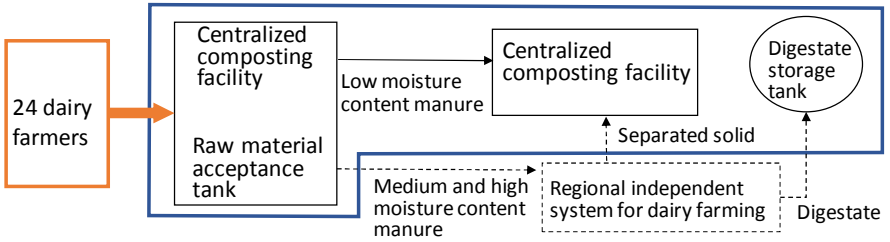
To achieve reduction in construction cost


Existing facilities available for use


Existing composting facility

④ 24 dairy farmers manage the composting facility

A consensus has already been formed on introducing a new system



JA Akan has a better environment for introducing this biogas plant

①-1 Ideas in raw material procurement

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Processing only of medium and high moisture-content waste that is difficult to compost

[Liquid fertilizer used]

Urine & slurry 95 (tons/day)

Medium and High-moisture animal waste [Total] 60 (tons/day)

Waste feed, etc. Disposal of 12 (tons/day)

Low-moisture animal waste 46 (tons/day)

Medium moisture content animal waste (Moisture content of approx. 85%)

High-moisture animal waste (Moisture content of approx. 88%)

[Target raw materials]

Plant dehydration sludge

Sewage sludge

Waste feed

Low-moisture animal waste (Moisture content of approx. 80% or lower)

[Compost maturation possible as is]

①-2 Ideas in raw material procurement

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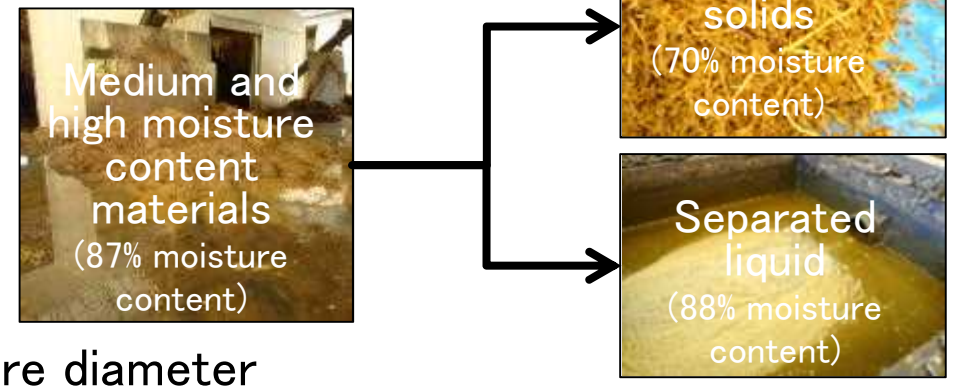
Introduction of hi-performance domestic solid/liquid separator
Liquid/solid separation possible from mixture of straw and animal waste that is normally difficult to process



Optimal combination of screen pore diameter

	 + 	
Separation ratio (Weight ratio)	Solid	Liquid
	35%	65%
Moisture content	70% (TS 30%)	88% (TS 12%)
Suitability of methane fermentation	—	○
Suitability of compost production	○	—

②-1 Ideas in energy conversion

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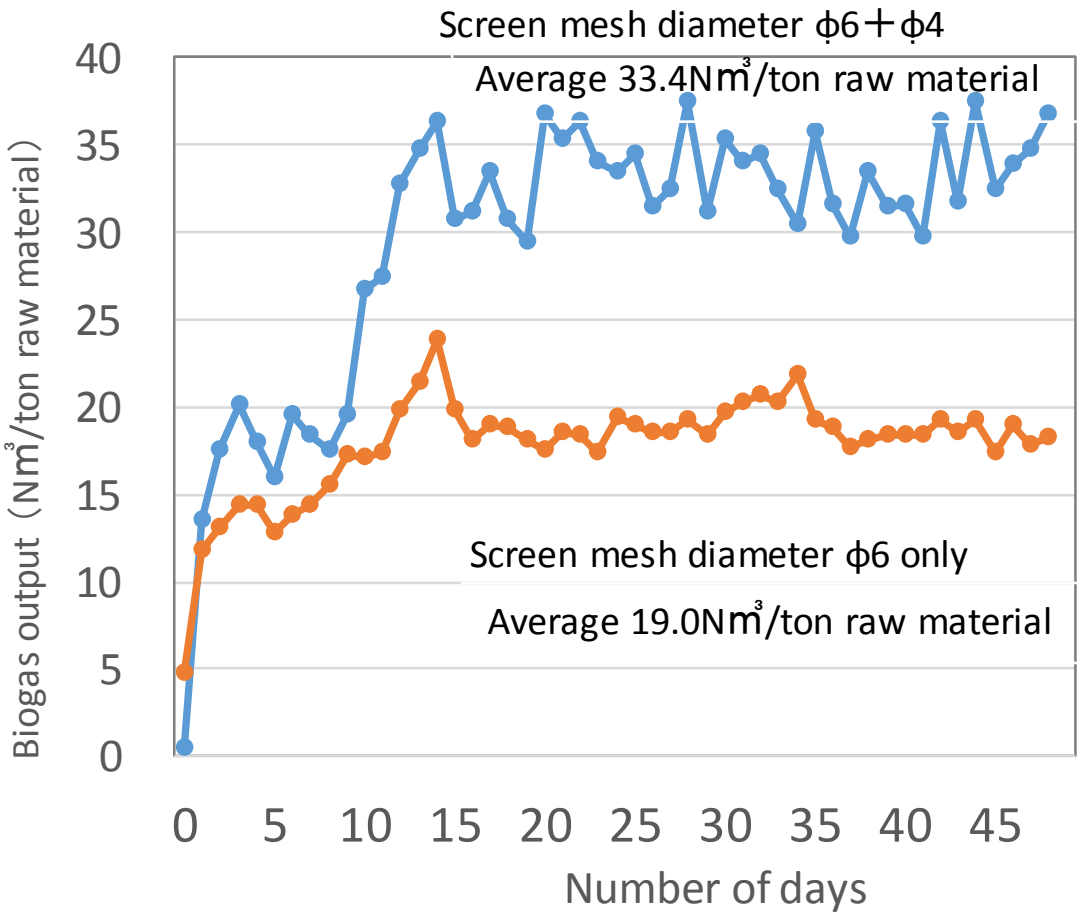
Methane fermentation of liquid enabled by optimal screen pore size combination



➡Steady biogas production & stability in energy supply and demand

②-2 Ideas in energy conversion

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[Case of production with separated liquid only]

60 (tons/day)

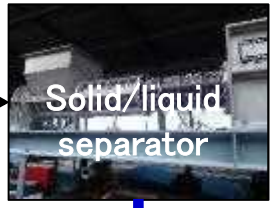
Biogas output
15,631 (MJ/day)
(749m³/day)

[Gas use facilities]
Gas power generator
Gas boiler

Separated liquid
43.7 (tons/day)

Recovered heat (※) 13,911 (MJ/day)
Consumption by plant (Jan) ＜25,467 (MJ/day)

[Case of production with separated liquid + unused animal waste]



Biogas output
39,781 (MJ/day) (
1,905m³/day)

[Gas use facilities]
Gas power generator
Gas boiler

Separated liquid
43.7 (tons/day)

Unused animal waste
42 (tons/day)

Recovered heat (※) 33,937 (MJ/day)
Consumption by plant (Jan) ＞ 33,548 (MJ/day)

②-3 Ideas in energy conversion

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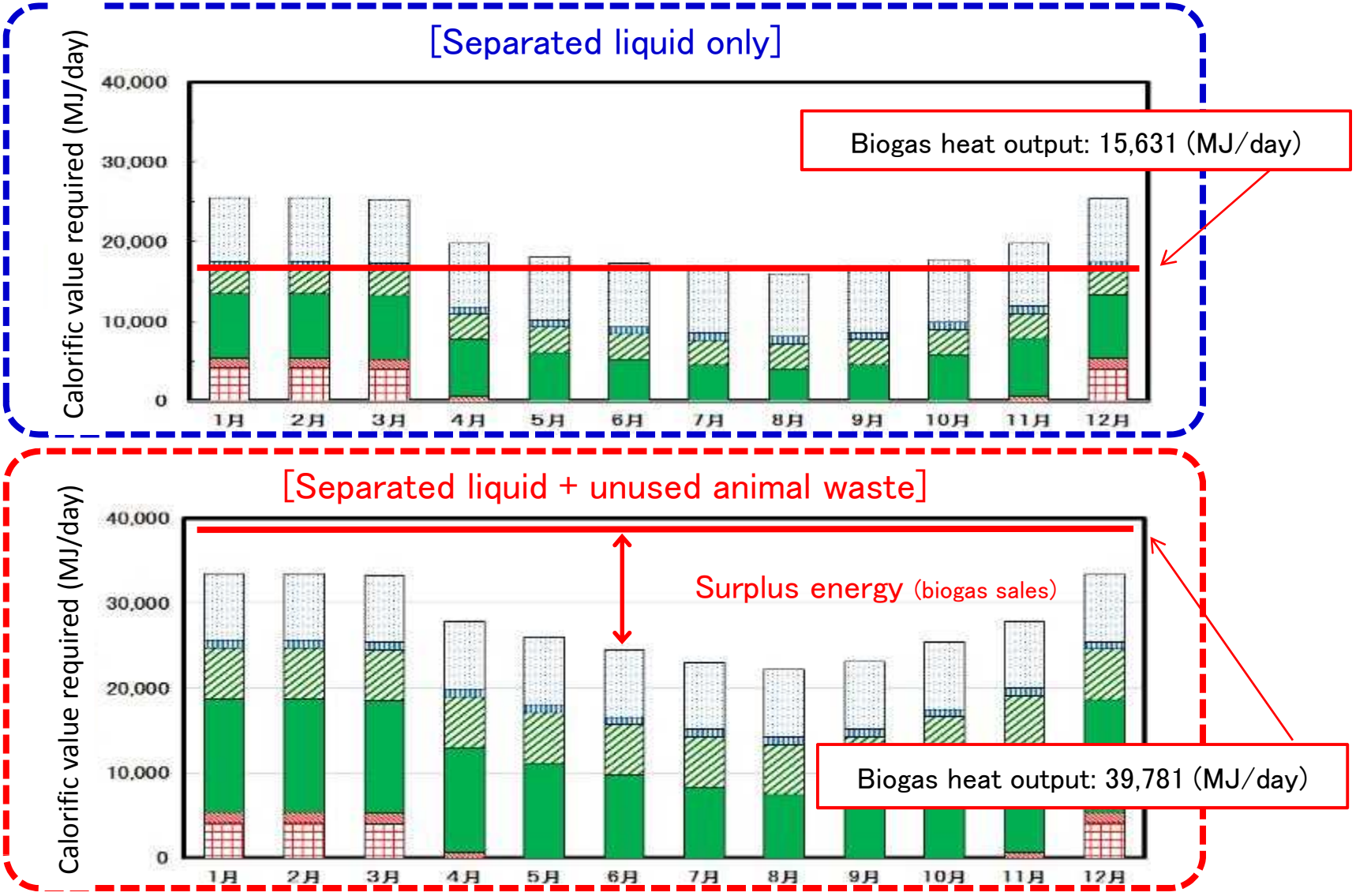

③-1 Ideas in energy use

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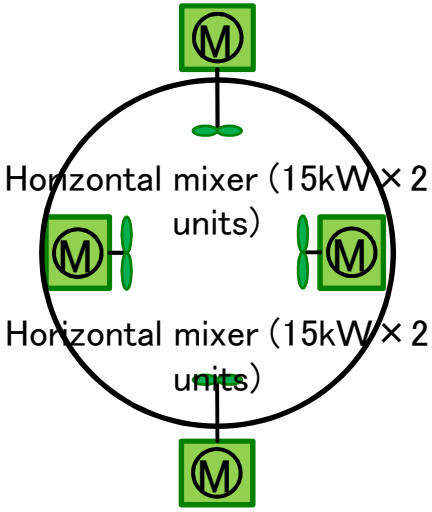
Energy consumption control with inclined mixer

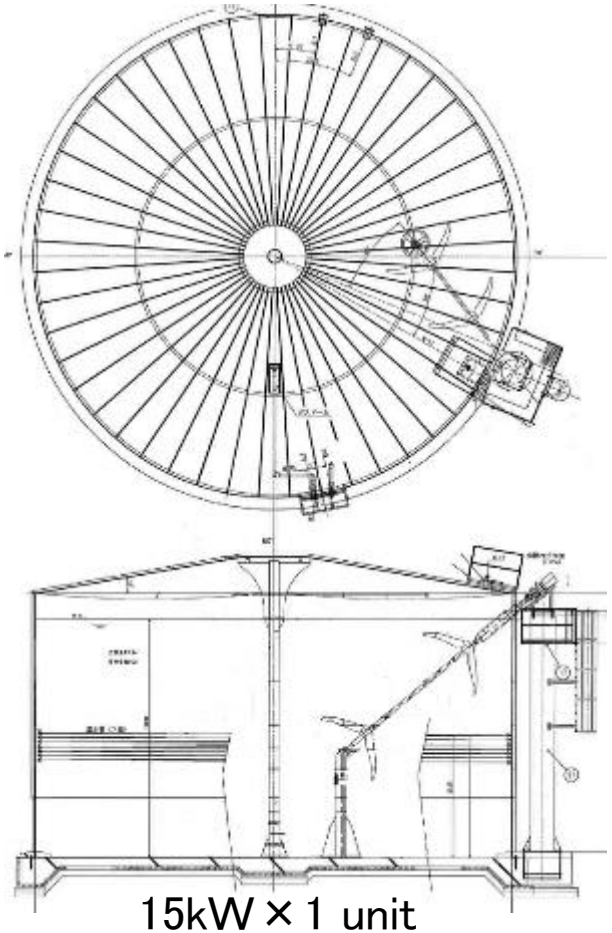
In conventional mixing method (Total output: 60kW)



15kW × 4 units
(When tank capacity is 1800m^3)

When inclined mixer is used (Total output: 15kW)

Actual installation
(Courtesy of manufacturer website)



15kW × 1 unit
(When tank capacity is 1800m^3)

③-2 Ideas in material (co-product) use

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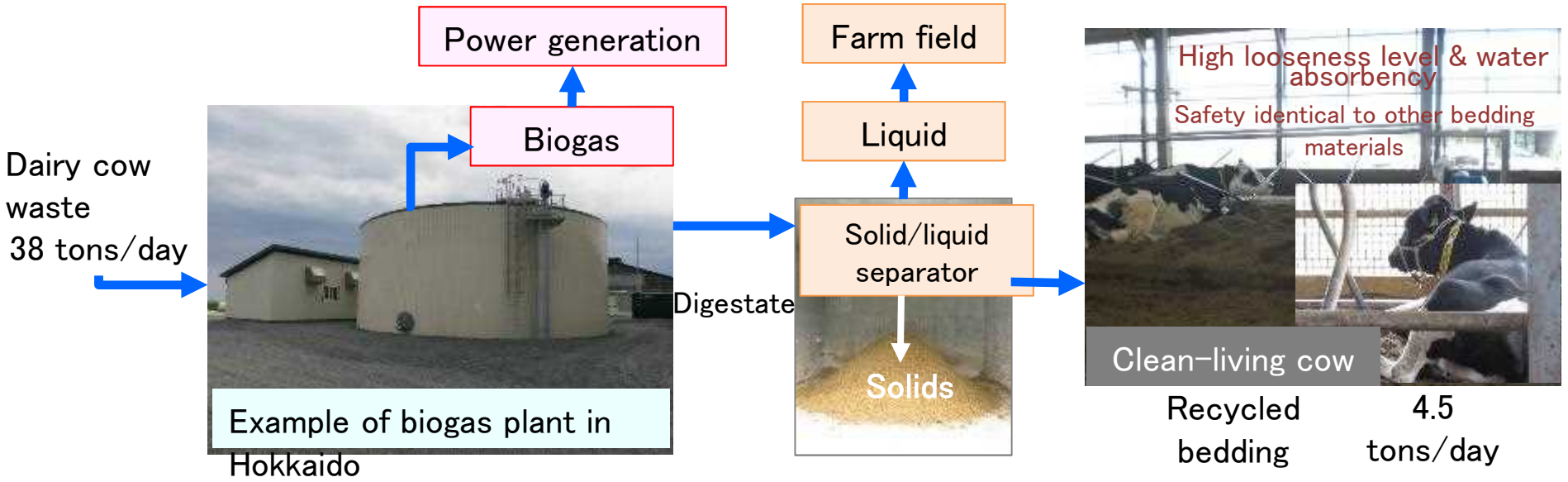
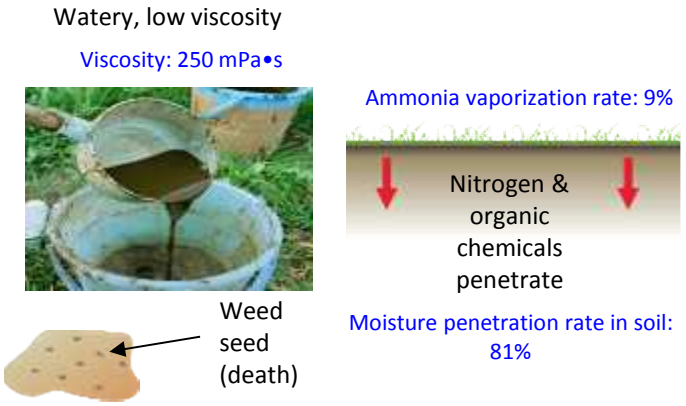
Recycled bedding made from digestion from the dairy cow waste biogas plant



Use of Digestion

Chemical fertilizer use reduced by more than 30%, and quality feed crop is produced as well



④-1 Ideas for the system as a whole

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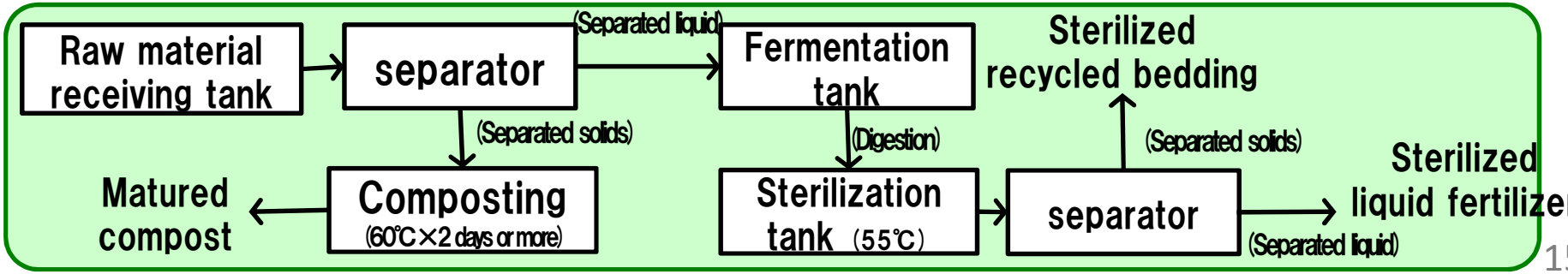
① Construction cost reduction with use of existing facilities & equipment

② The system expected to cut down CO2 by 3,800 tons/year

③ Agreement concluded between JA Akan and Composting facility management council (24 dairy farmers who are members), allowing continual system operation & management.

④ With dairy farmer share of processing fee on the rise（current at・￥24,500 per head/year), the system curbs further rise.

⑤ Digestion sterilization with surplus heat and complete compost maturation with fermentation heat prevents spread of Johne's disease, a grave disease.



Project schedule

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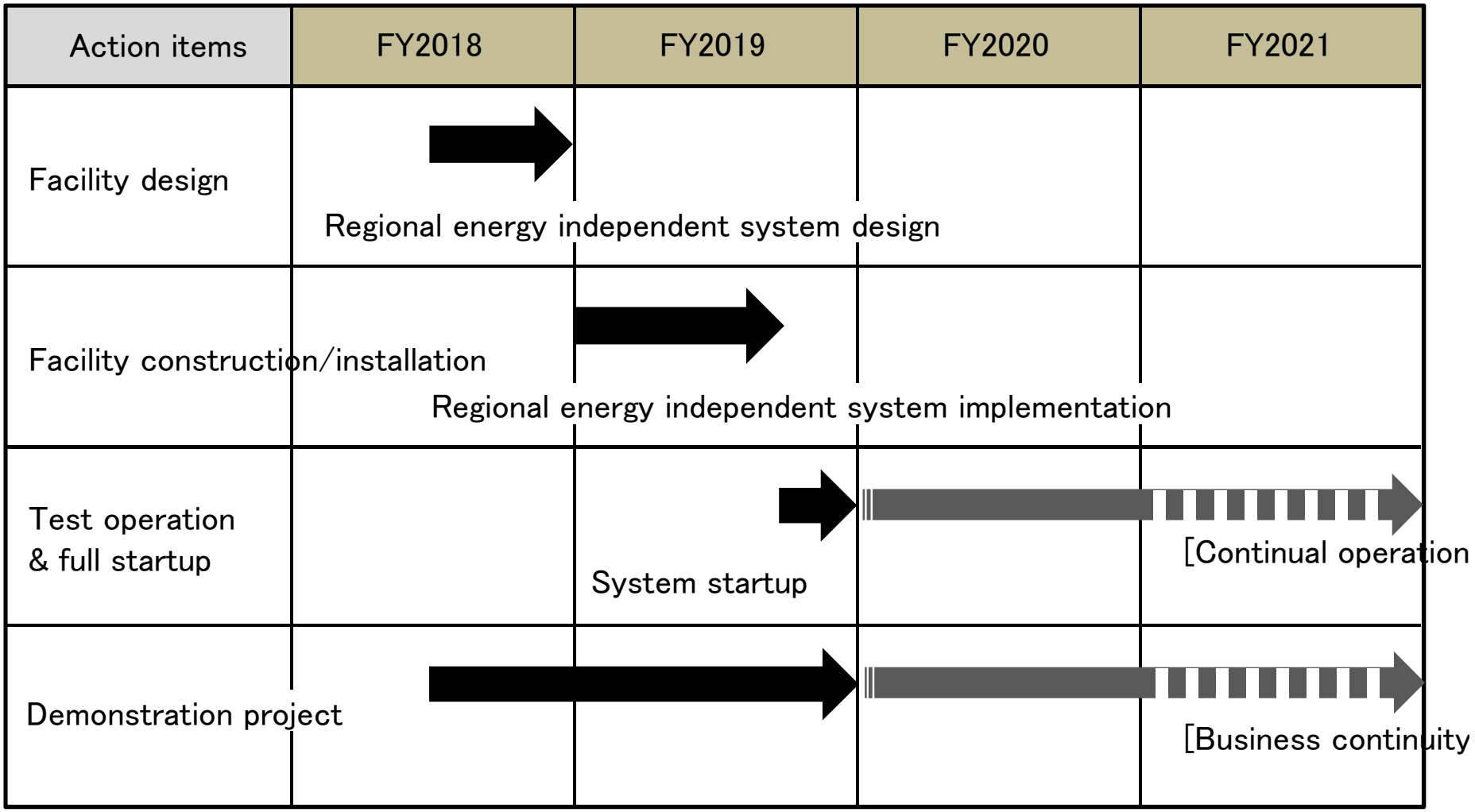

Conceptual image of JA Akan Biogas Plant at completion

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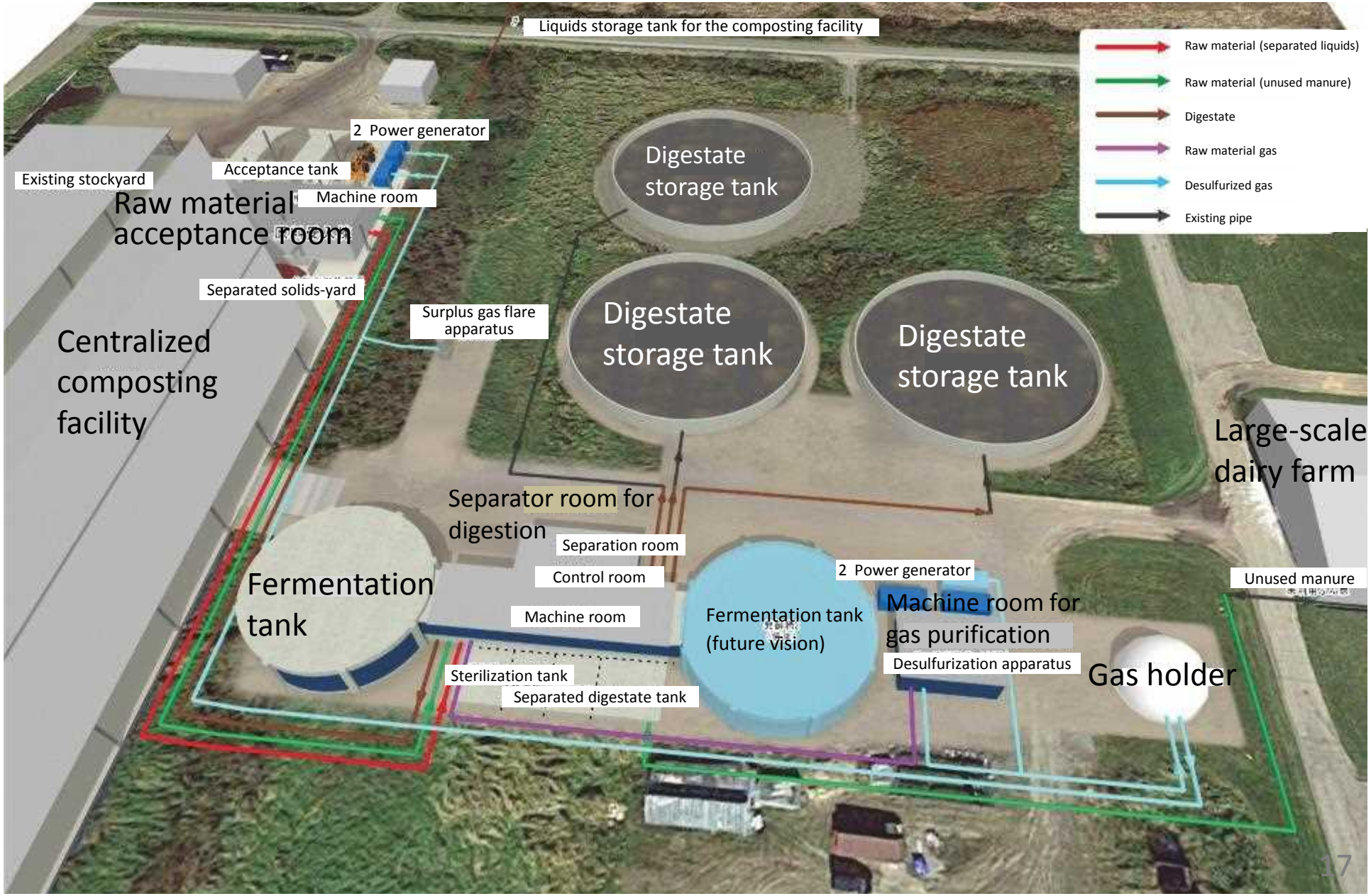

Dissemination of the regional energy independent system model

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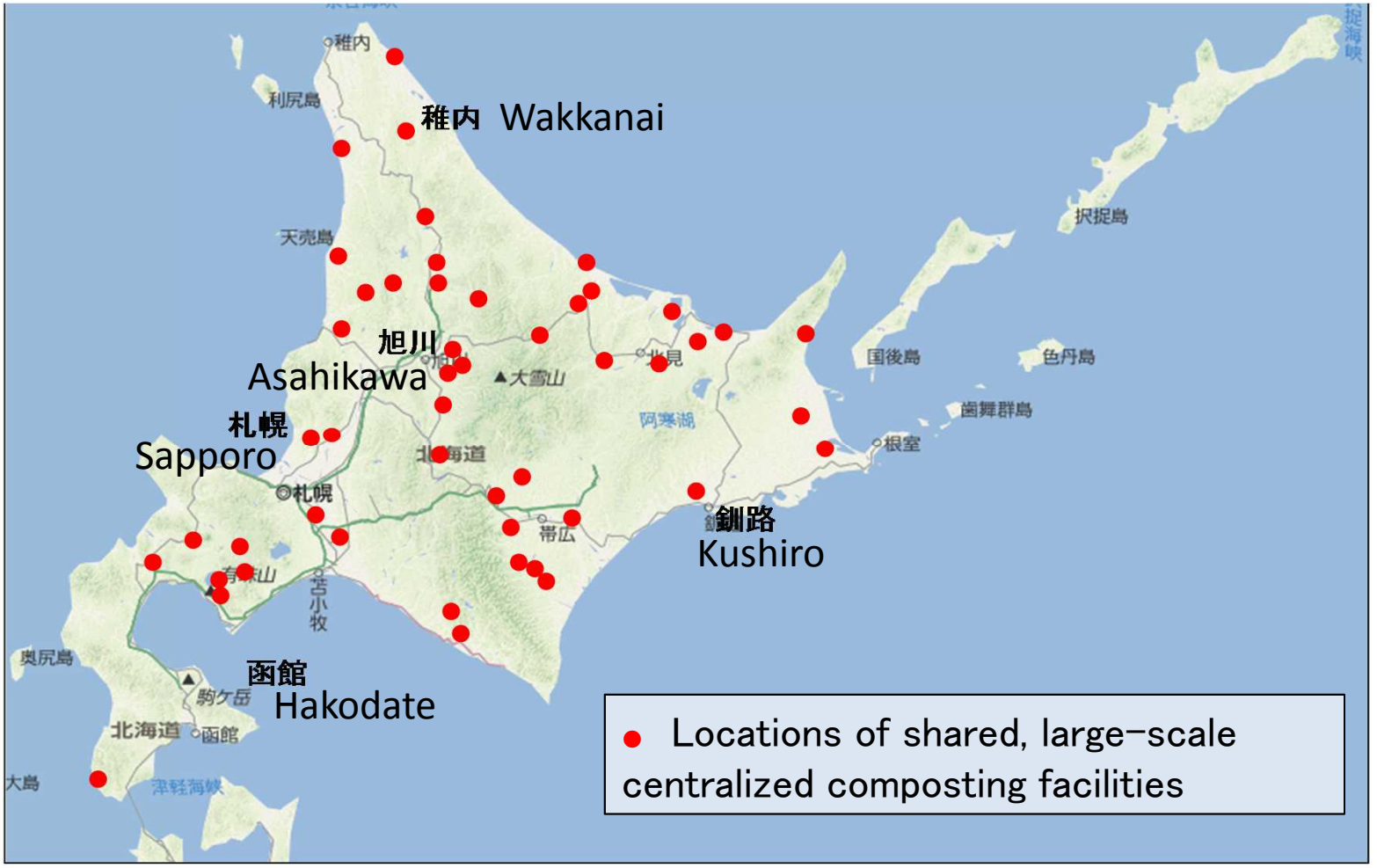

The regional energy independent system model created through demonstration under the project to be promoted to the 49 large-scale centralized composting facilities in Hokkaido that face the same problems and issues as JA Akan and to contribute to energy conservation in the entire dairy industry.