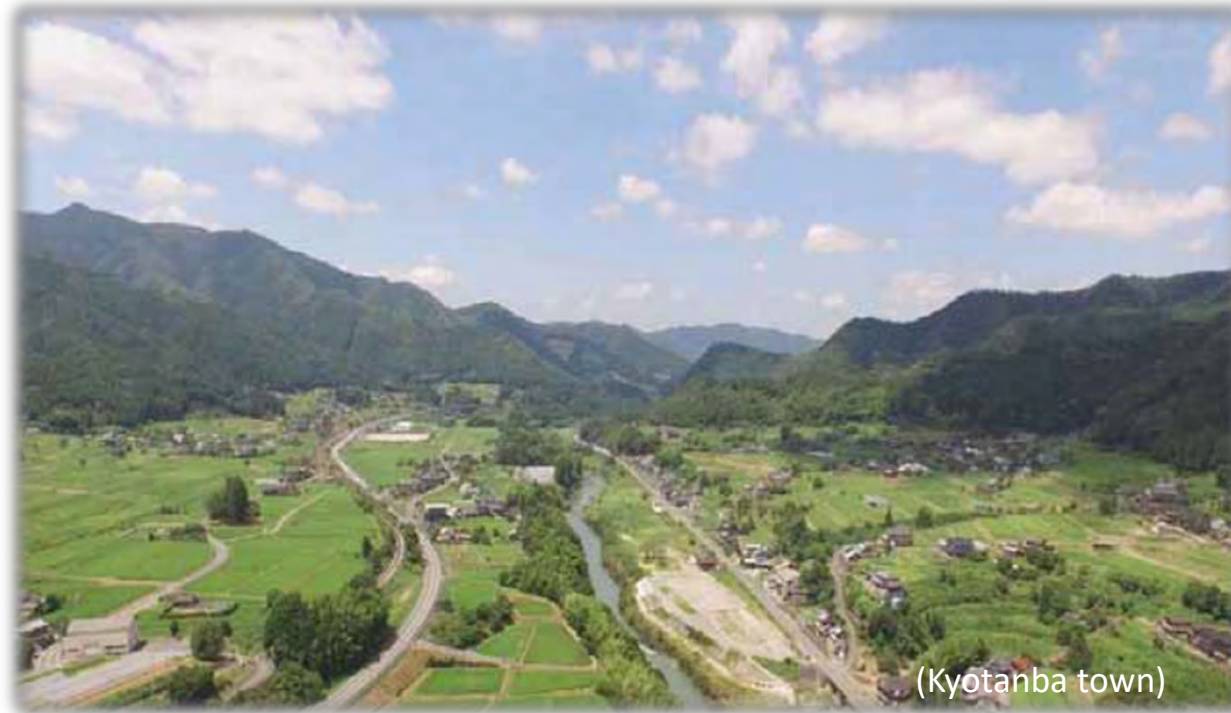


Decentralized anaerobic digestion system as a tool for better use of organic wastes



July 30, 2019

Yosuke KOGA

Ministry of Agriculture, Forestry and Fisheries

- 1. Governmental Plan for Biomass Utilization**
2. Biomass Town and Biomass Industrial City
3. Cases of Biomass Industrial Cities

Development of Biomass-related Government Policy/Strategy in Japan

- **Comprehensive Biomass Nippon Strategy** (decided by the Cabinet in 2002)

-> **Biomass Town**

Goal in 2010:

Utilizing over 80% of Waste biomass
Utilizing over 25% of unused biomass

- **The Fundamental Law for Promotion of Biomass Utilization** (enforced in 2009)



- **Basic Plan for Promotion of Biomass Utilization**

(decided by the Cabinet in 2010)

- **Great East Japan Earthquake and Fukushima Dai-ichi Nuclear Power Plant Accident (March 2011)**

- **Feed-in Tariff Law (for renewable energy)** (enforced in 2012)

- **Biomass Commercialization Strategy**

(decided by the biomass utilization promotion council in 2012)

-> **Biomass Industrial Cities/Regions**

- **Energy Basic Plan** (decided by the Cabinet in 2014)

- **Long-term Energy Supply and Demand Outlook**
(decided by the Ministry of Economy, Trade and Industry in 2015)

- **Global Warming Countermeasures Basic Plan** (decided by the Cabinet on May 2016)

- **New Basic Plan for Promotion of Biomass Utilization**

(decided by the Cabinet in 2016)

Outlook of Biomass power generation
in 2030

→ 3.7 to 4.6% of total electric power

(Mid-term goal)

26% reduction in 2030

(Long-term goal)

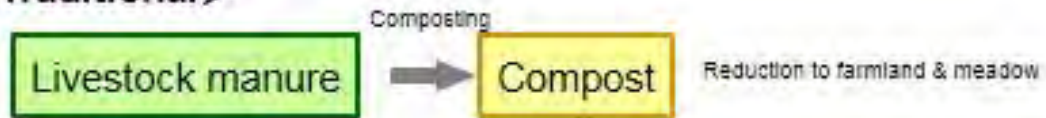
80% reduction in 2050

Key features of the Basic Plan

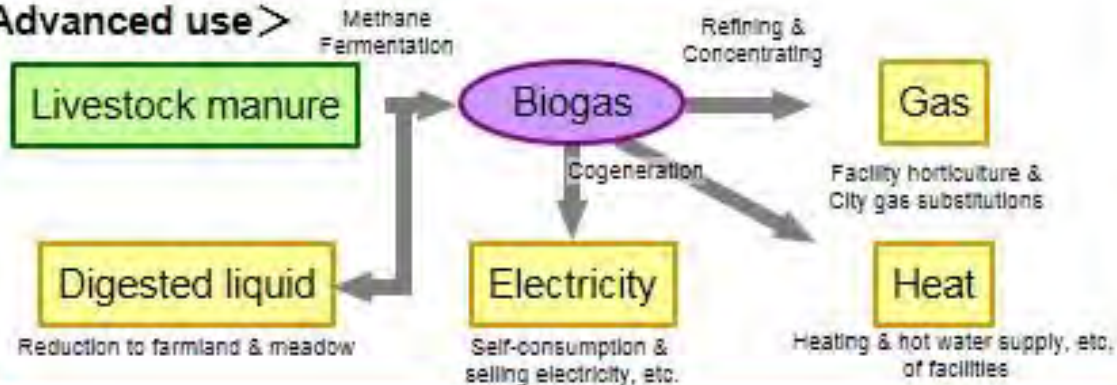
Activities which generate more economic value

Advanced use (Generate more economic value)

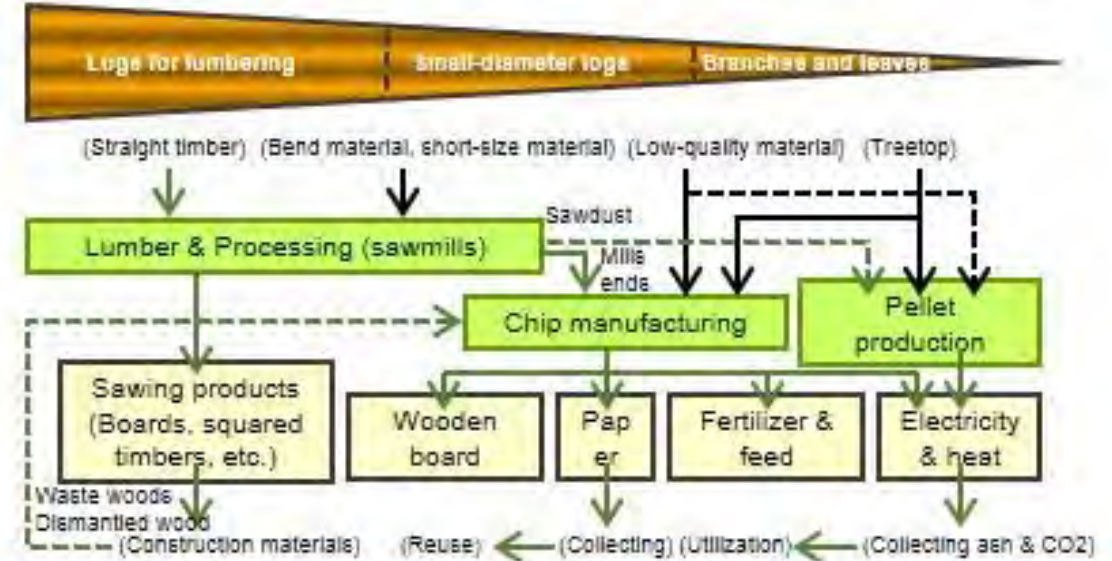
<Traditional>



<Advanced use>



Multi-step use (Use the limited resources thoroughly)



Heat utilization (Promoting more efficient energy use as heat)

- In the agricultural production sites and regional heat demand facilities, biomass utilization for heat is expected to be an alternative for fossil fuel
- Half of energy demand is for heat in general, and most of the energy consumption in agricultural production sites is heat utilization -> heat utilization of biomass should be promoted
 - * The energy efficiency of heat utilization is better than power generation. (Heat utilization: about 60 to 90%, Power generation: about 10 to 40%)
- Accelerate efforts of combined heat and power (CHP)

Goals of the Basic Plan

Sustainable and self-sustaining activities in the region

Activities in which earned profits are returned to the region

1. Industrial development and job creation
2. Reduction of waste disposal costs and labor
3. Supply of cheaper energy and products

Sharing successful cases widely and extending businesses horizontally

Revitalization of agriculture, forestry and fisheries as well as rural areas

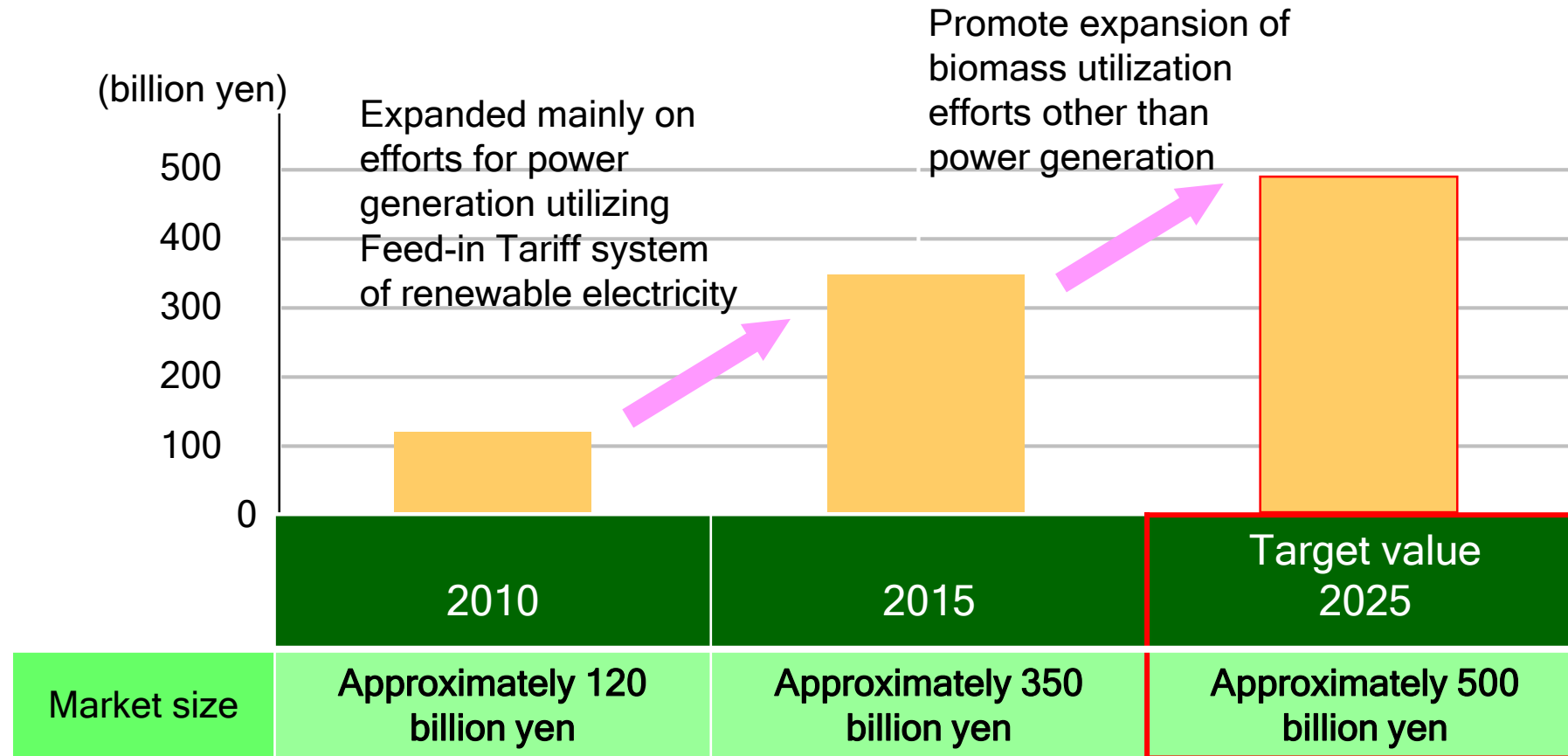
Sustainable society with less environmental burden

Creation of new industry

Expansion of Biomass Utilization under the Basic Plan

	2010	2015	[Mid-and-long term trends]	2025																																
Generated amount of biomass (Carbon equivalent value)	Approx. 35 million tons	Approx. 34 million tons	Waste-based biomass tends to be declining due to the activities of suppressing occurrence, etc.	[Forecast] Approx. 32 million tons																																
Usage of biomass (Carbon equivalent value)	Approx. 23 million tons [Utilization ratio] Approx. 65.7%	Approx. 24 million tons [Utilization ratio] About 70.6%	<p>[Promotion measures]</p> <ul style="list-style-type: none"> Promote the multi-step utilization and heat utilization with high-energy efficiency Promote utilization, while striving for compatibility between materials use and energy use so as not to affect the stable wood supply Support the creation of a plan that leads to a virtuous circle of regional economies according to the actual regional circumstances, and promote the activities by which the created value can lead to the development of agriculture, forestry, and fishery and return profit to regions 	<p>[Target Value]</p> <p>Approx. 26 million tons</p> <p>Utilization ratio</p> <p>About 90%</p> <p>About 85%</p> <p>100%</p> <p>About 85%</p> <p>About 40%</p> <p>About 97%</p> <p>About 95%</p> <p>About 45%</p> <p>Over 30%</p>																																
		<table border="1"> <thead> <tr> <th>Types of biomass</th> <th>generation amount</th> <th>utilization amount</th> <th>Utilization ratio</th> </tr> </thead> <tbody> <tr> <td rowspan="7">Waste biomass</td> <td>Livestock excrement</td> <td>4.86 million tons 4.19 million tons</td> <td>87%</td> </tr> <tr> <td>Sewage sludge</td> <td>900 thousand tons 560 thousand tons</td> <td>63%</td> </tr> <tr> <td>Black liquor</td> <td>4.13 million tons 4.13 million tons</td> <td>100%</td> </tr> <tr> <td>Paper</td> <td>10.23 million tons 8.29 million tons</td> <td>81%</td> </tr> <tr> <td>Food waste</td> <td>690 thousand tons 170 thousand tons</td> <td>24%</td> </tr> <tr> <td>Waste materials from sawmill factories, etc.</td> <td>3.2 million tons 3.1 million tons</td> <td>97%</td> </tr> <tr> <td>Wood chips derived from construction</td> <td>2.2 million tons 2.07 million tons</td> <td>94%</td> </tr> <tr> <td rowspan="2">Unused biomass</td> <td>Non-edible parts of crops (except for plowed-in parts)</td> <td>4.48 million tons 1.42 million tons</td> <td>32%</td> </tr> <tr> <td>Leftover forest wood</td> <td>4 million tons 360 thousand tons</td> <td>9%</td> </tr> </tbody> </table>	Types of biomass	generation amount	utilization amount	Utilization ratio	Waste biomass	Livestock excrement	4.86 million tons 4.19 million tons	87%	Sewage sludge	900 thousand tons 560 thousand tons	63%	Black liquor	4.13 million tons 4.13 million tons	100%	Paper	10.23 million tons 8.29 million tons	81%	Food waste	690 thousand tons 170 thousand tons	24%	Waste materials from sawmill factories, etc.	3.2 million tons 3.1 million tons	97%	Wood chips derived from construction	2.2 million tons 2.07 million tons	94%	Unused biomass	Non-edible parts of crops (except for plowed-in parts)	4.48 million tons 1.42 million tons	32%	Leftover forest wood	4 million tons 360 thousand tons	9%	
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Expansion of Biomass Utilization under the Basic Plan



Estimation of the market size of the biomass industry (surveyed by the Ministry of Agriculture, forestry, and fisheries: preliminary version)

1. Governmental Plan for Biomass Utilization
- 2. Biomass Industrial City**
3. Cases of Biomass Industrial Cities

- Biomass Industrial City (2013- now)

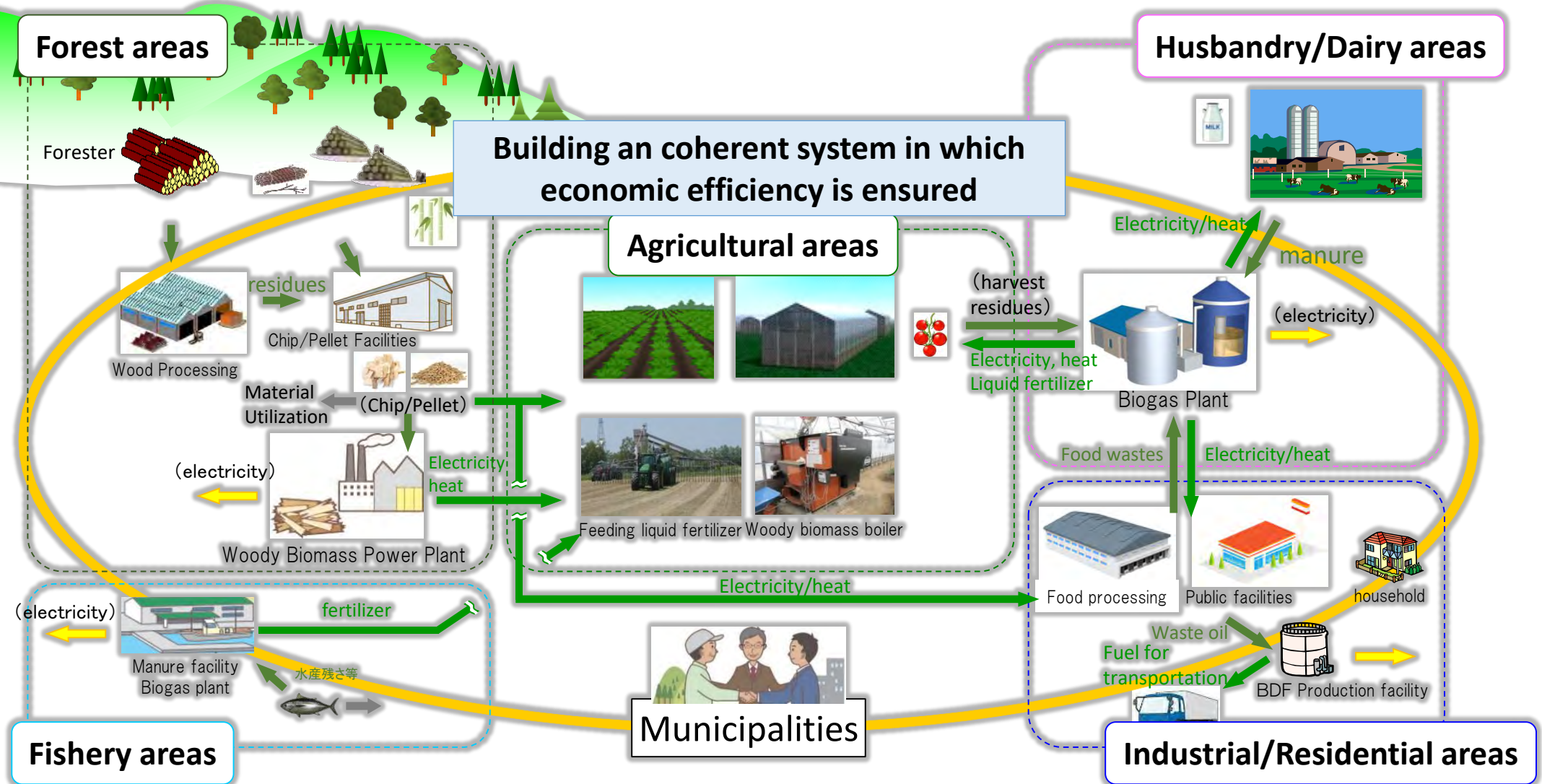
- Biomass Commercialization Strategy (2012)

- Municipalities can develop “Biomass Industrial City” vision which creates industry utilizing local biomass and builds local circular economy

- With an eye to economic efficiency, Biomass Industrial City plan is evaluated by technical/financial experts in light of 1) leading model, 2) feasibility, 3) regional spillover effect, 4) implementation scheme; then selected by the relevant Ministries

- 83 municipalities have been selected (start from 2013, as of 2018)

Biomass Industrial City



Rural Development centered on Biomass Utilization

Selected regions of Biomass Industrial City

FY 2013 (36 Municipalities)

Primary Selection(28Municipalities)

1. Tokachi region, Hokkaido
(19 Municipalities)
2. Shimokawa-cho, Hokkaido
3. Betsukai-cho, Hokkaido
4. HigashiMatsushima-shi, Mlyagi
5. Ushiku-shi, Ibaraki
6. Niigata-shi, Niigata
7. Obu-shi, Aichi
8. Mitoyo-shi, Kagawa

Secondary Selection (8 Municipalities)

9. Kushiro-shi, Hokkaido
10. Okoppe-cho, Hokkaido
11. Minamisanriku-cho, Miyagi
12. Hamamatsu-shi, Shizuoka
13. Tsu-shi, Mie
14. Okuizumo-cho, Shimane
15. Maniwa-shi, Okayama
16. Nishiawakura-son, Okayama

FY 2018 (5 Municipalities)

61. Wakkanai-shi, Hokkaido
62. Hamatonbetsu-cho, Hokkaido
63. Horonobe-cho, Hokkaido
64. Yabu-shi, Hyogo
65. Hokuei-cho, Tottori

FY 2014 (6 Municipalities)

17. Imizu-shi, Toyama
18. Sumoto-shi, Hyogo
19. Okinoshima-cho, Shimane
20. Miyama-shi, Hukuoka
21. Saga-shi, Saga
22. Saiki-shi, Oita

FY 2015 (11 Municipalities)

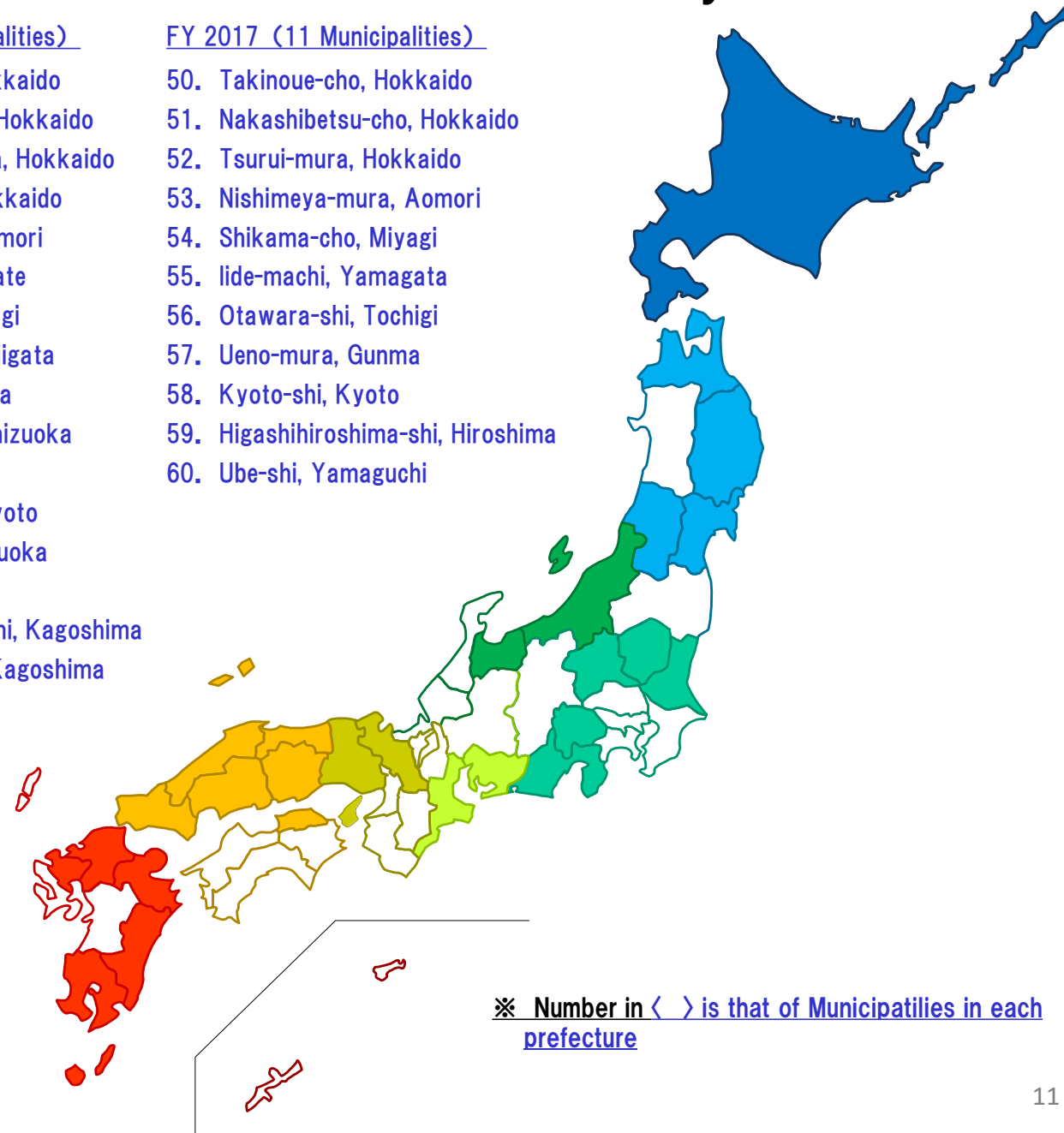
23. Hiratori-cho, Hokkaido
24. Osaki-shi, Miyagi
25. Mogami-machi, Ymagata
26. Motegi-machi, Tochigi
27. Kai-shi, Yamanashi
28. Nantan-shi, Kyoto
29. linan-cho, Shimane
30. Tsuyama-shi, Okayama
31. Munakata-shi, Hukuoka
32. Usuki-shi, Oita
33. Kobayashi-shi, Miyazaki

FY 2016 (16 Municipalities)

34. Shiriuchi-cho, Hokkaido
35. Otoineppu-mura, Hokkaido
36. Nishiokoppe-mura, Hokkaido
37. Shibetya-cho, Hokkaido
38. Hirakawa-shi, Aomori
39. Ichinoseki-shi, Iwate
40. Kami-machi, Miyagi
41. Tokamachi-shi, Niigata
42. Nanto-shi, Toyama
43. Kakegawa-shi, Shizuoka
44. Handa-shi, Aichi
45. Kyotanba-cho, Kyoto
46. Itoshima-shi, Hukuoka
47. Kunisaki-shi, Oita
48. Satsumasendai-shi, Kagoshima
49. Nagashima-cho, Kagoshima

FY 2017 (11 Municipalities)

50. Takinoue-cho, Hokkaido
51. Nakashibetsu-cho, Hokkaido
52. Tsurui-mura, Hokkaido
53. Nishimeya-mura, Aomori
54. Shikama-cho, Miyagi
55. Iide-machi, Yamagata
56. Otawara-shi, Tochigi
57. Ueno-mura, Gunma
58. Kyoto-shi, Kyoto
59. Higashihiroshima-shi, Hiroshima
60. Ube-shi, Yamaguchi



※ Number in < > is that of Municipalities in each prefecture

Follow-up/Support scheme of Biomass Industrial Cities

- Each biomass industrial city is periodically required to provide the latest operating information of each planned facilities
 - 64 facilities in 39 Biomass Industrial Cities have started to operate (as of FY2018)
- Government provides supports such as institutional/regulatory /technical advice/consultation and best practices as well as introduces relevant measures (subsidies, tax benefits, etc.)

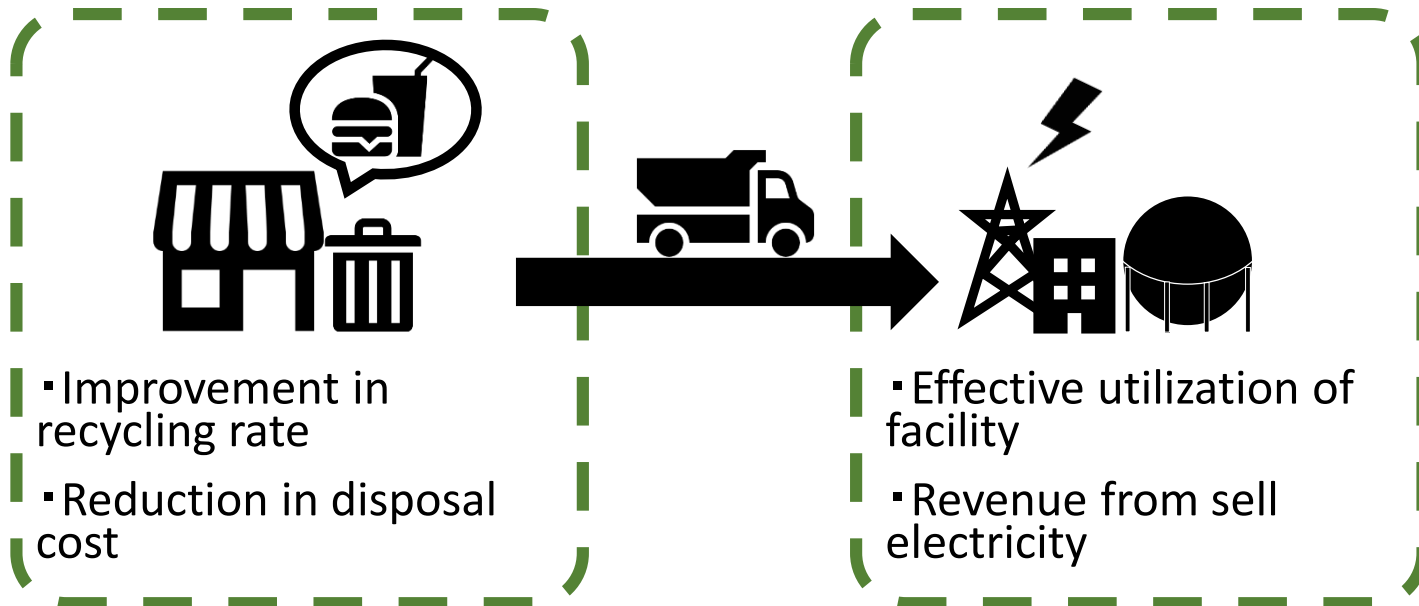
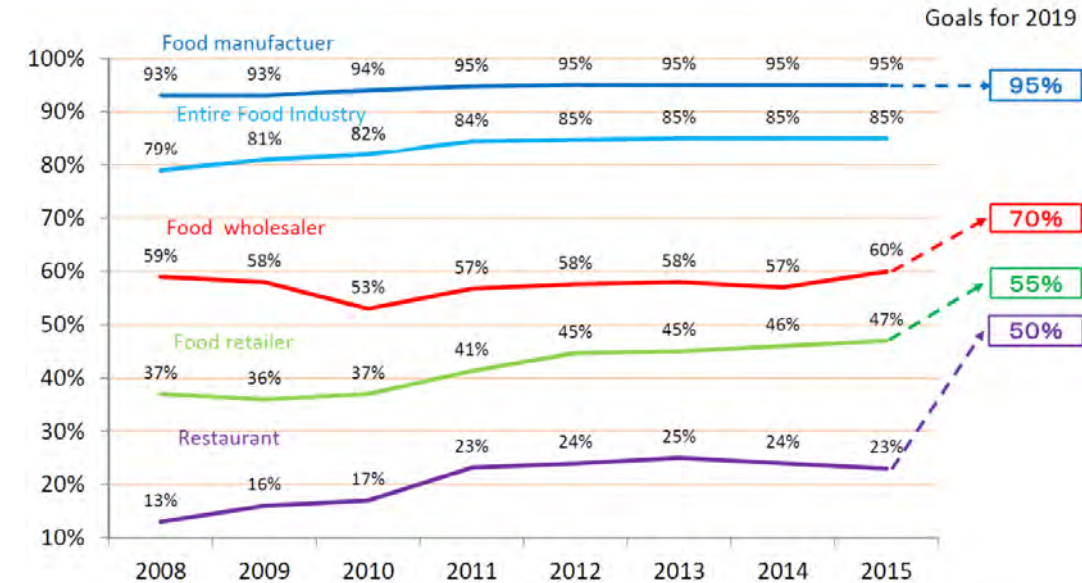
An efficient utilization of digestive fluid

- It is effective to return digestion liquid to farmland as organic manure from the point of reduction in running cost.
- Support the extension activities for farmers to expand the use of digestive liquid.



Energy utilization of business-related wastes

- It is more difficult for downstream companies in the food industry to recycle food waste. In fact, the recycle rate get lower in the order of food wholesaler, food retailer and restaurants.
- In recent years, we promot the new type of methane fermentation using both sewage sludge and food waste.

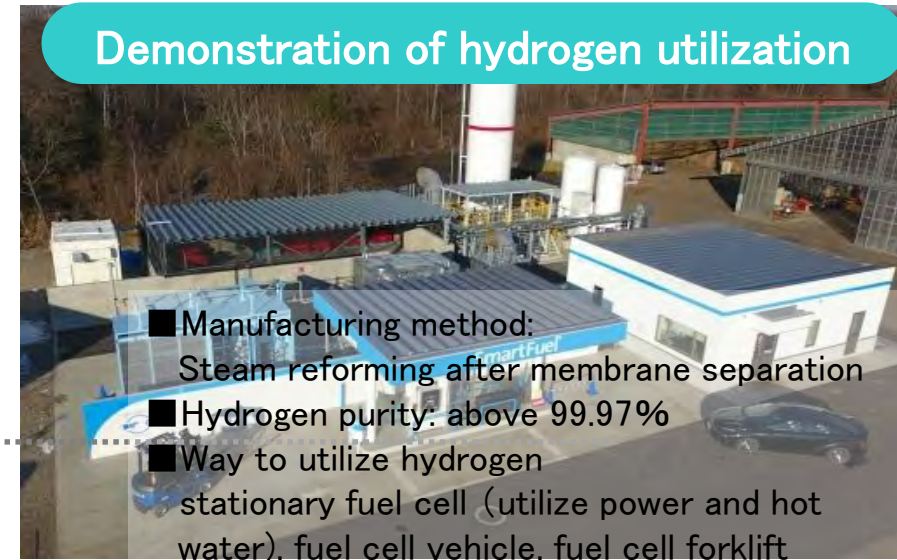


1. Governmental Plan for Biomass Utilization
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Case 1: Shikaoi Town (Hokkaido)

Hokkaido Shikaoi Environmental Preservation Center (Nakashikaoi biogas plant)

- Start of operation: 2007
- Processing capacity:
livestock excrement
94.8t/day
- Main facilities:
Generator
100kW×1, 190kW×1
Hot water boiler
100,000kcal×3
Steam boiler
1,000kg/h×1



Five main merits of biogas plant

1. Improvement of the environment
2. Improvement of agricultural productivity
3. Prevention of global warming
4. Establishment of recycle-based society
5. Activation of rural economy



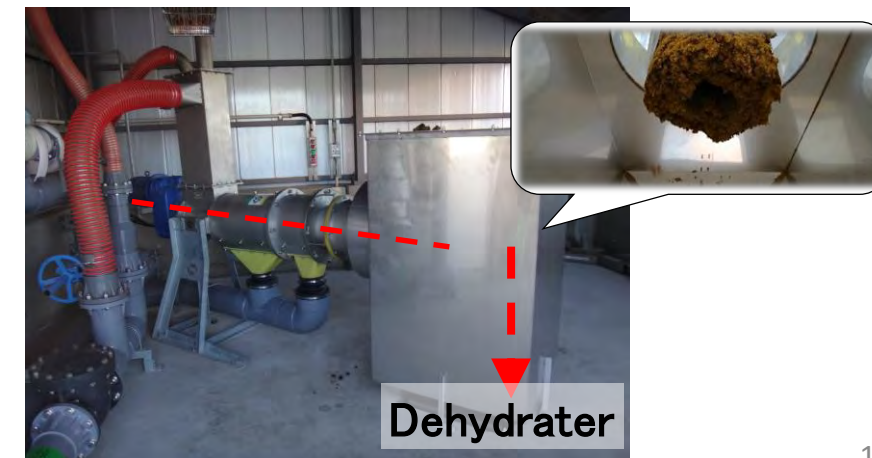
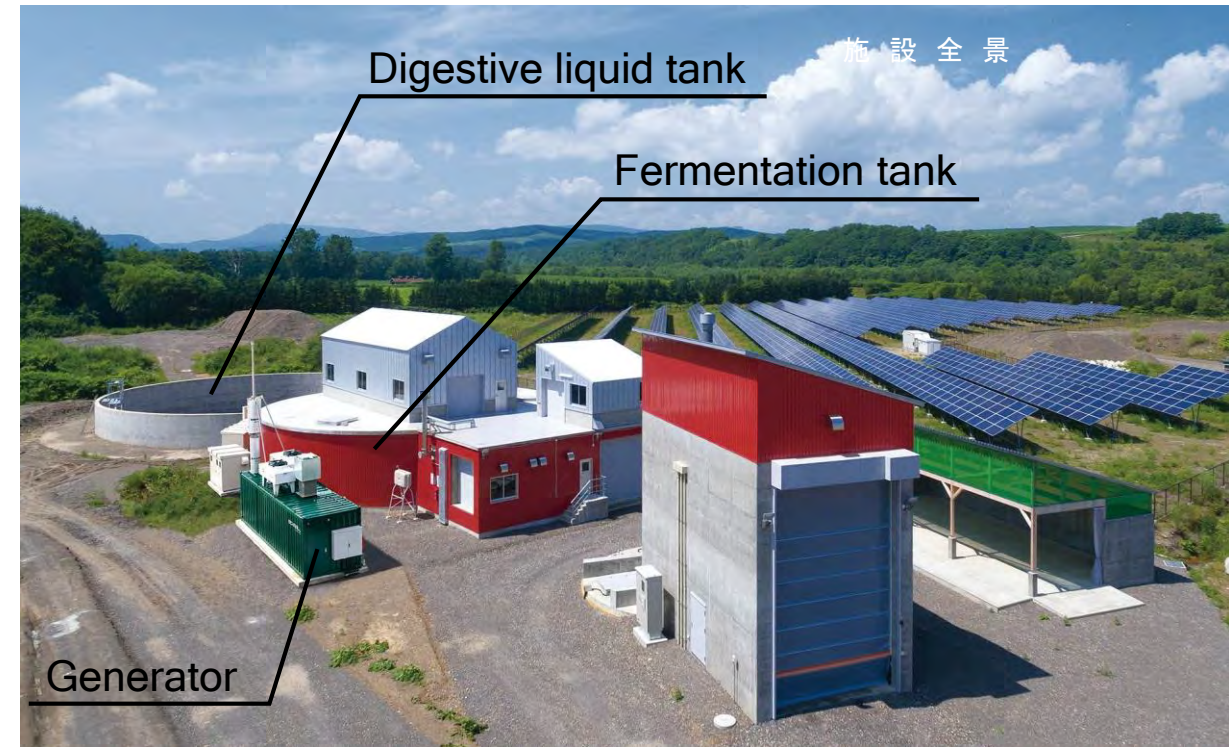
Case 2: Okoppe Town (Hokkaido)

Okoppe Hokko biogas plant

- Start of operation: November 2016
- Processing capacity:
livestock excrement 37.89 t/day
- Main facilities:
Generator 170kW×1
digestion liquid tank ×3 (satellite tank ×2)

The heat recovered from generators is utilized for warming biomass fermenters.

Methane digestion liquid to scattered on farmland as organic manure



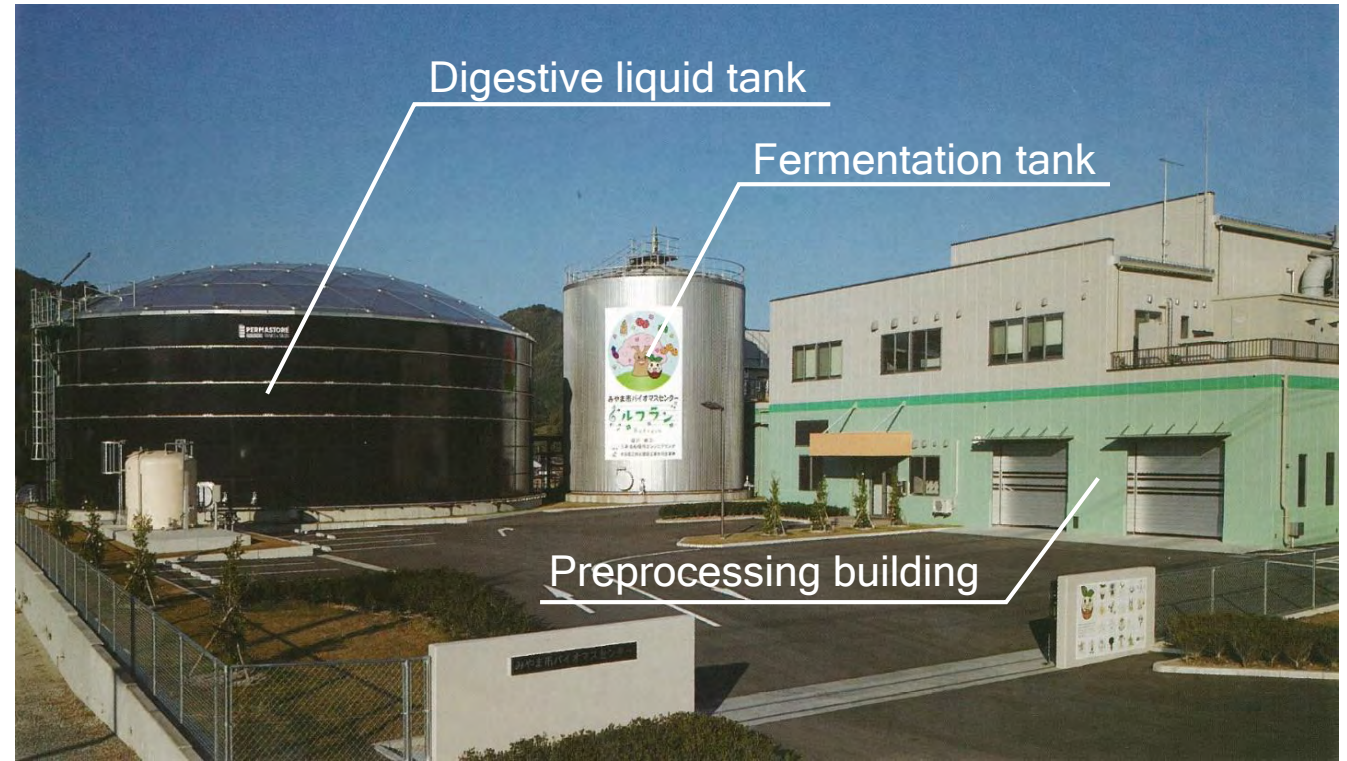
Case 3: Miyama City (Fukuoka)

Miyama City Biomass Center (Refrain)

- Start of operation: December 2018
- Processing capacity:
 - Food waste 10 t/day
 - Human waste sludge 42 t/day
 - Septic tank sludge 78 t/day
- Main facilities:
 - Generator 25kW×4
 - Hot water boiler

It helps biogas plants to consume electricity for themselves.

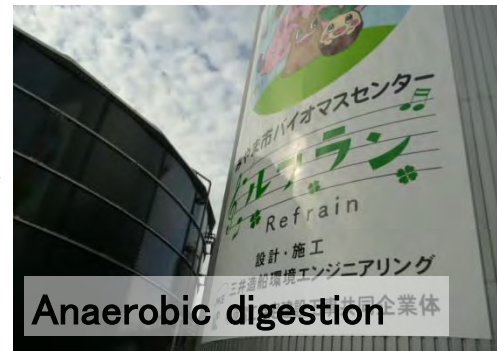
Methane digestion liquid to scattered on farmland as organic manure



Utilization of residual heat generated in biomass power generation



Waste



Biogas



Heat



Summary

- New Basic Plan for Biomass Utilization promotes activities with more economic value (advanced use, multi-step use, utilization as heat)
- Biomass Industrial City is an coherent system (incl. material procurement, sales of output, establishment of implementation scheme, consensus formation of stakeholders) in which economic efficiency is ensured
- Biomass Industrial Cities (currently 83 municipalities) are expected to be leading models of biomass utilization and relevant market expansion

Thank you for your attention!