

Current livestock-related environmental issues and responses

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Livestock Production Promotion Division
Livestock Industry Department
Agricultural Production Bureau
Ministry of Agriculture, Forestry and Fisheries (MAFF)

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1. Current livestock-related environmental issues: (i) amounts of livestock waste generated

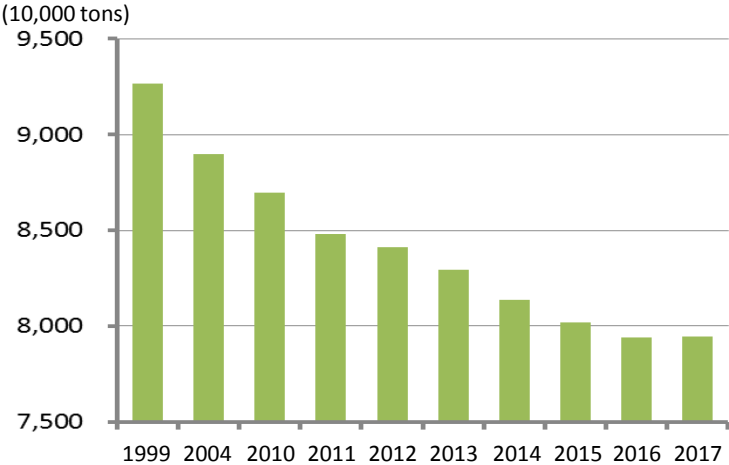
- The amount of waste generated per animal varies depending on livestock type and weight, feed type and intake amount, water intake, livestock farming practices and the season, etc.
- The amount of livestock waste generated annually in Japan (approximately 79 million tons in 2017) is decreasing due to a decline in the number of farm animals. Dairy cattle, beef cattle and pigs each constitute approximately 30% of the total amount of farm animal manure nationwide.

○ Examples of waste amounts (in kg) generated per animal per day

		Feces	Urine	Total	Annual total
Dairy cattle	Milking cows	45.5	13.4	58.9	21.5 t
	Dry cows / heifers	29.7	6.1	35.8	13.1 t
	Feeder cattle	17.9	6.7	24.6	9.0 t
Beef cattle	<2 y.o.	17.8	6.5	24.3	8.9 t
	≥2 y.o.	20.0	6.7	26.7	9.7 t
	Dairy cattle for beef	18.0	7.2	25.2	9.2 t
Pigs	Hogs	2.1	3.8	5.9	2.2 t
	Breeding pigs	3.3	7.0	10.3	3.8 t
Layers	Chicks	0.059	—	0.059	21.5 kg
	Adult hens	0.136	—	0.136	49.6 kg
Broilers		0.130	—	0.130	47.5 kg

Source: Livestock Industry's Environmental Improvement Organization

○ Changes in the amount of livestock waste generated in Japan



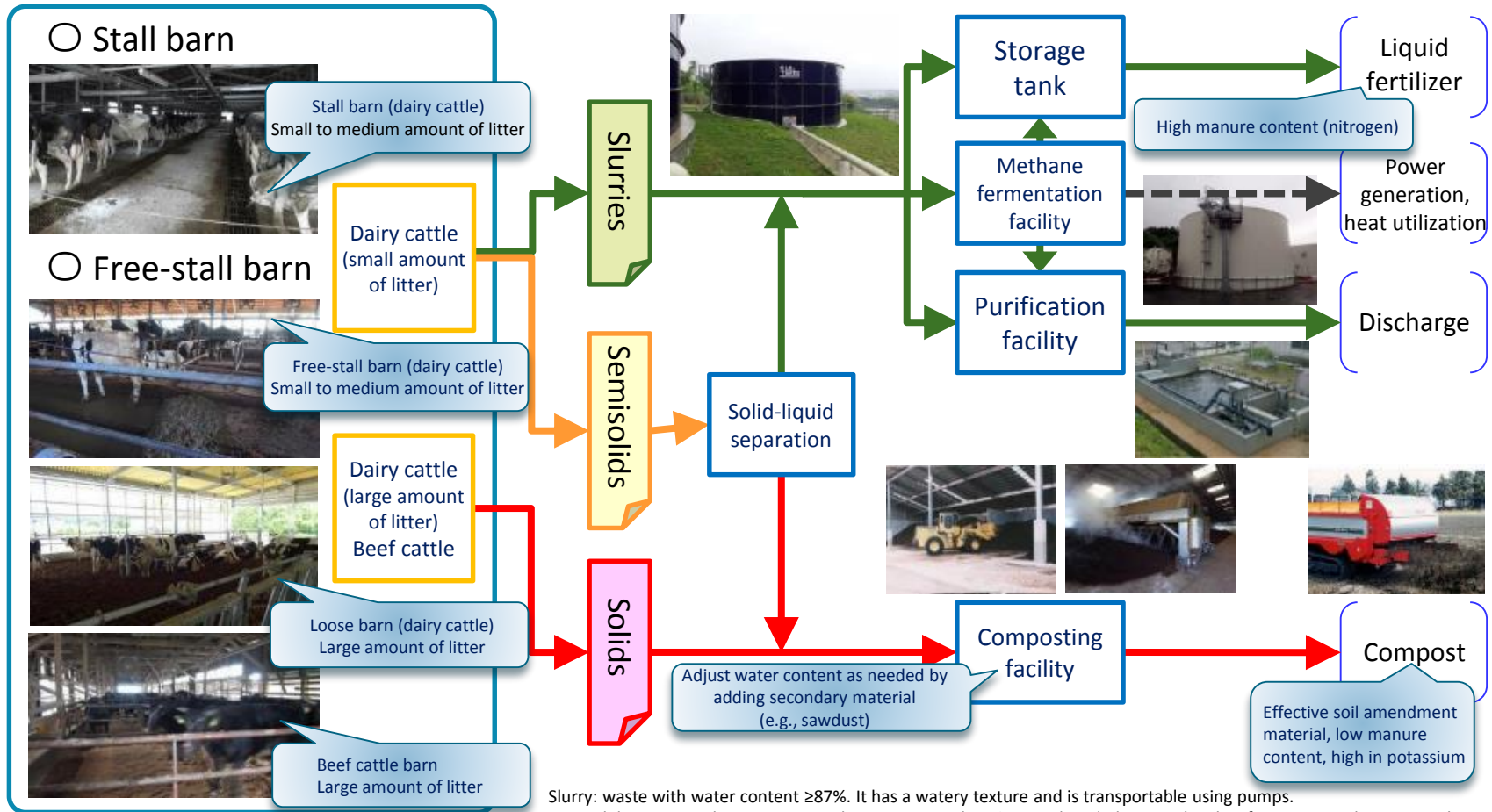
○ Amounts of waste generated by different types of livestock animals

	Amount (10,000 tons)
Dairy cattle	2,200
Beef cattle	2,300
Pigs	2,200
Layers	800
Broilers	500
Total	7,900

Source: Estimated from “Livestock Farming Statistics,” MAFF

1. Current livestock-related environmental issues: (ii) waste treatment process (dairy and beef cattle)

- Because dairy cows need to drink a large amount of water to produce milk, the water content of their waste is high. This waste is treated in various ways as its characteristics vary greatly depending on farming practices.
- Because beef cattle feces is low in water content and such cattle are usually fed collectively, most of its feces is processed into compost.



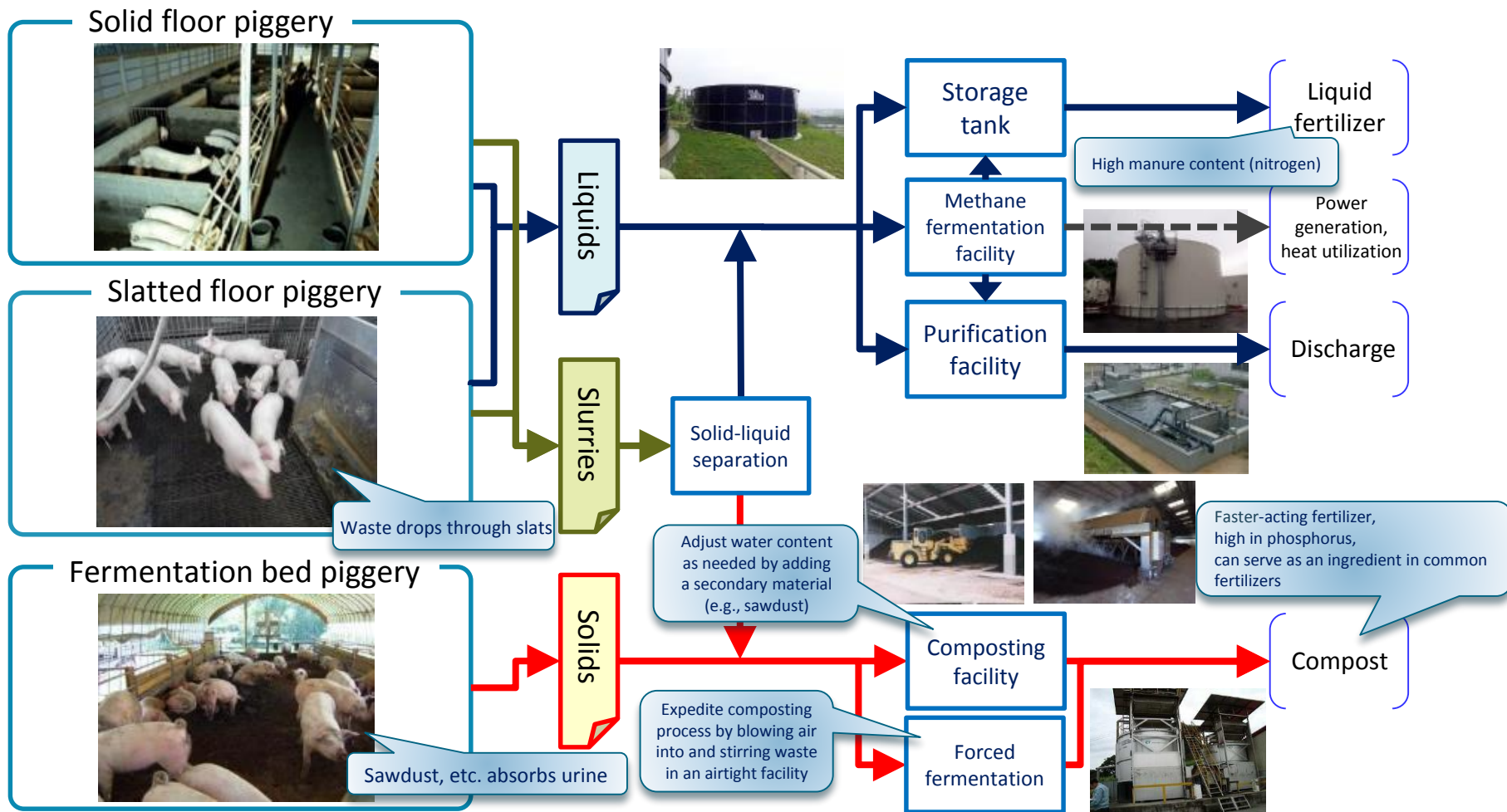
Slurry: waste with water content $\geq 87\%$. It has a watery texture and is transportable using pumps.

Semisolids: waste with water content between 84 and 87%. It can be piled up to a height of approximately 50 cm without collapsing.

Solids: waste with water content $< 84\%$. It can be piled up to a greater height.

1. Current livestock-related environmental issues: (iii) waste treatment process (pigs)

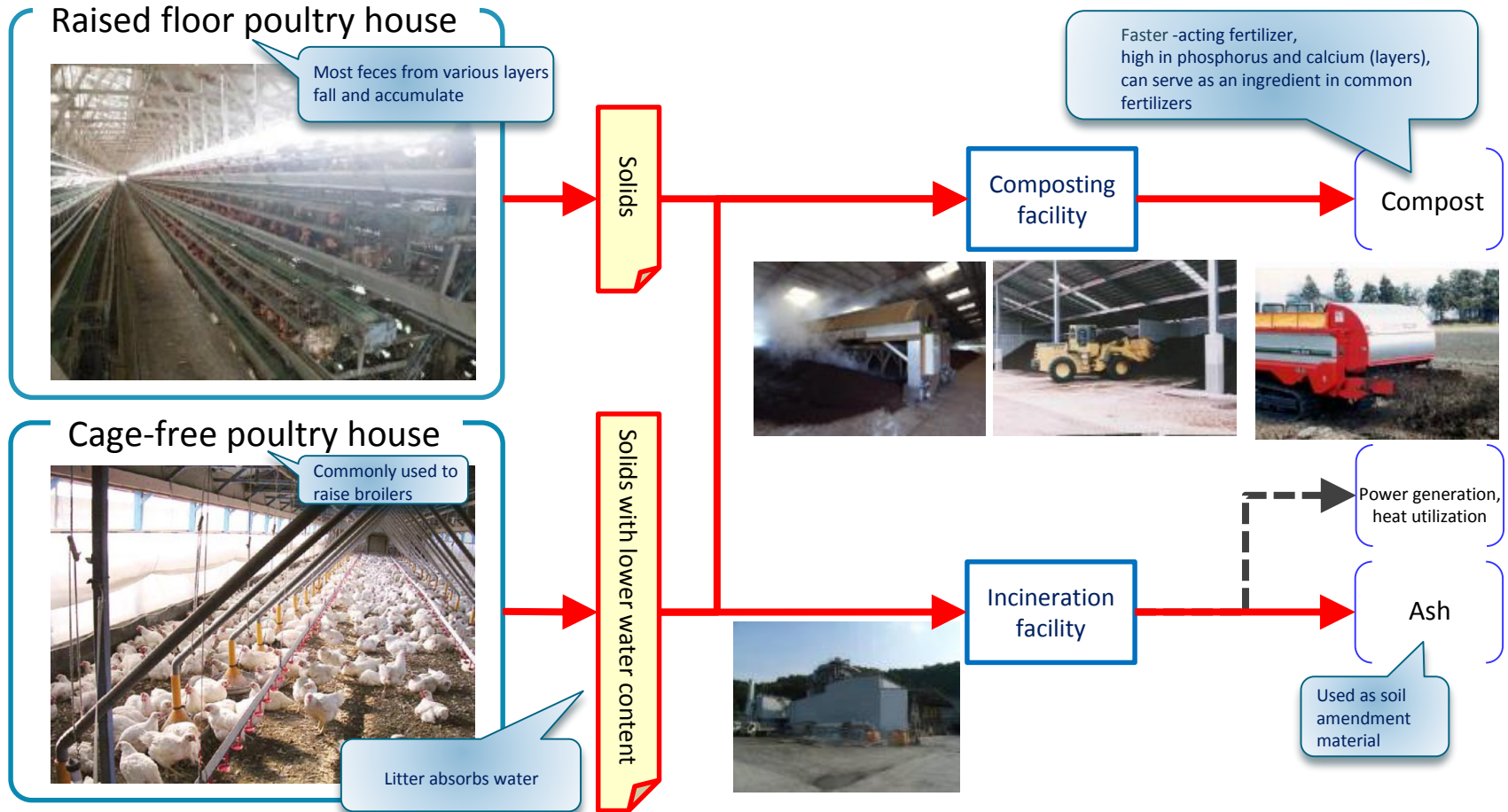
- Because pigs produce a large amount of urine, processing of the water content of pig waste is important. Their waste is usually separated into feces and urine, both of which are then processed using different methods. Another method uses a fermentation floor to absorb urine, thereby enabling the processing of waste into compost.
- It is important to address offensive odor issues—a source of many public complaints.



Photos of the concrete floor piggery and fermentation bed piggery were provided by the Livestock Industry Association and the Livestock Industry's Environmental Improvement Organization, respectively.

1. Current livestock-related environmental issues: (iv) waste treatment process (poultry)

- Poultry waste is suited for composting due to its low water content. It is rich in fertilizer components, making it a fast-acting fertilizer and is important as an effective fertilizer ingredient.
- Advanced utilization of poultry waste by means of burning has been put into practice. Broiler waste is particularly suited for this purpose because its water content decreases during its removal from a poultry house.
- It is important to take measures to reduce offensive odor from the waste of layers—a source of many public complaints.

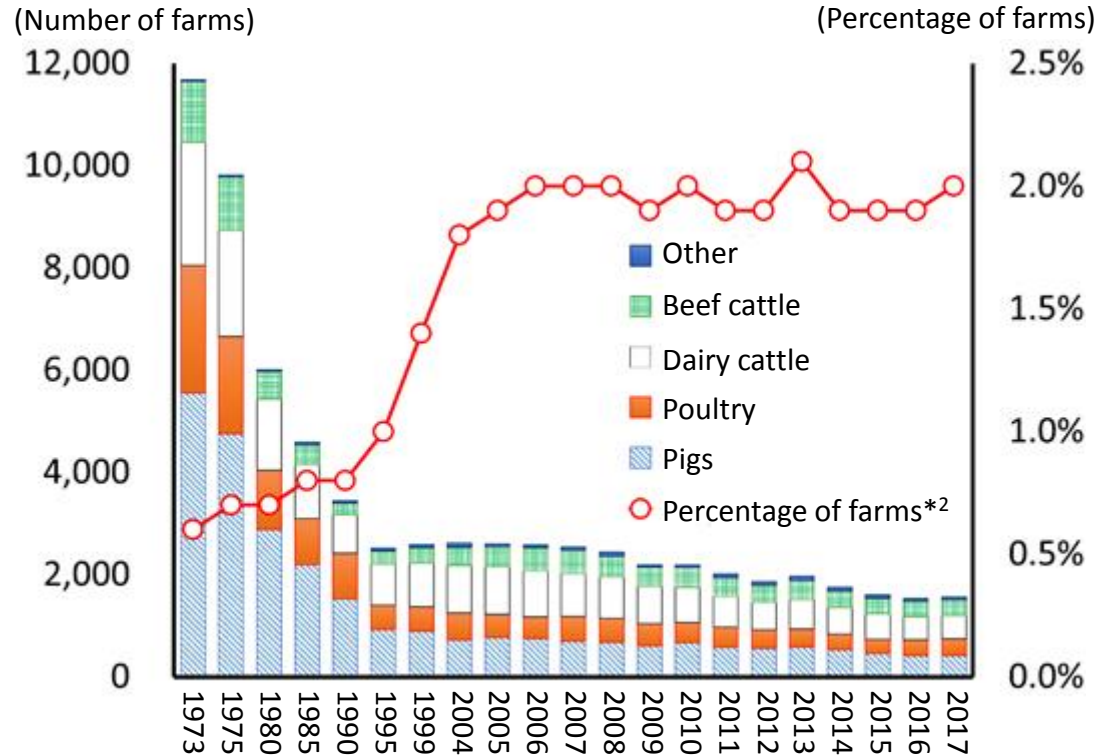


This photo of the cage-free poultry house was provided by the Japan Livestock Technology Association.

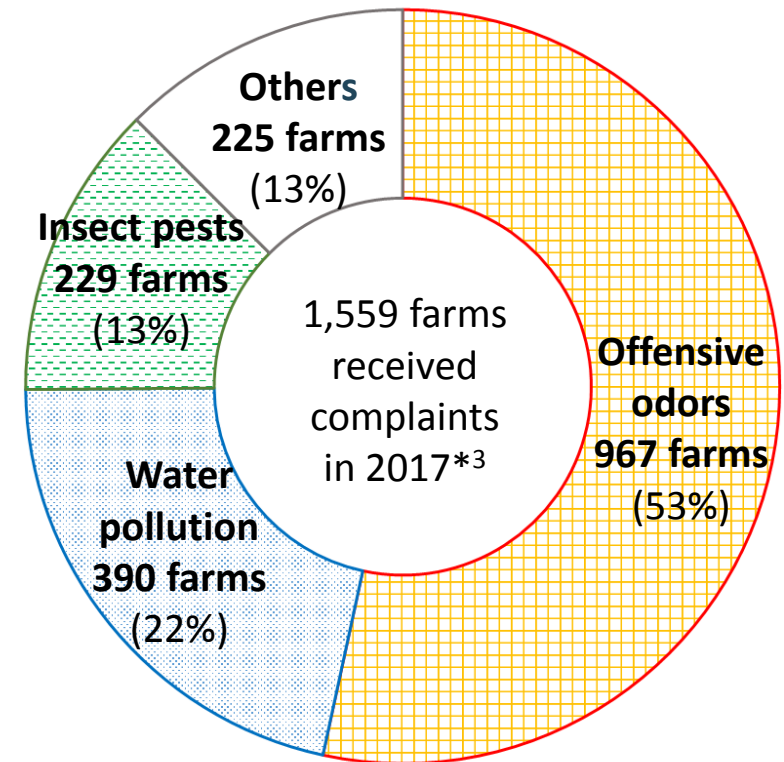
1. Current livestock-related environmental issues: (v) public complaints (in general)

- While the number of complaints related to livestock business operations has been decreasing overall, the percentage of livestock farms that receive complaints has remained approximately the same.
- A majority of the complaints concern offensive odors.

○ Changes in the number and percentage of livestock farms that received complaints*¹



○ Complaint breakdown



*¹ We were not always able to identify which type of livestock was the specific source of the complaints in the case of farms that handle multiple types of livestock. These farms were counted only for the livestock type that is their main focus.

*² The "percentage of farms" was calculated after excluding farms in the "other" category (farms that manage horses or other less common animals).

*³ The percentages for different complaint categories do not add up to 100% because farms that received multiple complaints for different animal types were counted only once.

1. Current livestock-related environmental issues: (vi) public complaints (by livestock type, complaint type and farming scale)

- Dairy cattle and pig farms represented the two most common sources of complaints in terms of the number of farms that received complaints. Pig farms (mainly for offensive odors) and layer farms (mainly for offensive odors and pest problems) represented the two most common sources of complaints in terms of the percentage of farms that received complaints.
- Larger scale farms tended to receive more complaints in terms of the percentage of farms that received complaints. This trend was true for all types of livestock animals except broilers.

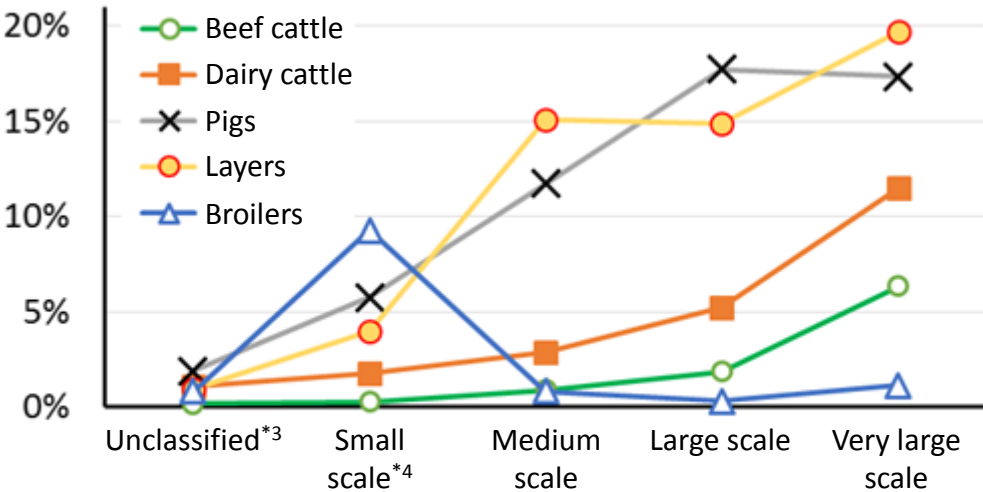
○ No. of farms that received complaints in 2017 (by livestock type and complaint type)^{*1} ○ Percentage of farms that received complaints in 2017 in relation to their farming scale

(Numbers in parentheses represent percentages of farms that received complaints.)

	Offensive odors	Water pollution	Insect pests	Other	Total*2
Dairy cattle	287 (1.8%)	101 (0.6%)	57 (0.3%)	78 (0.5%)	451 (2.6%)
Beef cattle	182 (0.4%)	70 (0.1%)	40 (0.1%)	66 (0.1%)	313 (0.8%)
Pigs	268 (5.7%)	154 (3.3%)	22 (0.5%)	33 (0.7%)	409 (8.8%)
Layers	152 (6.5%)	46 (2.0%)	104 (4.4%)	16 (0.7%)	259 (11.0%)
Broilers	53 (2.3%)	11 (0.5%)	2 (0.1%)	7 (0.3%)	70 (3.0%)
Other	25	8	4	25	57
Total	967	390	229	225	1,559

^{*1} We were not always able to identify which type of livestock was the specific source of the complaints in the case of farms that handle multiple types of livestock. These farms were counted only for the livestock type that is their main focus.

^{*2} The percentages for different complaint categories do not add up to 100% because farms that received multiple complaints for different animal types were counted only once.



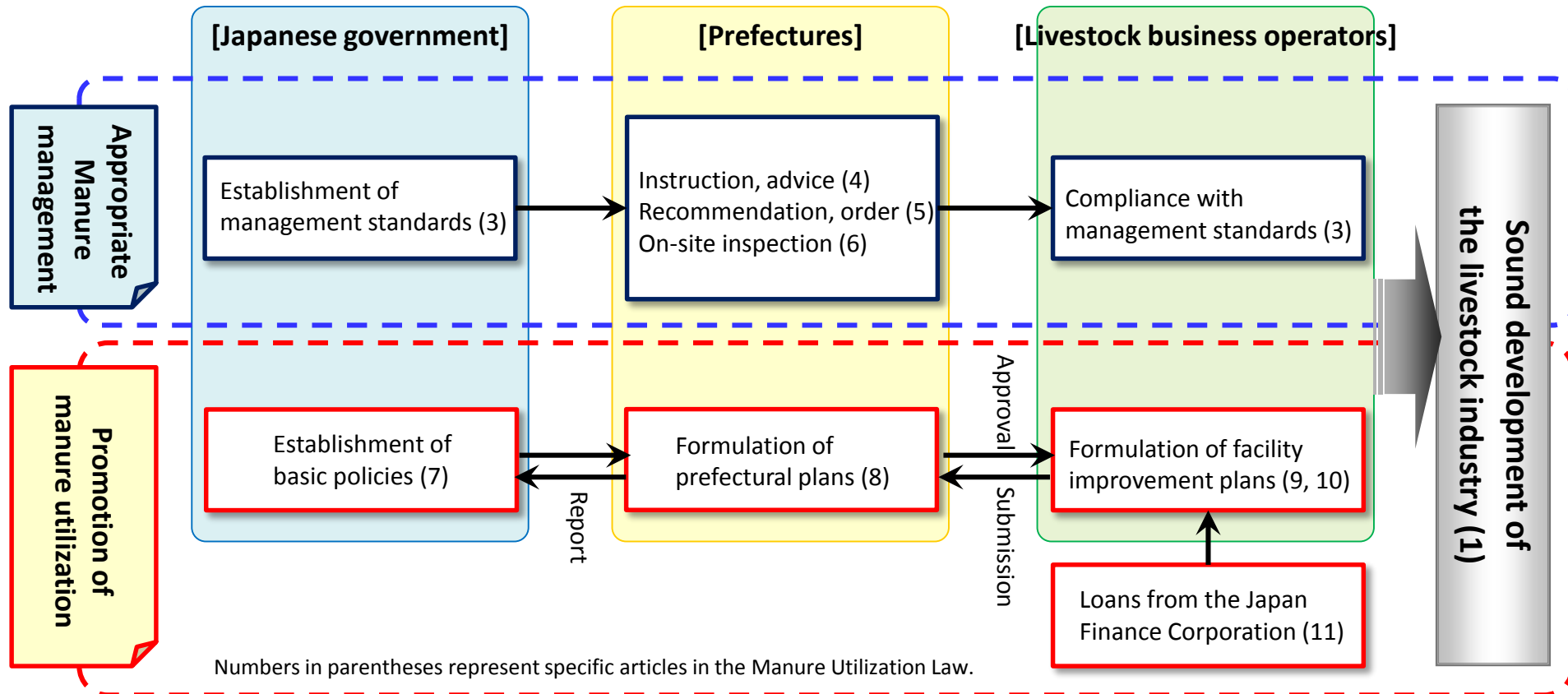
Beef cattle (No. of animals)	(-9)	-19	-99	-499	500-	No. of animals 1,000 birds
Dairy cattle (No. of adults)	(-9)	-29	-99	-299	300-	
Pigs (No. of fattened pigs)	(-100)	-999	-1,999	-2,999	3,000-	
Layers (No. of adult hens)	(-2)	-10	-50	-100	100-	
Broilers (No. of animals transported for sale annually)	(-2)	-100	-300	-500	500-	

^{*3} For the sake of convenience, farming scale was divided into five categories based on the number of animals per farm as indicated in the table above. The numbers in parentheses represent numbers of animals in the “unclassified” category.

^{*4} The percentages of small-scale layer / broiler farms that received complaints may have been overestimated because extremely small-scale farms were not taken into account.

2. Manure Law: (i) implementation system

- The law was enacted in 1999 and put into full effect in 2004. It is officially known as the Act on the Appropriate Treatment and Promotion of Utilization of Livestock Manure.
- The law stipulates that livestock business operators (excluding small-scale farmers) are obliged to meet manure management standards set by the Japanese government. Prefectures provide instruction and advice to these operators.
- The Japanese government formulates basic policies to promote the utilization of livestock waste and prefectures formulate specific plans to implement the policy. Livestock business operators may submit proposals in connection with applications for loans to improve their facilities.



2. Manure Law: (ii) management standards and farmer compliance status

- Implementation regulations pursuant to the law provide waste treatment standards that livestock business operators (excluding small-scale farmers) should comply with. These standards are applied to cattle, pigs, poultry and horses.
- The law prohibits improper management of livestock waste (piling or excavation leading to soil and water pollution). The law also requires livestock management facilities to have structures that prevent rain-caused animal waste runoff and infiltration into the ground. In addition, the law requires livestock business operators to properly maintain and examine their facilities and keep records of amounts of animal waste generated.
- Nearly all livestock farmers subject to the law have been complying with the waste management standards since the law entered into full effect in 2004.

○ Waste management standards pursuant to the law (outline) ○

1. Livestock management facility structure

- The flooring materials used in the waste management facilities of farms generating solid waste should be impermeable to waste (e.g., concrete). Proper covering materials and proper sidewalls should be added to the facilities.
- Where farms generate liquid waste, waste management facilities should be equipped with waste storage tanks constructed using materials impermeable to waste.

*Standards do not apply to farms with:

<10 cows or horses

<100 pigs

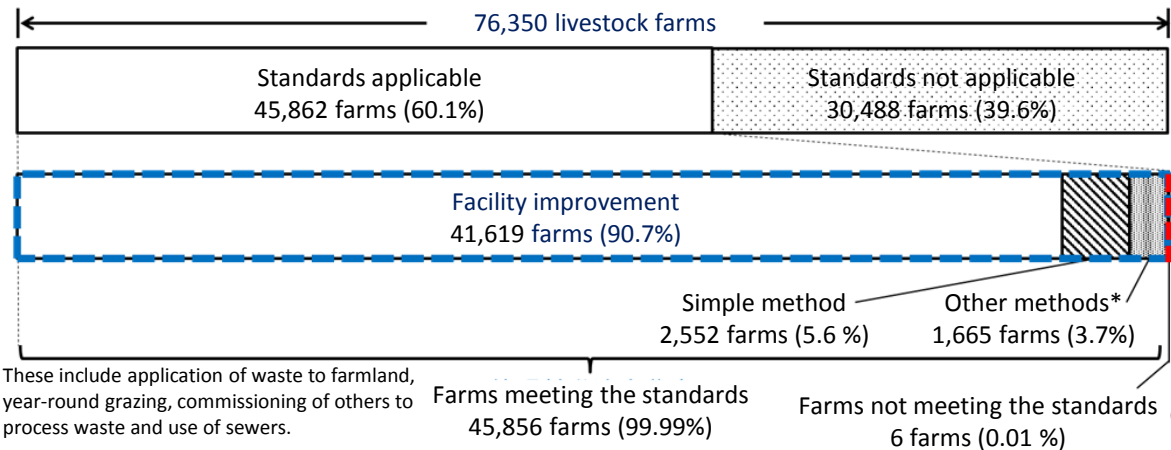
<2,000 chickens

2. Livestock waste management methods

- Livestock waste should be managed by facilities constructed for that purpose.
- Waste management facilities should be regularly examined and maintained, and promptly repaired when necessary.
- Records should be kept of the amounts of livestock waste generated annually, waste treatment methods used and the amount of waste treated by each treatment method.



○ Implementation status of the law (as of December 1, 2017)



3. Livestock waste utilization: (i) basic promotion policy

- The Minister of MAFF formulates a basic policy to promote livestock waste utilization (hereinafter referred to as the “basic policy”) to comprehensively and systematically promote livestock waste use in accordance with the Manure Law.
- The current basic policy was drawn up in 2015 to address livestock-related environmental issues to meet the following FY2025 goals: (i) promote livestock waste composting through coordination between the crop and livestock agricultural industries, (ii) promote the use of livestock waste to generate energy when processing it into compost is difficult and (iii) appropriately respond to strengthened environmental regulations and develop communities for both farmers and non-farmers.

<Main points of the basic policy (established in April 2015)>

○ Promote livestock waste composting

- To **encourage community-scale use of compost** in farms and for feed rice production, the policy promotes initiatives to reduce the labor intensiveness of compost production and application by increasing the availability of outsourcing services and to coordinate collaboration between livestock-related parties.
- To meet the needs of compost users and encourage **distribution of compost across wide areas** through proper communication, the policy promotes the introduction of necessary equipment and facilities (e.g., compost composition analyzers, equipment to produce palletized compost and compost application vehicles) and transmission of information via the internet, etc.

○ Promotion of use of livestock waste to generate energy

- To encourage biomass utilization and avoid excessive accumulation of livestock waste, the policy promotes **increased use of livestock waste in energy production by means of methane fermentation and incineration, etc.** These initiatives may lead to an increase in farmers’ income by allowing them to generate electricity for their own use or for sale.
- The Feed-in Tariff program for renewable energy has been applied to livestock waste utilization while **assessing medium-term cost-benefit effects and prospects for raw material acquisition, etc.**

○ Responses to livestock-related environmental issues

- A third party, such as a local government, **facilitates communication between livestock farmers and neighboring residents** while considering advice from experts.
- Farmers should account for the **possibility of stricter future environmental regulations** in their plans when establishing their livestock facilities.

○ Other

- **Efforts should be made to advance consumers’ understanding of the significance of the livestock industry in society**, particularly from the viewpoint of the resource cycle, including compost utilization.
- Sanitary measures are being considered to **protect the health of livestock animals** during the production and transportation of compost (e.g., preventing accidental scattering of compost and disinfection of compost carrying vehicles and transportation routes).

3. Livestock waste utilization: (ii) advanced utilization

- Advanced utilization of livestock waste—including methane fermentation (anaerobic fermentation to produce methane gas for heat utilization and power generation)—is being implemented to meet specific community needs.
- Japan's feed-in tariff (FIT) program for renewable energy, which was launched in 2012, has increased the profitability of biomass power generation businesses. FY2017 unit prices for electricity generated via methane fermentation and incineration were 39 yen + tax and 17 yen + tax per kWh, respectively.
- Careful consideration of the advantages and disadvantages of advanced utilization is important in planning its implementation.

○ Advanced utilization types

➤ Methane fermentation

Livestock waste in liquid form is anaerobically fermented in a sealed fermenter to produce methane gas which can be burned to generate heat and electricity.



➤ Incineration

Livestock waste with low water content (mainly broiler feces) is completely burned to produce heat and electricity. Ash resulting from this process can be used as fertilizer or for other purposes.



➤ Carbonization

Livestock waste with low water content is burned to some extent to produce charcoal which can be used as a soil amendment material and deodorizer, etc.



○ Changes in the number of advanced utilization facilities

	2010	2011	2012	2014	2016
Methane fermentation	74	74	90	124	179 (39)
Heat	64	61	61	71	73
Electricity	46	47	63	94	159 (39)
Incineration	79	98	99	118	116 (0)
Heat	32	45	47	72	70
Electricity	4	5	6	7	6 (0)
Carbonization	12	9	9	10	9
Heat	0	0	0	1	1
Electricity	0	0	0	0	0
Carbide synthesis	10	9	9	10	9

Source: Surveys by the MAFF Livestock Production Promotion Division

* Facilities with FIT certification are included from the 2012 figures.

* The numbers in parentheses in the 2016 column represent numbers of facilities scheduled to begin operating as early as FY2017.

○ Advantages and disadvantages of advanced utilization

	Methane fermentation	Incineration	Carbonization
Advantages	• Increased profits due to reduced utility costs and additional income from the sale of electricity • Odor control (Processing in sealed containers prevents leakage of offensive odors.) • Fermentation residue (liquid from digested materials) can be used as liquid fertilizer.	• Increased profits due to reduced utility costs and additional income from the sale of electricity • Reduced animal waste by volume	• Reduced animal waste volume • Enables carbide synthesis
Disadvantages	• Facility maintenance is expensive. • Application of residual fermentation liquid is not common practice (if not applied, the liquid is subject to purification processing). • Fermentation process requires skillful management.	• Facility maintenance is expensive. • Unit price of electricity derived from incineration is lower than that from methane fermentation.	• Facility maintenance is expensive.

4. Other relevant laws and regulations: (i) laws related to water quality

- To protect public water supplies from pollution, livestock farms that operate at or beyond a certain scale need to fulfill notification requirements, and the water discharged from these farms is subject to water quality regulations pursuant to the Water Pollution Prevention Act and other relevant laws. Livestock business operators are required to observe temporary standards set for certain substances that may be present in discharged water.
- Regulations and standards may vary for different bodies of water and municipalities (more stringent regulations may apply to certain areas under specific ordinances).

○ Main requirements for livestock business operators

- ✓ Operators are required to provide notice before engaging in the farming of cattle, pigs or horses over a certain scale. Such farms are considered to be “specified workplaces.”
- ✓ Operators of specified workplaces are required to provide notice of any changes made to previously submitted information.
- ✓ Operators are required to comply with water quality regulations and standards applying to discharged wastewater.
- ✓ Operators are required to take measurements of discharged wastewater at least once a year and retain records thereof.

○ Outline of regulations

Specified workplaces: workplaces equipped with specified facilities (a piggery 50 m² in size or larger, a cattle barn 200 m² in size or larger or a stable 500 m² in size or larger)

○ Standards for 28 toxic substances in discharged wastewater (cadmium, cyanic compounds, etc.)

- Livestock business operators are required to monitor levels of nitrate-nitrogen, including ammonia, ammonia compounds, nitrites and nitrates.
- A temporary standard has been set for nitrate-nitrogen at 600 mg/L, effective until June 2019.

Specified workplaces that discharge 50 m³ of wastewater per day or more on average

- 16 effluent standards to ensure the safety of human living environments (chemical oxygen demand (COD), suspended solids (SS), etc.)
- Livestock business operators are required to monitor pH and levels of biochemical oxygen demand (BOD), COD, SS and coliform group bacteria.

Of the abovementioned specified workplaces, those associated with closed sea areas (88 such areas have been designated by the Minister of the Environment.)

○ Effluent standards for nitrogen and phosphorus

- Temporary standards for these elements have been set for pig farms (nitrogen, 170 mg/L; phosphorus, 25 mg/L) which are effective until September 2018.

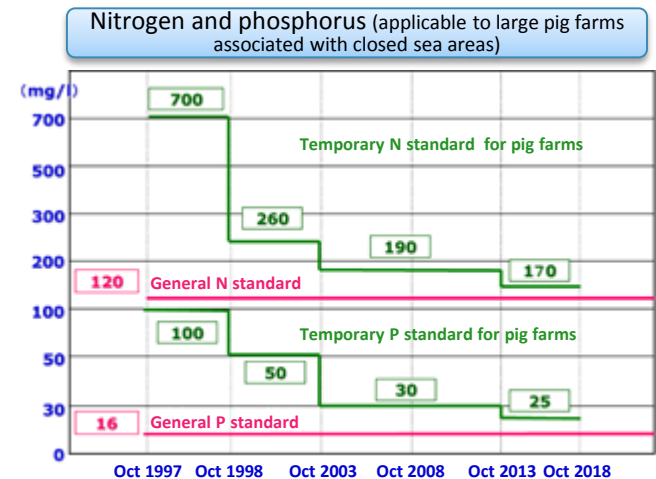
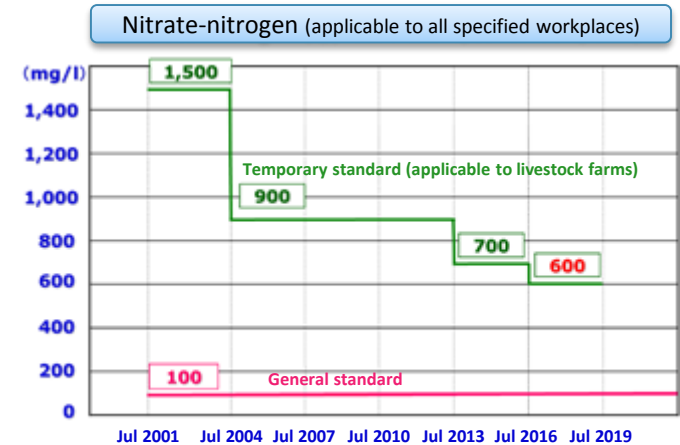
Of the abovementioned specified workplaces, those associated with Tokyo Bay, Ise Bay or the Seto Inland Sea

○ Regulatory standards to reduce the total amount of water pollutants (COD, nitrogen and phosphorus)

- Prefectural governors determine specific regulatory standards.

In addition to the requirements and regulations mentioned above, specified workplaces associated with 11 designated lakes (based on the Act on Special Measures concerning Conservation of Lake Water Quality) are required to comply with allowable pollutant loads and structural standards for small livestock barns.

○ Temporary effluent standards for the livestock industry



4. Other relevant laws and regulations: (ii) Offensive Odor Control Act

- The Offensive Odor Control Act regulates offensive odors released from workplaces irrespective of their sizes. Prefectural governors and mayors determine specific areas to be regulated, regulation methods and regulation standards. As of the end of FY2015, 73.7% of municipalities in Japan have designated areas to be regulated.
- There are two approaches to offensive odor regulation: based on the concentrations of specific offensive odor-causing substances and based on the use of an odor index which was developed by quantifying human olfactory perception. More municipalities are adopting the use of the odor index because it can enable adequate handling of mixed odors, unlike the other approach, which relies on the concentrations of individual odor-causing substances.
- When a local government detects an offensive odor at a level exceeding the regulatory standards and judges it to be damaging the living environment of local residents, the local government requests that the odor source takes measures under the law to improve the situation.

Regulation methods and standards

(i) Controlling 22 designated offensive odor-causing substances

Designated offensive odor-causing substance	Allowable concentration*	Designated offensive odor-causing substance	Allowable concentration*
Ammonia	1~5	Isovaleraldehyde	0.003~0.01
Methyl mercaptan	0.002~0.01	Isobutanol	0.9~20
Hydrogen sulfide	0.02~0.2	Ethyl acetate	3~20
Methyl sulfide	0.01~0.2	Methyl isobutyl ketone	1~6
Methyl disulfide	0.009~0.1	Toluene	10~60
Trimethylamine	0.005~0.07	Styrene	0.4~2
Acetaldehyde	0.05~0.5	Xylene	1~5
Propionaldehyde	0.05~0.5	Propionic acid	0.03~0.2
Normal butylaldehyde	0.009~0.08	Normal butyric acid	0.001~0.006
Isobutyraldehyde	0.02~0.2	Normal valeric acid	0.0009~0.004
Normal valeraldehyde	0.009~0.05	Isovaleric acid	0.001~0.01

* Range of allowable concentrations in PPM determined by prefectural governors, etc.

Substances commonly found on livestock farms

(ii) Odor index-based regulations

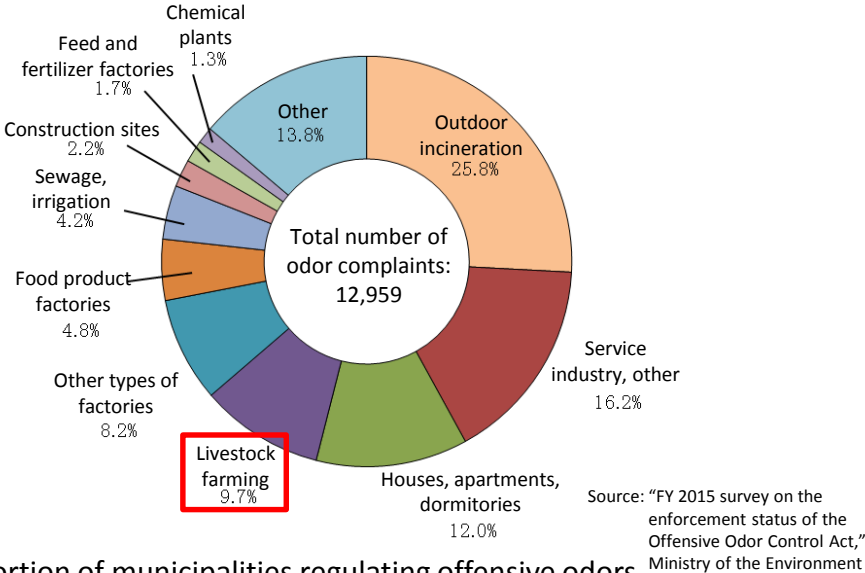
Offensive odors are regulated using an odor index. The index value for each substance was obtained by first determining the lowest concentration of the substance perceivable by humans, taking the log of that number and multiplying it by 10. Prefectural governors, etc. have established regulatory standards based on odor index values ranging between 10 and 21.



Odor testing in action (photo provided by the Ministry of the Environment)

$$\text{Odor index} = 10 \times \text{Log (odor concentration)}$$

Proportion of livestock-related odor complaints to all odor complaints



Proportion of municipalities regulating offensive odors

	No. of municipalities	No. of municipalities with designated areas for regulation	No. of municipalities adopting odor index-based regulations
City	790	741(93.8%)	290(39.1%)
Ward	23	23(100%)	23(100%)
Town	745	462(62.0%)	126(27.3%)
Village	183	57(31.1%)	19(33.3%)
Total	1,741	1,283(73.7%)	458(35.7%)

4. Other relevant laws and regulations: (iii) Fertilizer Regulation Act and the Waste Management Law

- Livestock business operators intending to supply livestock waste for the production of compost, etc. for agricultural use (excluding their own use) are required to submit notification to the relevant prefecture (for special fertilizer production) or register with the Japanese government (for normal fertilizer production) in accordance with the Fertilizer Regulation Act.
- Compost to be used for normal fertilizer production needs to meet new official standards for mixed compost compound fertilizer, etc. These standards—which permit the use of compost as the main ingredient in normal fertilizer—may promote greater compost use.
- Livestock waste not intended for any particular use needs to be properly disposed of in accordance with the Waste Management Law.

Fertilizer Regulation Act

○ Special fertilizers

- Including rice bran, compost and other types of fertilizer designated by the Minister of MAFF.
- The prefectural governor must be notified of any intention to produce, import or sell these fertilizers as well as any changes in these activities.
- These fertilizers must be labeled with the following information to be offered for sale:

fertilizer name, name and address of the seller, product weight, production date, ingredients, main ingredient content*, etc.

(* nitrogen, phosphorus, potassium, copper, zinc, lime, C/N ratio and water content)

○ Normal fertilizers

- All fertilizers that do not fall under the special fertilizer category.
- Production and import of these fertilizers require registration with the Minister of MAFF, etc. and sales of them require notification to the prefectural governor. Any changes in these activities also require similar registration/notification.
- Production of these fertilizers needs to meet official standards.



Mixed compost compound fertilizer containing pig manure compost (photo provided by Asahi Industries Co., Ltd.)

◆ Official standards for normal fertilizers containing livestock manure as the main ingredient

Fertilizer type	Main ingredient	Note
Processed poultry manure fertilizer	Dried poultry manure	
Mixed organic fertilizer	Mixture of organic fertilizer and carbonized poultry manure	
Compound fertilizer	Mixture of nitrogenous fertilizer with carbonized poultry manure or ash resulting from burning either poultry manure or a mixture of poultry and cattle manure. The mixture is processed into pellets, etc.	Added in 2016
Mixed fertilizer	Mixture of nitrogenous fertilizer with carbonized poultry manure or ash resulting from burning either poultry manure or a mixture of poultry and cattle manure	Added in 2016
Animal manure compound fertilizer	Mixture of nitrogenous fertilizer with dried cattle/pig manure (up to 70% in content). The mixture is processed into pellets, etc.	Added in 2012
Mixed compost compound fertilizer	Mixture of nitrogenous fertilizer with compost derived from animal manure (up to 50% in content). The mixture is processed into pellets, etc. and dried.	Added in 2012

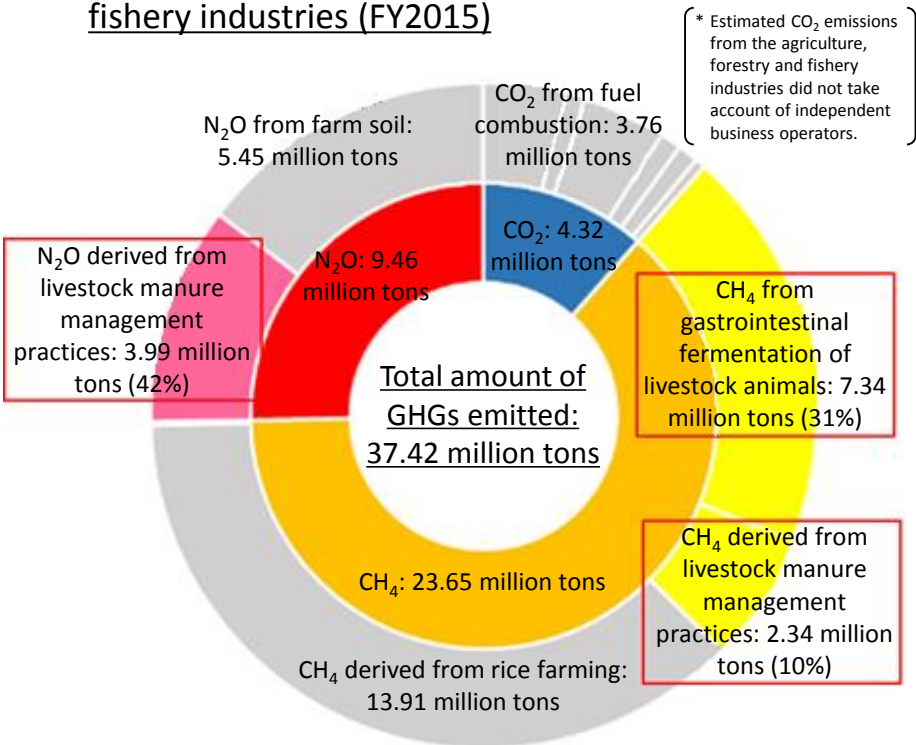
Waste Management Law (formally known as the Waste Management and Public Cleansing Act)

- Disposal of livestock manure as industrial waste needs to be handled properly by an authorized service provider.
- Improper disposal of livestock waste is prohibited.

5. Other: (i) livestock industry measures to mitigate global warming

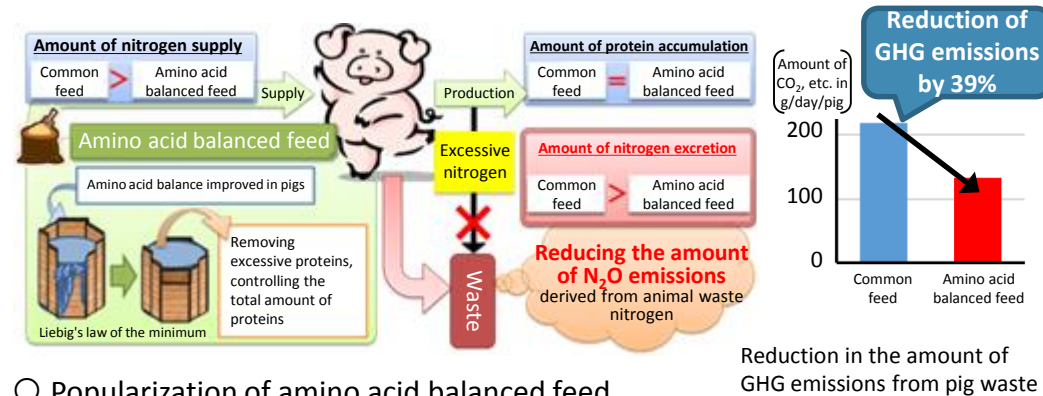
- While worldwide efforts are being made to address the global warming issue, the livestock industry produces greenhouse gases (GHGs), including methane (CH_4) and nitrous oxide (N_2O) derived from manure management practices and CH_4 derived from the gastrointestinal fermentation of animals. Japan annually produces approximately 1.3 billion tons of GHGs (CO_2 equivalents). GHGs derived from the livestock industry represent approximately 1% of the GHGs produced nationwide and approximately one-third of the GHGs derived from the agriculture, forestry and fishery industries.
- Livestock industry measures to reduce GHG emissions include development of amino acid balanced feed, treatment of wastewater to reduce N_2O emission and promotion of compost utilization to increase the capacity of soil to store carbon. New technologies are being developed to facilitate these measures.

○ GHG emissions from the agriculture, forestry and fishery industries (FY2015)

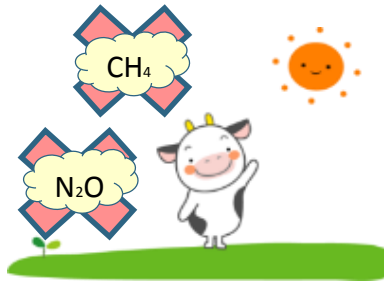


Source: "Japan's national greenhouse gas emissions in fiscal year 2015 (preliminary figures)," Ministry of the Environment, and "National greenhouse gas inventory report of Japan 2017"

○ Technologies to reduce livestock-related GHG emissions



○ Popularization of amino acid balanced feed



○ R&D related to variability of livestock-related GHGs between individual animals



○ R&D related to livestock management technology for GHG reduction

Source: "Overview of the plan for global warming countermeasures of the Ministry of Agriculture, Forestry and Fisheries (March 2017)" 15

5. Other: (ii) main support for measures addressing livestock-related environmental issues (FY2018)

- In principle, livestock business operators should assume responsibility for implementing measures to address livestock-related environmental issues. However, when they intend to implement such measures in compliance with the Japanese government's policies to strengthen livestock production infrastructure, they may be eligible to receive subsidies to improve their facilities. They also may be eligible to use leasing services and receive tax benefits to improve their facilities.
- The introduction and popularization of appropriate technologies are important in promoting measures to address livestock-related environmental issues. We , therefore, offer training to develop on-site farm advisors and popularize examples of livestock farmers implementing such measures effectively.

➤ Assistance with the introduction of facilities and machinery

Assistance is provided to improve facilities (e.g., composting sheds) and machinery in the form of subsidy programs (which in principle cover 50% of the cost for farms intending to expand the scale of their operations and where other requirements are met), leasing of facilities and machines (no subsidies available), tax benefits and financing, etc.

➤ Assistance with power generation through the feed-in tariff (FIT) program

Assistance is provided to support renewable energy-based power generation, such as biomass power generation using livestock waste. The Japanese government sets unit prices for electricity generated in this manner to ensure that farmers' income from the sale of electricity exceeds the cost of improving, operating and maintaining facilities and machinery necessary for power generation.

➤ Assistance with technological development

Assistance is provided to national, regional and university research organizations that develop new technologies to facilitate compost utilization, sewage treatment and odor control, etc.

➤ Human resources development

Annual training sessions are held on different subjects—such as composting, sewage treatment and odor control—to develop on-site farm technical advisors. More than 10,000 people have received such training.

➤ Popularization of good examples and new technologies

Surveys are conducted to identify examples of farmers effectively implementing measures or adopting new technologies to address livestock-related environmental issues. Such examples are widely publicized to promote their nationwide adoption. 16