

Climate change adaptation and mitigation

The pressing global challenge of climate change is one of the most important issues as it makes a significant impact on the business and strategy of the Ajinomoto Group. As climate change continues to worsen, we can expect to see more risks, such as difficulty in procuring raw materials. The Group regards climate change as a Group-wide material risk and opportunity. As such, we are looking at countermeasures from the four perspectives of governance, strategy, risk management, and metrics and targets. In addition to promoting energy-saving activities and the use of renewables to help reduce our impact throughout the whole product life cycle, we will participate in global initiatives, striving to solve problems while collaborating both internally and externally.

Specific examples

- Reduction of greenhouse gas emissions (Scope 1, 2, and 3)
- Energy management
- Fuel management
- Air quality

Related opportunities and risks (○ Opportunity ● Risk)

- Initiatives toward net-zero GHG emissions, and cost competitiveness ensured through reduced carbon tax burden
- Collaboration with outside organizations on decarbonization
- Failure to procure raw materials due to climate change
- Damaged corporate value due to delayed response to climate change

Key initiatives by the Ajinomoto Group

- Long-term effort to turning the overall product lifecycle carbon neutral
- Initiatives to reduce energy use during production and transportation
- Convert to fuels with lower greenhouse gas emissions emission factors
- Use of internal carbon-pricing
- Disclosing information in line with the Task Force on Climate-related Financial Disclosures (TCFD) (scenario analysis, etc.)
- Lowering environmental impact by feed-use amino acids (reduction of soil and water pollution)

Related SDGs



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Framework

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Response to climate change risks

The Ajinomoto Group uses the bounty of nature such as agricultural products. We understand that responding to climate change is an urgent issue in conducting business in a sustainable manner. To this end, we work to explore countermeasures and disclose related information based on the recommendations of the Task Force on Climate-related Financial Disclosures (TCFD). In addition, our greenhouse gas (GHG) emissions reduction targets have been approved by the Science Based Targets initiative (SBTi), a joint organization endorsed by major global companies. Furthermore, we have announced our participation in the RE100 initiative, which aims to use electricity from 100% renewable energy. In addition, in March 2022, we submitted a commitment letter to the SBTi declaring that we would achieve net zero GHG emissions by fiscal 2050.

Disclosures based on the TCFD recommendations

Governance

The Ajinomoto Group Policies (AGP) show the ideal way of thinking and actions with which Group companies, officers, and employees should comply. The Ajinomoto Group is committed to complying honestly with this policy, and we will continue to develop and operate our internal control system properly. We are also strengthening our system that considers sustainability, including addressing climate change, as an active risk-taking opportunity, and continuously enhancing our corporate value.

The Board of Directors has established the Sustainability Advisory Council as a subordinate body, creating a system for making recommendations on the Group's approach to sustainability from a multiple-stakeholder perspective. The Board of Directors determines materiality items related to sustainability that serve as guidelines for ASV management, including items related to climate change. The Executive Committee has established the Sustainability Committee as a subordinate body, which selects and extracts significant risks and opportunities Group-wide, including those related to climate change, and assesses the degree of impact, formulates strategies to combat these, and manages their progress.

Strategy

Products in the Ajinomoto Group's business domains range from seasoning, food, and frozen foods to healthcare. Further, our operations span the globe. Climate change may impact Group operations in many ways. Major natural disasters may become diminished our business activities, affecting our ability to procure raw materials and fuel. Disasters may also alter the consumption of our products.

The Group reviews production over the short, medium, and long term, considering the physical risks of climate change (droughts, floods, rising sea levels, changes in yield of our main raw materials, etc.) and transition risks (introduction of carbon tax, tightening of other laws and regulations, increasing energy unit prices, changes in consumer preferences, etc.).

Since fiscal 2018, we have included a scenario analysis of the impacts of climate change on our business. We also established a framework for a more quantitative assessment of risk based on the TCFD recommendations. As a result of scenario analyses, we are reviewing counterstrategies related to physical and transition risks, such as switching to energy sources with low GHG emissions and product development that links sustainability initiatives to product added value, and we are formulating business strategies accordingly.

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Risk management

In light of politics, economics, social conditions, climate change, and other circumstances surrounding the Group, the Sustainability Committee determines the overall level of risks reflecting the impact on our business and likelihood of occurrence. The committee then identifies the significant risks Group-wide and considers strategies in response.

For materiality issues identified as Group-wide risks, the Sustainability Committee formulates and implements Group-wide response strategies, and regularly monitors and manages the status of risk responses. The committee uses scenario analysis to assess the Group's climate-related risks and opportunities. Enterprise continuity plans (ECPs) have been developed for each business site to uncover risks specific to each site, including climate change, and to explore countermeasures to address these.

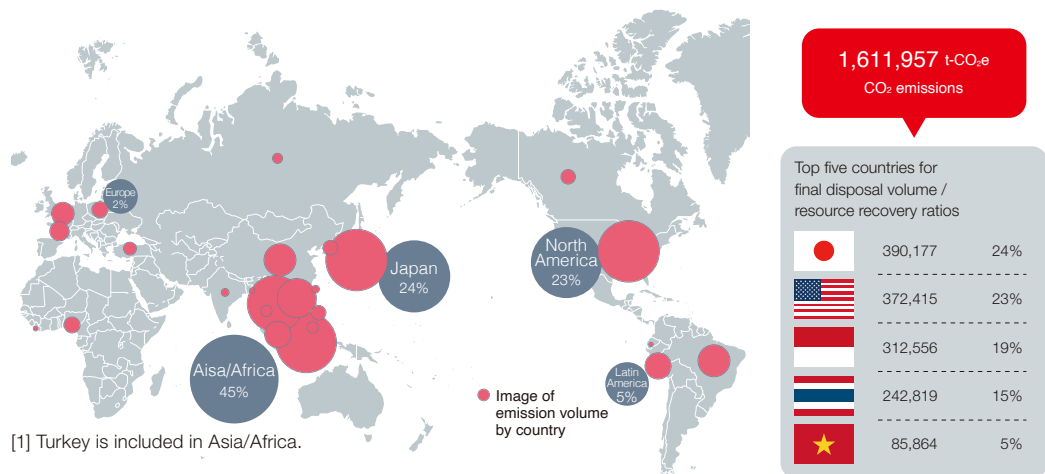
Climate-related risks are regarded as part of significant risks Group-wide. We evaluate the impact of physical risks and transition risks, such as legal risks and market risks, based on published reports and expert advice. The committee's review and recommendations were reported four times during fiscal 2021 at meetings of the Executive Committee and the Board of Directors.

Metrics and targets

Total Scope 1 and 2 GHG emissions for fiscal 2021 were down approximately 300,000 tons of CO₂e from the previous fiscal year to 1,611,957 tons of CO₂e. The top five countries of Japan, the United States, Indonesia, Thailand and Vietnam accounted for 87% of this total. Scope 3 emissions were down approximately 840,000 tons of CO₂e from the previous fiscal year to 10,948,000 tons of CO₂e. Total emissions from Scope 1, 2, and 3 came to 12,600,000 tons of CO₂e, with Scope 3 emissions comprising more than 87% of the total.

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CO₂ emissions (Scope 1 and 2) by area^[1] (Fiscal 2021)



For fiscal 2030, we have set a target of 50% reduction in Scope 1 and Scope 2 GHG emissions versus fiscal 2018 levels. We acquired SBTi approval for this target for its 1.5°C scenario in April 2020. As measures to meet this goal, we are promoting energy-saving activities, a switch to fuels with low GHG emissions, the use of renewables such as biomass and solar power, and the introduction of lower energy-consumption processes. Specifically, at the Kyushu Plant, we have switched fuels from heavy oil to natural gas, and at the Kamphaeng Phet Plant in Thailand, we have introduced cogeneration facilities. In fiscal 2018, base emissions were 1,962,000 tons of CO₂e, calculated by subtracting Scope 1 and 2 GHG emissions from companies that would become outside of the Group's scope on or after fiscal 2019 in accordance with SBTi standards. By comparison, emissions in fiscal 2021 were 1,612,000 tons of CO₂e, down 18% and greatly exceeding our target for the year. In particular, with regard to Scope 2, we made significant progress year-on-year by concluding direct contracts with renewable energy power plants in Brazil, procuring renewable energy certificates in

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Thailand, and concluding contracts with power companies with low CO₂ emission factors in Japan. For the SBTi target of Scope 3 emissions (excluding Category 11), we have set a fiscal 2030 target of a 24% reduction of GHG emissions per volume unit (per one ton of production) over fiscal 2018 levels. Of these, raw materials are causing approximately 60% of total GHG emissions over the whole product life cycle, therefore we are encouraging raw materials suppliers to reduce their GHG emissions, and are considering the introduction of new technologies such as on-site ammonia production. The GHG emissions intensity per ton of production, retroactively adjusted for Scope 3 (excluding Category 11) GHG emissions of companies that became outside of the Group's scope on or after fiscal 2019 in accordance with SBTi standards, was down 1% from the previous fiscal year, but increased 8% compared to fiscal 2018, the base year.

GHG emissions calculated from IEA^[2] CO₂ emissions factors

(t-CO₂e)

	FY2017	FY2018	FY2019	FY2020	FY2021
Scope 1 emissions	1,244,676	1,196,969	1,013,315	1,008,811	1,005,363
Scope 2 emissions (market-based method)	1,072,248	1,015,723	960,375	901,789	606,594
Scope 1 and 2 total emissions	2,316,924	2,212,692	1,973,690	1,910,600	1,611,957
Scope 3 emissions	11,972,183	11,933,270	11,821,564	11,787,705	10,947,844
Scope 1, 2, and 3 total emissions	14,289,107	14,145,962	13,795,254	13,698,305	12,559,801

[2] International Energy Agency

GHG emissions per volume unit calculated from IEA CO₂ emissions factors

(t-CO₂e)

	FY2017	FY2018	FY2019	FY2020	FY2021
Scope 1 and 2 emissions per volume unit (intensity per ton of production)	0.86	0.84	0.79	0.79	0.68
Scope 3 emissions per volume unit (intensity per ton of production)	4.46	4.54	4.71	4.87	4.64
Reference value: Production volume (1,000 t)	2,684	2,627	2,512	2,423	2,360
Scope 1 and 2 emissions per volume unit (intensity per million yen of sales)	—	1.99	1.79	1.78	1.40
Scope 3 emissions per volume unit (intensity per million yen of sales)	—	10.7	10.7	11.0	9.5
Consolidated sales (million yen)	—	1,114,308	1,100,039	1,071,453	1,149,370

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Scope 1 and 2 emissions and Scope 3 (excluding Category 11) intensity retroactively adjusted for companies that became outside of the Group's scope on or after fiscal 2019 in accordance with SBTi standards

(t-CO₂e)

	FY2018	FY2019	FY2020	FY2021
Scope 1 and 2 total emissions (market-based method)	1,961,516	1,779,380	1,752,812	1,611,957
Scope 3 emissions (excluding Category 11)	9,876,834	9,858,584	9,951,981	9,550,897
Scope 3 emissions per volume unit (excluding Category 11)	3.76	3.92	4.11	4.05

SBTi targets and progress

	FY2021		FY2025	FY2030
	Target	Result	Target	Target
Scope 1 and 2 GHG emission reduction rate (vs. FY2018)	14%+ decrease	18% decrease	30% decrease	50% decrease
Scope 3 (excluding Category 11) GHG emissions per volume unit reduction rate (vs. FY2018)	6% decrease	8% increase	14% decrease	24% decrease

NOx and other atmospheric emissions

	FY2018	FY2019	FY2020	FY2021
Nitrogen oxide (NOx)	9,421	5,224	6,637	5,673
Sulfur oxide (SOx)	10,701	6,779	7,016	7,676
Particulates	1,827	884	1,310	871
CFCs ^[1]	11	9	7	5

[1] Figures for fiscal 2019 and beyond exclude natural refrigerants and other non-fluorocarbons due to the redefinition of CFCs, HCFCs, and HFCs.

Summary of scenario analysis conducted

In fiscal 2021, we conducted a scenario analysis of the impact of climate change on our global umami seasonings and domestic mainstay products (equivalent to 24% of consolidated sales) in 2030 and 2050 under the assumption that the average global temperature rises by 2°C or 4°C by 2100 versus post-Industrial Revolution levels. We review production over the medium and long term, considering the physical risks of climate change (droughts, floods, rising sea levels, changes in raw material yields, etc.) and transition risks (introduction of carbon tax, tightening of other laws and regulations, increasing energy unit prices, changes in consumer preferences, etc.).

From fiscal 2022 onward, we intend to further enhance our risk and opportunity analysis by expanding the range of products covered and placing more emphasis on the water risk of raw materials.

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Scenario analysis assumptions by year

	Y2020 ^[1]	FY2021	FY2022 (Plan)
Business	Umami seasonings (global), mainstay domestic products	Umami seasonings (global), mainstay domestic products	Umami seasonings (global), mainstay domestic and overseas products
Time of occurrence	2030	2030/2050	2030/2050
Scenario	2°C/4°C	2°C/4°C	2°C/4°C

[1] Please refer to the 2021 Sustainability Data Book for the results of the scenario analysis conducted in fiscal 2020.

The average temperature difference in 2030 between the 2°C and 4°C scenarios is about 0.2°C, which means that no significant difference in physical risk is expected.

The following is a summary of the risks and opportunities based on a scenario analysis for the year 2050, when the average temperature difference is expected to be about 1°C and there is expected to be a difference in physical risk, as well as countermeasures to address these.

■ Scenario analysis: Risks

2°C scenario (2050)			
Risk/Risk categories	Business impact	Potential financial impact	Countermeasures
Physical risks			
Average temperature increase	Decline in productivity of agriculture, livestock, and fishery products	1.5 billion yen/year	<ul style="list-style-type: none"> • More diversified areas of procurement • R&D on alternative raw materials • Development of environmentally-friendly manufacturing methods
Increased severity and frequency of floods and droughts	Increased raw material procurement costs	To be calculated	<ul style="list-style-type: none"> • More diversified areas of procurement • R&D on alternative raw materials
Transition risks			
Mandates and regulations on products	Increasing raw material procurement costs due to tighter laws and regulations on traceability, etc.	To be calculated	<ul style="list-style-type: none"> • Information gathering for suppliers • Collaboration with suppliers
Changes in consumer preferences	Changing needs due to rising temperatures	To be calculated	<ul style="list-style-type: none"> • Promotion of the nutritional value of products
Carbon pricing mechanisms	Rising raw materials and fuel procurement costs due to carbon taxes and emissions trading	Group-wide, 2030: 20 billion yen/year ^[1] 2050: 30 billion yen/year ^[1]	<ul style="list-style-type: none"> • Visualization of financial impact of internal carbon-pricing systems • Fossil fuel phase-out • Use of renewable energies • Development of environmentally-friendly manufacturing methods

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4°C scenario (2050)			
Risk/Risk categories	Business impact	Potential financial impact	Countermeasures
Physical risks			
Average temperature increase	Decline in productivity of agriculture, livestock, and fishery products	2.0 billion yen/year	<ul style="list-style-type: none"> • More diversified areas of procurement • R&D on alternative raw materials • Introduction of high temperature-tolerant varieties • Reflection in sales price • Development of environmentally-friendly manufacturing methods
Increased severity and frequency of floods and droughts	Increased raw material procurement costs, shutdown of operations, and decreased sales due to delivery delays	0.1 billion yen/year	<ul style="list-style-type: none"> • More diversified areas of procurement • R&D on alternative raw materials
Transition risks			
Changes in consumer preferences	Changing needs due to rising temperatures	To be calculated	<ul style="list-style-type: none"> • Promotion of the nutritional value of products
Increasing fuel costs	Increasing fuel procurement costs	1.0 billion yen/year	<ul style="list-style-type: none"> • Fossil fuel phase-out • Use of renewable energies • Development of environmentally-friendly manufacturing methods

[1] Calculated by multiplying the Group's fiscal 2018 standard greenhouse gas emissions approved by SBTi by 2030 carbon tax and emissions trading projections corresponding to the IEA's 2°C scenario (US\$75/t-CO₂ in developing economies and US\$100 in advanced economies, carbon taxes and emissions trading projections for 2040: US\$125 in developing economies and US\$140 in advanced economies). The 4°C scenario is the outcome of the current situation with no additional or higher carbon taxes or emissions trading expected.

■ Scenario analysis: Opportunities

2°C scenario (2050)			
Opportunities	Business impact	Potential financial impact	Countermeasures
Products and services with low CO ₂ emissions	Expanding needs through the expansion of ethical thinking	To be calculated	<ul style="list-style-type: none"> • Development of environmentally-friendly manufacturing methods and products • Promotion of initiatives to achieve high ESG ratings (only for 2°C) • Strengthening evidence of low environmental impact
Changes in consumer preferences	Changing needs due to growing health-consciousness and rising temperatures	To be calculated	<ul style="list-style-type: none"> • Improvement of the nutritional value of products • Promotion of the nutritional value of products • Development of environmentally-friendly manufacturing methods and products

Based on the results of the scenario analysis, we plan to invest in switching to alternative fuels, the use of renewable energy, and environmentally friendly manufacturing methods to further reduce GHG emissions. We will also work toward product development to devise symbiotic solutions so that our sustainability initiatives lead to greater added value for our products.

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Reduction of greenhouse gas emissions
in the value chain

Internal carbon-pricing

We are bolstering our decarbonization measures through the utilization of internal carbon-pricing systems so that we can avoid or mitigate the financial risks from carbon taxes and emissions trading, and we are promoting measures such as alternative fuels and use of renewable energy.

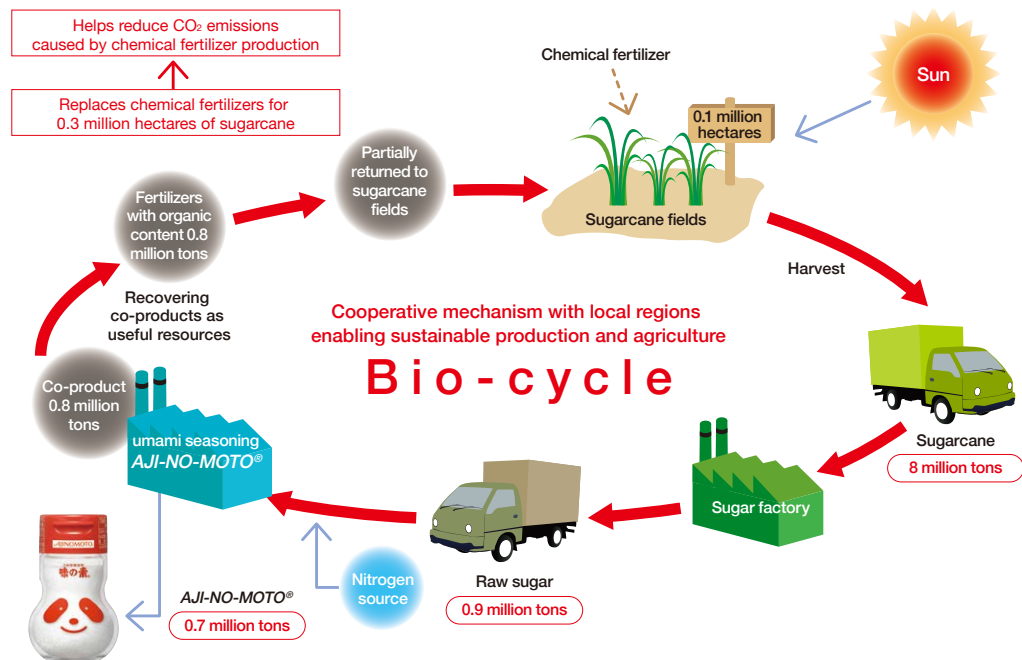
Bio-cycles contribute to reductions in greenhouse gas emissions

The Ajinomoto Group produces amino acids through fermentation processes from crops that are easily available in each region. We use as fertilizer and feed nearly 100% of the nutritionally rich by-products (co-products) that remain after extracting amino acids in the fermentation process. We call this type of circular amino acid fermentation processing a bio-cycle, and by introducing this in fermentation facilities around the world, we are working to reduce GHG emissions associated with production of ordinary chemical fertilizer and support sustainable agriculture.

Approach

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The Ajinomoto Group Bio-cycles



[1] The chart assumes worldwide annual Group production of approximately 0.7 million tons of the umami seasoning AJI-NO-MOTO® using only sugarcane. The figures for sugarcane grown and sugar production are commonly used global figures. The figures related to resources used for producing AJI-NO-MOTO® are based on actual statistics from the Group. Bio-cycle concept and image were revised considering the changes of production process and raw material procurement situation.

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Performance

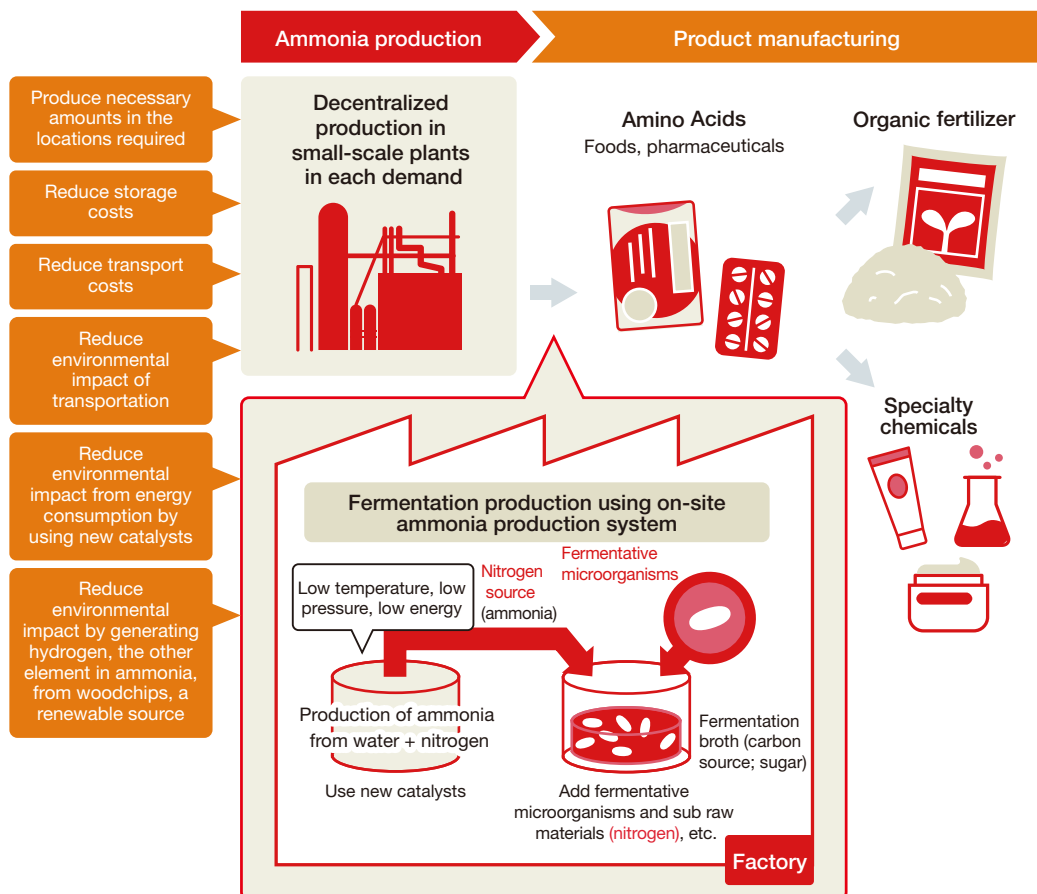
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Reducing environmental impact through on-site ammonia production

Currently, ammonia is produced worldwide using the Haber-Bosch process, and this generally uses natural gas as its raw material. This production method is carried out in large plants under high-temperature and high-pressure reaction conditions. It requires special equipment to transport the final product to where there is demand, and on transport, there is significant environmental impact in terms of CO₂ emissions, etc. The Ajinomoto Group procures ammonia externally as a raw material in the fermentation processes for amino acids, and to solve these problems, we are working toward practical implementation of on-site production to produce the necessary amount of ammonia where it is needed. In 2017, Ajinomoto Co., Inc., in partnership with Professor Hideo Hosono of the Tokyo Institute of Technology and others, established Tsubame BHB Co., Ltd., and we are working towards the commercialization of the world's first on-site production ammonia synthesis system using new catalysts discovered and developed by Professor Hosono. New catalysts allow to synthesize ammonia even under low-temperature and low-pressure conditions, which enables production in small-scale plants, something considered difficult to accomplish under the Haber-Bosch process. The small-scale plants can be located in the area of consumption, which will reduce costs and the environmental impact of transportation.

In October 2019, Tsubame BHB completed a pilot production facility at our Kawasaki Plant, launching operations capable of production of several tens of tons per year. We are moving forward with studies with the aim of commercializing this in 2023 or thereafter. At Ajinomoto Co., Inc., we are also developing green hydrogen production technology for using local renewable materials (wood chips) to produce hydrogen, a raw material of ammonia. By combining this technology and Tsubame BHB's ammonia synthesis technology, we estimate that the CO₂ emissions generated in the production of ammonia will be cut to one-eighth.

On-site ammonia production system



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Shifting to renewable energy

In August 2020, the Ajinomoto Group announced its participation in RE100, an international environmental initiative comprising companies aiming to achieve 100% renewable energy for electricity. Companies participating in RE100 are from diverse fields such as information technology through to automobile manufacturing. Member companies are asked to publicly announce their goals to use 100% renewable energy sources such as solar power, wind power, hydroelectric power, biomass, and geothermal power in their business activities by the year 2050.

In fiscal 2021, we made progress in shifting to renewable energy through measures like concluding direct contracts with renewable energy power plants in Brazil, procuring renewable energy certificates in Thailand, and concluding contracts with power companies with low CO₂ emission factors in Japan.

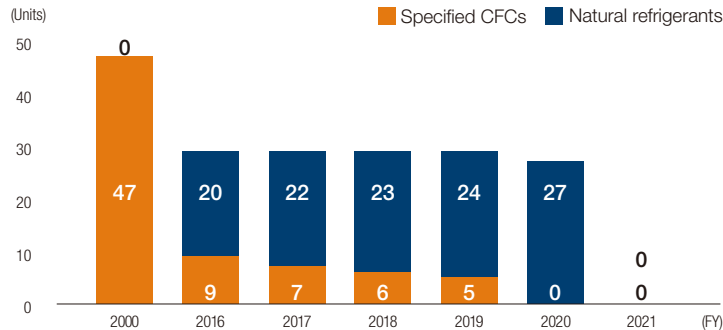
Management of fluorocarbons

The Ajinomoto Group aims to eliminate all Hydrofluorocarbons (HFCs) by fiscal 2030 at factories with equipment that use fluorocarbons. Our intent is to switch to natural refrigerants or refrigerants with low Global Warming Potential (GWP) of less than 150 when installing new or upgrading existing equipment.

In 2001, when Japanese frozen food factories were not yet required to discontinue their use of equipment using specified Chlorofluorocarbons (CFCs), we started with an initiative to phase out the usage of freezers using these chemicals, and as of the end of March 2021, we have eliminated the use of those freezers in Ajinomoto Frozen Foods Co., Inc.

We are continuing efforts at our plants to fully eliminate CFC substitutes by fiscal 2030, and will work to decrease use of fluorocarbons across the entire Ajinomoto Group.

Switching to fluorocarbon-free freezers (switching progress at frozen food factories in Japan)



Initiatives in transportation

The Ajinomoto Group is working to establish a sustainable logistics system. The F-LINE Project launched in 2015 by six food manufacturers^[1] operates joint transport in Hokkaido and Kyushu, as well as a joint mainline trunk transport in Hokkaido, in a spirit of competing on products, but distribute in cooperation.

Furthermore, the joint logistics company F-LINE CORPORATION, established by five food manufacturers^[2] including Ajinomoto Co., Inc., aims to provide efficient logistics throughout Japan by initiatives such as joint logistics.

[1] House Foods Group Inc., Kagome Co., Ltd., Nisshin Seifun Welna Inc., Nisshin Oillio Group, Ltd., Mizkan Co., Ltd., and Ajinomoto Co., Inc.

[2] Five companies listed in above [1] excluding Mizkan Co., Ltd.

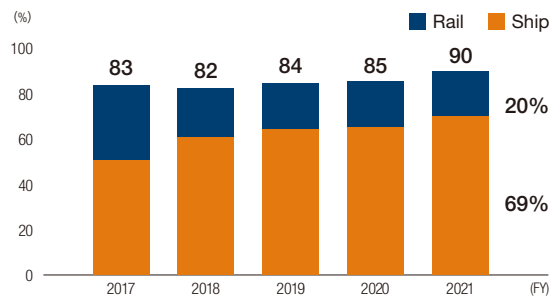
Modal shift ratio

The Ajinomoto Group has pursued a modal shift^[3] since 1995 in an effort to enhance transport capacity and make logistics more environmentally friendly. During fiscal 2021, Ajinomoto Co., Inc. achieved an overall 90% long-distance transport modal shift by using ships for transport.

Performance

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Modal shift ratio of Ajinomoto Co., Inc. for 500 km or more

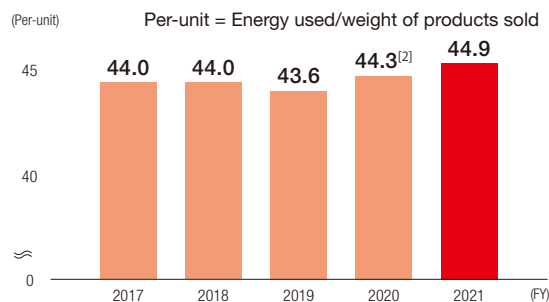


[3] Selecting rail or ship transport methods to generate a smaller environmental impact. Compared to commercial freight vehicles (trucks), railway container and ship transport results in CO₂ emissions of one-tenth and one-fifth, respectively.

Per-unit energy use in logistics

Ajinomoto Co., Inc., Ajinomoto Frozen Foods Co., Inc., and Ajinomoto AGF, Inc. are considered specified consignors under the Energy Conservation Act. Each company is legally obligated to make efforts in reducing per-unit energy use (crude oil equivalent) within their cargo logistics by at least 1% per year on average over five years, reporting results to the Japanese government. The total usage by these three companies reduced by an average of 3.8% over the five years to fiscal 2021 thanks to restructuring logistic network and improving the modal shift ratio.

Per-unit energy use in logistics^[1]



[1] Combined results for Ajinomoto Co., Inc., Ajinomoto Frozen Foods Co., Inc., and Ajinomoto AGF, Inc.

[2] Corrections have been made as a result of review of totals.

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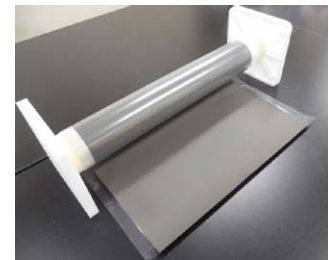
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Contribution to CO₂ reductions through new magnetic materials

As we enter the data society, we are seeing a rapid increase in demand for semiconductors used in PCs, servers, 5G base stations, and similar, and consequently societal demands for reduced CO₂ emissions by making these semiconductors more energy efficient. The electronic materials business is one of the core businesses of the Ajinomoto Group, in which we focus on providing interlayer insulating materials for semiconductor packages. We are leveraging our long-cultivated technical expertise and knowledge and involving stakeholders in the supply chain, and have developed new magnetic materials that enable power savings in ever-faster semiconductors. The innovative semiconductor package substrate attained through use of this magnetic material will contribute greatly to reduce electricity consumption and associated CO₂ emissions. The magnetic performance of this material also enables reductions in the size of the semiconductor power supply functions, which reduces the size of components to less than one-fifth that of conventional components. This also enables incorporation of a large number of these power supply functions into the semiconductor package substrate at a low cost, which helps with lower component counts thus achieving power savings, and contribute significantly towards the maintenance of a sustainable global environment. This magnetic material is beginning to be used in semiconductor package substrates for servers, AI, and other applications, and is being evaluated for introduction by our customers.

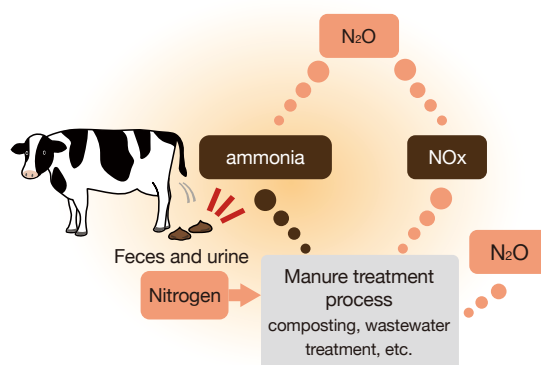


Newly developed magnetic materials
(Top) Paste type (Bottom) Film type

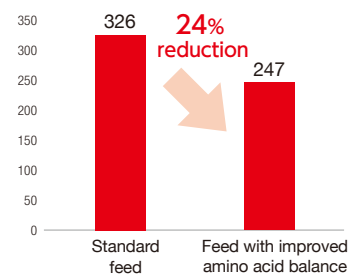
Reducing nitrogen emissions of livestock by amino acids for animal nutrition

Feeds with poor amino acid balance result in an oversupply of unnecessary amino acids, which is not utilized within the animals and excreted in large quantities as nitrogen compounds. In the process of manure management, nitrogen compounds turn into nitrous oxide (N₂O), which has environment impact of approximately 300 times the greenhouse gas effect of CO₂. When the amino acid balance in feed is adjusted using amino acids for animal nutrition, the amount of nitrogen compounds in the manure can be reduced by 20% to 30%. This can also reduce life-cycle CO₂ (LC-CO₂). Utilizing amino acids for animal nutrition contribute to sustainable livestock production that is friendly to the global environment.

N₂O cycle



Nitrogen emissions per dairy cow (g/day)



Source: Higuchi et al., 17th AAAP ANIMAL SCIENCE CONGRESS, 2016