

1. Transition of the CO₂ Emissions

<based on the level of CO₂ Emission in FY1991>

1) FY2001-FY2005

<Refer "Preventing Global Warming" in Corporate Citizenship Report 2010, website>

The Kikkoman Group, since its announcement of its medium- and long-term environmental preservation goals in August 2000, has considered the prevention of global warming as a priority. The goal set for major manufacturing group companies in Japan was to reduce CO₂ emissions to 92% (minus 8%) of the level in FY1991 by FY2011.

The target companies in FY1991 included Kikkoman Corp., Nippon Del Monte Corp. and Manns Wine Co., Ltd.

2) FY2006-FY2010

<Reported in FY2007>

In May 2005, the goal was further reduced to 90% of that of FY1991 level.

The target companies: 3 major domestic manufacturing companies (Kikkoman Corp., Nippon Del Monte Corp. and Manns Wine Co., Ltd.)

<Reported in FY2009>

Along with the reorganization of the companies within the Kikkoman Group, Kikkoman Corp. and Nippon Del Monte Corp. were separated and new names were given to the respective companies. (The target companies themselves were not changed.)

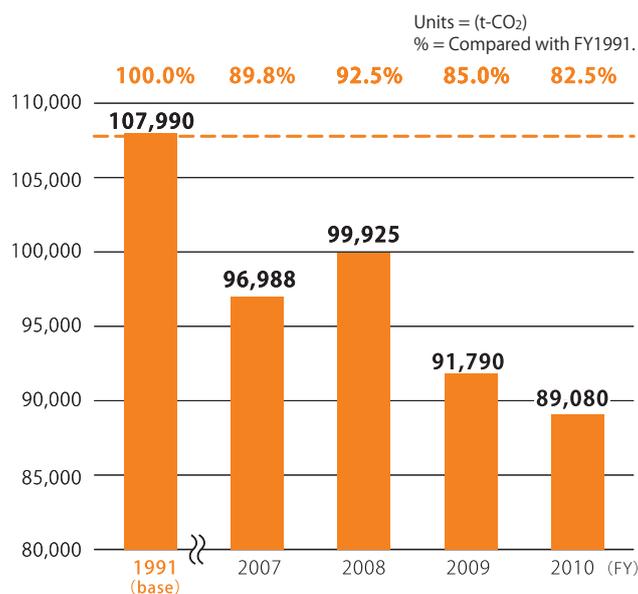
The target companies: 8 major domestic manufacturing companies (Kikkoman Corp., Hokkaido Kikkoman Co., Nagareyama Kikkoman Co., Ltd., Heisei Foods Co., Edogawa Foods Co., Nippon Del Monte Corp., Tohoku Del Monte Corp., and Manns Wine Co., Ltd.)

【FY2007-FY2010】

<Reported in FY2011>

Total CO₂ emissions from FY2007-FY2010 are shown in the following chart.

● Transition of the CO₂ emissions (Major manufacturing companies in Japan)



3) FY2011-FY2012

[FY2011]

<Refer "Preventing Global Warming" in Corporate Citizenship Report 2011, website>

In FY2011, the Kikkoman Group decided to lower the target of "global warming prevention" by FY2013 by 15% or more from the FY2006 level by reducing the total CO₂ emissions of major domestic companies. Further, target companies increased to 11 including Foodchemifa Co., Ltd., and Takara Shoyu Co., Ltd.

The target companies: 11 major domestic companies (Kikkoman Corp., Kikkoman Food Products Co., Hokkaido Kikkoman Co., Nagareyama Kikkoman Co., Ltd., Heisei Foods Co., Edogawa Foods Co., Nippon Del Monte Corp., Tohoku Del Monte Corp., Manns Wine Co., Ltd., Foodchemifa Co., Ltd., and Takara Shoyu Co., Ltd.)

In FY2011, the total CO₂ emissions of the 11 major domestic companies of the Kikkoman Group amounted to 126,057t-CO₂, which was 87.0% of the FY2006 level or the reduction of CO₂ emissions by 18,919t-CO₂. This reduction is attributed to the improvements of the Noda Factory, and the use of natural gas as boiler fuel by respective companies.

[FY2012]

<Refer "Preventing Global Warming," Corporate Citizenship Report 2012 detailed edition>

In FY2012, the Fukushima Factory of Nippon Del Monte Corp. and Tohoku Del Monte Corp. consolidated their business, and Foodchemifa Co., Ltd. was separated into Kikkoman Biochemifa Co. and Kikkoman Soyfoods Co., as a result, the number of target companies remained 11.

The target companies: 11 major domestic companies (Kikkoman Corp., Kikkoman Food Products Co., Hokkaido Kikkoman Co., Nagareyama Kikkoman Co., Ltd., Heisei Foods Co., Edogawa Foods Co., Nippon Del Monte Corp. (except for Fukushima Factory), Tohoku Del Monte Corp., Manns Wine Co., Ltd., Kikkoman Biochemifa Co., Kikkoman Soyfoods Co. and Takara Shoyu Co., Ltd.)

In FY2012, the total CO₂ emissions of the major domestic companies of the Kikkoman Group amounted to 114,030t-CO₂. It was 78.7% of the FY2006 level indicating the reduction of 30,946t-CO₂. The improvements made by consolidation in Nippon Del Monte Corp., and the use of natural gas as boiler fuel by respective companies contributed to this reduction.

4) FY2013-FY2015

[FY2013]

<Refer "Preventing Global Warming" in Corporate Citizenship Report 2013, website>

In FY2013, as part of our domestic "Global warming prevention" efforts, a more severe numerical goal for reduction of CO₂ emissions by major domestic companies was set. Emissions must be reduced by 17% or more of the FY2006 CO₂ emissions by FY2015. Saitama Kikkoman Co. which began its full operations in FY2013 was added to the list of target companies.

The target companies: 12 major domestic companies (Kikkoman Corp., Kikkoman Food Products Co., Hokkaido Kikkoman Co., Nagareyama Kikkoman Co., Ltd., Heisei Foods Co., Edogawa Foods Co., Saitama Kikkoman Co., Nippon Del Monte Corp. (except for Fukushima Factory), Tohoku Del Monte Corp., Manns Wine Co., Ltd., Kikkoman Biochemifa Co., Kikkoman Soyfoods Co. and Takara Shoyu Co., Ltd.)

The total CO₂ emissions by major companies in the Kikkoman Group amounted to 115,523t-CO₂ in FY2013, which was 79.7% of the FY2006 level, or a reduction of 29,453t-CO₂. Comparing to that of FY2012, however, CO₂ emissions increased by 1,493t-CO₂ as the production increased in volume in the fiscal year.

[FY2014]

<Refer "Preventing Global Warming," Corporate Citizenship Report 2014 detailed edition>

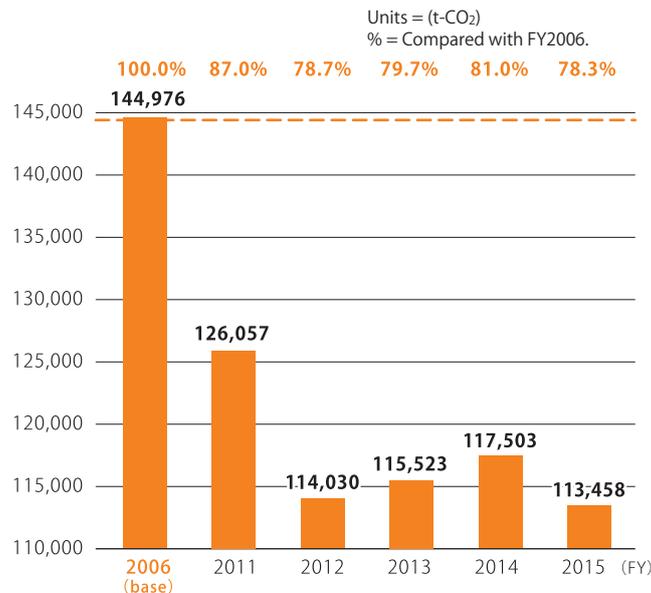
In FY2014, the total CO₂ emissions by major domestic companies of the Kikkoman Group was 117,503t-CO₂, which was 81.0% of that of FY2006, indicating a reduction by 27,473t-CO₂. However, in comparison with FY2013, there was an increase of 1,980t-CO₂ in total emissions related to increases in the total amount of manufacturing.

[FY2015]

<Refer “Preventing Global Warming,” Corporate Citizenship Report 2015 detailed edition>

In FY2015, the total CO₂ emissions by major domestic companies of the Kikkoman Group amounted to 113,458t-CO₂, which was 78.3% of that of FY2006, which was a reduction of 31,518t-CO₂. Comparing with FY2014, emissions decreased by 4,045t-CO₂.

● Transition of the CO₂ emissions (Major domestic companies)



5) FY2016-FY2018

[FY2016]

<Reported in FY2017>

In the Medium- and Long-term Environmental Preservation Goals FY2013-2015, the Kikkoman Group set forth two objectives concerning CO₂ emissions in its activities: First, to reduce the total CO₂ emissions at the major domestic companies by 17% or more from the FY 2006 levels by FY 2015, and second, to reduce the CO₂ emissions per unit of production at the major domestic companies and overseas manufacturing companies by 1% or more from that of the previous fiscal year (FY).

As a result, total CO₂ emissions by major domestic companies amounted to 113,458t-CO₂ in FY2015 which was less than the FY2006 level (144,976t-CO₂) by 31,518t-CO₂ or 21.7%. At the same time, CO₂ emissions per unit of production by major domestic companies as well as major overseas manufacturing companies was 0.156t-CO₂/t, a decrease by 0.005t-CO₂/t, or 3.1% from the level of FY2014 (0.161t-CO₂/t). Thus, both objectives were achieved.

In formulating the Medium-term Environmental Preservation Goals FY2016-2018, the Kikkoman Group designated the following new objectives.

[Objectives in the Medium-term Environmental Preservation Goals FY2016-2018]

(1) To reduce the CO₂ emissions per unit of production at the domestic manufacturing divisions by 20% or more from the FY 2006 levels by FY 2018.

The target divisions: 19 plants of domestic manufacturing companies: Kikkoman Food Products Co. (Noda and Takasago Factories), Hokkaido Kikkoman Co., Nagareyama Kikkoman Co., Ltd., Heisei Foods Co. (Main, Nakanodai, and Nishinippon Plants), Edogawa Foods Co., Saitama Kikkoman Co., Nippon Del Monte Corp. (Gunma and Nagano Plants), Tohoku Del Monte Corp., Manns Wine Co., Ltd. (Katsunuma and Komoro Wineries), Kikkoman Biochemifa Co. (Edogawa and Kamogawa Plants), Kikkoman Soyfoods Co. (Saitama, Gifu and Ibaraki Plants) and Takara Shoyu Co., Ltd. (Choshi Plant)

(2) To reduce the CO₂ emissions per unit of production at the major overseas manufacturing divisions by 3% or more from the FY 2015 levels by FY 2018.

The target divisions: 4 plants of major overseas manufacturing companies: Wisconsin and California Plants of Kikkoman Foods, Inc. (KFI), Plant of Kikkoman (S) Pte. Ltd. (KSP) and Plant of Kikkoman Foods Europe B.V.(KFE)

(3) To reduce the CO₂ emissions at the domestic sales and back-office divisions annually by 1% or more from that of the previous fiscal year (FY).

The target divisions: Domestic sales and back-office divisions: Kikkoman Corp., Kikkoman Food Products Co., Kikkoman Beverage Co., Kikkoman Business Service Co., Nippon Del Monte Agri Co. and Kikkoman Daily Co.

The CO₂ emissions at Kikkoman Group domestic manufacturing divisions (19 plants) in FY2016 were 108,000t-CO₂, which were decreased by 22.3% and 0.9% as compared with FY2006 (139,000t-CO₂) and FY2015 (109,000t-CO₂), respectively.

The CO₂ emissions at Kikkoman Group major overseas manufacturing divisions (4 plants) in FY2016 were 37,000t-CO₂, which were increased by 2.8% as compared with FY2015 (36,000t-CO₂).

The CO₂ emissions at Kikkoman Group domestic sales and back-office divisions in FY2016 were 4,100t-CO₂, which were decreased by 2.4% as compared with FY2015 (4,200t-CO₂). The objective was achieved in these divisions.

【FY2017】

<Reported in FY2019>

The CO₂ emissions at Kikkoman Group domestic manufacturing divisions (19 plants) in FY2017 were 107,000t-CO₂, which were decreased by 23.0% and 0.9% as compared with FY2006 (139,000t-CO₂) and FY2016 (108,000t-CO₂), respectively.

The CO₂ emissions at Kikkoman Group major overseas manufacturing divisions (4 plants) in FY2017 were 38,000t-CO₂, which were increased by 2.7% as compared with FY2016 (37,000t-CO₂).

The CO₂ emissions at Kikkoman Group domestic sales and back-office divisions in FY2017 were 4,100t-CO₂, equal to FY2016 (4,100t-CO₂). We could not achieve the objective.

*Kikkoman Beverage Co. merged Kikkoman Daily Co. on April 1, 2016.

The target divisions: Domestic sales and back-office divisions: Kikkoman Corp., Kikkoman Food Products Co., Kikkoman Beverage Co., Kikkoman Business Service Co. and Nippon Del Monte Agri Co.

【FY2018】

<Reported in FY2019>

The CO₂ emissions released by Kikkoman Group domestic manufacturing divisions (19 plants*) in FY2018 were 108,000t-CO₂, which were decreased by 22.3% and increased by 0.9% as compared with FY2006 (139,000t-CO₂) and FY2015 (107,000t-CO₂), respectively.

*Heisei Foods Co. merged Edogawa Foods Co. and changed its name to Kikkoman Foodtech Co. on April 1, 2017.

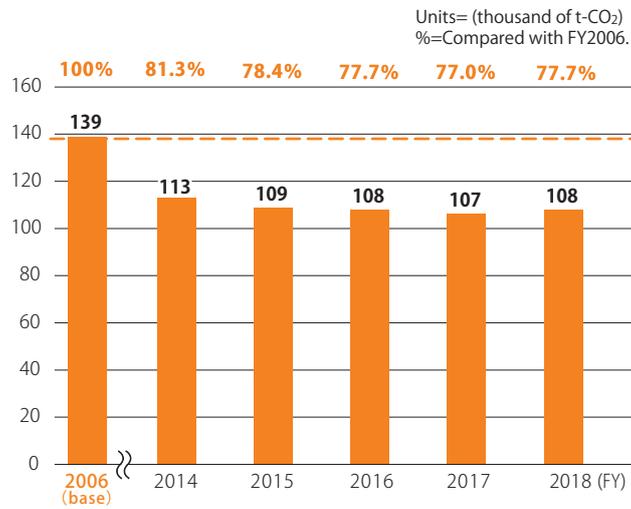
The target divisions: 19 plants of domestic manufacturing companies: Kikkoman Food Products Co. (Noda Factory and Takasago Factory), Hokkaido Kikkoman Co., Nagareyama Kikkoman Co., Ltd., Kikkoman Foodtech Co. (Main Plant, Nakanodai Plant, Edogawa Plant and Nishinippon Plant), Saitama Kikkoman Co., Nippon Del Monte Corp. (Gunma Plant and Nagano Plant), Manns Wine Co., Ltd. (Katsunuma Winery and Komoro Winery), Kikkoman Biochemifa Co. (Edogawa Plant and Kamogawa Plant), Kikkoman Soyfoods Co. (Saitama Plant, Gifu Plant and Ibaraki Plant) and Takara Shoyu Co., Ltd. (Choshi Plant)

The CO₂ emissions at Kikkoman Group major overseas manufacturing divisions (4 plants) in FY2018 were 42,000t-CO₂, which were increased by 10.5% as compared with FY2017 (38,000t-CO₂).

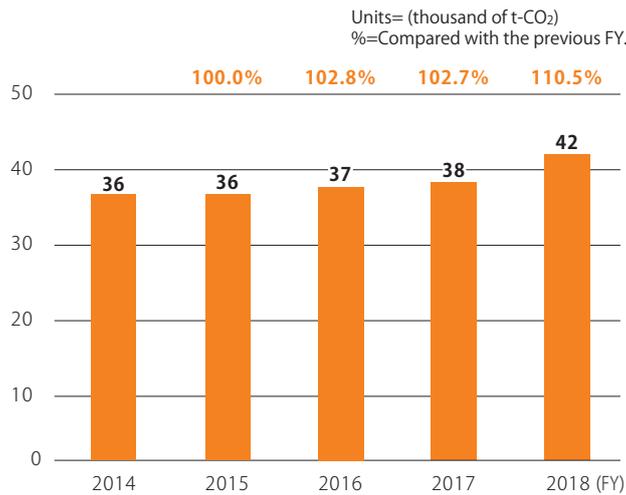
The CO₂ emissions at Kikkoman Group domestic sales and back-office divisions in FY2018 were 3,900t-CO₂, which were decreased by 4.9% as compared with FY2017 (4,100t-CO₂). The objective was achieved in these divisions.

Preventing Global Warming

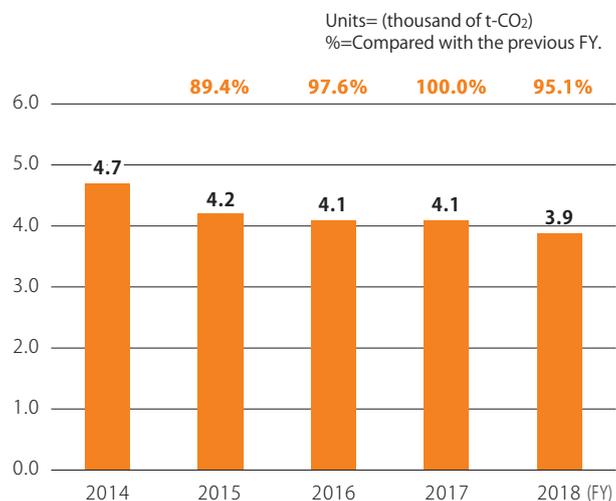
● Transition of the CO₂ emissions (Domestic manufacturing divisions)



● Transition of the CO₂ emissions (Major overseas manufacturing divisions)



● Transition of the CO₂ emissions (Domestic sales and back-office divisions)



2. Transition of the CO₂ Emissions per Unit of Production

1) Soy Sauce

<Refer "CO₂ Emissions per Unit of Production of Soy Sauce," Corporate Citizenship Report 2007>

CO₂ emissions per unit of production of soy sauce implies the total quantity of CO₂ discharged through the process of soy sauce production divided by the total quantity of produced soy sauce. The total amount of CO₂ emissions is affected by the quantity of production, however, CO₂ emissions per unit of production of soy sauce is not influenced by changes in the amount of production directly. Therefore, by comparing CO₂ emissions per the unit yearly, the outcomes of CO₂ reduction efforts as a result of the improvement of energy sources, processes and others can be observed. The Kikkoman Group is using the measurement of CO₂ emissions per unit of production of soy sauce as one of its management indicators to measure achievements of efforts. Until FY2007, the use of carbon neutral soy sauce cake as an alternative fuel to fossil fuels contributed to a reduction of CO₂ emissions in total as well as per unit of production of soy sauce.

2) Soy Sauce, Noodle Soup and Barbecue Sauce

[FY2008]

<Refer "CO₂ Emissions per Unit of Production of Soy Sauce, Noodle Sauce and Barbecue Sauce," Corporate Citizenship Report 2008>

In FY2008, the Kikkoman Group began to further add the amount of CO₂ emissions per unit of production of noodle sauce and barbecue sauce to its management indicators of CO₂ emissions per unit of production of soy sauce. It was intended to better manage CO₂ emissions within the factories by more accurately reflecting the actual situation of CO₂ emissions, as the share of producing noodle sauce and barbecue sauce is increasing.

Unfortunately in FY2008, the amount of CO₂ emissions per the unit corresponding to the amount of steam purchased from outside (0.024t-CO₂/kl) was added due to the revision of the Act on Promotion of Global Warming Countermeasures. Because of this, the total figure for this fiscal year was worsened by 15% over the previous fiscal year (0.161t-CO₂/kl in FY2007 to 0.185t-CO₂/kl in FY2008). Other than this, the amount of CO₂ emissions per unit of production of soy sauce, noodle sauce and barbecue sauce remained at the same level of FY2007 in FY2008 at 0.161t-CO₂/kl, which is 83.8% of the emissions level of FY1991.

[FY2009]

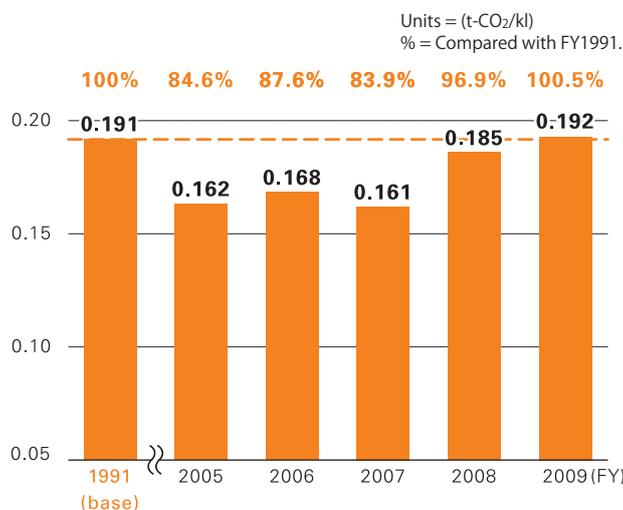
<Refer "CO₂ Emissions per Unit of Production of Soy Sauce, Noodle Soup and Barbeque Sauce," Corporate Citizenship Report 2009>

The CO₂ emissions per unit of production of soy sauce, noodle soup and barbeque sauce were reduced in total in FY2009 to 97% of the previous fiscal year. However, due to the decline in soy sauce production, which occupies the great majority of production, CO₂ emissions per unit of production rose by 3.7% over FY2008. This figure is 100.5% of the baseline year of FY1991. When the amount of CO₂ emissions related to steam purchase of FY2008 is deducted according to the revised law, CO₂ emissions per unit of production is 0.166t-CO₂/kl which is 87% of the amount in the previous fiscal year.

The transition of total CO₂ emissions per unit of production from FY2005 to FY2009 is as shown in the chart below.

Preventing Global Warming

Transition of the CO₂ emissions per unit of production of Soy Sauce, Noodle Soup and Barbeque Sauce



3) Refining the CO₂ Emissions per Unit of Production, a Group Goal was set

[FY2010]

<Refer "Reducing emissions per unit of production" in Corporate Citizenship Report 2010, website>

In FY2010, the Kikkoman Group made the following changes to the "CO₂ Emissions per Unit of Production of Soy Sauce, Noodle Soup and Barbeque Sauce" which had been used as one of the indicators to control global warming:

- In addition to the "soy sauce, noodle soup and barbeque sauce produced in Japan," "soy sauce, noodle soup and barbeque sauce produced in overseas plants," "soy milk produced by Foodchemifa Co., Ltd." "tomato products by Nippon Del Monte Corp.," and "wine by Manns Wine Co., Ltd." were included as targets.
- The unit of production was changed from the weight of the contents of soy sauce, noodle soup and barbeque sauce (per kilo liter) to the total weight including the package (per ton).
- Further, the goal of emissions per unit of production was set at 99% of the previous fiscal year.

With this, the Kikkoman Group established the system to control CO₂ emissions both from the aspects of total emissions and emissions per unit of production, in other words, from both quantitative and qualitative aspects. The emissions per unit of production in FY2010 were 97.8% of that of the previous fiscal year, thus, achieving the goal.

[FY2011]

<Reported in FY2012>

Furthermore, target companies were changed in FY2011 as below:

- The target companies required to control CO₂ emissions per unit of production were increased from major domestic manufacturing companies to major domestic companies and overseas manufacturing companies including Kikkoman Corp. with no manufacturing bases, and KFI (U.S.A.), KSP (Singapore) and KFE (Netherlands)

The target companies: 11 major domestic companies (Kikkoman Corp., Kikkoman Food Products Co., Hokkaido Kikkoman Co., Nagareyama Kikkoman Co., Ltd., Heisei Foods Co., Edogawa Foods Co., Nippon Del Monte Corp., Tohoku Del Monte Corp., Manns Wine Co., Ltd., Foodchemifa Co., Ltd., and Takara Shoyu Co., Ltd. and 3 major overseas manufacturing companies (KFI, KSP and KFE)

The amount of emissions per unit of production in FY2011 was 0.175t-CO₂/t, which was 100.6% of FY2010 or an increase by 0.001t-CO₂/t. The target to reduce emissions per unit of production to 99% and below could not be reached. This was affected by the review of the product lines conducted by Manns Wine Co., Ltd. and Nippon Del Monte Corp. The Kikkoman Group will strive for reducing CO₂ emissions per unit of production both in Japan and overseas.

*The amount of CO₂ emissions per unit of production in the previous fiscal year (FY2010) 0.174t-CO₂/t was re-evaluated by new target companies including Kikkoman Corp.



Preventing Global Warming

【FY2012】

<Refer “Preventing Global Warming” in Corporate Citizenship Report 2012, website>

In FY2012, the CO₂ emissions per unit of production of the major domestic and overseas companies of the Kikkoman Group was 0.170t-CO₂/t, 97.1% of that of the previous fiscal year or a reduction by 0.005t-CO₂/t. With this, our goal was achieved, thanks to the reduction of CO₂ emissions by Nippon Del Monte Corp.

*The amount of CO₂ emissions per unit of production was calculated, excluding Nippon Del Monte Corp. Fukushima Factory and Tohoku Del Monte Corp., the operations of which were terminated in FY2012.

The target companies: 11 major domestic companies (Kikkoman Corp., Kikkoman Food Products Co., Hokkaido Kikkoman Co., Nagareyama Kikkoman Co., Ltd., Heisei Foods Co., Edogawa Foods Co., Nippon Del Monte Corp., Manns Wine Co., Ltd., Kikkoman Biochemifa Co., Kikkoman Soyfoods Co. and Takara Shoyu Co., Ltd.) and 3 major overseas manufacturing companies (KFI, KSP and KFE)

【FY2013】

<Refer “Preventing Global Warming” in Corporate Citizenship Report 2013, website>

In FY2013, the CO₂ emissions per unit of production of major domestic companies and major overseas manufacturing companies in the Kikkoman Group was 0.165t-CO₂/t, which stood at 97.1% of the emissions of the previous fiscal year, or a reduction by 0.005t-CO₂/t. Even though the amount of total production increased, CO₂ emissions did not increase so much. The Kikkoman Group will make every effort to reduce CO₂ emissions per production unit.

*The amount of CO₂ emissions per unit of production was calculated adding Saitama Kikkoman Co., which began its full operations in FY2013.

The target companies: 11 major domestic companies (Kikkoman Corp., Kikkoman Food Products Co., Hokkaido Kikkoman Co., Nagareyama Kikkoman Co., Ltd., Heisei Foods Co., Edogawa Foods Co., Nippon Del Monte Corp., Manns Wine Co., Ltd., Kikkoman Biochemifa Co., Kikkoman Soyfoods Co. and Takara Shoyu Co., Ltd.) and 3 major overseas manufacturing companies (KFI, KSP and KFE)

【FY2014】

<Refer “Preventing Global Warming,” Corporate Citizenship Report 2014 detailed edition>

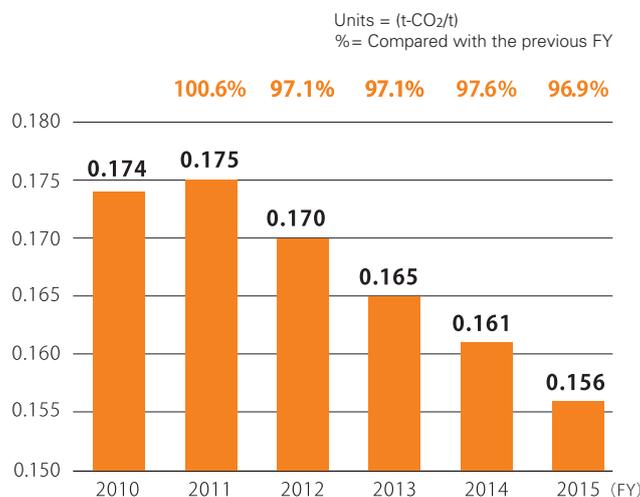
In FY2014, the CO₂ emissions per unit of production of major domestic companies and major overseas manufacturing companies in the Kikkoman Group totaled 0.161t-CO₂/t, which was a decrease by 0.004t-CO₂/t or 2.4% from that of FY2013. The goal to reduce more than 1% from the previous fiscal year level was achieved. This suggests that CO₂ emissions did not increase so much although the amount of manufacturing increased. In the future, we will continue our efforts to lower CO₂ emissions per unit of production in the Kikkoman Group as a whole including overseas manufacturers.

【FY2015】

<Refer “Preventing Global Warming,” Corporate Citizenship Report 2015 detailed edition>

In FY2015, the CO₂ emissions per unit of production of major domestic companies and major overseas manufacturing companies in the Kikkoman Group totaled 0.156t-CO₂/t, which was a decrease by 0.005t-CO₂/t or 3.1% from the level of FY2014. The goal to reduce more than 1% from the level of the previous fiscal year was achieved. We will continue our efforts to reduce CO₂ emissions per unit of production.

● Transition of the CO₂ emissions per unit of production (Major domestic companies and major overseas manufacturing companies)



4) New Goals for FY2016-FY2018

[FY2016]

<Reported in FY2017>

In the Medium- and Long-term Environmental Preservation Goals FY2013-2015, the Kikkoman Group set forth two objectives concerning CO₂ emissions in its activities: First, to reduce the total CO₂ emissions at the major domestic companies by 17% or more from the FY2006 levels by FY2015, and second, to reduce the CO₂ emissions per unit of production at the major domestic companies and major overseas manufacturing companies by 1% or more from that of the previous fiscal year (FY).

As a result, total CO₂ emissions by major domestic companies amounted to 113,458t-CO₂ in FY2015 which was less than the FY2006 level (144,976t-CO₂) by 31,518t-CO₂ or 21.7%. At the same time, CO₂ emissions per unit of production by major domestic companies as well as major overseas manufacturing companies was 0.156t-CO₂/t, a decrease by 0.005t-CO₂/t, or 3.1% from the level of FY2014 (0.161t-CO₂/t). Thus, both objectives were achieved.

In formulating the Medium-term Environmental Preservation Goals FY2016-2018, the Kikkoman Group designated the following new objectives in terms of preventing global warming (reducing CO₂ emissions) separately for Japan and overseas.

[Objectives in the Medium-term Environmental Preservation Goals FY2016-2018]

(1) To reduce the CO₂ emissions per unit of production at the domestic manufacturing divisions by 20% or more from the FY2006 levels by FY2018.

The target divisions: 19 plants of domestic manufacturing companies: Kikkoman Food Products Co. (Noda and Takasago Factories), Hokkaido Kikkoman Co., Nagareyama Kikkoman Co., Ltd., Heisei Foods Co. (Main, Nakanodai, and Nishinippon Plants), Edogawa Foods Co., Saitama Kikkoman Co., Nippon Del Monte Corp. (Gunma and Nagano Plants), Tohoku Del Monte Corp., Manns Wine Co., Ltd. (Katsunuma and Komoro Wineries), Kikkoman Biochemifa Co. (Edogawa and Kamogawa Plants), Kikkoman Soyfoods Co. (Saitama, Gifu and Ibaraki Plants) and Takara Shoyu Co., Ltd. (Choshi Plants)

(2) To reduce the CO₂ emissions per unit of production at the major overseas manufacturing divisions by 3% or more from the FY2015 levels by FY2018.

The target divisions: 4 plants of major overseas manufacturing companies: Wisconsin and California Plants of Kikkoman Foods, Inc. (KFI), Plant of Kikkoman (S) Pte. Ltd. (KSP) and Plant of Kikkoman Foods Europe B.V.(KFE)

(3) To reduce the CO₂ emissions at the domestic sales and back-office divisions annually by 1% or more from that of the previous fiscal year (FY).

The target divisions: Domestic sales and back-office divisions: Kikkoman Corp., Kikkoman Food Products Co., Kikkoman Beverage Co., Kikkoman Business Service Co., Nippon Del Monte Agri Co. and Kikkoman Daily Co.

*Change in the calculation formula of CO₂ emissions per unit of production:

In calculating CO₂ emissions per unit of production, the weights of containers and packaging had been included until the previous fiscal year (FY2015). From FY2016, the weights of containers and packaging have been excluded from the calculation. With this, the relation between manufacturing activities and CO₂ emissions became more accurately understood, which helped promote CO₂ emissions reduction activities more efficiently.

The CO₂ emissions per unit of production at Kikkoman Group domestic manufacturing divisions in FY2016 was 0.154t-CO₂/t, which was decreased by 17.6% and 3.1% as compared with FY2006 (0.187t-CO₂/t) and FY2015 (0.159t-CO₂/t), respectively.

The CO₂ emissions per unit of production by major overseas manufacturing divisions in FY2016 was 0.173t-CO₂/t, which was decreased by 1.1% as compared with FY2015 (0.175t-CO₂/t).

【FY2017】

<Reported in FY2019>

The CO₂ emissions per unit of production at Kikkoman Group domestic manufacturing divisions in FY2017 was 0.151t-CO₂/t, which was decreased by 19.3% and 1.9% as compared with FY2006 (0.187t-CO₂/t) and FY2016 (0.154t-CO₂/t), respectively.

The CO₂ emissions per unit of production at Kikkoman Group major overseas manufacturing divisions in FY2017 was 0.171t-CO₂/t, which was decreased by 2.3% and 1.2% as compared with FY2015 (0.175t-CO₂/t) and FY2016 (0.173t-CO₂/t), respectively.

【FY2018】

<Reported in FY2019>

The CO₂ emissions per unit of production at Kikkoman Group domestic manufacturing divisions* in FY2018 was 0.151t-CO₂/t, which was decreased by 19.3% as compared with FY2006 (0.187t-CO₂/t) and was equal to FY2017 (0.151t-CO₂/t). We could not achieve the objective.

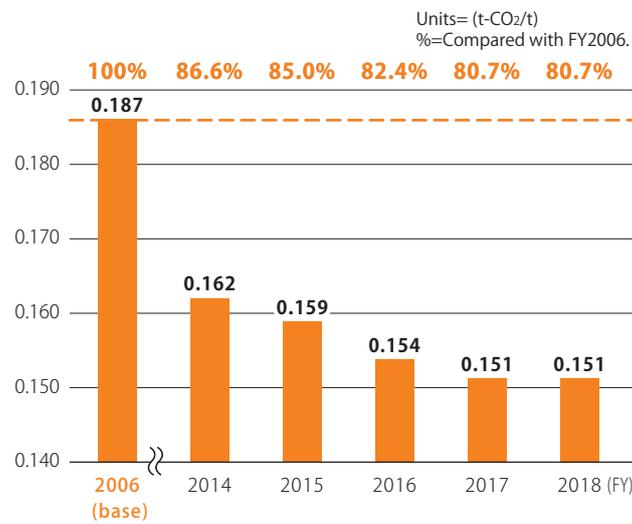
*Heisei Foods Co. merged Edogawa Foods Co. and changed its name to Kikkoman Foodtech Co. on April 1, 2017.

The target divisions: 19 plants of domestic manufacturing companies: Kikkoman Food Products Co. (Noda Factory and Takasago Factory), Hokkaido Kikkoman Co., Nagareyama Kikkoman Co., Ltd., Kikkoman Foodtech Co. (Main Plant, Nakanodai Plant, Edogawa Plant and Nishinippon Plant), Saitama Kikkoman Co., Nippon Del Monte Corp. (Gunma Plant and Nagano Plant), Manns Wine Co., Ltd. (Katsunuma Winery and Komoro Winery), Kikkoman Biochemifa Co. (Edogawa Plant and Kamogawa Plant), Kikkoman Soyfoods Co. (Saitama Plant, Gifu Plant and Ibaraki Plant) and Takara Shoyu Co., Ltd. (Choshi Plant)

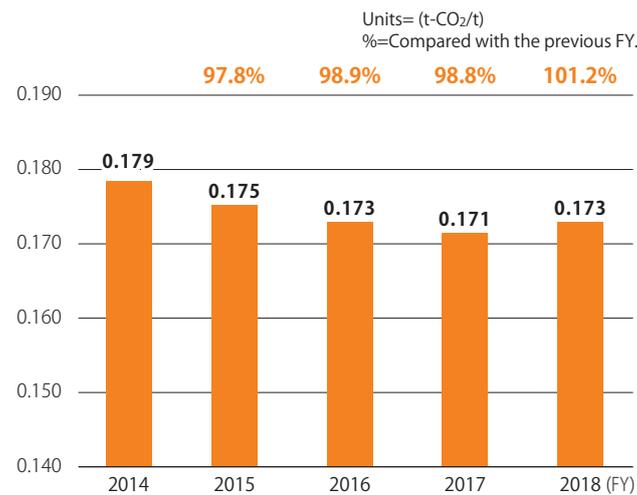
The CO₂ emissions per unit of production at Kikkoman Group major overseas manufacturing divisions in FY2018 was 0.173t-CO₂/t, which was decreased by 1.1% as compared with FY2015 (0.175t-CO₂/t). We could not achieve the objective.

Preventing Global Warming

● Transition of the CO₂ emissions per unit of production (Domestic manufacturing divisions)



● Transition of the CO₂ emissions per unit of production (Major overseas manufacturing divisions)



3. Approaches Taken by Plants

<Reported in FY2017>

The manufacturing divisions of the Kikkoman Group are making efforts to reduce CO₂ emissions through reviewing and updating their manufacturing methods as well as reviewing and replacing their equipment and energy sources (replacing with energy-saving equipment, changing fuel from heavy oil to gas, using solar power generation, and so forth).

Heavy oil boilers were replaced with gas boilers at the Edogawa Plant of Kikkoman Biochemifa Co. and the Second Production Department of the Noda Factory of Kikkoman Food Products Co., in FY2013, followed by the Research & Development Division and Nakanodai Plant of Heisei Foods Co.* in FY2014.

● Compact gas boilers (Edogawa Plant, Kikkoman Biochemifa Co.)



● Compact gas boilers (Second Production Department, Noda Factory, Kikkoman Food Products Co.)



● Compact gas boilers (R&D Division)



● Compact gas boilers (Nakanodai plant, Heisei Foods Co.*)



For work efficiency, the Nakanodai Plant of Heisei Foods Co.* had been using steam transported through a pipe from the heavy oil boiler at the Noda Factory nearby. However, considering that large amounts of heat were lost during transportation through the steam pipe between the two factories, it was an inefficient method of energy supply. As the boiler became too old, the supply of steam from the Noda Factory was terminated in August 2013, and new compact gas boilers were installed at the Nakanodai Plant to enhance energy efficiency. The compact gas boilers emit less CO₂ than a heavy oil boiler, and produces steam efficiently. As a result, yearly CO₂ emissions could be reduced by about 2,000t-CO₂.

Preventing Global Warming

- Compact gas boilers
(Main Plant, Heisei Foods Co.*)



- Compact gas boilers
(Nagareyama Kikkoman Co., Ltd.)



- Compact gas boilers
(First Production Department, Noda Factory, Kikkoman Food Products Co.)



In FY2015, heavy oil boilers were replaced with gas boilers at the Main Plant of Heisei Foods Co.,* and Nagareyama Kikkoman Co., Ltd. which produces *mirin* and other food items. Heavy oil boilers were then replaced at the First Production Department of Noda Factory of Kikkoman Food Products Co., in FY2016.

*Heisei Foods Co. merged Edogawa Foods Co. and changed its name to Kikkoman Foodtech Co. on April 1, 2017.

Preventing Global Warming

<Reported in FY2019>

- Compact gas boilers
(Katsunuma Winery, Manns Wine Co., Ltd.)



In FY2018, heavy oil boilers were replaced to gas boilers at the Katsunuma Winery of Manns Wine Co., Ltd.

<Reported in FY2017>

- Turbo refrigerator
(Saitama Plant, Kikkoman Soyfoods Co.)



- Air handling unit to use remaining power for air conditioning



The Saitama Plant of Kikkoman Soyfoods Co. which manufactures soymilk products introduced two turbo refrigerators to cool heat-sterilized soymilk in FY2014 replacing the conventional flash chiller. With the stronger cooling power of the turbo refrigerators, the factory successfully reduced its CO₂ emissions by 1,300t-CO₂ per year.

As the new refrigerators had surplus cooling capacity, construction to enable use of the capability for air conditioning as well was undertaken, resulting in the further reduction of CO₂ emissions by 200t-CO₂ per year.

Preventing Global Warming

<Reported in FY2019>

● Noda Factory, Kikkoman Food Products Company



● Solar panels installed on the roof of the factory



● Saitama Kikkoman Company



● Solar panels installed on the roof of the company



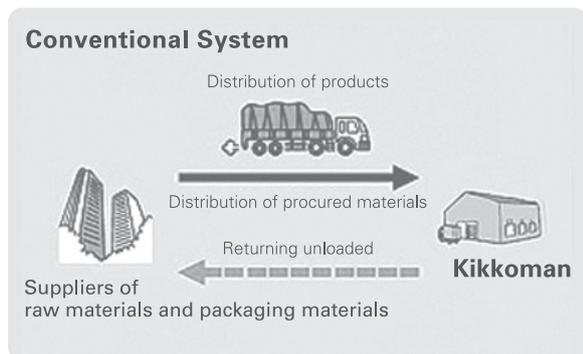
Solar panels (Solar power generation equipment) were installed on the roof of the Noda Factory of Kikkoman Food Products Co. and California Plant of Kikkoman Foods, Inc. (KFI) in FY2011, followed by the Saitama Kikkoman Co. in FY2013.

4. Approaches in the Distribution System

<Reported in FY2017>

The Kikkoman Group pays consideration to CO₂ emissions in the Distribution Divisions (consolidated subsidiary, Sobu Logistics Co., Ltd., etc.) and tries to reduce these emissions.

● Conventional procurement distribution



● Unified procurement and product distribution



In May 2004, distribution centers and storage facilities were rearranged to facilitate better flow lines of trucks and eliminating wasteful truck traffic. Further, the procurement and distribution of raw materials (beans, wheat, etc.) and packaging materials (plastic bottles, etc.) and the product distribution (shipping products) were integrated. The loading rate per round trip was heightened (travelling without decreasing loads), a great amount of CO₂ emissions was successfully reduced.

● Trucks for product transportation



● Fuel-Efficient, Low Exhaust Gas Emissions Mark



In addition, further reduction of CO₂ emissions will be sought by using fuel-efficient trucks with low gas emissions, and encouraging truck drivers to thoroughly practice ecological driving behind the wheel.

Sobu Logistics Co., Ltd. has obtained the Green Management Certificate (by the Foundation for Promoting Personal Mobility and Ecological Transportation) which is gaining interest among the transportation industry and business customers.

Preventing Global Warming

Rail freight transportation of products



Eco-Rail Mark



As a means to further reduce CO₂ emissions per unit of transportation, railway freight is positively used. In FY2006, Sobu Logistics Co., Ltd. received the certification of “Eco-Rail Mark Corporation” by the Railway Freight Association.

5. Approaches for Office Buildings

<Reported in FY2017>

The Office Divisions of the Kikkoman Group are strongly promoting a wide range of efforts to prevent global warming. They include controlling room temperatures for summer (28°C) and winter (20°C), encouraging staff to wear lightweight clothes in summer, reducing the use of lighting, turning lights off when not in use, strictly controlling the use of OA equipments, encouraging in-house conferences through TV, practicing ecological driving of company motorcars, and purchasing fuel-efficient motorcars and hybrid motorcars.

1) Kikkoman Noda Head Office Building (Noda City, Chiba)

The Kikkoman Noda Head Office building, completed in 1999, was designed to be an environmentally sustainable office. In keeping with the goal of maintaining harmony with the natural environment and lowering environmental loads, various advanced technological devices are employed.

The building, with its use of advanced devices, was highly evaluated by specialists, and it received the New Office Promotion Award of the Nikkei New Office Award and the 7th Architectural Culture Award of Chiba Prefecture in 2001, the Examination Committee Encouragement Prize of the 9th Environmental and Energy Saving Architecture Award by the Institute of Building Environment and Energy Conservation in 2002, the 4th Sustainable Architecture Award by the Japan Institute of Architects (JIA) in 2003 and the Special Award “Ten-Year Award” of the Society of Heating, Air-conditioning and Sanitary Engineers of Japan (SHASE) in 2011.

Preventing Global Warming

● Kikkoman Noda Head Office Building (offices)



The Noda Head Office compound has two buildings. The North Building is for offices and the South Building for conference rooms. In the rectangular-shaped Office Building stretching from east to west, office rooms are arranged on the north side to ensure stable luminance. On the south side is the entrance hall built in a wellhole style. Large windows allow the maximum use of sunshine and winds. In addition, other devices are installed to help reduce energy consumption for lighting and air-conditioning. They include the luminance control system controlled by the daylight sensor, the horizontal external louvers to control the flow of sun light into the rooms, double-glass air flow to enhance insulation, and the warm-water thermal storage (summer) and the ice thermal storage system (winter) using energy from the heat-recovery type of pump.

With these measures, the total electricity used for lighting per fine day (lighting time from 6:00 to 20:30 hours) was reduced by 42% and the perimeter annual load (PAL) was reduced by 29% as well.

Further, lamps at the lounge, entrance hall and, toilets have been replaced with LED lamps for the sake of saving electricity.

● Office Building (Open ceiling space on the south side)



● Conference room building and “Water Garden”



In the open yard between the Office Building and Conference Room Building is the “Water Garden” which has a pond for storing rain water as a way to maintain a secure water resource in case of need and to create a pleasing landscape.

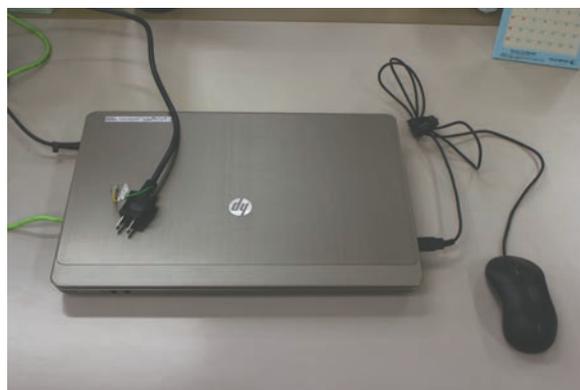
Preventing Global Warming

2) Kikkoman Tokyo Head Office Building (Minato-ku, Tokyo)

● Kikkoman Tokyo Head Office Building



● “Reducing Stand-by Power Consumption” Operation



At the Kikkoman Tokyo Head Office in Minato city, Tokyo the practice of unplugging all 900 office-use computers to reduce stand-by power consumption began in FY2015. On the day before holidays, employees are reminded to be sure to unplug their computers through the in-house announcement system as a greater energy saving effect is expected on holidays. Activities by respective companies are shared at Environment Preservation Promotion Committee meetings and spread to other office divisions.

3) Kikkoman General Hospital (Noda City, Chiba)

As part of community service activities, the Kikkoman Group has been managing Kikkoman General Hospital in Noda city in Chiba prefecture, the place of foundation of the company.

The origin is that one of the founding families established a health care institution in 1862 for workers in the soy sauce brewing house and their families. Later, the founding families of Kikkoman which gathered to form the Noda Soy Sauce Brewing Union decided upon the establishment of a hospital to commemorate the enthronement of Emperor Taisho, and Noda Hospital was opened in 1914. In later years, it has been expanded as Kikkoman General Hospital to serve people in the local community.

Considering the advent of an aged society, Kikkoman General Hospital was renewed in 2012 to provide more comprehensive medical services.

● Noda Hospital when opened in 1914



● Kikkoman General Hospital (Solar panels in front)



With an earthquake resistant structure, the new hospital is designed to maintain its functional integrity even in times of disaster. Additionally, due consideration has been given to the environment through enabling full use of natural lighting, placement of solar panels at the entrance to enable power generation, efficient use of well water and implementation of energy saving equipment and instruments.

6. Carbon Footprint of Products

1) Carbon Footprint of Products

<Reported in FY2010>

Carbon Footprint of Products (CFP) is a yardstick to measure greenhouse gases (carbon dioxide CO₂, dinitrogen monoxide N₂O, perfluorocarbons PFCs, sulfur hexafluoride SF₆, methane CH₄, hydrofluorocarbons HFCs) discharged at every stage of the lifecycle of products and services including manufacturing and transporting packages and raw materials, product manufacturing, distribution, using products, and disposal and recycling. The measured figures are presented at various sales tools, such as packages, shelves at stores, catalogues and so on, to help customers choose environmentally friendly merchandise and services.

The CFP assessment is promoted in countries in Europe and North America, but International CFP Standards have not yet been formulated. In Japan, the Ministry of the Environment, the Ministry of Economy, Trade and Industry and the Ministry of Agriculture, Forestry and Fisheries have each established a Committee respectively to discuss the issue, but they are still in the stage of research.

Major developments in Japan include:

- Ministry of the Environment: Conference to Promote the Visualization of Greenhouse Gases
- Ministry of Economy, Trade and Industry: Study Group on Practical Application and Spread of the Carbon Footprint of Product Scheme (participation by Foodchemifa Co., Ltd.)
- Ministry of Agriculture, Forestry and Fisheries: Study Group on Visualizing CO₂ in the Food Industry (participation by Kikkoman Corp.)
- Society of Non-Traditional Technology: Food Study Group, the Institute of Life Cycle Assessment, Japan (commissioned by the Ministry of Economy, Trade and Industry) (participation by Kikkoman Corp.)

In these groups, the members are exchanging views, and discussing the environment for introducing the CFP scheme, and the assessment standards independently.

In the Kikkoman Group, Foodchemifa (currently Kikkoman Soyfoods) calculated the CFP of the soy milk "Oishii Muchosei Tonyu (1000ml)" using the method by the Study Group on Practical Application and Spread of the Carbon Footprint of Product Scheme and published the outcome in the "Eco Products 2008" fair. In Kikkoman, the Carbon Footprint of Product Study Group was established and assessed the CFP of the soy sauce "Kikkoman Tokusen Marudaizu Shoyu" (1 liter (L) bottle).

2) CFP of Soy Milk (1000ml)

<Refer "CFP value and display on the Soy Milk (1000 ml)," Corporate Citizenship Report 2009>

The CFP of the soy milk "Oishii Muchosei Tonyu (1000ml)" was measured according to the formula laid by the Study Group on Practical Application and Spread of the Carbon Foot Print Scheme. As a result, the total amount of CO₂ emissions was 447grams throughout the life of the soymilk from the raw materials to disposal and recycling. The breakdown by stage showed 42% from the raw materials, 33% from production process, 23% from distribution and sales, and 2% from disposal and recycling. The figure includes 110grams of total CO₂ emissions in manufacturing the paper pack (by Japan Tetra Pack).

Preventing Global Warming

● CFP of the soy milk “Oishii Muchosei Tonyu (1000ml)”



3) CFP of Soy Sauce (1 liter Bottle)

<Refer "CFP value for the Soy Sauce (1L bottle) ," Corporate Citizenship Report 2009>

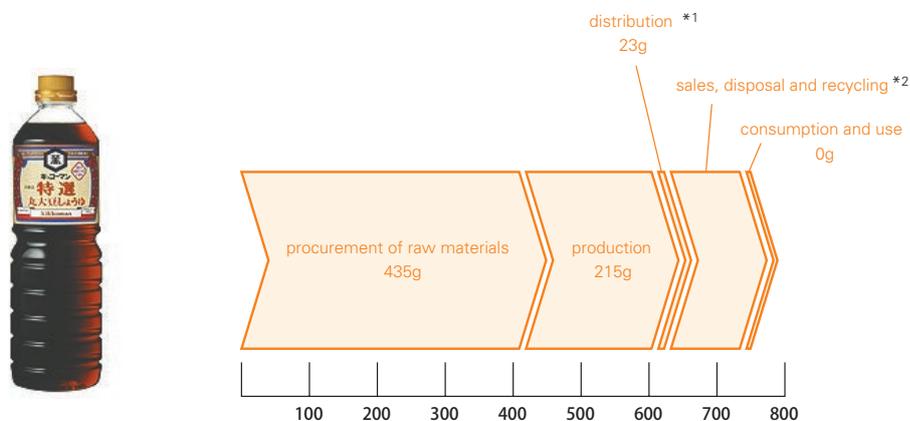
The CFP of the soy sauce “Kikkoman Tokusen Marudaizu Shoyu (1L bottle)” was calculated based on the standard designated by the Carbon Footprint of Product Study Group set up within Kikkoman.

Principles for CFP measurement at Kikkoman Corp.

- For the distribution stage, the amount of CO₂ emissions of the primary distribution stage right from the factory will be used.
- For the use stage by households, CO₂ emissions will be counted as zero, as no energy is required to use soy sauce.
- For the sales and disposal and recycling stages, CO₂ emissions will not be counted, as we must depend only on estimated amounts.

The resultant CFP figure was 673 grams for the soy sauce, “Kikkoman Tokusen Marudaizu Shoyu (1L bottle)”, 435 grams at the stage of raw material procurement, 215 grams at production, and 23 grams for distribution.

● CFP figure for the soy sauce “Kikkoman Tokusen Marudaizu Shoyu (1L bottle)”



*1 Distribution is limited to the primary distribution stage.

*2 The estimated volume for the Sales, Disposal and Recycling stage.

<Reported in FY2011>

The results were presented at the Food Research workshop by the Institute of Life Cycle Assessment, Japan held in September 2009.

<Reported in FY2012>

The results were presented at the 70th Research Presentation meeting of the Japan Soy Sauce Technology Center held in Shoudo Island in June 2010, which drew attention as the first soy sauce-related CFP research.

