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RE: 'Global floral trends and the strategy of Japan'

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(1) **Global floral trends**

Global floral trends are summarized in two words: "sustainable" and "wellbeing." It is the two key points of the SDGs (Sustainable Development Goals) that are often heard recently, which consists of the 17 sustainable development goals advocated by the United Nations to be achieved by 2030. And these two words will be the secret keys to spread "The happy lifestyle with flowers and plants" not only in Japan but all over the world in the after Covid-19.

① **Sustainable**

'Sustainable' means "to maintain and continue the current environment for descendants." It has been a global movement since the Kyoto Protocol for Global Warming Countermeasures was adopted in 1997. In the production and distribution of flowers, based on the "carbon footprint", which is an index of how much carbon dioxide is emitted, the flowers produced in the ever-spring highland area on the equator are transported by refrigerated sea containers instead of the airplanes. While shifting, local production for the local consumption is also emphasized. In addition, we are in an era where only safe and secure flowers that have produced with less pesticides, fertilizers, water, energy, etc. and obtained the environmental certificate such as MPS, can be distributed. Furthermore, the discovery of the "long-term refrigerated storage technology for flowers" and the "freshness management index for flowers" called "temperature- time value" which are invented to realize these shifts will change the common sense of flower production and distribution in the future.

② **Wellbeing**

Wellbeing is the goal of "people all over the world becoming healthy and happy human beings physically and socially." Since the "benefits of flowers" such as "healing people and making them positive" have been scientifically proven, there is a movement to "promote a life with flowers". Until now, the flower industry has been trying to produce and sell "products called flowers", but by creating more "what flowers can do", a bright future can be seen.

(2) Right land, right crop, right distribution and local production for local consumption

Producing flowers in a naturally blooming environment produces flowers without wasting energy. In plateaus on the equator, such as Colombia, Ecuador, Kenya and Malaysia (Cameron Highlands), it is possible to plant flowers every day in the everlasting spring. "Carbon foot print" that shows the amount of carbon dioxide emitted, as representative of the greenhouse gases, in the life cycle of flower breeding, production, distribution, consumption, and disposal is used as an indicator of "sustainable" value.

A rough comparison of the "sustainable" values is carried out on domestic and Colombian carnations. Domestic carnations in Japan, that use heavy oil for heating, emit around 1000g CO₂ per stem, while Colombian carnations, that are naturally produced in a greenhouse like a circus tent without heating requirement, (as the same for the outdoor flower production in Japan), emit 50-100g CO₂ per stem. If the transportation part to Japan is added, it will be +40g CO₂ per stem for the sea refrigerated container transportation, compared to +1100g CO₂ per stem for the air transportation. In other words, from the viewpoint of the "sustainable" index called "carbon footprint", the evaluation is higher in the order of Colombian sea transportation > domestic > Colombian air transportation.

Regarding the transportation part, truck transportation is 1/10 and sea refrigerated container transportation is 1/50 of the carbon dioxide emissions compared with air transportation for the same distance. In the future, flower transportation will change into "sustainable" transportation using cold chains, even if it takes more days.

In general, the domestic flower transportation cost in Japan is high, but it should be kept within 8% of the flower market prices. If it is 10% or more, the immediate improvement should be done.

If the flower packing technology of the Netherlands and Colombia to pack more than twice than Japan in the same box ensuring the flower quality is disseminated, the transportation cost per stem will be cheaper and at the same time it will lead to more "sustainable" transportation. (Photo 1)

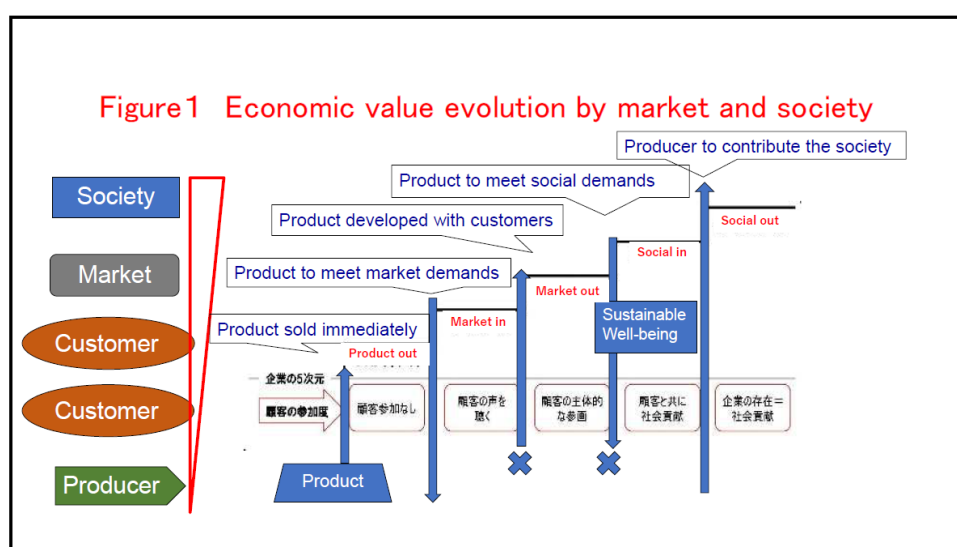


In addition, the open filed grown flowers should be reviewed in Japan. And if the local produced flowers are to send to far away large consumption areas, the carbon dioxide emissions will increase by 20% or more, so that the promotion of local production for local consumption is also required.

Photo 1 Carnation packing method in Colombia

(3) The era of safe and secure flowers and the role of certification

In producing a merchandise called flowers, there are five steps in which the economy grows in relation to the customers, the market and the society : In step 1, like in old days, the flowers produced are sold to the customers immediately. (Product OUT) Next, step 2 cannot be sold unless the product meets the market requirement. (Market IN) Step 3 is to consult with the customers and produce the products required by the market. (Market OUT) Step 4 will not be sold unless the flowers meet the social demands such as "sustainable" and "wellbeing" like the flower industry in Europe and the United States. (Social IN) And step 5 is to produce flowers that can contribute to the society. (Social OUT): However, the current state of the Japanese flower industry has not yet been able to grow from Step 3. (Figure 1)



We have entered an era in which the production and distribution of flowers that are friendly to the "global environment" and "people" have the social value. Consumers can purchase products "certified" by the third parties, such as GAP and MPS certification, that "this producer or flower shop produces or distributes flowers are friendly to the environment and workers.". And even if consumers buy the certified flowers at a slightly higher price, they will think that they have "fulfilled the social responsibility."

By the way, MPS (Milieu Programma Sierteelt), which was established in the Netherlands in 1995 and has become the certification of "sustainable flowers" in the world. MPS does not set absolute environmental standards, but should report regularly on the usage of the four elements of pesticides, fertilizer, water, and energy and the employment status, which are compared and assessed the current state of production among producers in the region every three months for determining the rank of MPS-A, B and C. Like riding on a scale every day to lose weight, in the Netherlands, flower

production in the same area increased by 30% in the first 10 years from MPS introduction, but fertilizers were the same, pesticides and energy could be reduced by 25%. Because this system is simple and effective, Global GAP, which is the world's agricultural certification, has partnered with MPS to become MPS-GAP certified.

In the world flower industry, an international NGO called FSI (The Floriculture Sustainability Initiative) was established in 2012 to realize the "sustainable flowers" in the production and distribution. Under the title of FSI2020, the activities are developed to realize that more than 90% of flowers produced and distributed worldwide should obtain international certification such as MPS by 2020. In response to this, Royal Flora Holland of the Netherlands, the world's largest wholesale flower market, announced that it will set 2021 as a transition period and will not handle flowers that have not obtained international certification after 2022. In the future, it is highly possible that flowers that do not have MPS certification will not be able to be exported when exporting flowers from Japan.

Furthermore, when "sustainable flowers" become widespread through "certification", producers who feel that the waste and loss of flowers are "too good to waste" will gradually shift to "custom-made" production, and in Europe and the United States, there is a movement toward "Repurpose Flower" in the flower retail shops in which the flowers once used for weddings etc., are not thrown away, but are donated to nursing home cares for the elderly or converted into dried flowers.

(4) Long-term refrigerated storage technology for flowers and quality control based on temperature and time values

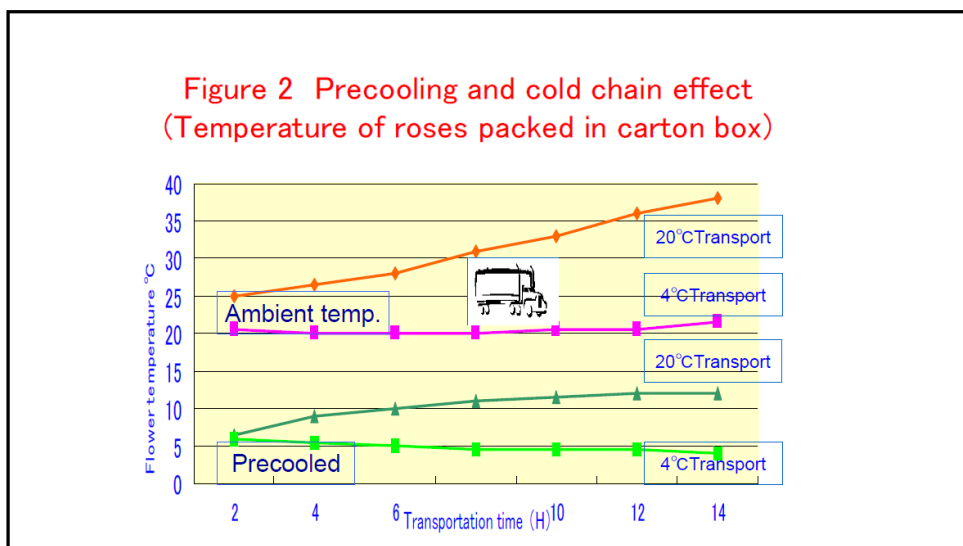
Since 2007, in the Netherlands, Academia, Industry and Government have collaborated to develop a technology called the COCOS project to transport flowers in refrigerated sea containers. The results will be the know-how that will significantly change the production and distribution of flowers in Japan in the future.

Traditionally, it has been said that ordinary cut flowers can be stored at 5 °C for several days. (However, tropical orchids and anthuriums are 13 °C) On the other hand, it was found that the general "optimal storage temperature of cut flowers is 0.5-2 °C" and "deterioration starts 500 °C · h (Temperature · hour) after flower harvest". 500 °C · h means that if the temperature of the flower after flower harvest is 25 °C, deterioration will start in less than 20 hours (25 °C * 20 hours) or in less than one day. But in case of 1 °C, it will be 500 hours (1 °C * 500 hours) and it means the flowers can be transported and stored under the cold chain for more than 20 days. The premise is pretreatment and precooling. Pretreatment is performed with the appropriate

preservatives after flower harvest, but even for cut flowers with low ethylene sensitivity, if stress is felt due to high temperature, low temperature, water drop, malnutrition, storage in the dark, etc., ethylene gas, an aging hormone, is released by itself. It has become clear that carnations, Eustoma, and delphiniums, which are highly sensitive to ethylene, are pretreated with an STS agent for ethylene, but STS pretreatment is also effective for chrysanthemums and roses, which are less sensitive to ethylene.

Pre-cooling cut flowers immediately after flower harvest slows down physical activities such as breathing and puts them in a state like hibernation. Particular attention should be paid to keeping the temperature of cut flowers below 2 °C before packing. It takes about one night to precool cut flowers harvested at outside temperature in a refrigerator at 2 °C, but if you use a differential pressure precooler installed in the refrigerator, you can precool in about 30 minutes.

Cut flowers packed in boxes without pre-cooling generate heat by their own breathing when stored and transported at 20 °C, and after 14 hours, they reach nearly 40 °C and become stuffy with sweat. Even when they are stored and transported at 4 °C, the box acts as a heat insulating material, and the temperature of cut flowers does not drop and remains around 20 °C. At that time, when the box is opened several hours later, gray mold often develops. This is because gray mold grows explosively within a few hours when the two conditions of flower temperature of 18-23 °C and humidity of 90% or more overlap. "Pre-cooling before packing" is the key to drastically reduce quality complaints. (Figure 2)



The "optimal storage temperature of 0.5-2 °C" and "500 °C · h value" of general cut flowers, are the know-how for "long-term refrigerated storage technology of flowers" can be put into practice immediately. Even if the problem that some of the cut flowers that

have been cultivated cannot be shipped due to the concentration work of flower harvest and shipping or advanced flower productions for the festival days, it can be solved by changing the shipping preparation using the refrigerator from 3 weeks before the shipment. In addition, by pre-cooling the flowers as soon as possible and connecting the cold chain to the market, the original vase life of the flowers that the producers have cultivated for with great care will be highly evaluated by retailers and consumers.

(5) Wellbeing life with flowers

① Amazing "benefit of flowers"

In 2006, Professor N. Etcoff of Harvard Medical School announced the benefits of flowers, saying, "Flowers in the home increase compassion and make you feel less depressed. It also increases motivation." It made "Flowers in the home" positioned as a necessity. Since then, research and coverage of the benefits of flowers have become active in Europe and the United States, and "a happy lifestyle with flowers" has become widespread as a measure to eliminate social unrest such as the Lehman shock. And the flowers play an important role in the wellbeing life of the current and after-COVID-19 crisis.

The "gift flower" makes the recipient feel joy instantly and receives the giver's feelings obediently. (2005 Rutgers University J.H. Jones) In response to this, in Europe and the United States, "Thank you bouquet", "Sorry bouquet", and "Love confession bouquet" are popular. "Flowers in the workplace" reduces work stress, enhances concentration, and improves work efficiency by 12%. (1996 Washington State University V.I. Lohr) Furthermore, the working environment will be improved and the absentee rate will be drastically reduced from 15% to 5%. (T. Fjeld, Oslo Agricultural University, 1998) In the future, "flowers in the workplace" will be an important factor from the perspective of creating a working environment for "work style reform" in Japan. "Hospital flowers" accelerates the recovery of patients and reduces the use of postoperative sedatives. (2008 Kansas State University S.H. Park) In Japan, mainly in the Kansai region, some hospitals did not accept sympathy flowers due to the possibility to nosocomial infections, but a few years ago the Ministry of Health, Labor and Welfare announced that the cases were unfound. "Flowers & plants to improve the cityscape" prevent garbage, graffiti and crime, and increase the value of real estate in the area. (2015 Pennsylvania University S.H. Han) Also, urban greening relieves psychological stress and halves crimes that lead to anger and violence. (2001 Illinois University W.C. Sullivan) "Flowers decorating stores and interiors" attracts customers and increases staying time and sales by 12%. (2002 Washington University K.L. Wolf) Also, for young generations, it is a cool action to send

out "I am in a beautiful place with flowers" on SNS with photos and videos. Aoyama Flower Market Tea House, opened by Park Corporation, the mother company of the famous flower shop chain "Aoyama Flower Market", is very successful by many young generations visited every day with about 1 hour waiting time to enjoy meals and drinks in the environment of flowers and greenery. "School Flowers" promotes children's concentration, memory and creativity and improves their grades by 10-14%. (2010 University of Technology Sydney J. Daly) It is said that one-third of Japanese elementary and junior high school students have chronic fatigue syndrome. Stress interferes with deep sleep. As one of the countermeasures, the flower's "Green Odor" has begun to be in the limelight. "Green Odor" promotes good sleep and improves health and performance. (Professor Akikazu Hatanaka, Yamaguchi University, 1996) As a "flower for the elderly," "gardening" brings health and mental stability to the elderly. (2008 University of Kansas S.A. Park) Furthermore, "gardening" will foster the elderly suffered from dementia with joy, a sense of accomplishment and fellowship. (2006 Kings University, UK, J. Moriarty)

② The center of "biophilic design" is flowers

Nowadays, "biophilic design" is attracting attention in the global construction industry. "Biophilia" means to create a life and work environment where flowers and plants are close to us and feel the nature, based on the "Biophilia" theory that "people innately like nature" by Dr. E.O. Wilson of the United States. And it has been found that putting



yourself in a "biophilic" environment enhances your health, wellbeing, productivity and creativity. The masterpiece is the Amazon headquarters in Seattle, USA, which makes you think of a dome-shaped botanical garden. (Photo 2)

Photo 2 by [NBBJ](#)

It is said that modern people, in particular, spend more than 90% of their time in buildings on average. Furthermore, the population tends to be concentrated by 40% or more in the metropolises of each country, "biophilic" lifestyle is required mainly in the workplaces and places of living in the metropolises using flowers, plants, natural light, and water to prepare the natural environment. A good example is Singapore, which was founded 56 years ago by the late Mr. Lee Kuan Yew. At that time, when the condominiums where the people lived and the wide roads that govern smooth traffic were constructed, the white concrete of Singapore was completed. Mr. Lee, who loved Japan so much, established the "National Park Board" to create a "Garden City" like the lush Imperial Palace in the middle of Tokyo to make Singapore a world-class city. It made full

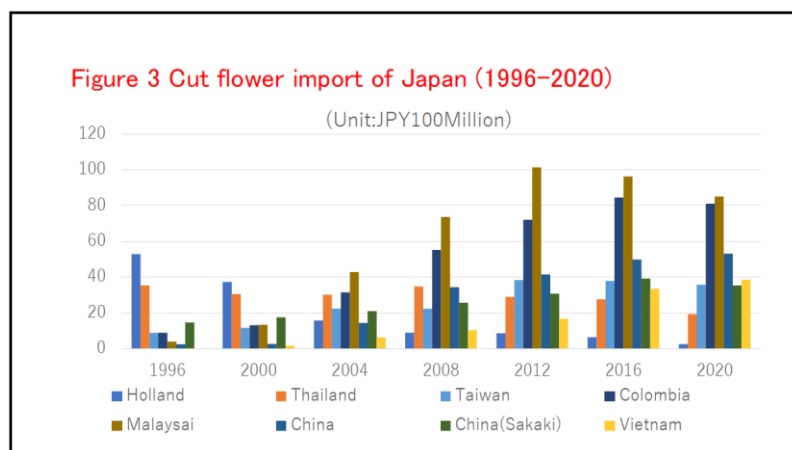
of green Singapore at present. In addition, about 10 years before he died, he tried to create a "biophilic" country and advocated "City in the Garden", that sets up first a "garden", an environment where people can come into contact with nature and live happily and healthily then make the places around the garden to live and work. About 100 Ha of Gardens by the Bay was opened in a landfill on the coastline 10 years ago and welcomes people with rare flowers and plants collected from all over the world. In 2019, there were 12 million visitors from home and abroad, more than double the population of Singapore.

(6) Actual conditions of Japanese flower imports

① Trends in cut flower imports to Japan

The import value of cut flowers has increased more than 1.5 times in the last 10 years, reaching JPY44.9 billion in 2019 on Japan arrival basis (C & F price). Considering that the domestic production value of cut flowers of about JPY210 billion is simply added to the import value of cut flowers as the total sales of cut flowers, the sales share of imported cut flowers continues to grow to 18%. However, looking at the number (stem) of cut flowers, the share of imported cut flowers will be even higher, 28%, compared to about 4.8 billion stems, which is the sum of 3.48 billion stems of domestic cut flowers and 1.34 billion stems of imported cut flowers in 2019.

In the past, two countries, Thailand (Dendrobiumphalaenopsis) and the Netherlands (Lily, Spray chrysanthemum, etc.), which supplied rare flowers, accounted for more than 50% of the countries that export cut flowers to Japan. But in recent years, it has changed to the ever-spring highlands on the equator such as Malaysia (spray chrysanthemum), Colombia (carnation), and Kenya (rose) and Japan neighboring countries like India (rose), China (carnation, chrysanthemum), Taiwan (oncidium, anthurium, chrysanthemum) and Vietnam (spray chrysanthemum) and the cut flowers imports are growing. (Fig. 3)



② Role of cut flower import and import status of the major items

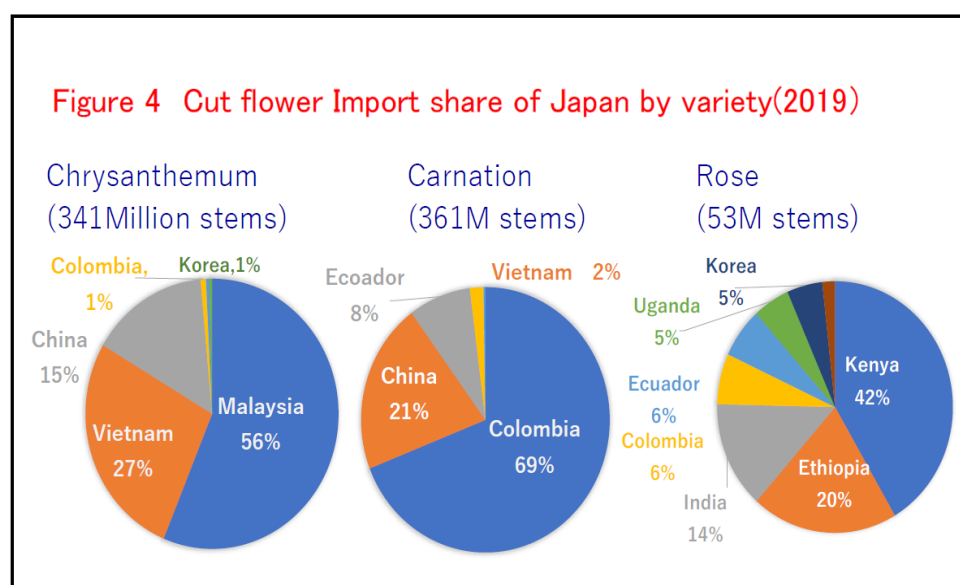
The roles of imported cut flowers are

- 1) Supply of new varieties and rare flowers (new)
- 2) Supply during the off-season of domestic production and high demand period (complementary)
- 3) A large volume of flowers of a certain quality at a relatively low price year-round supply (stable supply)

There are three major categories, but the flower import for Buddhism bouquets and households use is increasing from the highlands on the equator at mass retailers as the stably supply of every week. As a result, 70% of imports were previously concentrated in the five months from August to December, but they have been dispersed in each month. In 2019, the import shares of spray chrysanthemum, carnation and rose were 52%, 64% and 21%, respectively.

The import status by variety in 2019 is 341 million stems of chrysanthemum, mainly by spray chrysanthemum as 199 million stems from Malaysia (4% by ship) and 97 million stems from Vietnam (84% by ship) and 53 million stems of mainly disbud chrysanthemum from China (99% by ship). Carnations are 361 million stems as 249 million stems from Colombia (5% by ship), 75 million stems from China (77% by ship), and 29 million stems from Ecuador, mainly by refrigerated sea container taking about one month from Ecuador. (72% by ship).

There are 53 million stems of roses import, 22 million stems from Kenya and 11 million stems from Ethiopia, which are the two major exporters to Japan, and except for 2.6 million stems from South Korea by sea containers, all are shipped by air. (Fig. 4)



As these import records shows, when "long-term refrigerated storage technology for flowers" is developed and the demand for "sustainable" transportation increases, the imports by the refrigerated containers of ships instead of airplanes are increasing in chrysanthemum, carnation, lily and cut leaves. In 2019, 41% of chrysanthemums, 27% of carnations and 4% of roses were imported by refrigerated sea containers.

In addition to being used as materials, cut flowers that have already been processed or semi-processed for Buddhism bouquets are regularly imported from China.

Imports of cut leaves and cut branches used for bouquets, flower arrangements, Buddhism bouquets are also increasing. Sakaki leaf (China) and Lemon Leaf (USA) are stable in demand and Cordyline (Malaysia), Ruscus (Israel, Mexico), Monstella (Malaysia), Polyscias (Thailand), Adina (Taiwan), fruit-bearing Hypericum (Ethiopia, Ecuador) and Viburnum, as well as the Australian Eucalyptus and Grevillea which are getting popular in the place of the declining demands of Leather Fern (Indonesia, Guatemala), Dracaena (Malaysia), Italian Ruscus (Italy). (Table 5)

Table 5 Cut leaf and branch import of Japan
(2000 VS 2019)

Unit:1000 stems				Unit:1000 stems			
Variety	2000	2019	%	Variety	2000	2019	%
Hypericum	—	26,887	Popular	Leather Leaf Fern	82,819	47,686	58%
Lemon leaf	12,469	22,116	177%	Dracaena	37,361	24,404	65%
Cordyline	382	20,952	5485%	Liriope	11,192	7,825	70%
Ruscus	918	10,859	1183%	Bear Grass	10,210	4,492	44%
Monstera	83	4,866	5863%	Italian Ruscus	7,088	1,317	19%
Eucalyptus	1,336	4,471	335%				
Polyscias	12	3,943	32858%				
Willow	—	1,690	Popular				
Adina	—	1,209	Popular				
Grevillea	—	1,103	Popular				
Podocarpus	93	1,041	1119%				

Imported tropical flowers and Australian native flowers have also become popular. But they are still at a few percent of total sales. However, as they are items with very unique shape and long vase life, florists should take them on more challenges in the future.

③ Price composition of imported cut flowers




Regarding the price composition of imported cut flowers, which is often asked by domestic producers, here are rough index of carnations from Colombia, spray chrysanthemum from Malaysia, and rose from Kenya.

If the flower auction market price of a Colombian carnation in Japan is JPY45 per stem, the FOB price (transportation cost paid by the purchaser) that the producer can receive when boarding an airplane at the local airport is only JPY17 (38% of auction

market price). Looking at this price alone, domestic producers cannot compete. However, if you consider that the minimum cost of importing is JPY34, which is the sum of JPY13 (28%) of the transportation cost by air to Japan and JPY4 of import expenses excluding the commissions of the import trading company. There is a possibility that domestic products can be countered by giving them unique varieties and other characteristics. However, Colombian carnations, which are imported by the refrigerated sea containers taking for about a month, have also appeared. The transportation by ship can reduce the transportation cost by air more than half.

In case of Malaysian spray chrysanthemum, the market selling price is JPY66 per stem, while the FOB price received by the producer is JPY22 (33%), and the minimum import cost is 49 yen. However, Malaysian spray chrysanthemum generally has a larger flower volume than domestically produced flowers in Japan, and since the producers have teamed up with seed companies to introduce varieties of the Japanese market preferences, the average unit price of the market is also higher than Japanese product. The opposite phenomenon from the usual imported flowers is occurring. In addition, the number of flights has decreased due to the COVIT-19, and the challenge of transporting in refrigerated sea containers for two weeks has begun. However, spray chrysanthemum, which has a long vase life, rich in colors and flower shape, is the second most used flowers in European households after carnation and from the idea of "carbon footprint", the domestic grown spray chrysanthemum displayed with the sign of "domestic grown" at retail stores in Europe, is gaining popularity as 'local production for local consumption'.

In case of Kenyan roses, the market selling price is JPY120 per stem, the FOB price received by the producer is JPY38 (32%), and the minimum import cost is JPY75. The petals are large with good color and long vase life. Since it has also obtained MPS certification, it is promising for environmentally friendly retail stores. But unfortunately, there are still no Japanese flower importers who carry them by sea refrigerated container over a month, like EU countries do. (Table 6)

Table 6 Price composition of imported cut flowers to Japan			
<Per stem>	Carnation (ex. Colombia)	Spray Chrysanthemum (ex. Malaysia)	Rose (ex. Kenya)
Auction Market Japan	JPY45 (100%)	JPY66 (100%)	JPY120 (100%)
Market commission	05 (10%)	07 (10%)	12 (10%)
Importer commission	04 (8%)	06 (8%)	10 (8%)
Repacking charge			15 (13%)
Truckage to market	02 (5%)	04 (7%)	08 (5%)
Fumigation fee	01 (3%)	01 (2%)	02 (2%)
PQ/Customs fee	02 (5%)	01 (2%)	03 (3%)
Airfreight	13 (28%)	20 (30%)	30 (25%)
Royalty		02 (3%)	
Box charge	01 (3%)	03 (5%)	02 (2%)
FOB price Export country	17 (38%)	22 (33%)	38 (32%)
			

(7) Current status and characteristics of flower production in major exporting countries

① Colombia

Around the capital city, Bogotá, the highlands around 2,600 m above sea level on the equator are the center of flower production. The sunshine hours are constant throughout the year, and the temperature is 25 °C in the daytime and 8 °C at night. The average wage is about JPY50,000 per month, including social security and welfare expenses. Many women are active in the flower industry.

The flower production area is about 7,500ha, consisting of 2,500ha for roses, 1,100ha for carnations, 700ha for chrysanthemums, and 1,100ha for hydrangea, which has been growing in recent years. The export value in 2019 reached JPY150 billion, 80% for the United States, 4% for the United Kingdom and Russia, and 3% for Japan. The export of bouquets has been growing for the United States.

There are many farms around 20ha, and large ones reach 100ha. The greenhouse is as simple as a circus tent. Many farms are trying to differentiate themselves by partnering with breeding companies to expand their only one product lines as well as to process flowers into bouquets.

Recently, the exports in refrigerated containers by ship have also begun, arriving in the United States in 7 days, Europe in 23 days, and Japan in 30 days, and the fare is about one-third of the air fare. This movement has been accelerated by COVID-19, and now more than 50% of the shipments to the United States are by ship.

Although the producers have obtained the certification of MPS etc. required for the country of export destination, they have "Floraverde (green flower)" as an environmental certification system unique to Colombia. This certification is a comprehensive certification that includes not only the environment but also social security, welfare, water resources protection, and the medical system with the members of 350 companies that control 75% of exports.

② Malaysia

In the country on the equator, the flower production area is about 2,600 ha with 2 major production areas: approximately 1400ha around Johor Bahru in the south where tropical plants such as orchids and dracaena are cultivated, and approximately 600ha in Cameron Highland (1,200-1,600m above sea level), located in the northwestern part of the everlasting spring plateau where spray chrysanthemum is cultivated.

The temperature of Cameron Highland is 22°C in the daytime and around 16°C at night, which is ideal for flower bud initiation of chrysanthemums to cultivate year-round only by lighting without the heating system nor the shading nets facility for blackout.

However, many farms are built in the shape of terraced rice fields at the foot of the mountain and are not intensive production with machines like in the Netherlands. The export value of cut flowers in 2019 has reached about JPY12 billion for Japan, Australia, Singapore, Thailand and China. The producers have not yet obtained environmental certification.

Most of the farm workers are migrant workers from Bangladesh, Myanmar, India, Laos, Indonesia, etc., and the monthly salary is around JPY40,000. Due to COVID-19, foreign workers cannot enter the country and there is a shortage of labor. In addition, the number of flights has been reduced and the airfare has soared, so that the refrigerated container transportation to Japan by ship has also started. It takes more than 10 days from the nearest Port Kelang to Kobe / Yokohama.

③ China

China has the world's largest flower production area of 170,000 ha. Of these, cut flowers are to be 60,000 ha, mainly in Yunnan, and potted plants to be 100,000 ha, mainly in Guangdong. Most of the flower production is small-scale production of about 2 mu (about 1300M2), and most of the production is domestic consumption by open field cultivation or simple tunnel type house cultivation.

The export of flowers will be about JPY12 billion in 2019, which is less than 10% of the production volume. There are several 100-mu (6.7ha) scale facility cultivations of chrysanthemums in coastal areas such as Hainan, Guangdong, and Zhejiang provinces, and they are shipped to Japan in refrigerated sea containers along with the constant supply of Sakaki leaf and Hisakaki leaf. Recently, Buddhism bouquets have been processed. In Kunming, Yunnan Province (the southwestern part of China), which is a plateau located in the northern part of Thailand at the altitude of about 1900 m, there are several facilities cultivated on a scale of 100 mu for the production of carnations, roses and cymbidiums. These flowers are exported by air via Thailand and Beijing, but the airfare in China is set high and it is difficult to export to Europe. Therefore, there are few producers who have obtained environmental certification such as MPS.

The labor cost of flower-producing workers in China is relatively low, with a monthly salary of around JPY20,000. The retention rate is low, training for employees is not often conducted, and the production technology is influenced by the skill of the individual in charge, not the company. Even in Kunming, the night temperature in winter is low, but farms with heating facilities are rare. In addition, payment of seedling royalties and pretreatment with flower preservatives are also required to be improved in the future.

④ Vietnam

Vietnam's flower production is 35,000ha (2018), and the center of cut flower production

is the Dalat Plateau (elevation 1,500m), which produces 2.8 billion stems flowers at 8,000ha. Inside the Tropic of Cancer with 12 degrees north latitude, and the temperature is stable at 26 °C in the daytime and 13 °C at night. The main production of chrysanthemum only has 600ha. The production volume (stems) by variety is 43% for chrysanthemum, 16% for rose, 13% for gladiolus, 5% for carnation, and 2% for lily. The export value of cut flowers in 2019 is about JPY3 billion. AGRIVINA, a foreign company that operates Dalat Hasfarm, is driving the export of cut flowers from Vietnam to Japan. With a production area of 110ha, it produces more than 160 million stems of cut flowers, and not only exports, but also handles bouquet processing, flower wholesale, flower shop management and flower sales at the major mass retailers in Vietnam,

As the Dutch vice president devotedly instructed hard-working Vietnamese employees, he succeeded in changing the production control system from weekly to daily for chrysanthemum production, achieving more than four work cycles per year. They plant the uniform seedlings in a flat field and darken when the plant height reaches 40 cm. Since the quality is uniform, flower harvest, sorting, sleeve in, and insertion into a water bucket containing the pretreatment solutions are performed in the field.

Since then, the cold chain has been thoroughly implemented, and the cut flowers are immediately cooled to 2°C at the flower packing house, and when they are well cooled, they are boxed in a room at 12°C within 30 minutes. After being precooled by differential pressure precooler at 1°C, they are loaded into the refrigerated sea container at 0.6°C to ship to Japan for about 10 days. Dalat Hasfarm also has obtained MPS certification.

In order to support future Vietnamese flower production, in Dalat, there are some movements by Japanese flower enterprises such as the establishment of a training farm by JAICA and Himeji flower auction market, opening of a flower center with the flower auction market function by Ota flower auction market, and production of chrysanthemum at the local farm by the Japanese importer, Ocean Trading..

(8) The turning point of the Japanese flower industry has come

① Misunderstanding of decrease in domestic production of flowers and increase in imports

In the 21 years from 1999, the production area of domestic cut flowers in Japan decreased by 32% to 13410 ha. Chrysanthemum, which occupies 1/3 of the total production area, has also decreased by 30%, but carnations, roses, gypsophila and statice have been reduced by more than 40%. (Table 7)

Table 7 Production area of cut flower in Japan

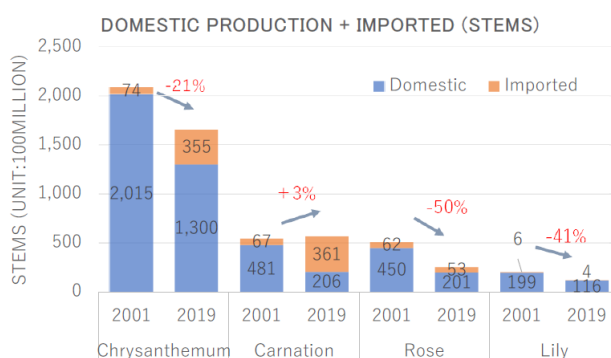
Production area:1999	2020	+ / -
Total	19,700 ha	13,410 ha - 6,290 ha (-32%)
• Chrysanthemum	6,190 ha	4,314 ha - 1,876 ha (-30%)
• Carnation	508 ha	262 ha - 246 ha (-48%)
• Rose	605 ha	291 ha - 314 ha (-52%)
• Eustoma	451 ha	411 ha - 40 ha (- 9%)
• Gypsophila	424 ha	196 ha - 228 ha (-54%)
• Limonium	308 ha	168 ha - 140 ha (-45%)
• Lily	871 ha	659 ha - 212 ha (-24%)
• Alstroemeria	118 ha	79 ha - 39 ha (-33%)

These production declines are to make up by importing flowers more, but in fact it is not enough. The peak number of cut flowers used in Japan was 6.5 billion stems in 1996 (5.8 billion stems domestically produced + 700 million stems imported), and then decreased to 4.7 billion stems in 2019 by 28% (3.4 billion stems domestically produced and 1.3 billion stems imported).

Comparing the total number of cut flowers, including the number of domestically produced and imported flowers in 2001 and 2019, by variety, chrysanthemum decreased by 21% to 1,655 million stems, carnation increased by 3% to 556,700 million stems, rose decreased by 50% to 253 million stems and lilies decreased by 41% to 120 million stems.

Since the population decline rate in Japan during the period is less than 1%, there is a possibility that the current production and distribution system has blind spots that cannot stimulate demand, or that production is not based on demand. (Table 8)

Table 8 The number of cut flowers used in Japan by variety



Comparing the 2019 sales statistics of Royal Flora Holland in the Netherlands, which is the world's largest flower auction market, and that of all flower auction markets in Japan, about 3.3 billion stems of roses were sold with the average unit price at JPY27 in the Netherlands while 345 million stems in Japan with the average unit price at JPY83. The average unit price of roses in Japan is about three times higher than that of the Netherlands, but the quantity is about 1/10 and the total sales amount is 1/3. The reason is that roses in Japan have been used mainly for business demand for many years with the stem length of 60 cm or more, while roses in the Netherlands have also for business demand with a stem length of 1 m, but the mainstream is household and casual gift demands with the stem length of 50 cm or less.

There is also a hidden market in Japan where it is difficult to get on the domestic flower production statistics. They are agricultural products direct sales stores and roadside stations. According to the announcement by the Ministry of Agriculture, Forestry and Fisheries in 2017, there are about 12,000 permanent direct sales stores nationwide in Japan with sales of about JPY1 trillion. Flowers, mainly with the size that cannot be put on the flower auction markets, account for about 15% of sales, and sales are close to JPY150 billion. The purpose of the purchase is "relatively cheap with long-lasting" for household use or casual gifts to be distributed to friends and neighbors.

② The past, present and future of flower demand

Weddings were a major part of the demand for flower business in Japan. The number of weddings peaked at 1.2 million couples in 1970 and dropped to 610,000 couples in 2017. However, the wedding ceremony and reception markets have been keeping at the same level for the past 10 years at JPY1.4 trillion. There is a tendency to spend money on wedding bouquets and holding "Only one!" weddings. (2018 Yano Research Institute)

The market for funerals was 1.3 million cases in 2016, at JPY1.79 trillion but the number of funerals will increase to 1.7 million cases by 2040. However, in metropolitan areas, the growth rate of the funeral market is expected to increase slightly, as 75% of the funerals have begun to change from conventional general funerals to family funerals and direct funerals. (2017 Yano Research Institute) The "family funeral with full of flowers" organized by Hibiya Kadan is a movement to make waves to the flower industry, which will place a flower-decorated casket in the center of the ceremonial hall for family funerals. Unlike the traditional chrysanthemum-centered flower altar, it also uses abundant flower materials other than chrysanthemums.

Demand for Buddhism bouquets, which are said to account for 60% of cut flower sales at general mass retailers, may drop sharply in the future. The number of religion unbelievers, especially young people, is increasing, and only one-third of the people

believe in Buddhism. (2009 NHK) Also, among the 53 million households nationwide, the number of households with Buddhist altars has decreased to one-third. And most of the people who offer flowers to the Buddhist altar are over 60 years old. The producers of cut flowers for Buddhism bouquets, mainly chrysanthemum, should start experiments on the production and distribution of varieties that can be used for household demand and casual gifts.

Japan is also one of the world's leading gift nations. The gift market is said to be JPY17 trillion. Among them, 'Casual gifts' are growing significantly, which are given to family members, loved ones, friends, neighbors, etc. on anniversaries and casually, and the market size is JPY3.6 trillion in 2014. (2014 Yano Research Institute) It is known that casual gifts will increase as household demand increases in the development of the flower industry in Europe and the United States. The annual per capita purchase of flowers around the world is 127 € in Switzerland, 114 € in Denmark, 108 € in Germany, 104 € in the United Kingdom, 95 € in the United States, and 38 € in Japan. The United States is 2.5 times than that of Japan, and Switzerland is 3.3 times. (AIPH & Union Fleur 2020: Data from each country 2018 and 2019)

COVID-19 has caused an amazing phenomenon in the flower industry. The purchase of flowers has increased, especially among households in their 20s who rarely buy flowers. They enjoy "Stay Home!" with flowers, and give flowers to family members, loved ones, and friends who can't meet in the distance to convey their hearts to flowers asking for "How are you?" (Table 9)

Table 9 COVID-19 changed floral consumption in Japan

Floral consumption increased in younger (Z) generations

Household consumption comparison April 2020 vs April 2019

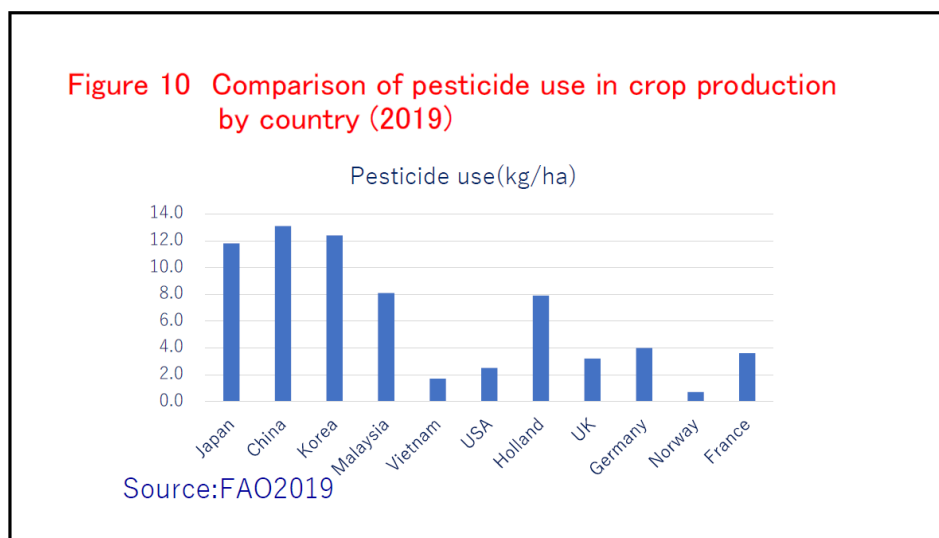
	All ages	20s	30s	40s	50s	60s	70s~
Total consumption	-11.0%	-28.2%	-13.6%	-12.3%	-7.2%	-7.9%	-12.7%
Cut flowers	-14.0%	2066.7%	-16.1%	-5.2%	-30.5%	-22.9%	-5.5%
Potted, young plants	0.7%	733.3%	-10.3%	12.1%	-19.0%	29.3%	-13.1%
Gardening materials	16.8%	641.2%	172.7%	41.1%	11.3%	13.4%	5.9%

Source: Japanese Ministry of Internal Affairs and Communications "Household Survey"
This table is created by Ms. Kyoko Aoki

Rather than worrying about the future population decline for flowers consumption, using the COVID-19 as a notch, we should make a "wellbeing life with flowers" in Japan by promoting the household demand for flowers and casually giving flowers.

③ The future of flower production and distribution

When SDGs permeate society, "sustainable" flower production and distribution are required. As an example, the amount of pesticides used in the production of agricultural products is much lower in EU and USA than Japan, even though it was opposite 20 years ago, as the result that they have continued the production based on environmental certifications such as MPS and the production efficiency has been increasing. In other words, the challenge of "sustainable" flower production and distribution leads not only to environmental load reduction but also to production and distribution cost savings. (Table 10)



In addition, environmental certifications such as MPS record and report daily production conditions and processes such as pesticides, fertilizers, water, energy, and production volume. There is a smart agricultural project that uses AI to analyze these data combining with the data from DENSO's shape recognition sensors, illuminance meters, soil moisture meters, etc., to realize the optimal sustainable and automatic flower production using robots. It is carried by a team of the Wageningen University & Research in the Netherlands and National Agriculture and Food Research Organization in Japan.

It is said in Japan that more than 30% of the flowers produced in general cannot be shipped out, and the additional 20-30% loss in the distribution, which has become a negative topic for the flower industry in recent years as "flower loss". And it is the exact timing to promote a "wellbeing life" with flowers now. And first of all, we should set the standard of flowers for home use (length, before cutting, minimum flower life, etc.) from the consumer's point of view consulting to the leading flower shop chains and mass retailers. Then it should be realized combining the long vase life flower producers, and

"cold chain" technique for storage and distribution. In addition, the flower auction markets should improve several points such as separation of the sales and the distribution, 5 days per week sales instead of 3 days, promotion of contracted cultivation and local production for local consumption. And the flower retailers should challenge to realize the vase life guaranteed flower sales with flower food sachets to all the flower bouquets to promote the flower sales for home use and casual gifts within next 10 years.

Like Toyota's just in time delivery (Kanban) system, it is possible for the domestic flower producers to supply the required number of freshness flowers with the desired variety and the lower leaves removed in the next morning of the order receipt, or to cooperate with mass retailers and flower shop chains in the area for local products for local sales to differentiate from the imported flowers.

It is also interesting to specialize in the production of cut flowers that are difficult to import, such as lilies, native flowers and tropical flowers that are too heavy for expensive transport, and dahlia and cattleya with poor flower vase life.

However, originally Japan's flower production technology can be proud of to the world. It has bred unique varieties such as eustoma, dahlia, and roses that do not look like roses, and has been characterized by sweet pea and gloriosa, which have established unique cultivation technique for longer stem length. This field should be continuously developed. And looking forward to seeing the young successor producers to go to the farms in Vietnam and Malaysia during the fallow period of their farms and engage in flower production with the view to the flower markets in Japan, Asian countries, and even all over the world.

Nobu Kaishita 13th September, 2022

