Greenhouse in South Korea

1. Summary

Korea is among the top countries globally for per-capita vegetable consumption. In 2024, total production reached 8 million tons on 218,000 hectares, though both area and output have declined as diets shift toward meat. Self-sufficiency remains high at 83 percent. Koreans favor Asian vegetable varieties such as Chinese cabbage and radish, which are typically consumed fresh.

Paprika dominates exports, accounting for 53 percent of total vegetable export value, mainly to Japan. As domestic consumption has increased, the paprika export-to-domestic ratio shifted from 90:10 in the 1990s to 40:60 in 2024.

Ornamental plant production totaled KRW 538 billion (EUR 312 million) on 4,200 hectares, with demand largely corporate or ceremonial. Low household consumption limits the incentive to invest in high-quality greenhouses.

Vegetable greenhouses cover 53,517 hectares and are mostly low-tech plastic structures. High-value crops such as paprika, tomatoes, and strawberries are increasingly grown in mid- or high-tech systems, including substrate-based, climate-controlled production. The area of high-tech glasshouses for vegetable production continues to expand and has reached 353 hectares. Energy use in low-tech greenhouses comes primarily from kerosene or diesel, while high-tech glasshouses rely on electricity. Ornamental plant greenhouses cover 2,019 hectares, but growth in this segment has remained stagnant, with conditions particularly unfavorable for glasshouses.

Korean greenhouse horticulture evolved from low-tech plastic greenhouses in the 1980s to Dutch-built high-tech glasshouses in the 1990s, which boosted paprika exports. Large-scale projects between 2009 and 2013 often failed due to local farmer opposition and funding challenges, while smaller SME- and government-supported projects expanded gradually. Since 2018, the “Smart Farm” initiative has promoted high-tech horticulture through Smart Farm Innovation Valleys, with Dutch technologies contributing to climate control, training, and demonstration projects.

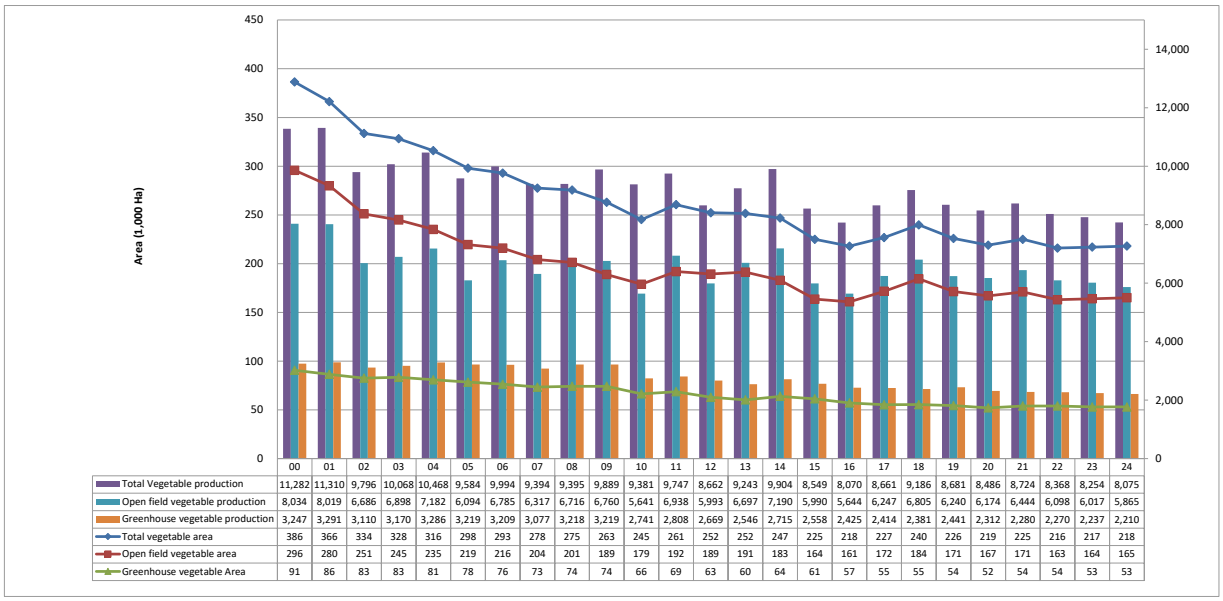
Market entry requires careful navigation: conglomerates may face opposition from local farmers, while SMEs encounter fewer barriers but need verified budgets. Partnerships with licensed, English-speaking local entities are essential. Private projects are less affected by nationalistic policies, and local investors, banks, and non-agricultural businesses are increasingly involved in the sector.

2. Overview Korean Horticulture

1) Vegetables

Korea ranks among the top countries globally for per-capita vegetable consumption. In 2024, total vegetable production was estimated at 8 million tons cultivated on 218,000 hectares. However, both cultivation area and production volume have declined as food culture shifts toward greater meat consumption. Despite this, the self-sufficiency rate for vegetables remains relatively high at 83 percent compared to other agricultural products like grains, fruits, and meat. Koreans prefer Asian vegetable varieties, such as Chinese cabbage and radish, which differ from those commonly produced in Europe or the Americas. Furthermore, Korean vegetables are mostly consumed fresh—as ingredients for kimchi, as leafy wraps accompanying BBQ, or as side dishes (banchan). Processed forms, such as frozen or dried vegetables, are not in high demand.

Figure 1. Vegetable Production and Farming Area by Open Field and Greenhouse, by Year



	00	01	02	03	04	05	06	07	08	09	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24
Total Vegetable production	11,282	11,310	9,796	10,068	10,468	9,584	9,994	9,394	9,395	9,889	9,381	9,747	8,662	9,243	9,904	8,549	8,070	8,661	9,186	8,681	8,486	8,724	8,368	8,254	8,075
Open field vegetable production	8,034	8,019	6,686	6,898	7,182	6,094	6,785	6,317	6,716	6,760	5,641	6,938	5,993	6,697	7,190	5,990	5,644	6,247	6,805	6,240	6,174	6,444	6,098	6,017	5,865
Greenhouse vegetable production	3,247	3,291	3,110	3,170	3,286	3,219	3,209	3,077	3,218	3,219	2,741	2,808	2,669	2,546	2,715	2,558	2,425	2,414	2,381	2,441	2,312	2,280	2,270	2,237	2,210
Total vegetable area	386	366	334	328	316	298	293	278	275	263	245	261	252	252	247	225	218	227	240	226	219	225	216	217	218
Open field vegetable area	296	280	251	245	235	219	216	204	201	189	179	192	189	191	183	164	161	172	184	171	167	171	163	164	165
Greenhouse vegetable Area	91	86	83	83	81	78	76	73	74	74	66	69	63	60	64	61	57	55	55	54	52	54	54	53	53

In 2024, paprika accounted for 53 percent of Korea's total vegetable export value, firmly establishing it as the country's most important export crop. Oyster mushrooms and enoki mushrooms followed as the next largest export items. Japan remained the dominant export destination, absorbing 56 percent of Korea's total vegetable exports, followed by the United States, Australia, and the Netherlands. In the same year, the Netherlands imported USD 6.7 million worth of vegetables from South Korea, mainly oyster mushrooms and enoki mushrooms.

Paprika exports are heavily concentrated in the Japanese market: 99.3 percent of Korea's total paprika exports were shipped to Japan, where Korean paprika accounted for a 70

percent share of imported paprika—down 13 percentage points compared with five years ago (see reasons below). Although Korea and China agreed on phytosanitary import requirements in 2019, exports to China remain negligible, representing only 0.4 percent of total export value.

When paprika production began in Korea in the 1990s, around 90 percent of output was exported, with just 10 percent consumed domestically. This export-oriented structure has gradually weakened, and by 2024 the export-to-domestic ratio had shifted to 40:60. This structural change is driven by three key factors. First, the domestic market offers higher margins, as the Japanese yen has depreciated to historic lows against the Korean won and the US dollar, significantly eroding export profitability. Second, Korean farmers are facing rising energy costs associated with high-tech greenhouse production. Third, domestic consumption has expanded as paprika has become more embedded in Korean food culture, supporting higher local prices.

According to an OECD report, Korea has the highest agricultural producer prices in the world—around 170 percent of the global average—allowing high-tech greenhouse farmers to secure margins of 30 to 50 percent. While demand from Japan remains stable, declining export margins have prompted Korean farmers to increasingly prioritize the domestic market. To achieve sustainable long-term growth, Korea will need greater innovation to scale up production and further develop foreign markets.

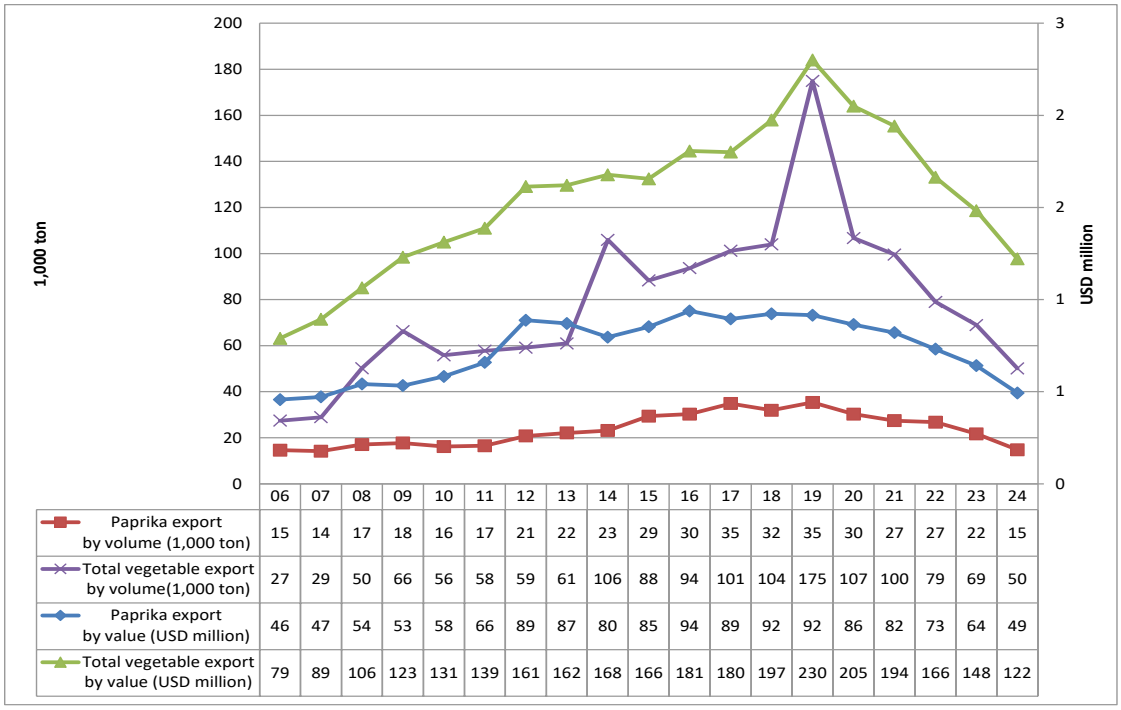
A similar pattern can be observed in the tomato sector. Korea once exported USD 14.8 million worth of tomatoes, almost entirely to Japan, but exports have declined steadily and fell to just USD 4.1 million in 2024.

Table 1. Top 20 Vegetable Crops by Farming Area in 2024

No.	Vegetables	Area (ha)	Production (1,000 ton)
1	Chinese Cabbage	28,637	1,948
2	Red Pepper	26,430	68
3	Garlic	23,290	285
3	Green onion	19,105	525
4	Onion	18,614	1,175
5	Radish	18,497	1,036
6	Water melon	10,673	404
7	Pumpkin	10,360	319
8	Cabbage	8,347	341
9	Tomato	6,086	371
10	Strawberry	5,612	155
11	Oriental Melon	4,504	213
12	Lettuce	4,458	113
13	Spinach	4,421	58
14	Cucumber	4,154	295
15	Green Pepper	3,717	143

16	Carrot	3,054	105
17	Ginger	2,491	28
18	Melon	1,664	44
19	Chive	1,602	69
20	Water Parsley	1,074	25

Figure 2. Total Vegetable and Paprika Exports from Korea, by Year



	06	07	08	09	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24
Paprika export by volume (1,000 ton)	15	14	17	18	16	17	21	22	23	29	30	35	32	35	30	27	27	22	15
Total vegetable export by volume(1,000 ton)	27	29	50	66	56	58	59	61	106	88	94	101	104	175	107	100	79	69	50
Paprika export by value (USD million)	46	47	54	53	58	66	89	87	80	85	94	89	92	92	86	82	73	64	49
Total vegetable export by value (USD million)	79	89	106	123	131	139	161	162	168	166	181	180	197	230	205	194	166	148	122

2) Ornamental plants

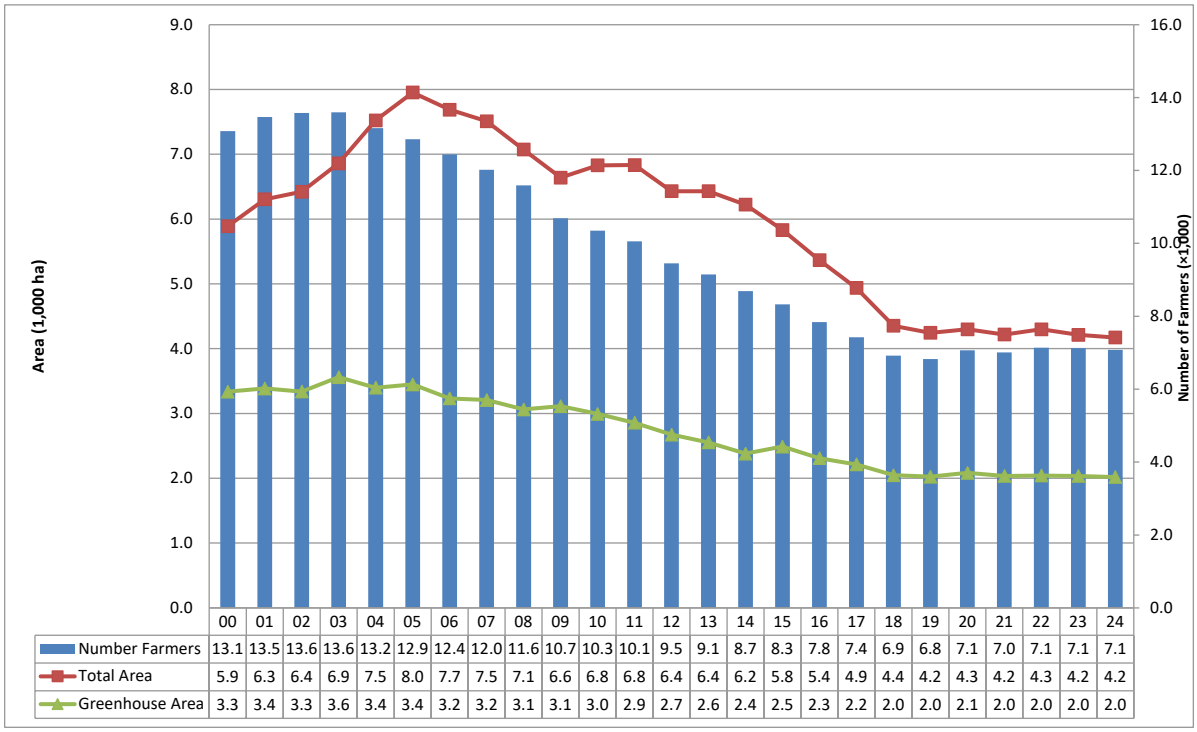
Total ornamental plant production in 2024 was estimated at KRW 538 billion (EUR 312 million), produced on approximately 4,200 hectares of farmland. The total cultivation area for ornamental plants expanded steadily until 2005, in line with rising flower consumption. Since then, however, the area has declined sharply as flower demand contracted following the global economic downturn. Notably, consumption failed to recover even after broader economic conditions improved.

Flower consumption in Korea is driven primarily by corporate demand for ceremonial occasions and by floral decorations in hotels, while individual household consumption remains very low compared with other developed countries. Ornamental plant exports have also declined since 2010, as illustrated in Figure 5. In most countries, flower consumption tends to increase alongside rising income levels; therefore, Korea's declining consumption despite continued growth in per-capita income is highly unusual. This trend is partly explained by a loss of consumer trust, stemming from the sector's limited progress

in innovation and its inability to reduce prices. As a result, many Korean consumers remain reluctant to purchase flowers at prevailing price levels.

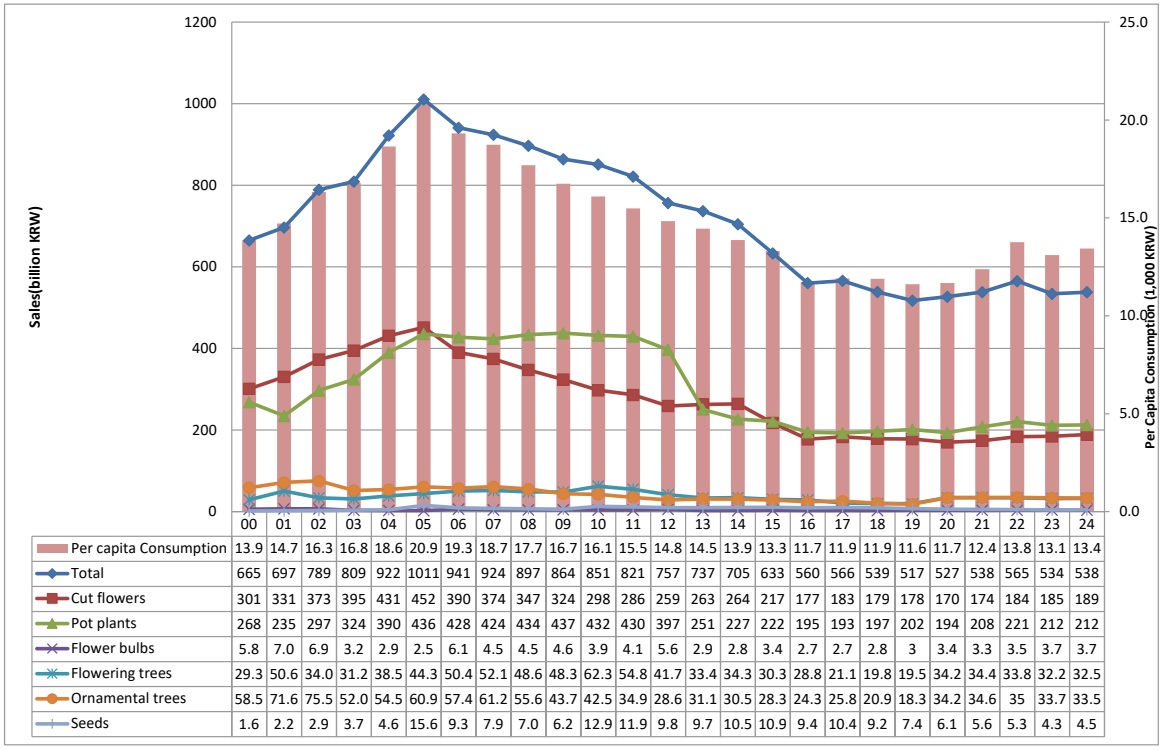
Since 2019, younger consumers have increasingly begun purchasing flowers—either individually or through subscription services—to decorate their homes, reversing the earlier downward trend. However, they frequently express dissatisfaction with the short vase life of domestically produced flowers. Traditionally, the Korean flower sector has focused on ceremonial uses, where longevity is less critical. Consequently, flowers are rarely stored or transported using cold-chain systems. To meet the growing demand for longer-lasting flowers, imports have increased accordingly.

Figure 3. Number of Farmers and Cultivated Area for Ornamental Plants by Year



	00	01	02	03	04	05	06	07	08	09	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24
Number Farmers	13.1	13.5	13.6	13.6	13.2	12.9	12.4	12.0	11.6	10.7	10.3	10.1	9.5	9.1	8.7	8.3	7.8	7.4	6.9	6.8	7.1	7.0	7.1	7.1	7.1
Total Area	5.9	6.3	6.4	6.9	7.5	8.0	7.7	7.5	7.1	6.6	6.8	6.8	6.4	6.4	6.2	5.8	5.4	4.9	4.4	4.2	4.3	4.2	4.3	4.2	4.2
Greenhouse Area	3.3	3.4	3.3	3.6	3.4	3.4	3.2	3.2	3.1	3.1	3.0	2.9	2.7	2.6	2.4	2.5	2.3	2.2	2.0	2.0	2.1	2.0	2.0	2.0	2.0

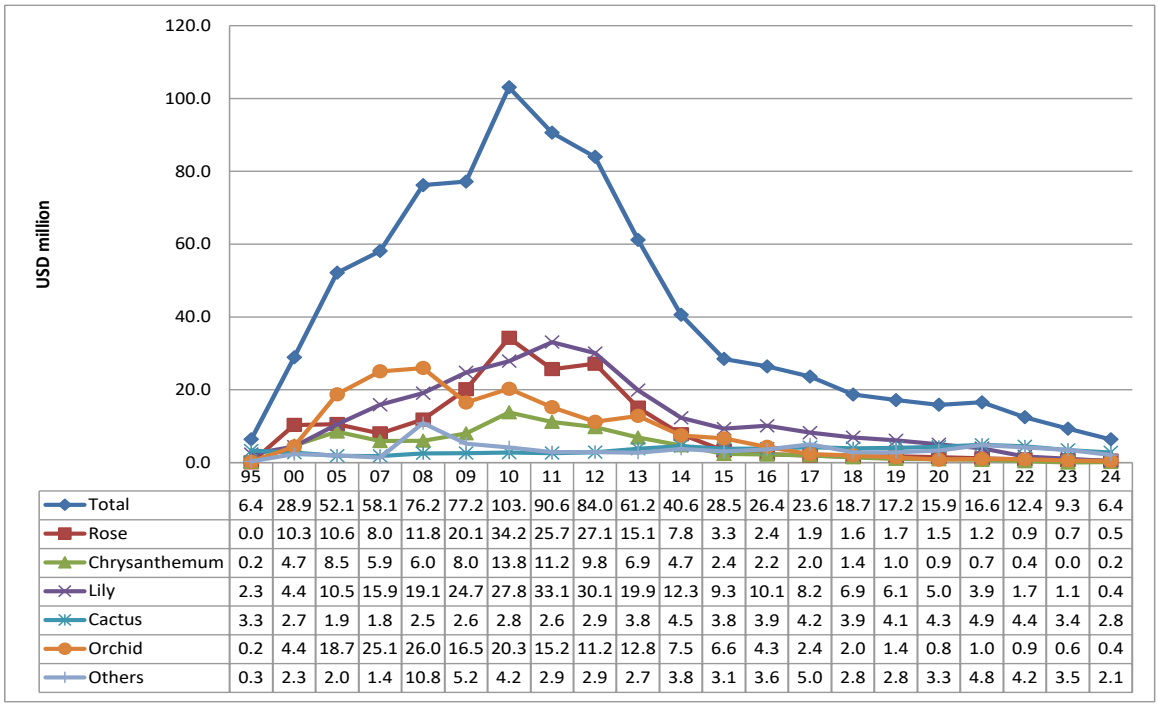
Figure 4. Ornamental Plant Sales and Per Capita Consumption by Year



	00	01	02	03	04	05	06	07	08	09	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24
Per capita Consumption	13.9	14.7	16.3	16.8	18.6	20.9	19.3	18.7	17.7	16.7	16.1	15.5	14.8	14.5	13.9	13.3	11.7	11.9	11.9	11.6	11.7	12.4	13.8	13.1	13.4
Total	665	697	789	809	922	1011	941	924	897	864	851	821	757	737	705	633	560	566	539	517	527	538	565	534	538
Cut flowers	301	331	373	395	431	452	390	374	347	324	298	286	259	263	264	217	177	183	179	178	170	174	184	185	189
Pot plants	268	235	297	324	390	436	428	424	434	437	432	430	397	251	227	222	195	193	197	202	194	208	221	212	212
Flower bulbs	5.8	7.0	6.9	3.2	2.9	2.5	6.1	4.5	4.5	4.6	3.9	4.1	5.6	2.9	2.8	3.4	2.7	2.7	2.8	3	3.4	3.3	3.5	3.7	3.7
Flowering trees	29.3	50.6	34.0	31.2	38.5	44.3	50.4	52.1	48.6	48.3	62.3	54.8	41.7	33.4	34.3	30.3	28.8	21.1	19.8	19.5	34.2	34.4	33.8	32.2	32.5
Ornamental trees	58.5	71.6	75.5	52.0	54.5	60.9	57.4	61.2	55.6	43.7	42.5	34.9	28.6	31.1	30.5	28.3	24.3	25.8	20.9	18.3	34.2	34.6	35	33.7	33.5
Seeds	1.6	2.2	2.9	3.7	4.6	15.6	9.3	7.9	7.0	6.2	12.9	11.9	9.8	9.7	10.5	10.9	9.4	10.4	9.2	7.4	6.1	5.6	5.3	4.3	4.5

* 1 EUR = around KRW 1,694 as of January 2025

Figure 5. Export of Ornamental Plants from Korea



	95	00	05	07	08	09	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24
Total	6.4	28.9	52.1	58.1	76.2	77.2	103.	90.6	84.0	61.2	40.6	28.5	26.4	23.6	18.7	17.2	15.9	16.6	12.4	9.3	6.4
Rose	0.0	10.3	10.6	8.0	11.8	20.1	34.2	25.7	27.1	15.1	7.8	3.3	2.4	1.9	1.6	1.7	1.5	1.2	0.9	0.7	0.5
Chrysanthemum	0.2	4.7	8.5	5.9	6.0	8.0	13.8	11.2	9.8	6.9	4.7	2.4	2.2	2.0	1.4	1.0	0.9	0.7	0.4	0.0	0.2
Lily	2.3	4.4	10.5	15.9	19.1	24.7	27.8	33.1	30.1	19.9	12.3	9.3	10.1	8.2	6.9	6.1	5.0	3.9	1.7	1.1	0.4
Cactus	3.3	2.7	1.9	1.8	2.5	2.6	2.8	2.6	2.9	3.8	4.5	3.8	3.9	4.2	3.9	4.1	4.3	4.9	4.4	3.4	2.8
Orchid	0.2	4.4	18.7	25.1	26.0	16.5	20.3	15.2	11.2	12.8	7.5	6.6	4.3	2.4	2.0	1.4	0.8	1.0	0.9	0.6	0.4
Others	0.3	2.3	2.0	1.4	10.8	5.2	4.2	2.9	2.9	2.7	3.8	3.1	3.6	5.0	2.8	2.8	3.3	4.8	4.2	3.5	2.1

3. Greenhouses in Korea

1) Greenhouses for Vegetables

In 2024, the total greenhouse area used for vegetable production was 53,517 ha, of which 53,079 ha were plastic greenhouses and 353 ha were glasshouses. While the total vegetable greenhouse area has been declining since 2010, the area of glasshouses has increased steadily, driven by the production of high-value vegetables such as paprika and tomatoes.

Table 2. Vegetable Greenhouse Area by Material Type and Year (unit: ha)

Year	Total	Plastic	Hard board	Glass
2006	46,354	46,094	45	215
2007	50,157	49,828	104	225
2008	50,297	49,990	55	252
2009	50,024	49,605	133	286
2010	48,835	48,465	98	272
2011	49,537	49,175	88	274
2012	47,924	47,556	90	278
2013	51,058	50,686	67	306
2014	51,787	51,382	76	329
2015	52,526	52,099	76	351
2016	51,909	51,477	79	353
2017	52,418	51,997	75	346
2018	51,244	50,876	65	285
2019	52,094	51,719	65	310
2020	52,444	52,055	67	321
2021	53,239	52,846	71	322
2022	52,808	52,404	69	335
2023	53,106	52,721	75	310
2024	53,517	53,079	85	353

Watermelons account for the largest greenhouse cultivation area, exceeding 10,673 hectares, and are produced predominantly in soil-based systems within low-tech plastic greenhouses. Green peppers, cucumbers, and Oriental melons (a Korean variety known as *chamoe*) are also mainly cultivated in low-tech plastic greenhouses.

When comparing the total glasshouse area (353 hectares in 2024, Table 2) with the total paprika greenhouse area (776 hectares in 2024, Table 3), it is evident that a significant share of paprika production also takes place in mid-tech plastic greenhouses. The same is true for tomatoes.

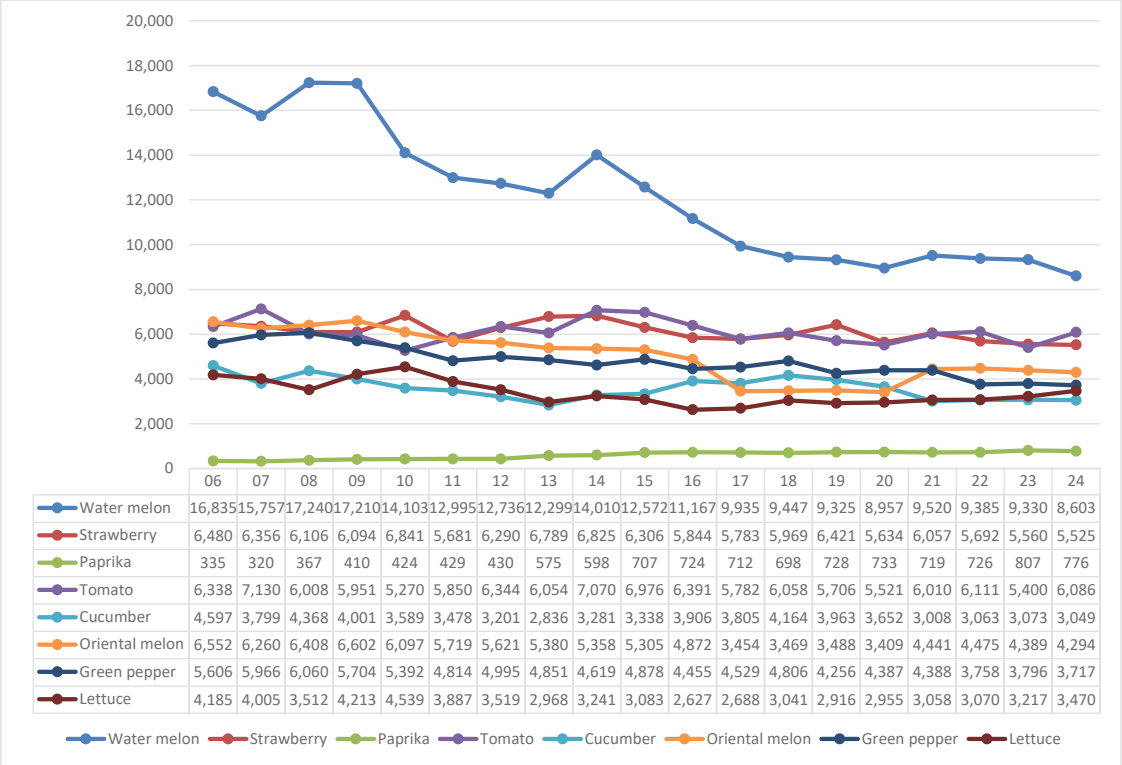
Strawberry production has recently been shifting toward mid-tech and high-tech greenhouse systems, often using substrate cultivation. Korean strawberry varieties such

as *Seolhyang* and *Jookhyang* are gaining popularity in Southeast Asia and Australia, prompting growers to invest more actively in advanced greenhouse facilities. Fully climate-controlled, year-round strawberry production and leafy vegetable cultivation using moving-gutter systems are among the most recent trends in the Korean greenhouse market.

Table 3. Major Geenhouse Vegetables in 2024

Vegetables	Total Area (ha)	Greenhouse Area (ha)	Greenhouse Area Ratio (%)	Total Production (1,000 ton)	Greenhouse Production (1,000 ton)	Greenhouse Production Ratio (%)
Water melon	10,673	8,603	80.6	404	334	82.7
Tomato	6,086	6,086	100.0	371	371	100.0
Strawberry	5,612	5,525	98.4	155	153	98.7
Oriental melon	4,504	4,294	95.3	213	207	97.2
Green Pepper	3,717	3,717	100.0	143	143	100.0
Lettuce	4,458	3,470	77.8	113	94	83.2
Cucumber	4,154	3,049	73.4	295	250	84.7
Chinese cabbage	28,637	2,573	9.0	1,948	108	5.5
Pumpkin	10,360	2,347	22.7	319	119	37.3
Green onion	19,105	2,166	11.3	525	58	11.0
Spinach	4,421	2,051	46.4	58	32	55.2
Melon	1,664	1,654	99.4	44	44	100.0
Chive	1,602	1,175	73.3	69	54	78.3
Paprika	776	776	100.0	87	87	100.0

Figure 6. Greenhouse Area by Major Vegetable, by Year



	06	07	08	09	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24
Water melon	16,835	15,757	17,240	17,210	14,103	12,995	12,736	12,299	14,010	12,572	11,167	9,935	9,447	9,325	8,957	9,520	9,385	9,330	8,603
Strawberry	6,480	6,356	6,106	6,094	6,841	5,681	6,290	6,789	6,825	6,306	5,844	5,783	5,969	6,421	5,634	6,057	5,692	5,560	5,525
Paprika	335	320	367	410	424	429	430	575	598	707	724	712	698	728	733	719	726	807	776
Tomato	6,338	7,130	6,008	5,951	5,270	5,850	6,344	6,054	7,070	6,976	6,391	5,782	6,058	5,706	5,521	6,010	6,111	5,400	6,086
Cucumber	4,597	3,799	4,368	4,001	3,589	3,478	3,201	2,836	3,281	3,338	3,906	3,805	4,164	3,963	3,652	3,008	3,063	3,073	3,049
Oriental melon	6,552	6,260	6,408	6,602	6,097	5,719	5,621	5,380	5,358	5,305	4,872	3,454	3,469	3,488	3,409	4,441	4,475	4,389	4,294
Green pepper	5,606	5,966	6,060	5,704	5,392	4,814	4,995	4,851	4,619	4,878	4,455	4,529	4,806	4,256	4,387	4,388	3,758	3,796	3,717
Lettuce	4,185	4,005	3,512	4,213	4,539	3,887	3,519	2,968	3,241	3,083	2,627	2,688	3,041	2,916	2,955	3,058	3,070	3,217	3,470

The greenhouse area using coco peat has more than doubled over the past ten years. Farmers are increasingly choosing coco peat because of its low cost and ease of recycling. The use of perlite has also expanded steadily.

Korean farmers primarily rely on groundwater, which is available in most agricultural areas. Most low-tech and mid-tech greenhouses use this water without additional treatment, whereas high-tech glasshouses typically install reverse-osmosis filtration systems.

Table 4. Greenhouse Types by Structure (2024, unit: ha)

Plastic greenhouse						Hard board greenhouse				Glasshouse			
Single			Linked			Single		Linked		Single	Linked		
Tunnel	Arch	Others	Tunnel	Arch	Others	Roof	Arch	Roof	Arch		Roof	Venlo	Others
22,263	20,879	535	2,829	4,512	96	9	23	19	32	14	116	195	28

Table 5. Greenhouse Types by Nutrient Supply Method (2024, unit: ha)

Solid medium				Water			
Pearlite	Rock wool	Coco peat	Others	DFT	NFT	Spray	Others
1,145	246	2,032	838	88	28	62	231

Regarding energy use in Korean greenhouses, approximately 64 percent of the total greenhouse area is unheated, as most are low-tech plastic structures used for vegetable production only between late winter and early spring. However, the share of unheated greenhouses is gradually declining. Among heated greenhouses, oil remains the primary energy source, with kerosene use increasing over the past decade to become the most common fuel. The use of gas, electricity, and geothermal energy is also on the rise.

Recently constructed high-tech glasshouses tend to rely on electricity as their primary energy source, given its relative affordability and operational convenience. The Korean government offers farmers a preferential electricity tariff of approximately KRW 1,210 (EUR 0.71) per kW, which is about 40% of the industrial or household rate.

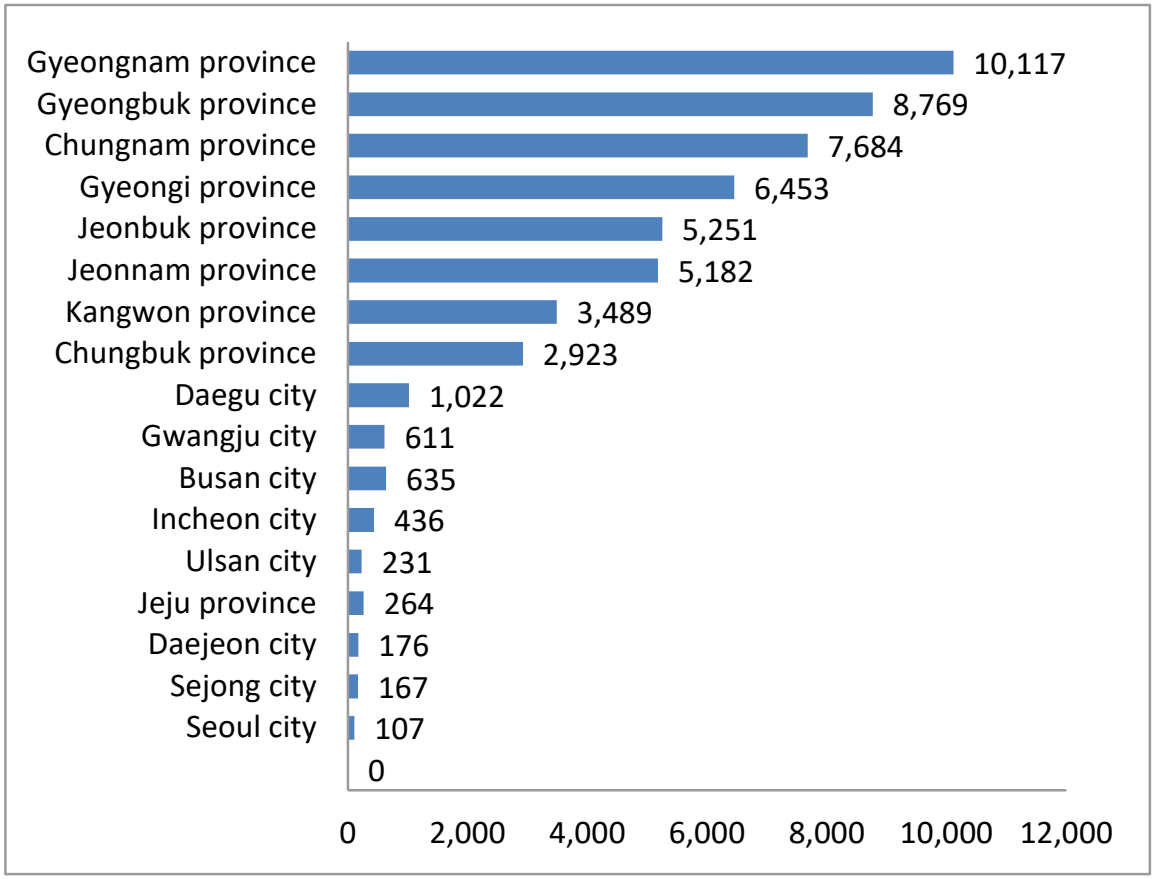
In contrast to the Netherlands, Korea has limited gas pipeline infrastructure in rural areas, and only a small number of farms are equipped with combined heat and power (CHP) systems. Since 2010, the Korean government has promoted geothermal energy through dedicated subsidy programs. In addition, the agricultural office of the Netherlands Embassy has advocated aquathermal (ATES) technology over the past three years, although no concrete projects have yet been implemented.

Table 6. Greenhouse Types by Energy Source (2024, unit: ha)

No Heating	Heating												
	Solid fuel						Oil				gas	electricity	Geo-thermal
	Waste wood	briquette	Coal coke	Waste tire	Wood pellet	Others	Diesel	Heavy oil	kerosene	Others			
34,143	150	137	38	1	571	385	4,663	1,556	8,317	789	247	2,198	322

Gyeongsangnam (Gyeongnam) and Gyeongsangbuk (Gyeongbuk) Provinces in southeastern Korea are the country's main vegetable greenhouse districts, benefiting from geographic advantages for transporting fresh vegetables to Japan. According to 2024 statistics, approximately 35 percent of all greenhouses are located in these two provinces. However, the fastest-growing greenhouse areas are in the southwest—Jeollabuk(Jeonbuk) and Jeollanam (Jeonnam) Provinces—where several large-scale land reclamation projects are underway. As a result, 49 percent of glasshouses are concentrated in these southwestern provinces.

Figure 7. Vegetable Greenhouse Area by Province (2024, unit: ha)



2) Greenhouses for Ornamental Plants

The total greenhouse area for ornamental plants in 2024 was 2,019 hectares, of which 1,711 hectares were plastic greenhouses and 57 hectares were glasshouses. Most cut flowers and potted plants in Korea are grown under greenhouse conditions.

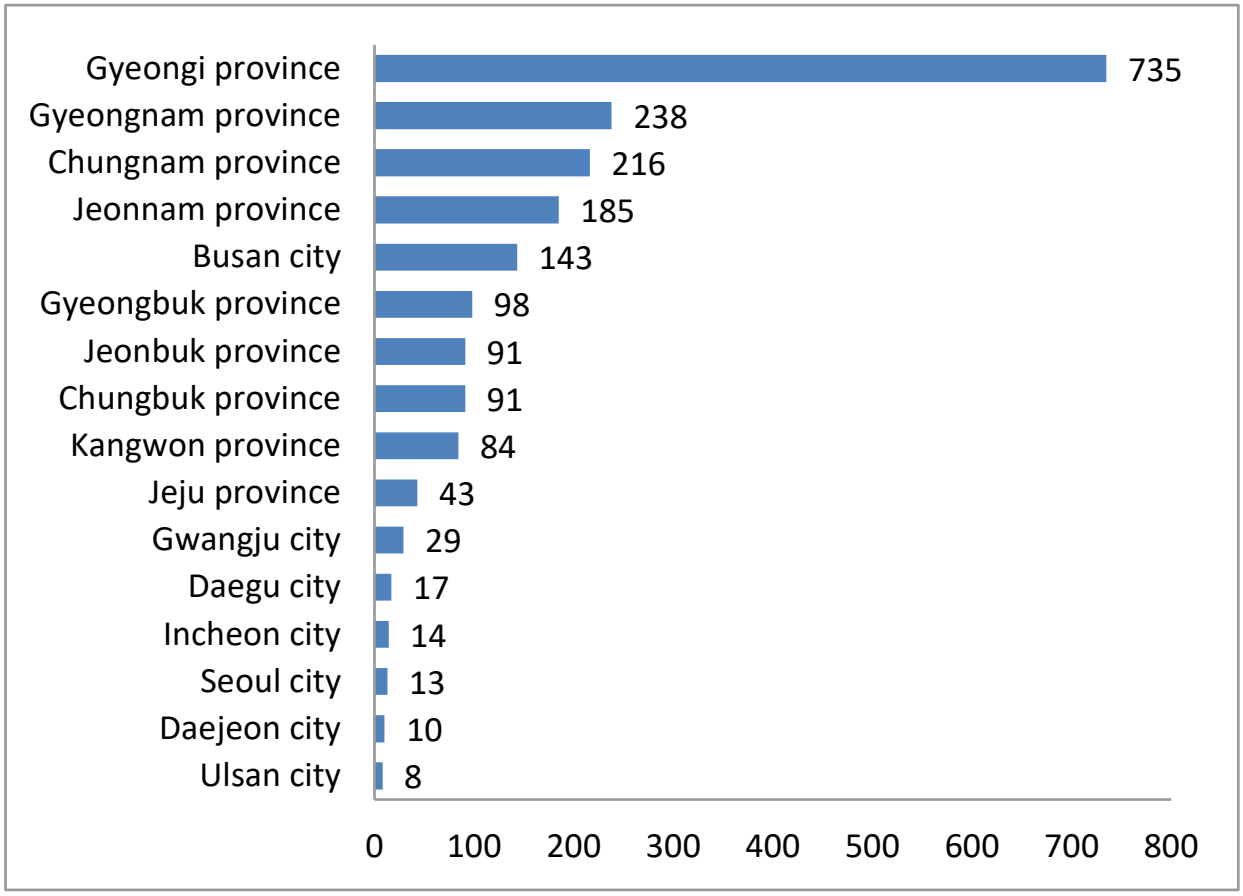
Ornamental plant growers are generally less inclined to invest in high-tech greenhouses compared with vegetable growers, who recognize the necessity of advanced facilities for producing high-value export vegetables. As noted earlier, the Korean flower sector primarily targets ceremonial uses rather than individual consumption. Consequently, the demand for high-quality flowers is relatively low, and farmers tend to favor inexpensive, low-tech plastic greenhouses. This helps explain why the glasshouse area for ornamental plants declined from 140 hectares in the early 2000s to just 57 hectares in 2024.

Ornamental plant greenhouses are largely concentrated in Gyeonggi Province, where farmers can easily transport flowers to Seoul. Gyeonggi and Gyeongnam, both located near the country's two largest cities—Seoul and Busan—have maintained relatively stable ornamental plant areas, while areas in other provinces farther from major cities have contracted drastically over the past decade. This highlights the importance of proximity to large urban markets for the continued viability of floriculture farming.

Table 7. Greenhouse Area for Ornamental Plants, by Year (Unit: ha)

Year	Total	Plastic	Hard board	Glass
2006	3,232	2,728	239	99
2007	3,208	2,737	226	94
2008	3,063	2,619	220	78
2009	3,112	2,679	207	82
2010	2,994	2,577	213	73
2011	2,856	2,465	208	69
2012	2,866	2,560	162	71
2013	2,762	2,456	164	69
2014	2,584	2,324	138	64
2015	2,489	2,256	132	52
2016	2,309	2,078	130	50
2017	2,215	1,963	133	71
2018	2,048	1,779	146	74
2019	2,024	1,770	148	57
2020	2,083	1,774	162	58
2021	2,036	1,729	158	59
2022	2,042	1,743	151	58
2023	2,035	1,725	157	57
2024	2,019	1,711	154	57

Figure 8. Ornamental Plant Greenhouse Area by Province (2024, Unit: ha)



4. History of Korean Greenhouse Horticulture and Lessons Learned

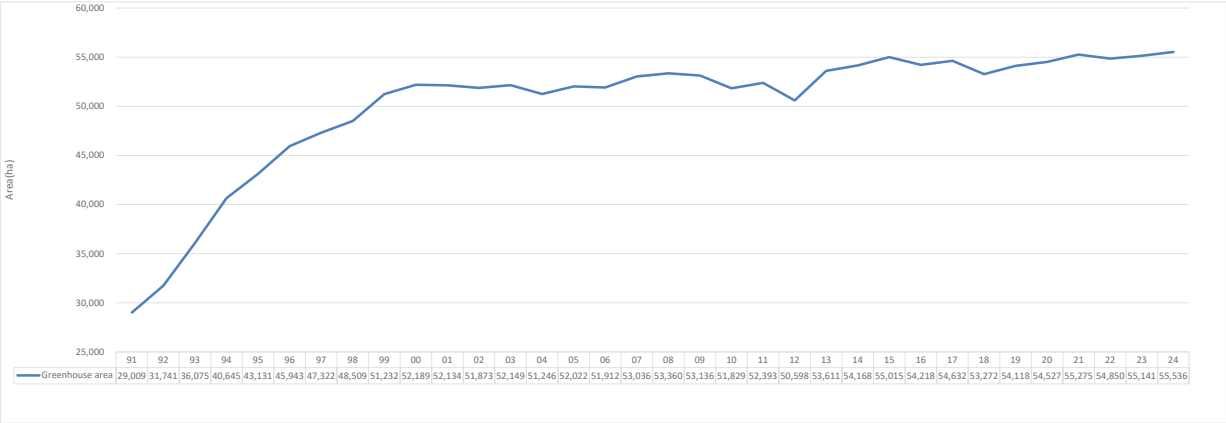
1) Before 1990: Development of Plastic Greenhouses

Korea has an extreme climate, with hot and humid summers and cold, dry winters. Korean farmers began growing certain vegetables in plastic greenhouses during the winter to avoid the intense summer sun. Korea receives significantly more sunshine than the Netherlands (Korea: 2,420 hours; Netherlands: 1,480 hours), leading farmers to believe that plastic greenhouses were sufficient for horticultural crops.

As most Korean farmers operated small-scale farms and could not afford modern glasshouses, the country developed more affordable plastic greenhouses without sophisticated systems. This expansion of low-tech greenhouses during the 1980s and 1990s is referred to in Korea as the “White Revolution.”

Picture 1. Korea’s Low-Tech Greenhouses

Figure 9. Total Greenhouse Area (Vegetables + Ornamental Plants) by Year (ha)

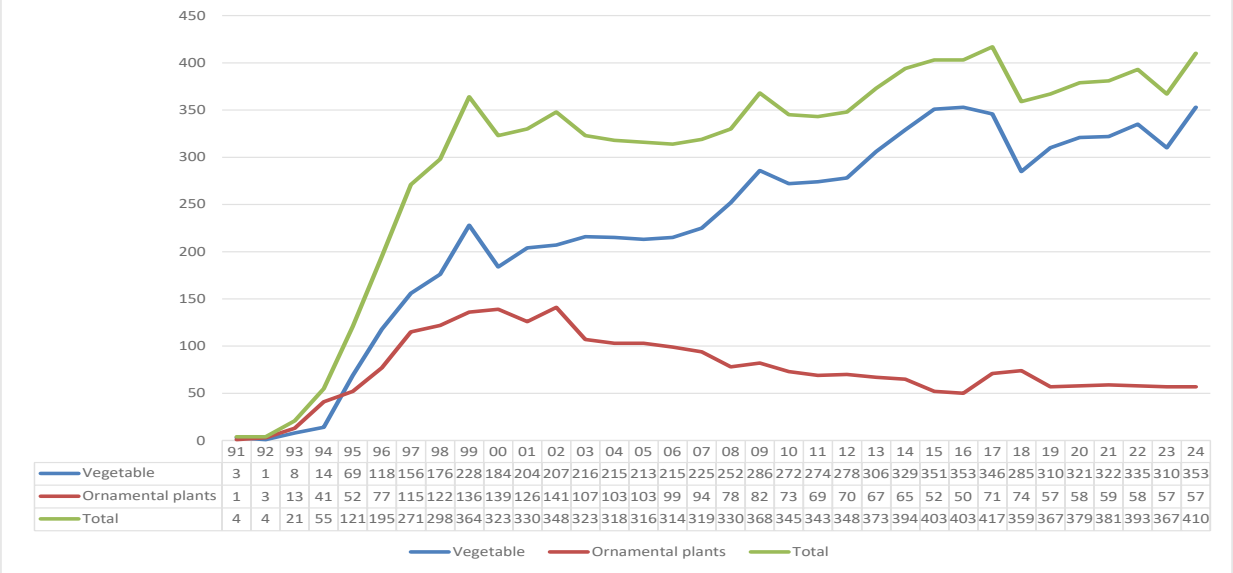


2) 1990–1999: Start of the Subsidy Program for Glasshouses

During the 1990s, Korean greenhouse horticulture continued to expand. To improve efficiency and modernize greenhouses, MAFRA (the Korean Ministry of Agriculture, Food and Rural Affairs) introduced a subsidy program for high-tech (glass) greenhouses. Many vegetable and flower farmers applied, and a significant number of high-tech greenhouses were constructed under this program.

Most of these greenhouses were built by Dutch greenhouse contractors on a turnkey basis, as local (plastic) greenhouse builders had limited knowledge or technology for high-tech structures. There were two requirements for receiving the subsidy: 1) at least two farmers had to collaborate on the greenhouse, and 2) the produce had to be intended for export.

Figure 10. Glasshouse Area by Year (ha)



*Lessons Learned from Cooperation Between Korea and the Netherlands in the 1990s

- Cooperation between the two countries led to several success stories: Korea became the largest exporter of paprika to Japan, and many of the leading vegetable exporters in Korea were established during this period.
- The requirement that more than two farmers collaborate was often an obstacle, as conflicts arose due to a lack of cooperative spirit among farmers.
- Most greenhouses for ornamental plants were not successful. Korean flower farmers indicated that expensive glasshouses are unnecessary for flowers, as domestic consumers generally do not appreciate the higher quality produced in high-tech glasshouses. As a result, most of the recent state-of-the-art greenhouses are focused on vegetable production.

Picture 2. Mid-Tech Plastic Greenhouse for Roses

3) 2000–2008: Stagnation

After the subsidy program ended, there were almost no large-scale glasshouse projects in Korea. Since local farmers were generally not large-scale or wealthy enough to invest in high-tech greenhouses, new projects could not proceed without government subsidies. As a result, many Dutch companies and their local partners exited the Korean greenhouse sector.

Picture 3. Mid-Tech Plastic Greenhouse for Tomatoes with an Automatic Roof Vent

4) 2009–2013: Unfruitful Efforts to Revive the Sector

In 2009, MAFRA (the Korean Ministry of Agriculture) announced a large-scale agri-food complex project. The plan was to lease reclaimed lands such as Saemangeum, the Yeongsan River area, and Hwaong (locations indicated in Picture 3) to large-scale companies, offering support for infrastructure and funding. The Korean government promoted high-tech greenhouses in these areas, believing that hi-tech greenhouse horticulture would boost agricultural exports.

Approximately 114 ha in Saemangeum, 200 ha in the Yeongsan River area, and 100 ha in Hwaong were allocated to agricultural companies. One of the largest investors was Dongbu Group, Korea's largest fertilizer producer, which secured 50 ha in Saemangeum and 100 ha in Hwaong for vegetable farming. Fifty hectares in the Yeongsan River area were assigned to Hanbetall, a newly established company formed by paprika farmers near the Yeongsan River. Nongsan Trading, which had successfully exported paprika to Japan since

the 1990s, also received 64 ha in Saemangeum. Several other non-agricultural companies also expressed interest in vegetable farming with high-tech greenhouses.

However, the projects ultimately failed or were abruptly halted. Dongbu Group had begun building Asia's largest, cutting-edge glasshouse—12 ha in size, with an investment of KRW 57 billion (EUR 43 million)—in Hwaong in February 2011. The greenhouse was completed in late 2012, and tomato cultivation with harvests and exports was scheduled for March 2013. Immediately after completion, Dongbu decided to halt its large-scale glasshouse operations in Hwaong. The decision was prompted by vehement protests from the national agricultural community, which argued that Dongbu's entry into large-scale farming threatened their livelihoods. As a result, Dongbu stopped all ongoing horticulture projects not only in Hwaong but also in Saemangeum. After prolonged controversy, the Hwaong greenhouse was sold to Wooil Farm. This case had a significant impact on discussions regarding the development of Korean horticulture, leading the government to cease support for agricultural companies' greenhouse projects. Hanbetall lacked the financial capacity to continue its project without government support, and Nongsan Trading also decided not to proceed.

During this period, Korean farmers who had learned Dutch greenhouse horticulture systems through practical training programs or institutes attempted to build their own greenhouses, which were not necessarily turnkey projects. Many greenhouses were constructed using a combination of Dutch climate control and interior automation systems, along with locally sourced frames, aluminum, glass, and other products. Dongbu's Hwaong greenhouse was also built in this manner. However, lacking the necessary knowledge and system support, farmers faced numerous challenges after completion, such as system mismatches and water leakage issues.

Picture 4. Reclaimed Land for Greenhouses in Korea

*Lessons Learned from the Projects Between 2009 and 2013

- Opposition from local farmers is a significant obstacle in the greenhouse business in Korea. Conglomerates seeking to enter the horticultural sector may have a higher chance of success if they avoid government subsidies, as this reduces the likelihood of confrontations with local farmers.
- Small companies or cooperatives of small farmers are usually not financially strong. Since it is generally difficult to secure subsidies from central or regional governments, these farmers or cooperatives are likely to abandon their projects or plans if funding is not obtained.
- Local greenhouse builders are highly influential in lobbying for greenhouse construction projects. Although they often develop products based on knowledge of Dutch systems, the quality of these locally produced products is frequently unsatisfactory for farmers.
- Regarding ambitious government-led greenhouse projects, many regional and central government officials or researchers visited the Netherlands to study Dutch horticulture. However, most of these visits did not result in tangible cooperation or business outcomes. The effectiveness of such visits needs to be evaluated more carefully.

5) 2014–2017: A Difficult Market with Limited Opportunities

After the symbolic case of Dongbu, all discussions about creating large modern greenhouse districts were canceled or suspended. Conglomerates considering investment in agriculture also withdrew their plans. Later, LG Group (LG CNS) attempted to enter high-tech horticulture by constructing more than 100 ha of glasshouses in Saemangeum. This project was also abandoned due to opposition from farmers' organizations.

Under these circumstances, two approaches emerged to continue financing high-tech greenhouses:

- Governmental support for some promising farmers: The Korean government selected a few promising farmers and financed their plans to build high-tech greenhouses. Woodeumgee Farm, for example, constructed a 2 ha semi-closed greenhouse with this support and has successfully expanded its business.
- Participation by SME companies: JOIN, one of Korea's largest egg producers, established a 3-hectare high-tech greenhouse to enter the horticulture sector without provoking conflicts with farmers or farmers' organizations. Similarly, Saebom and Sunmate, both prominent greenhouse builders, have developed their own high-tech greenhouse facilities.

Picture 5. A Semi-Closed Greenhouse Built by a Local Farmer in Cooperation with a Dutch Horticulture Company

* Lessons Learned from Projects Between 2014 and 2017

- Opposition from local farmers remains an obstacle in Korea's greenhouse horticulture sector, but it is gradually weakening. As long as a company is not a well-known conglomerate, it can generally enter the market without major resistance.

6) 2018–Present: Smart Farming Becomes a Trend

"Smart Farm"—the term Koreans use for high-tech horticulture—has emerged as a major trend and a future-oriented business model. The movement gained momentum after the Korean government announced its "Fourth Industrial Revolution" policy in 2018. In line with this policy, MAFRA (the Korean Ministry of Agriculture, Food and Rural Affairs) established four Smart Farm Innovation Valleys (SFIVs) in Sangju, Gimje, Goheung, and

Miryang, featuring high-tech agricultural training centers, leasable greenhouses and vertical farms, and demonstration farms.

The Netherlands has been involved in several SFIV projects, despite some controversy surrounding Dutch participation. For example, the SFIV in Goheung was constructed by a Dutch greenhouse company on a turnkey basis; the SFIV in Gimje utilizes a Dutch climate control system; and the SFIV in Sangju established the World Horti Center Korea to train local farmers. These cases underscore the significant role of Dutch technologies and expertise in the success of the SFIV initiative.

Beyond the four SFIVs, population decline and economic challenges in rural areas have led governors and mayors to propose large greenhouse projects as part of local economic strategies during the 2022 regional elections. Regional governments remain open to collaboration with the Netherlands to ensure project quality and effectiveness. Although only a few projects have been realized over the past four years, this trend is expected to gain momentum again ahead of the 2026 elections.

The smart-farm movement has also raised awareness of greenhouse horticulture beyond the agricultural sector, attracting interest from non-agricultural businesses. Notably, alongside the agricultural bank (Nonghyup), commercial banks and private investors are increasingly financing large greenhouse projects, helping to reduce the sector's reliance on government subsidies. Some Dutch investors have expressed interest in establishing farms in Korea. Meanwhile, a Korean steel company aims to develop a large greenhouse district—similar to Agriport A7—to utilize its waste heat, and a Korean electronics company is developing an AI module for vertical farms. Several provincial governments are planning demonstration farms in cooperation with the Netherlands, and some universities are seeking to build state-of-the-art research greenhouses while exploring opportunities for collaboration in research, training, and education.

* Lessons Learned from Projects Between 2018 and present

- Government–subsidized projects tend to be more concrete, but Dutch turnkey builders face challenges due to the government's nationalistic approach. Participation in projects through components such as climate control, substrates, logistics, seeds, and education is comparatively easier.
- Private projects are not affected by nationalistic or protectionist policies. However, Korean private investors—especially new entrants—tend to be overly optimistic or take a more casual approach to horticultural business, making projects less concrete. It is therefore important to verify how well-prepared they are for high-tech horticulture operations.

5. Key Considerations for Entering Korea's High-Tech Horticulture Market

- The Korean government's policy is to promote higher-value agriculture and agri-food exports. To achieve this, Korea focuses on high-tech greenhouse horticulture, particularly on new (reclaimed) lands. Many greenhouse projects planned for reclaimed lands have been canceled or delayed due to a lack of investment and/or opposition from existing farmers. Despite these challenges, this policy direction is expected to remain unchanged.
- If the Korean customer is a conglomerate, opposition from local farmers may pose an obstacle for greenhouse projects.
- If the Korean customer is a small farmer or an SME, they are unlikely to face resistance from other farmers. Dutch horticulture companies wishing to cooperate with such clients, however, must verify whether the customer has already secured the necessary budget. Small farmers or companies often rely heavily on government support, and obtaining subsidies is not always guaranteed.
- Several local greenhouse builders operate in Korea but typically have relatively limited technological capabilities. Experienced farmers are aware of the problems associated with greenhouses constructed by local builders. Nevertheless, local builders often secure projects due to their strong lobbying activities.
- For government-led projects, it is difficult for Dutch companies to participate. The Korean government prioritizes having greenhouses built by local companies—regardless of quality—based on a nationalistic approach. This has resulted in significant maintenance issues, yet the policy stance is unlikely to change. This situation is particularly challenging for turnkey greenhouse builders, while providers of climate-control systems, substrates, and seeds are relatively less affected. Private-sector projects, however, do not face such constraints.
- Korean customers tend to request extensive information from Dutch horticulture companies before initiating greenhouse projects. Koreans are generally very precise and detail-oriented, which often requires Dutch builders to provide comprehensive information. It is recommended to maintain close communication with Korean customers from the outset to build trust and avoid misunderstandings or unfulfilled expectations.
- Starting a business in Korea is not always easy due to two fundamental challenges: the language barrier and obtaining the necessary licenses to operate. Many Koreans, particularly in the older generation, do not speak English fluently. Greenhouse construction requires a construction license held by a Korean national. Therefore, it is critical to identify the right Korean partners who can communicate in English and hold the required licenses. A strong network and experience in the greenhouse horticulture sector are also important. The Agriculture Office at the Embassy of the Netherlands in Seoul (LAN Seoul) has played a crucial role in connecting parties and facilitating new or expanding businesses across Korea.

6. Relevant Fairs & Magazines

1) Fairs

- KIEMSTA: Korean International Exhibition of Machinery, Equipment, Science, and Technology for Agriculture.
  Website: http://www.ekiemsta.com/online2024/eng/main/main.php
  This show is held every other year November. The next edition is scheduled for 2026.

2) Magazine

- The Monthly Horticulture (http://www.hortitimes.com) is the most widely read magazine among horticulture stakeholders. It is published in Korean.

7. Source

- Statistics from MAFRA (http://www.mafra.go.kr)
- Statistics from KITA (http://www.kita.net)