Report on Survey of Domestic Bioindustry 2020

December 2021

MINISTRY OF TRADE, INDUSTRY & ENERGY
Korea Biotechnology Industry Organization

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I. Survey Overview

1 Survey Overview

A. Data Sources

○ Bio-Convergence Industry Division, Ministry of Trade, Industry and Energy (www.motie.go.kr)

○ Statistical Sources: Korea Biotechnology Industry Organization (www.koreabio.org)

B. Type of Statistics and Authorized Number

○ Type of Statistics: General ・ Survey Statistics

○ Authorized Number: No. 115015

○ Authorized Date: October 30th, 2003

C. Survey Period

○ Survey Baseline Date: December 31, 2020

○ Targeted Survey Period: January 1, 2020 – December 31, 2020

○ Survey Period: August 9, 2021 – October 29, 2021

D. Scope

○ Based on the domestic biotechnology and the 'Classification Code of Bioindustry (KS J 1009, reorganized by the Korean Agency for Technology and Standards and the Ministry of Trade, Industry and Energy in January 2008 / revised in Dec. 29, 2016)' which enacted and revised the scope and definition of the bioindustry, the scope of the survey refers to domestic businesses engaged in the following activities related to biotechnology.
- Using biotechnology as the main technology in the R&D phase
- Using biotechnology in the manufacturing, production, and service (including R&D) phases
- Producing machine, equipment, or plant that are used in the biotechnological process of the R&D phase or the production phases
- Directly importing the above products from the corresponding country

* The survey includes companies that have generated sales through the activities stated above as well as those that are promoting R&D.

E. Survey Targets

○ Primary Selection: Companies based on the Key Findings in 2019

○ Secondary Selection: Identification of new companies
- Stage 1: Companies designated and extracted by Korea Standard Industry Classification (KSIC) linked to the Bioindustry Classification Code (KS J 1009)
- Stage 2: Check whether the major keywords of the bio area are included based on the selection of keywords in the bio area based on the Bioindustry Classification Code (KS J 1009) and the purpose of company, name of items and services handled, and the name of the research institute.

F. Survey Units

○ The survey units refer to companies that sell products or services which went through the production process of value-adding after the assembled capital equipment or raw materials were bought under the control of the entrepreneur.

○ The survey units include public enterprises (state-owned enterprises, public enterprises), public - private companies, the private companies (private enterprises, collective enterprises, partnership, joint venture, anonymous company, Co., Ltd., Co., Ltd., co-operatives).

○ In case the company has more than two businesses, the survey unit included the sum of the corresponding business' results and received the responses based on the bioindustry results among the overall industrial activities.

G. Methodology and Approach

○ Survey Methodology: Via mail, fax, e-mail, telephone, face-to-face interview

○ Survey Approach: Researcher → Research Company → Korea Biotechnology Industry Organization → Ministry of Trade, Industry and Energy

H. Announcement of Results

○ Announcement Period: Once a year

○ Form of Announcement: Publication of the Report on Fact Finding Survey of Domestic Bioindustry

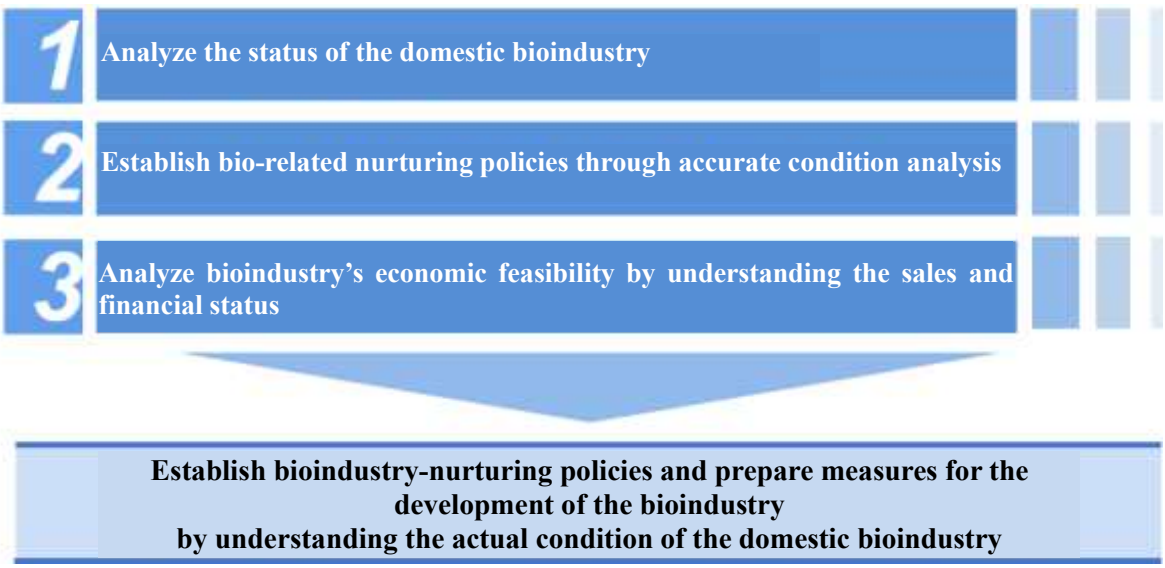
2 Background and Purpose

○ The Ministry of Trade, Industry and Energy and the Korea Biotechnology Industry Organization have been conducting a fact finding survey on the domestic bioindustry since 2003 to build groundwork for economic analysis, international comparison and establishment of related nurturing policies through analyzing the overall status of bioindustry and its actual condition.

○ The "Report on Fact Finding Survey of Domestic Bioindustry Based on 2020," which was first conducted in August 2021, aims to increase its success rate as a complete enumeration survey and to grasp a more accurate understanding of the status of the domestic bioindustry through systematic verification.

○ This survey aims to analyze bioindustry's economic feasibility through understanding the sales and financial status and to establish bio-related nurturing policies through analyzing the status and the accurate actual condition of the domestic bioindustry.

○ Through the Key Findings, the Ministry of Trade, Industry and Energy and the Korea Biotechnology Industry Organization intend to contribute to the development of the domestic bioindustry.



3 Methodology

Target	Company representatives, researchers, or managers in bioindustry such as biopharmaceutical, biochemical and bioenergy, biofood, bioenvironment, biomedical equipment, bioinstrument and bioequipment, bioresource, and bioservice
Area	Nationwide (17 cities and provinces including Seoul and 6 metropolitan cities)
Methodology	Research was conducted via mail, fax, e-mail, and telephone, and face-to-face interview by researcher
Data-mining tool	Structured Questionnaire
Size of population	1,288 companies (Among primarily selected 1,320 companies, 32 were excluded due to temporary/permanent close-down and other reasons)
Size of valid sample	1,027 companies (79.7% of the population)

4 Contents

Category	Main Contents of the Survey
Company Information	- Name of Company, Name of Representative - Business Registration Number, Corporate-Parent (Group) Name - Phone, Establishment Date - Address - Respondent Information
General Status	- Capital, Capital Ratio of Net Worth - Number of Workers - Existence of exclusive business, type of company, place of business - Items in income statement (sales, cost of sales, selling/management expenses, non-operating income/expenses, income tax expenses, etc.)
Status of Bioindustry	- Core business - Manpower status - R&D and facility investment costs - Cooperation with other organizations - Phase of growth - Period resulted in sales - Product, service, commerce technology (resulted in sales, export/import)

5 Terminology

A. General Status

○ Selected Companies

① Venture company: Refers to companies certified as a venture company by meeting the requirements of venture capital investment, investment in R&D, companies developing new technologies, and technology assessment companies according to the "Act on Special Measures for the Promotion of Venture Businesses."

② INNO-BIZ: Refers to companies certified as a "Small and Medium-sized Business with Innovative Technology" after being evaluated of its technological competitiveness and internal stability through R&D.

③ MAIN-BIZ: Refers to companies certified as a "Small and Medium-sized Business with Innovative Management" after being evaluated of its innovative activities and capabilities in overall management.

④ Listed Company: Refers to companies that are qualified buy or sell the issued stocks in stock markets such as KOSDAQ and KONEX.

○ Capital: Refers to the current amount of capital that is paid by the corporation (headquarters).

○ Capital Ratio of Net Worth: Refers to the total amount of capital and is equal to "total capital."

B. Manpower Status

○ Received responses from three groups among bioindustry workers: research, production, and others including sales/administrative.

① Research: Refers to the R&D personnel in the bioindustry.

② Production: Refers to manpower engaged in production and facility/quality management in the bioindustry (excluding manpower in R&D centers).

③ Others including sales/administrative: Refers to all manpower except research and production manpower in the bioindustry.

C. R&D and Sales

○ R&D Cost: Refers to total expenditures invested in research activities for the purpose of developing new products or new technologies for the past year of 2020. It includes selling expenses in the income statement and the manufacturing statement, current development and research expenses for management, and land and equipment acquisition costs related to R&D in the balance sheet.

① R&D Cost: Includes in-house R&D costs (labor costs, material costs, and other expenses), subcontracted R&D costs, technology introduction costs, etc.

② Facility Investment Cost: Includes machinery and equipment, land, and building acquisition costs.

○ Generation of Sales

① Sales of finished products directly produced by the company.

② Sales of finished products manufactured by outsourced companies after supplying raw materials or half-finished products.

③ Refers to the generation of revenue resulting from provision of services and transfer of technology. It includes both domestic sales and export activities.

D. Definition of Bioindustry Classification Scheme

1) [KS J 1009] Bioindustry Classification Code

○ On January 31, 2008, the Korean Agency for Technology and Standards enacted the Korean Standards (KS) J 1009 (Bioindustry Classification Code) that coded the bioindustry into 8 classifications.
- The Korean Agency for Technology and Standards revised the standards on December 29, 2016 to enhance the usability of statistics and expression of industrial growth over the following five years by reflecting the rapidly changing trend of biotechnology and bio products.

<Overview of Bioindustry Classification Scheme>

■ **Purpose of Classification**
○ To clarify the scope of bioindustry
- Defined companies that use biotechnology in the R&D, manufacturing, production, and service phases

○ To propose standardized evidences that can be used for bioindustry-related statistics and institutions without confusion
- Preparing industrial statistics such as profits generated from using biotechnology

○ To build groundwork for analysis such as economic structure, industrial structure, relationship with other industries

○ To secure the connectivity with the classification scheme of international bioindustry
- Preparing groundwork for comparing and analyzing the statistical data of the international bioindustry

■ Targets and Standard of Classification
○ Industrial activities conducted by companies using biotechnology

○ Characteristics of outputs (products produced or services provided) using biotechnology in the R&D production, and service phases
- The functions and the market of the outputs

■ **Classification Scheme**
○ Consists of 8 upper divisions and 51 middle divisions
- The upper divisions are categorized in accordance with KS J 1009 (Bioindustry Classification Code).
- The middle divisions are categorized by the goods sold using biotechnology or the services provided using biotechnology. They are categorized in connection with the industrial activities of the corresponding upper division.

>> [Table 1- 1] [KS J 1009] Bioindustry Classification Code

Code	Name of Industrial Classification
1	**Biopharmaceutical Industry**
1010	Bio-antibiotics
1020	Biologically manufactured low-molecular medicine
1030	Vaccines
1040	Hormones
1050	Therapeutic antibodies and cytokines
1060	Hemotherapeutics
1070	Cell-based therapeutics
1080	Gene therapeutics
1090	Biological diagnostic products
1100	Enzymes and live bacteria medicines
1110	Biomaterial-based medicines
1120	Veterinary biopharmaceuticals
1000	Other biopharmaceuticals
2	**Biochemical and Bioenergy Industry**
2010	Biopolymers
2020	Industrial enzymes and reagents
2030	Enzymes and reagents for research
2040	Biocosmetics and home & personal care chemicals
2050	Biological agrochemicals and fertilizers
2060	Biofuels
2000	Other biochemical and bioenergy products
3	**Biofood Industry**
3010	Functional health foods
3020	Food-grade microorganisms & enzymes
3030	Food additives
3040	Fermented foods
3050	Feed additives
3000	Other biofoods
4	**Bioenvironmental Industry**
4010	Biological treatment agents and systems
4020	Materials and equipments for bio-immobilization
4030	Bioenvironmental agents and systems for treatment and recycling
4040	Measuring apparatus and service for environmental pollution and assessment
4000	Other bioenvironmental products and services

>> [Table 1- 1] [KS J 1009] Bioindustry Classification Code (Cont'd)

Code	Name of Industrial Classification
5	**Biomedical Equipment Industry**
5010	Biosensors
5020	In-vitro diagnostics
5030	Medical devices using biosensors and/or biomarkers
5000	Other biomedical equipments
6	**Bioinstrument and Bioequipment Industry**
6010	Gene/protein/peptide analysis, synthesis, and manufacturing instruments
6020	Cell analysis and cultivation equipments
6030	Multi-functional and other bioanalysis instruments
6040	R&D and manufacturing equipments
6050	Bioprocess equipment parts
6000	Other bioinstruments and bioequipments
7	**Bioresource Industry**
7010	Seeds and seedlings
7020	Genetically Modified Organisms for use as food, feed or processing
7030	Experimental animals
7000	Other bioresources
8	**Bioservice Industry**
8010	Bio-consignment production and procuration services
8020	Bio-diagnostic and analytical services
8030	Clinical/non-clinical R&D services
8040	Other R&D services
8050	Processing, treatment, and warehousing services
8000	Other bioservices

* Refer to <Appendix 1> for the explanation on the classification scheme.

2) [Annex] Biotechnology Classification Code

○ 13 divisions of biotechnology classification codes are prepared in the form of annex to the Korean Standards (KS) KS J 1009 (Biotechnology Classification Code).

<Overview of Biotechnology Classification Scheme>

■ Purpose of Classification

○ To define the scope of the domestic bioindustry
○ To analyze the usage condition of biotechnology in the domestic industry

■ Target and Standard of Classification

○ To establish the classification scheme of biotechnology used in industries
○ To emphasize the technology currently used in the bioindustry and the R&D field
○ To reflect the vision of future bioindustry and the development of biotechnology

■ Classification Scheme

○ Consists of two divisions—upper and middle—with 13 upper divisions and 68 middle divisions
○ The upper divisions cover the technical scope of the middle divisions below, and are configured to facilitate the response and substitution of specific detailed technologies
○ The middle divisions limit the scope of the technologies classified in the upper divisions, and include the definitions of the related new technologies in a list type.
○ Each of the 68 middle divisions has a list-based definition to explain the definition and scope of the classified technologies. This list-based definition is described mainly in terms of technology names used in the industry and R&D fields. Duplicate names are allowed within the middle divisions.

>> [Table 1- 2] [Annex] Biotechnology Classification Code

Code	Name of Technological Classification
A	**Genetic Engineering**
A1	Gene manipulation
A2	Gene expression and regulation
A3	Gene application
A4	Gene therapy
A0	Other genetic engineering, N.E.S.
B	**Protein Engineering**
B1	Protein structure analysis
B2	Protein function analysis
B3	Complex protein engineering
B4	Peptide engineering
B5	Protein application
B0	Other protein engineering, N.E.S.
C	**Other Macromolecule Engineering**
C1	Lipid engineering
C2	Carbohydrate engineering
C0	Other macromolecule engineering
D	**Therapeutic Cell and Tissue Engineering**
D1	Therapeutics cell utilization
D2	Bioenvironment regulation
D3	Functional biomaterial development
D4	Cell engineering
D5	Tissue engineering
D0	Other cell and tissue engineering, N.E.S.
E	**Systems Biology and Bioinformatics**
E1	Gene sequence analysis
E2	Functional genomics
E3	Proteomics
E4	Bioinformatics
E0	Other systems biology and bioinformatics, N.E.S.
F	**Metabolic Engineering**
F1	Metabolite production
F2	Applications of metabolic engineering
F3	Understanding the metabolism and metabolic pathways
F0	Other metabolic engineering, N.E.S.
G	**Bioprocess**
G1.	Fermentation engineering
G2.	Cell culture engineering
G3.	Biotransformation
G4.	Bioseparation engineering
G5.	Industrialization
G0.	Other bioprocesses, N.E.S.

>> [Table 1- 2] [Annex] Biotechnology Classification Code (Cont'd)

Code	Name of Technological Classification
H	**Bioresource Production and Utilization**
H1	Plant resource utilization technology
H2	Animal resource utilization technology
H3	Microbial resource utilization technology
H4	Insect resource utilization technology
H5	Marine/freshwater organism technology
H6	Food engineering
H7	Biomaterializing technology
H8	Biodiversity conservation
H0	Other bioresource production and utilization, N.E.S.
I	**Environmental Biotechnology and Bioenergy Technology**
I1	Clean technology
I2	Environmental pollution control and management technology
I3	Bioenergy technology
I0	Other environmental biotechnology and bioenergy, N.E.S.
J	**Nanobiotechnology**
J1	Nano-biodevice fabrication
J2	Nano-biomaterial technology
J3	Nano drug delivery system
J4	BioNEMS (Nanoelectromechanical systems), nano-LOC (lab-on-a-chip)
J0	Other nanobiotechnology, N.E.S.
K	**Bioelectronics**
K1	Biosensor fabrication
K2	Bioelectronic device fabrication
K3	Biochip fabrication
K4	Microfluidics
K0	Other bioelectronics, N.E.S.
L	**Biosafety and Efficacy Evaluation**
L1	Safety evaluation
L2	Safety management
L3	Environmental assessment
L4	Biohazard management
L5	Efficacy evaluation
L0	Other biosafety and efficacy evaluation, N.E.S.
M	**Other Biotechnology**
M1	Combinatorial biology
M2	Drug delivery
M3	Immunotherapy technology
M0	Other biotechnology, N.E.S.

* Refer to <Appendix 1> for the explanation on the classification scheme.

[Special Notes on Statistical Data]

1) The missing values (no response, not sure, and none of the above) were excluded from the statistical calculation (statistical analysis was conducted based on 100% data with the missing values excluded.)

2) The sum of detail items and the total sum may not be identical as all the statistical values are rounded values.

3) This report calculates down to one place of decimals and related symbols are as the following:
「-」 : none of the above
「0.0」: less than the unit

4) Any inquiries on this report should be contacted to the Bioindustry Policy Division of the Korea Biotechnology Industry Organization.
(Tel.: +82-31-628-0040, 0052)

II. Key Findings

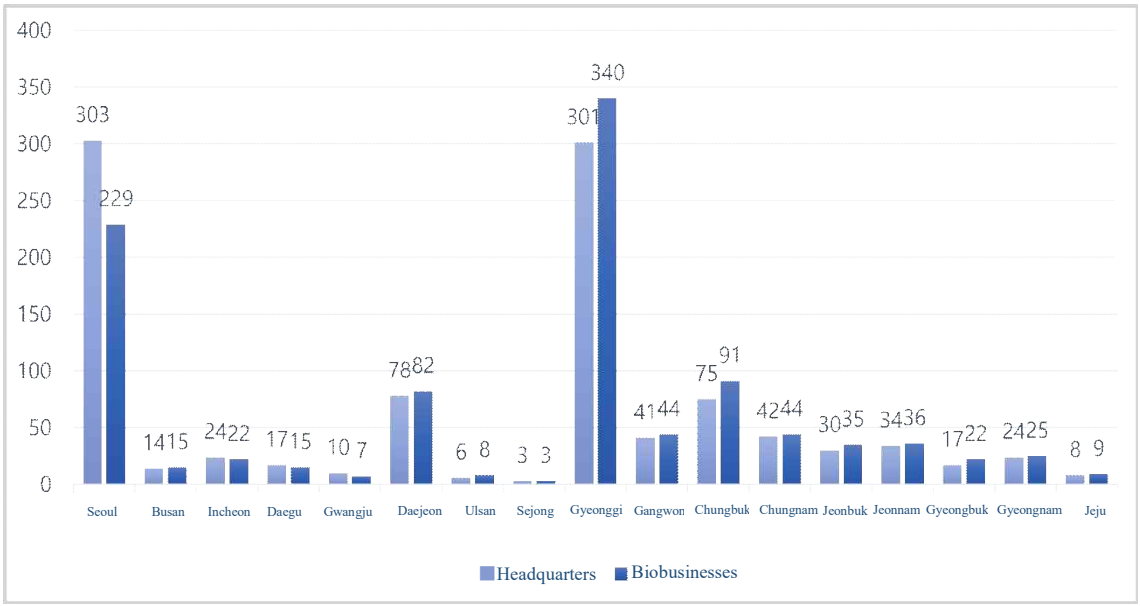
1 General Status of Bioindustry

A. Bioindustry's Distribution per Region

○ Headquarters and biobusinesses are mostly located in Seoul and Gyeonggi Province, with 303 headquarters in Seoul, 301 in Gyeonggi Province, and 229 biobusinesses in Seoul and 340 in Gyeonggi Province.

<Figure 2-1> Bioindustry's Distribution per Region

(Unit: companies)



* Region of biobusinesses were analyzed in the following order: plant > R&D center > headquarters.

○ The top 3 provinces for businesses in the domestic bioindustry by category are as follows.

- Biopharmaceutical Industry: Gyeonggi 37.1% > Seoul 30.7% > Chungbuk 10.1%
- Biochemical and Bioenergy Industry: Gyeonggi 24.1 > Daejeon 12.6% > Seoul 9.9%
- Biofood Industry: Gyeonggi 28.2% > Chungbuk 13.5% > Seoul 10.0%
- Bioenvironmental Industry: Gyeonggi 37.5% > Jeonnam 9.4% > Seou/Busan/Gangwon 6.3%
- Biomedical Equipment Industry: Gyeonggi 33.% > Seoul 24.4% > Gangwon 9.5%
- Bioinstrument and Bioequipment Industry: Gyeonggi 51.6% > Seoul 19.4% > Daejeon 14.5%
- Bioresource Industry: Gyeonggi 46.7% > Seoul/Daejeon/Chungbuk 13.3% > Jeonbuk/Jeonnam 6.7%
- Bioservice Industry: Seoul 48.5% > Gyeonggi 28.2% > Daejeon 8.7%

<Table 2-1> Bioindustry's Distribution per Region by Category

(Unit: companies)

Industrial Category	Total	Seoul	Busan	Incheon	Daegu	Gwangju	Daejeon	Ulsan	Sejong
Total	**1,027**	**229**	**15**	**22**	**15**	**7**	**82**	**8**	**3**
Biopharmaceutical	326	100	3	10	4	1	17	-	-
Biochemical and Bioenergy	191	19	4	4	4	1	24	6	1
Biofood	170	17	3	-	2	1	8	-	2
Bioenvironmental	64	4	4	3	3	1	3	2	-
Biomedical Equipment	96	25	1	-	-	1	10	-	-
Bioinstrument and Bioequipment	62	12	-	2	1	-	9	-	-
Bioresource	15	2	-	-	-	-	2	-	-
Bioservice	103	50	-	3	1	2	9	-	-

Industrial Category	Gyeonggi	Gangwon	Chungbuk	Chungnam	Jeonbuk	Jeonnam	Gyeongbuk	Gyeongnam	Jeju
Total	**340**	**44**	**91**	**44**	**35**	**36**	**22**	**25**	**9**
Biopharmaceutical	121	11	33	15	2	1	4	3	1
Biochemical and Bioenergy	46	7	15	11	12	15	7	11	4
Biofood	48	11	23	13	12	12	7	8	3
Bioenvironmental	24	4	2	1	2	6	2	2	1
Biomedical Equipment	33	8	9	3	2	1	2	1	-
Bioinstrument and Bioequipment	32	1	4	1	-	-	-	-	-
Bioresource	7	-	2	-	1	1	-	-	-
Bioservice	29	2	3	-	4	-	-	-	-

* The result analyzed the results of 1 core business that was selected for each company.
** Region of biobusinesses were analyzed in the following order: factory > R&D center > headquarters.

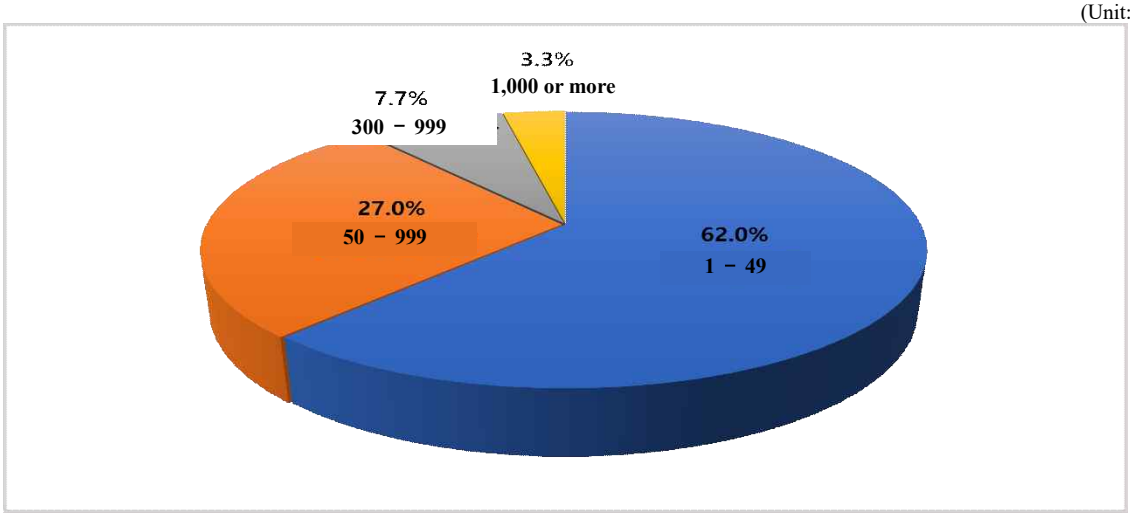
B. Bioindustry's Distribution per Size of Workers

○ There are 634 companies (62.0%) that belong to "less than 50 workers" among total size of workers (excluding 4 unclassified companies.)

○ There were 34 companies (3.3%) with 1,000 or more employees.

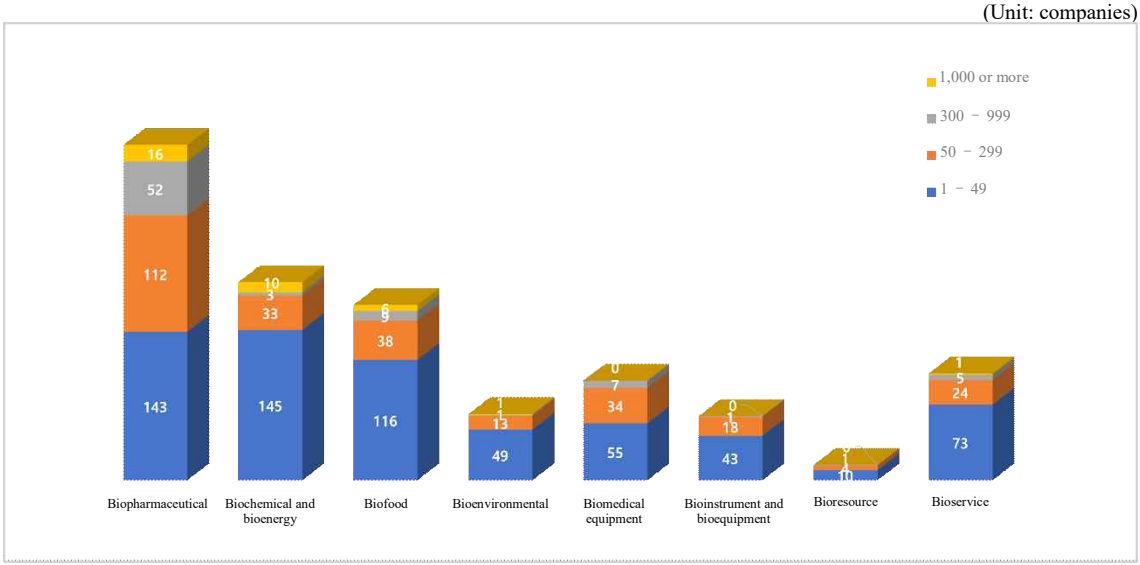
<Figure 2-2> Bioindustry's Distribution per Size of Workers

(Unit: %)



<Figure 2-3> Bioindustry's Distribution per Category and Size

(Unit: companies)



* Companies that did not have information on the size of workers were excluded from the statistical data.

C. Bioindustry's Distribution on the Existence of Other Businesses

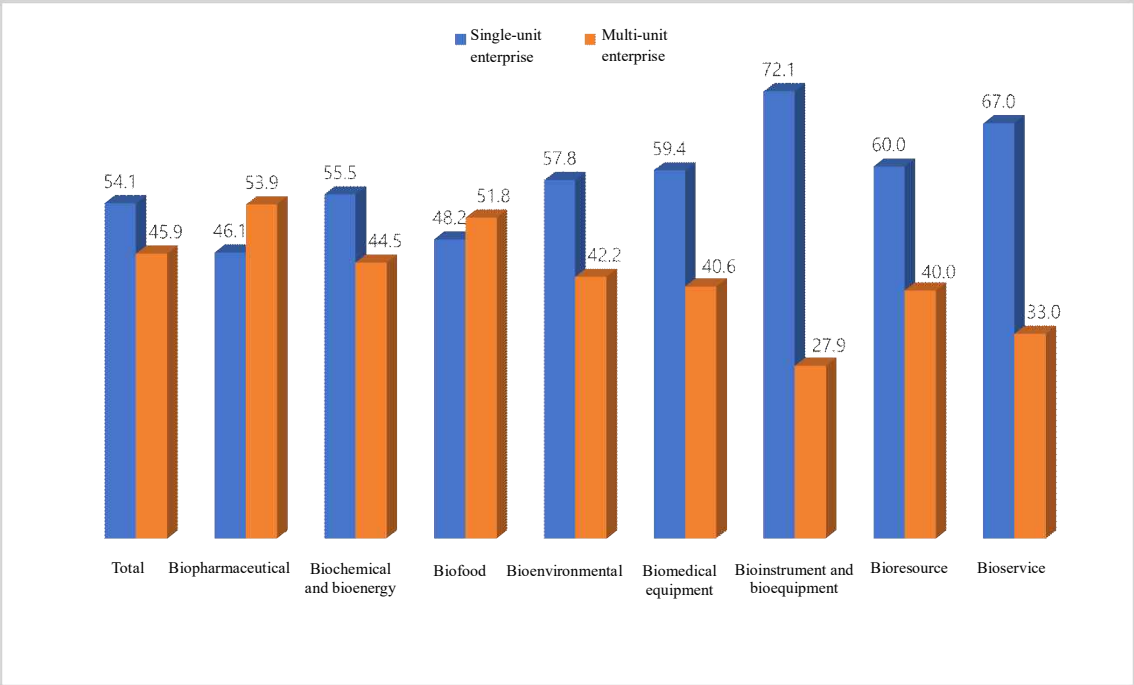
○ Bioindustry's existence of other businesses refers to the existence of plants, R&D centers or branches in other location.

○ Companies that do not have factories, R&D centers, or branches in other locations are categorized as "single-unit enterprise," while companies that have factories, branches, R&D centers, stores in other locations are categorized as "multi-unit enterprise."

○ Out of 1,027 bioindustry companies, 552 companies (54.1%) are "single-unit enterprises" and 469 companies (45.9%) are "multi-unit enterprises" (excluding 6 unclassified companies.)

<Figure 2-4> Bioindustry's Existence of Other Businesses

(Unit: %)



* Excluded samples that could not classify their operation status as either single-unit or multiple-unit.

D. Bioindustry's Financial Analysis

○ The average capital of all bioindustry companies was surveyed as KRW 10.8 billion and the ratio of net worth was 29%.

○ Companies in biochemical and bioenergy industry had higher average amount of capital reaching KRW 21 billion. Companies in biopharmaceutical industry and companies in bioinstrument and bioequipment industry had higher value compared to other bioindustries with average ratio of net worth reaching 51% and 49%, respectively.

<Table 2- 2> Bioindustry's Financial Standing Analysis by Category

(Unit: companies, million KRW, %)

Industrial Category	No. of Companies	Capital				Ratio of Net Worth			
		No. of Respondents	Minimum	Maximum	Average	No. of Respondents	Minimum	Maximum	Average
Total	**1,027**	**978**	**3**	**1,488,993**	**10,795**	**951**	**-13,624**	**100**	**29**
Biopharmaceutical	326	308	14	391,406	14,064	304	-394	100	51
Biochemical and Bioenergy	191	182	3	1,488,993	21,002	172	-228	98	47
Biofood	170	165	10	368,842	7,273	160	-806	98	41
Bioenvironmental	64	62	30	10,846	1,252	59	-178	88	43
Biomedical Equipment	96	90	50	46,659	4,851	89	-701	95	33
Bioinstrument and Bioequipment	62	59	33	13,398	1,024	57	-54	100	49
Bioresource	15	15	117	50,899	8,712	15	-52	85	38
Bioservice	103	97	5	165,412	5,132	95	-13,624	99	-119

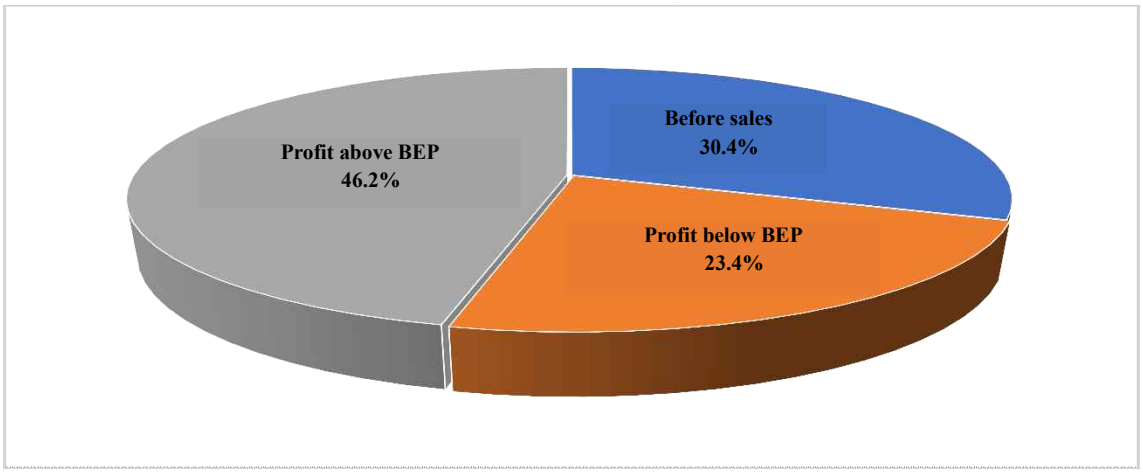
E. Type of Biobusiness' Sales Generation in Bioindustry

○ The result for type of biobusiness' revenue includes responses from 953 companies out of 1,027 total participants, of which 74 were "no response."

○ Out of 953 companies, 290 companies (30.4%) belonged to the phase of "before sales" in 2020, while 223 companies (23.4%) out of 663 companies that generated sales in the bioindustry were "below the break-even point (BEP)."

<Figure 2-5> Type of Biobusiness' Sales Generation in Bioindustry

(Unit: %)

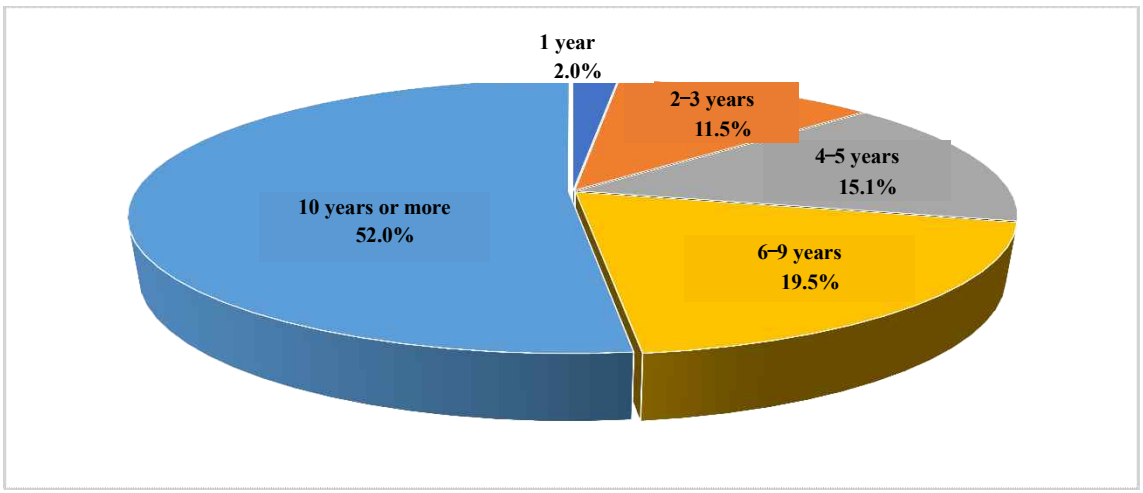


* Excluded unclassified samples.

○ Out of the 663 companies that generated sales in 2020, 13 companies (2.0%) had their first sales in 2020, and 345 companies (52.0%) have generated sales for more than 10 years.

<Figure 2-6> Bioindustry's Sales Period

(Unit: %)



2 Manpower Status in Bioindustry

A. Manpower Status of 2020

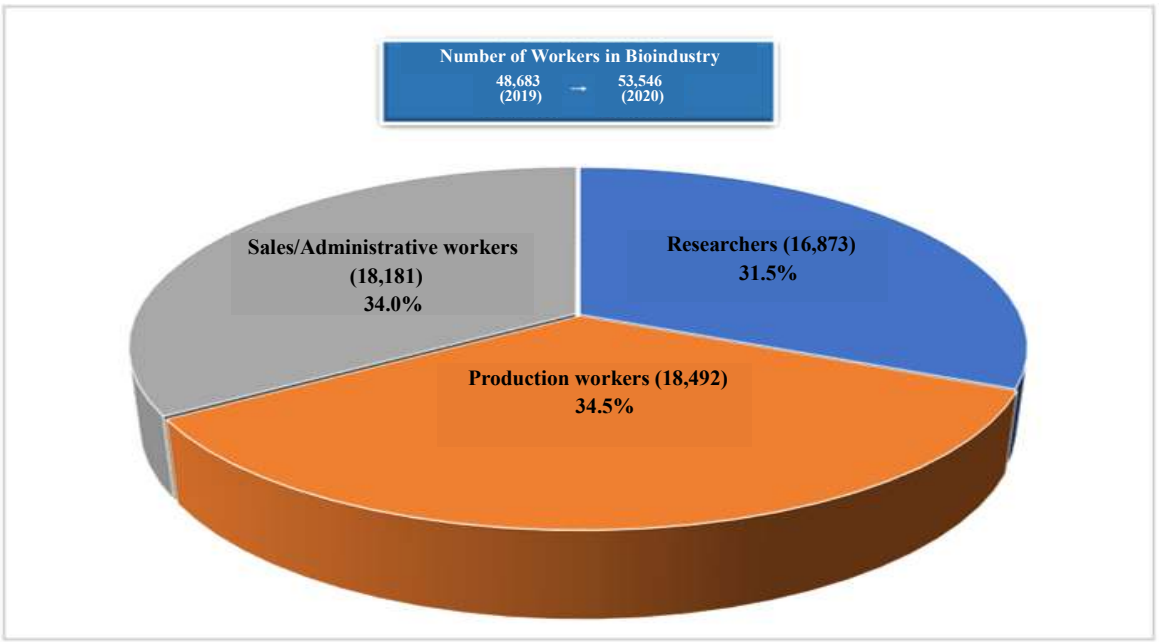
1) Manpower Status per Category

○ Out of 1,027 domestic bioindustry companies in 2020, there was an increase of 4,863 workers compared to 2019, reaching a total of 53,546 workers (excluding 20 of non-responding companies). There is an average of 53 workers per company.

○ Manpower of bioindustry consists of 16,873 researchers (31.5%), 18,492 production workers (34.5%), and 18,181 sales/administrative workers (34.0%).

<Figure 2-7> 2020 Bioindustry's Distribution of Manpower

(Unit: persons, %)



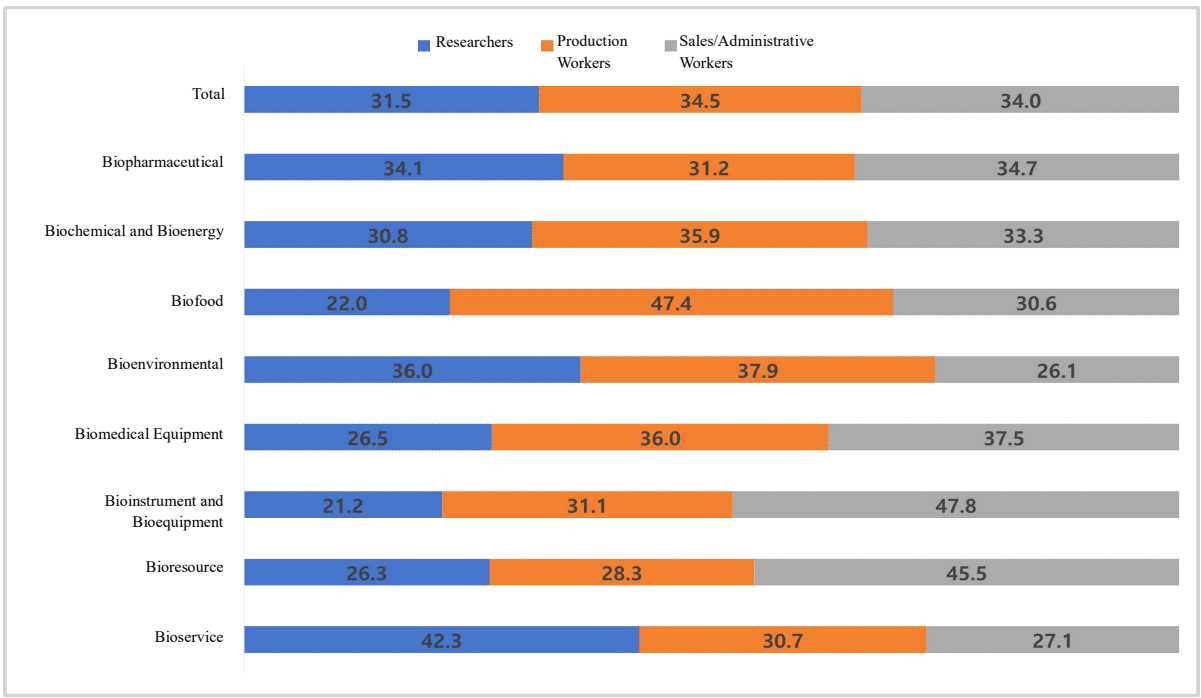
<Table 2-3> 2020 Bioindustry's Manpower Distribution

(Unit: companies, persons, %)

Industrial Category		No. of Respondents	Research	Production	Sales/Administrative	Total	Distribution Ratio
Total	**No. of Employees**	**1,027**	**16,873**	**18,492**	**18,181**	**53,546**	**100.0**
	Distribution Ratio	**100.0**	**31.5**	**34.5**	**34.0**	**100.0**	
Biopharmaceutical		326	7,451	6,802	7,579	21,832	40.8
Biochemical and Bioenergy		191	2,119	2,471	2,294	6,884	12.9
Biofood		170	1,592	3,432	2,215	7,239	13.5
Bioenvironmental		64	372	392	270	1,034	1.9
Biomedical Equipment		96	1,648	2,240	2,332	6,220	11.6
Bioinstrument and Bioequipment		62	507	744	1,144	2,395	4.5
Bioresource		15	283	305	490	1,078	2.0
Bioservice		103	2,901	2,106	1,857	6,864	12.8

<Figure 2-8> Bioindustry's Manpower Proportion of 2020

(Unit: %)

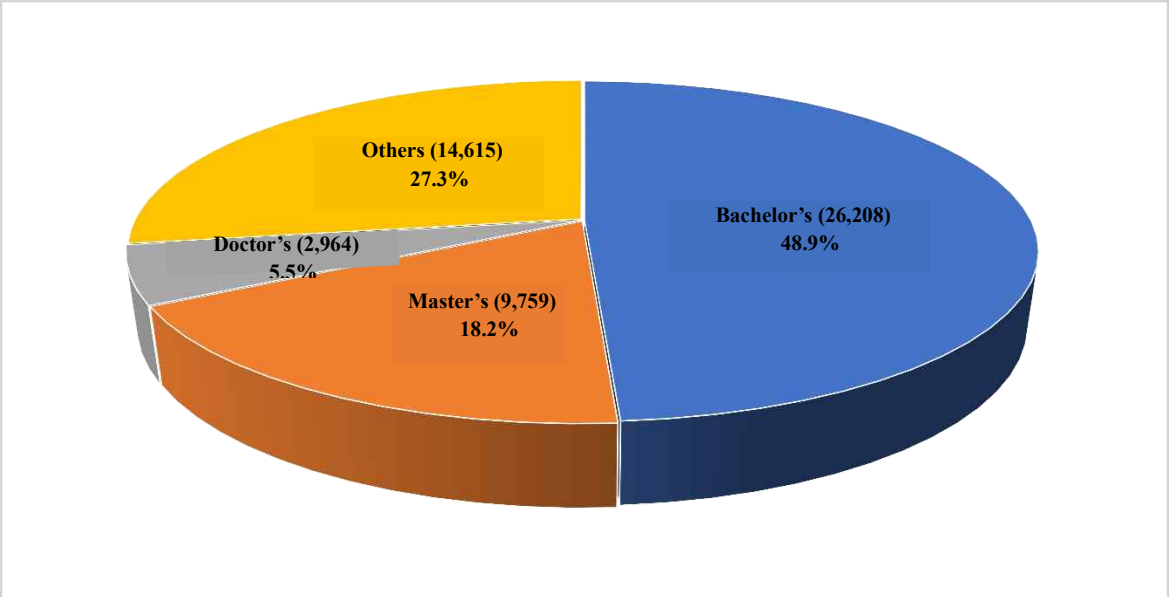


2) Manpower Status by Academic Degree

○ Among the bioindustry manpower in 2020, workers with bachelor's degree were the largest in number, reaching 26,208 persons (48.9%). Others ranked second with 14,615 workers (27.3%), followed by 9,759 workers with master's degree (18.2%) and 2,964 workers with doctor's degree (5.5%).

<Figure 2-9> Bioindustry's Academic Degree Proportion of Workers of 2020

(Unit: persons, %)



<Table 2- 4> 2020 Bioindustry's Distribution of Academic Degree

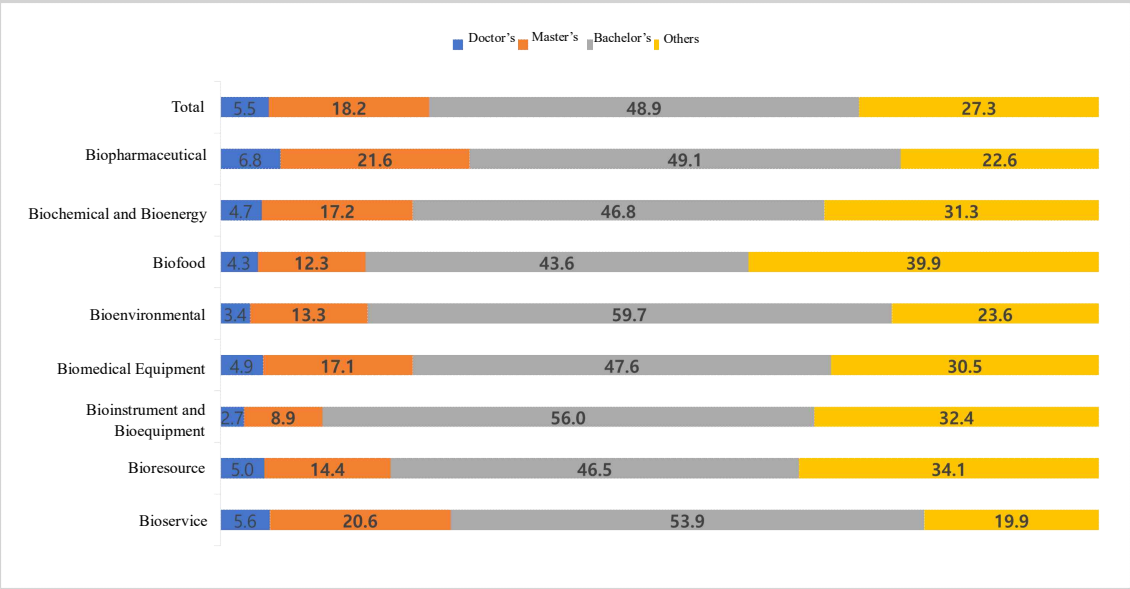
(Unit: persons, %)

Industrial Category		Doctor's	Master's	Bachelor's	Others	Total	Distribution Ratio
Total	**No. of Employees**	**2,964**	**9,759**	**26,208**	**14,615**	**53,546**	**100.0**
	Distribution Ratio	**5.5**	**18.2**	**48.9**	**27.3**	**100.0**	
Biopharmaceutical		1,488	4,709	10,710	4,925	21,832	40.8
Biochemical and Bioenergy		324	1,184	3,223	2,153	6,884	12.9
Biofood		309	887	3,155	2,888	7,239	13.5
Bioenvironmental		35	138	617	244	1,034	1.9
Biomedical Equipment		302	1,061	2,961	1,896	6,220	11.6
Bioinstrument and Bioequipment		65	213	1,341	776	2,395	4.5
Bioresource		54	155	501	368	1,078	2.0
Bioservice		387	1,412	3,700	1,365	6,864	12.8

○ The proportion of elite manpower such as workers with master's and doctor's degree was 23.8% in total. The proportions of elite manpower were relatively high in the biopharmaceutical industry (28.4%), the bioservice industry (26.2%), and the biochemical and bioenergy industry and the biomedical equipment industry (21.9%).

<Figure 2-10> Bioindustry's Academic Degree Proportion of 2020

(Unit: %)



3) Manpower Distribution by Region

○ As of 2020, the number of manpower in the bioindustry was highest in Gyeonggi Province with 16,193 persons, accounting for 30.2%. Next followed Chungbuk (8,991 persons), Seoul (8,394), and Incheon (5,898).

<Table 2- 5> 2020 Bioindustry's Manpower Distribution by Region

(Unit: persons, %)

Area		Doctor's	Master's	Bachelor's	Others	Total	Distribution Ratio
Total	**No. of Employees**	**2,964**	**9,759**	**26,208**	**14,615**	**53,546**	**100.0**
	Distribution Ratio	**5.5**	**18.2**	**48.9**	**27.3**	**100.0**	
Seoul		575	1,819	4,795	1,205	8,394	15.7
Busan		12	37	152	57	258	0.5
Incheon		325	1,133	2,975	1,465	5,898	11.0
Daegu		14	49	735	664	1,462	2.7
Gwangju		9	22	36	4	71	0.1
Daejeon		215	517	1,324	405	2,461	4.6
Ulsan		27	147	675	337	1,186	2.2
Sejong		9	82	188	98	377	0.7
Gyeonggi		1,065	3,328	7,431	4,369	16,193	30.2
Gangwon		155	461	1,169	1,096	2,881	5.4
Chungbuk		352	1,513	4,222	2,904	8,991	16.8
Chungnam		94	312	834	788	2,028	3.8
Jeonbuk		37	122	570	608	1,337	2.5
Jeonnam		25	92	472	225	814	1.5
Gyeongbuk		17	37	196	136	386	0.7
Gyeongnam		24	64	324	157	569	1.1
Jeju		9	24	110	97	240	0.4

B. Recent Trend of Bioindustry Manpower Status

1) 2018~2020 Bioindustry's Trend of Manpower Status

① Bioindustry's Trend of Manpower Status

○ As of 2020, the number of manpower in the bioindustry was 53,546, an increase of 4,863 workers (10.0%) compared to 2019.

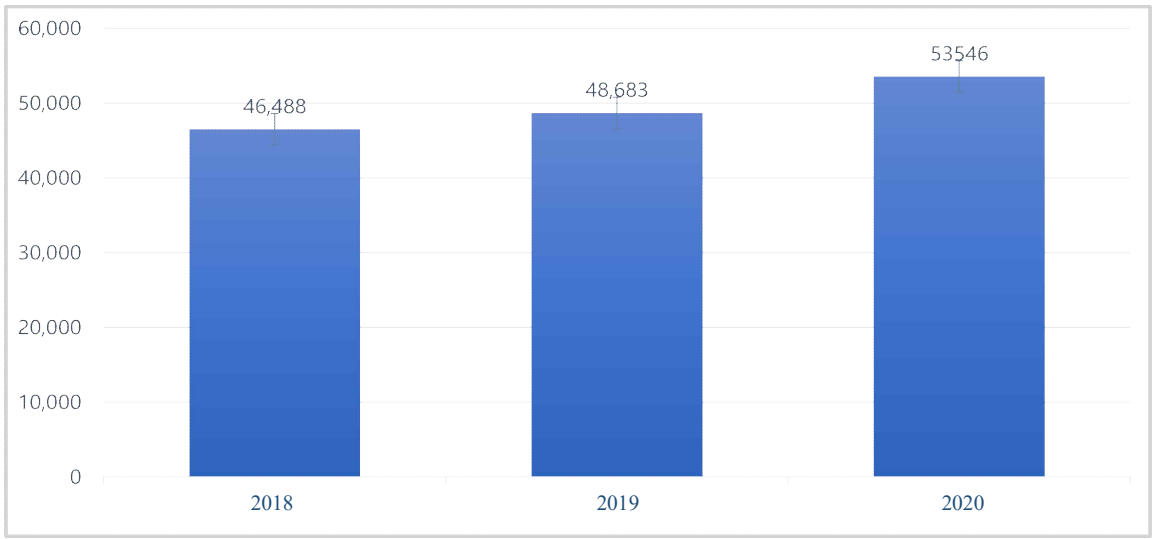
<Table 2-7> 2018–2020 Bioindustry's Change in Manpower

(Unit: persons, %)

Classification	2018	2019	2020	Annual Average Rate of Change
No. of Employees	46,488	48,683	53,546	7.3
Rate of Change	3.5	4.7	10.0	

<Figure 2-11> 2018–2020 Bioindustry's Trend of Manpower

(Unit: persons)



② Bioindustry's Trend in Academic Degree of Manpower

○ Compared to 2019, the number of bioindustry workers in 2020 with doctor's degree, master's degree, and bachelor's degree increased by 6.1%, 3.9%, and 10.1%, respectively. The number of workers with bachelor's degrees increased most by 2,410 persons compared to the previous year.

○ Others showed the biggest increase rate (15.1%) with an increase of 1,918 compared to the previous year.

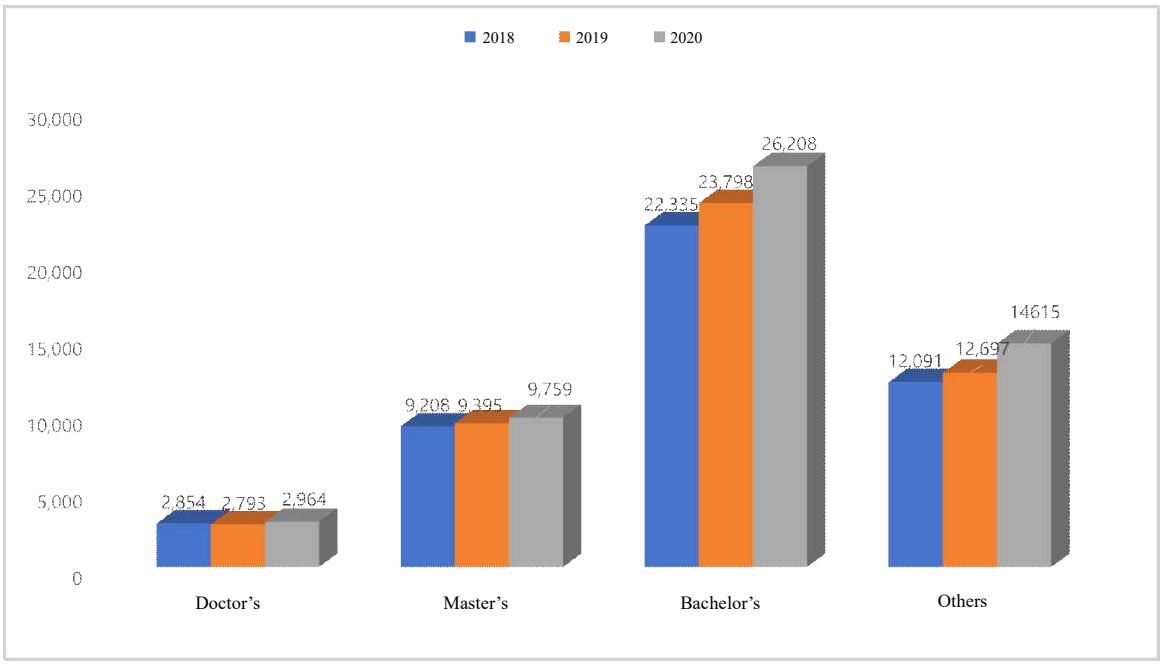
<Table 2-8> 2018–2020 Bioindustry's Trend in Academic Degree of Manpower

(Unit: persons, %)

Degree	2018		2019		2020		Variation from Previous Year		Annual Average Rate of Change
	No. of Employees	Distribution Ratio	No. of Employees	Distribution Ratio	No. of Employees	Distribution Ratio	No. of Employees	Rate of Change	
Total	**46,488**	**100**	**48,683**	**100**	**53,546**	**100**	**4,863**	**10.0**	**7.3**
Doctor's	2,854	6.1	2,793	5.7	2,964	5.5	171	6.1	1.9
Master's	9,208	19.8	9,395	19.3	9,759	18.2	364	3.9	2.9
Bachelor's	22,335	48	23,798	48.9	26,208	48.9	2,410	10.1	8.3
Others	12,091	26	12,697	26.1	14615	27.3	1,918	15.1	9.9

<Figure 2-12> 2018–2020 Bioindustry's Trend in Academic Degree of Manpower

(Unit: persons)



2) 2016–2020 Bioindustry's Trend of Manpower

① Bioindustry's Trend of Manpower Status

○ For the past five years, the number of manpower in the bioindustry has continued to increase by 6.5%.

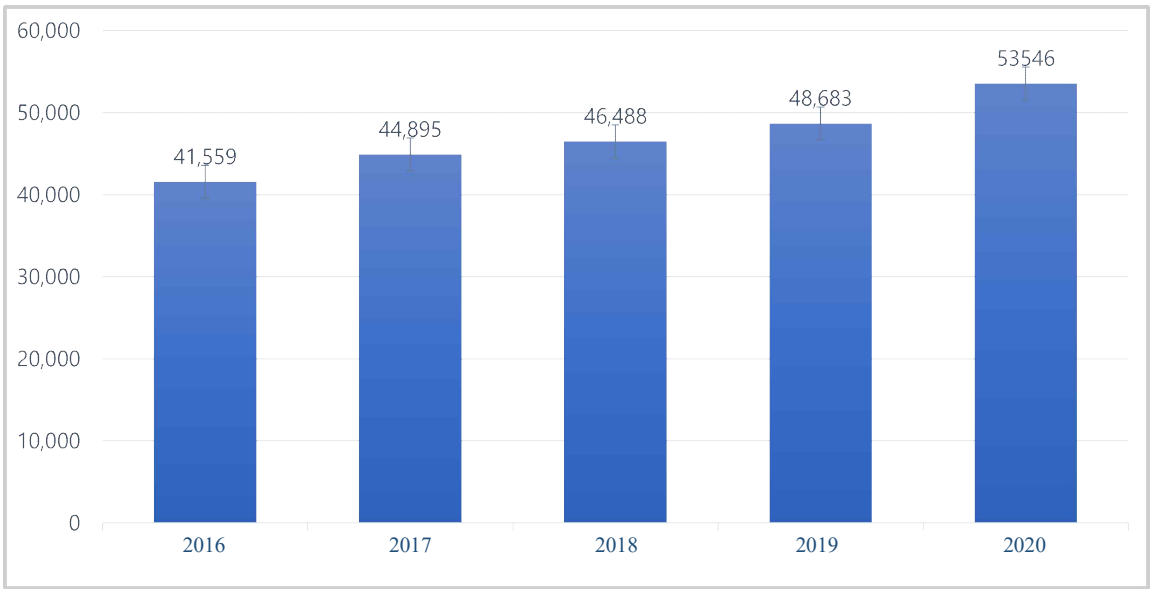
<Table 2-9> 2016–2020 Bioindustry's Change in Manpower

(Unit: persons, %)

Classification	2016	2017	2018	2019	2020	Annual Average Rate of Change
No. of Employees	41,559	44,895	46,488	48,683	53,546	6.5
Rate of Change	3.1	8.0	3.5	4.7	10.0	

<Figure 2-13> 2016–2020 Bioindustry's Trend of Manpower

(Unit: persons)



② Bioindustry's Trend in Academic Degree of Manpower

○ From 2016 to 2020, the number of employees with an academic degree (bachelor's, master's, or doctor's) showed steady increase. Workers with bachelor's degree, doctor's degree, and master's degree increased by 10.1%, 5.2%, and 3.2%, respectively.

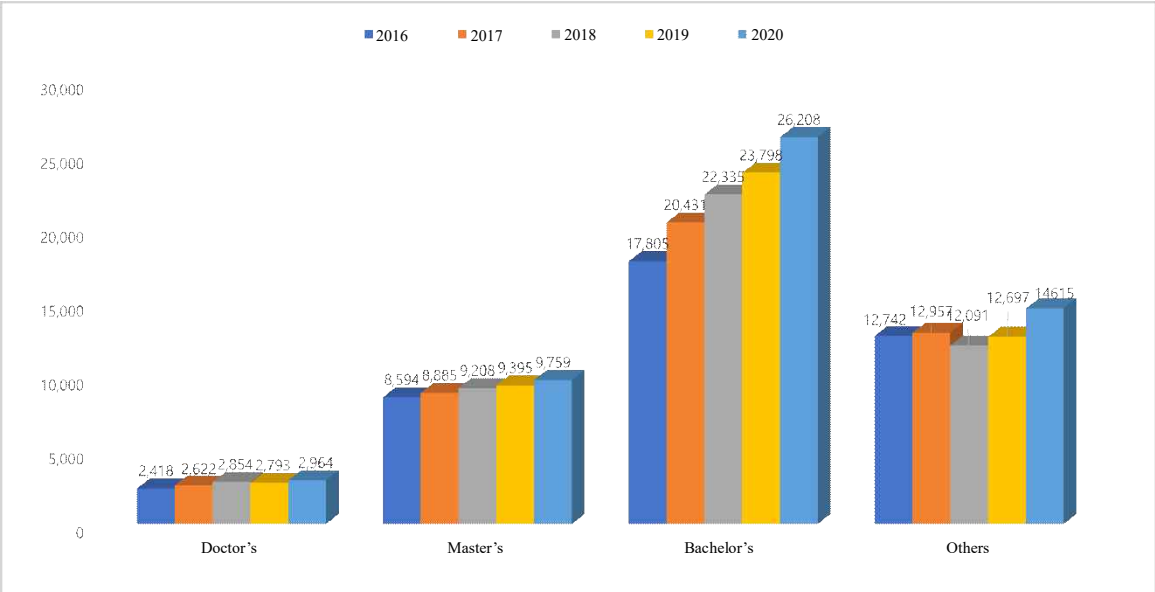
<Table 2-10> 2016–2020 Bioindustry's Trend in Academic Degree of Manpower

(Unit: persons, %)

Degree	2016		2017		2018		2019		2020		Variation from Previous Year		Annual Average Rate of Change
	No. of Employees	Distribution Ratio	No. of Employees	Distribution Ratio	No. of Employees	Distribution Ratio	No. of Employees	Distribution Ratio	No. of Employees	Distribution Ratio	No. of Employees	Rate of Change	
Total	**41,559**	**100.0**	**44,895**	**100.0**	**46,488**	**100.0**	**48,683**	**100**	**53,546**	**100**	**4,863**	**10.0**	**6.5**
Doctor's	2,418	5.8	2,622	5.8	2,854	5.8	2,793	5.7	2,964	5.5	171	6.1	5.2
Master's	8,594	20.7	8,885	19.8	9,208	18.7	9,395	19.3	9,759	18.2	364	3.9	3.2
Bachelor's	17,805	42.8	20,431	45.5	22,335	45.5	23,798	48.9	26,208	48.9	2,410	10.1	10.1
Others	12,742	30.7	12,957	28.9	12,091	24.6	12,697	26.1	14615	27.3	1,918	15.1	3.5

<Figure 2-14> 2016–2020 Bioindustry's Trend in Academic Degree of Manpower

(Unit: persons)



3 Investment Status of Bioindustry

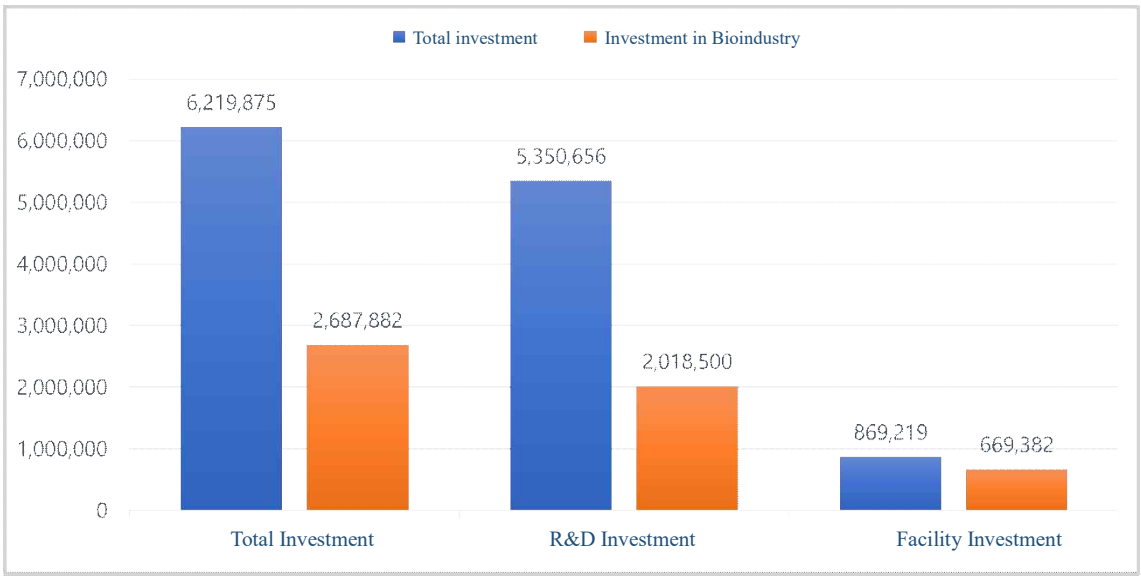
A. Bioindustry's Investment Status of 2020

○ The total amount of investments in bioindustry companies in 2020 was KRW 6,219.9 billion, and the total investment cost turned out to be 43.2% of the total investment fee reaching KRW 2,687.9 billion.

○ The R&D cost in the bioindustry turned out to be 37.7% of the total cost reaching KRW 2,018.5 billion, and the facility investment cost took 77.0% of the total cost of KRW 669.4 billion.

<Figure 2-15> 2020 Total Investment Cost and Investment in Bioindustry

(Unit: million KRW)



○ Among the bioindustries, the total investment was highest in the biopharmaceutical industry with KRW 1,799.2 billion (66.9%), followed by the bioservice with KRW 238.8 billion (8.9%) and the biomedical equipment with KRW 210.3 billion (7.8%). These three core bioindustries took 83.6% of the total investment cost.

○ Comparing the size of R&D cost by bioindustry, the biopharmaceutical industry was the largest with KRW 1,477.1 billion (73.2%), followed by the biomedical equipment with KRW 140.7 billion (7.0%) and the bioservice with KRW 127.4 billion (6.3%). These three core bioindustries took 86.5% of the total R&D cost.

○ The average R&D cost per bioindustry company was highest in the biopharmaceutical industry with KRW 4.9 billion, followed by the biomedical equipment with KRW 1.5 billion and the bioservice with KRW 1.3 billion.

○ The total facility investment cost by bioindustry was highest in the biopharmaceutical industry with KRW 322.1 billion (48.1%), followed by the bioservice with KRW 111.5 billion (16.7%).

○ The average facility investment cost per bioindustry company was highest in the bioservice with KRW 1.1 billion, followed by the biopharmaceutical with KRW 1,070 million and the biomedical equipment with KRW 740 million.

<Table 2-11> 2020 Bioindustry's Size of Investment

(Unit: companies, million KRW)

Industrial Category	No. of Companies	No. of Respondents	R&D Investment		Facility Investment		Total Investment	
			Total	Average	Total	Average	Total	Average
Total	**1,027**	**988**	**2,018,500**	**2,043**	**669,382**	**678**	**2,687,882**	**2,721**
Biopharmaceutical	326	301	1,477,053	4,907	322,111	1,070	1,799,164	5,977
Biochemical and Bioenergy	191	188	125,771	669	61,266	326	187,037	995
Biofood	170	168	102,690	611	84,874	505	187,564	1,116
Bioenvironmental	64	61	13,291	218	8,864	145	22,155	363
Biomedical Equipment	96	94	140,748	1,497	69,578	740	210,326	2,238
Bioinstrument and Bioequipment	62	60	19,589	326	9,106	152	28,695	478
Bioresource	15	15	11,986	799	2,113	141	14,099	940
Bioservice	103	101	127,372	1,261	111,470	1,104	238,842	2,365

○ The size of total investment in bioindustries was highest in the order of Gyeonggi (KRW 985.4 billion, 36.7%), Chungbuk (KRW 459.1 billion, 17.1%), and Incheon (KRW 401.2 billion, 14.9%). The top three regions account for 68.7% of the total investment.

○ The size of overall R&D investment was highest in the order of Gyeonggi (38.3%), Chungbuk (18.4%), and Seoul (12.6%), while the facility investment was highest in the order of Gyeonggi (31.8%), Incheon (24.0%), and Daejeon (13.5%).

○ The average size of R&D investment was highest in Incheon with KRW 11.5 billion, and the facility investment was also highest in Incheon with KRW 8million.

<Table 2-12> 2020 Bioindustry's Size of Investment by Area

(Unit: companies, million KRW)

Area	No. of Companies	No. of Respondents	R&D Investment		Facility investment		Total Investment	
			Total	Average	Total	Average	Total	Average
Total	**1,027**	**988**	**2,018,500**	**2,043**	**669,382**	**678**	**2,687,882**	**2,721**
Seoul	229	212	253,497	1,196	40,024	189	293,521	1,385
Busan	15	15	3,104	207	1,150	77	4,254	284
Incheon	22	21	240,818	11,468	160,406	7,638	401,224	19,106
Daegu	15	14	6,235	445	5,570	398	11,805	843
Gwangju	7	7	2,884	412	340	49	3,224	461
Daejeon	82	82	150,501	1,835	90,126	1,099	240,627	2,934
Ulsan	8	8	25,571	3,196	1,050	131	26,621	3,328
Sejong	3	3	5,379	1,793	6,803	2,268	12,182	4,061
Gyeonggi	340	327	772,590	2,363	212,858	651	985,448	3,014
Gangwon	44	44	81,031	1,842	21,211	482	102,242	2,324
Chungbuk	91	86	370,758	4,311	88,377	1,028	459,135	5,339
Chungnam	44	43	26,479	616	7,692	179	34,171	795
Jeonbuk	35	34	25,311	744	1,389	41	26,700	785
Jeonnam	36	36	7,519	209	10,100	281	17,619	489
Gyeongbuk	22	22	33,783	1,536	11,580	526	45,363	2,062
Gyeongnam	25	25	9,244	370	3,178	127	12,422	497
Jeju	9	9	3,796	422	7,528	836	11,324	1,258

B. Recent Trend of Investment Status

1) 2018–2020 Bioindustry's Trend of Investment

○ The annual average growth rate of investment in the bioindustry for the past three years is 5.8%.
- R&D investment increased by 9.0% and facility investment decreased by 2.4%.

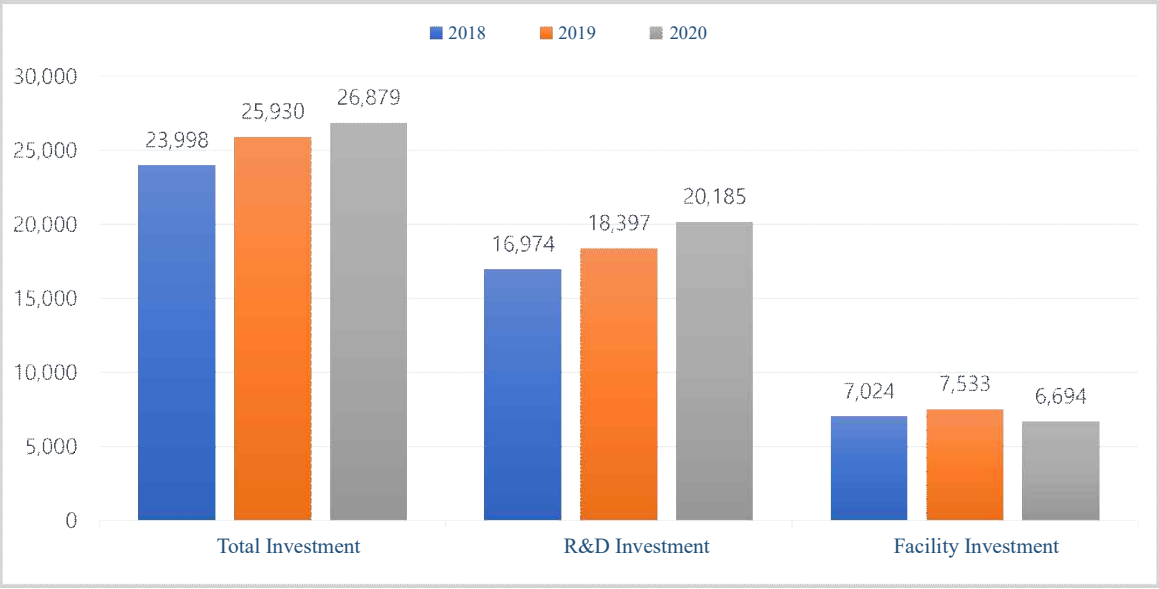
<Table 2-13> 2018–2020 Bioindustry's Trend of Investment

(Unit: 100 million KRW, %)

Classification		2018	2019	2020	Annual Average Rate of Change
Total Investment	Amount	23,998	25,930	26,879	5.8
	Rate of Change	8.3	8.1	3.7	
R&D Investment	Amount	16,974	18,397	20,185	9.0
	Rate of Change	13.4	8.4	9.7	
Facility Investment	Amount	7,024	7,533	6,694	-2.4
	Rate of Change	-2.3	7.2	-11.1	

<Figure 2-16> 2018–2020 Bioindustry Investment Trend

(Unit: 100 million KRW)



○ Looking into the overall size of investment in bioindustries in 2020, compared to 2019, investments greatly increased by 78.1% in the bioinstrument and bioequipment industry for the past three years; however, there was a sharp decrease in the biochemical and bioenergy by 7.6% and the biofood by 5.6%.

<Table 2-14> 2018–2020 Bioindustry's Trend in Overall Size of Investment

(Unit: million KRW, %)

Classification	2018		2019		2020		Variation from Previous Year	Annual Average Rate of Change
	Investment Amount	Distribution Ratio	Investment Amount	Distribution Ratio	Investment Amount	Distribution Ratio		
Total	**2,399,846**	**100**	**2,592,954**	**100.0**	**2,687,882**	**100.0**	**3.7**	**5.8**
Biopharmaceutical	1,536,020	64	1,694,527	65.4	1,799,164	66.9	6.2	8.2
Biochemical and Bioenergy	219,180	9.1	246,320	9.5	187,037	7.0	-24.1	-7.6
Biofood	210,377	8.8	211,224	8.1	187,564	7.0	-11.2	-5.6
Bioenvironmental	17,168	0.7	20,411	0.8	22,155	0.8	8.5	13.6
Biomedical Equipment	165,315	6.9	156,733	6.0	210,326	7.8	34.2	12.8
Bioinstrument and Bioequipment	9,042	0.4	15,741	0.6	28,695	1.1	82.3	78.1
Bioresource	12,091	0.5	13,571	0.5	14,099	0.5	3.9	8.0
Bioservice	230,653	9.6	234,427	9.0	238,842	8.9	1.9	1.8

○ For the past three years, the R&D investment cost has increased by 50.4% in the bioinstrument and bioequipment industry, 25.7% in the biomedical equipment, and 23.3% in the bioservice. However, there was a decrease in the biofood industry by 10.1% and the biochemical and bioenergy by 8.3%.

○ For the past three years, the facility investment cost has increased significantly in the bioinstrument and bioequipment industry by 388.9%. In the bioservice industry, the facility investment decreased by 12.9% whereas the R&D investment increased.

<Table 2-15> 2018–2020 Bioindustry's Trend of R&D and Facility Investment Cost

(Unit: million KRW, %)

Industrial Category	2018		2019		2020		Variation from Previous Year		Annual Average Rate of Change	
	R&D	Facility	R&D	Facility	R&D	Facility	R&D	Facility	R&D	Facility
Total	**1,697,419**	**702,427**	**1,839,677**	**753,277**	**2,018,500**	**669,382**	**9.7**	**-11.1**	**9.0**	**-2.4**
Biopharmaceutical	1,217,383	318,637	1,311,581	382,946	1,477,053	322,111	12.6	-15.9	10.1	0.5
Biochemical and Bioenergy	149,539	69,641	147,326	98,994	125,771	61,266	-14.6	-38.1	-8.3	-6.2
Biofood	126,919	83,458	129,144	82,080	102,690	84,874	-20.5	3.4	-10.1	0.8
Bioenvironmental	11,810	5,358	13,246	7,165	13,291	8,864	0.3	23.7	6.1	28.6
Biomedical Equipment	89,130	76,185	101,860	54,873	140,748	69,578	38.2	26.8	25.7	-4.4
Bioinstrument and Bioequipment	8,661	381	13,087	2,654	19,589	9,106	49.7	243.1	50.4	388.9
Bioresource	10,244	1,847	11,084	2,487	11,986	2,113	8.1	-15.0	8.2	7.0
Bioservice	83,733	146,920	112,349	122,078	127,372	111,470	13.4	-8.7	23.3	-12.9

2) 2016–2020 Bioindustry's Trend of Investment

○ Total investment in the bioindustry has been on a steady rise over the past five years by 7.0%, a 3.7% increase year on year.

- The R&D investment and the facility investment increased by 9.3% and 1.2%, respectively.

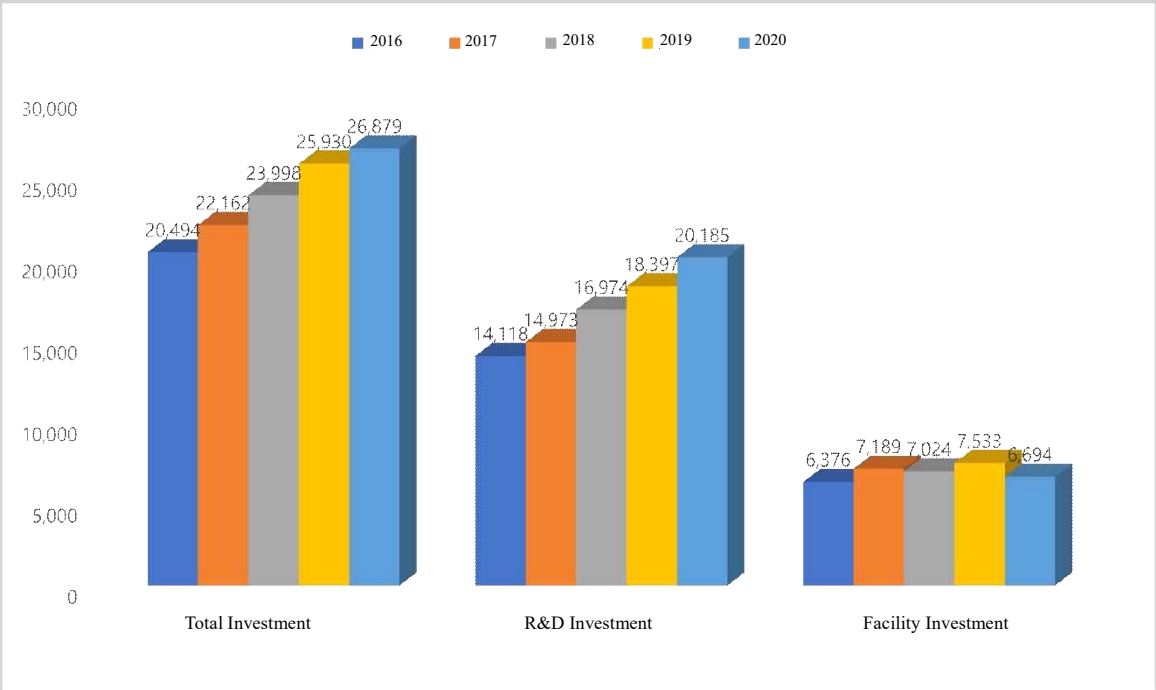
<Table 2-16> 2016–2020 Bioindustry's Trend of Investment

(Unit: 100 million KRW, %)

Classification		2016	2017	2018	2019	2020	Annual Average Rate of Change
Total Investment	Amount	20,494	22,162	23,998	25,930	26,879	7.0
	Rate of Change	19.3	8.1	8.3	8.1	3.7	
R&D Investment	Amount	14,118	14,973	16,974	18,397	20,185	9.3
	Rate of Change	7.9	6.1	13.4	8.4	9.7	
Facility Investment	Amount	6,376	7,189	7,024	7,533	6,694	1.2
	Rate of Change	55.5	12.8	-2.3	7.2	-11.1	

<Figure 2-17> 2016–2020 Bioindustry Investment Trend

(Unit: 100 million KRW)



○ The biopharmaceutical industry has consistently accounted for more than 60% of investment in the bioindustry since 2016.

○ Compared to the previous year, the size of investment in the bioinstrument and bioequipment industry greatly increased by 82.3% and that in the biomedical equipment industry grew by 34.2%. However, the size of investment decreased by 24.1% and 11.2% in the biochemical and bioenergy and the biofood, respectively.

<Table 2-17> 2016–2020 Bioindustry's Trend in Overall Size of Investment

(Unit: million KRW, %)

Industrial Category	2016		2017		2018		2019		2020		Variation from Previous Year	Annual Average Rate of Change
	Investment Amount	Distribution Ratio	Investment Amount	Distribution Ratio	Investment Amount	Distribution Ratio	Investment Amount	Distribution Ratio	Investment Amount	Distribution Ratio		
Total	**2,049,417**	**100.0**	**2,216,223**	**100.0**	**2,399,846**	**100.0**	**2,592,954**	**100.0**	**2,687,882**	**100.0**	**3.7**	**7.0**
Biopharmaceutical	1,253,438	61.2	1,525,964	68.9	1,536,020	64.0	1,694,527	65.4	1,799,164	66.9	6.2	9.5
Biochemical and Bioenergy	162,176	7.9	178,397	8.0	219,180	9.1	246,320	9.5	187,037	7.0	-24.1	3.6
Biofood	113,818	5.6	122,904	5.5	210,377	8.8	211,224	8.1	187,564	7.0	-11.2	13.3
Bioenvironmental	10,874	0.5	11,622	0.5	17,168	0.7	20,411	0.8	22,155	0.8	8.5	19.5
Biomedical Equipment	122,189	6.0	98,489	4.4	165,315	6.9	156,733	6.0	210,326	7.8	34.2	14.5
Bioinstrument and Bioequipment	15,525	0.8	14,881	0.7	9,042	0.4	15,741	0.6	28,695	1.1	82.3	16.6
Bioresource	25,288	1.2	25,504	1.2	12,091	0.5	13,571	0.5	14,099	0.5	3.9	-13.6
Bioservice	346,109	16.9	238,462	10.8	230,653	9.6	234,427	9.0	238,842	8.9	1.9	-8.9

○ The annual average rate of change in R&D investment for the past five years was highest in the bioservice industry with an increase of 27.0%, followed by the biomedical equipment (25.9%) and the bioinstrument and bioequipment (13.0%). However, the R&D investment decreased in the bioresource and the biofood by 14.4% and 0.4%, respectively.

○ The annual average rate of change in facility investment was highest in the biofood industry with 72.9%, followed by the bioenvironmental (51.1%) and the bioinstrument and bioequipment (26.1%). However, the size of the facility investment in the bioservice industry whose rate of change in the R&D investment was the highest showed a decrease of 21.7%. That of the bioresource industry decreased (by 8.4%), same as its R&D investment.

<Table 2-18> 2016–2020 Bioindustry's Trend of R&D and Facility Investment Cost

(Unit: 100 million KRW, %)

Industrial Category	2016		2017		2018		2019		2020		Variation from Previous Year		Annual Average Rate of Change	
	R&D	Facility	R&D	Facility	R&D	Facility	R&D	Facility	R&D	Facility	R&D	Facility	R&D	Facility
Total	**14,118**	**6,376**	**14,973**	**7,189**	**16,974**	**7,024**	**18,397**	**7,533**	**20,185**	**6,694**	**9.7**	**-11.1**	**9.3**	**1.2**
Biopharmaceutical	10,455	2,080	11,150	4,109	12,174	3,186	13,116	3,829	14,771	3,221	12.6	-15.9	9.0	11.6
Biochemical and Bioenergy	1,137	485	1,165	619	1,495	696	1,473	990	1,258	613	-14.6	-38.1	2.6	6.0
Biofood	1,043	95	1,121	108	1,269	835	1,291	821	1,027	849	-20.5	3.4	-0.4	72.9
Bioenvironmental	92	17	99	17	118	54	132	72	133	89	0.3	23.7	9.6	51.1
Biomedical Equipment	561	661	572	413	891	762	1,019	549	1,407	696	38.2	26.8	25.9	1.3
Bioinstrument and Bioequipment	120	36	127	22	87	4	131	27	196	91	49.7	243.1	13.0	26.1
Bioresource	223	30	222	33	102	18	111	25	120	21	8.1	-15.0	-14.4	-8.4
Bioservice	489	2,972	517	1,868	837	1,469	1,123	1,221	1,274	1,115	13.4	-8.7	27.0	-21.7

4 Cooperation with Other Organizations

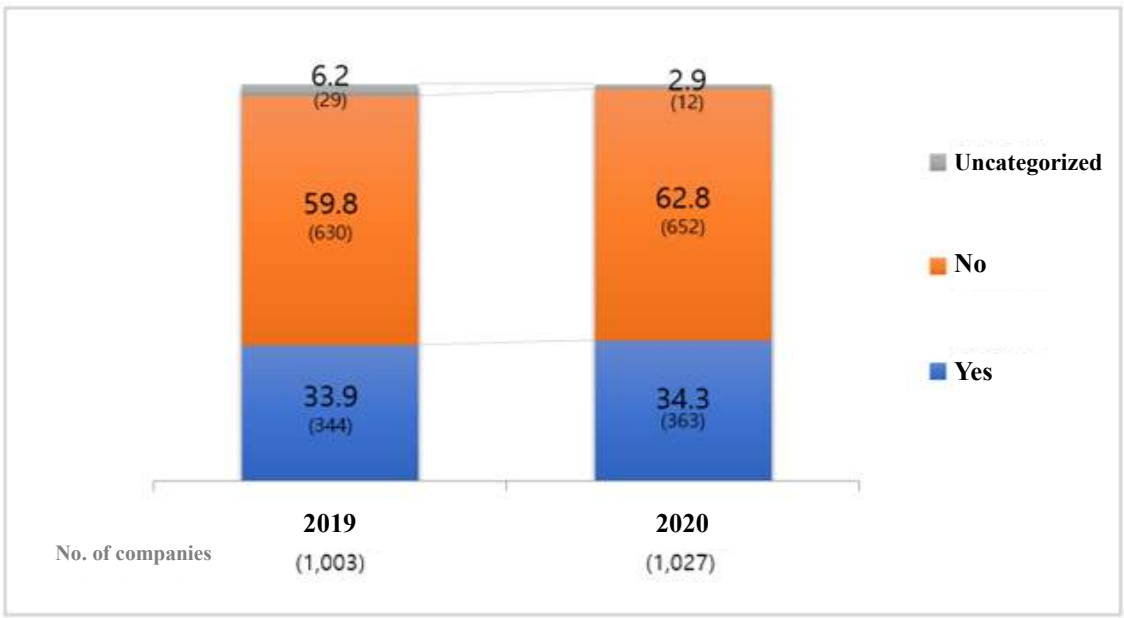
A. Cooperation Types

1) Cooperative Relationship with Other Organizations

○ Out of a total of 1,027 companies, 363 companies had cooperative relationships with other organizations, accounting for 34.3%. Of 1,015 companies except uncategorized companies, 35.8% had cooperative relationships with other organizations.

<Figure 2-18> Cooperative Relationship with Other Organizations

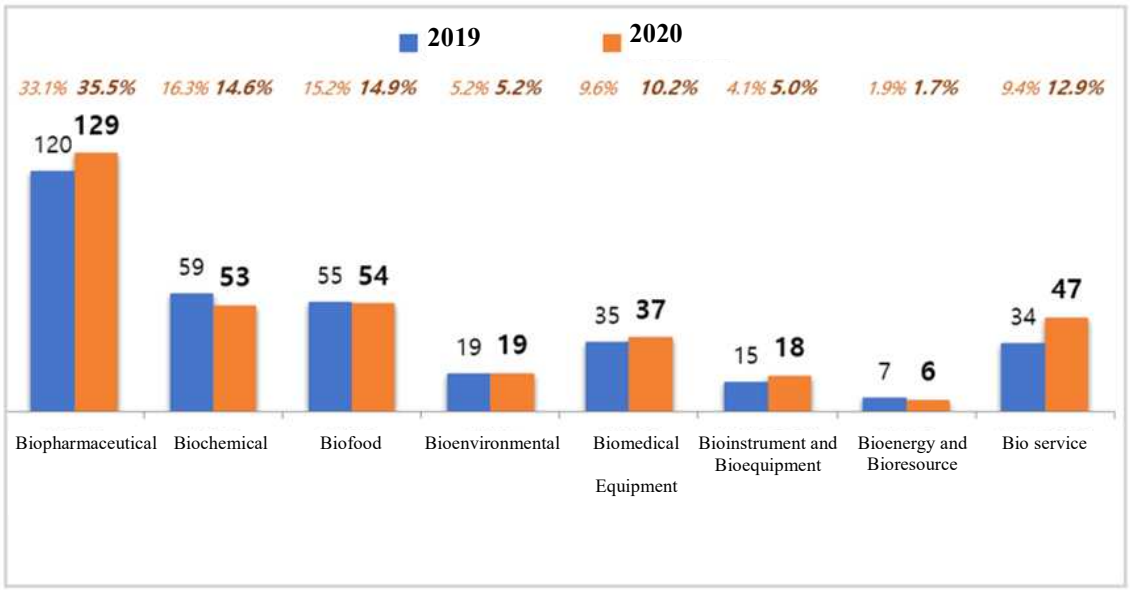
(Unit: % (total no. of companies))



○ According to bioindustries, a cooperative relationship was established in large numbers in the order of biopharmaceutical (129 companies), biofood (54), and biochemical and bioenergy (53). The total number of cooperative relationships in the three industries was 236, accounting for 65.0% of 363 companies holding cooperative relationships.

<Figure 2-19> No. of Companies Holding Cooperative Relationships by Bioindustrial Category

(Unit: companies)

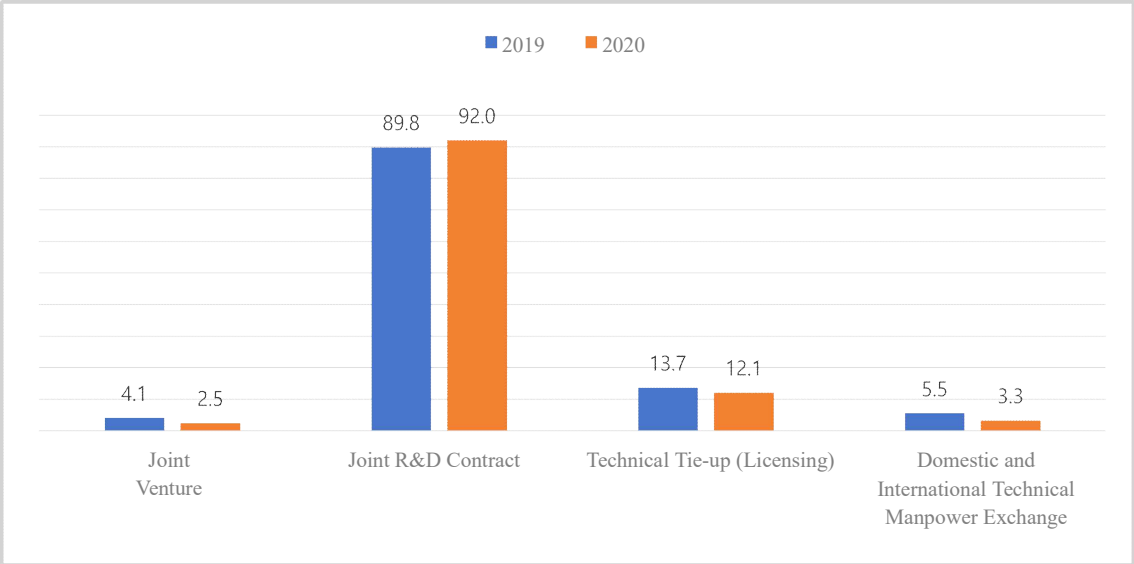


2) Types of Cooperative Relationship with Other Organizations

○ For the type of cooperation identified based on the 363 responding companies, joint R&D contracts were most common at 92.0%, followed by technology tie-up and licensing (12.1%), domestic and international technical manpower exchange (3.3%), and joint venture (2.5%).

<Figure 2-20> Types of Cooperative Relationship with Other Organizations

(Unit: %)



* The above chart shows the responses from companies that hold cooperative relationships (2019: 344 companies; 2020: 363 companies). Multiple responses accepted.

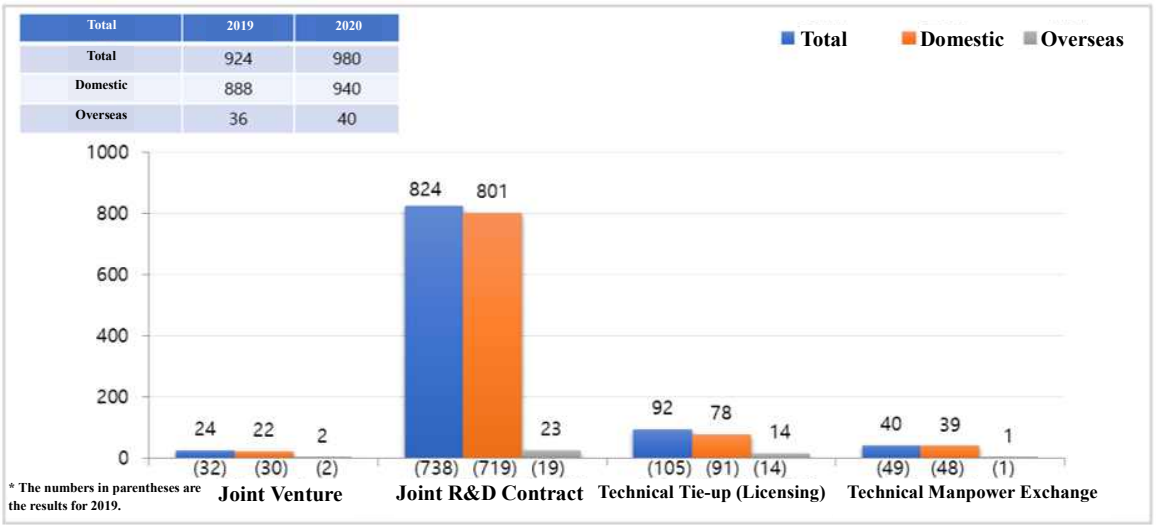
3) Number of Cooperation Cases by Cooperative Relationship Type

○ The number of cooperative relationships among 363 companies totaled 980 cases, with 940 cases in Korea (95.9%) and 40 cases abroad (4.1%).

○ Among the types of cooperative relations, the largest number of cases was joint R&D contracts, with 824 cases consisting of 801 in Korea and 23 abroad.

<Figure 2-21> No. of Cooperation Cases by Cooperative Relationship Type

(Unit: cases)



* The above chart shows the responses from companies that hold cooperative relationships (2019: 344 companies; 2020: 363 companies). Multiple responses accepted.

○ The number of cooperation cases by bioindustrial category and by cooperation type was 339 in the biopharmaceutical industry, accounting for 34.6% of the total of 980 cases.

○ The bioservice industry and the biochemical and bioenergy industry had 164 cases (16.7%) and 149 cases (15.2%), respectively. The three industries account for 66.5% of the total cases.

<Table 2-19> No. of Cooperation Cases by Bioindustrial Category and Cooperation Type

(Unit: cases)

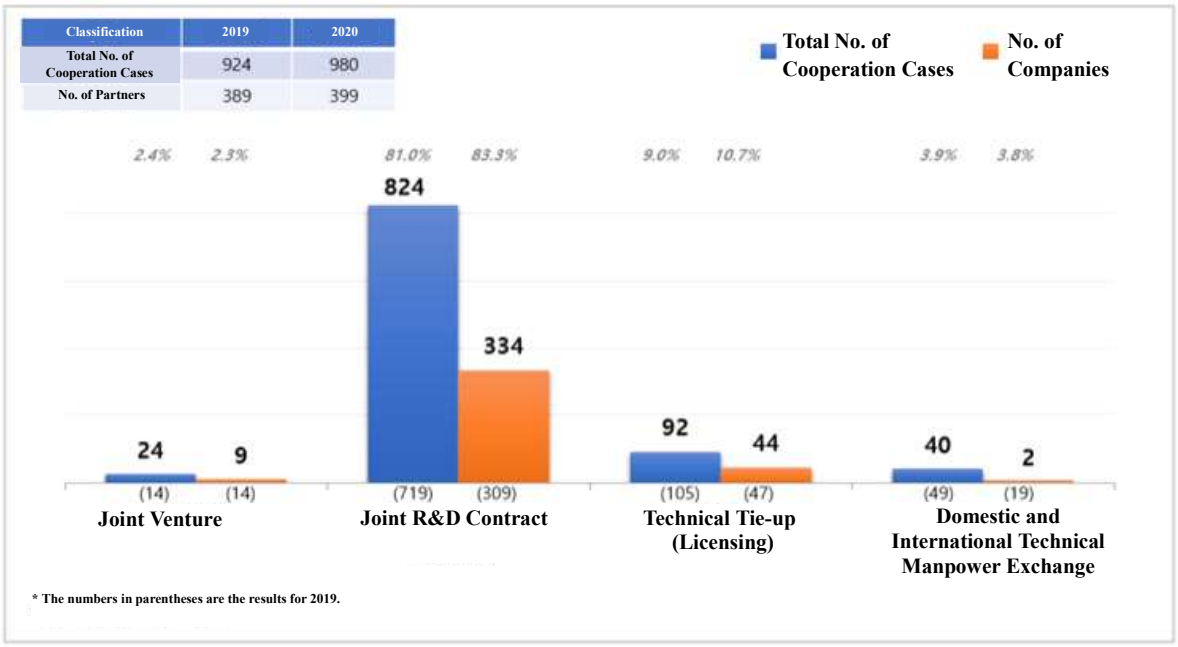
Industrial Category	2019		2020		Cooperation Type			
	Total		Total		Joint Venture	Joint R&D Contract	Technical Tie-up (Licensing)	Technical Manpower Exchange
Total	**924**	**(100.0%)**	**980**	**(100.0%)**	**24**	**824**	**92**	**40**
Biopharmaceutical	376	(40.7%)	339	(34.6%)	12	271	50	6
Biochemical and Bioenergy	154	(16.7%)	149	(15.2%)	-	123	10	16
Biofood	129	(14.0%)	123	(12.6%)	-	117	4	2
Bioenvironmental	27	(2.9%)	27	(2.8%)	-	24	3	-
Biomedical Equipment	89	(9.6%)	105	(10.7%)	11	71	19	4
Bioinstrument and Bioequipment	54	(5.8%)	50	(5.1%)	1	49	-	-
Bioresource	23	(2.5%)	23	(2.3%)	-	23	-	-
Bioservice	72	(7.8%)	164	(16.7%)	-	146	6	12

4) Number of Partners by Cooperative Relationship Type

○ Among the types of cooperation, 334 companies (92.0%) have established a joint R&D contract relationship, which makes up the largest part, and the number of joint R&D cases was found to be 824. It was found that companies holding joint R&D contracts conducted 2.5 joint R&D cases on average.

<Figure 2-22> No. of Partners by Cooperative Relationship Type

(Unit: cases; companies)



* The above chart shows the responses from companies that hold cooperative relationships (2019: 344 companies; 2020: 363 companies). Multiple responses accepted.

○ The biopharmaceutical industry has the greatest number of companies with cooperative relationships with 148 companies (37.1%), followed by the biochemical and bioenergy (14.3%) and the biofood (14.0%).

<Table 2-20> No. of Partners by Bioindustrial Category and Cooperation

(Unit: companies)

Industrial Category	2019		2020		Cooperation Type			
	Total		Total		Joint Venture	Joint R&D Contract	Technical Tie-up (Licensing)	Technical Manpower Exchange
Total	**389**	**(100.0%)**	**399**	**(100.0%)**	**9**	**334**	**44**	**12**
Biopharmaceutical	144	(37.0%)	148	(37.1%)	6	115	23	4
Biochemical and Bioenergy	67	(17.2%)	57	(14.3%)	-	49	5	3
Biofood	60	(15.4%)	56	(14.0%)	-	51	4	1
Bioenvironmental	21	(5.4%)	20	(5.0%)	-	18	2	-
Biomedical Equipment	37	(9.5%)	42	(10.5%)	2	33	5	2
Bioinstrument and Bioequipment	17	(4.4%)	19	(4.8%)	1	18	-	-
Bioresource	7	(1.8%)	6	(1.5%)	-	6	-	-
Bioservice	36	(9.3%)	51	(12.8%)	-	44	5	2

B. Cooperation Stages

1) Number of Cooperation Cases by Cooperation Stage

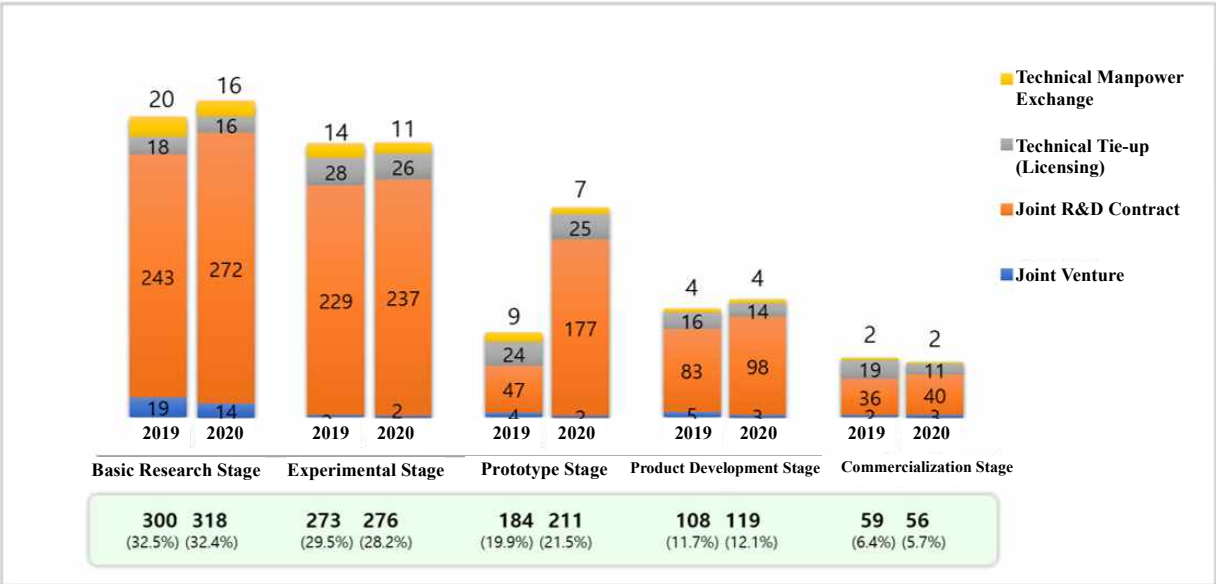
○ As per cooperation stage, the basic research stage has the largest proportion at 32.4% (318 cases) out of a total of 980 cases. It was followed by the experimental stage at 28.2% (276 cases).

○ The commercialization stage, which is the final stage, showed a low ratio of 5.7% (56 cases), indicating that companies have cooperation with mainly other institutions at the initial stage of the project.

○ The number of cooperation cases increased year on year throughout all stages except the commercialization stage.

<Figure 2-23> No. of Cooperation Cases by Cooperation Stage

(Unit: cases)



* The above chart shows the responses from companies that hold cooperative relationships (2019: 344 companies; 2020: 363 companies). Multiple responses accepted.

<Table 2-21> No. of Cooperation Cases by Cooperation Stage

(Unit: cases)

Classification	Total Cooperative Relationships	Domestic					Overseas				
		Total	Joint Venture	Joint R&D	Technical Tie-up	Technical Manpower Exchange	Total	Joint Venture	Joint R&D	Technical Tie-up	Technical Manpower Exchange
Total of 2019	**924**	**888**	**30**	**719**	**91**	**48**	**36**	**2**	**19**	**14**	**1**
Total of 2020	**980**	**940**	**22**	**801**	**78**	**39**	**40**	**2**	**23**	**14**	**1**
Basic Research Stage	318	311	14	267	14	16	7	0	5	2	0
Experimental Stage	276	273	2	235	26	10	3	0	2	0	1
Prototype Stage	211	191	1	166	17	7	20	1	11	8	0
Product Development Stage	119	112	3	93	12	4	7	0	5	2	0
Commercialization Stage	56	53	2	40	9	2	3	1	0	2	0

○ By bioindustrial classification, the biopharmaceutical industry (119 cases), the bioservice (69 cases), and the biochemical and bioenergy (45 cases) had the greatest numbers of cooperation cases in the basic research stage in 2020, whereas the biofood (46 cases) and the biomedical equipment (33 cases) cooperated more in the experimental stage.

<Table 2-22> No. of Cooperation Cases by Bioindustrial Category and Cooperation Stage

(Unit: cases)

Industrial Category	Total No. of Companies	Companies with Cooperative Relationships	Cooperation Stage						
			Basic Research Stage	Experimental Stage	Prototype Stage	Product Development Stage	Commercialization Stage	Total	
Total	**1,027**	**363**	**318**	**276**	**211**	**119**	**56**	**980**	**(100.0%)**
Biopharmaceutical	326	129	119	97	86	29	8	339	(34.6%)
Biochemical and Bioenergy	191	53	45	32	29	26	17	149	(15.2%)
Biofood	170	54	32	46	20	21	4	123	(12.6%)
Bioenvironmental	64	19	13	5	6	-	3	27	(2.8%)
Biomedical Equipment	96	37	28	33	19	15	10	105	(10.7%)
Bioinstrument and Bioequipment	62	18	10	12	19	9	-	50	(5.1%)
Bioresource	15	6	2	18	-	3	-	23	(2.3%)
Bioservice	103	47	69	33	32	16	14	164	(16.7%)

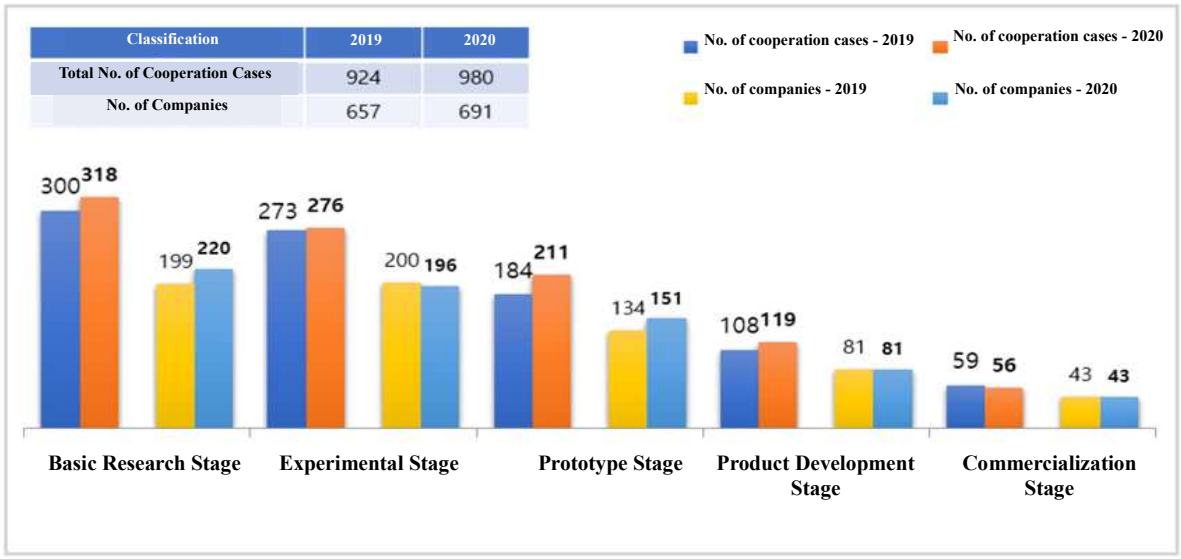
2) Number of Partners by Cooperation Stage

○ A total of 691 companies have a cooperative relationship at each stage, including those with multiple responses, with 220 companies in the basic research stage, making up the largest part at 31.2%.

○ The number of partners decreased in the experimental stage and is the same in the product development and commercialization stages, whereas the number increased in the basic research and prototype stages.

<Figure 2-24> No. of Partners by Cooperation Stage

(Unit: cases; companies)



* The above chart shows the responses from companies that hold cooperative relationships (2019: 344 companies; 2020: 363 companies). Multiple responses accepted.

<Table 2-23> No. of Cooperation Cases and Partners by Cooperation Stage

(Unit: cases; companies; %)

Classification		Total	Basic Research	Experimental Stage	Prototype Stage	Product Development Stage	Commercialization Stage
No. of Cooperation Cases	Domestic	980	318	276	211	119	56
	Overseas	40	7	3	20	7	3
Total		**1,020**	**318**	**276**	**211**	**119**	**56**
Percentage (%)		100	31.2	27.1	20.7	11.7	5.5
No. of Companies	Domestic	670	217	193	142	78	40
	Overseas	21	3	3	9	3	3
Sum (companies)		**691**	**220**	**196**	**151**	**81**	**43**
Percentage (%)		100	31.8	28.4	21.9	11.7	6.2

○ The number of partners by bioindustrial category and cooperation stage was 465 in the biopharmaceutical (35.9%), biochemical and bioenergy (15.9%), and bioservice (15.5%) industries, accounting for 67.3% of the total.

○ The biopharmaceutical (86 companies), biochemical and bioenergy (34), and bioservice (42) industries have relatively large numbers of companies in the basic research stage.

<Table 2-24> No. of Partners by Bioindustrial Category and Cooperation

(Unit: companies)

Industrial Category	2019		2020		Cooperation Stage				
	Total		Total		Basic Research	Experimental Stage	Prototype Stage	Product Development Stage	Commercialization Stage
Total	**657**	**(100.0%)**	**691**	**(100.0%)**	**220**	**196**	**151**	**81**	**43**
Biopharmaceutical	272	(41.4%)	248	(35.9%)	86	75	60	20	7
Biochemical and Bioenergy	115	(17.5%)	110	(15.9%)	34	26	20	18	12
Biofood	87	(13.2%)	82	(11.9%)	22	28	16	13	3
Bioenvironmental	22	(3.3%)	22	(3.2%)	10	4	6	0	2
Biomedical Equipment	65	(9.9%)	77	(11.1%)	16	25	15	12	9
Bioinstrument and Bioequipment	29	(4.4%)	36	(5.2%)	8	9	11	8	0
Bioresource	12	(1.8%)	9	(1.3%)	2	5	0	2	0
Bioservice	55	(8.4%)	107	(15.5%)	42	24	23	8	10

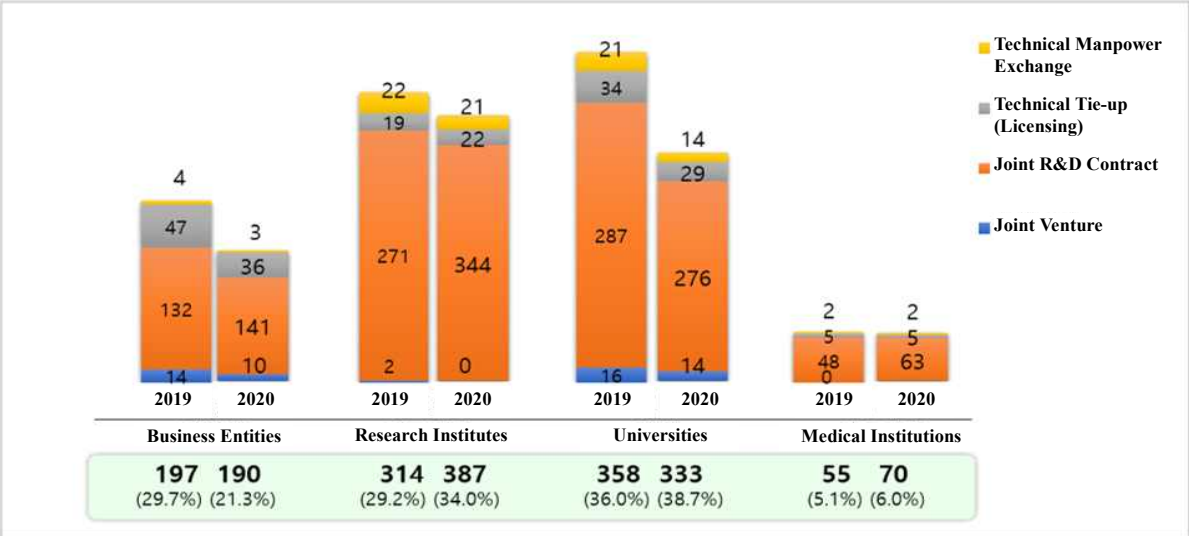
C. Cooperating Organizations

1) Number of Cooperation Cases by Cooperating Organization

○ Of the total of 980 cases, there were 387 cases (39.5%) with research institutes, 333 cases (34.0%) with universities, 190 cases (19.4%) with business entities, and 70 cases (7.1%) with medical institutions.

<Figure 2-25> No. of Cooperation Cases by Cooperating Organization

(Unit: cases)



* The above chart shows the responses from companies that hold cooperative relationships (2019: 344 companies; 2020: 363 companies). Multiple responses accepted.

<Table 2-25> No. of Cooperation Cases by Cooperating Organization

(Unit: cases)

Classification	Total Cooperative Relationships	Domestic					Overseas				
		Total	Joint Venture	Joint R&D	Technical Tie-up	Technical Manpower Exchange	Total	Joint Venture	Joint R&D	Technical Tie-up	Technical Manpower Exchange
Total	**980**	**940**	**22**	**801**	**78**	**39**	**40**	**2**	**23**	**14**	**1**
Business Entities	190	161	9	126	23	3	29	1	15	13	-
SMEs and Venture Companies	127	102	7	78	14	3	25	-	14	11	-
Middle-standing Companies	34	34	1	29	4	-	0	-	-	-	-
Large Enterprises	29	25	1	19	5	-	4	1	1	2	-
Research Institutes	387	385	-	343	21	21	2	-	1	1	-
Government-funded Research Institutes	345	343	-	315	16	12	2	-	1	1	-
Private Research Institutes	42	42	-	28	5	9	0	-	-	-	-
Universities	333	325	13	270	29	13	8	1	6	-	1
Medical Institutions	70	69	-	62	5	2	1	-	1	-	-

○ By bioindustial category, the biopharmaceutical and biofood industries have large numbers of cooperation cases with universities, whereas the biochemical and bioenergy industry has a relatively large number of cooperation cases with research institutes.

<Table 2-26> No. of Cooperation Cases by Bioindustrial Category and Cooperating Organization

(Unit: cases)

Industrial Category	Total No. of Companies	Companies with Cooperative Relationships	Cooperating Organization					
			Business Entities	Research Institutes	Universities	Medical Institutions	Total	
Total	**1,027**	**363**	**190**	**387**	**333**	**70**	**980**	**(100.0%)**
Biopharmaceutical	326	129	108	91	114	26	339	(34.6%)
Biochemical and Bioenergy	191	53	15	89	44	1	149	(15.2%)
Biofood	170	54	17	47	59	-	123	(12.6%)
Bioenvironmental	64	19	2	16	8	1	27	(2.8%)
Biomedical Equipment	96	37	16	36	39	14	105	(10.7%)
Bioinstrument and Bioequipment	62	18	9	21	16	4	50	(5.1%)
Bioresource	15	6	-	14	9	-	23	(2.3%)
Bioservice	103	47	23	73	44	24	164	(16.7%)

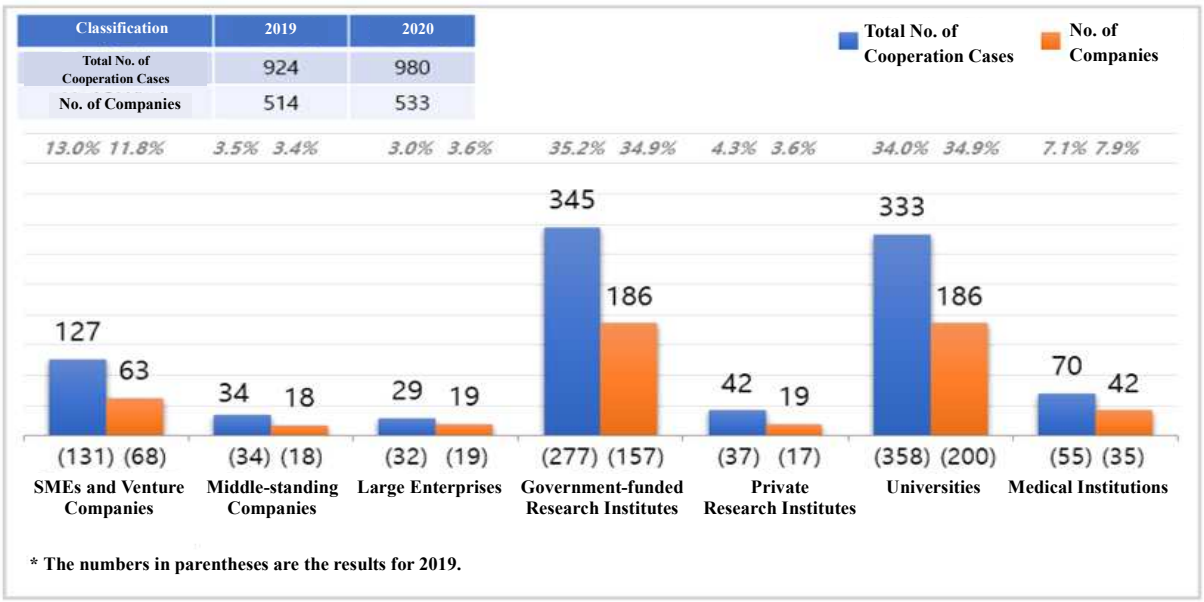
2) Number of Partners by Cooperating Organization

○ Of the total of 980 cases, cooperation cases with government-funded research institutes were the most common with 345 cases accounting for 35.2%, followed by universities (333 cases, 34.0%), SMEs and venture companies (127 cases, 13.0%), medical institutions (70 cases, 7.1%), middle-standing companies (34 cases, 3.5%), private research institutes (42 cases, 4.3%), and large enterprises (29 cases, 3.0%) in order.

○ It was found that a total of 333 cooperation cases were conducted with universities.

<Figure 2-26> No. of Partners by Cooperating Organization

(Unit: cases; companies)



* The above chart shows the responses from companies that hold cooperative relationships (2019: 344 companies; 2020: 363 companies). Multiple responses accepted.

○ By bioindustrial field, the biopharmaceutical industry, bioservice industry, and biochemical and bioenergy industry account for 36.6%, 15.6%, and 13.9% of the total companies with cooperation relationships, respectively, which makes up 66.0% of the total.

○ Companies cooperating with universities constitute the largest part in the biopharmaceutical industry (69 cases). Companies cooperating with research institutes account for a large part in the bioservice industry (33 cases) and the biochemical and bioenergy industry (36 cases).

<Table 2-27> No. of Partners by Cooperating Organization and by Bioindustry

(Unit: companies)

Industrial Category	Total No. of Companies	Companies with Cooperative Relationships	Cooperating Organization					
			Business Entities	Research Institutes	Universities	Medical Institutions	Total	
Total	**1,027**	**363**	**100**	**205**	**186**	**42**	**533**	**(100.0%)**
Biopharmaceutical	326	129	52	58	69	16	195	(36.6%)
Biochemical and Bioenergy	191	53	11	36	26	1	74	(13.9%)
Biofood	170	54	7	29	28	-	64	(12.0%)
Bioenvironmental	64	19	1	12	7	1	21	(3.9%)
Biomedical Equipment	96	37	12	23	19	9	63	(11.8%)
Bioinstrument and Bioequipment	62	18	4	11	9	2	26	(4.9%)
Bioresource	15	6	-	3	4	-	7	(1.3%)
Bioservice	103	47	13	33	24	13	83	(15.6%)

<Table 2-28> Domestic and Overseas Cooperative Relationships and Cooperating Organizations

(Unit: cases; units; %)

Classification			Total	Venture Companies	Middle-standing Companies	Large Enterprises	Government-funded Research Institutes	Private Research Institutes	Universities	Medical Institutions
Joint Venture	Total Investments	Domestic	22	7	1	1	-	-	13	-
		Overseas	2	-	-	1	-	-	1	-
		Subtotal	24	7	1	2	-	-	14	-
	No. of Companies	Domestic	10	4	1	1	-	-	4	-
		Overseas	2	-	-	1	-	-	1	-
		Subtotal	12	4	1	2	-	-	5	-
Joint R&D Contract	Total Investments	Domestic	801	78	29	19	315	28	270	62
		Overseas	23	14	-	1	1	-	6	1
		Subtotal	824	92	29	20	316	28	276	63
	No. of Companies	Domestic	435	39	14	12	167	14	152	37
		Overseas	9	4	-	1	1	-	2	1
		Subtotal	444	43	14	13	168	14	154	38
Technical Tie-up (Licensing)	Total Investments	Domestic	78	14	4	5	16	5	29	5
		Overseas	14	11	-	2	1	-	-	-
		Subtotal	92	25	4	7	17	5	29	5
	No. of Companies	Domestic	50	9	3	3	12	3	18	2
		Overseas	7	5	-	1	1	-	-	-
		Subtotal	57	14	3	4	13	3	18	2
Domestic and International Technical Manpower Exchange	Total Investments	Domestic	39	3	-	-	12	9	13	2
		Overseas	1	-	-	-	-	-	1	-
		Subtotal	40	3	-	-	12	9	14	2
	No. of Companies	Domestic	19	2	-	-	5	2	8	2
		Overseas	1	-	-	-	-	-	1	-
		Subtotal	20	2	-	-	5	2	9	2
Total Cooperation Cases			**1,017**	**140**	**37**	**33**	**351**	**38**	**346**	**72**
Percentage			**100.0**	**13.8**	**3.6**	**3.2**	**34.5**	**3.7**	**34.0**	**7.1**
Companies in Total			**533**	**63**	**18**	**19**	**186**	**19**	**186**	**42**
Percentage			**100.0**	**11.8**	**3.4**	**3.6**	**34.9**	**3.6**	**34.9**	**7.9**

3) Cooperating Organizations by Scale of Workers

○ Bio-companies with 1 to 49 employees cooperated with research institutes the most (195 cases in total, 194 cases at home).

○ Bio-companies with at least 1,000 employees cooperated with universities the most, 31 cases (25 cases in Korea) in 2020.

<Table 2-29> Cooperating Organizations by Scale of Workers

(Unit: cases)

Classification		Total Cooperative Relationships	Business Entities				Research Institutes			Universities	Medical Institutions
			Total	SMEs and Venture Companies	Middle-standing Companies	Large Enterprises	Total	Government-funded Research Institutes	Private Research Institutes		
Total	**Total**	**976**	**189**	**126**	**34**	**29**	**385**	**343**	**42**	**332**	**70**
	1 – 49	458	76	52	16	8	195	174	21	157	30
	50 – 299	306	67	53	6	8	116	111	5	100	23
	300 – 999	123	27	16	2	9	37	32	5	44	15
	1,000 or more	89	19	5	10	4	37	26	11	31	2
Domestic	**Total**	**936**	**160**	**101**	**34**	**25**	**383**	**341**	**42**	**324**	**69**
	1 – 49	442	61	37	16	8	194	173	21	157	30
	50 – 299	298	59	46	6	7	116	111	5	100	23
	300 – 999	117	25	14	2	9	36	31	5	42	14
	1,000 or more	79	15	4	10	1	37	26	11	25	2
Overseas	**Total**	**40**	**29**	**25**	**-**	**4**	**2**	**2**	**-**	**8**	**1**
	1 – 49	16	15	15	-	-	1	1	-	-	-
	50 – 299	8	8	7	-	1	-	-	-	-	-
	300 – 999	6	2	2	-	-	1	1	-	2	1
	1,000 or more	10	4	1	-	3	-	-	-	6	-

5 Supply and Demand Status of Bioindustry

A. Bioindustry's Supply and Demand Status of 2020

○ The total supply and demand size of the domestic bioindustries in 2020 is KRW 19,834.7 billion, increased by KRW 5,109.7 billion (34.7%) year on year.

○ The production scale was KRW 17,492.3 billion accounting for 88.2%, and the size of imports was KRW 2,342.4 billion (11.8%).

○ The total size of domestic demand was KRW 9,818.9 billion accounting for 49.5% of total supply. The total size of exports was KRW 10,015.8 billion (50.5%).

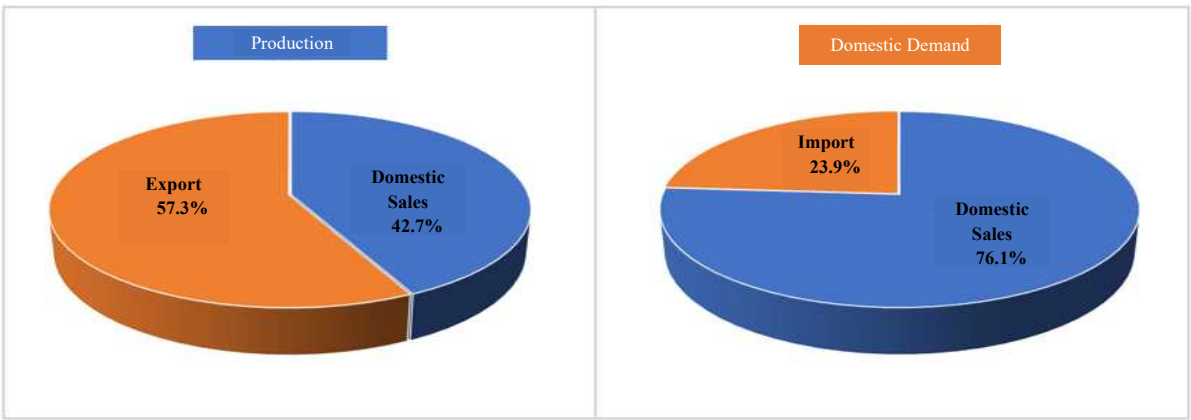
<Table 2-30> 2018–2020 Bioindustry's Trend of Supply and Demand

(Unit: 100 million KRW, %)

Year	Supply				Total	Demand			
	Production		Import			Domestic Demand		Export	
	Amount	Distribution Ratio	Amount	Distribution Ratio		Amount	Distribution Ratio	Amount	Distribution Ratio
2018	106,067	86.0	17,282	14.0	123,348	70,966	57.5	52,382	49.4
2019	126,586	86.0	20,665	10.4	147,250	81,836	55.6	65,414	44.4
2020	**174,923**	**88.2**	**23,424**	**11.8**	**198,347**	**98,189**	**49.5**	**100,158**	**50.5**
Annual Average Rate of Change	**28.4**		**16.4**		**26.8**	**17.6**		**38.3**	

<Figure 2-27> 2020 Bioindustry's Size of Production and Domestic Demand

(Unit: %)



○ For the production scale in the bioindustry, the biopharmaceutical industry, biofood industry, and biomedical equipment industry accounted for KRW 5,062.9 billion (28.9%), KRW 4,214.6 billion (24.1%), and KRW 3,879.5 billion (22.2%), respectively, accounting for a majority, 75.2% of the total production.

○ In the domestic market, the biopharmaceutical industry (KRW 3,674.4 billion, 37.4%), biochemical and bioenergy industry (KRW 1,890.3 billion, 19.3%), and biofood industry (KRW 1,899.1 billion, 19.3%) made up 76.0%.

<Table 2-31> 2020 Bioindustry's Status of Production and Domestic Demand

(Unit: million KRW, %)

Industrial Category	Production				Domestic Demand			
	Domestic Sales	Export	Total	Distribution Ratio	Domestic Sales	Import	Total	Distribution Ratio
Total	**7,476,541**	**10,015,805**	**17,492,346**	**100.0**	**7,476,541**	**2,342,382**	**9,818,923**	**100.0**
Biopharmaceutical	1,810,940	3,251,919	5,062,859	28.9	1,810,940	1,863,444	3,674,384	37.4
Biochemical and Bioenergy	1,794,145	318,243	2,112,388	12.1	1,794,145	96,166	1,890,311	19.3
Biofood	1,794,966	2,419,588	4,214,554	24.1	1,794,966	104,164	1,899,130	19.3
Bioenvironmental	98,439	112	98,551	0.6	98,439	168	98,607	1.0
Biomedical Equipment	887,475	2,991,996	3,879,471	22.2	887,475	47,119	934,594	9.5
Bioinstrument and Bioequipment	144,416	49,168	193,584	1.1	144,416	208,917	353,333	3.6
Bioresource	109,296	11,793	121,089	0.7	109,296	19,919	129,215	1.3
Bioservice	836,864	972,987	1,809,851	10.3	836,864	2,484	839,348	8.5

○ The size of supply and domestic demand in Gyeonggi Province occupies 41.8% (KRW 7,311.7 billion) and 27.7% (KRW 2,723.8 billion), respectively, and is the highest compared to other provinces.

<Table 2-32> 2020 Bioindustry's Status of Production and Domestic Demand by Area

(Unit: million KRW, %)

Area	Production				Domestic Demand			
	Domestic Sales	Export	Total	Distribution Ratio	Domestic Sales	Import	Total	Distribution Ratio
Total	**7,476,541**	**10,015,805**	**17,492,346**	**100.0**	**7,476,541**	**2,342,382**	**9,818,923**	**100.0**
Seoul	949,441	611,457	1,560,898	8.9	949,441	1,882,457	2,831,898	28.8
Busan	5,252	3,602	8,854	0.1	5,252	1,652	6,904	0.1
Incheon	384,136	3,158,062	3,542,198	20.2	384,136	2,986	387,122	3.9
Daegu	45,997	41,900	87,897	0.5	45,997	6	46,003	0.5
Gwangju	1,357	0	1,357	0.0	1,357	-	1,357	0.0
Daejeon	404,690	92,888	497,578	2.8	404,690	26,667	431,357	4.4
Ulsan	643,298	6,893	650,191	3.7	643,298	448	643,746	6.6
Sejong	1,387	0	1,387	0.0	1,387	-	1,387	0.0
Gyeonggi	2,462,247	4,849,433	7,311,680	41.8	2,462,247	261,540	2,723,787	27.7
Gangwon	200,599	331,339	531,938	3.0	200,599	31,903	232,502	2.4
Chungbuk	1,365,162	686,305	2,051,467	11.7	1,365,162	72,100	1,437,262	14.6
Chungnam	133,727	48,262	181,989	1.0	133,727	16,721	150,448	1.5
Jeonbuk	267,582	66,960	334,542	1.9	267,582	1,650	269,232	2.7
Jeonnam	270,398	46,153	316,551	1.8	270,398	12,186	282,584	2.9
Gyeongbuk	294,567	37,295	331,862	1.9	294,567	20,339	314,906	3.2
Gyeongnam	33,016	29,659	62,675	0.4	33,016	11,608	44,624	0.5
Jeju	13,685	5,598	19,283	0.1	13,685	118	13,803	0.1

B. Recent Trend of Supply and Demand Status

1) 2018–2020 Trend of Supply and Demand Status

○ The size of production and domestic demand in the bioindustries continued to grow between 2018 and 2020.

○ The annual average rate of change in the supply and demand, production, and domestic demand since 2018 marked 26.8.%, 28.4%, and 17.6%, respectively.

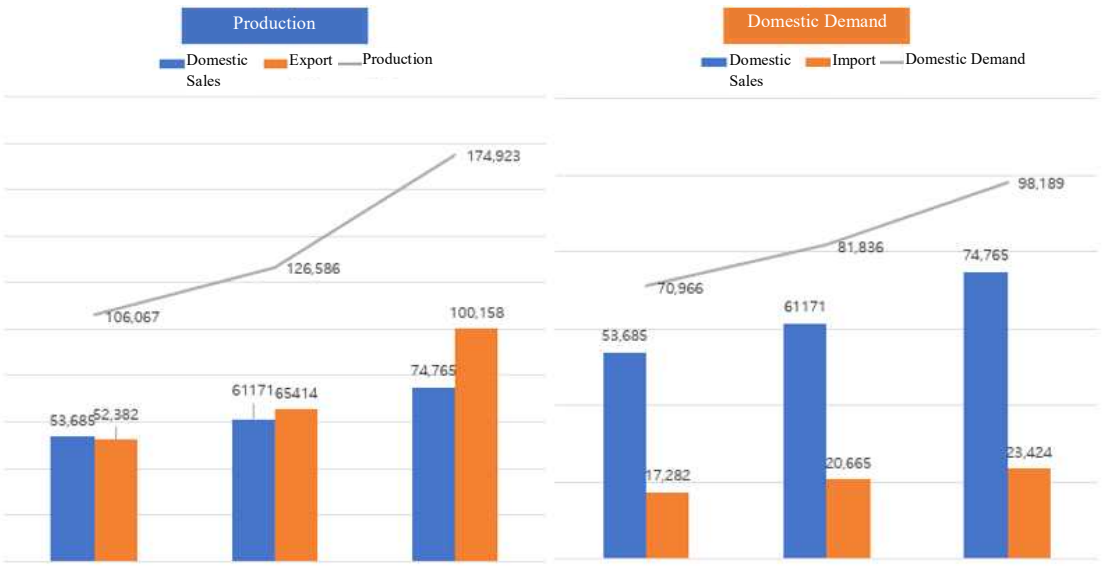
<Table 2-33> 2018–2020 Bioindustry's Trend of Production and Domestic Demand

(Unit: 100 million KRW, %)

Classification		2018	2019	2020	Annual Average Rate of Change
Supply and Demand (Production + Import)	Amount	123,348	147,250	198,347	26.8
	Rate of Change	5.3	19.4	34.7	
Production (Domestic Sales + Export)	Amount	106,067	126,586	174,923	28.4
	Rate of Change	4.5	19.3	38.2	
Domestic Demand (Domestic Sales + import)	Amount	70,966	81,836	98,189	17.6
	Rate of Change	8.4	15.3	20.0	

<Figure 2-28> 2018–2020 Bioindustry's Trend of Production and Domestic Demand

(Unit: 100 million KRW)



○ In 2020, production increased by 38.2% year on year, and the biomedical equipment industry showed the highest growth rate at 271.7%.

○ The biopharmaceutical industry, which makes up the largest part in the total production, increased by 19.8% year on year, whereas the bioresource industry decreased by 3.7%.

○ The domestic demand in 2020 grew by 20.0% year on year with a 78.6% increase in the bioenvironmental industry and an 156.9% increase in the biomedical equipment industry. On the other hand, the bioresource industry decreased by 1.2%.

<Table 2-34> 2018–2020 Bioindustry's Trend of Supply and Demand by Category

(Unit: 100 million KRW, %)

Industrial Category	Production					Domestic Demand				
	2018	2019	2020	Variation from Previous Year	Annual Average Rate of Change	2018	2019	2020	Variation from Previous Year	Annual Average Rate of Change
Total	**106,067**	**126,586**	**174,923**	**38.2**	**28.4**	**70,966**	**81,836**	**98,189**	**20.0**	**17.6**
Biopharmaceutical	35,101	42,246	50,629	19.8	20.1	29,793	32,623	36,744	12.6	11.1
Biochemical and Bioenergy	17,916	18,561	21,124	13.8	8.6	18,083	18,412	18,903	2.7	2.2
Biofood	31,015	39,903	42,146	5.6	16.6	12,947	16,385	18,991	15.9	21.1
Bioenvironmental	577	557	986	77.0	30.8	562	552	986	78.6	32.5
Biomedical Equipment	8,482	10,438	38,795	271.7	113.9	2,714	3,638	9,346	156.9	85.6
Bioinstrument and Bioequipment	889	1,105	1,936	75.2	47.6	1,240	2,455	3,533	43.9	68.8
Bioresource	1,785	1,257	1,211	-3.7	-17.6	1,793	1,308	1,292	-1.2	-15.1
Bioservice	10,302	12,519	18,099	44.6	32.5	3,834	6,464	8,393	29.8	48.0

2) 2016–2020 Trend of Supply and Demand Status

○ The trend of supply and demand of the bioindustries over the past five years can be summarized as follows: the production scale showed a steady increase at 17.2% and the domestic demand also grew with an annual average of 12.7%.

<Table 2-35> 2016–2020 Bioindustry's Trend of Supply and Demand

(Unit: 100 million KRW,

Classification		2016	2017	2018	2019	2020	Annual Average Rate of Change
Supply and Demand (Production + Import)	Amount	107,208	117,150	123,348	147,250	198,347	16.6
	Rate of Change	8.2	9.3	5.3	19.4	34.7	
Production (Domestic Sales + Export)	Amount	92,611	101,457	106,067	126,586	174,923	17.2
	Rate of Change	8.9	9.6	4.5	19.3	38.2	
Domestic Demand (Domestic Sales + Import)	Amount	60,898	65,466	70,966	81,836	98,189	12.7
	Rate of Change	8.2	7.5	8.4	15.3	20.0	

(Unit: 100 million KRW, %)

<Figure 2-29> 2016–2020 Bioindustry's Trend of Production and Domestic Demand

(Unit: 100 million KRW)

<Table 2-36> 2016–2020 Bioindustry's Trend of Supply and Demand by Category

□ 2016–2020 Bioindustry's Trend of Supply and Demand by Category

(Unit: 100 million KRW, %)

Industrial Category	Production							Domestic Demand						
	2016	2017	2018	2019	2020	Variation from Previous Year	Annual Average Rate of Change	2016	2017	2018	2019	2020	Variation from Previous Year	Annual Average Rate of Change
Total	**92,611**	**101,457**	**106,067**	**126,586**	**174,923**	**38.2**	**17.2**	**60,898**	**65,466**	**70,966**	**81,836**	**98,189**	**20.0**	**12.7**
Biopharmaceutical	33,576	35,044	35,101	42,246	50,629	19.8	10.8	28,384	29,287	29,793	32,623	36,744	12.6	6.7
Biochemical and Bioenergy	13,335	15,944	17,916	18,561	21,124	13.8	12.2	12,836	15,644	18,083	18,412	18,903	2.7	10.2
Biofood	29,192	31,241	31,015	39,903	42,146	5.6	9.6	12,342	12,659	12,947	16,385	18,991	15.9	11.4
Bioenvironmental	296	462	577	557	986	77.0	35.1	293	460	562	552	986	78.6	35.4
Biomedical Equipment	7,477	7,771	8,482	10,438	38,795	271.7	50.9	1,897	1,963	2,714	3,638	9,346	156.9	49.0
Bioinstrument and Bioequipment	1,199	1,130	889	1,105	1,936	75.2	12.7	1,163	1,174	1,240	2,455	3,533	43.9	32.0
Bioresource	1,691	1,711	1,785	1,257	1,211	-3.7	-8.0	1,529	1,561	1,793	1,308	1,292	-1.2	-4.1
Bioservice	5,848	8,153	10,302	12,519	18,099	44.6	32.6	2,455	2,718	3,834	6,464	8,393	29.8	36.0

6 Domestic Sales of Bioindustry

A. Domestic Sales Status of 2020

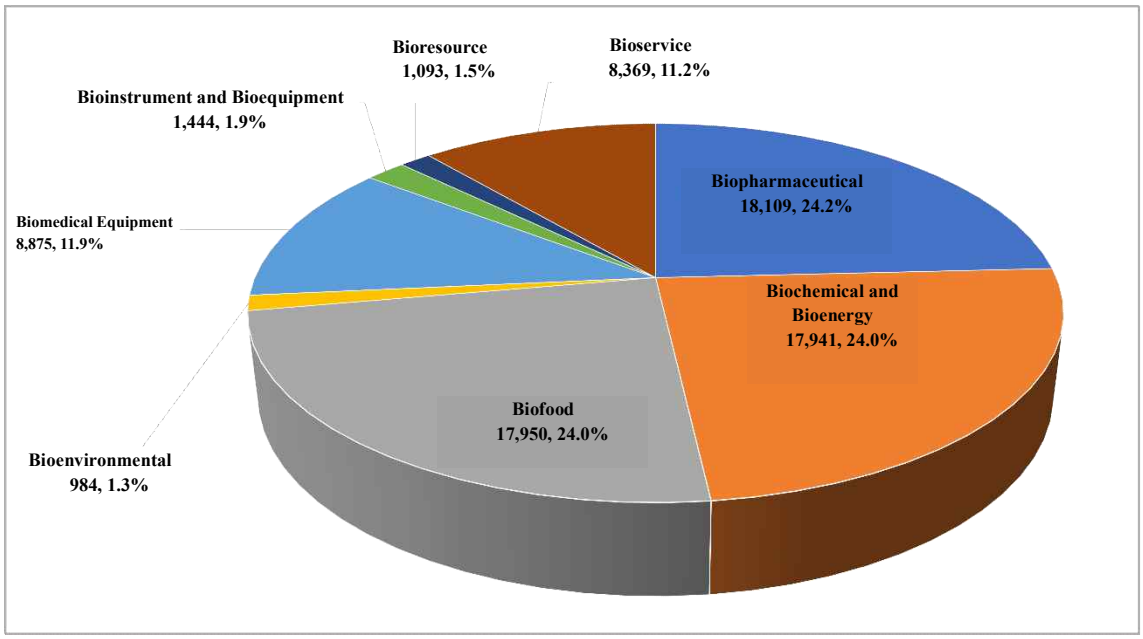
○ The size of bioindustry's domestic sales in 2020 reached KRW 7,476.5 billion, and the biopharmaceutical industry took the largest proportion among them with KRW 1,810.9 billion (24.2%).

○ The following largest industries were the biofood industry with KRW 1,795 billion (24.0%), and the biochemical and bioenergy industry with KRW 1,794.1 billion (24.0%).

○ Domestic sales of the bioindustry in 2020 accounted for 72.2% of the total market in three industries: biopharmaceutical, biochemical and bioenergy, and biofood industries.

<Figure 2-30> 2020 Bioindustry's Size of Domestic Sales by Category

(Unit: 100 million KRW, %)



○ [Table 2-37] shows the domestic bioproducts that have more than 1.0% domestic sales among 51 domestic bioproducts and bioservices, in the order of size. The size of domestic sales of biofuels accounted for 14.6% of the total bioindustry with KRW 1,093.8 billion.

○ The following largest bioproducts were feed additives (11.9%), in-vitro diagnostics (9.6%), and functional health foods (8.3%) in order. A total of 23 products make up at least 1.0% of the domestic sales.

<Table 2-37> 2020 Main Bioproduct's Size of Domestic Sales

(Unit: million KRW, %)

Rank	Code	Product Name	Domestic Sales	Distribution Ratio
1	2060	Biofuels	1,093,848	14.6
2	3050	Feed additives	888,715	11.9
3	5020	In-vitro diagnostics	717,490	9.6
4	3010	Functional health foods	620,598	8.3
5	1000	Other veterinaty biopharmaceuticals	445,902	6.0
6	1060	Hemotherapeutics	432,312	5.8
7	2040	Biocosmetics and home & personal care chemicals	424,699	5.7
8	1030	Vaccines	420,664	5.6
9	8010	Bio-consignment production and procuration services	343,975	4.6
10	8030	R&D services	187,203	2.5
11	3030	Food additives	182,520	2.4
12	5000	Other biomedical equipments	169,406	2.3
13	1040	Hormones	156,503	2.1
14	8020	Bio-diagnostic and analytical services	137,776	1.8
15	2050	Biological agrochemicals and fertilizers	102,238	1.4
16	1120	Veterinary biopharmaceuticals	93,049	1.2
17	3040	Fermented foods	85,420	1.1
18	7010	Seeds and seedlings	81,894	1.1
19	1050	Therapeutic antibodies and cytokines	80,728	1.1
20	2030	Enzymes and reagents for research	78,000	1.0
21	8040	Other R&D services	77,396	1.0
22	1070	Cell-based therapeutics	75,197	1.0
23	6000	Other bioinstruments and bioequipments	74,969	1.0

B. Recent Trend of Domestic Sales Status

1) 2018–2020 Trend of Domestic Sales Status

○ The size of bioindustry's domestic sales in 2020 was KRW 7,476.5 billion, which increased by KRW 1,359.4 billion (22.2%) from KRW 6,117.2 billion in 2019.

○ The annual average growth rate of bioindustry's domestic sales for the past three years is 18.0%.

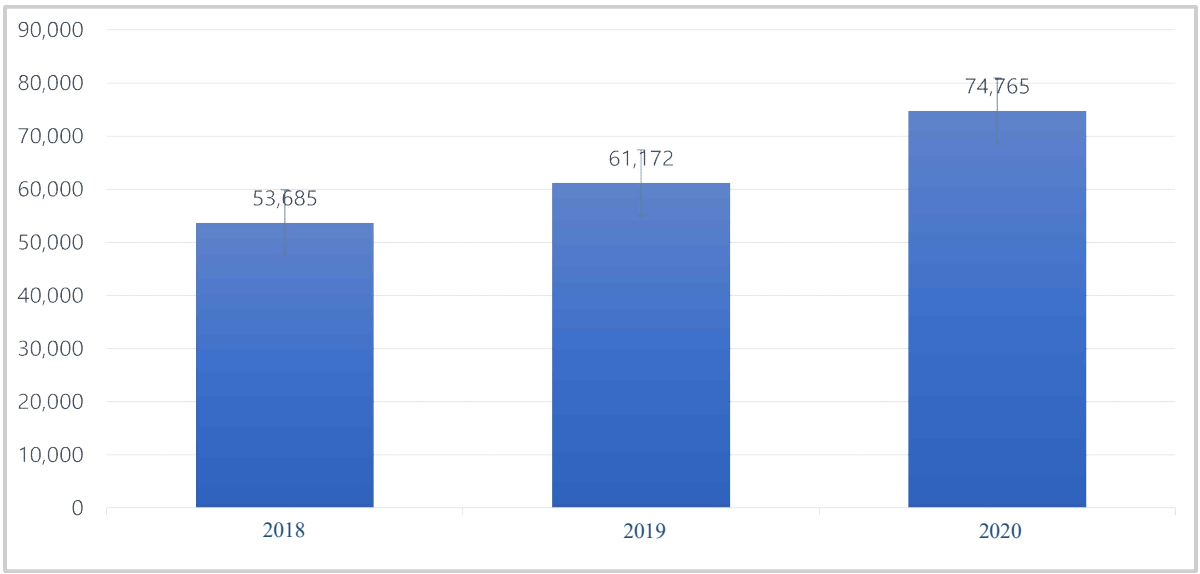
<Table 2-38> 2018–2020 Bioindustry's Trend of Domestic Sales

(Unit: 100 million KRW, %)

Classification		2018	2019	2020	Annual Average Rate of Change
Domestic Sales	Amount	53,685	61,172	74,765	18.0
	Rate of Change	7.9	13.9	22.2	

<Figure 2-31> 2018–2020 Bioindustry's Trend of Domestic Sales

(Unit: 100 million KRW)



○ The biopharmaceutical industry accounts for the largest part at 24.2% of the entire bioindustry.

○ The biochemical and bioenergy industry, which made up the largest part of the entire bioindustry until 2019, grew by 3.4% year on year, which accordingly has a similar size (24.0%) to the biopharmaceutical industry. The biofood industry accounted for 24.0%, increased by 13.5% year on year.

○ The year-on-year growth of the biomedical equipment industry (186.7%) and the bioinstrument and bioequipment industry (106.1%) sticks out.

<Table 2-39 > 2018–2020 Bioindustry's Trend of Domestic Sales by Category

(Unit: 100 million KRW, %)

Industrial Category	2018		2019		2020		Variation from Previous Year		Annual Average Rate of Change
	Domestic Sales	Distribution Ratio	Domestic Sales	Distribution Ratio	Domestic Sales	Distribution Ratio	Domestic Sales	Rate of Change	
Total	**53,685**	**100**	**61,172**	**100.0**	**74,765**	**100.0**	**13,593**	**22.2**	**18.0**
Biopharmaceutical	15,699	29.2	16,180	26.5	18,109	24.2	1,929	11.9	7.4
Biochemical and Bioenergy	16,825	31.3	17,356	28.4	17,941	24.0	585	3.4	3.3
Biofood	12,447	23.2	15,818	25.9	17,950	24.0	2,131	13.5	20.1
Bioenvironmental	560	1.0	551	0.9	984	1.3	434	78.8	32.6
Biomedical Equipment	2,211	4.1	3,095	5.1	8875	11.9	5,780	186.7	100.3
Bioinstrument and Bioequipment	585	1.1	701	1.1	1,444	1.9	743	106.1	57.1
Bioresource	1,549	2.9	1,041	1.7	1093	1.5	52	5.0	-16.0
Bioservice	3,810	7.1	6,430	10.5	8369	11.2	1,939	30.1	48.2

2) 2016–2020 Trend of Domestic Sales Status

○ The size of domestic sales increased by 12.7% annually over the past five years.

○ It has grown steadily since 2016 and reached over KRW 5 trillion in 2018.

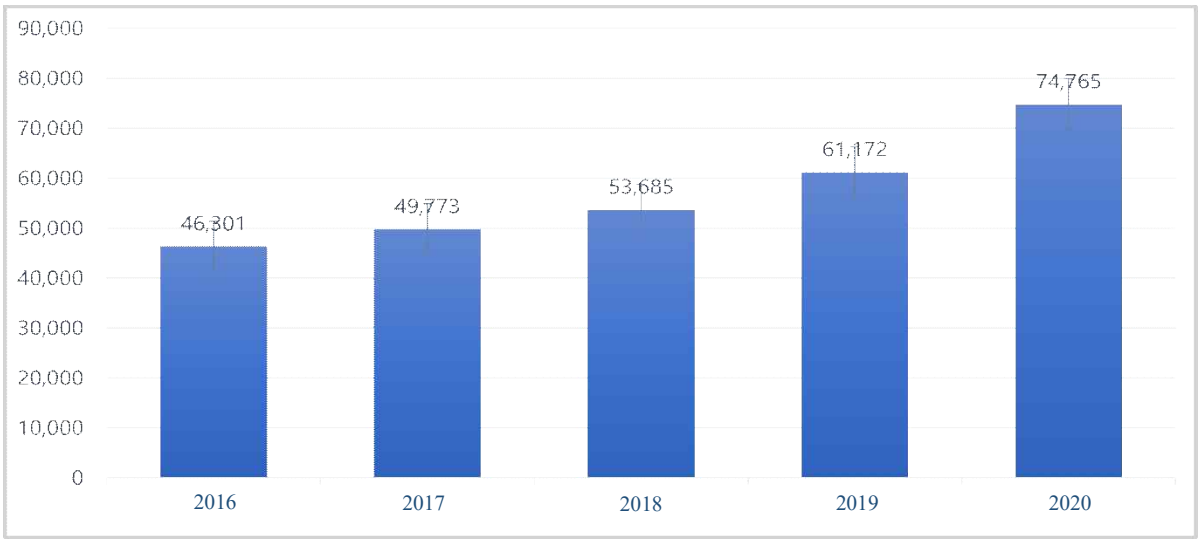
<Table 2-40> 2016–2020 Bioindustry's Trend of Domestic Sales

(Unit: 100 million KRW, %)

Classification		2016	2017	2018	2019	2020	Annual Average Rate of Change
Domestic Sales	Amount	46,301	49,773	53,685	61,172	74,765	12.7
	Rate of Change	9.8	7.5	7.9	13.9	22.2	

<Figure 2-32> 2016–2020 Bioindustry's Trend of Domestic Sales

(Unit: 100 million KRW)



<Table 2-41> 2016–2020 Bioindustry's Trend of Domestic Sales by Category

(Unit: 100 million KRW, %)

Industrial Category	2016		2017		2018		2019		2020		Variation from Previous Year		Annual Average Rate of Change
	Domestic Sales	Distribution Ratio	Domestic Sales	Distribution Ratio	Domestic Sales	Distribution Ratio	Domestic Sales	Distribution Ratio	Domestic Sales	Distribution Ratio	Domestic Sales	Rate of Change	
Total	**46,301**	**100**	**49,773**	**100**	**53,685**	**100**	**61,172**	**100.0**	**74,765**	**100.0**	**13,594**	**22.2**	**12.7**
Biopharmaceutical	15,999	34.6	15,882	31.9	15,699	29.2	16,180	26.1	18,109	23.9	1,929	11.9	3.1
Biochemistry and Bioenergy	11,950	25.8	14,811	29.8	16,825	31.3	17,356	29.4	17,941	24.9	585	3.4	10.7
Biofood	11,930	25.8	12,199	24.5	12,447	23.2	15,818	25.5	17,950	23.7	2,131	13.5	10.8
Bioenvironmental	290	0.6	458	0.9	560	1.0	551	0.9	984	1.3	434	78.8	35.7
Biomedical Equipment	1,574	3.4	1,641	3.3	2,211	4.1	3,095	5.0	8,875	11.7	5,780	186.7	54.1
Bioinstrument and Bioequipment	638	1.4	660	1.3	585	1.1	701	1.1	1,444	1.9	743	106.1	22.7
Bioresource	1,474	3.2	1,498	3.0	1,549	2.9	1,041	1.7	1,093	1.4	52	5.0	-7.2
Bioservice	2,447	5.3	2,624	5.3	3,809	7.1	6,430	10.4	8,369	11.1	1,939	30.1	36.0

7 Export Status of Bioindustry

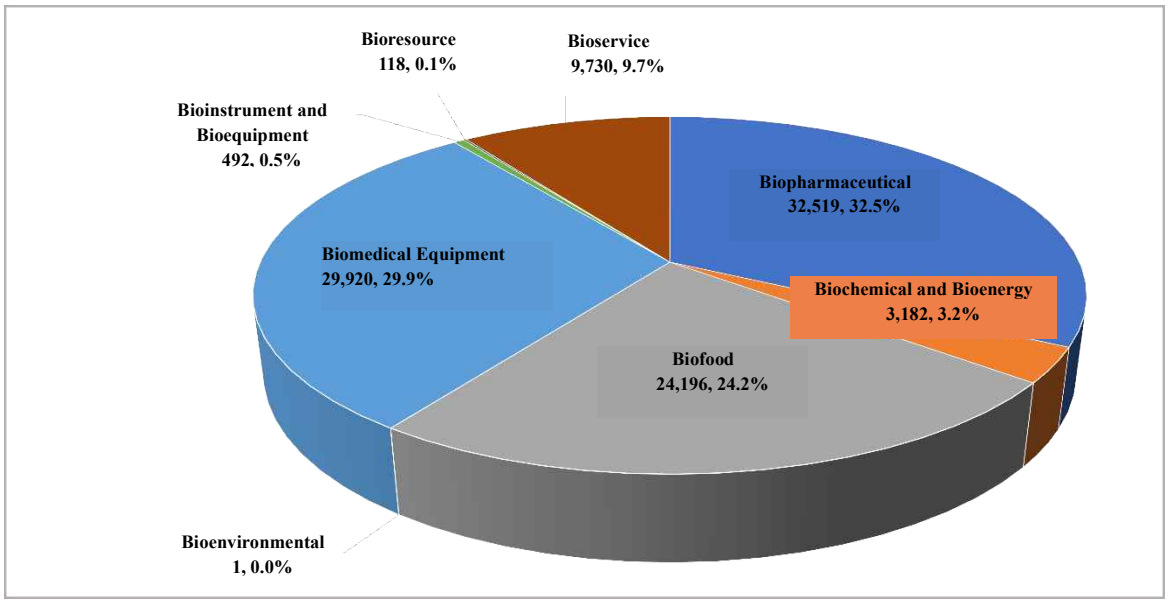
A. Export Status of 2020

○ The bioindustry's size of exports in 2020 reached KRW 10,015.8 billion.

○ According to the bioindustry's size of export by category, the biopharmaceutical industry accounted for the largest amount with KRW 3,251.9 billion (32.5%), followed by the biomedical equipment industry with KRW 2,992 billion, making up 29.9%.

<Figure 2-33> 2020 Bioindustry's Size of Export by Category

(Unit: 100 million KRW, %)



○ Among domestic bioproducts, biotechnologies, and bioservices, [Table 2-42] shows domestic bioproducts whose export proportion was 1.0% or more according to the size, with 11 products showing an export of 1.0% or more.

○ In-vitro diagnostics ranked the highest amount of export with KRW 2,728.6 billion (27.2%), followed by therapeutic antibodies and cytokines (23.1%), feed additives (18.3%), bio-consignment production and procuration services (8.9%), and food additives (5.3%). Two of the five largest export products are biofood products.

<Table 2-42> 2020 Main Bioproduct's Export

(Unit: million KRW, %)

Rank	Code	Product Name	Export Amount	Distribution Ratio
1	5020	In-vitro diagnostics	2,728,560	27.2
2	1050	Therapeutic antibodies and cytokines	2,309,740	23.1
3	3050	Feed additives	1,833,667	18.3
4	8010	Bio-consignment production and procuration services	895,564	8.9
5	3030	Food additives	530,844	5.3
6	1000	Other biopharmaceuticals	294,018	2.9
7	5000	Other biomedical equipments	262,171	2.6
8	1030	Vaccines	249,478	2.5
9	1060	Hemotherapeutics	155,981	1.6
10	2060	Biofuels	136,698	1.4
11	2040	Biocosmetics and home & personal care chemicals	101,445	1.0

B. Recent Trend of Export Status

1) 2018–2020 Trend of Export

○ The export size of the domestic bioindustry in 2020 was KRW 10,015.8 billion, which increased by KRW 3,474.4 billion (53.1%) from 2019.

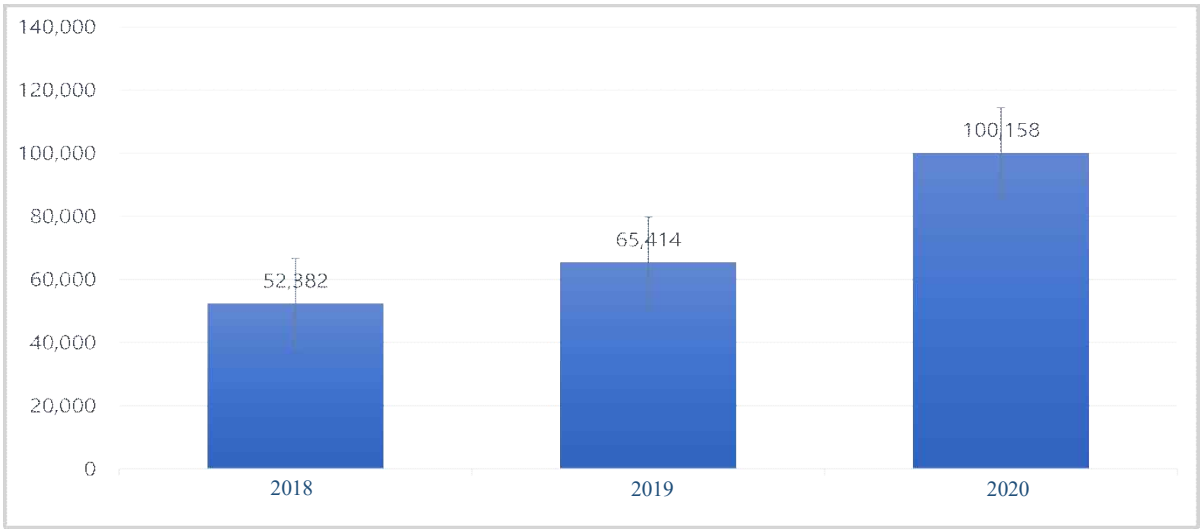
<Table 2-43> 2018–2020 Bioindustry's Trend of Export

(Unit: 100 million KRW, %)

Classification		2018	2019	2020	Annual Average Rate of Change
Export	Amount	52,382	65,414	100,158	38.3
	Rate of Change	1.4	24.9	53.1	

<Figure 2-34> 2018–2020 Bioindustry's Trend of Export

(Unit: 100 million KRW)



○ The amount of exports in the biopharmaceutical industry accounted for the largest proportion at KRW 3,251.9 billion, which increased by KRW 645.3 billion (24.8%) from 2019. On the other hand, exports in the bioenvironmental industry and the bioresource industry decreased by KRW 500 million (-82.3%) and KRW 9.8 billion (-45.4%), respectively.

○ Exports grew the most in the biomedical equipment industry (307.5%) and decreased the most in the bioenvironmental industry (-82.3%) compared to the previous year.

<Table 2-44> 2018–2020 Bioindustry's Trend of Export by Category

(Unit: 100 million KRW, %)

Industrial Category	2018		2019		2020		Variation from Previous Year		Annual Average Rate of Change
	Export Amount	Distribution Ratio	Export Amount	Distribution Ratio	Export Amount	Distribution Ratio	Export Amount	Rate of Change	
Total	**52,382**	**100**	**65,414**	**100.0**	**100,158**	**100.0**	**34,744**	**53.1**	**38.3**
Biopharmaceutical	19,401	29.2	26,066	39.8	32,519	32.5	6,453	24.8	29.5
Biochemical and Bioenergy	1,091	31.3	1,205	1.8	3,182	3.2	1,978	164.1	70.8
Biofood	18,568	23.2	24,085	36.8	24,196	24.2	111	0.5	14.2
Bioenvironmental	16	1	6	0.0	1	0.0	-5	-82.3	-73.9
Biomedical Equipment	6,271	4.1	7,343	11.2	29,920	29.9	22,577	307.5	118.4
Bioinstrument and Bioequipment	305	1.1	405	0.6	492	0.5	87	21.5	27.0
Bioresource	236	2.9	216	0.3	118	0.1	-98	-45.4	-29.3
Bioservice	6,493	7.1	6,089	9.3	9,730	9.7	3,641	59.8	22.4

2) 2016–2020 Trend of Export

○ The bioindustry's size of exports has continued to grow by 21.3% over the past five years, and has risen significantly by 53.1% year on year.

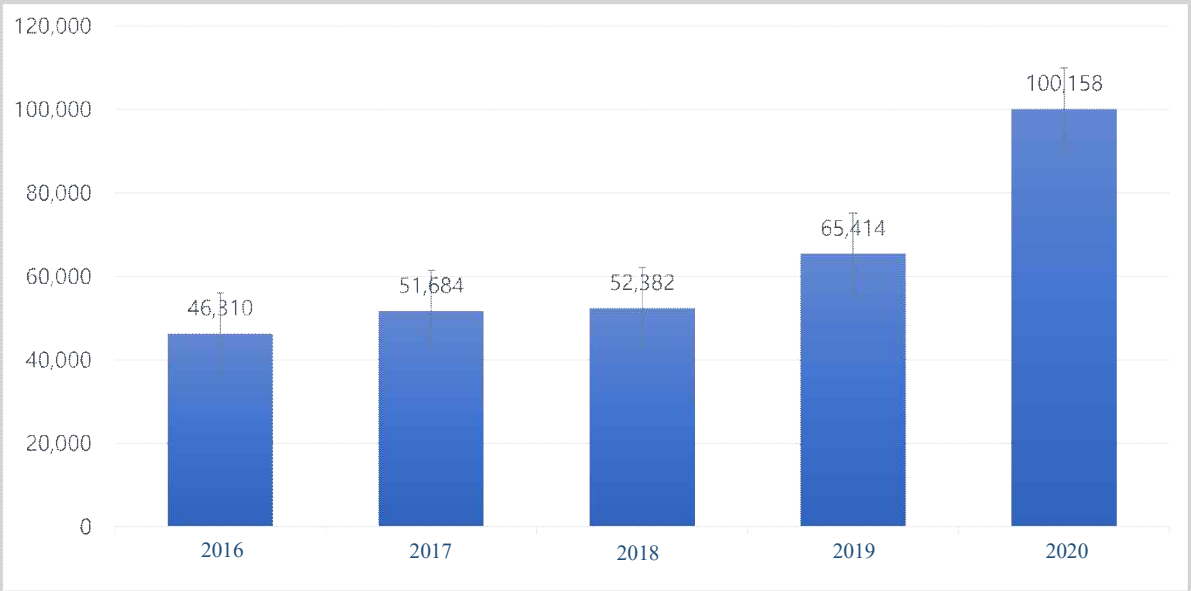
<Table 2-45> 2016–2020 Bioindustry's Trend of Export

(Unit: 100 million KRW, %)

Classification		2016	2017	2018	2019	2020	Annual Average Rate of Change
Export	Amount	46,310	51,684	52,382	65,414	100,158	21.3
	Rate of Change	8.0	11.6	1.4	24.9	53.1	

<Figure 2-35> 2016–2020 Bioindustry's Trend of Export

(Unit: 100 million KRW)



<Table 2-46> 2016–2020 Bioindustry's Trend of Export by Category

(Unit: 100 million KRW, %)

Industrial Category	2016		2017		2018		2019		2020		Variation from Previous Year		Annual Average Rate of Change
	Export Amount	Distribution Ratio	Export Amount	Distribution Ratio	Export Amount	Distribution Ratio	Export Amount	Distribution Ratio	Export Amount	Distribution Ratio	Export Amount	Rate of Change	
Total	**46,310**	**100.0**	**51,684**	**100.0**	**52,382**	**100.0**	**65,414**	**100.0**	**100,158**	**100.0**	**34,744**	**53.1**	**21.3**
Biopharmaceutical	17,577	38	19,162	37.1	19,401	29.2	26,066	39.8	32,519	32.5	6,453	24.8	16.6
Biochemical and Bioenergy	1,385	3	1,134	2.2	1,091	31.3	1,205	1.8	3,182	3.2	1,978	164.1	23.1
Biofood	17,262	37.3	19,043	36.8	18,568	23.2	24,085	36.8	24,196	24.2	111	0.5	8.8
Bioenvironmental	4	0	4	0	16	1	6	0.0	1	0.0	-5	-82.3	-28.6
Biomedical Equipment	5,903	12.7	6,130	11.9	6,271	4.1	7,343	11.2	29,920	29.9	22,577	307.5	50.0
Bioinstrument and Bioequipment	560	1.2	469	0.9	305	1.1	405	0.6	492	0.5	87	21.5	-3.2
Bioresource	217	0.5	213	0.4	236	2.9	216	0.3	118	0.1	-98	-45.4	-14.1
Bioservice	3,401	7.3	5,529	10.7	6,493	7.1	6,089	9.3	9,730	9.7	3,641	59.8	30.1

8 Import Status of Bioindustry

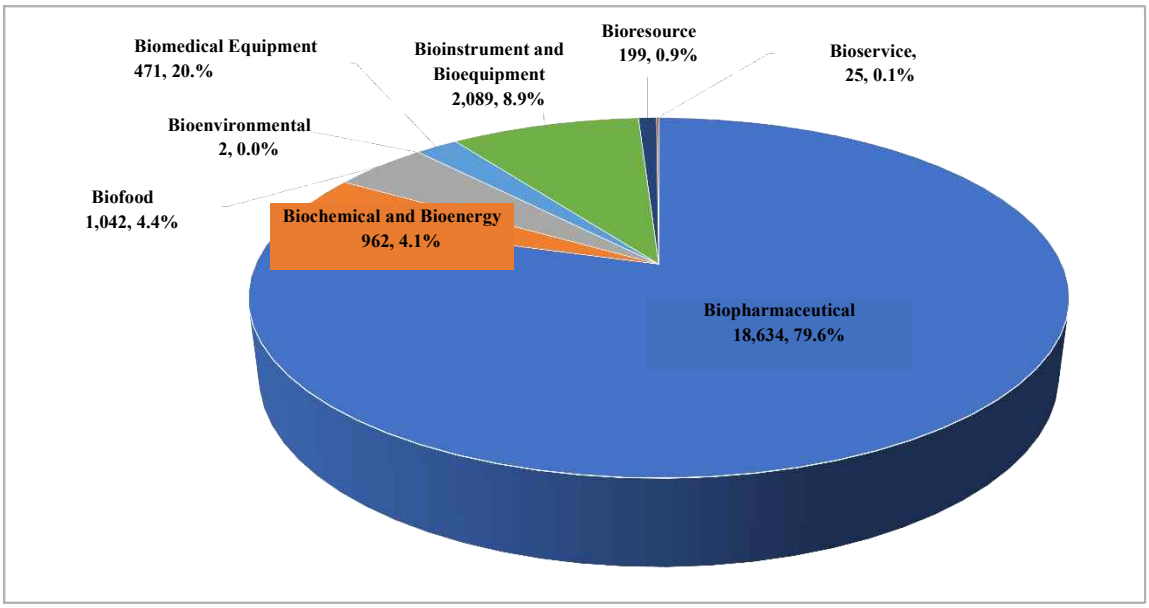
A. Import Status of 2020

○ The bioindustry's size of imports in 2020 reached KRW 2,342.4 billion.

○ Comparing the size of imports by bioindustry, the biopharmaceutical industry accounted for 79.6% of the total imports, which accounts for the majority of the industry.

<Figure 2-36> 2020 Bioindustry's Size of Import by Category

(Unit: 100 million KRW, %)



○ 11 products had more than 1.0% of imports among domestic bioproducts, biotechnologies, and bioservices in 2020.

○ Of the total imports, therapeutic antibodies and cytokines accounted for the largest part at KRW 829.7 billion (35.4%), followed by vaccines at KRW 414.7 billion (17.7%), hormones at KRW 306.3 billion (13.1%), hemotherapeutics at KRW 190.5 billion (8.1%), and other bioinstruments and bioequipments at KRW 124.4 billion (5.3%).

○ The amount of imports of the top 5 imported items made up 79.6% of the total import amount.

<Table 2-47> 2020 Main Bioproduct's Import

(Unit: million KRW, %)

Rank	Code	Product Name	Import Amount	Distribution Ratio
1	1050	Therapeutic antibodies and cytokines	829,720	35.4
2	1030	Vaccines	414,687	17.7
3	1040	Hormones	306,288	13.1
4	1060	Hemotherapeutics	190,495	8.1
5	6000	Other bioinstruments and bioequipments	124,416	5.3
6	1000	Other biopharmaceuticals	101,059	4.3
7	3010	Functional health foods	86,505	3.7
8	6030	Multi-functional and other bioanalysis instruments	52,563	2.2
9	2030	Enzymes and reagents for research	49,041	2.1
10	6010	Gene/protein/peptide analysis, synthesis, and manufacturing instruments	30,551	1.3
11	5000	Other biomedical equipments	25,001	1.1

B. Recent Trend of Import Status

1) 2018–2020 Bioindustry's Trend of Import

○ The amount of imports in the domestic bioindustry in 2020 were KRW 2,342.4 billion, which increased by KRW 275.9 billion (13.4%) from KRW 2,066.5 billion in 2019.

○ The import size has grown by 16.4% annually over the past three years

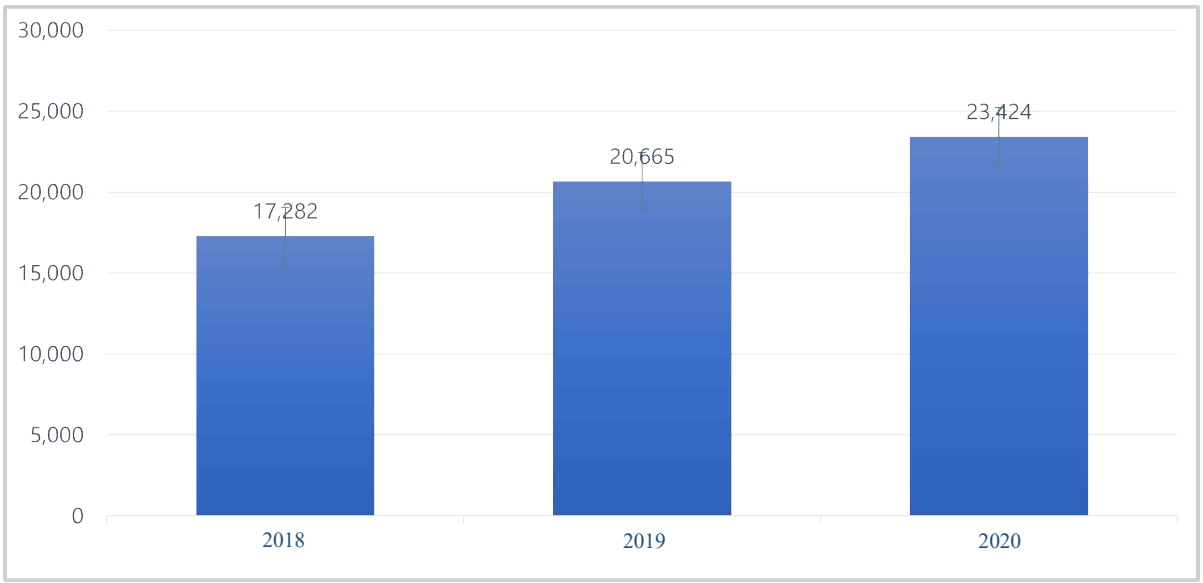
<Table 2-48> 2018–2020 Bioindustry's Trend of Import

(Unit: 100 million KRW, %)

Classification		2018	2019	2020	Annual Average Rate of Change
Import	Amount	17,282	20,665	23,424	16.4
	Rate of Change	10.1	19.6	13.4	

<Figure 2-37> 2018–2020 Bioindustry's Trend of Import

(Unit: 100 million KRW)



<Table 2-49> 2018–2020 Bioindustry's Trend of Import by Category

(Unit: 100 million KRW, %)

Industrial Category	2018		2019		2020		Variation from Previous Year		Annual Average Rate of Change
	Import Amount	Distribution Ratio	Import Amount	Distribution Ratio	Import Amount	Distribution Ratio	Import Amount	Rate of Change	
Total	**17,282**	**100.0**	**20,665**	**100.0**	**23,424**	**100.0**	**2,759**	**13.4**	**16.4**
Biopharmaceutical	14,093	81.5	16,443	79.6	18,634	79.6	2,191	13.3	15.0
Biochemical and Bioenergy	1,258	7.3	1,056	5.1	962	4.1	-94	-8.9	-12.6
Biofood	500	2.9	567	2.7	1,042	4.4	475	83.8	44.4
Bioenvironmental	2	0.0	1	0.0	2	0.0	1	100.0	0.0
Biomedical Equipment	504	2.9	543	2.6	471	2.0	-72	-13.3	-3.3
Bioinstrument and Bioequipment	655	3.8	1,754	8.5	2,089	8.9	335	19.1	78.6
Bioresource	245	1.4	267	1.3	199	0.8	-68	-25.5	-9.9
Bioservice	24	0.1	34	0.2	25	0.1	-9	-26.5	2.1

2) 2016–2020 Bioindustry's Trend of Import

○ The import size in the domestic bioindustry has continued to increase at an annual average growth rate of 12.6% for the past five years.

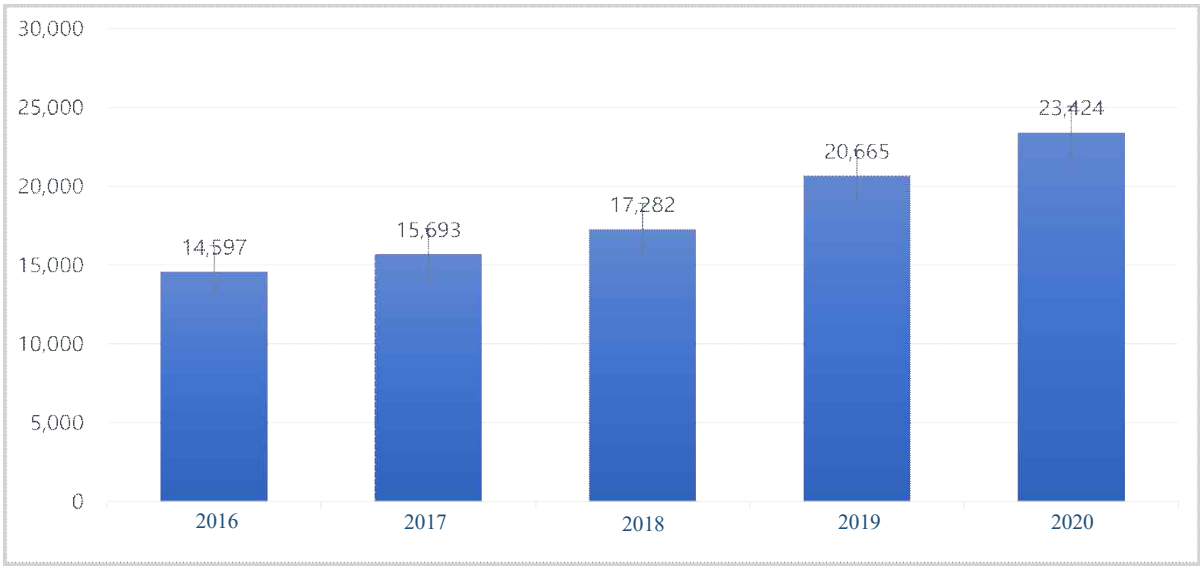
<Table 2-50> 2016–2020 Bioindustry's Trend of Import

(Unit: 100 million KRW, %)

Classification		2016	2017	2018	2019	2020	Annual Average Rate of Change
Import	Amount	14,597	15,693	17,282	20,665	23,424	12.6
	Rate of Change	3.6	7.5	10.1	19.6	13.4	

<Figure 2-38> 2016–2020 Bioindustry's Trend of Import

(Unit: 100 million KRW)



<Table 2-51> 2016–2020 Bioindustry's Trend of Import by Category

(Unit: 100 million KRW, %)

Industrial Category	2016		2017		2018		2019		2020		Variation from Previous Year		Annual Average Rate of Change
	Import	Distribution Ratio	Import	Distribution Ratio	Import	Distribution Ratio	Import Amount	Distribution Ratio	Import Amount	Distribution Ratio	Import Amount	Rate of Change	
Total	**14,597**	**100.0**	**15,693**	**100.0**	**17,282**	**100.0**	**20,665**	**100.0**	**23,424**	**100.0**	**2,759**	**13.4**	**12.6**
Biopharmaceutical	12,385	85.4	13,404	82.8	14,093	82.8	16,443	79.6	18,634	79.6	2,191	13.3	10.8
Biochemical and Bioenergy	886	5.3	833	7.0	1,258	7.0	1,056	5.1	962	4.1	-94	-8.9	2.1
Biofood	412	2.9	461	2.8	500	2.8	567	2.7	1,042	4.4	475	83.8	26.1
Bioenvironmental	2	0.0	2	0.0	2	0.0	1	0.0	2	0.0	1	100.0	0.0
Biomedical Equipment	323	2.1	322	2.2	504	2.2	543	2.6	471	2.0	-72	-13.3	9.9
Bioinstrument and Bioequipment	525	3.3	514	3.8	655	3.8	1,754	8.5	2,089	8.9	335	19.1	41.2
Bioresource	55	0.4	63	1.4	245	1.4	267	1.3	199	0.8	-68	-25.5	37.9
Bioservice	9	0.6	94	0.0	24	0.0	34	0.2	25	0.1	-9	-26.5	29.1

III. Statistical Tables

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<Table 1> General Status of Company

<Table 1-1> Distribution by Geography

Classification		No. of Companies	Seoul	Busan	Incheon	Daegu	Gwangju	Daejeon	Ulsan	Sejong	Gyeonggi	Gangwon	Chungbuk	Chungnam	Jeonbuk	Jeonnam	Gyeongbuk	Gyeongnam	Jeju
Total		**1,027**	**229**	**15**	**22**	**15**	**7**	**82**	**8**	**3**	**340**	**44**	**91**	**44**	**35**	**36**	**22**	**25**	**9**
Core Industries	Biopharmaceutical	326	100	3	10	4	1	17	-	-	121	11	33	15	2	1	4	3	1
	Biochemical and Bioenergy	191	19	4	4	4	1	24	6	1	46	7	15	11	12	15	7	11	4
	Biofood	170	17	3	-	2	1	8	-	2	48	11	23	13	12	12	7	8	3
	Bioenvironmental	64	4	4	3	3	1	3	2	-	24	4	2	1	2	6	2	2	1
	Biomedical Equipment	96	25	1	-	-	1	10	-	-	33	8	9	3	2	1	2	1	-
	Bioinstrument and Bioequipment	62	12	-	2	1	-	9	-	-	32	1	4	1	-	-	-	-	-
	Bioresource	15	2	-	-	-	-	2	-	-	7	-	2	-	1	1	-	-	-
	Bioservice	103	50	-	3	1	2	9	-	-	29	2	3	-	4	-	-	-	-
Total Number of Workers	1 – 49	634	135	13	10	11	7	59	3	-	193	28	50	29	28	27	16	18	7
	50 – 299	276	64	2	7	2	-	17	4	1	103	11	27	9	6	9	5	7	2
	300 – 999	79	25	-	2	1	-	2	-	-	30	4	10	4	-	-	1	-	-
	1,000 or more	34	3	-	2	1	-	4	1	2	14	1	4	1	1	-	-	-	-
	Unknown	4	2	-	1	-	-	-	-	-	-	-	-	1	-	-	-	-	-
By Area	Seoul	229	229	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	Busan	15	-	15	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	Incheon	22	-	-	22	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	Daegu	15	-	-	-	15	-	-	-	-	-	-	-	-	-	-	-	-	-
	Gwangju	7	-	-	-	-	7	-	-	-	-	-	-	-	-	-	-	-	-
	Daejeon	82	-	-	-	-	-	82	-	-	-	-	-	-	-	-	-	-	-
	Ulsan	8	-	-	-	-	-	-	8	-	-	-	-	-	-	-	-	-	-
	Sejong	3	-	-	-	-	-	-	-	3	-	-	-	-	-	-	-	-	-
	Gyeonggi	340	-	-	-	-	-	-	-	-	340	-	-	-	-	-	-	-	-
	Gangwon	44	-	-	-	-	-	-	-	-	-	44	-	-	-	-	-	-	-
	Chungbuk	91	-	-	-	-	-	-	-	-	-	-	91	-	-	-	-	-	-
	Chungnam	44	-	-	-	-	-	-	-	-	-	-	-	44	-	-	-	-	-
	Jeonbuk	35	-	-	-	-	-	-	-	-	-	-	-	-	35	-	-	-	-
	Jeonnam	36	-	-	-	-	-	-	-	-	-	-	-	-	-	36	-	-	-
	Gyeongbuk	22	-	-	-	-	-	-	-	-	-	-	-	-	-	-	22	-	-
	Gyeongnam	25	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	25	-
	Jeju	9	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	9

<Table 1-2> Existence of Other Businesses Within the Company (Unit: companies)

Classification		No. of Companies	Single-unit Enterprise	Multi-unit Enterprise	Unknown
Total		**1,027**	**552**	**469**	**6**
Core Industries	Biopharmaceutical	326	148	173	5
	Biochemical and Bioenergy	191	106	85	-
	Biofood	170	82	88	-
	Bioenvironmental	64	37	27	-
	Biomedical Equipment	96	57	39	-
	Bioinstrument and Bioequipment	62	44	17	1
	Bioresource	15	9	6	-
	Bioservice	103	69	34	-
Total Number of Workers	1 – 49	634	436	198	-
	50 – 299	276	97	178	1
	300 – 999	79	16	60	3
	1,000 or more	34	1	33	-
	Unknown	4	2	-	2
By Area	Seoul	229	149	76	4
	Busan	15	9	6	-
	Incheon	22	15	6	1
	Daegu	15	8	7	-
	Gwangju	7	6	1	-
	Daejeon	82	51	31	-
	Ulsan	8	3	5	-
	Sejong	3	1	2	-
	Gyeonggi	340	171	168	1
	Gangwon	44	21	23	-
	Chungbuk	91	35	56	-
	Chungnam	44	17	27	-
	Jeonbuk	35	17	18	-
	Jeonnam	36	18	18	-
	Gyeongbuk	22	12	10	-
	Gyeongnam	25	14	11	-
	Jeju	9	5	4	-

<Table 1-3> Distribution by Type of Company [Multiple Responses] (Unit: companies)

Classification		No. of Companies	Venture Companies	INNO-BIZ	MAIN-BIZ	KONEX-listed Companies	KOSDAQ-listed Companies	Listed Companies	N/A or Unknown
Total		**1,027**	**537**	**352**	**74**	**25**	**168**	**72**	**268**
Core Industries	Biopharmaceutical	326	159	79	9	11	81	44	77
	Biochemical and Bioenergy	191	84	69	17	-	15	12	64
	Biofood	170	82	64	14	2	22	12	43
	Bioenvironmental	64	30	28	9	-	-	1	22
	Biomedical Equipment	96	67	51	11	2	24	1	19
	Bioinstrument and Bioequipment	62	30	25	7	-	7	-	22
	Bioresource	15	9	3	-	1	2	1	4
	Bioservice	103	76	33	7	9	17	1	17
Total Number of Workers	1 – 49	634	395	216	48	16	29	3	174
	50 – 299	276	136	131	24	9	112	17	59
	300 – 999	79	5	5	2	-	23	25	28
	1,000 or more	34	-	-	-	-	3	27	4
	Unknown	4	1	-	-	-	1	-	3
By Area	Seoul	229	121	53	9	11	33	11	81
	Busan	15	7	3	1	-	2	-	6
	Incheon	22	7	5	-	-	4	2	9
	Daegu	15	8	5	1	-	1	2	4
	Gwangju	7	5	2	-	-	-	-	2
	Daejeon	82	59	36	4	2	13	5	14
	Ulsan	8	1	1	-	-	1	3	3
	Sejong	3	1	-	-	-	-	2	-
	Gyeonggi	340	186	125	23	4	72	34	64
	Gangwon	44	29	25	5	3	8	1	5
	Chungbuk	91	41	32	11	3	20	3	24
	Chungnam	44	15	13	3	-	4	5	14
	Jeonbuk	35	16	15	7	1	2	2	10
	Jeonnam	36	20	16	7	-	3	1	11
	Gyeongbuk	22	8	7	2	1	1	1	10
	Gyeongnam	25	8	11	-	-	4	-	9
	Jeju	9	5	3	1	-	-	-	2

<Table 1-3A> Distribution by Type of Company - Certification [Multiple Responses] (Unit: companies)

Classification		No. of Companies	Venture Companies	INNO-BIZ	MAIN-BIZ	N/A or Unknown
Total		**1,027**	**537**	**352**	**74**	**385**
Core Industries	Biopharmaceutical	326	159	79	9	144
	Biochemical and Bioenergy	191	84	69	17	83
	Biofood	170	82	64	14	62
	Bioenvironmental	64	30	28	9	23
	Biomedical Equipment	96	67	51	11	22
	Bioinstrument and Bioequipment	62	30	25	7	22
	Bioresource	15	9	3	-	6
	Bioservice	103	76	33	7	23
Total Number of Workers	1 – 49	634	395	216	48	177
	50 – 299	276	136	131	24	99
	300 – 999	79	5	5	2	72
	1,000 or more	34	-	-	-	34
	Unknown	4	1	-	-	3
By Area	Seoul	229	121	53	9	99
	Busan	15	7	3	1	7
	Incheon	22	7	5	-	13
	Daegu	15	8	5	1	6
	Gwangju	7	5	2	-	2
	Daejeon	82	59	36	4	19
	Ulsan	8	1	1	-	7
	Sejong	3	1	-	-	2
	Gyeonggi	340	186	125	23	112
	Gangwon	44	29	25	5	9
	Chungbuk	91	41	32	11	38
	Chungnam	44	15	13	3	22
	Jeonbuk	35	16	15	7	13
	Jeonnam	36	20	16	7	12
	Gyeongbuk	22	8	7	2	11
	Gyeongnam	25	8	11	-	11
	Jeju	9	5	3	1	2

<Table 1-3B> Distribution by Type of Company– Listed (Unit: companies)

Classification		No. of Companies	KONEX-listed Companies	KOSDAQ-listed Companies	Listed Companies	N/A or Unknown
Total		**1,027**	**25**	**168**	**72**	**762**
Core Industries	Biopharmaceutical	326	11	81	44	190
	Biochemical and Bioenergy	191	-	15	12	164
	Biofood	170	2	22	12	134
	Bioenvironmental	64	-	-	1	63
	Biomedical Equipment	96	2	24	1	69
	Bioinstrument and Bioequipment	62	-	7	-	55
	Bioresource	15	1	2	1	11
	Bioservice	103	9	17	1	76
Total Number of Workers	1 – 49	634	16	29	3	586
	50 – 299	276	9	112	17	138
	300 – 999	79	-	23	25	31
	1,000 or more	34	-	3	27	4
	Unknown	4	-	1	-	3
By Area	Seoul	229	11	33	11	174
	Busan	15	-	2	-	13
	Incheon	22	-	4	2	16
	Daegu	15	-	1	2	12
	Gwangju	7	-	-	-	7
	Daejeon	82	2	13	5	62
	Ulsan	8	-	1	3	4
	Sejong	3	-	-	2	1
	Gyeonggi	340	4	72	34	230
	Gangwon	44	3	8	1	32
	Chungbuk	91	3	20	3	65
	Chungnam	44	-	4	5	35
	Jeonbuk	35	1	2	2	30
	Jeonnam	36	-	3	1	32
	Gyeongbuk	22	1	1	1	19
	Gyeongnam	25	-	4	-	21
	Jeju	9	-	-	-	9

<Table 1-4> Distribution by Establishment Year (Unit: companies)

Classification		No. of Companies	Before 1950	1951 – 1980	1981 – 1990	1991 – 1995	1996 – 2000	2001 – 2005	2006 – 2010	2011 – 2015	After 2016
Total		**1,027**	**6**	**85**	**70**	**57**	**197**	**166**	**163**	**156**	**127**
Core Industries	Biopharmaceutical	326	5	45	34	22	49	24	39	52	56
	Biochemical and Bioenergy	191	-	13	13	8	44	30	35	35	13
	Biofood	170	1	18	10	8	43	42	23	11	14
	Bioenvironmental	64	-	4	2	6	13	20	10	6	3
	Biomedical Equipment	96	-	2	4	3	22	15	18	24	8
	Bioinstrument and Bioequipment	62	-	-	4	8	10	16	9	10	5
	Bioresource	15	-	2	1	1	-	3	3	4	1
	Bioservice	103	-	1	2	1	16	16	26	14	27
Total Number of Workers	1 – 49	634	-	12	17	21	123	114	118	120	109
	50 – 299	276	2	33	29	28	64	46	37	25	12
	300 – 999	79	3	24	22	7	9	4	4	4	2
	1,000 or more	34	1	16	2	1	-	2	4	5	3
	Unknown	4	-	-	-	-	1	-	-	2	1
By Area	Seoul	229	2	16	19	18	43	26	31	42	32
	Busan	15	-	1	1	-	-	4	5	2	2
	Incheon	22	-	1	2	1	3	3	2	9	1
	Daegu	15	-	3	-	-	2	3	3	1	3
	Gwangju	7	-	-	-	-	1	1	1	-	4
	Daejeon	82	-	6	3	1	21	12	17	12	10
	Ulsan	8	-	1	-	1	1	-	1	2	2
	Sejong	3	-	1	-	-	1	-	-	1	-
	Gyeonggi	340	4	34	24	15	58	52	56	50	47
	Gangwon	44	-	2	-	3	12	7	10	6	4
	Chungbuk	91	-	7	6	11	19	23	6	11	8
	Chungnam	44	-	6	6	1	14	5	5	4	3
	Jeonbuk	35	-	3	2	2	6	6	4	5	7
	Jeonnam	36	-	2	2	1	3	10	12	5	1
	Gyeongbuk	22	-	-	1	2	4	5	5	3	2
	Gyeongnam	25	-	2	3	1	8	5	5	1	-
	Jeju	9	-	-	1	-	1	4	-	2	1

<Table 1-5A> Distribution of Representatives by Gender (Unit: companies)

Classification		No. of Companies	Male	Female
Total		**1,027**	**924**	**103**
Core Industries	Biopharmaceutical	326	294	32
	Biochemical and Bioenergy	191	169	22
	Biofood	170	159	11
	Bioenvironmental	64	54	10
	Biomedical Equipment	96	87	9
	Bioinstrument and Bioequipment	62	57	5
	Bioresource	15	15	-
	Bioservice	103	89	14
Total Number of Workers	1 – 49	634	559	75
	50 – 299	276	252	24
	300 – 999	79	77	2
	1,000 or more	34	33	1
	Unknown	4	3	1
By Area	Seoul	229	193	36
	Busan	15	13	2
	Incheon	22	17	5
	Daegu	15	12	3
	Gwangju	7	7	-
	Daejeon	82	74	8
	Ulsan	8	7	1
	Sejong	3	3	-
	Gyeonggi	340	315	25
	Gangwon	44	41	3
	Chungbuk	91	84	7
	Chungnam	44	44	-
	Jeonbuk	35	33	2
	Jeonnam	36	32	4
	Gyeongbuk	22	20	2
	Gyeongnam	25	21	4
	Jeju	9	8	1

<Table 1-5B> Distribution by Total Number of Workers (Unit: companies)

Classification		No. of Companies	1 – 49	50 – 299	300 – 999	1,000 or more	Unknown
Total		**1,027**	**634**	**276**	**79**	**34**	**4**
Core Industries	Biopharmaceutical	326	143	112	52	16	3
	Biochemical and Bioenergy	191	145	33	3	10	-
	Biofood	170	116	38	9	6	1
	Bioenvironmental	64	49	13	1	1	-
	Biomedical Equipment	96	55	34	7	-	-
	Bioinstrument and Bioequipment	62	43	18	1	-	-
	Bioresource	15	10	4	1	-	-
	Bioservice	103	73	24	5	1	-
Total Number of Workers	1 – 49	634	634	-	-	-	-
	50 – 299	276	-	276	-	-	-
	300 – 999	79	-	-	79	-	-
	1,000 or more	34	-	-	-	34	-
	Unknown	4	-	-	-	-	4
By Area	Seoul	229	135	64	25	3	2
	Busan	15	13	2	-	-	-
	Incheon	22	10	7	2	2	1
	Daegu	15	11	2	1	1	-
	Gwangju	7	7	-	-	-	-
	Daejeon	82	59	17	2	4	-
	Ulsan	8	3	4	-	1	-
	Sejong	3	-	1	-	2	-
	Gyeonggi	340	193	103	30	14	-
	Gangwon	44	28	11	4	1	-
	Chungbuk	91	50	27	10	4	-
	Chungnam	44	29	9	4	1	1
	Jeonbuk	35	28	6	-	1	-
	Jeonnam	36	27	9	-	-	-
	Gyeongbuk	22	16	5	1	-	-
	Gyeongnam	25	18	7	-	-	-
	Jeju	9	7	2	-	-	-

<Table 1-5C> Total Number of Workers (Unit: persons)

Classification		No. of Companies	No. of Respondents	Total No. of Workers		Male		Female		Unknown	
				Total	Average	Total	Average	Total	Average	Total	Average
Total		**1,027**	**1,023**	**246,953**	**241**	**159,391**	**156**	**48,485**	**47**	**39,077**	**38**
Core Industries	Biopharmaceutical	326	323	86,835	269	39,801	123	19,022	59	28,012	87
	Biochemical and Bioenergy	191	191	100,515	526	84,259	441	8,621	45	7,635	40
	Biofood	170	169	33,098	196	21,368	126	11,730	69	0	0
	Bioenvironmental	64	64	5,325	83	1,967	31	372	6	2,986	47
	Biomedical Equipment	96	96	7,707	80	4,567	48	3,104	32	36	
	Bioinstrument and Bioequipment	62	62	3,144	51	1,995	32	741	12	408	7
	Bioresource	15	15	1,205	80	724	48	481	32	0	0
	Bioservice	103	103	9,124	89	4,710	46	4,414	43	0	0
Total Number of Workers	1 – 49	634	634	10,638	17	6,568	10	3,973	6	97	
	50 – 299	276	276	33,975	123	20,872	76	11,602	42	1,501	5
	300 – 999	79	79	38,310	485	21,207	268	11,067	140	6,036	76
	1,000 or more	34	34	164,030	4,824	110,744	3,257	21,843	642	31,443	925
	Unknown	4	0	-	-	-	-	-	-	-	-
By Area	Seoul	229	227	25,127	111	12,760	56	7,239	32	5,128	23
	Busan	15	15	543	36	377	25	166	11	0	0
	Incheon	22	21	7,860	374	4,233	202	2,719	129	908	43
	Daegu	15	15	2,502	167	1,801	120	701	47	0	0
	Gwangju	7	7	73	10	46	7	27	4	0	0
	Daejeon	82	82	15,738	192	12,068	147	3,670	45	0	0
	Ulsan	8	8	2,151	269	607	76	75	9	1,469	184
	Sejong	3	3	3,468	1,156	2,404	801	1,064	355	0	0
	Gyeonggi	340	340	133,622	393	103,107	303	21,072	62	9,443	28
	Gangwon	44	44	6,959	158	4,826	110	2,133	48	0	0
	Chungbuk	91	91	33,988	373	8,415	92	4,156	46	21,417	235
	Chungnam	44	43	4,962	115	3,795	88	1,167	27	0	0
	Jeonbuk	35	35	6,087	174	2,798	80	3,289	94	0	0
	Jeonnam	36	36	1,257	35	853	24	404	11	0	0
	Gyeongbuk	22	22	1,171	53	314	14	145	7	712	32
	Gyeongnam	25	25	1,070	43	755	30	315	13	0	0
	Jeju	9	9	375	42	232	26	143	16	0	0

<Table 1-6> Capital Status (Unit: million KRW)

Classification		No. of Companies	Capital		
			No. of Respondents	Total	Average
Total		**1,027**	**978**	**10,557,214**	**10,795**
Core Industries	Biopharmaceutical	326	308	4,331,749	14,064
	Biochemical and Bioenergy	191	182	3,822,314	21,002
	Biofood	170	165	1,200,042	7,273
	Bioenvironmental	64	62	77,613	1,252
	Biomedical Equipment	96	90	436,564	4,851
	Bioinstrument and Bioequipment	62	59	60,413	1,024
	Bioresource	15	15	130,673	8,712
	Bioservice	103	97	497,846	5,132
Total Number of Workers	1 – 49	634	591	1,412,977	2,391
	50 – 299	276	273	2,626,549	9,621
	300 – 999	79	78	1,515,547	19,430
	1,000 or more	34	34	4,992,192	146,829
	Unknown	4	2	9,949	4,975
By Area	Seoul	229	208	2,180,313	10,482
	Busan	15	14	57,651	4,118
	Incheon	22	21	724,889	34,519
	Daegu	15	14	79,768	5,698
	Gwangju	7	7	2,720	389
	Daejeon	82	77	1,311,031	17,026
	Ulsan	8	7	169,309	24,187
	Sejong	3	3	19,161	6,387
	Gyeonggi	340	334	3,872,510	11,594
	Gangwon	44	43	524,585	12,200
	Chungbuk	91	85	960,305	11,298
	Chungnam	44	41	301,993	7,366
	Jeonbuk	35	35	92,232	2,635
	Jeonnam	36	35	104,359	2,982
	Gyeongbuk	22	20	65,211	3,261
	Gyeongnam	25	25	75,920	3,037
	Jeju	9	9	15,257	1,695

<Table 1-7> Ratio of Net Worth (Unit: %)

Classification		No. of Companies	Ratio of Net Worth	
			No. of Respondents	Average
Total		**1,027**	**951**	**29**
Core Industries	Biopharmaceutical	326	304	51
	Biochemical and Bioenergy	191	172	47
	Biofood	170	160	41
	Bioenvironmental	64	59	43
	Biomedical Equipment	96	89	33
	Bioinstrument and Bioequipment	62	57	49
	Bioresource	15	15	38
	Bioservice	103	95	-119
Total Number of Workers	1 – 49	634	564	9
	50 – 299	276	273	58
	300 – 999	79	78	57
	1,000 or more	34	34	60
	Unknown	4	2	51
By Area	Seoul	229	202	-27
	Busan	15	13	18
	Incheon	22	21	44
	Daegu	15	13	45
	Gwangju	7	6	63
	Daejeon	82	77	45
	Ulsan	8	7	51
	Sejong	3	3	57
	Gyeonggi	340	324	46
	Gangwon	44	42	33
	Chungbuk	91	84	46
	Chungnam	44	40	51
	Jeonbuk	35	34	16
	Jeonnam	36	35	50
	Gyeongbuk	22	18	44
	Gyeongnam	25	24	47
	Jeju	9	8	41

<Table 1-8> Net Income / Net Loss (Unit: million KRW)

Classification		No. of Companies	Net Income / Net Loss		
			No. of Respondents	Total	Average
Total		**1,027**	**949**	**5,573,942**	**5,873**
Core Industries	Biopharmaceutical	326	304	396,199	1,303
	Biochemical and Bioenergy	191	171	2,260,534	13,219
	Biofood	170	159	858,579	5,400
	Bioenvironmental	64	59	73,808	1,251
	Biomedical Equipment	96	89	1,829,408	20,555
	Bioinstrument and Bioequipment	62	57	70,523	1,237
	Bioresource	15	15	-38,156	-2,544
	Bioservice	103	95	123,047	1,295
Total Number of Workers	1 – 49	634	562	-505,356	-899
	50 – 299	276	273	234,145	858
	300 – 999	79	78	1,985,452	25,455
	1,000 or more	34	34	3,863,075	113,620
	Unknown	4	2	-3,374	-1,687
By Area	Seoul	229	202	474,210	2,348
	Busan	15	13	-61,813	-4,755
	Incheon	22	20	1,182,240	59,112
	Daegu	15	13	35,252	2,712
	Gwangju	7	6	-3,060	-510
	Daejeon	82	77	1,176,802	15,283
	Ulsan	8	7	-16,397	-2,342
	Sejong	3	3	55,232	18,411
	Gyeonggi	340	325	2,300,135	7,077
	Gangwon	44	42	47,960	1,142
	Chungbuk	91	84	132,394	1,576
	Chungnam	44	40	17,647	441
	Jeonbuk	35	34	148,727	4,374
	Jeonnam	36	35	24,019	686
	Gyeongbuk	22	17	41,385	2,434
	Gyeongnam	25	23	8,031	349
	Jeju	9	8	11,178	1,397

<Table 2> Manpower Status of Bioindustry

<Table 2-1> Manpower Status of Researchers (Unit: persons)

Classification		No. of Companies	No. of Respondents	Bioindustry Workers		Researchers: Total		Researchers: Doctor's		Researchers: Master's		Researchers: Bachelor's		Researchers: Other	
				Total	Average	Total	Average	Total	Average	Total	Average	Total	Average	Total	Average
Total		**1,027**	**1,007**	**53,546**	**53**	**16,873**	**17**	**2,618**	**3**	**7,255**	**7**	**6,596**	**7**	**404**	-
Core Industries	Biopharmaceutical	326	307	21,832	71	7,451	24	1,306	4	3,576	12	2,419	8	150	-
	Biochemical and Bioenergy	191	191	6,884	36	2,119	11	295	2	1,008	5	746	4	70	-
	Biofood	170	170	7,239	43	1,592	9	283	2	695	4	582	3	32	-
	Bioenvironmental	64	64	1,034	16	372	6	34	1	117	2	220	3	1	-
	Biomedical Equipment	96	95	6,220	65	1,648	17	251	3	705	7	683	7	9	-
	Bioinstrument and Bioequipment	62	62	2,395	39	507	8	60	1	149	2	278	4	20	-
	Bioresource	15	15	1,078	72	283	19	49	3	101	7	133	9	0	0
	Bioservice	103	103	6,864	67	2,901	28	340	3	904	9	1,535	15	122	1
Total Number of Workers	1 – 49	634	633	9,227	15	3,791	6	721	1	1,401	2	1,652	3	17	-
	50 – 299	276	268	20,496	76	5,948	22	786	3	2,292	9	2,762	10	108	-
	300 – 999	79	70	10,503	150	3,203	46	546	8	1,405	20	1,161	17	91	1
	1,000 or more	34	34	13,269	390	3,912	115	561	17	2,142	63	1,021	30	188	6
	Unknown	4	2	51	26	19	10	4	2	15	8	0	0	0	0
By Area	Seoul	229	212	8,394	40	3,517	17	510	2	1,346	6	1,598	8	63	-
	Busan	15	15	258	17	67	4	11	1	29	2	24	2	3	-
	Incheon	22	22	5,898	268	1,474	67	251	11	700	32	473	22	50	2
	Daegu	15	15	1,462	97	218	15	11	1	31	2	146	10	30	2
	Gwangju	7	7	71	10	43	6	9	1	22	3	12	2	0	0
	Daejeon	82	82	2,461	30	1,053	13	190	2	424	5	432	5	7	-
	Ulsan	8	8	1,186	148	186	23	23	3	94	12	49	6	20	3
	Sejong	3	3	377	126	149	50	9	3	82	27	45	15	13	4
	Gyeonggi	340	339	16,193	48	6,027	18	1,014	3	2,668	8	2,253	7	92	-
	Gangwon	44	44	2,881	65	667	15	123	3	309	7	235	5	0	0
	Chungbuk	91	91	8,991	99	2,242	25	292	3	1,044	11	809	9	97	1
	Chungnam	44	44	2,028	46	453	10	75	2	235	5	141	3	2	-
	Jeonbuk	35	35	1,337	38	258	7	33	1	95	3	109	3	21	1
	Jeonnam	36	36	814	23	231	6	18	1	70	2	140	4	3	-
	Gyeongbuk	22	20	386	19	110	6	17	1	34	2	56	3	3	-
	Gyeongnam	25	25	569	23	126	5	24	1	54	2	48	2	0	0
	Jeju	9	9	240	27	52	6	8	1	18	2	26	3	0	0

<Table 2-2> Manpower Status of Production Workers (Unit: persons)

Classification		No. of Companies	No. of Respondents	Bioindustry Workers		Production Workers: Total		Production Workers: Doctor's		Production Workers: Master's		Production Workers: Bachelor's		Production Workers: Others	
				Total	Average	Total	Average	Total	Average	Total	Average	Total	Average	Total	Average
Total		**1,027**	**1,007**	**53,546**	**53**	**18,492**	**18**	**46**	**-**	**810**	**1**	**6,128**	**6**	**11,508**	**11**
Core Industries	Biopharmaceutical	326	307	21,832	71	6,802	22	23	-	396	1	2,725	9	3,658	12
	Biochemical and Bioenergy	191	191	6,884	36	2,471	13	5	-	48	-	667	3	1,751	9
	Biofood	170	170	7,239	43	3,432	20	4	-	35	-	1,001	6	2,392	14
	Bioenvironmental	64	64	1,034	16	392	6	0	0	5	-	175	3	212	3
	Biomedical Equipment	96	95	6,220	65	2,240	24	1	-	70	1	541	6	1,628	17
	Bioinstrument and Bioequipment	62	62	2,395	39	744	12	1	-	19	-	169	3	555	9
	Bioresource	15	15	1,078	72	305	20	3	-	20	1	62	4	220	15
	Bioservice	103	103	6,864	67	2,106	20	9	-	217	2	788	8	1,092	11
Total Number of Workers	1 – 49	634	633	9,227	15	1,947	3	3	-	44	-	614	1	1,286	2
	50 – 299	276	268	20,496	76	6,809	25	7	-	164	1	1,945	7	4,693	18
	300 – 999	79	70	10,503	150	3,869	55	13	-	243	3	984	14	2,629	38
	1,000 or more	34	34	13,269	390	5,848	172	22	1	356	10	2,570	76	2,900	85
	Unknown	4	2	51	26	19	10	1	1	3	2	15	8	0	0
By Area	Seoul	229	212	8,394	40	1,171	6	1	-	54	-	407	2	709	3
	Busan	15	15	258	17	43	3	0	0	0	0	18	1	25	2
	Incheon	22	22	5,898	268	3,102	141	9	-	213	10	1,572	71	1,308	59
	Daegu	15	15	1,462	97	519	35	0	0	3	-	169	11	347	23
	Gwangju	7	7	71	10	2	-	0	0	0	0	0	0	2	-
	Daejeon	82	82	2,461	30	621	8	3	-	39	-	233	3	346	4
	Ulsan	8	8	1,186	148	437	55	2	-	19	2	157	20	259	32
	Sejong	3	3	377	126	188	63	0	0	0	0	106	35	82	27
	Gyeonggi	340	339	16,193	48	4,996	15	10	-	221	1	1,314	4	3,451	10
	Gangwon	44	44	2,881	65	1,338	30	0	0	35	1	311	7	992	23
	Chungbuk	91	91	8,991	99	3,610	40	17	-	214	2	1,141	13	2,238	25
	Chungnam	44	44	2,028	46	876	20	1	-	5	-	168	4	702	16
	Jeonbuk	35	35	1,337	38	704	20	2	-	5	-	188	5	509	15
	Jeonnam	36	36	814	23	294	8	1	-	0	0	108	3	185	5
	Gyeongbuk	22	20	386	19	182	9	0	0	0	0	59	3	123	6
	Gyeongnam	25	25	569	23	311	12	0	0	1	-	160	6	150	6
	Jeju	9	9	240	27	98	11	0	0	1	-	17	2	80	9

<Table 2-3> Manpower Status of Other Positions Including Sales/Administrative (Unit: persons)

Classification		No. of Companies	No. of Respondents	Bioindustry Workers		Other Positions: Total		Other Positions: Doctor's		Other Positions: Master's		Other Positions: Bachelor's		Other Positions: Others	
				Total	Average	Total	Average	Total	Average	Total	Average	Total	Average	Total	Average
Total		**1,027**	**1,007**	**53,546**	**53**	**18,181**	**18**	**300**		**1,694**	**2**	**13,484**	**13**	**2,703**	**3**
Core Industries	Biopharmaceutical	326	307	21,832	71	7,579	25	159	1	737	2	5,566	18	1,117	4
	Biochemical and Bioenergy	191	191	6,884	36	2,294	12	24	-	128	1	1,810	9	332	2
	Biofood	170	170	7,239	43	2,215	13	22	-	157	1	1,572	9	464	3
	Bioenvironmental	64	64	1,034	16	270	4	1	-	16	-	222	3	31	-
	Biomedical Equipment	96	95	6,220	65	2,332	25	50	1	286	3	1,737	18	259	3
	Bioinstrument and Bioequipment	62	62	2,395	39	1,144	18	4	-	45	1	894	14	201	3
	Bioresource	15	15	1,078	72	490	33	2	-	34	2	306	20	148	10
	Bioservice	103	103	6,864	67	1,857	18	38	-	291	3	1,377	13	151	1
Total Number of Workers	1 – 49	634	633	9,227	15	3,489	6	45	-	203	-	2,887	5	354	1
	50 – 299	276	268	20,496	76	7,739	29	61	-	584	2	5,905	22	1,189	4
	300 – 999	79	70	10,503	150	3,431	49	142	2	570	8	2,213	32	506	7
	1,000 or more	34	34	13,269	390	3,509	103	50	1	336	10	2,471	73	652	19
	Unknown	4	2	51	26	13	7	2	1	1	1	8	4	2	1
By Area	Seoul	229	212	8,394	40	3,706	17	64	-	419	2	2,790	13	433	2
	Busan	15	15	258	17	148	10	1	-	8	1	110	7	29	2
	Incheon	22	22	5,898	268	1,322	60	65	3	220	10	930	42	107	5
	Daegu	15	15	1,462	97	725	48	3	-	15	1	420	28	287	19
	Gwangju	7	7	71	10	26	4	0	0	0	0	24	3	2	-
	Daejeon	82	82	2,461	30	787	10	22	-	54	1	659	8	52	1
	Ulsan	8	8	1,186	148	563	70	2	-	34	4	469	59	58	7
	Sejong	3	3	377	126	40	13	0	0	0	0	37	12	3	1
	Gyeonggi	340	339	16,193	48	5,170	15	41	-	439	1	3,864	11	826	2
	Gangwon	44	44	2,881	65	876	20	32	1	117	3	623	14	104	2
	Chungbuk	91	91	8,991	99	3,139	34	43	-	255	3	2,272	25	569	6
	Chungnam	44	44	2,028	46	699	16	18	-	72	2	525	12	84	2
	Jeonbuk	35	35	1,337	38	375	11	2	-	22	1	273	8	78	2
	Jeonnam	36	36	814	23	289	8	6	-	22	1	224	6	37	1
	Gyeongbuk	22	20	386	19	94	5	0	0	3	-	81	4	10	1
	Gyeongnam	25	25	569	23	132	5	0	0	9	-	116	5	7	-
	Jeju	9	9	240	27	90	10	1	-	5	1	67	7	17	2

<Table 3> Investment Status of Bioindustry

<Table 3> Investment Status of Bioindustry (Unit: million KRW)

Classification		No. of Companies	No. of Respondents	R&D Investment		Facility Investment		Total Investment		Bio R&D Investment		Bio Facility Investment		Bio Total Investment	
				Total	Average	Total	Average	Total	Average	Total	Average	Total	Average	Total	Average
Total		**1,027**	**988**	**5,350,656**	**5,416**	**869,219**	**880**	**6,219,875**	**6,295**	**2,018,500**	**2,043**	**669,382**	**678**	**2,687,882**	**2,721**
Core Industries	Biopharmaceuticals	326	301	2,856,589	9,490	437,135	1,452	3,293,724	10,943	1,477,053	4,907	322,111	1,070	1,799,164	5,977
	Biochemical and Bioenergy	191	188	1,842,724	9,802	116,641	620	1,959,365	10,422	125,771	669	61,266	326	187,037	995
	Biofood	170	168	177,358	1,056	109,075	649	286,433	1,705	102,690	611	84,874	505	187,564	1,116
	Bioenvironment	64	61	25,490	418	10,504	172	35,994	590	13,291	218	8,864	145	22,155	363
	Biomedical Equipment	96	94	194,567	2,070	71,338	759	265,905	2,829	140,748	1,497	69,578	740	210,326	2,238
	Bioinstrument and Bioequipment	62	60	28,924	482	9,306	155	38,230	637	19,589	326	9,106	152	28,695	478
	Bioresources	15	15	36,434	2,429	2,113	141	38,547	2,570	11,986	799	2,113	141	14,099	940
	Bioservice	103	101	188,570	1,867	113,107	1,120	301,677	2,987	127,372	1,261	111,470	1,104	238,842	2,365
Total Number of Workers	1 – 49	634	622	517,805	832	74,866	120	592,671	953	374,616	602	71,593	115	446,209	717
	50 – 299	276	262	919,336	3,509	232,797	889	1,152,133	4,397	592,801	2,263	196,561	750	789,362	3,013
	300 – 999	79	70	645,809	9,226	150,394	2,148	796,203	11,374	317,274	4,532	132,456	1,892	449,730	6,425
	1,000 or more	34	32	3,258,855	101,839	410,862	12,839	3,669,717	114,679	726,483	22,703	268,472	8,390	994,955	31,092
	Unknown	4	2	8,851	4,426	300	150	9,151	4,576	7,326	3,663	300	150	7,626	3,813
By Area	Seoul	229	212	557,014	2,627	50,869	240	607,883	2,867	253,497	1,196	40,024	189	293,521	1,385
	Busan	15	15	5,104	340	15,084	1,006	20,188	1,346	3,104	207	1,150	77	4,254	284
	Incheon	22	21	326,695	15,557	160,456	7,641	487,151	23,198	240,818	11,468	160,406	7,638	401,224	19,106
	Daegu	15	14	88,579	6,327	6,570	469	95,149	6,796	6,235	445	5,570	398	11,805	843
	Gwangju	7	7	3,084	441	360	51	3,444	492	2,884	412	340	49	3,224	461
	Daejeon	82	82	482,813	5,888	126,945	1,548	609,758	7,436	150,501	1,835	90,126	1,099	240,627	2,934
	Ulsan	8	8	47,834	5,979	5,600	700	53,434	6,679	25,571	3,196	1,050	131	26,621	3,328
	Sejong	3	3	9,679	3,226	14,503	4,834	24,182	8,061	5,379	1,793	6,803	2,268	12,182	4,061
	Gyeonggi	340	327	2,994,871	9,159	325,346	995	3,320,217	10,154	772,590	2,363	212,858	651	985,448	3,014
	Gangwon	44	44	97,746	2,222	22,916	521	120,662	2,742	81,031	1,842	21,211	482	102,242	2,324
	Chungbuk	91	86	536,972	6,244	91,577	1,065	628,549	7,309	370,758	4,311	88,377	1,028	459,135	5,339
	Chungnam	44	43	87,690	2,039	10,460	243	98,150	2,283	26,479	616	7,692	179	34,171	795
	Jeonbuk	35	34	52,040	1,531	3,877	114	55,917	1,645	25,311	744	1,389	41	26,700	785
	Jeonnam	36	36	9,734	270	11,659	324	21,393	594	7,519	209	10,100	281	17,619	489
	Gyeongbuk	22	22	33,898	1,541	12,286	558	46,184	2,099	33,783	1,536	11,580	526	45,363	2,062
	Gyeongnam	25	25	10,101	404	3,183	127	13,284	531	9,244	370	3,178	127	12,422	497
	Jeju	9	9	6,802	756	7,528	836	14,330	1,592	3,796	422	7,528	836	11,324	1,258

<Table 4> Cooperation in Bioindustry

<Table 4-1> Status of Cooperative Relationship with Other Organizations [Multiple Responses] (Unit: companies)

Classification		No. of Companies	With Cooperative Relationship	Joint Venture	Joint R&D Contract	Technical Tie-up (Licensing)	Domestic/International Technical Manpower Exchange	Without Cooperative Relationship	Unknown
Total		**1,027**	**363**	**9**	**334**	**44**	**12**	**652**	**12**
Core Industries	Biopharmaceutical	326	129	6	115	23	4	187	10
	Biochemical and Bioenergy	191	53	-	49	5	3	137	1
	Biofood	170	54	-	51	4	1	116	-
	Bioenvironmental	64	19	-	18	2	-	45	-
	Biomedical Equipment	96	37	2	33	5	2	58	1
	Bioinstrument and Bioequipment	62	18	1	18	-	-	44	-
	Bioresource	15	6	-	6	-	-	9	-
	Bioservice	103	47	-	44	5	2	56	-
Total Number of Workers	1 – 49	634	206	2	190	22	4	428	-
	50 – 299	276	107	4	97	10	5	168	1
	300 – 999	79	30	1	28	8	2	43	6
	1,000 or more	34	18	2	17	3	1	13	3
	Unknown	4	2	-	2	1	-	-	2
By Area	Seoul	229	78	-	72	9	2	144	7
	Busan	15	4	-	3	-	1	11	-
	Incheon	22	7	-	7	1	-	14	1
	Daegu	15	5	-	5	-	-	10	-
	Gwangju	7	4	-	4	-	-	3	-
	Daejeon	82	33	2	30	2	3	49	-
	Ulsan	8	2	-	2	-	-	5	1
	Sejong	3	1	-	1	-	-	2	-
	Gyeonggi	340	125	6	115	15	4	214	1
	Gangwon	44	24	-	21	4	1	20	-
	Chungbuk	91	31	1	28	6	1	59	1
	Chungnam	44	14	-	13	3	-	29	1
	Jeonbuk	35	9	-	7	4	-	26	-
	Jeonnam	36	10	-	10	-	-	26	-
	Gyeongbuk	22	4	-	4	-	-	18	-
	Gyeongnam	25	8	-	8	-	-	17	-
	Jeju	9	4	-	4	-	-	5	-

<Table 4-2> Status of Joint Investment Cooperation (Unit: cases)

Classification		No. of Companies	With Cooperative Relationship	No. of Respondents (Joint Venture)	Domestic					
					Total	Basic Research	Experimental	Prototype	Product Development	Commercialization
Total		**1,027**	**363**	**9**	**22**	**14**	**2**	**1**	**3**	**2**
Core Industries	Biopharmaceutical	326	129	6	11	4	2	1	2	2
	Biochemical and Bioenergy	191	53	-	-	-	-	-	-	-
	Biofood	170	54	-	-	-	-	-	-	-
	Bioenvironmental	64	19	-	-	-	-	-	-	-
	Biomedical Equipment	96	37	2	10	10	-	-	-	-
	Bioinstrument and Bioequipment	62	18	1	1	-	-	-	1	-
	Bioresource	15	6	-	-	-	-	-	-	-
	Bioservice	103	47	-	-	-	-	-	-	-
Total Number of Workers	1 – 49	634	206	2	2	1	-	-	1	-
	50 – 299	276	107	4	14	10	-	-	2	2
	300 – 999	79	30	1	3	2	1	-	-	-
	1,000 or more	34	18	2	3	1	1	1	-	-
	Unknown	4	2	-	-	-	-	-	-	-
By Area	Seoul	229	78	-	-	-	-	-	-	-
	Busan	15	4	-	-	-	-	-	-	-
	Incheon	22	7	-	-	-	-	-	-	-
	Daegu	15	5	-	-	-	-	-	-	-
	Gwangju	7	4	-	-	-	-	-	-	-
	Daejeon	82	33	2	3	1	-	-	-	2
	Ulsan	8	2	-	-	-	-	-	-	-
	Sejong	3	1	-	-	-	-	-	-	-
	Gyeonggi	340	125	6	19	13	2	1	3	-
	Gangwon	44	24	-	-	-	-	-	-	-
	Chungbuk	91	31	1	-	-	-	-	-	-
	Chungnam	44	14	-	-	-	-	-	-	-
	Jeonbuk	35	9	-	-	-	-	-	-	-
	Jeonnam	36	10	-	-	-	-	-	-	-
	Gyeongbuk	22	4	-	-	-	-	-	-	-
	Gyeongnam	25	8	-	-	-	-	-	-	-
	Jeju	9	4	-	-	-	-	-	-	-

Classification		No. of Companies	With Cooperative Relationship	No. of Respondents (Joint Venture)	Domestic					
					Total	Basic Research	Experimental	Prototype	Product Development	Commercialization
Total		**1,027**	**363**	**9**	**22**	**14**	**2**	**1**	**3**	**2**
Core Industries	Biopharmaceutical	326	129	6	1	-	-	1	-	-
	Biochemical and Bioenergy	191	53	-	-	-	-	-	-	-
	Biofood	170	54	-	-	-	-	-	-	-
	Bioenvironmental	64	19	-	-	-	-	-	-	-
	Biomedical Equipment	96	37	2	1	-	-	-	-	1
	Bioinstrument and Bioequipment	62	18	1	-	-	-	-	-	-
	Bioresource	15	6	-	-	-	-	-	-	-
	Bioservice	103	47	-	-	-	-	-	-	-
Total Number of Workers	1 – 49	634	206	2	-	-	-	-	-	-
	50 – 299	276	107	4	1	-	-	-	-	1
	300 – 999	79	30	1	-	-	-	-	-	-
	1,000 or more	34	18	2	1	-	-	1	-	-
	Unknown	4	2	-	-	-	-	-	-	-
By Area	Seoul	229	78	-	-	-	-	-	-	-
	Busan	15	4	-	-	-	-	-	-	-
	Incheon	22	7	-	-	-	-	-	-	-
	Daegu	15	5	-	-	-	-	-	-	-
	Gwangju	7	4	-	-	-	-	-	-	-
	Daejeon	82	33	2	-	-	-	-	-	-
	Ulsan	8	2	-	-	-	-	-	-	-
	Sejong	3	1	-	-	-	-	-	-	-
	Gyeonggi	340	125	6	1	-	-	1	-	-
	Gangwon	44	24	-	-	-	-	-	-	-
	Chungbuk	91	31	1	1	-	-	-	-	1
	Chungnam	44	14	-	-	-	-	-	-	-
	Jeonbuk	35	9	-	-	-	-	-	-	-
	Jeonnam	36	10	-	-	-	-	-	-	-
	Gyeongbuk	22	4	-	-	-	-	-	-	-
	Gyeongnam	25	8	-	-	-	-	-	-	-
	Jeju	9	4	-	-	-	-	-	-	-

Classification		No. of Companies	With Cooperative Relationship	No. of Respondents (Joint Venture)	Domestic (SMEs / Ventures)					
					Total	Basic Research	Experimental	Prototype	Product Development	Commercialization
Total		**1,027**	**363**	**9**	**7**	**4**	**2**	**-**	**1**	**-**
Core Industries	Biopharmaceutical	326	129	6	7	4	2	-	1	-
	Biochemical and Bioenergy	191	53	-	-	-	-	-	-	-
	Biofood	170	54	-	-	-	-	-	-	-
	Bioenvironmental	64	19	-	-	-	-	-	-	-
	Biomedical Equipment	96	37	2	-	-	-	-	-	-
	Bioinstrument and Bioequipment	62	18	1	-	-	-	-	-	-
	Bioresource	15	6	-	-	-	-	-	-	-
	Bioservice	103	47	-	-	-	-	-	-	-
Total Number of Workers	1 – 49	634	206	2	1	1	-	-	-	-
	50 – 299	276	107	4	1	-	-	-	1	-
	300 – 999	79	30	1	3	2	1	-	-	-
	1,000 or more	34	18	2	2	1	1	-	-	-
	Unknown	4	2	-	-	-	-	-	-	-
By Area	Seoul	229	78	-	-	-	-	-	-	-
	Busan	15	4	-	-	-	-	-	-	-
	Incheon	22	7	-	-	-	-	-	-	-
	Daegu	15	5	-	-	-	-	-	-	-
	Gwangju	7	4	-	-	-	-	-	-	-
	Daejeon	82	33	2	1	1	-	-	-	-
	Ulsan	8	2	-	-	-	-	-	-	-
	Sejong	3	1	-	-	-	-	-	-	-
	Gyeonggi	340	125	6	6	3	2	-	1	-
	Gangwon	44	24	-	-	-	-	-	-	-
	Chungbuk	91	31	1	-	-	-	-	-	-
	Chungnam	44	14	-	-	-	-	-	-	-
	Jeonbuk	35	9	-	-	-	-	-	-	-
	Jeonnam	36	10	-	-	-	-	-	-	-
	Gyeongbuk	22	4	-	-	-	-	-	-	-
	Gyeongnam	25	8	-	-	-	-	-	-	-
	Jeju	9	4	-	-	-	-	-	-	-

Classification		No. of Companies	With Cooperative Relationship	No. of Respondents (Joint Venture)	Overseas (SMEs / Ventures)					
					Total	Basic Research	Experimental	Prototype	Product Development	Commercialization
Total		**1,027**	**363**	**9**	-	-	-	-	-	-
Core Industries	Biopharmaceutical	326	129	6	-	-	-	-	-	-
	Biochemical and Bioenergy	191	53	-	-	-	-	-	-	-
	Biofood	170	54	-	-	-	-	-	-	-
	Bioenvironmental	64	19	-	-	-	-	-	-	-
	Biomedical Equipment	96	37	2	-	-	-	-	-	-
	Bioinstrument and Bioequipment	62	18	1	-	-	-	-	-	-
	Bioresource	15	6	-	-	-	-	-	-	-
	Bioservice	103	47	-	-	-	-	-	-	-
Total Number of Workers	1 – 49	634	206	2	-	-	-	-	-	-
	50 – 299	276	107	4	-	-	-	-	-	-
	300 – 999	79	30	1	-	-	-	-	-	-
	1,000 or more	34	18	2	-	-	-	-	-	-
	Unknown	4	2	-	-	-	-	-	-	-
By Area	Seoul	229	78	-	-	-	-	-	-	-
	Busan	15	4	-	-	-	-	-	-	-
	Incheon	22	7	-	-	-	-	-	-	-
	Daegu	15	5	-	-	-	-	-	-	-
	Gwangju	7	4	-	-	-	-	-	-	-
	Daejeon	82	33	2	-	-	-	-	-	-
	Ulsan	8	2	-	-	-	-	-	-	-
	Sejong	3	1	-	-	-	-	-	-	-
	Gyeonggi	340	125	6	-	-	-	-	-	-
	Gangwon	44	24	-	-	-	-	-	-	-
	Chungbuk	91	31	1	-	-	-	-	-	-
	Chungnam	44	14	-	-	-	-	-	-	-
	Jeonbuk	35	9	-	-	-	-	-	-	-
	Jeonnam	36	10	-	-	-	-	-	-	-
	Gyeongbuk	22	4	-	-	-	-	-	-	-
	Gyeongnam	25	8	-	-	-	-	-	-	-
	Jeju	9	4	-	-	-	-	-	-	-

Classification		No. of Companies	With Cooperative Relationship	No. of Respondents (Joint Venture)	Domestic (Middle-standing Companies)					
					Total	Basic Research	Experimental	Prototype	Product Development	Commercialization
Total		**1,027**	**363**	**9**	**1**	**-**	**-**	**-**	**-**	**1**
Core Industries	Biopharmaceutical	326	129	6	1	-	-	-	-	1
	Biochemical and Bioenergy	191	53	-	-	-	-	-	-	-
	Biofood	170	54	-	-	-	-	-	-	-
	Bioenvironmental	64	19	-	-	-	-	-	-	-
	Biomedical Equipment	96	37	2	-	-	-	-	-	-
	Bioinstrument and Bioequipment	62	18	1	-	-	-	-	-	-
	Bioresource	15	6	-	-	-	-	-	-	-
	Bioservice	103	47	-	-	-	-	-	-	-
Total Number of Workers	1 – 49	634	206	2	-	-	-	-	-	-
	50 – 299	276	107	4	1	-	-	-	-	1
	300 – 999	79	30	1	-	-	-	-	-	-
	1,000 or more	34	18	2	-	-	-	-	-	-
	Unknown	4	2	-	-	-	-	-	-	-
By Area	Seoul	229	78	-	-	-	-	-	-	-
	Busan	15	4	-	-	-	-	-	-	-
	Incheon	22	7	-	-	-	-	-	-	-
	Daegu	15	5	-	-	-	-	-	-	-
	Gwangju	7	4	-	-	-	-	-	-	-
	Daejeon	82	33	2	1	-	-	-	-	1
	Ulsan	8	2	-	-	-	-	-	-	-
	Sejong	3	1	-	-	-	-	-	-	-
	Gyeonggi	340	125	6	-	-	-	-	-	-
	Gangwon	44	24	-	-	-	-	-	-	-
	Chungbuk	91	31	1	-	-	-	-	-	-
	Chungnam	44	14	-	-	-	-	-	-	-
	Jeonbuk	35	9	-	-	-	-	-	-	-
	Jeonnam	36	10	-	-	-	-	-	-	-
	Gyeongbuk	22	4	-	-	-	-	-	-	-
	Gyeongnam	25	8	-	-	-	-	-	-	-
	Jeju	9	4	-	-	-	-	-	-	-

Classification		No. of Companies	With Cooperative Relationship	No. of Respondent (Joint Venture)	Overseas (Middle-standing Companies)					
					Total	Basic Research	Experimental	Prototype	Product Development	Commercialization
Total		**1,027**	**363**	**9**	**-**	**-**	**-**	**-**	**-**	**-**
Core Industries	Biopharmaceutical	326	129	6	-	-	-	-	-	-
	Biochemical and Bioenergy	191	53	-	-	-	-	-	-	-
	Biofood	170	54	-	-	-	-	-	-	-
	Bioenvironmental	64	19	-	-	-	-	-	-	-
	Biomedical Equipment	96	37	2	-	-	-	-	-	-
	Bioinstrument and Bioequipment	62	18	1	-	-	-	-	-	-
	Bioresource	15	6	-	-	-	-	-	-	-
	Bioservice	103	47	-	-	-	-	-	-	-
Total Number of Workers	1 – 49	634	206	2	-	-	-	-	-	-
	50 – 299	276	107	4	-	-	-	-	-	-
	300 – 999	79	30	1	-	-	-	-	-	-
	1,000 or more	34	18	2	-	-	-	-	-	-
	Unknown	4	2	-	-	-	-	-	-	-
By Area	Seoul	229	78	-	-	-	-	-	-	-
	Busan	15	4	-	-	-	-	-	-	-
	Incheon	22	7	-	-	-	-	-	-	-
	Daegu	15	5	-	-	-	-	-	-	-
	Gwangju	7	4	-	-	-	-	-	-	-
	Daejeon	82	33	2	-	-	-	-	-	-
	Ulsan	8	2	-	-	-	-	-	-	-
	Sejong	3	1	-	-	-	-	-	-	-
	Gyeonggi	340	125	6	-	-	-	-	-	-
	Gangwon	44	24	-	-	-	-	-	-	-
	Chungbuk	91	31	1	-	-	-	-	-	-
	Chungnam	44	14	-	-	-	-	-	-	-
	Jeonbuk	35	9	-	-	-	-	-	-	-
	Jeonnam	36	10	-	-	-	-	-	-	-
	Gyeongbuk	22	4	-	-	-	-	-	-	-
	Gyeongnam	25	8	-	-	-	-	-	-	-
	Jeju	9	4	-	-	-	-	-	-	-

Classification		No. of Companies	With Cooperative Relationship	No. of Respondents (Joint Venture)	Domestic (Large Enterprises)					
					Total	Basic Research	Experimental	Prototype	Product Development	Commercialization
Total		**1,027**	**363**	**9**	**1**	**-**	**-**	**-**	**1**	**-**
Core Industries	Biopharmaceutical	326	129	6	1	-	-	-	1	-
	Biochemical and Bioenergy	191	53	-	-	-	-	-	-	-
	Biofood	170	54	-	-	-	-	-	-	-
	Bioenvironmental	64	19	-	-	-	-	-	-	-
	Biomedical Equipment	96	37	2	-	-	-	-	-	-
	Bioinstrument and Bioequipment	62	18	1	-	-	-	-	-	-
	Bioresource	15	6	-	-	-	-	-	-	-
	Bioservice	103	47	-	-	-	-	-	-	-
Total Number of Workers	1 – 49	634	206	2	-	-	-	-	-	-
	50 – 299	276	107	4	1	-	-	-	1	-
	300 – 999	79	30	1	-	-	-	-	-	-
	1,000 or more	34	18	2	-	-	-	-	-	-
	Unknown	4	2	-	-	-	-	-	-	-
By Area	Seoul	229	78	-	-	-	-	-	-	-
	Busan	15	4	-	-	-	-	-	-	-
	Incheon	22	7	-	-	-	-	-	-	-
	Daegu	15	5	-	-	-	-	-	-	-
	Gwangju	7	4	-	-	-	-	-	-	-
	Daejeon	82	33	2	-	-	-	-	-	-
	Ulsan	8	2	-	-	-	-	-	-	-
	Sejong	3	1	-	-	-	-	-	-	-
	Gyeonggi	340	125	6	1	-	-	-	1	-
	Gangwon	44	24	-	-	-	-	-	-	-
	Chungbuk	91	31	1	-	-	-	-	-	-
	Chungnam	44	14	-	-	-	-	-	-	-
	Jeonbuk	35	9	-	-	-	-	-	-	-
	Jeonnam	36	10	-	-	-	-	-	-	-
	Gyeongbuk	22	4	-	-	-	-	-	-	-
	Gyeongnam	25	8	-	-	-	-	-	-	-
	Jeju	9	4	-	-	-	-	-	-	-

Classification		No. of Companies	With Cooperative Relationship	No. of Respondents (Joint Venture)	Overseas (Large Enterprises)					
					Total	Basic Research	Experimental	Prototype	Product Development	Commercialization
Total		**1,027**	**363**	**9**	**1**	**-**	**-**	**-**	**-**	**1**
Core Industries	Biopharmaceutical	326	129	6	-	-	-	-	-	-
	Biochemical and Bioenergy	191	53	-	-	-	-	-	-	-
	Biofood	170	54	-	-	-	-	-	-	-
	Bioenvironmental	64	19	-	-	-	-	-	-	-
	Biomedical Equipment	96	37	2	1	-	-	-	-	1
	Bioinstrument and Bioequipment	62	18	1	-	-	-	-	-	-
	Bioresource	15	6	-	-	-	-	-	-	-
	Bioservice	103	47	-	-	-	-	-	-	-
Total Number of Workers	1 – 49	634	206	2	-	-	-	-	-	-
	50 – 299	276	107	4	1	-	-	-	-	1
	300 – 999	79	30	1	-	-	-	-	-	-
	1,000 or more	34	18	2	-	-	-	-	-	-
	Unknown	4	2	-	-	-	-	-	-	-
By Area	Seoul	229	78	-	-	-	-	-	-	-
	Busan	15	4	-	-	-	-	-	-	-
	Incheon	22	7	-	-	-	-	-	-	-
	Daegu	15	5	-	-	-	-	-	-	-
	Gwangju	7	4	-	-	-	-	-	-	-
	Daejeon	82	33	2	-	-	-	-	-	-
	Ulsan	8	2	-	-	-	-	-	-	-
	Sejong	3	1	-	-	-	-	-	-	-
	Gyeonggi	340	125	6	-	-	-	-	-	-
	Gangwon	44	24	-	-	-	-	-	-	-
	Chungbuk	91	31	1	1	-	-	-	-	1
	Chungnam	44	14	-	-	-	-	-	-	-
	Jeonbuk	35	9	-	-	-	-	-	-	-
	Jeonnam	36	10	-	-	-	-	-	-	-
	Gyeongbuk	22	4	-	-	-	-	-	-	-
	Gyeongnam	25	8	-	-	-	-	-	-	-
	Jeju	9	4	-	-	-	-	-	-	-

Classification		No. of Companies	With Cooperative Relationship	No. of Respondents (Joint Venture)	Domestic (Government-funded)					
					Total	Basic Research	Experimental	Prototype	Product Development	Commercialization
Total		1,027	363	9	-	-	-	-	-	-
Core Industries	Biopharmaceutical	326	129	6	-	-	-	-	-	-
	Biochemical and Bioenergy	191	53	-	-	-	-	-	-	-
	Biofood	170	54	-	-	-	-	-	-	-
	Bioenvironmental	64	19	-	-	-	-	-	-	-
	Biomedical Equipment	96	37	2	-	-	-	-	-	-
	Bioinstrument and Bioequipment	62	18	1	-	-	-	-	-	-
	Bioresource	15	6	-	-	-	-	-	-	-
	Bioservice	103	47	-	-	-	-	-	-	-
Total Number of Workers	1 – 49	634	206	2	-	-	-	-	-	-
	50 – 299	276	107	4	-	-	-	-	-	-
	300 – 999	79	30	1	-	-	-	-	-	-
	1,000 or more	34	18	2	-	-	-	-	-	-
	Unknown	4	2	-	-	-	-	-	-	-
By Area	Seoul	229	78	-	-	-	-	-	-	-
	Busan	15	4	-	-	-	-	-	-	-
	Incheon	22	7	-	-	-	-	-	-	-
	Daegu	15	5	-	-	-	-	-	-	-
	Gwangju	7	4	-	-	-	-	-	-	-
	Daejeon	82	33	2	-	-	-	-	-	-
	Ulsan	8	2	-	-	-	-	-	-	-
	Sejong	3	1	-	-	-	-	-	-	-
	Gyeonggi	340	125	6	-	-	-	-	-	-
	Gangwon	44	24	-	-	-	-	-	-	-
	Chungbuk	91	31	1	-	-	-	-	-	-
	Chungnam	44	14	-	-	-	-	-	-	-
	Jeonbuk	35	9	-	-	-	-	-	-	-
	Jeonnam	36	10	-	-	-	-	-	-	-
	Gyeongbuk	22	4	-	-	-	-	-	-	-
	Gyeongnam	25	8	-	-	-	-	-	-	-
	Jeju	9	4	-	-	-	-	-	-	-

Classification		No. of Companies	With Cooperative Relationship	No. of Respondents (Joint Venture)	Overseas (Government-funded)					
					Total	Basic Research	Experimental	Prototype	Product Development	Commercialization
Total		1,027	363	9	-	-	-	-	-	-
Core Industries	Biopharmaceutical	326	129	6	-	-	-	-	-	-
	Biochemical and Bioenergy	191	53	-	-	-	-	-	-	-
	Biofood	170	54	-	-	-	-	-	-	-
	Bioenvironmental	64	19	-	-	-	-	-	-	-
	Biomedical Equipment	96	37	2	-	-	-	-	-	-
	Bioinstrument and Bioequipment	62	18	1	-	-	-	-	-	-
	Bioresource	15	6	-	-	-	-	-	-	-
	Bioservice	103	47	-	-	-	-	-	-	-
Total Number of Workers	1 – 49	634	206	2	-	-	-	-	-	-
	50 – 299	276	107	4	-	-	-	-	-	-
	300 – 999	79	30	1	-	-	-	-	-	-
	1,000 or more	34	18	2	-	-	-	-	-	-
	Unknown	4	2	-	-	-	-	-	-	-
By Area	Seoul	229	78	-	-	-	-	-	-	-
	Busan	15	4	-	-	-	-	-	-	-
	Incheon	22	7	-	-	-	-	-	-	-
	Daegu	15	5	-	-	-	-	-	-	-
	Gwangju	7	4	-	-	-	-	-	-	-
	Daejeon	82	33	2	-	-	-	-	-	-
	Ulsan	8	2	-	-	-	-	-	-	-
	Sejong	3	1	-	-	-	-	-	-	-
	Gyeonggi	340	125	6	-	-	-	-	-	-
	Gangwon	44	24	-	-	-	-	-	-	-
	Chungbuk	91	31	1	-	-	-	-	-	-
	Chungnam	44	14	-	-	-	-	-	-	-
	Jeonbuk	35	9	-	-	-	-	-	-	-
	Jeonnam	36	10	-	-	-	-	-	-	-
	Gyeongbuk	22	4	-	-	-	-	-	-	-
	Gyeongnam	25	8	-	-	-	-	-	-	-
	Jeju	9	4	-	-	-	-	-	-	-

Classification		No. of Companies	With Cooperative Relationship	No. of Respondents (Joint Venture)	Domestic (Private Research)					
					Total	Basic Research	Experimental	Prototype	Product Development	Commercialization
Total		**1,027**	**363**	**9**	**-**	**-**	**-**	**-**	**-**	**-**
Core Industries	Biopharmaceutical	326	129	6	-	-	-	-	-	-
	Biochemical and Bioenergy	191	53	-	-	-	-	-	-	-
	Biofood	170	54	-	-	-	-	-	-	-
	Bioenvironmental	64	19	-	-	-	-	-	-	-
	Biomedical Equipment	96	37	2	-	-	-	-	-	-
	Bioinstrument and Bioequipment	62	18	1	-	-	-	-	-	-
	Bioresource	15	6	-	-	-	-	-	-	-
	Bioservice	103	47	-	-	-	-	-	-	-
Total Number of Workers	1 – 49	634	206	2	-	-	-	-	-	-
	50 – 299	276	107	4	-	-	-	-	-	-
	300 – 999	79	30	1	-	-	-	-	-	-
	1,000 or more	34	18	2	-	-	-	-	-	-
	Unknown	4	2	-	-	-	-	-	-	-
By Area	Seoul	229	78	-	-	-	-	-	-	-
	Busan	15	4	-	-	-	-	-	-	-
	Incheon	22	7	-	-	-	-	-	-	-
	Daegu	15	5	-	-	-	-	-	-	-
	Gwangju	7	4	-	-	-	-	-	-	-
	Daejeon	82	33	2	-	-	-	-	-	-
	Ulsan	8	2	-	-	-	-	-	-	-
	Sejong	3	1	-	-	-	-	-	-	-
	Gyeonggi	340	125	6	-	-	-	-	-	-
	Gangwon	44	24	-	-	-	-	-	-	-
	Chungbuk	91	31	1	-	-	-	-	-	-
	Chungnam	44	14	-	-	-	-	-	-	-
	Jeonbuk	35	9	-	-	-	-	-	-	-
	Jeonnam	36	10	-	-	-	-	-	-	-
	Gyeongbuk	22	4	-	-	-	-	-	-	-
	Gyeongnam	25	8	-	-	-	-	-	-	-
	Jeju	9	4	-	-	-	-	-	-	-

Classification		No. of Companies	With Cooperative Relationship	No. of Respondents (Joint Venture)	Overseas (Private Research)					
					Total	Basic Research	Experimental	Prototype	Product Development	Commercialization
Total		**1,027**	**363**	**9**	**-**	**-**	**-**	**-**	**-**	**-**
Core Industries	Biopharmaceutical	326	129	6	-	-	-	-	-	-
	Biochemical and Bioenergy	191	53	-	-	-	-	-	-	-
	Biofood	170	54	-	-	-	-	-	-	-
	Bioenvironmental	64	19	-	-	-	-	-	-	-
	Biomedical Equipment	96	37	2	-	-	-	-	-	-
	Bioinstrument and Bioequipment	62	18	1	-	-	-	-	-	-
	Bioresource	15	6	-	-	-	-	-	-	-
	Bioservice	103	47	-	-	-	-	-	-	-
Total Number of Workers	1 – 49	634	206	2	-	-	-	-	-	-
	50 – 299	276	107	4	-	-	-	-	-	-
	300 – 999	79	30	1	-	-	-	-	-	-
	1,000 or more	34	18	2	-	-	-	-	-	-
	Unknown	4	2	-	-	-	-	-	-	-
By Area	Seoul	229	78	-	-	-	-	-	-	-
	Busan	15	4	-	-	-	-	-	-	-
	Incheon	22	7	-	-	-	-	-	-	-
	Daegu	15	5	-	-	-	-	-	-	-
	Gwangju	7	4	-	-	-	-	-	-	-
	Daejeon	82	33	2	-	-	-	-	-	-
	Ulsan	8	2	-	-	-	-	-	-	-
	Sejong	3	1	-	-	-	-	-	-	-
	Gyeonggi	340	125	6	-	-	-	-	-	-
	Gangwon	44	24	-	-	-	-	-	-	-
	Chungbuk	91	31	1	-	-	-	-	-	-
	Chungnam	44	14	-	-	-	-	-	-	-
	Jeonbuk	35	9	-	-	-	-	-	-	-
	Jeonnam	36	10	-	-	-	-	-	-	-
	Gyeongbuk	22	4	-	-	-	-	-	-	-
	Gyeongnam	25	8	-	-	-	-	-	-	-
	Jeju	9	4	-	-	-	-	-	-	-

Classification		No. of Companies	With Cooperative Relationship	No. of Respondents (Joint Venture)	Domestic (Universities)					
					Total	Basic Research	Experimental	Prototype	Product Development	Commercialization
Total		**1,027**	**363**	**9**	**13**	**10**	**-**	**1**	**1**	**1**
Core Industries	Biopharmaceutical	326	129	6	2	-	-	1	-	1
	Biochemical and Bioenergy	191	53	-	-	-	-	-	-	-
	Biofood	170	54	-	-	-	-	-	-	-
	Bioenvironmental	64	19	-	-	-	-	-	-	-
	Biomedical Equipment	96	37	2	10	10	-	-	-	-
	Bioinstrument and Bioequipment	62	18	1	1	-	-	-	1	-
	Bioresource	15	6	-	-	-	-	-	-	-
	Bioservice	103	47	-	-	-	-	-	-	-
Total Number of Workers	1 – 49	634	206	2	1	-	-	-	1	-
	50 – 299	276	107	4	11	10	-	-	-	1
	300 – 999	79	30	1	-	-	-	-	-	-
	1,000 or more	34	18	2	1	-	-	1	-	-
	Unknown	4	2	-	-	-	-	-	-	-
By Area	Seoul	229	78	-	-	-	-	-	-	-
	Busan	15	4	-	-	-	-	-	-	-
	Incheon	22	7	-	-	-	-	-	-	-
	Daegu	15	5	-	-	-	-	-	-	-
	Gwangju	7	4	-	-	-	-	-	-	-
	Daejeon	82	33	2	1	-	-	-	-	1
	Ulsan	8	2	-	-	-	-	-	-	-
	Sejong	3	1	-	-	-	-	-	-	-
	Gyeonggi	340	125	6	12	10	-	1	1	-
	Gangwon	44	24	-	-	-	-	-	-	-
	Chungbuk	91	31	1	-	-	-	-	-	-
	Chungnam	44	14	-	-	-	-	-	-	-
	Jeonbuk	35	9	-	-	-	-	-	-	-
	Jeonnam	36	10	-	-	-	-	-	-	-
	Gyeongbuk	22	4	-	-	-	-	-	-	-
	Gyeongnam	25	8	-	-	-	-	-	-	-
	Jeju	9	4	-	-	-	-	-	-	-

Classification		No. of Companies	With Cooperative Relationship	No. of Respondents (Joint Venture)	Overseas (Universities)					
					Total	Basic Research	Experimental	Prototype	Product Development	Commercialization
Total		**1,027**	**363**	**9**	**1**	**-**	**-**	**1**	**-**	**-**
Core Industries	Biopharmaceutical	326	129	6	1	-	-	1	-	-
	Biochemical and Bioenergy	191	53	-	-	-	-	-	-	-
	Biofood	170	54	-	-	-	-	-	-	-
	Bioenvironmental	64	19	-	-	-	-	-	-	-
	Biomedical Equipment	96	37	2	-	-	-	-	-	-
	Bioinstrument and Bioequipment	62	18	1	-	-	-	-	-	-
	Bioresource	15	6	-	-	-	-	-	-	-
	Bioservice	103	47	-	-	-	-	-	-	-
Total Number of Workers	1 – 49	634	206	2	-	-	-	-	-	-
	50 – 299	276	107	4	-	-	-	-	-	-
	300 – 999	79	30	1	-	-	-	-	-	-
	1,000 or more	34	18	2	1	-	-	1	-	-
	Unknown	4	2	-	-	-	-	-	-	-
By Area	Seoul	229	78	-	-	-	-	-	-	-
	Busan	15	4	-	-	-	-	-	-	-
	Incheon	22	7	-	-	-	-	-	-	-
	Daegu	15	5	-	-	-	-	-	-	-
	Gwangju	7	4	-	-	-	-	-	-	-
	Daejeon	82	33	2	-	-	-	-	-	-
	Ulsan	8	2	-	-	-	-	-	-	-
	Sejong	3	1	-	-	-	-	-	-	-
	Gyeonggi	340	125	6	1	-	-	1	-	-
	Gangwon	44	24	-	-	-	-	-	-	-
	Chungbuk	91	31	1	-	-	-	-	-	-
	Chungnam	44	14	-	-	-	-	-	-	-
	Jeonbuk	35	9	-	-	-	-	-	-	-
	Jeonnam	36	10	-	-	-	-	-	-	-
	Gyeongbuk	22	4	-	-	-	-	-	-	-
	Gyeongnam	25	8	-	-	-	-	-	-	-
	Jeju	9	4	-	-	-	-	-	-	-

Classification		No. of Companies	With Cooperative Relationship	No. of Respondents (Joint Venture)	Domestic (Medical Institutions)					
					Total	Basic Research	Experimental	Prototype	Product Development	Commercialization
Total		1,027	363	9	-	-	-	-	-	-
Core Industries	Biopharmaceutical	326	129	6	-	-	-	-	-	-
	Biochemical and Bioenergy	191	53	-	-	-	-	-	-	-
	Biofood	170	54	-	-	-	-	-	-	-
	Bioenvironmental	64	19	-	-	-	-	-	-	-
	Biomedical Equipment	96	37	2	-	-	-	-	-	-
	Bioinstrument and Bioequipment	62	18	1	-	-	-	-	-	-
	Bioresource	15	6	-	-	-	-	-	-	-
	Bioservice	103	47	-	-	-	-	-	-	-
Total Number of Workers	1 – 49	634	206	2	-	-	-	-	-	-
	50 – 299	276	107	4	-	-	-	-	-	-
	300 – 999	79	30	1	-	-	-	-	-	-
	1,000 or more	34	18	2	-	-	-	-	-	-
	Unknown	4	2	-	-	-	-	-	-	-
By Area	Seoul	229	78	-	-	-	-	-	-	-
	Busan	15	4	-	-	-	-	-	-	-
	Incheon	22	7	-	-	-	-	-	-	-
	Daegu	15	5	-	-	-	-	-	-	-
	Gwangju	7	4	-	-	-	-	-	-	-
	Daejeon	82	33	2	-	-	-	-	-	-
	Ulsan	8	2	-	-	-	-	-	-	-
	Sejong	3	1	-	-	-	-	-	-	-
	Gyeonggi	340	125	6	-	-	-	-	-	-
	Gangwon	44	24	-	-	-	-	-	-	-
	Chungbuk	91	31	1	-	-	-	-	-	-
	Chungnam	44	14	-	-	-	-	-	-	-
	Jeonbuk	35	9	-	-	-	-	-	-	-
	Jeonnam	36	10	-	-	-	-	-	-	-
	Gyeongbuk	22	4	-	-	-	-	-	-	-
	Gyeongnam	25	8	-	-	-	-	-	-	-
	Jeju	9	4	-	-	-	-	-	-	-

Classification		**No. of Companies**	**With Cooperative Relationship**	**No. of Respondents (Joint Venture)**	**Overseas (Medical Institutions)**					
					Total	**Basic Research**	**Experimental**	**Prototype**	**Product Development**	**Commercialization**
Total		**1,027**	**363**	**9**	-	-	-	-	-	-
Core Industries	Biopharmaceutical	326	129	6	-	-	-	-	-	-
	Biochemical and Bioenergy	191	53	-	-	-	-	-	-	-
	Biofood	170	54	-	-	-	-	-	-	-
	Bioenvironmental	64	19	-	-	-	-	-	-	-
	Biomedical Equipment	96	37	2	-	-	-	-	-	-
	Bioinstrument and Bioequipment	62	18	1	-	-	-	-	-	-
	Bioresource	15	6	-	-	-	-	-	-	-
	Bioservice	103	47	-	-	-	-	-	-	-
Total Number of Workers	1 – 49	634	206	2	-	-	-	-	-	-
	50 – 299	276	107	4	-	-	-	-	-	-
	300 – 999	79	30	1	-	-	-	-	-	-
	1,000 or more	34	18	2	-	-	-	-	-	-
	Unknown	4	2	-	-	-	-	-	-	-
By Area	Seoul	229	78	-	-	-	-	-	-	-
	Busan	15	4	-	-	-	-	-	-	-
	Incheon	22	7	-	-	-	-	-	-	-
	Daegu	15	5	-	-	-	-	-	-	-
	Gwangju	7	4	-	-	-	-	-	-	-
	Daejeon	82	33	2	-	-	-	-	-	-
	Ulsan	8	2	-	-	-	-	-	-	-
	Sejong	3	1	-	-	-	-	-	-	-
	Gyeonggi	340	125	6	-	-	-	-	-	-
	Gangwon	44	24	-	-	-	-	-	-	-
	Chungbuk	91	31	1	-	-	-	-	-	-
	Chungnam	44	14	-	-	-	-	-	-	-
	Jeonbuk	35	9	-	-	-	-	-	-	-
	Jeonnam	36	10	-	-	-	-	-	-	-
	Gyeongbuk	22	4	-	-	-	-	-	-	-
	Gyeongnam	25	8	-	-	-	-	-	-	-
	Jeju	9	4	-	-	-	-	-	-	-

<Table 4-3> Status of Joint R&D Contract Cooperation (Unit: cases)

Classification		No. of Companies	With Cooperative Relationship	No. of Respondents (Joint R&D Contract)	Domestic					
					Total	Basic Research	Experimental	Prototype	Product Development	Commercialization
Total		**1,027**	**363**	**334**	**801**	**267**	**235**	**166**	**93**	**40**
Core Industries	Biopharmaceutical	326	129	115	251	95	80	56	14	6
	Biochemical and Bioenergy	191	53	49	122	42	22	23	21	14
	Biofood	170	54	51	117	30	44	19	20	4
	Bioenvironmental	64	19	18	24	13	5	6	-	-
	Biomedical Equipment	96	37	33	69	17	23	12	12	5
	Bioinstrument and Bioequipment	62	18	18	49	10	12	19	8	-
	Bioresource	15	6	6	23	2	18	-	3	-
	Bioservice	103	47	44	146	58	31	31	15	11
Total Number of Workers	1 – 49	634	206	190	392	143	97	88	47	17
	50 – 299	276	107	97	245	72	81	46	33	13
	300 – 999	79	30	28	99	30	38	19	8	4
	1,000 or more	34	18	17	62	20	19	13	4	6
	Unknown	4	2	2	3	2	-	-	1	-
By Area	Seoul	229	78	72	177	65	57	29	16	10
	Busan	15	4	3	6	2	2	1	1	-
	Incheon	22	7	7	12	6	1	5	-	-
	Daegu	15	5	5	13	1	5	4	3	-
	Gwangju	7	4	4	8	3	4	-	-	1
	Daejeon	82	33	30	74	23	20	22	8	1
	Ulsan	8	2	2	4	1	1	-	2	-
	Sejong	3	1	1	1	-	-	-	-	1
	Gyeonggi	340	125	115	284	96	82	71	23	12
	Gangwon	44	24	21	37	10	11	8	7	1
	Chungbuk	91	31	28	64	18	22	11	8	5
	Chungnam	44	14	13	35	14	5	4	12	-
	Jeonbuk	35	9	7	17	4	3	2	7	1
	Jeonnam	36	10	10	34	8	14	4	4	4
	Gyeongbuk	22	4	4	12	3	5	1	-	3
	Gyeongnam	25	8	8	15	9	2	3	1	-
	Jeju	9	4	4	8	4	1	1	1	1

Classification		No. of Companies	With Cooperative Relationship	No. of Respondents (Joint R&D Contract)	Overseas					
					Total	Basic Research	Experimental	Prototype	Product Development	Commercialization
Total		**1,027**	**363**	**334**	**23**	**5**	**2**	**11**	**5**	**-**
Core Industries	Biopharmaceutical	326	129	115	20	5	-	10	5	-
	Biochemical and Bioenergy	191	53	49	1	-	1	-	-	-
	Biofood	170	54	51	-	-	-	-	-	-
	Bioenvironmental	64	19	18	-	-	-	-	-	-
	Biomedical Equipment	96	37	33	2	-	1	1	-	-
	Bioinstrument and Bioequipment	62	18	18	-	-	-	-	-	-
	Bioresource	15	6	6	-	-	-	-	-	-
	Bioservice	103	47	44	-	-	-	-	-	-
Total Number of Workers	1 – 49	634	206	190	8	-	-	6	2	-
	50 – 299	276	107	97	6	-	-	3	3	-
	300 – 999	79	30	28	3	-	1	2	-	-
	1,000 or more	34	18	17	6	5	1	-	-	-
	Unknown	4	2	2	-	-	-	-	-	-
By Area	Seoul	229	78	72	1	-	-	1	-	-
	Busan	15	4	3	-	-	-	-	-	-
	Incheon	22	7	7	-	-	-	-	-	-
	Daegu	15	5	5	-	-	-	-	-	-
	Gwangju	7	4	4	-	-	-	-	-	-
	Daejeon	82	33	30	1	-	1	-	-	-
	Ulsan	8	2	2	-	-	-	-	-	-
	Sejong	3	1	1	-	-	-	-	-	-
	Gyeonggi	340	125	115	6	-	-	3	3	-
	Gangwon	44	24	21	7	-	-	5	2	-
	Chungbuk	91	31	28	8	5	1	2	-	-
	Chungnam	44	14	13	-	-	-	-	-	-
	Jeonbuk	35	9	7	-	-	-	-	-	-
	Jeonnam	36	10	10	-	-	-	-	-	-
	Gyeongbuk	22	4	4	-	-	-	-	-	-
	Gyeongnam	25	8	8	-	-	-	-	-	-
	Jeju	9	4	4	-	-	-	-	-	-

Classification		No. of Companies	With Cooperative Relationship	No. of Respondents (Joint R&D Contract)	Domestic (SMEs / Ventures)						Overseas (SMEs / Ventures)					
					Total	Basic Research	Experimental	Prototype	Product Development	Commercialization	Total	Basic Research	Experimental	Prototype	Product Development	Commercialization
Total		**1,027**	**363**	**334**	**78**	**27**	**22**	**16**	**12**	**1**	**14**	**-**	**-**	**9**	**5**	**-**
Core Industries	Biopharmaceutical	326	129	115	37	13	10	11	2	1	14	-	-	9	5	-
	Biochemical and Bioenergy	191	53	49	2	2	-	-	-	-	-	-	-	-	-	-
	Biofood	170	54	51	12	3	6	3	-	-	-	-	-	-	-	-
	Bioenvironmental	64	19	18	2	2	-	-	-	-	-	-	-	-	-	-
	Biomedical Equipment	96	37	33	4	1	2	-	1	-	-	-	-	-	-	-
	Bioinstrument and Bioequipment	62	18	18	9	2	2	2	3	-	-	-	-	-	-	-
	Bioresource	15	6	6	-	-	-	-	-	-	-	-	-	-	-	-
	Bioservice	103	47	44	12	4	2	-	6	-	-	-	-	-	-	-
Total Number of Workers	1 – 49	634	206	190	31	17	7	1	6	-	7	-	-	5	2	-
	50 – 299	276	107	97	37	8	10	13	5	1	6	-	-	3	3	-
	300 – 999	79	30	28	7	-	4	2	1	-	1	-	-	1	-	-
	1,000 or more	34	18	17	2	1	1	-	-	-	-	-	-	-	-	-
	Unknown	4	2	2	1	1	-	-	-	-	-	-	-	-	-	-
By Area	Seoul	229	78	72	16	5	5	3	3	-	-	-	-	-	-	-
	Busan	15	4	3	2	2	-	-	-	-	-	-	-	-	-	-
	Incheon	22	7	7	1	1	-	-	-	-	-	-	-	-	-	-
	Daegu	15	5	5	1	1	-	-	-	-	-	-	-	-	-	-
	Gwangju	7	4	4	-	-	-	-	-	-	-	-	-	-	-	-
	Daejeon	82	33	30	2	1	-	-	1	-	-	-	-	-	-	-
	Ulsan	8	2	2	-	-	-	-	-	-	-	-	-	-	-	-
	Sejong	3	1	1	-	-	-	-	-	-	-	-	-	-	-	-
	Gyeonggi	340	125	115	31	10	8	10	2	1	6	-	-	3	3	-
	Gangwon	44	24	21	9	3	3	3	-	-	7	-	-	5	2	-
	Chungbuk	91	31	28	6	1	5	-	-	-	1	-	-	1	-	-
	Chungnam	44	14	13	-	-	-	-	-	-	-	-	-	-	-	-
	Jeonbuk	35	9	7	6	-	-	-	6	-	-	-	-	-	-	-
	Jeonnam	36	10	10	-	-	-	-	-	-	-	-	-	-	-	-
	Gyeongbuk	22	4	4	-	-	-	-	-	-	-	-	-	-	-	-
	Gyeongnam	25	8	8	3	2	1	-	-	-	-	-	-	-	-	-
	Jeju	9	4	4	1	1	-	-	-	-	-	-	-	-	-	-

Classification		No. of Companies	With Cooperative Relationship	No. of Respondents (Joint R&D Contract)	Domestic (Middle-standing Companies)						Overseas (Middle-standing Companies)					
					Total	Basic Research	Experimental	Prototype	Product Development	Commercialization	Total	Basic Research	Experimental	Prototype	Product Development	Commercialization
Total		**1,027**	**363**	**334**	**29**	**12**	**5**	**6**	**3**	**3**	**-**	**-**	**-**	**-**	**-**	**-**
Core Industries	Biopharmaceutical	326	129	115	19	7	4	6	1	1	-	-	-	-	-	-
	Biochemical and Bioenergy	191	53	49	-	-	-	-	-	-	-	-	-	-	-	-
	Biofood	170	54	51	5	1	-	-	2	2	-	-	-	-	-	-
	Bioenvironmental	64	19	18	-	-	-	-	-	-	-	-	-	-	-	-
	Biomedical Equipment	96	37	33	1	1	-	-	-	-	-	-	-	-	-	-
	Bioinstrument and Bioequipment	62	18	18	-	-	-	-	-	-	-	-	-	-	-	-
	Bioresource	15	6	6	-	-	-	-	-	-	-	-	-	-	-	-
	Bioservice	103	47	44	4	3	1	-	-	-	-	-	-	-	-	-
Total Number of Workers	1 – 49	634	206	190	16	9	1	1	2	3	-	-	-	-	-	-
	50 – 299	276	107	97	3	-	1	2	-	-	-	-	-	-	-	-
	300 – 999	79	30	28	2	1	-	-	1	-	-	-	-	-	-	-
	1,000 or more	34	18	17	8	2	3	3	-	-	-	-	-	-	-	-
	Unknown	4	2	2	-	-	-	-	-	-	-	-	-	-	-	-
By Area	Seoul	229	78	72	6	3	2	-	1	-	-	-	-	-	-	-
	Busan	15	4	3	-	-	-	-	-	-	-	-	-	-	-	-
	Incheon	22	7	7	-	-	-	-	-	-	-	-	-	-	-	-
	Daegu	15	5	5	-	-	-	-	-	-	-	-	-	-	-	-
	Gwangju	7	4	4	1	-	-	-	-	1	-	-	-	-	-	-
	Daejeon	82	33	30	2	-	-	2	-	-	-	-	-	-	-	-
	Ulsan	8	2	2	-	-	-	-	-	-	-	-	-	-	-	-
	Sejong	3	1	1	-	-	-	-	-	-	-	-	-	-	-	-
	Gyeonggi	340	125	115	15	8	3	4	-	-	-	-	-	-	-	-
	Gangwon	44	24	21	-	-	-	-	-	-	-	-	-	-	-	-
	Chungbuk	91	31	28	5	1	-	-	2	2	-	-	-	-	-	-
	Chungnam	44	14	13	-	-	-	-	-	-	-	-	-	-	-	-
	Jeonbuk	35	9	7	-	-	-	-	-	-	-	-	-	-	-	-
	Jeonnam	36	10	10	-	-	-	-	-	-	-	-	-	-	-	-
	Gyeongbuk	22	4	4	-	-	-	-	-	-	-	-	-	-	-	-
	Gyeongnam	25	8	8	-	-	-	-	-	-	-	-	-	-	-	-
	Jeju	9	4	4	-	-	-	-	-	-	-	-	-	-	-	-

Classification		No. of Companies	With Cooperative Relationship	No. of Respondents (Joint R&D Contract)	Domestic (Large Enterprises)						Overseas (Large Enterprises)					
					Total	Basic Research	Experimental	Prototype	Product Development	Commercialization	Total	Basic Research	Experimental	Prototype	Product Development	Commercialization
Total		**1,027**	**363**	**334**	**19**	**7**	**5**	**1**	**3**	**3**	**1**	**-**	**1**	**-**	**-**	**-**
Core Industries	Biopharmaceutical	326	129	115	4	3	1	-	-	-	-	-	-	-	-	-
	Biochemical and Bioenergy	191	53	49	7	3	2	-	1	1	1	-	1	-	-	-
	Biofood	170	54	51	-	-	-	-	-	-	-	-	-	-	-	-
	Bioenvironmental	64	19	18	-	-	-	-	-	-	-	-	-	-	-	-
	Biomedical Equipment	96	37	33	3	-	1	-	1	1	-	-	-	-	-	-
	Bioinstrument and Biocquipment	62	18	18	-	-	-	-	-	-	-	-	-	-	-	-
	Bioresource	15	6	6	-	-	-	-	-	-	-	-	-	-	-	-
	Bioservice	103	47	44	5	1	1	1	1	1	-	-	-	-	-	-
Total Number of Workers	1 – 49	634	206	190	4	3	1	-	-	-	-	-	-	-	-	-
	50 – 299	276	107	97	6	1	3	-	1	1	-	-	-	-	-	-
	300 – 999	79	30	28	8	2	1	1	2	2	-	-	-	-	-	-
	1,000 or more	34	18	17	1	1	-	-	-	-	1	-	1	-	-	-
	Unknown	4	2	2	-	-	-	-	-	-	-	-	-	-	-	-
By Area	Seoul	229	78	72	10	2	3	1	2	2	-	-	-	-	-	-
	Busan	15	4	3	-	-	-	-	-	-	-	-	-	-	-	-
	Incheon	22	7	7	-	-	-	-	-	-	-	-	-	-	-	-
	Daegu	15	5	5	-	-	-	-	-	-	-	-	-	-	-	-
	Gwangju	7	4	4	-	-	-	-	-	-	-	-	-	-	-	-
	Daejeon	82	33	30	1	1	-	-	-	-	1	-	1	-	-	-
	Ulsan	8	2	2	-	-	-	-	-	-	-	-	-	-	-	-
	Sejong	3	1	1	-	-	-	-	-	-	-	-	-	-	-	-
	Gyeonggi	340	125	115	2	1	1	-	-	-	-	-	-	-	-	-
	Gangwon	44	24	21	2	2	-	-	-	-	-	-	-	-	-	-
	Chungbuk	91	31	28	-	-	-	-	-	-	-	-	-	-	-	-
	Chungnam	44	14	13	2	1	1	-	-	-	-	-	-	-	-	-
	Jeonbuk	35	9	7	-	-	-	-	-	-	-	-	-	-	-	-
	Jeonnam	36	10	10	2	-	-	-	1	1	-	-	-	-	-	-
	Gyeongbuk	22	4	4	-	-	-	-	-	-	-	-	-	-	-	-
	Gyeongnam	25	8	8	-	-	-	-	-	-	-	-	-	-	-	-
	Jeju	9	4	4	-	-	-	-	-	-	-	-	-	-	-	-

Classification		No. of Companies	With Cooperative Relationship	No. of Respondents (Joint R&D Contract)	Domestic (Government-funded)						Overseas (Government-funded)					
					Total	Basic Research	Experimental	Prototype	Product Development	Commercialization	Total	Basic Research	Experimental	Prototype	Product Development	Commercialization
Total		**1,027**	**363**	**334**	**315**	**95**	**89**	**65**	**41**	**25**	**1**	**-**	**-**	**1**	**-**	**-**
Core Industries	Biopharmaceutical	326	129	115	75	27	22	20	5	1	1	-	-	1	-	-
	Biochemical and Bioenergy	191	53	49	62	16	10	13	12	11	-	-	-	-	-	-
	Biofood	170	54	51	40	10	17	6	5	2	-	-	-	-	-	-
	Bioenvironmental	64	19	18	14	9	2	3	-	-	-	-	-	-	-	-
	Biomedical Equipment	96	37	33	30	6	7	5	8	4	-	-	-	-	-	-
	Bioinstrument and Biocquipment	62	18	18	21	4	5	10	2	-	-	-	-	-	-	-
	Bioresource	15	6	6	14	2	9	-	3	-	-	-	-	-	-	-
	Bioservice	103	47	44	59	21	17	8	6	7	-	-	-	-	-	-
Total Number of Workers	1 – 49	634	206	190	162	57	35	40	18	12	1	-	-	1	-	-
	50 – 299	276	107	97	104	27	37	16	18	6	-	-	-	-	-	-
	300 – 999	79	30	28	28	7	11	7	2	1	-	-	-	-	-	-
	1,000 or more	34	18	17	20	4	6	2	2	6	-	-	-	-	-	-
	Unknown	4	2	2	1	-	-	-	1	-	-	-	-	-	-	-
By Area	Seoul	229	78	72	59	21	16	9	7	6	1	-	-	1	-	-
	Busan	15	4	3	-	-	-	-	-	-	-	-	-	-	-	-
	Incheon	22	7	7	4	2	1	1	-	-	-	-	-	-	-	-
	Daegu	15	5	5	4	-	-	3	1	-	-	-	-	-	-	-
	Gwangju	7	4	4	6	2	4	-	-	-	-	-	-	-	-	-
	Daejeon	82	33	30	31	14	7	6	3	1	-	-	-	-	-	-
	Ulsan	8	2	2	4	1	1	-	2	-	-	-	-	-	-	-
	Sejong	3	1	1	1	-	-	-	-	1	-	-	-	-	-	-
	Gyeonggi	340	125	115	124	29	35	32	17	11	-	-	-	-	-	-
	Gangwon	44	24	21	7	1	2	1	2	1	-	-	-	-	-	-
	Chungbuk	91	31	28	21	8	5	3	4	1	-	-	-	-	-	-
	Chungnam	44	14	13	12	5	2	3	2	-	-	-	-	-	-	-
	Jeonbuk	35	9	7	6	3	-	1	1	1	-	-	-	-	-	-
	Jeonnam	36	10	10	26	6	13	3	2	2	-	-	-	-	-	-
	Gyeongbuk	22	4	4	3	-	2	-	-	1	-	-	-	-	-	-
	Gyeongnam	25	8	8	7	3	1	3	-	-	-	-	-	-	-	-
	Jeju	9	4	4	-	-	-	-	-	-	-	-	-	-	-	-

Classification		No. of Companies	With Cooperative Relationship	No. of Respondents (Joint R&D Contract)	Domestic (Private Research)						Overseas (Private Research)					
					Total	Basic Research	Experimental	Prototype	Product Development	Commercialization	Total	Basic Research	Experimental	Prototype	Product Development	Commercialization
Total		**1,027**	**363**	**334**	**28**	**10**	**5**	**6**	**6**	**1**	**-**	**-**	**-**	**-**	**-**	**-**
Core Industries	Biopharmaceutical	326	129	115	5	3	2	-	-	-	-	-	-	-	-	-
	Biochemical and Bioenergy	191	53	49	11	6	1	3	1	-	-	-	-	-	-	-
	Biofood	170	54	51	4	-	-	-	4	-	-	-	-	-	-	-
	Bioenvironmental	64	19	18	-	-	-	-	-	-	-	-	-	-	-	-
	Biomedical Equipment	96	37	33	1	-	1	-	-	-	-	-	-	-	-	-
	Bioinstrument and Bioequipment	62	18	18	-	-	-	-	-	-	-	-	-	-	-	-
	Bioresource	15	6	6	-	-	-	-	-	-	-	-	-	-	-	-
	Bioservice	103	47	44	7	1	1	3	1	1	-	-	-	-	-	-
Total Number of Workers	1 – 49	634	206	190	13	4	4	-	5	-	-	-	-	-	-	-
	50 – 299	276	107	97	5	2	1	2	-	-	-	-	-	-	-	-
	300 – 999	79	30	28	5	2	-	1	1	1	-	-	-	-	-	-
	1,000 or more	34	18	17	5	2	-	3	-	-	-	-	-	-	-	-
	Unknown	4	2	2	-	-	-	-	-	-	-	-	-	-	-	-
By Area	Seoul	229	78	72	11	4	3	2	1	1	-	-	-	-	-	-
	Busan	15	4	3	-	-	-	-	-	-	-	-	-	-	-	-
	Incheon	22	7	7	1	1	-	-	-	-	-	-	-	-	-	-
	Daegu	15	5	5	-	-	-	-	-	-	-	-	-	-	-	-
	Gwangju	7	4	4	-	-	-	-	-	-	-	-	-	-	-	-
	Daejeon	82	33	30	5	-	1	3	1	-	-	-	-	-	-	-
	Ulsan	8	2	2	-	-	-	-	-	-	-	-	-	-	-	-
	Sejong	3	1	1	-	-	-	-	-	-	-	-	-	-	-	-
	Gyeonggi	340	125	115	2	2	-	-	-	-	-	-	-	-	-	-
	Gangwon	44	24	21	-	-	-	-	-	-	-	-	-	-	-	-
	Chungbuk	91	31	28	1	-	-	1	-	-	-	-	-	-	-	-
	Chungnam	44	14	13	8	3	1	-	4	-	-	-	-	-	-	-
	Jeonbuk	35	9	7	-	-	-	-	-	-	-	-	-	-	-	-
	Jeonnam	36	10	10	-	-	-	-	-	-	-	-	-	-	-	-
	Gyeongbuk	22	4	4	-	-	-	-	-	-	-	-	-	-	-	-
	Gyeongnam	25	8	8	-	-	-	-	-	-	-	-	-	-	-	-
	Jeju	9	4	4	-	-	-	-	-	-	-	-	-	-	-	-

Classification		No. of Companies	With Cooperative Relationship	No. of Respondents (Joint R&D Contract)	Domestic (Universities)						Overseas (Universities)					
					Total	Basic Research	Experimental	Prototype	Product Development	Commercialization	Total	Basic Research	Experimental	Prototype	Product Development	Commercialization
Total		**1,027**	**363**	**334**	**270**	**89**	**91**	**58**	**26**	**6**	**6**	**5**	**1**	**-**	**-**	**-**
Core Industries	Biopharmaceutical	326	129	115	85	29	31	17	6	2	5	5	-	-	-	-
	Biochemical and Bioenergy	191	53	49	39	15	8	7	7	2	-	-	-	-	-	-
	Biofood	170	54	51	56	16	21	10	9	-	-	-	-	-	-	-
	Bioenvironmental	64	19	18	7	1	3	3	-	-	-	-	-	-	-	-
	Biomedical Equipment	96	37	33	23	5	10	7	1	-	1	-	1	-	-	-
	Bioinstrument and Bioequipment	62	18	18	15	4	3	6	2	-	-	-	-	-	-	-
	Bioresource	15	6	6	9	-	9	-	-	-	-	-	-	-	-	-
	Bioservice	103	47	44	36	19	6	8	1	2	-	-	-	-	-	-
Total Number of Workers	1 – 49	634	206	190	137	41	42	37	15	2	-	-	-	-	-	-
	50 – 299	276	107	97	73	27	25	9	8	4	-	-	-	-	-	-
	300 – 999	79	30	28	35	11	16	7	1	-	1	-	1	-	-	-
	1,000 or more	34	18	17	24	9	8	5	2	-	5	5	-	-	-	-
	Unknown	4	2	2	1	1	-	-	-	-	-	-	-	-	-	-
By Area	Seoul	229	78	72	50	20	21	8	1	-	-	-	-	-	-	-
	Busan	15	4	3	4	-	2	1	1	-	-	-	-	-	-	-
	Incheon	22	7	7	5	2	-	3	-	-	-	-	-	-	-	-
	Daegu	15	5	5	5	-	3	1	1	-	-	-	-	-	-	-
	Gwangju	7	4	4	1	1	-	-	-	-	-	-	-	-	-	-
	Daejeon	82	33	30	28	6	11	8	3	-	-	-	-	-	-	-
	Ulsan	8	2	2	-	-	-	-	-	-	-	-	-	-	-	-
	Sejong	3	1	1	-	-	-	-	-	-	-	-	-	-	-	-
	Gyeonggi	340	125	115	84	31	28	21	4	-	-	-	-	-	-	-
	Gangwon	44	24	21	19	4	6	4	5	-	-	-	-	-	-	-
	Chungbuk	91	31	28	29	7	11	7	2	2	6	5	1	-	-	-
	Chungnam	44	14	13	13	5	1	1	6	-	-	-	-	-	-	-
	Jeonbuk	35	9	7	5	1	3	1	-	-	-	-	-	-	-	-
	Jeonnam	36	10	10	6	2	1	1	1	1	-	-	-	-	-	-
	Gyeongbuk	22	4	4	9	3	3	1	-	2	-	-	-	-	-	-
	Gyeongnam	25	8	8	5	4	-	-	1	-	-	-	-	-	-	-
	Jeju	9	4	4	7	3	1	1	1	1	-	-	-	-	-	-

Classification		No. of Companies	With Cooperative Relationship	No. of Respondents (Joint R&D Contract)	Domestic (Medical Institutions)						Overseas (Medical Institutions)					
					Total	Basic Research	Experimental	Prototype	Product Development	Commercialization	Total	Basic Research	Experimental	Prototype	Product Development	Commercialization
Total		**1,027**	**363**	**334**	**62**	**27**	**18**	**14**	**2**	**1**	**1**	**-**	**-**	**1**	**-**	**-**
Core Industries	Biopharmaceutical	326	129	115	26	13	10	2	-	1	-	-	-	-	-	-
	Biochemical and Bioenergy	191	53	49	1	-	1	-	-	-	-	-	-	-	-	-
	Biofood	170	54	51	-	-	-	-	-	-	-	-	-	-	-	-
	Bioenvironmental	64	19	18	1	1	-	-	-	-	-	-	-	-	-	-
	Biomedical Equipment	96	37	33	7	4	2	-	1	-	1	-	-	1	-	-
	Bioinstrument and Bioequipment	62	18	18	4	-	2	1	1	-	-	-	-	-	-	-
	Bioresource	15	6	6	-	-	-	-	-	-	-	-	-	-	-	-
	Bioservice	103	47	44	23	9	3	11	-	-	-	-	-	-	-	-
Total Number of Workers	1 – 49	634	206	190	29	12	7	9	1	-	-	-	-	-	-	-
	50 – 299	276	107	97	17	7	4	4	1	1	-	-	-	-	-	-
	300 – 999	79	30	28	14	7	6	1	-	-	1	-	-	1	-	-
	1,000 or more	34	18	17	2	1	1	-	-	-	-	-	-	-	-	-
	Unknown	4	2	2	-	-	-	-	-	-	-	-	-	-	-	-
By Area	Seoul	229	78	72	25	10	7	6	1	1	-	-	-	-	-	-
	Busan	15	4	3	-	-	-	-	-	-	-	-	-	-	-	-
	Incheon	22	7	7	1	-	-	1	-	-	-	-	-	-	-	-
	Daegu	15	5	5	3	-	2	-	1	-	-	-	-	-	-	-
	Gwangju	7	4	4	-	-	-	-	-	-	-	-	-	-	-	-
	Daejeon	82	33	30	5	1	1	3	-	-	-	-	-	-	-	-
	Ulsan	8	2	2	-	-	-	-	-	-	-	-	-	-	-	-
	Sejong	3	1	1	-	-	-	-	-	-	-	-	-	-	-	-
	Gyeonggi	340	125	115	26	15	7	4	-	-	-	-	-	-	-	-
	Gangwon	44	24	21	-	-	-	-	-	-	-	-	-	-	-	-
	Chungbuk	91	31	28	2	1	1	-	-	-	1	-	-	1	-	-
	Chungnam	44	14	13	-	-	-	-	-	-	-	-	-	-	-	-
	Jeonbuk	35	9	7	-	-	-	-	-	-	-	-	-	-	-	-
	Jeonnam	36	10	10	-	-	-	-	-	-	-	-	-	-	-	-
	Gyeongbuk	22	4	4	-	-	-	-	-	-	-	-	-	-	-	-
	Gyeongnam	25	8	8	-	-	-	-	-	-	-	-	-	-	-	-
	Jeju	9	4	4	-	-	-	-	-	-	-	-	-	-	-	-

<Table 4-4> Status of Technical Tie-Up (Licensing) Cooperation (Unit: cases)

Classification		No. of Companies	With Cooperative Relationship	No. of Respondents (Technical Tie-Up)	Domestic					
					Total	Basic Research	Experimental	Prototype	Product Development	Commercialization
Total		1,027	363	44	78	14	26	17	12	9
Core Industries	Biopharmaceutical	326	129	23	38	10	13	9	6	-
	Biochemical and Bioenergy	191	53	5	9	2	3	2	1	1
	Biofood	170	54	4	4	2	1	-	1	-
	Bioenvironmental	64	19	2	3	-	-	-	-	3
	Biomedical Equipment	96	37	5	19	-	7	6	3	3
	Bioinstrument and Bioequipment	62	18	-	-	-	-	-	-	-
	Bioresource	15	6	-	-	-	-	-	-	-
	Bioservice	103	47	5	5	-	2	-	1	2
Total Number of Workers	1 – 49	634	206	22	31	8	13	3	2	5
	50 – 299	276	107	10	31	2	9	12	7	1
	300 – 999	79	30	8	13	4	4	2	-	3
	1,000 or more	34	18	3	2	-	-	-	2	-
	Unknown	4	2	1	1	-	-	-	1	-
By Area	Seoul	229	78	9	11	1	5	1	-	4
	Busan	15	4	-	-	-	-	-	-	-
	Incheon	22	7	1	4	-	2	2	-	-
	Daegu	15	5	-	-	-	-	-	-	-
	Gwangju	7	4	-	-	-	-	-	-	-
	Daejeon	82	33	2	3	1	-	-	1	1
	Ulsan	8	2	-	-	-	-	-	-	-
	Sejong	3	1	-	-	-	-	-	-	-
	Gyeonggi	340	125	15	25	7	5	8	4	1
	Gangwon	44	24	4	7	-	4	3	-	-
	Chungbuk	91	31	6	19	1	7	3	5	3
	Chungnam	44	14	3	3	2	-	-	1	-
	Jeonbuk	35	9	4	6	2	3	-	1	-
	Jeonnam	36	10	-	-	-	-	-	-	-
	Gyeongbuk	22	4	-	-	-	-	-	-	-
	Gyeongnam	25	8	-	-	-	-	-	-	-
	Jeju	9	4	-	-	-	-	-	-	-

Classification		No. of Companies	With Cooperative Relationship	No. of Respondents (Technical Tie-Up)	Overseas					
					Total	Basic Research	Experimental	Prototype	Product Development	Commercialization
Total		1,027	363	44	14	2	-	8	2	2
Core Industries	Biopharmaceutical	326	129	23	12	2	-	8	2	-
	Biochemical and Bioenergy	191	53	5	1	-	-	-	-	1
	Biofood	170	54	4	-	-	-	-	-	-
	Bioenvironmental	64	19	2	-	-	-	-	-	-
	Biomedical Equipment	96	37	5	-	-	-	-	-	-
	Bioinstrument and Bioequipment	62	18	-	-	-	-	-	-	-
	Bioresource	15	6	-	-	-	-	-	-	-
	Bioservice	103	47	5	1	-	-	-	-	1
Total Number of Workers	1 – 49	634	206	22	8	-	-	5	2	1
	50 – 299	276	107	10	1	1	-	-	-	-
	300 – 999	79	30	8	2	-	-	1	-	1
	1,000 or more	34	18	3	3	1	-	2	-	-
	Unknown	4	2	1	-	-	-	-	-	-
By Area	Seoul	229	78	9	2	1	-	-	-	1
	Busan	15	4	-	-	-	-	-	-	-
	Incheon	22	7	1	-	-	-	-	-	-
	Daegu	15	5	-	-	-	-	-	-	-
	Gwangju	7	4	-	-	-	-	-	-	-
	Daejeon	82	33	2	-	-	-	-	-	-
	Ulsan	8	2	-	-	-	-	-	-	-
	Sejong	3	1	-	-	-	-	-	-	-
	Gyeonggi	340	125	15	3	1	-	2	-	-
	Gangwon	44	24	4	8	-	-	5	2	1
	Chungbuk	91	31	6	1	-	-	1	-	-
	Chungnam	44	14	3	-	-	-	-	-	-
	Jeonbuk	35	9	4	-	-	-	-	-	-
	Jeonnam	36	10	-	-	-	-	-	-	-
	Gyeongbuk	22	4	-	-	-	-	-	-	-
	Gyeongnam	25	8	-	-	-	-	-	-	-
	Jeju	9	4	-	-	-	-	-	-	-

Classification		No. of Companies	With Cooperative Relationship	No. of Respondents (Technical Tie-Up)	Domestic (SMEs / Ventures)						Overseas (SMEs / Ventures)					
					Total	Basic Research	Experimental	Prototype	Product Development	Commercialization	Total	Basic Research	Experimental	Prototype	Product Development	Commercialization
Total		**1,027**	**363**	**44**	**14**	**2**	**4**	**2**	**3**	**3**	**11**	**2**	**-**	**6**	**2**	**1**
Core Industries	Biopharmaceutical	326	129	23	7	2	3	1	1	-	10	2	-	6	2	-
	Biochemical and Bioenergy	191	53	5	3	-	1	-	1	1	1	-	-	-	-	1
	Biofood	170	54	4	-	-	-	-	-	-	-	-	-	-	-	-
	Bioenvironmental	64	19	2	-	-	-	-	-	-	-	-	-	-	-	-
	Biomedical Equipment	96	37	5	3	-	-	1	1	1	-	-	-	-	-	-
	Bioinstrument and Bioequipment	62	18	-	-	-	-	-	-	-	-	-	-	-	-	-
	Bioresource	15	6	-	-	-	-	-	-	-	-	-	-	-	-	-
	Bioservice	103	47	5	1	-	-	-	-	1	-	-	-	-	-	-
Total Number of Workers	1 – 49	634	206	22	4	-	1	-	1	2	8	-	-	5	2	1
	50 – 299	276	107	10	6	-	2	1	2	1	1	1	-	-	-	-
	300 – 999	79	30	8	4	2	1	1	-	-	1	-	-	1	-	-
	1,000 or more	34	18	3	-	-	-	-	-	-	1	1	-	-	-	-
	Unknown	4	2	1	-	-	-	-	-	-	-	-	-	-	-	-
By Area	Seoul	229	78	9	1	-	-	-	-	1	1	1	-	-	-	-
	Busan	15	4	-	-	-	-	-	-	-	-	-	-	-	-	-
	Incheon	22	7	1	-	-	-	-	-	-	-	-	-	-	-	-
	Daegu	15	5	-	-	-	-	-	-	-	-	-	-	-	-	-
	Gwangju	7	4	-	-	-	-	-	-	-	-	-	-	-	-	-
	Daejeon	82	33	2	2	-	-	-	1	1	-	-	-	-	-	-
	Ulsan	8	2	-	-	-	-	-	-	-	-	-	-	-	-	-
	Sejong	3	1	-	-	-	-	-	-	-	-	-	-	-	-	-
	Gyeonggi	340	125	15	5	2	2	-	1	-	1	1	-	-	-	-
	Gangwon	44	24	4	3	-	2	1	-	-	8	-	-	5	2	1
	Chungbuk	91	31	6	3	-	-	1	1	1	1	-	-	1	-	-
	Chungnam	44	14	3	-	-	-	-	-	-	-	-	-	-	-	-
	Jeonbuk	35	9	4	-	-	-	-	-	-	-	-	-	-	-	-
	Jeonnam	36	10	-	-	-	-	-	-	-	-	-	-	-	-	-
	Gyeongbuk	22	4	-	-	-	-	-	-	-	-	-	-	-	-	-
	Gyeongnam	25	8	-	-	-	-	-	-	-	-	-	-	-	-	-
	Jeju	9	4	-	-	-	-	-	-	-	-	-	-	-	-	-

Classification		No. of Companies	With Cooperative Relationship	No. of Respondents (Technical Tie-Up)	Domestic (Middle-standing Companies)						Overseas (Middle-standing Companies)					
					Total	Basic Research	Experimental	Prototype	Product Development	Commercialization	Total	Basic Research	Experimental	Prototype	Product Development	Commercialization
Total		**1,027**	**363**	**44**	**4**	**-**	**1**	**1**	**2**	**-**	**-**	**-**	**-**	**-**	**-**	**-**
Core Industries	Biopharmaceutical	326	129	23	3	-	-	1	2	-	-	-	-	-	-	-
	Biochemical and Bioenergy	191	53	5	-	-	-	-	-	-	-	-	-	-	-	-
	Biofood	170	54	4	-	-	-	-	-	-	-	-	-	-	-	-
	Bioenvironmental	64	19	2	-	-	-	-	-	-	-	-	-	-	-	-
	Biomedical Equipment	96	37	5	-	-	-	-	-	-	-	-	-	-	-	-
	Bioinstrument and Bioequipment	62	18	-	-	-	-	-	-	-	-	-	-	-	-	-
	Bioresource	15	6	-	-	-	-	-	-	-	-	-	-	-	-	-
	Bioservice	103	47	5	1	-	1	-	-	-	-	-	-	-	-	-
Total Number of Workers	1 – 49	634	206	22	-	-	-	-	-	-	-	-	-	-	-	-
	50 – 299	276	107	10	2	-	1	1	-	-	-	-	-	-	-	-
	300 – 999	79	30	8	-	-	-	-	-	-	-	-	-	-	-	-
	1,000 or more	34	18	3	2	-	-	-	2	-	-	-	-	-	-	-
	Unknown	4	2	1	-	-	-	-	-	-	-	-	-	-	-	-
By Area	Seoul	229	78	9	1	-	1	-	-	-	-	-	-	-	-	-
	Busan	15	4	-	-	-	-	-	-	-	-	-	-	-	-	-
	Incheon	22	7	1	-	-	-	-	-	-	-	-	-	-	-	-
	Daegu	15	5	-	-	-	-	-	-	-	-	-	-	-	-	-
	Gwangju	7	4	-	-	-	-	-	-	-	-	-	-	-	-	-
	Daejeon	82	33	2	-	-	-	-	-	-	-	-	-	-	-	-
	Ulsan	8	2	-	-	-	-	-	-	-	-	-	-	-	-	-
	Sejong	3	1	-	-	-	-	-	-	-	-	-	-	-	-	-
	Gyeonggi	340	125	15	1	-	-	1	-	-	-	-	-	-	-	-
	Gangwon	44	24	4	-	-	-	-	-	-	-	-	-	-	-	-
	Chungbuk	91	31	6	2	-	-	-	2	-	-	-	-	-	-	-
	Chungnam	44	14	3	-	-	-	-	-	-	-	-	-	-	-	-
	Jeonbuk	35	9	4	-	-	-	-	-	-	-	-	-	-	-	-
	Jeonnam	36	10	-	-	-	-	-	-	-	-	-	-	-	-	-
	Gyeongbuk	22	4	-	-	-	-	-	-	-	-	-	-	-	-	-
	Gyeongnam	25	8	-	-	-	-	-	-	-	-	-	-	-	-	-
	Jeju	9	4	-	-	-	-	-	-	-	-	-	-	-	-	-

Classification		No. of Companies	With Cooperative Relationship	No. of Respondents (Technical Tie-Up)	Domestic (Large Enterprises)						Overseas (Large Enterprises)					
					Total	Basic Research	Experimental	Prototype	Product Development	Commercialization	Total	Basic Research	Experimental	Prototype	Product Development	Commercialization
Total		**1,027**	**363**	**44**	**5**	**1**	**4**	**-**	**-**	**-**	**2**	**-**	**-**	**2**	**-**	**-**
Core Industries	Biopharmaceutical	326	129	23	3	1	2	-	-	-	2	-	-	2	-	-
	Biochemical and Bioenergy	191	53	5	-	-	-	-	-	-	-	-	-	-	-	-
	Biofood	170	54	4	-	-	-	-	-	-	-	-	-	-	-	-
	Bioenvironmental	64	19	2	-	-	-	-	-	-	-	-	-	-	-	-
	Biomedical Equipment	96	37	5	2	-	2	-	-	-	-	-	-	-	-	-
	Bioinstrument and Bioequipment	62	18	-	-	-	-	-	-	-	-	-	-	-	-	-
	Bioresource	15	6	-	-	-	-	-	-	-	-	-	-	-	-	-
	Bioservice	103	47	5	-	-	-	-	-	-	-	-	-	-	-	-
Total Number of Workers	1 – 49	634	206	22	4	1	3	-	-	-	-	-	-	-	-	-
	50 – 299	276	107	10	-	-	-	-	-	-	-	-	-	-	-	-
	300 – 999	79	30	8	1	-	1	-	-	-	-	-	-	-	-	-
	1,000 or more	34	18	3	-	-	-	-	-	-	2	-	-	2	-	-
	Unknown	4	2	1	-	-	-	-	-	-	-	-	-	-	-	-
By Area	Seoul	229	78	9	-	-	-	-	-	-	-	-	-	-	-	-
	Busan	15	4	-	-	-	-	-	-	-	-	-	-	-	-	-
	Incheon	22	7	1	-	-	-	-	-	-	-	-	-	-	-	-
	Daegu	15	5	-	-	-	-	-	-	-	-	-	-	-	-	-
	Gwangju	7	4	-	-	-	-	-	-	-	-	-	-	-	-	-
	Daejeon	82	33	2	-	-	-	-	-	-	-	-	-	-	-	-
	Ulsan	8	2	-	-	-	-	-	-	-	-	-	-	-	-	-
	Sejong	3	1	-	-	-	-	-	-	-	-	-	-	-	-	-
	Gyeonggi	340	125	15	1	-	1	-	-	-	2	-	-	2	-	-
	Gangwon	44	24	4	-	-	-	-	-	-	-	-	-	-	-	-
	Chungbuk	91	31	6	1	-	1	-	-	-	-	-	-	-	-	-
	Chungnam	44	14	3	-	-	-	-	-	-	-	-	-	-	-	-
	Jeonbuk	35	9	4	3	1	2	-	-	-	-	-	-	-	-	-
	Jeonnam	36	10	-	-	-	-	-	-	-	-	-	-	-	-	-
	Gyeongbuk	22	4	-	-	-	-	-	-	-	-	-	-	-	-	-
	Gyeongnam	25	8	-	-	-	-	-	-	-	-	-	-	-	-	-
	Jeju	9	4	-	-	-	-	-	-	-	-	-	-	-	-	-

Classification		No. of Companies	With Cooperative Relationship	No. of Respondents (Technical Tie-Up)	Domestic (Government-funded)						Overseas (Government-funded)					
					Total	Basic Research	Experimental	Prototype	Product Development	Commercialization	Total	Basic Research	Experimental	Prototype	Product Development	Commercialization
Total		**1,027**	**363**	**44**	**16**	**3**	**4**	**4**	**2**	**3**	**1**	**-**	**-**	**-**	**-**	**1**
Core Industries	Biopharmaceutical	326	129	23	4	2	1	1	-	-	-	-	-	-	-	-
	Biochemical and Bioenergy	191	53	5	2	-	1	1	-	-	-	-	-	-	-	-
	Biofood	170	54	4	3	1	1	-	1	-	-	-	-	-	-	-
	Bioenvironmental	64	19	2	2	-	-	-	-	2	-	-	-	-	-	-
	Biomedical Equipment	96	37	5	4	-	-	2	1	1	-	-	-	-	-	-
	Bioinstrument and Bioequipment	62	18	-	-	-	-	-	-	-	-	-	-	-	-	-
	Bioresource	15	6	-	-	-	-	-	-	-	-	-	-	-	-	-
	Bioservice	103	47	5	1	-	1	-	-	-	1	-	-	-	-	1
Total Number of Workers	1 – 49	634	206	22	7	1	3	1	-	2	-	-	-	-	-	-
	50 – 299	276	107	10	6	1	1	3	1	-	-	-	-	-	-	-
	300 – 999	79	30	8	2	1	-	-	-	1	1	-	-	-	-	1
	1,000 or more	34	18	3	-	-	-	-	-	-	-	-	-	-	-	-
	Unknown	4	2	1	1	-	-	-	1	-	-	-	-	-	-	-
By Area	Seoul	229	78	9	2	-	-	-	-	2	1	-	-	-	-	1
	Busan	15	4	-	-	-	-	-	-	-	-	-	-	-	-	-
	Incheon	22	7	1	2	-	1	1	-	-	-	-	-	-	-	-
	Daegu	15	5	-	-	-	-	-	-	-	-	-	-	-	-	-
	Gwangju	7	4	-	-	-	-	-	-	-	-	-	-	-	-	-
	Daejeon	82	33	2	1	1	-	-	-	-	-	-	-	-	-	-
	Ulsan	8	2	-	-	-	-	-	-	-	-	-	-	-	-	-
	Sejong	3	1	-	-	-	-	-	-	-	-	-	-	-	-	-
	Gyeonggi	340	125	15	2	1	-	1	-	-	-	-	-	-	-	-
	Gangwon	44	24	4	2	-	1	1	-	-	-	-	-	-	-	-
	Chungbuk	91	31	6	4	-	1	1	1	1	-	-	-	-	-	-
	Chungnam	44	14	3	1	-	-	-	1	-	-	-	-	-	-	-
	Jeonbuk	35	9	4	2	1	1	-	-	-	-	-	-	-	-	-
	Jeonnam	36	10	-	-	-	-	-	-	-	-	-	-	-	-	-
	Gyeongbuk	22	4	-	-	-	-	-	-	-	-	-	-	-	-	-
	Gyeongnam	25	8	-	-	-	-	-	-	-	-	-	-	-	-	-
	Jeju	9	4	-	-	-	-	-	-	-	-	-	-	-	-	-

Classification		No. of Companies	With Cooperative Relationship	No. of Respondents (Technical Tie-Up)	Domestic (Private Research)						Overseas (Private Research)					
					Total	Basic Research	Experimental	Prototype	Product Development	Commercialization	Total	Basic Research	Experimental	Prototype	Product Development	Commercialization
Total		**1,027**	**363**	**44**	**5**	**3**	**2**	-	-	-	-	-	-	-	-	-
Core Industries	Biopharmaceutical	326	129	23	5	3	2	-	-	-	-	-	-	-	-	-
	Biochemical and Bioenergy	191	53	5	-	-	-	-	-	-	-	-	-	-	-	-
	Biofood	170	54	4	-	-	-	-	-	-	-	-	-	-	-	-
	Bioenvironmental	64	19	2	-	-	-	-	-	-	-	-	-	-	-	-
	Biomedical Equipment	96	37	5	-	-	-	-	-	-	-	-	-	-	-	-
	Bioinstrument and Bioequipment	62	18	-	-	-	-	-	-	-	-	-	-	-	-	-
	Bioresource	15	6	-	-	-	-	-	-	-	-	-	-	-	-	-
	Bioservice	103	47	5	-	-	-	-	-	-	-	-	-	-	-	-
Total Number of Workers	1 – 49	634	206	22	5	3	2	-	-	-	-	-	-	-	-	-
	50 – 299	276	107	10	-	-	-	-	-	-	-	-	-	-	-	-
	300 – 999	79	30	8	-	-	-	-	-	-	-	-	-	-	-	-
	1,000 or more	34	18	3	-	-	-	-	-	-	-	-	-	-	-	-
	Unknown	4	2	1	-	-	-	-	-	-	-	-	-	-	-	-
By Area	Seoul	229	78	9	3	1	2	-	-	-	-	-	-	-	-	-
	Busan	15	4	-	-	-	-	-	-	-	-	-	-	-	-	-
	Incheon	22	7	1	-	-	-	-	-	-	-	-	-	-	-	-
	Daegu	15	5	-	-	-	-	-	-	-	-	-	-	-	-	-
	Gwangju	7	4	-	-	-	-	-	-	-	-	-	-	-	-	-
	Daejeon	82	33	2	-	-	-	-	-	-	-	-	-	-	-	-
	Ulsan	8	2	-	-	-	-	-	-	-	-	-	-	-	-	-
	Sejong	3	1	-	-	-	-	-	-	-	-	-	-	-	-	-
	Gyeonggi	340	125	15	2	2	-	-	-	-	-	-	-	-	-	-
	Gangwon	44	24	4	-	-	-	-	-	-	-	-	-	-	-	-
	Chungbuk	91	31	6	-	-	-	-	-	-	-	-	-	-	-	-
	Chungnam	44	14	3	-	-	-	-	-	-	-	-	-	-	-	-
	Jeonbuk	35	9	4	-	-	-	-	-	-	-	-	-	-	-	-
	Jeonnam	36	10	-	-	-	-	-	-	-	-	-	-	-	-	-
	Gyeongbuk	22	4	-	-	-	-	-	-	-	-	-	-	-	-	-
	Gyeongnam	25	8	-	-	-	-	-	-	-	-	-	-	-	-	-
	Jeju	9	4	-	-	-	-	-	-	-	-	-	-	-	-	-

Classification		No. of Companies	With Cooperative Relationship	No. of Respondents (Technical Tie-Up)	Domestic (Universities)						Overseas (Universities)					
					Total	Basic Research	Experimental	Prototype	Product Development	Commercialization	Total	Basic Research	Experimental	Prototype	Product Development	Commercialization
Total		**1,027**	**363**	**44**	**29**	**5**	**7**	**9**	**5**	**3**	-	-	-	-	-	-
Core Industries	Biopharmaceutical	326	129	23	16	2	5	6	3	-	-	-	-	-	-	-
	Biochemical and Bioenergy	191	53	5	4	2	1	1	-	-	-	-	-	-	-	-
	Biofood	170	54	4	1	1	-	-	-	-	-	-	-	-	-	-
	Bioenvironmental	64	19	2	1	-	-	-	-	1	-	-	-	-	-	-
	Biomedical Equipment	96	37	5	5	-	1	2	1	1	-	-	-	-	-	-
	Bioinstrument and Bioequipment	62	18	-	-	-	-	-	-	-	-	-	-	-	-	-
	Bioresource	15	6	-	-	-	-	-	-	-	-	-	-	-	-	-
	Bioservice	103	47	5	2	-	-	-	1	1	-	-	-	-	-	-
Total Number of Workers	1 – 49	634	206	22	11	3	4	2	1	1	-	-	-	-	-	-
	50 – 299	276	107	10	12	1	1	6	4	-	-	-	-	-	-	-
	300 – 999	79	30	8	6	1	2	1	-	2	-	-	-	-	-	-
	1,000 or more	34	18	3	-	-	-	-	-	-	-	-	-	-	-	-
	Unknown	4	2	1	-	-	-	-	-	-	-	-	-	-	-	-
By Area	Seoul	229	78	9	4	-	2	1	-	1	-	-	-	-	-	-
	Busan	15	4	-	-	-	-	-	-	-	-	-	-	-	-	-
	Incheon	22	7	1	2	-	1	1	-	-	-	-	-	-	-	-
	Daegu	15	5	-	-	-	-	-	-	-	-	-	-	-	-	-
	Gwangju	7	4	-	-	-	-	-	-	-	-	-	-	-	-	-
	Daejeon	82	33	2	-	-	-	-	-	-	-	-	-	-	-	-
	Ulsan	8	2	-	-	-	-	-	-	-	-	-	-	-	-	-
	Sejong	3	1	-	-	-	-	-	-	-	-	-	-	-	-	-
	Gyeonggi	340	125	15	13	2	2	5	3	1	-	-	-	-	-	-
	Gangwon	44	24	4	2	-	1	1	-	-	-	-	-	-	-	-
	Chungbuk	91	31	6	5	1	1	1	1	1	-	-	-	-	-	-
	Chungnam	44	14	3	2	2	-	-	-	-	-	-	-	-	-	-
	Jeonbuk	35	9	4	1	-	-	-	1	-	-	-	-	-	-	-
	Jeonnam	36	10	-	-	-	-	-	-	-	-	-	-	-	-	-
	Gyeongbuk	22	4	-	-	-	-	-	-	-	-	-	-	-	-	-
	Gyeongnam	25	8	-	-	-	-	-	-	-	-	-	-	-	-	-
	Jeju	9	4	-	-	-	-	-	-	-	-	-	-	-	-	-

Classification		No. of Companies	With Cooperative Relationship	No. of Respondents (Technical Tie-Up)	Domestic (Medical Institutions)						Overseas (Medical Institutions)					
					Total	Basic Research	Experimental	Prototype	Product Development	Commercialization	Total	Basic Research	Experimental	Prototype	Product Development	Commercialization
Total		**1,027**	**363**	**44**	**5**	**-**	**4**	**1**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**
Core Industries	Biopharmaceutical	326	129	23	-	-	-	-	-	-	-	-	-	-	-	-
	Biochemical and Bioenergy	191	53	5	-	-	-	-	-	-	-	-	-	-	-	-
	Biofood	170	54	4	-	-	-	-	-	-	-	-	-	-	-	-
	Bioenvironmental	64	19	2	-	-	-	-	-	-	-	-	-	-	-	-
	Biomedical Equipment	96	37	5	5	-	4	1	-	-	-	-	-	-	-	-
	Bioinstrument and Bioequipment	62	18	-	-	-	-	-	-	-	-	-	-	-	-	-
	Bioresource	15	6	-	-	-	-	-	-	-	-	-	-	-	-	-
	Bioservice	103	47	5	-	-	-	-	-	-	-	-	-	-	-	-
Total Number of Workers	1 – 49	634	206	22	-	-	-	-	-	-	-	-	-	-	-	-
	50 – 299	276	107	10	5	-	4	1	-	-	-	-	-	-	-	-
	300 – 999	79	30	8	-	-	-	-	-	-	-	-	-	-	-	-
	1,000 or more	34	18	3	-	-	-	-	-	-	-	-	-	-	-	-
	Unknown	4	2	1	-	-	-	-	-	-	-	-	-	-	-	-
By Area	Seoul	229	78	9	-	-	-	-	-	-	-	-	-	-	-	-
	Busan	15	4	-	-	-	-	-	-	-	-	-	-	-	-	-
	Incheon	22	7	1	-	-	-	-	-	-	-	-	-	-	-	-
	Daegu	15	5	-	-	-	-	-	-	-	-	-	-	-	-	-
	Gwangju	7	4	-	-	-	-	-	-	-	-	-	-	-	-	-
	Daejeon	82	33	2	-	-	-	-	-	-	-	-	-	-	-	-
	Ulsan	8	2	-	-	-	-	-	-	-	-	-	-	-	-	-
	Sejong	3	1	-	-	-	-	-	-	-	-	-	-	-	-	-
	Gyeonggi	340	125	15	1	-	-	1	-	-	-	-	-	-	-	-
	Gangwon	44	24	4	-	-	-	-	-	-	-	-	-	-	-	-
	Chungbuk	91	31	6	4	-	4	-	-	-	-	-	-	-	-	-
	Chungnam	44	14	3	-	-	-	-	-	-	-	-	-	-	-	-
	Jeonbuk	35	9	4	-	-	-	-	-	-	-	-	-	-	-	-
	Jeonnam	36	10	-	-	-	-	-	-	-	-	-	-	-	-	-
	Gyeongbuk	22	4	-	-	-	-	-	-	-	-	-	-	-	-	-
	Gyeongnam	25	8	-	-	-	-	-	-	-	-	-	-	-	-	-
	Jeju	9	4	-	-	-	-	-	-	-	-	-	-	-	-	-

<Table 4-5> Status of Domestic/International Technical Manpower Exchange Cooperation (Unit: cases)

Classification		No. of Companies	With Cooperative Relationship	No. of Respondents (Technical Manpower Exchange)	Domestic					
					Total	Basic Research	Experimental	Prototype	Product Development	Commercialization
Total		**1,027**	**363**	**12**	**39**	**16**	**10**	**7**	**4**	**2**
Core Industries	Biopharmaceutical	326	129	4	5	3	1	1	-	-
	Biochemical and Bioenergy	191	53	3	16	1	6	4	4	1
	Biofood	170	54	1	2	-	1	1	-	-
	Bioenvironmental	64	19	-	-	-	-	-	-	-
	Biomedical Equipment	96	37	2	4	1	2	-	-	1
	Bioinstrument and Bioequipment	62	18	-	-	-	-	-	-	-
	Bioresource	15	6	-	-	-	-	-	-	-
	Bioservice	103	47	2	12	11	-	1	-	-
Total Number of Workers	1 – 49	634	206	4	17	12	3	1	-	1
	50 – 299	276	107	5	8	4	2	2	-	-
	300 – 999	79	30	2	2	-	1	-	-	1
	1,000 or more	34	18	1	12	-	4	4	4	-
	Unknown	4	2	-	-	-	-	-	-	-
By Area	Seoul	229	78	2	12	12	-	-	-	-
	Busan	15	4	1	2	-	1	1	-	-
	Incheon	22	7	-	-	-	-	-	-	-
	Daegu	15	5	-	-	-	-	-	-	-
	Gwangju	7	4	-	-	-	-	-	-	-
	Daejeon	82	33	3	16	1	6	4	4	1
	Ulsan	8	2	-	-	-	-	-	-	-
	Sejong	3	1	-	-	-	-	-	-	-
	Gyeonggi	340	125	4	5	2	1	2	-	-
	Gangwon	44	24	1	3	1	2	-	-	-
	Chungbuk	91	31	1	1	-	-	-	-	1
	Chungnam	44	14	-	-	-	-	-	-	-
	Jeonbuk	35	9	-	-	-	-	-	-	-
	Jeonnam	36	10	-	-	-	-	-	-	-
	Gyeongbuk	22	4	-	-	-	-	-	-	-
	Gyeongnam	25	8	-	-	-	-	-	-	-
	Jeju	9	4	-	-	-	-	-	-	-

Classification		No. of Companies	With Cooperative Relationship	No. of Respondents (Technical Manpower Exchange)	Overseas					
					Total	Basic Research	Experimental	Prototype	Product Development	Commercialization
Total		**1,027**	**363**	**12**	**1**	**-**	**1**	**-**	**-**	**-**
Core Industries	Biopharmaceutical	326	129	4	1	-	1	-	-	-
	Biochemical and Bioenergy	191	53	3	-	-	-	-	-	-
	Biofood	170	54	1	-	-	-	-	-	-
	Bioenvironmental	64	19	-	-	-	-	-	-	-
	Biomedical Equipment	96	37	2	-	-	-	-	-	-
	Bioinstrument and Bioequipment	62	18	-	-	-	-	-	-	-
	Bioresource	15	6	-	-	-	-	-	-	-
	Bioservice	103	47	2	-	-	-	-	-	-
Total Number of Workers	1 – 49	634	206	4	-	-	-	-	-	-
	50 – 299	276	107	5	-	-	-	-	-	-
	300 – 999	79	30	2	1	-	1	-	-	-
	1,000 or more	34	18	1	-	-	-	-	-	-
	Unknown	4	2	-	-	-	-	-	-	-
By Area	Seoul	229	78	2	-	-	-	-	-	-
	Busan	15	4	1	-	-	-	-	-	-
	Incheon	22	7	-	-	-	-	-	-	-
	Daegu	15	5	-	-	-	-	-	-	-
	Gwangju	7	4	-	-	-	-	-	-	-
	Daejeon	82	33	3	-	-	-	-	-	-
	Ulsan	8	2	-	-	-	-	-	-	-
	Sejong	3	1	-	-	-	-	-	-	-
	Gyeonggi	340	125	4	1	-	1	-	-	-
	Gangwon	44	24	1	-	-	-	-	-	-
	Chungbuk	91	31	1	-	-	-	-	-	-
	Chungnam	44	14	-	-	-	-	-	-	-
	Jeonbuk	35	9	-	-	-	-	-	-	-
	Jeonnam	36	10	-	-	-	-	-	-	-
	Gyeongbuk	22	4	-	-	-	-	-	-	-
	Gyeongnam	25	8	-	-	-	-	-	-	-
	Jeju	9	4	-	-	-	-	-	-	-

Classification		No. of Companies	With Cooperative Relationship	No. of Respondents (Technical Manpower Exchange)	Domestic (SMEs / Ventures)						Overseas (SMEs / Ventures)					
					Total	Basic Research	Experimental	Prototype	Product Development	Commercialization	Total	Basic Research	Experimental	Prototype	Product Development	Commercialization
Total		**1,027**	**363**	**12**	**3**	**1**	**1**	**-**	**-**	**1**	**-**	**-**	**-**	**-**	**-**	**-**
Core Industries	Biopharmaceutical	326	129	4	-	-	-	-	-	-	-	-	-	-	-	-
	Biochemical and Bioenergy	191	53	3	1	-	-	-	-	1	-	-	-	-	-	-
	Biofood	170	54	1	-	-	-	-	-	-	-	-	-	-	-	-
	Bioenvironmental	64	19	-	-	-	-	-	-	-	-	-	-	-	-	-
	Biomedical Equipment	96	37	2	2	1	1	-	-	-	-	-	-	-	-	-
	Bioinstrument and Bioequipment	62	18	-	-	-	-	-	-	-	-	-	-	-	-	-
	Bioresource	15	6	-	-	-	-	-	-	-	-	-	-	-	-	-
	Bioservice	103	47	2	-	-	-	-	-	-	-	-	-	-	-	-
Total Number of Workers	1 – 49	634	206	4	1	-	-	-	-	1	-	-	-	-	-	-
	50 – 299	276	107	5	2	1	1	-	-	-	-	-	-	-	-	-
	300 – 999	79	30	2	-	-	-	-	-	-	-	-	-	-	-	-
	1,000 or more	34	18	1	-	-	-	-	-	-	-	-	-	-	-	-
	Unknown	4	2	-	-	-	-	-	-	-	-	-	-	-	-	-
By Area	Seoul	229	78	2	-	-	-	-	-	-	-	-	-	-	-	-
	Busan	15	4	1	-	-	-	-	-	-	-	-	-	-	-	-
	Incheon	22	7	-	-	-	-	-	-	-	-	-	-	-	-	-
	Daegu	15	5	-	-	-	-	-	-	-	-	-	-	-	-	-
	Gwangju	7	4	-	-	-	-	-	-	-	-	-	-	-	-	-
	Daejeon	82	33	3	1	-	-	-	-	1	-	-	-	-	-	-
	Ulsan	8	2	-	-	-	-	-	-	-	-	-	-	-	-	-
	Sejong	3	1	-	-	-	-	-	-	-	-	-	-	-	-	-
	Gyeonggi	340	125	4	-	-	-	-	-	-	-	-	-	-	-	-
	Gangwon	44	24	1	2	1	1	-	-	-	-	-	-	-	-	-
	Chungbuk	91	31	1	-	-	-	-	-	-	-	-	-	-	-	-
	Chungnam	44	14	-	-	-	-	-	-	-	-	-	-	-	-	-
	Jeonbuk	35	9	-	-	-	-	-	-	-	-	-	-	-	-	-
	Jeonnam	36	10	-	-	-	-	-	-	-	-	-	-	-	-	-
	Gyeongbuk	22	4	-	-	-	-	-	-	-	-	-	-	-	-	-
	Gyeongnam	25	8	-	-	-	-	-	-	-	-	-	-	-	-	-
	Jeju	9	4	-	-	-	-	-	-	-	-	-	-	-	-	-

Classification		No. of Companies	With Cooperative Relationship	No. of Respondents (Technical Manpower Exchange)	Domestic (Middle-standing Companies)						Overseas (Middle-standing Companies)					
					Total	Basic Research	Experimental	Prototype	Product Development	Commercialization	Total	Basic Research	Experimental	Prototype	Product Development	Commercialization
Total		**1,027**	**363**	**12**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	-
Core Industries	Biopharmaceutical	326	129	4	-	-	-	-	-	-	-	-	-	-	-	-
	Biochemical and Bioenergy	191	53	3	-	-	-	-	-	-	-	-	-	-	-	-
	Biofood	170	54	1	-	-	-	-	-	-	-	-	-	-	-	-
	Bioenvironmental	64	19	-	-	-	-	-	-	-	-	-	-	-	-	-
	Biomedical Equipment	96	37	2	-	-	-	-	-	-	-	-	-	-	-	-
	Bioinstrument and Bioequipment	62	18	-	-	-	-	-	-	-	-	-	-	-	-	-
	Bioresource	15	6	-	-	-	-	-	-	-	-	-	-	-	-	-
	Bioservice	103	47	2	-	-	-	-	-	-	-	-	-	-	-	-
Total Number of Workers	1 – 49	634	206	4	-	-	-	-	-	-	-	-	-	-	-	-
	50 – 299	276	107	5	-	-	-	-	-	-	-	-	-	-	-	-
	300 – 999	79	30	2	-	-	-	-	-	-	-	-	-	-	-	-
	1,000 or more	34	18	1	-	-	-	-	-	-	-	-	-	-	-	-
	Unknown	4	2	-	-	-	-	-	-	-	-	-	-	-	-	-
By Area	Seoul	229	78	2	-	-	-	-	-	-	-	-	-	-	-	-
	Busan	15	4	1	-	-	-	-	-	-	-	-	-	-	-	-
	Incheon	22	7	-	-	-	-	-	-	-	-	-	-	-	-	-
	Daegu	15	5	-	-	-	-	-	-	-	-	-	-	-	-	-
	Gwangju	7	4	-	-	-	-	-	-	-	-	-	-	-	-	-
	Daejeon	82	33	3	-	-	-	-	-	-	-	-	-	-	-	-
	Ulsan	8	2	-	-	-	-	-	-	-	-	-	-	-	-	-
	Sejong	3	1	-	-	-	-	-	-	-	-	-	-	-	-	-
	Gyeonggi	340	125	4	-	-	-	-	-	-	-	-	-	-	-	-
	Gangwon	44	24	1	-	-	-	-	-	-	-	-	-	-	-	-
	Chungbuk	91	31	1	-	-	-	-	-	-	-	-	-	-	-	-
	Chungnam	44	14	-	-	-	-	-	-	-	-	-	-	-	-	-
	Jeonbuk	35	9	-	-	-	-	-	-	-	-	-	-	-	-	-
	Jeonnam	36	10	-	-	-	-	-	-	-	-	-	-	-	-	-
	Gyeongbuk	22	4	-	-	-	-	-	-	-	-	-	-	-	-	-
	Gyeongnam	25	8	-	-	-	-	-	-	-	-	-	-	-	-	-
	Jeju	9	4	-	-	-	-	-	-	-	-	-	-	-	-	-

Classification		No. of Companies	With Cooperative Relationship	No. of Respondents (Technical Manpower Exchange)	Domestic (Large Enterprises)						Overseas (Large Enterprises)					
					Total	Basic Research	Experimental	Prototype	Product Development	Commercialization	Total	Basic Research	Experimental	Prototype	Product Development	Commercialization
Total		**1,027**	**363**	**12**	-	-	-	-	-	-	-	-	-	-	-	-
Core Industries	Biopharmaceutical	326	129	4	-	-	-	-	-	-	-	-	-	-	-	-
	Biochemical and Bioenergy	191	53	3	-	-	-	-	-	-	-	-	-	-	-	-
	Biofood	170	54	1	-	-	-	-	-	-	-	-	-	-	-	-
	Bioenvironmental	64	19	-	-	-	-	-	-	-	-	-	-	-	-	-
	Biomedical Equipment	96	37	2	-	-	-	-	-	-	-	-	-	-	-	-
	Bioinstrument and Bioequipment	62	18	-	-	-	-	-	-	-	-	-	-	-	-	-
	Bioresource	15	6	-	-	-	-	-	-	-	-	-	-	-	-	-
	Bioservice	103	47	2	-	-	-	-	-	-	-	-	-	-	-	-
Total Number of Workers	1 – 49	634	206	4	-	-	-	-	-	-	-	-	-	-	-	-
	50 – 299	276	107	5	-	-	-	-	-	-	-	-	-	-	-	-
	300 – 999	79	30	2	-	-	-	-	-	-	-	-	-	-	-	-
	1,000 or more	34	18	1	-	-	-	-	-	-	-	-	-	-	-	-
	Unknown	4	2	-	-	-	-	-	-	-	-	-	-	-	-	-
By Area	Seoul	229	78	2	-	-	-	-	-	-	-	-	-	-	-	-
	Busan	15	4	1	-	-	-	-	-	-	-	-	-	-	-	-
	Incheon	22	7	-	-	-	-	-	-	-	-	-	-	-	-	-
	Daegu	15	5	-	-	-	-	-	-	-	-	-	-	-	-	-
	Gwangju	7	4	-	-	-	-	-	-	-	-	-	-	-	-	-
	Daejeon	82	33	3	-	-	-	-	-	-	-	-	-	-	-	-
	Ulsan	8	2	-	-	-	-	-	-	-	-	-	-	-	-	-
	Sejong	3	1	-	-	-	-	-	-	-	-	-	-	-	-	-
	Gyeonggi	340	125	4	-	-	-	-	-	-	-	-	-	-	-	-
	Gangwon	44	24	1	-	-	-	-	-	-	-	-	-	-	-	-
	Chungbuk	91	31	1	-	-	-	-	-	-	-	-	-	-	-	-
	Chungnam	44	14	-	-	-	-	-	-	-	-	-	-	-	-	-
	Jeonbuk	35	9	-	-	-	-	-	-	-	-	-	-	-	-	-
	Jeonnam	36	10	-	-	-	-	-	-	-	-	-	-	-	-	-
	Gyeongbuk	22	4	-	-	-	-	-	-	-	-	-	-	-	-	-
	Gyeongnam	25	8	-	-	-	-	-	-	-	-	-	-	-	-	-
	Jeju	9	4	-	-	-	-	-	-	-	-	-	-	-	-	-

Classification		No. of Companies	With Cooperative Relationship	No. of Respondents (Technical Manpower Exchange)	Domestic (Government-funded)						Overseas (Government-funded)					
					Total	Basic Research	Experimental	Prototype	Product Development	Commercialization	Total	Basic Research	Experimental	Prototype	Product Development	Commercialization
Total		**1,027**	**363**	**12**	**12**	**3**	**4**	**2**	**2**	**1**	-	-	-	-	-	-
Core Industries	Biopharmaceutical	326	129	4	1	1	-	-	-	-	-	-	-	-	-	-
	Biochemical and Bioenergy	191	53	3	8	-	4	2	2	-	-	-	-	-	-	-
	Biofood	170	54	1	-	-	-	-	-	-	-	-	-	-	-	-
	Bioenvironmental	64	19	-	-	-	-	-	-	-	-	-	-	-	-	-
	Biomedical Equipment	96	37	2	1	-	-	-	-	1	-	-	-	-	-	-
	Bioinstrument and Bioequipment	62	18	-	-	-	-	-	-	-	-	-	-	-	-	-
	Bioresource	15	6	-	-	-	-	-	-	-	-	-	-	-	-	-
	Bioservice	103	47	2	2	2	-	-	-	-	-	-	-	-	-	-
Total Number of Workers	1 – 49	634	206	4	4	2	2	-	-	-	-	-	-	-	-	-
	50 – 299	276	107	5	1	1	-	-	-	-	-	-	-	-	-	-
	300 – 999	79	30	2	1	-	-	-	-	1	-	-	-	-	-	-
	1,000 or more	34	18	1	6	-	2	2	2	-	-	-	-	-	-	-
	Unknown	4	2	-	-	-	-	-	-	-	-	-	-	-	-	-
By Area	Seoul	229	78	2	2	2	-	-	-	-	-	-	-	-	-	-
	Busan	15	4	1	-	-	-	-	-	-	-	-	-	-	-	-
	Incheon	22	7	-	-	-	-	-	-	-	-	-	-	-	-	-
	Daegu	15	5	-	-	-	-	-	-	-	-	-	-	-	-	-
	Gwangju	7	4	-	-	-	-	-	-	-	-	-	-	-	-	-
	Daejeon	82	33	3	8	-	4	2	2	-	-	-	-	-	-	-
	Ulsan	8	2	-	-	-	-	-	-	-	-	-	-	-	-	-
	Sejong	3	1	-	-	-	-	-	-	-	-	-	-	-	-	-
	Gyeonggi	340	125	4	1	1	-	-	-	-	-	-	-	-	-	-
	Gangwon	44	24	1	-	-	-	-	-	-	-	-	-	-	-	-
	Chungbuk	91	31	1	1	-	-	-	-	1	-	-	-	-	-	-
	Chungnam	44	14	-	-	-	-	-	-	-	-	-	-	-	-	-
	Jeonbuk	35	9	-	-	-	-	-	-	-	-	-	-	-	-	-
	Jeonnam	36	10	-	-	-	-	-	-	-	-	-	-	-	-	-
	Gyeongbuk	22	4	-	-	-	-	-	-	-	-	-	-	-	-	-
	Gyeongnam	25	8	-	-	-	-	-	-	-	-	-	-	-	-	-
	Jeju	9	4	-	-	-	-	-	-	-	-	-	-	-	-	-

Classification		No. of Companies	With Cooperative Relationship	No. of Respondents (Technical Manpower Exchange)	Domestic (Private Research)						Overseas (Private Research)					
					Total	Basic Research	Experimental	Prototype	Product Development	Commercialization	Total	Basic Research	Experimental	Prototype	Product Development	Commercialization
Total		**1,027**	**363**	**12**	**9**	**3**	**2**	**2**	**2**	-	-	-	-	-	-	-
Core Industries	Biopharmaceutical	326	129	4	-	-	-	-	-	-	-	-	-	-	-	-
	Biochemical and Bioenergy	191	53	3	6	-	2	2	2	-	-	-	-	-	-	-
	Biofood	170	54	1	-	-	-	-	-	-	-	-	-	-	-	-
	Bioenvironmental	64	19	-	-	-	-	-	-	-	-	-	-	-	-	-
	Biomedical Equipment	96	37	2	-	-	-	-	-	-	-	-	-	-	-	-
	Bioinstrument and Bioequipment	62	18	-	-	-	-	-	-	-	-	-	-	-	-	-
	Bioresource	15	6	-	-	-	-	-	-	-	-	-	-	-	-	-
	Bioservice	103	47	2	3	3	-	-	-	-	-	-	-	-	-	-
Total Number of Workers	1 – 49	634	206	4	3	3	-	-	-	-	-	-	-	-	-	-
	50 – 299	276	107	5	-	-	-	-	-	-	-	-	-	-	-	-
	300 – 999	79	30	2	-	-	-	-	-	-	-	-	-	-	-	-
	1,000 or more	34	18	1	6	-	2	2	2	-	-	-	-	-	-	-
	Unknown	4	2	-	-	-	-	-	-	-	-	-	-	-	-	-
By Area	Seoul	229	78	2	3	3	-	-	-	-	-	-	-	-	-	-
	Busan	15	4	1	-	-	-	-	-	-	-	-	-	-	-	-
	Incheon	22	7	-	-	-	-	-	-	-	-	-	-	-	-	-
	Daegu	15	5	-	-	-	-	-	-	-	-	-	-	-	-	-
	Gwangju	7	4	-	-	-	-	-	-	-	-	-	-	-	-	-
	Daejeon	82	33	3	6	-	2	2	2	-	-	-	-	-	-	-
	Ulsan	8	2	-	-	-	-	-	-	-	-	-	-	-	-	-
	Sejong	3	1	-	-	-	-	-	-	-	-	-	-	-	-	-
	Gyeonggi	340	125	4	-	-	-	-	-	-	-	-	-	-	-	-
	Gangwon	44	24	1	-	-	-	-	-	-	-	-	-	-	-	-
	Chungbuk	91	31	1	-	-	-	-	-	-	-	-	-	-	-	-
	Chungnam	44	14	-	-	-	-	-	-	-	-	-	-	-	-	-
	Jeonbuk	35	9	-	-	-	-	-	-	-	-	-	-	-	-	-
	Jeonnam	36	10	-	-	-	-	-	-	-	-	-	-	-	-	-
	Gyeongbuk	22	4	-	-	-	-	-	-	-	-	-	-	-	-	-
	Gyeongnam	25	8	-	-	-	-	-	-	-	-	-	-	-	-	-
	Jeju	9	4	-	-	-	-	-	-	-	-	-	-	-	-	-

Classification		No. of Companies	With Cooperative Relationship	No. of Respondents (Technical Manpower Exchange)	Domestic (Universities)						Overseas (Universities)					
					Total	Basic Research	Experimental	Prototype	Product Development	Commercialization	Total	Basic Research	Experimental	Prototype	Product Development	Commercialization
Total		**1,027**	**363**	**12**	**13**	**8**	**2**	**3**	-	-	**1**	-	**1**	-	-	-
Core Industries	Biopharmaceutical	326	129	4	4	2	1	1	-	-	1	-	1	-	-	-
	Biochemical and Bioenergy	191	53	3	1	1	-	-	-	-	-	-	-	-	-	-
	Biofood	170	54	1	2	-	1	1	-	-	-	-	-	-	-	-
	Bioenvironmental	64	19	-	-	-	-	-	-	-	-	-	-	-	-	-
	Biomedical Equipment	96	37	2	-	-	-	-	-	-	-	-	-	-	-	-
	Bioinstrument and Bioequipment	62	18	-	-	-	-	-	-	-	-	-	-	-	-	-
	Bioresource	15	6	-	-	-	-	-	-	-	-	-	-	-	-	-
	Bioservice	103	47	2	6	5	-	1	-	-	-	-	-	-	-	-
Total Number of Workers	1 – 49	634	206	4	8	6	1	1	-	-	-	-	-	-	-	-
	50 – 299	276	107	5	4	2	-	2	-	-	-	-	-	-	-	-
	300 – 999	79	30	2	1	-	1	-	-	-	1	-	1	-	-	-
	1,000 or more	34	18	1	-	-	-	-	-	-	-	-	-	-	-	-
	Unknown	4	2	-	-	-	-	-	-	-	-	-	-	-	-	-
By Area	Seoul	229	78	2	6	6	-	-	-	-	-	-	-	-	-	-
	Busan	15	4	1	2	-	1	1	-	-	-	-	-	-	-	-
	Incheon	22	7	-	-	-	-	-	-	-	-	-	-	-	-	-
	Daegu	15	5	-	-	-	-	-	-	-	-	-	-	-	-	-
	Gwangju	7	4	-	-	-	-	-	-	-	-	-	-	-	-	-
	Daejeon	82	33	3	1	1	-	-	-	-	-	-	-	-	-	-
	Ulsan	8	2	-	-	-	-	-	-	-	-	-	-	-	-	-
	Sejong	3	1	-	-	-	-	-	-	-	-	-	-	-	-	-
	Gyeonggi	340	125	4	4	1	1	2	-	-	1	-	1	-	-	-
	Gangwon	44	24	1	-	-	-	-	-	-	-	-	-	-	-	-
	Chungbuk	91	31	1	-	-	-	-	-	-	-	-	-	-	-	-
	Chungnam	44	14	-	-	-	-	-	-	-	-	-	-	-	-	-
	Jeonbuk	35	9	-	-	-	-	-	-	-	-	-	-	-	-	-
	Jeonnam	36	10	-	-	-	-	-	-	-	-	-	-	-	-	-
	Gyeongbuk	22	4	-	-	-	-	-	-	-	-	-	-	-	-	-
	Gyeongnam	25	8	-	-	-	-	-	-	-	-	-	-	-	-	-
	Jeju	9	4	-	-	-	-	-	-	-	-	-	-	-	-	-

Classification		No. of Companies	With Cooperative Relationship	No. of Respondents (Technical Manpower Exchange)	Domestic (Medical Institutions)						Overseas (Medical institutions)					
					Total	Basic Research	Experimental	Prototype	Product Development	Commercialization	Total	Basic Research	Experimental	Prototype	Product Development	Commercialization
Total		**1,027**	**363**	**12**	**2**	**1**	**1**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**
Core Industries	Biopharmaceutical	326	129	4	-	-	-	-	-	-	-	-	-	-	-	-
	Biochemical and Bioenergy	191	53	3	-	-	-	-	-	-	-	-	-	-	-	-
	Biofood	170	54	1	-	-	-	-	-	-	-	-	-	-	-	-
	Bioenvironmental	64	19	-	-	-	-	-	-	-	-	-	-	-	-	-
	Biomedical Equipment	96	37	2	1	-	1	-	-	-	-	-	-	-	-	-
	Bioinstrument and Bioequipment	62	18	-	-	-	-	-	-	-	-	-	-	-	-	-
	Bioresource	15	6	-	-	-	-	-	-	-	-	-	-	-	-	-
	Bioservice	103	47	2	1	1	-	-	-	-	-	-	-	-	-	-
Total Number of Workers	1 – 49	634	206	4	1	1	-	-	-	-	-	-	-	-	-	-
	50 – 299	276	107	5	1	-	1	-	-	-	-	-	-	-	-	-
	300 – 999	79	30	2	-	-	-	-	-	-	-	-	-	-	-	-
	1,000 or more	34	18	1	-	-	-	-	-	-	-	-	-	-	-	-
	Unknown	4	2	-	-	-	-	-	-	-	-	-	-	-	-	-
By Area	Seoul	229	78	2	1	1	-	-	-	-	-	-	-	-	-	-
	Busan	15	4	1	-	-	-	-	-	-	-	-	-	-	-	-
	Incheon	22	7	-	-	-	-	-	-	-	-	-	-	-	-	-
	Daegu	15	5	-	-	-	-	-	-	-	-	-	-	-	-	-
	Gwangju	7	4	-	-	-	-	-	-	-	-	-	-	-	-	-
	Daejeon	82	33	3	-	-	-	-	-	-	-	-	-	-	-	-
	Ulsan	8	2	-	-	-	-	-	-	-	-	-	-	-	-	-
	Sejong	3	1	-	-	-	-	-	-	-	-	-	-	-	-	-
	Gyeonggi	340	125	4	-	-	-	-	-	-	-	-	-	-	-	-
	Gangwon	44	24	1	1	-	1	-	-	-	-	-	-	-	-	-
	Chungbuk	91	31	1	-	-	-	-	-	-	-	-	-	-	-	-
	Chungnam	44	14	-	-	-	-	-	-	-	-	-	-	-	-	-
	Jeonbuk	35	9	-	-	-	-	-	-	-	-	-	-	-	-	-
	Jeonnam	36	10	-	-	-	-	-	-	-	-	-	-	-	-	-
	Gyeongbuk	22	4	-	-	-	-	-	-	-	-	-	-	-	-	-
	Gyeongnam	25	8	-	-	-	-	-	-	-	-	-	-	-	-	-
	Jeju	9	4	-	-	-	-	-	-	-	-	-	-	-	-	-

<Table 5> Size of Sales and Import in Bioindustry

<Table 5-1> Size of Domestic Sales and Export by Category Among Classification Scheme of Bioindustry (Unit: million KRW)

Industry / Category		No. of Respondents (Multiple Responses)	Domestic Sales	Export Amount	Total
			Total	Total	Total
Total		**1,196**	**7,476,541**	**10,015,805**	**17,492,346**
Industry with Sales Generated	Biopharmaceutical	191	1,810,940	3,251,919	5,062,859
	Biochemical and Bioenergy	265	1,794,145	318,243	2,112,388
	Biofood	271	1,794,966	2,419,588	4,214,554
	Bioenvironmental	61	98,439	112	98,551
	Biomedical Equipment	151	887,475	2,991,996	3,879,471
	Bioinstrument and Bioequipment	76	144,416	49,168	193,584
	Bioresource	17	109,296	11,793	121,089
	Bioservice	164	836,864	972,987	1,809,851
Biopharmaceutical	1000) Other biopharmaceuticals	41	445,902	294,018	739,920
	1010) Bio-antibiotics	9	32,514	87,474	119,988
	1020) Biologically manufactured low-molecular medicines	1	21,659	13,923	35,582
	1030) Vaccines	20	420,664	249,478	670,142
	1040) Hormones	15	156,503	94,719	251,222
	1050) Therapeutic antibodies and cytokines	30	80,728	2,309,740	2,390,468
	1060) Hemotherapeutics	5	432,312	155,981	588,293
	1070) Cell-based therapeutics	17	75,197	859	76,056
	1080) Gene therapeutics	6	1,825	425	2,250
	1090) Biomaterial-based medicines	1	1,193	2,934	4,127
	1100) Enzymes and live bacteria medicines	4	18,489	150	18,639
	1110) Biomaterial-based medicines	9	30,905	14,826	45,731
	1120) Veterinary biopharmaceuticals	33	93,049	27,393	120,442
	Total	191	1,810,940	3,251,919	5,062,859
Biochemical and Bioenergy	2000) Other biochemical and bioenergy products	13	35,421	472	35,893
	2010) Biopolymers	12	27,625	30,976	58,601
	2020) Industrial enzymes and reagents	6	32,314	5,282	37,596
	2030) Enzymes and reagents for research	33	78,000	39,630	117,630
	2040) Biocosmetics and home & personal care chemicals	81	424,699	101,445	526,144
	2050) Biological agrochemicals and fertilizers	102	102,238	3,740	105,978
	2060) Biofuels	18	1,093,848	136,698	1,230,546
	Total	265	1,794,145	318,243	2,112,388
Biofood	3000) Other biofoods	20	16,043	2,400	18,443
	3010) Functional health foods	129	620,598	52,649	673,247
	3020) Food-grade microorganisms & enzymes	3	1,670	27	1,697
	3030) Food additives	28	182,520	530,844	713,364
	3040) Fermented foods	7	85,420	0	85,420
	3050) Feed additives	84	888,715	1,833,667	2,722,382
	Total	271	1,794,966	2,419,588	4,214,554
Bioenvironmental	4000) Other bioenvironmental products and services	5	5,350	0	5,350
	4010) Biological treatment agents and systems	27	43,420	112	43,532
	4020) Materials and equipments for bio-immobilization	15	26,873	0	26,873
	4030) Bioenvironmental agents and systems for treatment and recycling	12	19,704	0	19,704
	4040) Measuring apparatus and service for environmental pollution and assessment	2	3,092	0	3,092
	Total	61	98,439	112	98,551

Industry / Category		No. of Respondents (Multiple Responses)	Domestic Sales	Export Amount	Total
			Total	Total	Total
Total		**1,196**	**7,476,541**	**10,015,805**	**17,492,346**
Biomedical Equipment	5000) Other biomedical equipments	51	169,406	262,171	431,577
	5010) Biosensors	5	314	24	338
	5020) In-vitro diagnostics	94	717,490	2,728,560	3,446,050
	5030) Medical devices using biosensors and/or biomarkers	1	265	1,241	1,506
	Total	151	887,475	2,991,996	3,879,471
Bioinstrument and Bioequipment	6000) Other bioinstruments and bioequipments	24	74,969	11,345	86,314
	6010) Gene/protein/peptide analysis, synthesis, and manufacturing instruments	8	7,548	4,693	12,241
	6020) Cell analysis and cultivation equipments	21	28,969	26,825	55,794
	6030) Multi-functional and other bioanalysis instruments	15	12,545	1,913	14,458
	6040) R&D and manufacturing equipments	6	20,155	4,392	24,547
	6050) Bioprocess equipment parts	2	230	0	230
	Total	76	144,416	49,168	193,584
	7000) Other bioresources	6	476	118	594
Bioresource	7010) Seeds and seedlings	4	81,894	8,389	90,283
	7020) Genetically Modified Organisms for use as food, feed or processing	2	3,585	2	3,587
	7030) Experimental animals	5	23,341	3,284	26,625
	Total	17	109,296	11,793	121,089
Bioservice	8000) Other bioservices	3	42,740	0	42,740
	8010) Bio-consignment production and procuration services	12	343,975	895,564	1,239,539
	8020) Bio-diagnostic and analytical services	53	137,776	50,356	188,132
	8030) Clinical/non-clinical R&D services	38	187,203	20,448	207,651
	8040) Other R&D services	45	77,396	2,311	79,707
	8050) Processing, treatment, and warehousing services	13	47,774	4,308	52,082
	Total	164	836,864	972,987	1,809,851

<Table 5-2> Size of Import by Category Among Classification Scheme of Bioindustry (Unit: million KRW)

Industry / Category		No. of Respondents (Multiple Responses)	Import Amount
			Total
Total		**326**	**2,342,382**
Industry Performing Imports	Biopharmaceutical	197	1,863,444
	Biochemical and Bioenergy	40	96,166
	Biofood	37	104,164
	Bioenvironmental	4	168
	Biomedical Equipment	20	47,119
	Bioinstrument and Bioequipment	22	208,917
	Bioresource	4	19,919
	Bioservice	2	2,484
Biopharmaceutical	1000) Other biopharmaceuticals	27	101,059
	1010) Bio-antibiotics	4	2,130
	1030) Vaccines	35	414,687
	1040) Hormones	36	306,288
	1050) Therapeutic antibodies and cytokines	69	829,720
	1060) Hemotherapeutics	19	190,495
	1090) Biological diagnostic products	2	6,627
	1100) Enzymes and live bacteria medicines	1	10,494
	1120) Veterinary biopharmaceuticals	4	1,942
	Total	197	1,863,444
Biochemical and Bioenergy	2000) Other biochemical and bioenergy products	5	21,681
	2010) Biopolymers	2	286
	2020) Industrial enzymes and reagents	5	956
	2030) Enzymes and reagents for research	11	49,041
	2040) Biocosmetics and home & personal care chemicals	2	513
	2050) Biological agrochemicals and fertilizers	10	15,063
	2060) Biofuels	5	8,626
	Total	40	96,166
Biofood	3000) Other biofoods	4	3,703
	3010) Functional health foods	18	86,505
	3020) Food-grade microorganisms & enzymes	3	2,364
	3030) Food additives	7	6,487
	3050) Feed additives	5	5,106
	Total	37	104,164
Bioenvironmental	4000) Other bioenvironmental products and services	2	142
	4010) Biological treatment agents and systems	1	12
	4030) Bioenvironmental agents and systems for treatment and recycling	1	14
	Total	4	168
Biomedical Equipment	5000) Other biomedical equipments	5	25,001
	5010) Biosensors	1	35
	5020) In-vitro diagnostics	14	22,083
	Total	20	47,119
Bioinstrument and Bioequipment	6000) Other bioinstruments and bioequipments	13	124,416
	6010) Gene/protein/peptide analysis, synthesis, and manufacturing instruments	2	30,551
	6020) Cell analysis and cultivation equipments	2	1,289
	6030) Multi-functional and other bioanalysis instruments	4	52,563
	6050) Bioprocess equipment parts	1	98
	Total	22	208,917
Bioresource	7000) Other bioresources	1	118
	7010) Seeds and seedlings	2	19,306
	7030) Experimental animals	1	496
	Total	4	19,919
Bioservice	8010) Bio-consignment production and procuration services	1	2,478
	8020) Bio-diagnostic and analytical services	1	6
	Total	2	2,484

<Table 6> Status of Bioindustry by Area

<Table 6-1> Bioindustry's Manpower Distribution by Area (Unit: persons)

		No. of Companies	No. of Respondents	Bioindustry Workers									
				Doctor's		Master's		Bachelor's		Others		Total	
				Total	Average	Total	Average	Total	Average	Total	Average	Total	Average
Total		**1,027**	**1,007**	2,964	3	9,759	10	26,208	26	14,615	15	53,546	53
Core Industries	Biopharmaceutical	326	307	1,488	5	4,709	15	10,710	35	4,925	16	21,832	71
	Biochemical and Bioenergy	191	191	324	2	1,184	6	3,223	17	2,153	11	6,884	36
	Biofood	170	170	309	2	887	5	3,155	19	2,888	17	7,239	43
	Bioenvironmental	64	64	35	1	138	2	617	10	244	4	1,034	16
	Biomedical Equipment	96	95	302	3	1,061	11	2,961	31	1,896	20	6,220	65
	Bioinstrument and Bioequipment	62	62	65	1	213	3	1,341	22	776	13	2,395	39
	Bioresource	15	15	54	4	155	10	501	33	368	25	1,078	72
	Bioservice	103	103	387	4	1,412	14	3,700	36	1,365	13	6,864	67
Total Number of Workers	1 – 49	634	633	769	1	1,648	3	5,153	8	1,657	3	9,227	15
	50 – 299	276	268	854	3	3,040	11	10,612	40	5,990	22	20,496	76
	300 – 999	79	70	701	10	2,218	32	4,358	62	3,226	46	10,503	150
	1,000 or more	34	34	633	19	2,834	83	6,062	178	3,740	110	13,269	390
	Unknown	4	2	7	4	19	10	23	12	2	1	51	26
By Area	Seoul	229	212	575	3	1,819	9	4,795	23	1,205	6	8,394	40
	Busan	15	15	12	1	37	2	152	10	57	4	258	17
	Incheon	22	22	325	15	1,133	52	2,975	135	1,465	67	5,898	268
	Daegu	15	15	14	1	49	3	735	49	664	44	1,462	97
	Gwangju	7	7	9	1	22	3	36	5	4	1	71	10
	Daejeon	82	82	215	3	517	6	1,324	16	405	5	2,461	30
	Ulsan	8	8	27	3	147	18	675	84	337	42	1,186	148
	Sejong	3	3	9	3	82	27	188	63	98	33	377	126
	Gyeonggi	340	339	1,065	3	3,328	10	7,431	22	4,369	13	16,193	48
	Gangwon	44	44	155	4	461	10	1,169	27	1,096	25	2,881	65
	Chungbuk	91	91	352	4	1,513	17	4,222	46	2,904	32	8,991	99
	Chungnam	44	44	94	2	312	7	834	19	788	18	2,028	46
	Jeonbuk	35	35	37	1	122	3	570	16	608	17	1,337	38
	Jeonnam	36	36	25	1	92	3	472	13	225	6	814	23
	Gyeongbuk	22	20	17	1	37	2	196	10	136	7	386	19
	Gyeongnam	25	25	24	1	64	3	324	13	157	6	569	23
	Jeju	9	9	9	1	24	3	110	12	97	11	240	27

		No. of Companies	No. of Respondents	Researchers									
				Doctor's		Master's		Bachelor's		Others		Total	
				Total	Average	Total	Average	Total	Average	Total	Average	Total	Average
Total		**1,027**	**1,007**	**2,618**	**3**	**7,255**	**7**	**6,596**	**7**	**404**		**16,873**	**17**
Core Industries	Biopharmaceutical	326	307	1,306	4	3,576	12	2,419	8	150		7,451	24
	Biochemical and Bioenergy	191	191	295	2	1,008	5	746	4	70		2,119	11
	Biofood	170	170	283	2	695	4	582	3	32		1,592	9
	Bioenvironmental	64	64	34	1	117	2	220	3	1		372	6
	Biomedical Equipment	96	95	251	3	705	7	683	7	9		1,648	17
	Bioinstrument and Bioequipment	62	62	60	1	149	2	278	4	20		507	8
	Bioresource	15	15	49	3	101	7	133	9	0	0	283	19
	Bioservice	103	103	340	3	904	9	1,535	15	122	1	2,901	28
Total Number of Workers	1 – 49	634	633	721	1	1,401	2	1,652	3	17		3,791	6
	50 – 299	276	268	786	3	2,292	9	2,762	10	108		5,948	22
	300 – 999	79	70	546	8	1,405	20	1,161	17	91	1	3,203	46
	1,000 or more	34	34	561	17	2,142	63	1,021	30	188	6	3,912	115
	Unknown	4	2	4	2	15	8	0	0	0	0	19	10
By Area	Seoul	229	212	510	2	1,346	6	1,598	8	63		3,517	17
	Busan	15	15	11	1	29	2	24	2	3		67	4
	Incheon	22	22	251	11	700	32	473	22	50	2	1,474	67
	Daegu	15	15	11	1	31	2	146	10	30	2	218	15
	Gwangju	7	7	9	1	22	3	12	2	0	0	43	6
	Daejeon	82	82	190	2	424	5	432	5	7		1,053	13
	Ulsan	8	8	23	3	94	12	49	6	20	3	186	23
	Sejong	3	3	9	3	82	27	45	15	13	4	149	50
	Gyeonggi	340	339	1,014	3	2,668	8	2,253	7	92		6,027	18
	Gangwon	44	44	123	3	309	7	235	5	0	0	667	15
	Chungbuk	91	91	292	3	1,044	11	809	9	97	1	2,242	25
	Chungnam	44	44	75	2	235	5	141	3	2		453	10
	Jeonbuk	35	35	33	1	95	3	109	3	21	1	258	7
	Jeonnam	36	36	18	1	70	2	140	4	3		231	6
	Gyeongbuk	22	20	17	1	34	2	56	3	3		110	6
	Gyeongnam	25	25	24	1	54	2	48	2	0	0	126	5
	Jeju	9	9	8	1	18	2	26	3	0	0	52	6

		No. of Companies	No. of Respondents	Production Workers									
				Doctor's		Master's		Bachelor's		Others		Total	
				Total	Average	Total	Average	Total	Average	Total	Average	Total	Average
Total		**1,027**	**1,007**	**46**		**810**	**1**	**6,128**	**6**	**11,508**	**11**	**18,492**	**18**
Core Industries	Biopharmaceutical	326	307	23		396	1	2,725	9	3,658	12	6,802	22
	Biochemical and Bioenergy	191	191	5		48		667	3	1,751	9	2,471	13
	Biofood	170	170	4		35		1,001	6	2,392	14	3,432	20
	Bioenvironmental	64	64	0	0	5		175	3	212	3	392	6
	Biomedical Equipment	96	95	1		70	1	541	6	1,628	17	2,240	24
	Bioinstrument and Bioequipment	62	62	1		19		169	3	555	9	744	12
	Bioresource	15	15	3		20	1	62	4	220	15	305	20
	Bioservice	103	103	9		217	2	788	8	1,092	11	2,106	20
Total Number of Workers	1 – 49	634	633	3		44		614	1	1,286	2	1,947	3
	50 – 299	276	268	7		164	1	1,945	7	4,693	18	6,809	25
	300 – 999	79	70	13		243	3	984	14	2,629	38	3,869	55
	1,000 or more	34	34	22	1	356	10	2,570	76	2,900	85	5,848	172
	Unknown	4	2	1	1	3	2	15	8	0	0	19	10
By Area	Seoul	229	212	1		54		407	2	709	3	1,171	6
	Busan	15	15	0	0	0	0	18	1	25	2	43	3
	Incheon	22	22	9		213	10	1,572	71	1,308	59	3,102	141
	Daegu	15	15	0	0	3		169	11	347	23	519	35
	Gwangju	7	7	0	0	0	0	0	0	2		2	
	Daejeon	82	82	3		39		233	3	346	4	621	8
	Ulsan	8	8	2		19	2	157	20	259	32	437	55
	Sejong	3	3	0	0	0	0	106	35	82	27	188	63
	Gyeonggi	340	339	10		221	1	1,314	4	3,451	10	4,996	15
	Gangwon	44	44	0	0	35	1	311	7	992	23	1,338	30
	Chungbuk	91	91	17		214	2	1,141	13	2,238	25	3,610	40
	Chungnam	44	44	1		5		168	4	702	16	876	20
	Jeonbuk	35	35	2		5		188	5	509	15	704	20
	Jeonnam	36	36	1		0	0	108	3	185	5	294	8
	Gyeongbuk	22	20	0	0	0	0	59	3	123	6	182	9
	Gyeongnam	25	25	0	0	1		160	6	150	6	311	12
	Jeju	9	9	0	0	1		17	2	80	9	98	11

		No. of Companies	No. of Respondents	Other Positions including Sales/Administrative									
				Doctor's		Master's		Bachelor's		Others		Total	
				Total	Average	Total	Average	Total	Average	Total	Average	Total	Average
Total		**1,027**	**1,007**	**300**		**1,694**	**2**	**13,484**	**13**	**2,703**	**3**	**18,181**	**18**
Core Industries	Biopharmaceutical	326	307	159	1	737	2	5,566	18	1,117	4	7,579	25
	Biochemical and Bioenergy	191	191	24		128	1	1,810	9	332	2	2,294	12
	Biofood	170	170	22		157	1	1,572	9	464	3	2,215	13
	Bioenvironmental	64	64	1		16		222	3	31		270	4
	Biomedical Equipment	96	95	50	1	286	3	1,737	18	259	3	2,332	25
	Bioinstrument and Bioequipment	62	62	4		45	1	894	14	201	3	1,144	18
	Bioresource	15	15	2		34	2	306	20	148	10	490	33
	Bioservice	103	103	38		291	3	1,377	13	151	1	1,857	18
Total Number of Workers	1 – 49	634	633	45		203		2,887	5	354	1	3,489	6
	50 – 299	276	268	61		584	2	5,905	22	1,189	4	7,739	29
	300 – 999	79	70	142	2	570	8	2,213	32	506	7	3,431	49
	1,000 or more	34	34	50	1	336	10	2,471	73	652	19	3,509	103
	Unknown	4	2	2	1	1	1	8	4	2	1	13	7
By Area	Seoul	229	212	64		419	2	2,790	13	433	2	3,706	17
	Busan	15	15	1		8	1	110	7	29	2	148	10
	Incheon	22	22	65	3	220	10	930	42	107	5	1,322	60
	Daegu	15	15	3		15	1	420	28	287	19	725	48
	Gwangju	7	7	0	0	0	0	24	3	2		26	4
	Daejeon	82	82	22		54	1	659	8	52	1	787	10
	Ulsan	8	8	2		34	4	469	59	58	7	563	70
	Sejong	3	3	0	0	0	0	37	12	3	1	40	13
	Gyeonggi	340	339	41		439	1	3,864	11	826	2	5,170	15
	Gangwon	44	44	32	1	117	3	623	14	104	2	876	20
	Chungbuk	91	91	43		255	3	2,272	25	569	6	3,139	34
	Chungnam	44	44	18		72	2	525	12	84	2	699	16
	Jeonbuk	35	35	2		22	1	273	8	78	2	375	11
	Jeonnam	36	36	6		22	1	224	6	37	1	289	8
	Gyeongbuk	22	20	0	0	3		81	4	10	1	94	5
	Gyeongnam	25	25	0	0	9		116	5	7		132	5
	Jeju	9	9	1		5	1	67	7	17	2	90	10

<Table 6-2> Investment Status of Bioindustry by Area (Unit: million KRW)

		No. of Companies	No. of Respondents	2020											
				R&D Investment		Facility Investment		Total Investment		Bio R&D Investment		Bio Facility Investment		Bio Total Investment	
				Total	Average	Total	Average	Total	Average	Total	Average	Total	Average	Total	Average
Total		**1,027**	**988**	**5,350,656**	**5,416**	**869,219**	**880**	**6,219,875**	**6,295**	**2,018,500**	**2,043**	**669,382**	**678**	**2,687,882**	**2,721**
Core Industries	Biopharmaceutical	326	301	2,856,589	9,490	437,135	1,452	3,293,724	10,943	1,477,053	4,907	322,111	1,070	1,799,164	5,977
	Biochemical and Bioenergy	191	188	1,842,724	9,802	116,641	620	1,959,365	10,422	125,771	669	61,266	326	187,037	995
	Biofood	170	168	177,358	1,056	109,075	649	286,433	1,705	102,690	611	84,874	505	187,564	1,116
	Bioenvironmental	64	61	25,490	418	10,504	172	35,994	590	13,291	218	8,864	145	22,155	363
	Biomedical Equipment	96	94	194,567	2,070	71,338	759	265,905	2,829	140,748	1,497	69,578	740	210,326	2,238
	Bioinstrument and Bioequipment	62	60	28,924	482	9,306	155	38,230	637	19,589	326	9,106	152	28,695	478
	Bioresource	15	15	36,434	2,429	2,113	141	38,547	2,570	11,986	799	2,113	141	14,099	940
	Bioservice	103	101	188,570	1,867	113,107	1,120	301,677	2,987	127,372	1,261	111,470	1,104	238,842	2,365
Total Number of Workers	1 – 49	634	622	517,805	832	74,866	120	592,671	953	374,616	602	71,593	115	446,209	717
	50 – 299	276	262	919,336	3,509	232,797	889	1,152,133	4,397	592,801	2,263	196,561	750	789,362	3,013
	300 – 999	79	70	645,809	9,226	150,394	2,148	796,203	11,374	317,274	4,532	132,456	1,892	449,730	6,425
	1,000 or more	34	32	3,258,855	101,839	410,862	12,839	3,669,717	114,679	726,483	22,703	268,472	8,390	994,955	31,092
	Unknown	4	2	8,851	4,426	300	150	9,151	4,576	7,326	3,663	300	150	7,626	3,813
By Area	Seoul	229	212	557,014	2,627	50,869	240	607,883	2,867	253,497	1,196	40,024	189	293,521	1,385
	Busan	15	15	5,104	340	15,084	1,006	20,188	1,346	3,104	207	1,150	77	4,254	284
	Incheon	22	21	326,695	15,557	160,456	7,641	487,151	23,198	240,818	11,468	160,406	7,638	401,224	19,106
	Daegu	15	14	88,579	6,327	6,570	469	95,149	6,796	6,235	445	5,570	398	11,805	843
	Gwangju	7	7	3,084	441	360	51	3,444	492	2,884	412	340	49	3,224	461
	Daejeon	82	82	482,813	5,888	126,945	1,548	609,758	7,436	150,501	1,835	90,126	1,099	240,627	2,934
	Ulsan	8	8	47,834	5,979	5,600	700	53,434	6,679	25,571	3,196	1,050	131	26,621	3,328
	Sejong	3	3	9,679	3,226	14,503	4,834	24,182	8,061	5,379	1,793	6,803	2,268	12,182	4,061
	Gyeonggi	340	327	2,994,871	9,159	325,346	995	3,320,217	10,154	772,590	2,363	212,858	651	985,448	3,014
	Gangwon	44	44	97,746	2,222	22,916	521	120,662	2,742	81,031	1,842	21,211	482	102,242	2,324
	Chungbuk	91	86	536,972	6,244	91,577	1,065	628,549	7,309	370,758	4,311	88,377	1,028	459,135	5,339
	Chungnam	44	43	87,690	2,039	10,460	243	98,150	2,283	26,479	616	7,692	179	34,171	795
	Jeonbuk	35	34	52,040	1,531	3,877	114	55,917	1,645	25,311	744	1,389	41	26,700	785
	Jeonnam	36	36	9,734	270	11,659	324	21,393	594	7,519	209	10,100	281	17,619	489
	Gyeongbuk	22	22	33,898	1,541	12,286	558	46,184	2,099	33,783	1,536	11,580	526	45,363	2,062
	Gyeongnam	25	25	10,101	404	3,183	127	13,284	531	9,244	370	3,178	127	12,422	497
	Jeju	9	9	6,802	756	7,528	836	14,330	1,592	3,796	422	7,528	836	11,324	1,258

<Table 6-3A> Bioindustry's Domestic Sales and Export by Area (Unit: million KRW)

		No. of Respondents (Multiple Responses)	Domestic Sales	Export Amount	Total
			Total	Total	Total
Total		**1,196**	**7,476,541**	**10,015,805**	**17,492,346**
By Area	Seoul	176	949,441	611,457	1,560,898
	Busan	15	5,252	3,602	8,854
	Incheon	19	384,136	3,158,062	3,542,198
	Daegu	19	45,997	41,900	87,897
	Gwangju	5	1,357	0	1,357
	Daejeon	89	404,690	92,888	497,578
	Ulsan	10	643,298	6,893	650,191
	Sejong	1	1,387	0	1,387
	Gyeonggi	403	2,462,247	4,849,433	7,311,680
	Gangwon	69	200,599	331,339	531,938
	Chungbuk	144	1,365,162	686,305	2,051,467
	Chungnam	63	133,727	48,262	181,989
	Jeonbuk	50	267,582	66,960	334,542
	Jeonnam	47	270,398	46,153	316,551
	Gyeongbuk	27	294,567	37,295	331,862
	Gyeongnam	42	33,016	29,659	62,675
	Jeju	17	13,685	5,598	19,283
Industry with Sales Generated	Biopharmaceutical	191	1,810,940	3,251,919	5,062,859
	Biochemical and Bioenergy	265	1,794,145	318,243	2,112,388
	Biofood	271	1,794,966	2,419,588	4,214,554
	Bioenvironmental	61	98,439	112	98,551
	Biomedical Equipment	151	887,475	2,991,996	3,879,471
	Bioinstrument and Bioequipment	76	144,416	49,168	193,584
	Bioresource	17	109,296	11,793	121,089
	Bioservice	164	836,864	972,987	1,809,851
Seoul	Biopharmaceutical	21	72,340	924	73,264
	Biochemical and Bioenergy	26	45,248	893	46,141
	Biofood	17	51,095	792	51,887
	Bioenvironmental	4	10,571	0	10,571
	Biomedical Equipment	27	477,956	518,749	996,705
	Bioinstrument and Bioequipment	6	18,827	979	19,806
	Bioresource	7	3,861	120	3,981
	Bioservice	68	269,543	88,999	358,542
Busan	Biopharmaceutical	1	0	1,666	1,666
	Biochemical and Bioenergy	3	2,080	0	2,080
	Biofood	3	2,010	0	2,010
	Bioenvironmental	3	138	0	138
	Biomedical Equipment	1	20	18	38
	Bioinstrument and Bioequipment	2	475	1,918	2,393
	Bioservice	2	529	0	529
Incheon	Biopharmaceutical	8	2,181	2,286,035	2,288,216
	Biochemical and Bioenergy	5	23,817	472	24,289
	Bioinstrument and Bioequipment	2	7,220	1,475	8,695
	Bioservice	4	350,918	870,079	1,220,997
Daegu	Biopharmaceutical	5	31,313	35,410	66,723
	Biochemical and Bioenergy	2	326	0	326
	Biofood	2	1,012	354	1,366
	Bioenvironmental	3	4,300	0	4,300
	Biomedical Equipment	3	8,730	6,136	14,866
	Bioinstrument and Bioequipment	1	123	0	123
	Bioservice	3	193	0	193
Gwangju	Biochemical and Bioenergy	1	60	0	60
	Biofood	1	739	0	739
	Bioenvironmental	1	104	0	104
	Bioservice	2	454	0	454
Daejeon	Biopharmaceutical	7	24,952	30,347	55,299
	Biochemical and Bioenergy	32	81,390	14,511	95,901
	Biofood	13	221,235	421	221,656
	Bioenvironmental	2	4,275	0	4,275
	Biomedical Equipment	10	47,677	40,447	88,124
	Bioinstrument and Bioequipment	12	18,300	7,153	25,453
	Bioresource	2	546	0	546
	Bioservice	11	6,315	7	6,322
Ulsan	Biochemical and Bioenergy	8	637,247	6,893	644,140
	Biofood	2	6,051	0	6,051

		No. of Respondents (Multiple Responses)	Domestic Sales	Export Amount	Total
			Total	Total	Total
Total		**1,196**	**7,476,541**	**10,015,805**	**17,492,346**
Sejong	Bioinstrument and Bioequipment	1	1,387	0	1,387
Gyeonggi	Biopharmaceutical	71	282,758	264,728	547,486
	Biochemical and Bioenergy	70	553,529	201,949	755,478
	Biofood	76	1,007,845	2,356,385	3,364,230
	Bioenvironmental	20	54,051	112	54,163
	Biomedical Equipment	60	210,708	1,971,144	2,181,852
	Bioinstrument and Bioequipment	45	85,009	36,801	121,810
	Bioresource	4	93,855	6,925	100,780
	Bioservice	57	174,492	11,390	185,882
Gangwon	Biopharmaceutical	14	71,266	80,693	151,959
	Biochemical and Bioenergy	11	9,134	3,008	12,142
	Biofood	20	42,201	6,458	48,659
	Bioenvironmental	5	1,726	0	1,726
	Biomedical Equipment	15	71,747	240,928	312,675
	Bioinstrument and Bioequipment	2	270	251	521
	Bioservice	2	4,255	0	4,255
Chungbuk	Biopharmaceutical	41	1,041,233	514,117	1,555,350
	Biochemical and Bioenergy	21	54,445	18,654	73,099
	Biofood	48	185,514	7,630	193,144
	Bioenvironmental	1	464	0	464
	Biomedical Equipment	22	42,582	143,522	186,104
	Bioinstrument and Bioequipment	2	10,658	354	11,012
	Bioresource	1	3,028	0	3,028
	Bioservice	8	27,238	2,027	29,265
Chungnam	Biopharmaceutical	14	42,871	2,299	45,170
	Biochemical and Bioenergy	13	26,003	275	26,278
	Biofood	26	45,873	2,250	48,123
	Bioenvironmental	3	5,368	0	5,368
	Biomedical Equipment	5	10,940	43,438	54,378
	Bioinstrument and Bioequipment	2	2,672	0	2,672
Jeonbuk	Biopharmaceutical	2	10,430	0	10,430
	Biochemical and Bioenergy	14	91,531	31,015	122,546
	Biofood	21	148,678	18,165	166,843
	Bioenvironmental	4	3,101	0	3,101
	Biomedical Equipment	3	12,551	16,276	28,827
	Bioresource	1	0	1,503	1,503
	Bioservice	5	1,291	0	1,291
Jeonnam	Biopharmaceutical	1	640	313	953
	Biochemical and Bioenergy	24	245,698	31,205	276,903
	Biofood	8	7,065	10,906	17,971
	Bioenvironmental	9	6,233	0	6,233
	Biomedical Equipment	1	1,120	0	1,120
	Bioresource	2	8,006	3,245	11,251
	Bioservice	2	1,636	484	2,120
Gyeongbuk	Biopharmaceutical	4	227,934	31,052	258,986
	Biochemical and Bioenergy	12	12,009	236	12,245
	Biofood	8	52,316	5,998	58,314
	Bioenvironmental	1	100	0	100
	Biomedical Equipment	2	2,208	9	2,217
Gyeongnam	Biopharmaceutical	2	3,022	4,336	7,358
	Biochemical and Bioenergy	19	6,171	5,237	11,408
	Biofood	17	21,987	8,760	30,747
	Bioenvironmental	2	600	0	600
	Biomedical Equipment	2	1,236	11,327	12,563
Jeju	Biochemical and Bioenergy	4	5,457	3,894	9,351
	Biofood	10	6,009	1,468	7,477
	Bioenvironmental	1	1,357	0	1,357
	Bioinstrument and Bioequipment	2	862	236	1,098

<Table 6-3B> Bioindustry's Import by Area (Unit: million KRW)

		No. of Respondents (Multiple Responses)	Import Amount
			Total
Total		**326**	**2,342,382**
By Area	Seoul	178	1,882,457
	Busan	1	1,652
	Incheon	3	2,986
	Daegu	1	6
	Gwangju	0	-
	Daejeon	19	26,667
	Ulsan	2	448
	Sejong	0	-
	Gyeonggi	65	261,540
	Gangwon	9	31,903
	Chungbuk	25	72,100
	Chungnam	7	16,721
	Jeonbuk	3	1,650
	Jeonnam	5	12,186
	Gyeongbuk	4	20,339
	Gyeongnam	3	11,608
	Jeju	1	118
Industry Performing Imports	Biopharmaceutical	197	1,863,444
	Biochemical and Bioenergy	40	96,166
	Biofood	37	104,164
	Bioenvironmental	4	168
	Biomedical Equipment	20	47,119
	Bioinstrument and Bioequipment	22	208,917
	Bioresource	4	19,919
	Bioservice	2	2,484
Seoul	Biopharmaceutical	160	1,729,821
	Biochemical and Bioenergy	4	46,774
	Biofood	3	17,019
	Biomedical Equipment	6	4,935
	Bioinstrument and Bioequipment	5	83,909
Busan	Biochemical and Bioenergy	1	1,652
Incheon	Biochemical and Bioenergy	1	271
	Bioinstrument and Bioequipment	1	236
	Bioservice	1	2,478
Daegu	Biopharmaceutical	1	6
Daejeon	Biopharmaceutical	3	612
	Biochemical and Bioenergy	8	5,173
	Biofood	2	297
	Biomedical Equipment	1	19,589
	Bioinstrument and Bioequipment	5	995
Ulsan	Biochemical and Bioenergy	1	437
	Bioenvironmental	1	12
Gyeonggi	Biopharmaceutical	14	48,855
	Biochemical and Bioenergy	11	25,720
	Biofood	15	59,875
	Bioenvironmental	2	142
	Biomedical Equipment	10	2,669
	Bioinstrument and Bioequipment	11	123,778
	Bioresource	1	496
	Bioservice	1	6
Gangwon	Biopharmaceutical	2	2,648
	Biochemical and Bioenergy	2	699
	Biofood	3	9,001
	Biomedical Equipment	2	19,555
Chungbuk	Biopharmaceutical	10	43,239
	Biochemical and Bioenergy	4	3,819
	Biofood	9	17,165
	Biomedical Equipment	1	372
	Bioresource	1	7,505
Chungnam	Biopharmaceutical	3	10,425
	Biochemical and Bioenergy	1	5,664
	Biofood	3	633
Jeonbuk	Biochemical and Bioenergy	1	1,475
	Biofood	1	57
	Bioresource	1	118

		No. of Respondents (Multiple Responses)	Import Amount
			Total
Total		**326**	**2,342,382**
Jeonnam	Biochemical and Bioenergy	3	372
	Bioenvironmental	1	14
	Bioresource	1	11,801
Gyeongbuk	Biopharmaceutical	3	19,329
	Biochemical and Bioenergy	1	1,010
Gyeongnam	Biopharmaceutical	1	8,508
	Biochemical and Bioenergy	2	3,100
Jeju	Biofood	1	118

Appendix 1. Explanation on Classification Scheme

[KS J 1009] Bioindustry Classification Code

1. Biopharmaceutical Industry

A field of study concerning biopharmaceuticals, medical drugs or medical equipment produced using biotechnology in the R&D or production process to diagnose, prevent and cure diverse diseases of human or animals. It is an industry that produces the following products (excluding medical instrument or diagnosis instrument).

1010 Bio-antibiotics

Base materials or related medicines that inhibit or kill the growth and proliferation of microorganisms to treat external or internal infections by using microorganisms.

Exception — Antibiotic base materials that are only synthesized through chemical process, intermediates, finished products
Biopharmaceuticals for animals

1020 Biologically manufactured low-molecular medicines

Base material or medicine of low molecular compound (less than 5,000) manufactured by fermentation, cell culture, and other similar methods.

1030 Vaccines

Antigens used to prevent or cure diseases selectively by artificially stimulating the immune system.

Exception — DNA vaccines and veterinary vaccines

1040 Hormones

Base materials and related medicines made of hormones, their variants or analogs to cure special diseases.

Includes — Growth factors

1050 Therapeutic antibodies and cytokines

Therapeutic antibodies and cytokines that are used to regulate bioimmune activities to cure cancer, virus infections, and immunological diseases.

1060 Hemotherapeutics

Blood protein products which were isolated from blood or biotechnologically manufactured materials and medical products, which are used to treat pathologic condition of patients (such as symptoms caused by deficiency in blood protein).

1070 Cell-based therapeutics

Cells that are artificially produced or products made up of such cells permanently implanted in human body for medical purposes to recover, transform, reproduce the system or the functionality of human cells, tissues, and organs.

Includes — Cell therapeutic products and artificial organs

Exception — Cell or tissue implanted immediately from donors after extraction or by preservation in cell/tissue banks

1080 Gene therapeutics

Medical products that implant DNA into a patient's body cells to prevent the development of and to treat genetic diseases, cancer, acquired immunodeficiency syndrome, infectious diseases, and other life-threatening or serious disorders.

Includes — DNA vaccines

Note — Products are categorized by implantation to patient such as naked DNA, naked RNA, various virus vectors, and allogenic stem cells.

1090 Biological diagnostic products

Biomaterial-based diagnostic medical products that are designed to diagnose the actual condition of diseases.

Exception — Diagnostic kits (or instruments) used for external diagnosis
Reagents used in experiments and research

1100 Enzymes and live bacteria medicines

Enzymes and live bacteria medicines that are dosed to alleviate or prevent gastrointestinal diseases.

1110 Biomaterial-based medicines

Medicines that are produced by biological or extraction process, such as gene recombination, which use bio-origin materials as base material or active ingredient to cure, alleviate, or prevent diseases.

Includes — Placenta medicines and hyaluronic acid products

1120 Veterinary biopharmaceuticals

Medicines that are produced by biological process such as fermentation or cell culture to diagnose, prevent, and cure animal diseases.

Includes — Veterinary vaccines and veterinary live bacteria medicines

Exception — Feed additives

1000 Other biopharmaceuticals

Other biopharmaceutical products that are not classified above (including base materials and intermediates).

2. Biochemical and Bioenergy Industry

Industry that manufactures, imports, researches and develops compounds using separation and purification technology or biotechnology from living organisms in the R&D or production process or that obtains energy (excluding products that are mainly used for medical purpose).

2010 Biopolymers

Materials (structural constituents), biocompatible polymers and biodegradable resins (functional packaging materials), bioplastics using biomass which are made from biomolecules such as proteins, nucleic acids or polysaccharides.

Exception Cell therapeutic products and gene therapeutics

2020 Industrial enzymes and reagents

Enzymes which are extracted from industrially valuable organisms or produced by biotechnology, and other industrial reagents.

2030 Enzymes and reagents for research

Reagents, buffer solutions, polymerases, reagent kits, DNA vectors, and gene expression systems.

2040 Biocosmetics and home & personal care chemicals

Household goods such as soap, detergents, and functional cosmetics.

2050 Biological agrochemicals and fertilizers

Microbial agents that are used to exterminate or control weeds, pests, or microorganisms that hinder the growth of crops, and microbial agents that enrich nutrients in soil to enhance the growth of crops.

Exception For agricultural pesticides and fertilizers produced by biological process using non-microbial or non-biological agents, refer to "2000) Other biochemical and bioenergy products."

2060 Biofuels

Alternative fuel substances produced from biomass such as biodiesel and bioethanol through chemical and biological transition processes.

2000 Other biochemical and bioenergy products

Other biochemical products that are not classified above (including macromolecular monomers, solvents, biogas, and others).

Note Development services are classified under the bioservice industry.

3. Biofood Industry

Industrial activities which produce foods, beverages, animal feed and animal/vegetable fat and oil using bio-purification technology or biotechnology in R&D or manufacturing process (excluding products that are mainly used for medical purpose).

3010 Functional health foods

Products using raw materials or ingredients that are useful to the human body and biotechnology (limited to foods recognized to be functional by the Ministry of Food and Drug Safety under the "Health Functional Foods Act").

3020 Food-grade microorganisms & enzymes

Microorganism and enzyme (bio-catalyst) products supplied for the manufacture of dairy products such as yogurt and cheese, and traditional fermented foods such as makgeolli, soybean paste, or fast-fermented bean paste.

Exception Functional health foods

3030 Food additives

Substances which are added in foods such as seasonings, food preservatives, nucleotides, peptides and lipids (including starch, organic acids and functional sugar, etc.).

Exception Functional health foods

3040 Fermented foods

Products that have undergone fermentation processing such as fermented sauces, alcoholic beverages, pickled vegetables, and fermented livestock foods.

Exception Functional health foods

3050 Feed additives

Various kinds of feed additives, nutrients, and feeds for animal raising or fish farming.

Exception Feed ingredients (single ingredients)
Veterinary pharmaceuticals including probiotics fall under 1120) Veterinary biopharmaceuticals.

3000 Other biofoods

Other biofoods that are not classified above (including raw materials and intermediates).

4. Bioenvironmental Industry

Industrial activities of manufacturing substances or systems for environmental cleanup, environmental restoration, and reducing/preventing environmental pollution using bioderivatives or biotechnology in the R&D or manufacturing process, or industrial activities of building pollution diagnosis and measurement services or facilities using these products. The following products or services are considered bioenvironmental industry:

4010 Biological treatment agents and systems

Microorganism agents (e.g. microorganisms, plants, animals) for environmental cleanup, reducing/preventing environmental pollution and environmental restoration, including construction and installation services associated with selling such products.

4020 Materials and equipments for bio-immobilization

Immobilized materials and equipments for environmental cleanup (e.g. waste/wastewater treatment or foul smell/VOC treatment), including construction and installation services associated with selling such products.

4030 Bioenvironmental agents and systems for treatment and recycling

Materials, equipments and systems for waste/wastewater treatment, air pollution (foul smell/VOC treatment included), environmental restoration and resource recycling, including construction and installation services associated with selling such products.

Exception 4010) Biological treatment agents and systems
4020) Materials and equipments for bio-immobilization

4040 Measuring apparatus and service for environmental pollution and assessment

Equipments which measure water quality and soil and air pollution level (including construction and installation services associated with selling such products), and pollution source diagnosis and pollution level measuring services on demand of customers.

Exception Biosensors

4000 Other bioenvironmental productions and services

Other bioenvironmental products that are not classified above (including raw materials and intermediates) and associated services such as consulting.

5. Biomedical Equipment Industry

Industrial activities which produce, import components/materials for medical or analytical purpose using nano/electronic technology, bio information or biotechnology in R&D or manufacturing process.

5010 Biosensors

Devices, materials, and systems that use biological elements or imitating biological elements and convert them into recognizable useful signals.

5020 In-vitro diagnostics

Diagnostic devices/equipment, diagnostic reagents and consumables that analyze target substances in samples derived from the human body.

5030 Medical devices using biosensors and/or biomarkers

Diagnostic instrument system that uses or applies biomarkers as its contrast medium.

Includes Medical instruments that utilize biomarkers and biosensors.

5000 Other biomedical equipments

Other biomedical components and materials that are not classified above.

6. Bioinstrument and Bioequipment Industry

Industrial activities which produce devices, equipments and plants for the purpose of using bioderivatives or biotechnologies in R&D or manufacturing process (including biomedical devices and diagnostic devices).

6010 Gene/protein/peptide analysis, synthesis and manufacturing instruments

Devices used for gene/protein/peptide analysis, synthesis, and production.

Includes PCR, real-time PCR, DNA sequencer, DNA/RNA/peptide synthesizer

6020 Cell analysis and cultivation equipments

Equipments used for cell analysis and cultivation of microorganisms, insects, animals, food, etc.

Includes Cell counter, incubator, and bioreactor

6030 Multi-functional and other bioanalysis instruments

Analysis and measurement devices and multi-functional complex devices that are not classified above.

Includes Spectrophotometer, plate reader, and HPLC

6040 R&D and manufacturing equipments

R&D and manufacturing equipments that are used in the bioindustry and are not classified above.

Includes Clean bench, image analyzer, filtration system, and freeze dryer

6050 Bioprocess equipment parts

Parts that can be utilized to replace key features of R&D and manufacturing equipments.

Includes Disposable bioreactor bag and mixing bag

6000 Other bioinstruments and bioequipments

Other bioinstruments, parts, and process software that are not classified above.

7. Bioresource Industry

Industrial activities of utilizing organisms (e.g. microorganisms, plants, animals, virus) or their derivatives (e.g. tissue, cell, nucleic acids, proteins, extracts), human biological materials in R&D or manufacturing process, and industrial activities which dig out and produce organisms which have novel functions and then cultivate or raise them.

7010 Seeds and seedlings

Seeds, improved seeds, mushroom strains and energy crops for forestry or agricultural use.

Includes Genetically modified seeds and seedlings

7020 Genetically Modified Organisms for use as food, feed or processing

Generically modified organisms including newly combined gene components by using biochemical technology.

Note Includes both land and marine aquatic organisms and are classified as food, feed, and processing.

7030 Experimental animals

Experimental animals including transgenic animals such as insects, mice, and rats.

7000 Other bioresources

Other bioresources that are not classified above.

Includes Microorganisms, animals and plants, cell lines, and biomass

8. Bioservice Industry

Industrial activities that provide high-value added services by integrating intermediates that embody bioinformation and knowledge in the manufacturing process.

8010 Bio-consignment production and procuration services

Services that provide and act as proxy to provide bio-related raw materials and products in processed form to meet customer needs based on bio-related information and basic knowledge.

Includes Bioproducts (pharmaceuticals, cosmetics, etc.) and consignment production/agency business such as CMOs

8020 Bio-diagnostic and analytical services

Services that systematically identify and quantify the behavior and secretion changes of genomes, proteins, metabolites, etc. and analyze and provide them comprehensively by linking the results with various physiological and pathological conditions.

8030 Clinical/non-clinical R&D services

Activities which conduct or support clinic/non-clinic R&D by proxy using biotechnology and knowledge.

Includes CROs, R&D and procuration services (drug discovery, mechanism R&D, safety and efficacy evaluation, approval/certification services, etc.)

8040 Other R&D services

Other services which conduct R&D by proxy to procure knowledge needed for manufacturing biotechnological products other than clinical/non-clinical R&D.

8050 Processing, treatment, and warehousing services

Services related to treatment, storage, and delivery of products applied to living things.

Includes — Cord blood preservation service, human-derived placenta processing, incubation and processing of cells, distribution and warehousing of pharmaceuticals, processing and preservation of clinical materials (blood, tissue, etc.)

8000 Other bioservices

New bioservices that are not classified above and related new industry groups that are recognized for its future importance and expansion.

Includes — MRO, global medical industry (export of hospitals, medical tours, etc.), integrated IT medical treatment (e.g., remote medical treatment)

[Appendix] Biotechnology Classification Code

A. Genetic Engineering

Technologies that alter the genetic traits of target organisms by manipulating or transplanting genes.

A1. Gene manipulation

Technologies used to directly manipulate genes, such as gene identification, isolation, modification, recombination, synthesis, amplification, and transfer.

Corresponding List

A101. Genetic material development
A102. Gene separation
A103. Gene cloning
A104. Gene transformation
A105. Gene screening
A106. Genetic mutation
A107. Gene targeting
A108. DNA synthesis
A109. DNA amplification

A2. Gene expression and regulation

Technologies used to change the expression method, level of expression, or expression rate of genetic information related to the replication, transcription, and translation of genetic information.

Corresponding List

A201. Host cell development
A202. Gene overexpression
A203. Secretory expression
A204. Gene replication and transcriptional regulation
A205. Signal transduction analysis
A206. Oncogenesis
A207. Gene expression profile analysis
A208. High throughput gene expression

A209. RNA interference

A3. Gene application

Technologies used to develop new forms of molecules, nuclei, and objects using genes.

Corresponding List

A301. Transgenic animals
A302. Transgenic plants
A303. Transgenic microorganisms
A304. Molecular evolution
A305. Genome shuffling

A4. Gene therapy

Technologies used during the entire treatment process to treat diseases, from development of therapeutic genes to introduction into the body and expression in the body.

Corresponding List

A401. Ex vivo therapy
A402. Gene therapy vector development and production
A403. Evaluation of gene transfer and expression
A404. Therapeutic gene development
A405. Germline gene therapy
A406. In vivo model for gene therapy
A407. Oncolytic virus therapy
A408. RNA interference
A409. DNA vaccine

A0. Other genetic engineering, N.E.S.

B. Protein Engineering

Technologies which analyze the structure and function of proteins and to design, create, or apply specific proteins.

B1. Protein structure analysis

Technologies used to analyze protein sequence, mass, planar structure, and 3D structures.

Corresponding List

B101. Protein mass spectrometry
B102. Protein sequence analysis
B103. Protein 3D structure analysis
B104. High throughput structural determination
B105. Protein linkage maps
B106. Protein-protein interaction mapping

B2. Protein function analysis

Technologies used to analyze protein functions such as protein stability, recognition, and reaction.

Corresponding List

B201. Protein stability analysis
B202. Protein folding analysis
B203. Protein recognition mechanism analysis
B204. Protein reaction analysis
B205. Inhibitor screening and development
B206. Protein linkage map analysis
B207. Protein-protein interaction mapping

B3. Complex protein engineering

Technologies used in protein modification, antibody and receptor manipulation, design of proteins, etc.

Corresponding List

B301. Antibody engineering
B302. Protein modification
B303. Receptor engineering
B304. Protein design
B305. Complex protein formation

B4. Peptide engineering

Technologies used for synthesis, purification, design, and structure and function analysis of peptides.

Corresponding List

B401. Peptide synthesis and purification
B402. Peptide design
B403. Peptide structure and function analysis
B404. Activated peptide utilization
B405. Multidimensional peptide separation

B5. Protein application

Technologies used to develop or use enzymes or combination biocatalysts using proteins.

Corresponding List

B501. Novel enzyme and live catalyst screening
B502. Artificial enzyme production and utilization
B503. Protein refolding
B504. Combinatorial biocatalysis
B505. Enzyme therapy

B0. Other protein engineering, N.E.S.

C. Other Macromolecule Engineering

Technologies which develop useful materials by analyzing the structure and function of large bioconstituents such as carbohydrates and lipids, and transforming or utilizing them.

C1. Lipid engineering

Technologies which develop useful materials such as functional lipids by separating or artificially synthesizing lipids present in nature, analyzing their structure and function, and transforming and processing them physically or biochemically.

Corresponding List

C101. Functional lipid development

C2. Carbohydrate engineering

Technologies which develop useful materials such as functional carbohydrates by separating or artificially synthesizing carbohydrates present in nature, analyzing their structure and function, and transforming and processing them physically or biochemically.

Corresponding List

C201. Polysaccharide chemistry
C202. Neoglycan technology
C203. Functional carbohydrate development

C0. Other macromolecule engineering, N.E.S

D. Therapeutic Cell and Tissue Engineering

Technologies used to create new cells that can express useful genetic traits and to utilize them or manufacture artificial biological tissues or organs to maintain, improve, or restore biological functions.

D1. Therapeutic cell utilization

Technologies used to treat damaged tissues or organs by inducing stem cells and somatic cells to differentiate into specific cells or tissues under appropriate conditions inside and outside the body.

Corresponding List

D101. Pluripotent stem cell utilization
D102. Multipotent stem cell utilization
D103. Progenitor cell utilization
D104. Therapeutic cell differentiation induction
D105. Cell/Immune cell based implant utilization
D106. Extracellular vesicle utilization

D2. Bioenvironment regulation

Technologies which create a physical and chemical environment similar to the environment in the body in order to maximize the specific functions that cells or tissues exhibit in the body.

Corresponding List

D201. Biological and chemical bioenvironment
D202. Physical, mechanical bioenvironment mimics
D203. Cell and biomaterials interface
D204. Hybrid tissue engineering

D3. Functional biomaterial development

Technologies which develop structurally and chemically modified functional biocompatible materials which can induce specific activities by interaction with cells and tissues in organisms.

Corresponding List

D301. New biomaterial development
D302. Biocompatibility enhancing technology
D303. Functional supporter development
D304. Biocompatibility materials development

D4. Cell engineering

Comprehensive cellular technologies including technologies for creating new cells such as hybrid cells or recombinant cells and for cell separation and culture.

Corresponding List

D401. Cell assays
D402. Cell manipulation
D403. Cell carrier

D5. Tissue engineering

Technologies used to maintain, improve, and restore biological functions by manufacturing artificial biological tissues or organs using cells or tissues and biocompatible materials.

Corresponding List

D501. Tissue assays

D502. Tissue microencapsulation
D503. Tissue manipulation
D504. Tissue culture

D0. Other cell and tissue engineering, N.E.S.

E. Systems Biology and Bioinformatics

Technologies which study the comprehensive characteristics of organisms through analysis and integration of components and interactions of living organisms, and technologies which obtain and utilize useful information by processing and handling information derived from organisms.

E1. Gene sequence analysis

Technologies which analyze the complete genetic information of an object using a sequence decoder, etc.

Corresponding List

E101. SNP (single nucleotide polymorphism) analysis
E102. cDNA library construction
E103. Gene expression profile analysis
E104. DNA chip development and application
E105. High throughput screening
E106. Full-length cDNA cloning
E107. Whole genome sequence technology

E2. Functional genomics

Technologies which identify genetic functions to obtain information necessary for disease diagnosis, prognosis prediction, and treatment development.

Corresponding List

E201. Proteome-related technology
E202. Genetic functional network analysis
E203. Comparative genomics
E204. Pharmacogenomics
E205. Toxicogenomics
E206. Gene targeting

E207. Transcriptomics
E208. Genotyping
E209. Haplotype profiling
E210. Genome-wide gene trapping
E211. Inverse genomics

E3. Proteomics

Technologies which investigate the structure and function of a specific protein and the interactions between proteins to understand cell behavior and genetic expression.

Corresponding List

E301. Protein display
E302. Protein informatics
E303. Cellular proteomics
E304. Disease-related expression profiling
E305. Pharmacoproteomics
E306. Protein chip development and application

E4. Bioinformatics

Technologies which obtain and utilize useful information by analyzing and processing biological information derived from living organisms using a computer.

Corresponding List

E401. Biological database construction
E402. Data mining system development
E403. Biological system modeling and simulation
E404. Base sequence analysis and design
E405. Structure/function prediction
E406. Biological network analysis

E0. Other systems biology and bioinformatics, N.E.S.

F. Metabolic Engineering

Technologies which increase the production of target metabolites or produce new metabolites by analyzing and transforming metabolic pathways and metabolic regulation systems.

F1. Metabolite production

Technologies which industrially produce primary metabolites (nucleic acids, amino acids, vitamins, etc.) essential for cell growth and secondary metabolites (antibiotics, pigments, etc.) that are biosynthesized after cell growth.

Corresponding List

F101. Primary metabolite production (amino acid, organic acid, alcohol, etc.)
F102. Secondary metabolite production (antibiotics, etc.)
F103. Production of other bioproducts
(nucleic acid, lipid, protein, carbohydrate, etc.)

F2. Applications of metabolic engineering

Technologies used to increase target metabolites, produce new metabolites, or biologically decompose non-natural substances by analyzing, modifying, and redesigning metabolic pathways and metabolic regulation systems.

Corresponding List

F201. Enhanced production of existing metabolites
F202. Production of novel metabolites
F203. Optimizing substrate utilization
F204. Designing pathways for degradation of xenobiotics
F205. Engineering of metabolic pathways and cellular system for improving mid and downstream bioprocesses

F3. Understanding the metabolism and metabolic pathway

Technologies which analyze and informationize the metabolic flow, metabolic regulation system, and metabolic network.

Corresponding List

F301. Metabolic flux analysis
F302. Metabolic flux regulation analysis
F303. Metabolic network analysis
F304. Metabolic profiling
F305. Isotopomer analysis

F0. Other metabolic engineering, N.E.S.

Corresponding List

F001. Integration of genome, transcriptome, proteome, metabolome and fluxome
F002. In silico metabolic engineering

G. Bioprocess

Process technologies such as culturing, biological transformation, recovery, and purification using living organisms or materials derived from living organisms to produce useful substances or products.

G1. Fermentation engineering

Microbial culturing technologies which are used to maximize production of useful substances.

Corresponding List

G101. Microbial strain improvement
G102. Microbial fermentation engineering
G103. High cell density culture
G104. Algal cell culture engineering
G105. Cell immobilization

G2. Cell culture engineering

Technologies used to optimally culture cell lines derived from animals, plants, and insects.

Corresponding List

G201. Animal cell culture engineering
G202. Plant cell culture engineering
G203. Insect cell culture engineering

G204. Cell line development
G205. Media development and optimization
G206. Immobilized cell culture technology
G207. Continuous/Perfusion cell culture technology

G3. Biotransformation

Technologies which convert precursor substances into other useful substances using catalysts derived from living organisms.

Corresponding List

G301. Enzyme reaction engineering
G302. Enzyme stabilization
G303. Enzyme immobilization
G304. Chirotechnology

G4. Bioseparation engineering

Technologies used for optimal recovery and purification of useful substances produced by biological processes.

Corresponding List

G401. Cell lysis
G402. Filtration / membrane separation
G403. Centrifugation
G404. Extraction
G405. Adsorption
G406. Chromatography
G407. Precipitation / Crystallization
G408. Drying
G409. Electrophoresis
G410. Cell separation
G411. Chiral separation

G5. Industrialization

Technologies which design, analyze, optimize, or manage processes to produce living organisms or substances derived from living organisms on an industrial scale.

Corresponding List

G501. Scale-up technology
G502. Bioreactor design and fabrication
G503. Process synthesis
G504. Process validation
G505. Quality assurance / control
G506. Biopharmaceutical manufacturing technology
G507. Plant design and economic analysis
G508. Process analysis technology

G0. Other bioprocesses, N.E.S.

Corresponding List

G001. Bioleaching
G002. Cryopreservation

H. Bioresource Production and Utilization

Technologies which produce and preserve biological resources such as animals, plants, and microorganisms efficiently and produce useful products by separating or processing materials obtained from them.

H1. Plant resource utilization technology

Technologies related to the conservation of genetic resources, genetic modification, molecular breeding, cultivation, pest control, processing and preservation of agricultural products, etc. to efficiently produce plant resources.

Corresponding List

H101. Cultivation and breeding
H102. Transgenic plant development and molecular breeding
H103. Plant transformation analysis and detection
H104. Plant cell differentiation
H105. Plant gene resource analysis and preservation
H106. Disease and pest control (Disease and parasite protection)
H107. Farm product quality control and storage

H2. Animal resource utilization technology

Technologies which produce related products that help to preserve, breed, proliferate, and efficiently produce animal resources, or use byproducts of the animal resource production process to produce useful products.

Corresponding List

H201. Animal resource utilization
H202. Animal breeding, development, and proliferation
H203. Transgenic animal development
H204. Animal disease and zoonosis control
H205. Test animal development and production
H206. Test animal management and utilization
H207. Animal feed production
H208. Animal byproduct processing technology
H209. Animal cell cloning technology

H3. Microbial resource utilization technology

Technologies which separate, identify, and manage useful microbial resources or use them to produce useful substances.

Corresponding List

H301. Screening and identification of microbial resources
H302. Fastidious microorganism isolation
H303. Mutant microorganism utilization
H304. Probiotics development and utilization

H4. Insect resource utilization technology

Technologies which produce useful substances by preserving or utilizing insect resources such as insect organisms, insect cells, and insect-related microorganisms.

Corresponding List

H401. Functional insects and their material utilization
H402. Utilization of insect organs and insect cell lines

H403. Preservation of insect resource and search for its application
H404. Utilization of insect-based microorganisms

H5. Marine/freshwater organism technology

Technologies which produce useful substances or use them for environmental preservation through conservation, separation, breeding, and utilization of biological resources related to marine or freshwater organisms.

Corresponding List

H501. Aquatic animal breeding and development
H502. Aquatic farming
H503. Excellent individual preservation
H504. Aquatic microorganism utilization
H505. Aquatic plant breeding and utilization
H506. Aquatic bioresource screening
H507. Aquatic environment preservation

H6. Food engineering

Technologies which produce and manage food or food materials through identification, evaluation, processing, and packaging of biological resources that can be used as general foods or functional health foods.

Corresponding List

H601. Food processing and packaging
H602. Functional food material production
H603. Food pollutant detection and management
H604. Fermentation foods and enzyme utilization
H605. Food quality and nutrition evaluation
H606. Food additive development

H7. Biomaterializing technology

Technologies which identify and evaluate biological materials from biological resources and produce useful substances or evaluate their functions through manipulations such as separation, purification, biocatalytic reaction, and biomimetics.

Corresponding List

H701. Metabolism-enhancing biomaterial screening

H702. Biomaterial production and utilization
H703. Biomaterial functionality evaluation
H704. Biomaterial separation and purification
H705. Biomimetry
H706. Molecular high-throughput screening

H8. Biodiversity conservation

Technologies which preserve and manage diversity of genes, species, and ecosystems.

Corresponding List

H801. Genetic diversity preservation and management
H802. Species diversity preservation and management
H803. Ecosystem diversity preservation and management
H804. Cryopreservation

H0. Other bioresource production and utilization, N.E.S.

Corresponding List

H001. Bioproduct engineering
H002. Life support system for closed environment

I. Environmental Biotechnology and Bioenergy Technology

Biotechnologies which are applied to environmental and bioenergy fields such as pollution measurement, treatment, and restoration.

I1. Clean technology

Production and management technologies using eco-friendly alternative raw materials and processes that can reduce the consumption of energy or resources or reduce the emission of environmental pollutants.

Corresponding List

I101. Process-related clean technology
I102. Biodegradable material production
I103. Bio-based solvent technology

I2. Environmental pollution control and management technology

Reduction and management technologies that can reduce emissions of environmental pollutants or restore the polluted natural environment to the natural environment, such as water quality, air, and soil.

Corresponding List

I201. Air pollution control and treatment
I202. Water pollution control and treatment
I203. Soil pollution control and remediation
I204. Waste treatment
I205. Environmental pollutants measurement and analysis
I206. Environmental measurement and control
I207. Ecosystem restoration

I3. Bioenergy technology

Technologies which produce and use energy-related products including electricity, fuel (liquid, solid, and gaseous), heat, chemicals, and other substances using renewable resources such as biomass.

Corresponding List

I301. Bioethanol production using starch biomass
I302. Bioethanol production using lignocellulosic biomass
I303. Biodiesel production
I304. Biogas production
I305. Biohydrogen production
I306. Biobutanol production

I0. Other environmental biotechnology and bioenergy technology, N.E.S.

J. Nanobiotechnology

Technologies which control and apply biomolecules at the nano scale by combining nanotechnology and biotechnology.

J1. Nano-biodevice fabrication

Bio device composition and production technologies which control organisms or substances derived from organisms at the nano scale.

Corresponding List

J101. Nano-DNA chip fabrication
J102. Nano-protein chip fabrication
J103. Nano fabrication (Nanochip production and application)
J104. Nano-bioelectronic device fabrication
J105. Nano-biosensor system
J106. Nano-bioactuator fabrication
J107. Nano-biosignal analysis

J2. Nano-biomaterial technology

Technologies which produce medical and industrial materials by controlling, designing, and processing organisms or substances derived from organisms at the nano scale to provide a bioregulation function.

Corresponding List

J201. Biomaterial self-assembly
J202. Biomaterial production for nano-biochip
J203. Hybrid nanomaterial manufacturing
J204. Bio-nanoparticle manufacturing
J205. Bio-nanomaterial thin film fabrication

J3. Nano drug delivery system

Technologies and systems which control drug release rate by controlling particles at the nano scale or to efficiently deliver drugs to target sites.

Corresponding List

J301. Nanomaterial for drug delivery
J302. Nanostructure manipulation and property analysis
J303. Nano-carrier manufacturing
J304. Discovery of molecular target for drug delivery

J4. BioNEMS (Nanoelectromechanical systems), nano-LOC (lab-on-a-chip)

Technologies which manufacture biochips using microprocessing technology controlled at the nano scale, and technologies which design, manufacture, and produce biochips to implement various operations such as mixing, reaction, separation, and analysis performed in laboratories.

Corresponding List

J401. Nanofluidics
J402. Nanoprocessing
J403. Nanolithography
J404. Surface and interface control
J405. Nano scale particle manipulation
J406. Nanoflow visualization & diagnosis

J0. Other nanobiotechnology, N.E.S.

K. Bioelectronics Engineering

Technologies which construct, produce, and utilize bio devices based on the detection function of living organisms or substances derived from living organisms.

K1. Biosensor fabrication
Technologies which design, construct, and produce devices that detect and quantitatively analyze specific substances by artificially implementing the detection function of living organisms or substances derived from living organisms.

Corresponding List

K101. Biomaterial immobilization
K102. Sensor array fabrication

K103. Biomolecule recognition analysis
K104. Sensor system design
K105. Signal detection and transduction
K106. Remote transmission

K2. Bioelectronic device fabrication

Technologies which design, construct, and manufacture devices that have the functions of detecting specific substances or processing information and storing information by artificially implementing the electronic transfer and preservation function of living organisms or substances derived from living organisms.

Corresponding List

K201. Biofilm fabrication
K202. Device fabrication
K203. Biomemory fabrication
K204. Biocomputing

K3. Biochip fabrication

Technologies which manufacture chips that analyze functions of genes, proteins, cells, etc. by immobilizing living organisms or substances derived from living organisms at high density on a solid substrate.

Corresponding List

K301. DNA chip fabrication and application
K302. Protein chip fabrication and application
K303. Cell chip fabrication and application
K304. High throughput screening
K305. Array fabrication
K306. Biodata mining
K307. Instrument manufacturing for biochips

K4. Microfluidics
Technologies which identify fluid phenomena in microstructures required for the collection, processing, separation, and transport of materials from a biochip and lab-on-a-chip.

Corresponding List

K401. Plastic microfabrication
K402. Microfluidics transport

K403. Low Reynolds number flow
K404. Multiscale flow simulation
K405. Microflow driving & manipulation
K406. Micro/nano scale particle manipulation
K407. Microflow visualization & diagnosis

K0. Other bioelectronics, N.E.S.

L. Biosafety and Efficacy Evaluation

Biotechnologies or technologies which evaluate the potential risk or biological efficacy derived from the products using the technology.

L1. Safety evaluation
Technologies related to biotechnology and the methods and tools for assessing potential risks from its products.

Corresponding List

L101. Medicine and cosmetics safety evaluation
L102. Food and food additives safety evaluation
L103. Chemical materials safety evaluation
L104. Biological agrochemicals safety evaluation
L105. Microbiological safety evaluation
L106. GMO safety evaluation
L107. Clinical trial
L108. Toxicity evaluation

L2. Safety management

Management technologies that can reduce or block potential risks originating from biotechnology and its products.

Corresponding List

L201. Safety management
L202. HACCP (hazard analysis critical control points)

L203. Safety management of GMOs

L3. Environmental assessment

Technologies related to evaluating the impact on the natural environment, living environment, social and economic environment, culture, etc. and establishing and evaluating methods to minimize or avoid environmental impact before implementing a project plan that affects the environment.

Corresponding List

L301. Environmental assessment of natural disaster
L302. Environmental assessment of chemicals
L303. Environmental assessment of radioactive materials
L304. Environmental assessment of synthetic resins and petroleum products
L305. Environmental assessment of magnetism
L306. Evaluation and management of GMOS
L307. Biodegradability evaluation

L4. Biohazard management

Technologies which prevent, manage, and restore disasters that can have a significant impact on humans and ecosystems due to leakage of toxic substances, pathogens, or organisms derived from biotechnology or artificial changes in the ecosystem.

Corresponding List

L401. Safety management of chemicals
L402. Safety management of radioactive materials
L403. Biohazard management caused by natural disaster
L404. Biological remediation restoration using microorganisms
L405. Biohazard management caused by bio-weapons

L5. Efficacy evaluation

Technologies which evaluate the efficacy of substances that promote or inhibit the activity of the human body, living organisms, or substances derived from living organisms.

Corresponding List

L501. *In vitro* assay
L502. In vivo assay
L503. Pharmacokinetic evaluation
L504. Preclinical trial
L505. Clinical trial I
L506. Clinical trial II
L507. Clinical trial III
L508. Clinical trial IV

L0. Other biosafety and efficacy evaluation, N.E.S.

M. Other Biotechnology

M1. Combinational biology

Technologies which secure the diversity of molecules through combined genetic information based on the genetic recombination method, to select potential candidates expected to have specific activity from this, and to secure genetic information regarding it.

Corresponding List

M101. Potential candidate shape library construction
M102. Hybrid polyketide antibiotics development

M2. Drug delivery

Technologies which minimize side effects of drugs and maximize efficacy and effects by controlling the drug release rate or efficiently delivering drugs to the target site.

Corresponding List

M201. Controlled release formulation

M202. Biomaterials for drug delivery
M203. Structure manipulation and property analysis
M204. Carrier development
M205. Discovery of molecular target for drug delivery

M3. Immunotherapy

Technologies which treat various diseases through the body's immune system by manufacturing, transforming, and activating substances and cells involved in the body's immune process.

Corresponding List

M301. Immunomodulator
M302. Immunotherapeutics
M303. Targeted immunotherapy

M0. Other biotechnology, N.E.S.

Appendix 2. Survey Questionnaire

승인번호
제 115015 호

Survey on Domestic Bioindustry 2020

Greetings!
We would like to extend our wishes for the tremendous development of your company.

The Ministry of Trade, Industry and Energy (MOTIE) conducts annual survey on domestic bioindustry companies for the purpose of enhancing their ability to analyze the domestic bioindustry. We also **aim to establish objective grounds and standards for the government's policy to foster and support the bioindustry.**

The Korea Biotechnology Industry Organization, also one of the conductors of this survey, is an organization representing the bioindustry. It was established in accordance with Article 38 of the Industrial Development Act, and is responsible for serving as a window to connect with the government, supporting the growth and expansion of the domestic bioindustry.

This statistical survey was created based on the Statistics Act, and the contents of the responses **are not used for any purposes other than statistical purposes. Corporate secrets are strictly protected** under Article 33 of the same Act.

The survey was conducted from January 1, 2020 to December 31, 2020.
Please note that your response will be used as a basis for the government's bioindustry-related policies and industrial development of the country. Please fill out each item as accurately and faithfully as possible.

* After filling out the survey, please kindly send it to the survey institution below by fax, e-mail, or mail.

Organizing agency: Ministry of Trade, Industry and Energy
Dedicated organization: Korea Biotechnology Industry Organization
Survey institution: Korea Enterprise Data Co., Ltd.

산업통상자원부 koreaBio 한국바이오협회

I. General Information

1. Company Name		2. Name of Representative (CEO)		Sex	□①Male □②Female
3. Business Registration Number	____ - ___ - _____	4. Name of Parent Company (Group)			
5. Phone Number	( ) -	6. Date of Establishment	_____ (MM YYYY)		
7. Address (Headquarters)	(Website: http://)				
8. Respondent	Name				
	Department / Position				
	TEL.	( ) -			
	FAX	( ) -			
	E-mail				

II. General Status of Company

9. How much is your company's capital **as of the end of 2020**? (Unit: KRW)
* Capital paid by the incorporated company (headquarters) as of December 31, 2020.

Trillion	100 billion	10 billion	Billion	100 million	10 million	Million

10. How much is your total and equity capital **as of the end of 2020**? (Unit: KRW)

	100 trillion	10 trillion	Trillion	100 billion	10 billion	Billion	100 million	10 million	Million
Total capital									

	100 trillion	10 trillion	Trillion	100 billion	10 billion	Billion	100 million	10 million	Million
Equity capital									

* Total capital includes the total amount of capital plus liabilities, which means the “sum of liabilities and equity” or “total assets.”
* Equity capital is [total capital – liabilities], which makes it the total capital.

11. **How many workers** are there in your company as of the end of 2020?

Number of employees (Regular workers + non-regular workers)	Total: _____ (Male: _____ / Female: _____)	□① 1 – 49
		□② 50 – 299
		□③ 300 – 999
		□④ 1,000 or more

* Number of employees include regular and non-regular workers. Non-regular workers: industrial technical personnel, service workers, part-time workers, dispatched workers, substitute workers, contract workers, house/home workers, and day workers.

12. Please check the following boxes whether your company is **a single-unit enterprise, a designated company, and your company's listing status.**

12-1. **Do you have any business units** that belong to the headquarters? □① Single-unit enterprise (Businesses that do not own plants, R&D centers, or branches) □② Businesses that own plants, branches, R&D centers, sales offices, or branches	12-2. **Certification (multiple responses allowed)** * as of the end of 2020 □① Venture company □② INNO-BIZ □③ MAIN-BIZ □④ N/A 12-3. **Listing** * as of the end of 2020 □① KONEX-listed company □② KOSDAQ-listed company □③ Listed company □④ N/A

12-4. Please fill out the following if you own **bioindustry-related plants** (bioproducts/services production and sales) or **R&D centers** (conducting R&D activities in the bioindustry) in other locations.

Order of Priority	Classification	Business Name	Address
1	□① Plant □② R&D Center		
2	□① Plant □② R&D Center		
3	□① Plant □② R&D Center		
4	□① Plant □② R&D Center		
5	□① Plant □② R&D Center		
6	□① Plant □② R&D Center		

13. How much is your company's net income or net loss as of year 2020 (Jan 1 – Dec 31, 2020)?
Please fill in **the sum of each item as shown on your income statement**. (Unit: KRW)

	10 trillion	**Trillion**	**100 billion**	**10 billion**	**Billion**	**100 million**	**10 million**	**Million**
① Sales								
② Cost of sales								
③ Selling and administrative expenses								
④ Non-operating income								
⑤ Non-operating expenses								
⑥ Income tax expense								
Net income / Net loss (① - ② - ③ + ④ - ⑤ - ⑥)								

* In the case of net loss for the current period, indicate with a minus (-) in front of the number.

III. Bioindustry

14. Please select **<u>both</u> the R&D and production status for the bioindustry** where your company conducts R&D and production activities, and **select <u>only one</u> of all the core areas.**

		Biopharmaceutical	Biochemical and Bioenergy	Biofood	Bioenvironmental	Biomedical Equipment	Bioinstrument and Bioequipment	Bioresource	Bioservice
R&D / Production (Multiple responses allowed)	R&D	①	②	③	④	⑤	⑥	⑦	⑧
	Production	①	②	③	④	⑤	⑥	⑦	⑧
Core Area (select one)		①	②	③	④	⑤	⑥	⑦	⑧

* For detailed items such as products and services, which are the outputs of industrial activities for each industry, refer to <Example> Bioindustry Classification Code [KS J 1009] on page 12.

15. Please indicate **the manpower status of bioindustry** in your company. Please make sure to include regular and non-regular workers. (Unit: persons)

Classification	Doctor's		Master's		Bachelor's		Others		Total	
Researchers	Male		Male		Male		Male		Male	
	Female		Female		Female		Female		Female	
Production Workers	Male		Male		Male		Male		Male	
	Female		Female		Female		Female		Female	
Other Positions including Sales/Administrative	Male		Male		Male		Male		Male	
	Female		Female		Female		Female		Female	

* Researchers: R&D personnel in the bioindustry.
* Production workers: Include production workers and facility/quality management workers working in the bioindustry other than R&D centers.
* Other positions including sales/administrative: All manpower in the bioindustry other than researchers and production workers.
* Non-regular workers refer to industrial technical personnel, service workers, part-time workers, dispatched workers, substitute workers, contract workers, telecommuters, day workers, etc.

16. Please fill in your company's **R&D and facility investment costs for the entire period of 2020.** (Unit: KRW)

* This is the total expenditure that your company may have invested in R&D activities for product and technology development for the entire period of 2020. Please refer to the following: the sales cost in your manufacturing cost statement and profit and loss statement, the current development cost and research expenses in your management expenses, and the cost of property, plant, and equipment as stated on your balance sheet.

Classification		(1) R&D Investment					(2) Facility Investment				
Year 2020 (Jan. 1 – Dec. 31, 2020)	Total Investment (Bioindustry + other)	10 billion	Billion	100 million	10 million	Million	10 billion	Billion	100 million	10 million	Million
	Investment in the Bioindustry	10 billion	Billion	100 million	10 million	Million	10 billion	Billion	100 million	10 million	Million

* R&D investment: R&D cost within your company (labor cost, materials cost, and other expenses), consignment R&D cost, technology introduction cost, etc.
* Facility investment (acquisition cost of property, plant, and equipment): costs for acquiring mechanical equipment, land, or building.
* Total investment = investment in the bioindustry + investment in other industries

17. Have your company ever had **a cooperative relationship with other organizations (companies, research institutes, universities, or medical institutions)** in the bioindustry in between the year (Jan 1 – Dec 31, 2020)?

* Cooperative relationship includes (1) joint venture, (2) joint R&D contract, (3) technical tie-up (licensing), and (4) technical manpower exchange with other organizations or businesses for products, services, or process innovation.

Explanations and Examples for Each Type of Cooperative Relationship	
(1) Joint Venture	Establishing a joint venture through joint investment between partners or acquiring a certain stake in the other partner company (equity investment)
(2) Joint R&D Contract	The process of investing resources and knowledge to achieve common R&D objectives and sharing the results (non-equity investment)
(3) Technical Tie-up (Licensing)	Obtaining (granting) the right to receive (share) production technology from (with) other companies, universities, or organizations or to develop new products, i.e., technology introduction (export technology)
(4) Domestic/International Technical Manpower Exchange	The dispatch (attraction) of related researchers for a certain period of time to acquire technical knowledge or to provide technical guidance from/to other companies, universities, and organizations

□ ① Yes (go to No. 17-1)

□ ② No (go to No. 18)

17-1. If yes, **what form of cooperation have you established with other organizations (companies, research institutes, universities, or medical institutions)? (Multiple responses allowed)**

* Example: In the case of a cooperative relationship in the form of a "joint venture" with a research institute or a "joint R&D contract" with a university, select both ① and ②.

① Joint Venture (Go to No. 17-2)	Establishing a joint venture through joint investment between partners or acquiring a certain stake in the other partner company (equity investment)
② Joint R&D Contract (Go to No. 17-3)	The process of investing resources and knowledge to achieve common R&D objectives and sharing the results (non-equity investment)
③ Technical Tie-up (Licensing) (Go to No. 17-4)	Obtaining (granting) the right to receive (share) production technology from (with) other companies, universities, or organizations or to develop new products, i.e., technology introduction (export technology)
④ Domestic/International Technical Manpower Exchange (Go to No. 17-5)	The dispatch (attraction) of related researchers for a certain period of time to acquire technical knowledge or to provide technical guidance from/to other companies, universities, and organizations

*** For questions 17-2 to 17-5, please enter the status of your cooperation with other organizations and the cooperation stages by type of cooperative relationship.**
Please refer to the description below to fill out this part.

Description	
① Basic Research Stage	Identification of candidate materials, conceptual design stage, etc.
② Experimental Stage	In-vitro, in-silico, non-clinical, laboratory prototype stage, etc.
③ Prototype Stage	Clinical trial phase 1 to 3, pilot scale production stage, etc.
④ Product Development Stage	FDA approval/permit, trial production, certification/standardization stage, etc.
⑤ Commercialization Stage	Main production, marketing, sales stage, etc.

17-2. Please select the **organization(s)** which you have agreed for a cooperative relationship **<u>in the form of a joint venture</u>**, and fill in **the status of the cooperation stage** for each organization.

* Select a cooperative organization first, then fill in the status of the cooperation stage for each organization.

* Cooperative stages are presented as ① basic research, ② experimental, ② prototype, ④ product development, and ⑤ commercialization (refer to page 6 for more details for each cooperation stage.)

(1) Joint Venture							
	Companies			Research Institutes		Universities	Medical Institutions
	SMEs and Venture Companies (1–299 workers)	Middle-standing Companies (300–999 workers)	Large Enterprises (1,000 workers or more)	Government-funded	Private		
Cooperative Relationship	□ ①	□ ②	□ ③	□ ④	□ ⑤	□ ⑥	□ ⑦
Domestic	(No. of cases) ① Basic research: _ ② Experimental: _ ③ Prototype: _ ④ Product development: _ ⑤ Commercialization: _	(No. of cases) ① Basic research: _ ② Experimental: _ ③ Prototype: _ ④ Product development: _ ⑤ Commercialization: _	(No. of cases) ① Basic research: _ ② Experimental: _ ③ Prototype: _ ④ Product development: _ ⑤ Commercialization: _	(No. of cases) ① Basic research: _ ② Experimental: _ ③ Prototype: _ ④ Product development: _ ⑤ Commercialization: _	(No. of cases) ① Basic research: _ ② Experimental: _ ③ Prototype: _ ④ Product development: _ ⑤ Commercialization: _	(No. of cases) ① Basic research: _ ② Experimental: _ ③ Prototype: _ ④ Product development: _ ⑤ Commercialization: _	(No. of cases) ① Basic research: _ ② Experimental: _ ③ Prototype: _ ④ Product development: _ ⑤ Commercialization: _
Overseas	(No. of cases) ① Basic research: _ ② Experimental: _ ③ Prototype: _ ④ Product development: _ ⑤ Commercialization: _	(No. of cases) ① Basic research: _ ② Experimental: _ ③ Prototype: _ ④ Product development: _ ⑤ Commercialization: _	(No. of cases) ① Basic research: _ ② Experimental: _ ③ Prototype: _ ④ Product development: _ ⑤ Commercialization: _	(No. of cases) ① Basic research: _ ② Experimental: _ ③ Prototype: _ ④ Product development: _ ⑤ Commercialization: _	(No. of cases) ① Basic research: _ ② Experimental: _ ③ Prototype: _ ④ Product development: _ ⑤ Commercialization: _	(No. of cases) ① Basic research: _ ② Experimental: _ ③ Prototype: _ ④ Product development: _ ⑤ Commercialization: _	(No. of cases) ① Basic research: _ ② Experimental: _ ③ Prototype: _ ④ Product development: _ ⑤ Commercialization: _

17-3. Please select the **organization(s)** which you have agreed for a cooperative relationship **<u>in the form of a joint R&D contract</u>**, and fill in **the status of the cooperation stage** for each organization.

* Select a cooperative organization first, then fill in the status of the cooperation stage for each organization.

* Cooperative stages are presented as ① basic research, ② experimental, ② prototype, ④ product development, and ⑤ commercialization (refer to page 6 for more details for each cooperation stage.)

(2) Joint R&D Contract							
	Companies			Research Institutes		Universities	Medical Institutions
	SMEs and Venture Companies (1–299 workers)	Middle-standing Companies (300–999 workers)	Large Enterprises (1,000 workers or more)	Government-funded	Private		
Cooperative Relationship	□ ①	□ ②	□ ③	□ ④	□ ⑤	□ ⑥	□ ⑦
Domestic	(No. of cases) ① Basic research: _ ② Experimental: _ ③ Prototype: _ ④ Product development: _ ⑤ Commercialization: _	(No. of cases) ① Basic research: _ ② Experimental: _ ③ Prototype: _ ④ Product development: _ ⑤ Commercialization: _	(No. of cases) ① Basic research: _ ② Experimental: _ ③ Prototype: _ ④ Product development: _ ⑤ Commercialization: _	(No. of cases) ① Basic research: _ ② Experimental: _ ③ Prototype: _ ④ Product development: _ ⑤ Commercialization: _	(No. of cases) ① Basic research: _ ② Experimental: _ ③ Prototype: _ ④ Product development: _ ⑤ Commercialization: _	(No. of cases) ① Basic research: _ ② Experimental: _ ③ Prototype: _ ④ Product development: _ ⑤ Commercialization: _	(No. of cases) ① Basic research: _ ② Experimental: _ ③ Prototype: _ ④ Product development: _ ⑤ Commercialization: _
Overseas	(No. of cases) ① Basic research: _ ② Experimental: _ ③ Prototype: _ ④ Product development: _ ⑤ Commercialization: _	(No. of cases) ① Basic research: _ ② Experimental: _ ③ Prototype: _ ④ Product development: _ ⑤ Commercialization: _	(No. of cases) ① Basic research: _ ② Experimental: _ ③ Prototype: _ ④ Product development: _ ⑤ Commercialization: _	(No. of cases) ① Basic research: _ ② Experimental: _ ③ Prototype: _ ④ Product development: _ ⑤ Commercialization: _	(No. of cases) ① Basic research: _ ② Experimental: _ ③ Prototype: _ ④ Product development: _ ⑤ Commercialization: _	(No. of cases) ① Basic research: _ ② Experimental: _ ③ Prototype: _ ④ Product development: _ ⑤ Commercialization: _	(No. of cases) ① Basic research: _ ② Experimental: _ ③ Prototype: _ ④ Product development: _ ⑤ Commercialization: _

17-4. Please select the **organization(s)** which you have agreed for a cooperative relationship **in the form of technical tie-up (licensing)**, and fill in **the status of the cooperation stage** for each organization.

* Select a cooperative organization first, then fill in the status of the cooperation stage for each organization.

* Cooperative stages are presented as ① basic research, ② experimental, ② prototype, ④ product development, and ⑤ commercialization (refer to page 6 for more details for each cooperation stage.)

(3) Technical Tie-up (Licensing)							
	Companies			Research Institutes		Universities	Medical Institutions
	SMEs and Venture Companies (1–299 workers)	Middle-standing Companies (300–999 workers)	Large Enterprises (1,000 workers or more)	Government-funded	Private		
Cooperative Relationship	□ ①	□ ②	□ ③	□ ④	□ ⑤	□ ⑥	□ ⑦
Domestic	(No. of cases) ① Basic research: _ ② Experimental: _ ③ Prototype: _ ④ Product development: _ ⑤ Commercialization: _	(No. of cases) ① Basic research: _ ② Experimental: _ ③ Prototype: _ ④ Product development: _ ⑤ Commercialization: _	(No. of cases) ① Basic research: _ ② Experimental: _ ③ Prototype: _ ④ Product development: _ ⑤ Commercialization: _	(No. of cases) ① Basic research: _ ② Experimental: _ ③ Prototype: _ ④ Product development: _ ⑤ Commercialization: _	(No. of cases) ① Basic research: _ ② Experimental: _ ③ Prototype: _ ④ Product development: _ ⑤ Commercialization: _	(No. of cases) ① Basic research: _ ② Experimental: _ ③ Prototype: _ ④ Product development: _ ⑤ Commercialization: _	(No. of cases) ① Basic research: _ ② Experimental: _ ③ Prototype: _ ④ Product development: _ ⑤ Commercialization: _
Overseas	(No. of cases) ① Basic research: _ ② Experimental: _ ③ Prototype: _ ④ Product development: _ ⑤ Commercialization: _	(No. of cases) ① Basic research: _ ② Experimental: _ ③ Prototype: _ ④ Product development: _ ⑤ Commercialization: _	(No. of cases) ① Basic research: _ ② Experimental: _ ③ Prototype: _ ④ Product development: _ ⑤ Commercialization: _	(No. of cases) ① Basic research: _ ② Experimental: _ ③ Prototype: _ ④ Product development: _ ⑤ Commercialization: _	(No. of cases) ① Basic research: _ ② Experimental: _ ③ Prototype: _ ④ Product development: _ ⑤ Commercialization: _	(No. of cases) ① Basic research: _ ② Experimental: _ ③ Prototype: _ ④ Product development: _ ⑤ Commercialization: _	(No. of cases) ① Basic research: _ ② Experimental: _ ③ Prototype: _ ④ Product development: _ ⑤ Commercialization: _

17-5. Please select the **organization(s)** which you have agreed for a cooperative relationship **in the form of domestic/international technical manpower exchange**, and fill in **the status of the cooperation stage** for each organization.

* Select a cooperative organization first, then fill in the status of the cooperation stage for each organization.

* Cooperative stages are presented as ① basic research, ② experimental, ② prototype, ④ product development, and ⑤ commercialization (refer to page 6 for more details for each cooperation stage.)

(4) Domestic/International Technical Manpower Exchange							
	Companies			Research Institutes		Universities	Medical Institutions
	SMEs and Venture Companies (1–299 workers)	Middle-standing Companies (300–999 workers)	Large Enterprises (1,000 workers or more)	Government-funded	Private		
Cooperative Relationship	□ ①	□ ②	□ ③	□ ④	□ ⑤	□ ⑥	□ ⑦
Domestic	(No. of cases) ① Basic research: _ ② Experimental: _ ③ Prototype: _ ④ Product development: _ ⑤ Commercialization: _	(No. of cases) ① Basic research: _ ② Experimental: _ ③ Prototype: _ ④ Product development: _ ⑤ Commercialization: _	(No. of cases) ① Basic research: _ ② Experimental: _ ③ Prototype: _ ④ Product development: _ ⑤ Commercialization: _	(No. of cases) ① Basic research: _ ② Experimental: _ ③ Prototype: _ ④ Product development: _ ⑤ Commercialization: _	(No. of cases) ① Basic research: _ ② Experimental: _ ③ Prototype: _ ④ Product development: _ ⑤ Commercialization: _	(No. of cases) ① Basic research: _ ② Experimental: _ ③ Prototype: _ ④ Product development: _ ⑤ Commercialization: _	(No. of cases) ① Basic research: _ ② Experimental: _ ③ Prototype: _ ④ Product development: _ ⑤ Commercialization: _
Overseas	(No. of cases) ① Basic research: _ ② Experimental: _ ③ Prototype: _ ④ Product development: _ ⑤ Commercialization: _	(No. of cases) ① Basic research: _ ② Experimental: _ ③ Prototype: _ ④ Product development: _ ⑤ Commercialization: _	(No. of cases) ① Basic research: _ ② Experimental: _ ③ Prototype: _ ④ Product development: _ ⑤ Commercialization: _	(No. of cases) ① Basic research: _ ② Experimental: _ ③ Prototype: _ ④ Product development: _ ⑤ Commercialization: _	(No. of cases) ① Basic research: _ ② Experimental: _ ③ Prototype: _ ④ Product development: _ ⑤ Commercialization: _	(No. of cases) ① Basic research: _ ② Experimental: _ ③ Prototype: _ ④ Product development: _ ⑤ Commercialization: _	(No. of cases) ① Basic research: _ ② Experimental: _ ③ Prototype: _ ④ Product development: _ ⑤ Commercialization: _

18. What is **the current growth stage** of your company for the bioindustry?

* **Sales generation** refers to the case where sales of finished products directly produced by the company and sales of the finished products through consignment manufacture by provision of raw materials or intermediate products to third-party companies or imports are generated by service provision or technology transfer. It corresponds to all results by domestic sales and export activities.

□① Before sales generation → Go to question 20

□② Sales generation (below BEP) → Go to question 18-1

□③ Sales generation (above BEP) → Go to question 18-1

18-1. **How long** has your company **generated sales** in the bioindustry?

□① 1 year □② 2–3 years □③ 4–5 years □④ 6–9 years □⑤ 10 years or more

19. Please indicate the products, services, or trading technologies in **the bioindustry** where your company generated sales in 2020 in the table below.

No.	Name (Product name, service name, transaction technology name)	Category	Classification Code	Domestic Sales (Unit: million KRW)	Export		
					Export Amount (Unit: thousand USD, POB)	Name of Country Exported To	Proportion of Exports by Country (%)
Example)	OOOO	☑ Finished product □ Intermediate product □ Service □ Technology	1 0 1 0	2,000	1,000	USA China	40% 60%
1		□ Finished product □ Intermediate product □ Service □ Technology		100			
2		□ Finished product □ Intermediate product □ Service □ Technology		100			
3		□ Finished product □ Intermediate product □ Service □ Technology		100			
4		□ Finished product □ Intermediate product □ Service □ Technology		100			
5		□ Finished product □ Intermediate product □ Service □ Technology		100			
6		□ Finished product □ Intermediate product □ Service □ Technology		100			
7		□ Finished product □ Intermediate product □ Service □ Technology		100			

* Intermediate products among the corresponding items include raw materials, intermediates, bulk, etc.
* For classification codes, refer to <Example> Bioindustry Classification Code [KS J 1009] on page 12.
* Exports should be indicated in the corresponding currency and unit.
* For the name of the country exported to, if the number of exporting countries is fewer than 5, indicate all, and if there are more than 5 countries, indicate each of the top 1 to 4 countries with the highest proportion.
* The proportion (%) of exports by country refers to the proportion of the country out of the total exports.

20. Please fill in the table below for products, services, or trading technologies in the overseas **bioindustry** that were imported in 2020.

No.	Name (Product name, service name, transaction technology name)	Category	Classification Code	Import Amount (Unit: thousand USD, CIF)	Name of the Country Imported From	Proportion of Imports by Country (%)
1		□ Finished product □ Intermediate product □ Service □ Technology				
2		□ Finished product □ Intermediate product □ Service □ Technology				
3		□ Finished product □ Intermediate product □ Service □ Technology				
4		□ Finished product □ Intermediate product □ Service □ Technology				
5		□ Finished product □ Intermediate product □ Service □ Technology				
6		□ Finished product □ Intermediate product □ Service □ Technology				
7		□ Finished product □ Intermediate product □ Service □ Technology				
8		□ Finished product □ Intermediate product □ Service □ Technology				
9		□ Finished product □ Intermediate product □ Service □ Technology				
10		□ Finished product □ Intermediate product □ Service □ Technology				

* Intermediate products among the corresponding items include raw materials, intermediates, bulk, etc.
* For classification codes, refer to <Example> Bioindustry Classification Code [KS J 1009] on page 12.
* Imports should be indicated in the corresponding currency and unit.
* For the name of the country imported from, if the number of importing countries is fewer than 5, indicate all, and if there are more than 5 countries, indicate each of the top 1 to 4 countries with the highest proportion.
* The proportion (%) of imports by country refers to the proportion of the country out of the total imports.
* If there are more than 10 items, please indicate them on a separate sheet.

♧ Thank you for sparing your time for the survey. ♧

<Example> Bioindustry Classification Code (KS J 1009)

Area	Code	Area	Code	Area	Code
Biopharmaceutical	1010) Bio-antibiotics 1020) Biologically manufactured low-molecular medicines 1030) Vaccines 1040) Hormones 1050) Therapeutic antibodies and cytokines 1060) Hemotherapeutics 1070) Cell-based therapeutics 1080) Gene therapeutics 1090) Biological diagnostic products 1100) Enzymes and live bacteria medicines 1110) Biomaterial-based medicines 1120) Veterinary biopharmaceuticals 1000) Other biopharmaceuticals	**Biochemical and Bioenergy**	2010) Biopolymers 2020) Industrial enzymes and reagents 2030) Enzymes and reagents for research 2040) Biocosmetics and home & personal care chemicals 2050) Biological agrochemicals and fertilizers 2060) Biofuels 2000) Other biochemical and bioenergy products	**Biofood**	3010) Functional health foods 3020) Food-grade microorganisms & enzymes 3030) Food additives 3040) Fermented foods 3050) Feed additives 3000) Other biofoods
Bioenvironmental	4010) Biological treatment agents and systems 4020) Materials and equipments for bio-immobilization 4030) Bioenvironmental agents and systems for treatment and recycling 4040) Measuring apparatus and service for environmental pollution and assessment 4000) Other bioenvironmental products and services	**Biomedical Equipment**	5010) Biosensors 5020) In-vitro diagnostics 5030) Medical devices using biosensors and/or biomarkers 5000) Other biomedical equipments	**Bioinstrument and Bioequipment**	6010) Gene/protein/peptide analysis, synthesis, and manufacturing instruments 6020) Cell analysis and cultivation equipments 6030) Multi-functional and other bioanalysis instruments 6040) R&D and manufacturing equipments 6050) Bioprocess equipment parts 6000) Other bioinstruments and bioequipments
Bioresource	7010) Seeds and seedlings 7020) Genetically Modified Organisms for use as food, feed or processing 7030) Experimental animals 7040) Other bioresources	**Bioservice**	8010) Bio-consignment production and procuration services 8020) Bio-diagnostic and analytical services 8030) Clinical/non-clinical R&D services 8040) Other R&D services$_{2)}$ 8050) Processing, treatment, and warehousing services 8000) Other bioservices		

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