Report on Survey of Domestic Bioindustry 2022

December 2023

MINISTRY OF TRADE, INDUSTRY & ENERGY
Korea Biotechnology Industry Organization

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1 Survey Overview

A. Data Sources

○ Bio-Convergence Industry Division, Ministry of Trade, Industry, and Energy

○ Statistical Sources: Korea Biotechnology Industry Organization

B. Type of Statistics and Authorized Number

○ Type of Statistics: General/Survey Statistics

○ Authorized Number: No. 115015

○ Authorized Date: October 30, 2003

C. Survey Period

○ Survey Baseline Date: December 31, 2022

○ Targeted Survey Period: January 1, 2022 – December 31, 2022

○ Survey Period: June 8, 2023 – October 13, 2023

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 on 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 2021

○ 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, and private companies (private enterprise, collective enterprise, general/limited partnership company, joint venture, anonymous company, limited company, stock company, and co-operative).

○ In case the company has two or more business entities, 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 Survey of Domestic Bioindustry

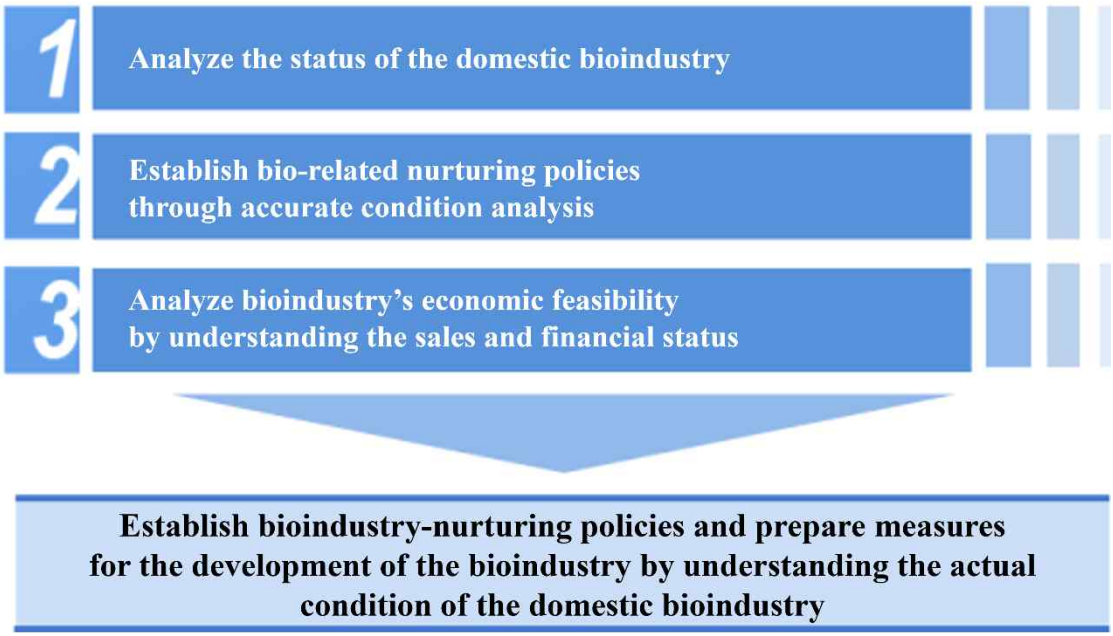
2 Background and Purpose

○ 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 Survey of Domestic Bioindustry 2022," which was first conducted in June 2023, 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	1,354 companies
Size of valid sample	1,089 companies (80.4% 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	- Total capital, equity capital - 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: Listing refers to the qualification granted to securities issued by companies, allowing them to be traded on the stock exchanges such as the Korea Exchange (KRX), KOSDAQ, and KONEX. A listed company is an entity that has obtained this qualification, enabling its securities to be traded on these markets.

○ Total Capital: Refers to the total amount of capital and liabilities and is equal to "total equity and liabilities" or "total assets."

○ Equity Capital: Refers to the total amount of capital and is equal to "total equity."

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 2022. 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, and 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

■ **Target 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	Industrial Classification
1	**Biopharmaceutical Industry**
1010	Bio-antibiotics
1020	Biologically manufactured low-molecular medicine
1030	Vaccines
1040	Hormones
1050	Therapeutic antibodies and cytokines
1060	Blood products
1070	Cell-based therapeutics
1080	Gene therapeutics
1090	Biological diagnostic products
1100	Enzyme and live bacteria medicine
1110	Biomaterial-based medicine
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 biochemicals and bioenergy
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 Inustry**
4010	Biological treatment agents and systems
4020	Materials and equipment for bio immobilization
4030	Bioenvironmental agents and systems for treatment and recycle
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	Industrial Classification
5	**Biomedical Equipment Industry**
5010	Biosensors
5020	In-vitro diagnostics
5030	Medical devices using biosensors and/or biomarkers
5000	Other biomedical equipment
6	**Bioinstrument and Bioequipment Industry**
6010	Gene/protein/peptide analysis, synthesis, and manufacturing instruments
6020	Cell analysis and cultivation equipment
6030	Multi-functional and other bioanalysis instruments
6040	R&D and manufacturing equipment
6050	Bioprocess equipment parts
6000	Other bioinstruments and bioequipment
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 & 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	Technological Classification
A	**Genetic Engineering**
A1	Gene manipulation
A2	Gene expression and regulation
A3	Gene application
A4	Gene therapy
A0	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	Protein engineering, n.e.s.
C	**Other Macromolecule Engineering**
C1	Lipid engineering
C2	Carbohydrate engineering
C0	Macromolecule engineering, n.e.s.
D	**Therapeutic Cell and Tissue Engineering**
D1	Therapeutic cell utilization
D2	Bioenvironment regulation
D3	Functional biomaterial development
D4	Cell engineering
D5	Tissue engineering
D0	Cell and tissue engineering, n.e.s.
E	**Systems Biology and Bioinformatics**
E1	Gene sequence analysis
E2	Functional genomics
E3	Proteomics
E4	Bioinformatics
E0	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	Metabolic engineering, n.e.s.
G	**Bioprocess**
G1.	Fermentation engineering
G2.	Cell culture engineering
G3.	Biotransformation
G4.	Bioseparation engineering
G5.	Industrialization
G0.	Bioprocess, n.e.s.

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

Code	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	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	Environmental biotechnology and bioenergy technology, 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	Nanobiotechnology, n.e.s.
K	**Bioelectronics Engineering**
K1	Biosensor fabrication
K2	Bioelectronic device fabrication
K3	Biochip fabrication
K4	Microfluidics
K0	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	Biosafety and efficacy evaluation, n.e.s.
M	**Other Biotechnology**
M1	Combinatorial biology
M2	Drug delivery
M3	Immunotherapy
M0	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% 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 Industry Statistics Team, Industry Policy Division, Korea Biotechnology Industry Organization.
   (Tel: +82-31-628-0040, 0020)

II. Key Findings

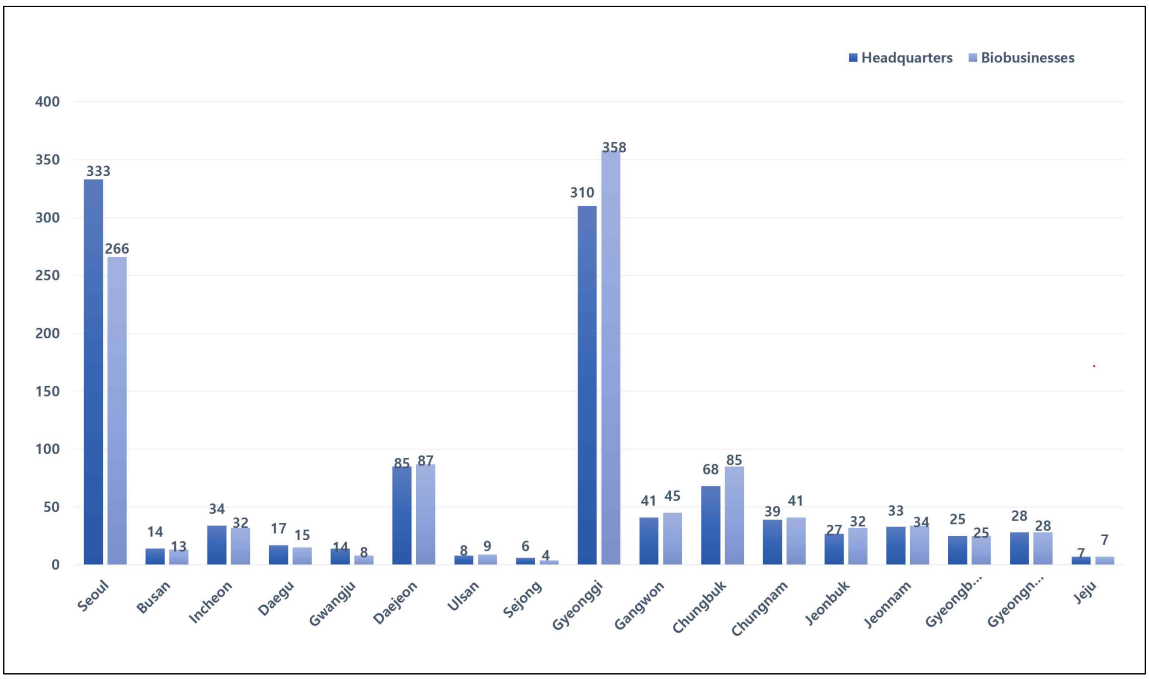
1 General Status of Bioindustry

A. Bioindustry's Distribution per Place

○ Headquarters and biobusinesses are mostly located in Seoul and Gyeonggi Province, with 333 headquarters in Seoul, 310 in Gyeonggi Province, and 266 biobusinesses in Seoul and 358 in Gyeonggi Province.

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

(Unit: companies)



* Place 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: Seoul 35.9% > Gyeonggi 35.4% > Chungbuk 7.7%
- Biochemical and Bioenergy Industry: Gyeonggi 23.9% > Seoul, Daejeon 11.4%
- Biofood Industry: Gyeonggi 28.6% > Chungbuk 14.3% > Seoul 10.1%
- Bioenvironmental Industry: Gyeonggi 32.1% > Jeonnam 10.7% > Seoul/Busan/Daegu/ Gangwon 7.1%
- Biomedical Equipment Industry: Gyeonggi 37.2% > Seoul 26.4% > Daejeon 9.1%
- Bioinstrument and Bioequipment Industry: Gyeonggi 54.5% > Seoul, Daejeon 16.4%
- Bioresource Industry: Gyeonggi 40.0% > Seoul, Daejeon, Chungbuk, Jeonnam 13.3%
- Bioservice Industry: Seoul 44.1% > Gyeonggi 31.5% > Daejeon 9.0%

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

(Unit: companies)

Industrial Category	Total	Seoul	Busan	Incheon	Daegu	Gwangju	Daejeon	Ulsan	Sejong	Gyeonggi
Total	**1,089**	**266**	**13**	**32**	**15**	**8**	**87**	**9**	**4**	**358**
Biopharmaceutical	362	130	3	14	3	0	21	1	0	128
Biochemical and Bioenergy	201	23	3	5	6	1	23	6	1	48
Biofood	168	17	2	0	2	3	8	0	2	48
Bioenvironmental	56	4	4	4	2	1	3	2	0	18
Biomedical Equipment	121	32	1	3	0	1	11	0	0	45
Bioinstrument and Bioequipment	55	9	0	1	0	0	9	0	1	30
Bioresource	15	2	0	0	0	0	2	0	0	6
Bioservice	111	49	0	5	2	2	10	0	0	35

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

(Unit: companies)

Industrial Category	Total	Gangwon	Chungbuk	Chungnam	Jeonbuk	Jeonnam	Gyeongbuk	Gyeongnam	Jeju
Total	**1,089**	**45**	**85**	**41**	**32**	**34**	**25**	**28**	**7**
Biopharmaceutical	362	10	28	11	2	2	5	3	1
Biochemical and Bioenergy	201	9	15	10	13	13	10	12	3
Biofood	168	10	24	14	11	9	5	10	3
Bioenvironmental	56	4	2	1	1	6	2	2	0
Biomedical Equipment	121	9	9	4	1	1	3	1	0
Bioinstrument and Bioequipment	55	1	2	1	0	1	0	0	0
Bioresource	15	0	2	0	1	2	0	0	0
Bioservice	111	2	3	0	3	0	0	0	0

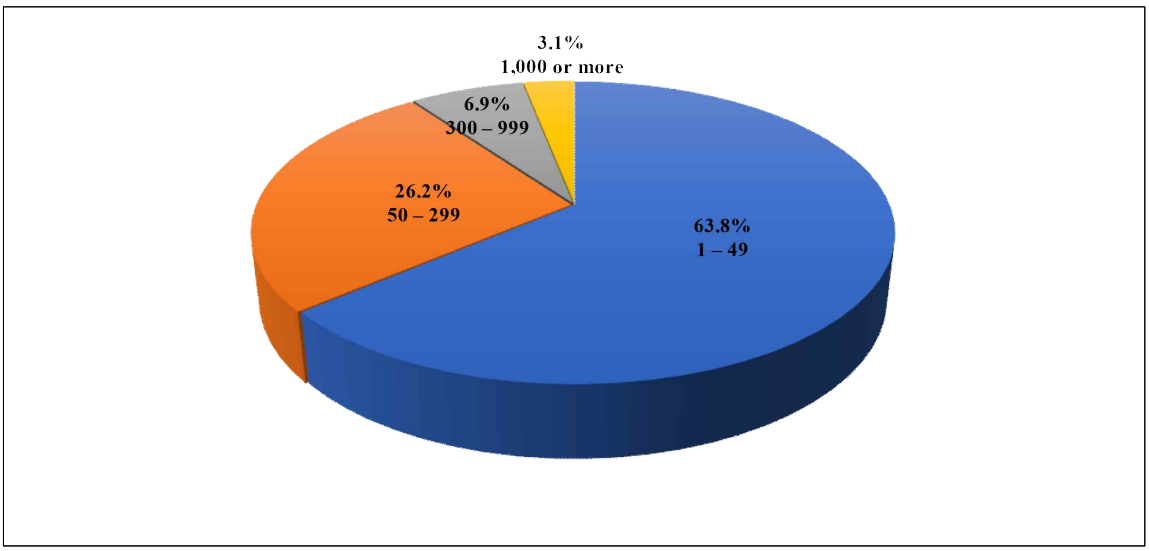
* The result analyzed the results of 1 core business that was selected for each company.
** Place of biobusinesses were analyzed in the following order: plant > R&D center > headquarters.

B. Bioindustry's Distribution per Size of Workers

○ There are 686 companies (63.8%) that belong to "less than 50 workers" among total size of workers (excluding 14 unclassified companies).

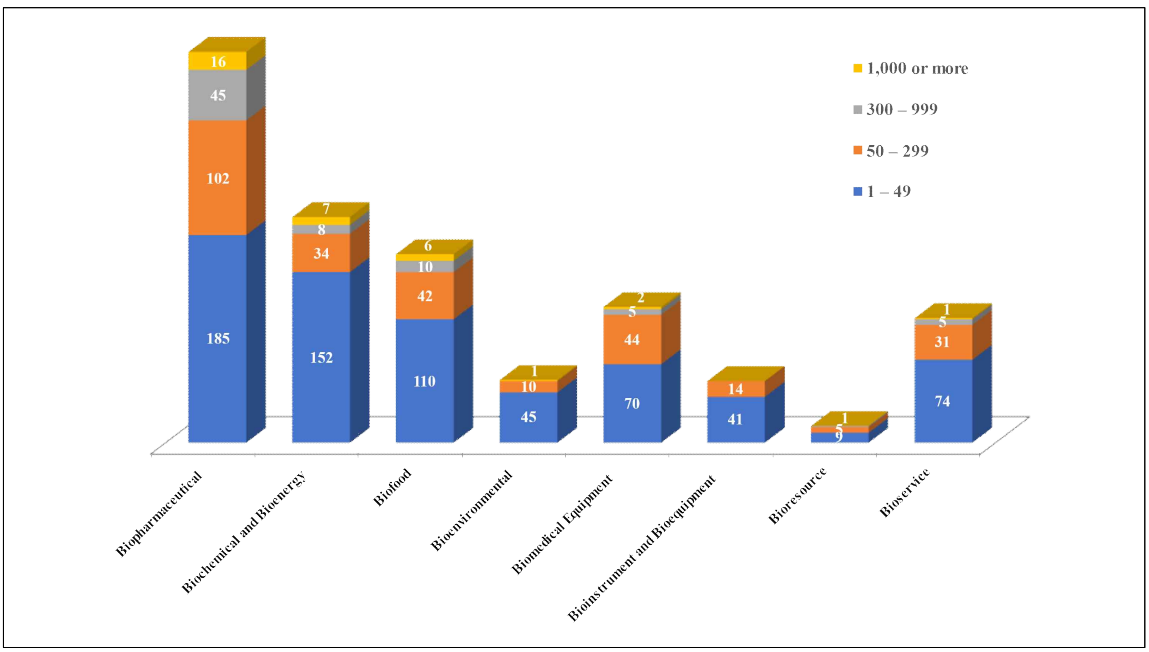
○ There were 33 companies (3.1%) with 1,000 or more workers.

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



<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

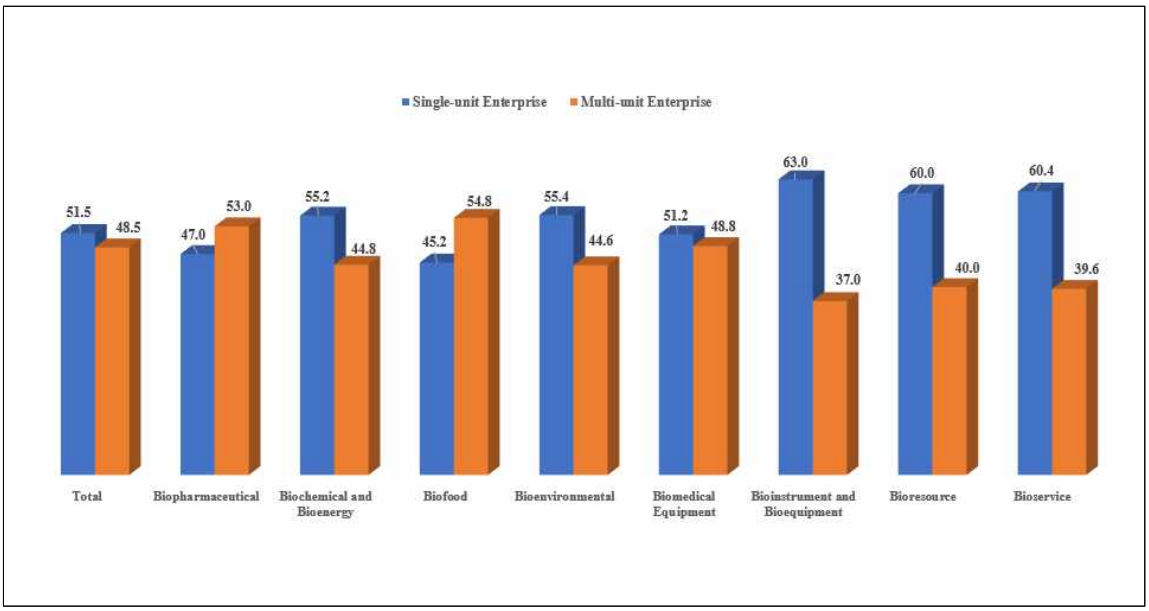
○ Bioindustry's existence of other businesses refers to the existence of plants, R&D centers or branches in other location.

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

○ Out of 1,089 bioindustry companies, 557 companies (51.5%) are "single-unit enterprises" and 524 companies (48.5%) are "multi-unit enterprises" (excluding 8 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 11.2 billion and the ratio of net worth was 31%.

○ Companies in biochemical and bioenergy industry had higher average amount of capital reaching KRW 21.5 billion. Companies in bioenvironmental, and bioinstrument and bioequipment industries, and companies in biochemical and bioenergy industries had higher values compared to other bioindustries with average ratio of net worth reaching 51% and 43%, respectively.

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

(Unit: companies, KRW 1 million, %)

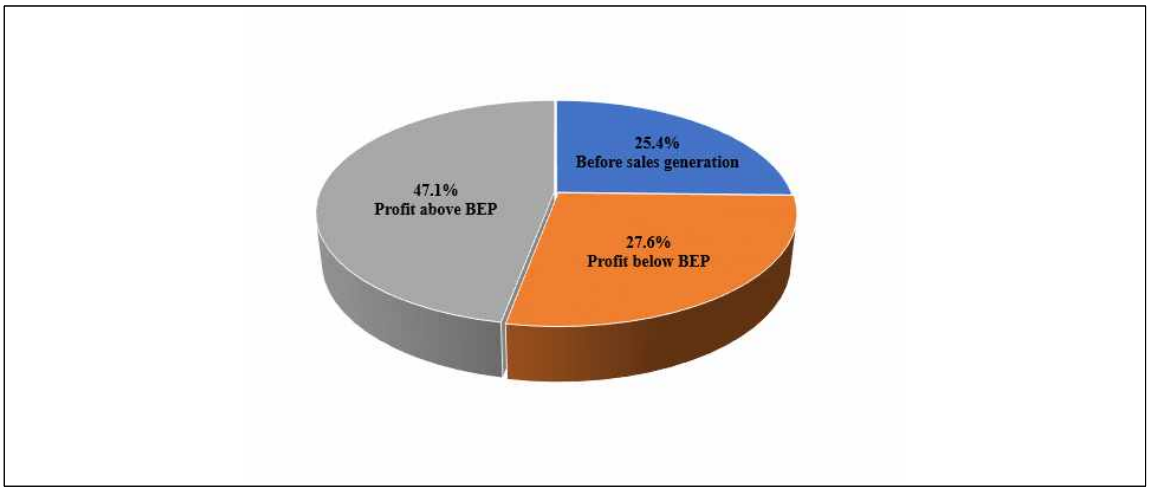
Industrial Category	No. of Companies	Capital				Ratio of Net Worth			
		No. of Respondents	Minimum	Maximum	Average	No. of Respondents	Minimum	Maximum	Average
Total	**1,089**	**1,032**	**-344**	**1,488,993**	**11,219**	**1,028**	**-1,704**	**100**	**31**
Biopharmaceutical	362	346	-344	391,406	14,254	345	-1,039	100	26
Biochemical and Bioenergy	201	181	0	1,488,993	21,496	180	-756	98	43
Biofood	168	162	10	368,842	7,528	162	-457	97	37
Bioenvironmental	56	53	30	10,536	1,099	53	-111	100	51
Biomedical Equipment	121	116	50	52,192	5,444	115	-1,181	99	27
Bioinstrument and Bioequipment	55	53	40	13,404	1,292	53	-75	94	51
Bioresource	15	14	129	59,292	11,171	14	-112	93	42
Bioservice	111	107	5	177,935	5,806	106	-1,704	98	5

E. Type of Biobusiness' Sales Generation in Bioindustry

○ The result for type of biobusiness' revenue includes responses from 986 companies out of 1,089 total participants, of which 103 were "no response."

○ Out of 986 companies, 250 companies (25.4%) belonged to the phase of "before sales" in 2022, while 464 companies (47.1%) out of 736 companies that generated sales in the bioindustry were "above the break-even point (BEP)."

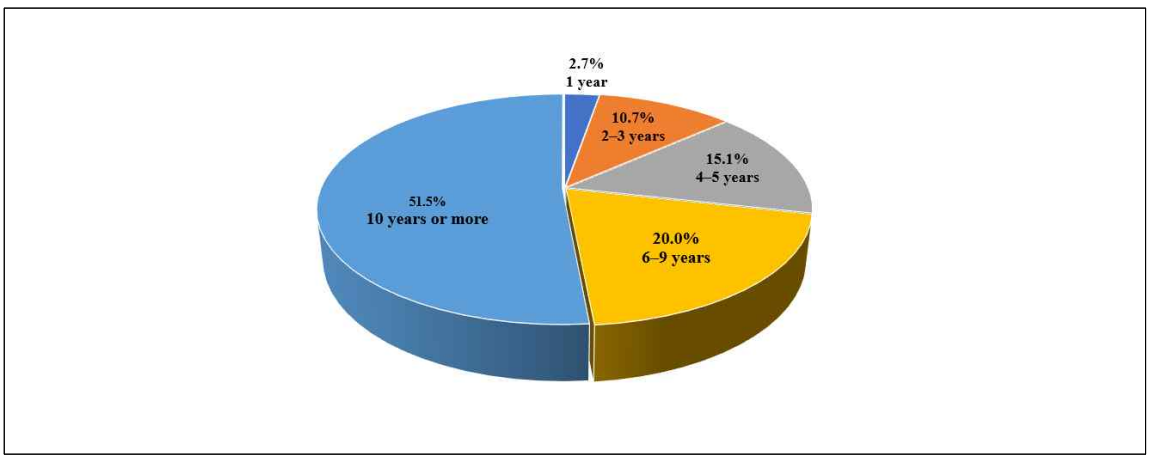
<Figure 2-5> Type of Biobusiness' Sales Generation in Bioindustry



* Excluded unclassified samples

○ Out of the companies that generated sales in 2022, 20 companies (2.7%) had their first sales in 2022, and 379 companies (51.5%) have generated sales for more than 10 years.

<Figure 2-6> Bioindustry's Sales Period



2 Manpower Status in Bioindustry

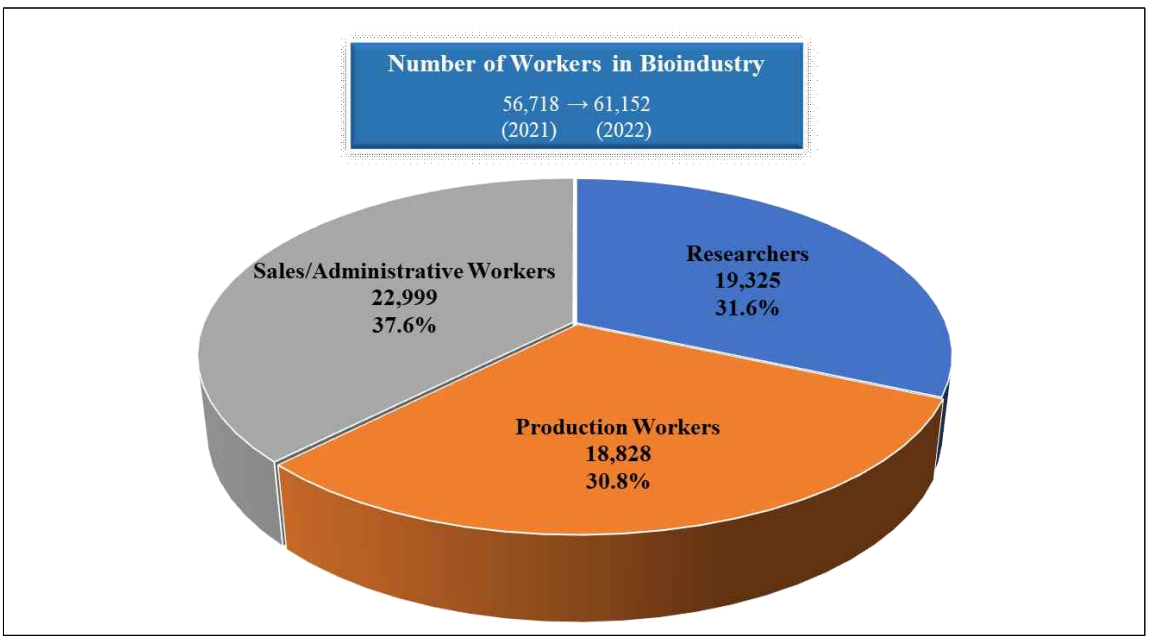
A. Manpower Status of 2022

1) Manpower Status per Category

○ As a result of responses from 1,074 companies out of 1,089 domestic bioindustry companies in 2022, of which 15 were “no response,” there was an increase of 4,434 workers compared to 2021, reaching a total of 61,152 workers, and an average of 57 workers per company.

○ Manpower of bioindustry consists of 19,325 researchers (31.6%), 18,828 production workers (30.8%), and 22,999 sales/administrative workers (37.6%).

<Figure 2-7> 2022 Bioindustry’s Distribution of Manpower



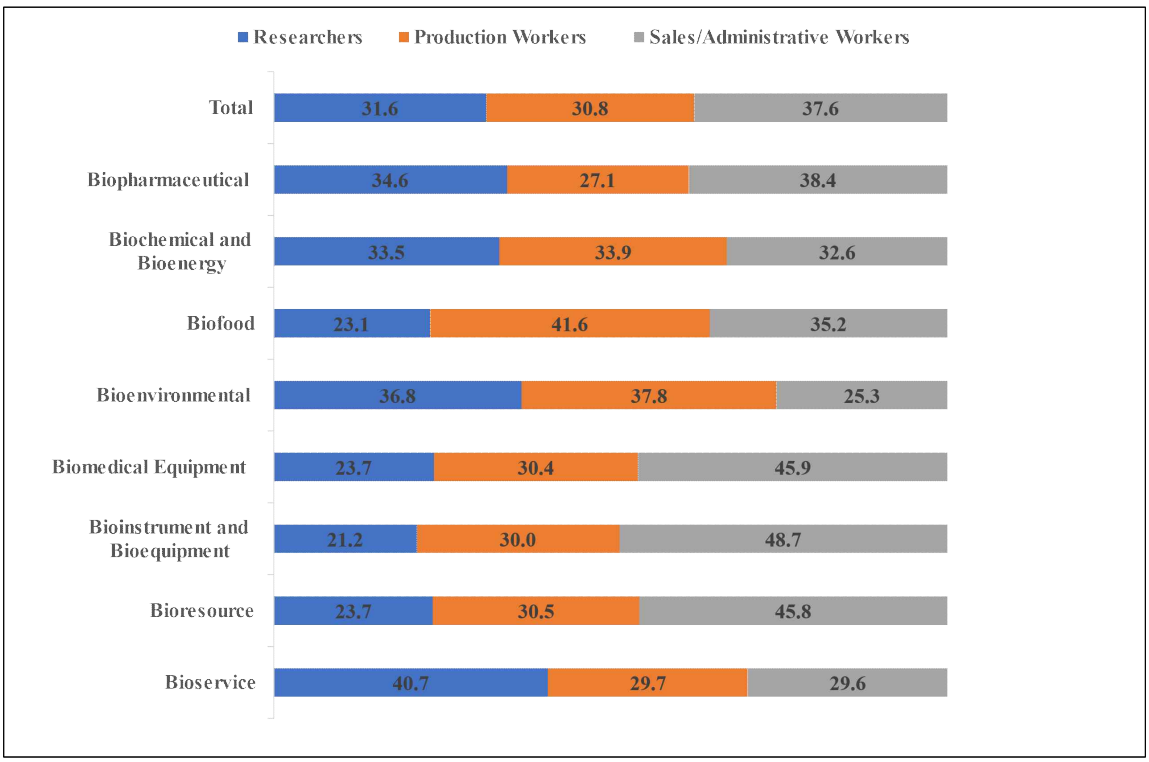
<Table 2-3> 2022 Bioindustry's Manpower Distribution

(Unit: companies, persons, %)

Industrial Category		No. of Respondents	Researchers	Production Workers	Sales/Administrative Workers	Total	Distribution Ratio
Total	**No. of Employees**	**1,074**	**19,325**	**18,828**	**22,999**	**61,152**	**100.0**
	Percentage	**100.0**	**31.6**	**30.8**	**37.6**	**100.0**	
Biopharmaceutical		348	9,019	7,055	10,003	26,077	42.6
Biochemical and Bioenergy		200	2,343	2,368	2,283	6,994	11.4
Biofood		168	1,768	3,180	2,691	7,639	12.5
Bioenvironmental		56	330	339	227	896	1.5
Biomedical Equipment		121	2,182	2,795	4,217	9,194	15.0
Bioinstrument and Bioequipment		55	377	533	865	1,775	2.9
Bioresource		15	260	335	502	1,097	1.8
Bioservice		111	3,046	2,223	2,211	7,480	12.2

<Figure 2-8> Bioindustry's Manpower Proportion of 2022

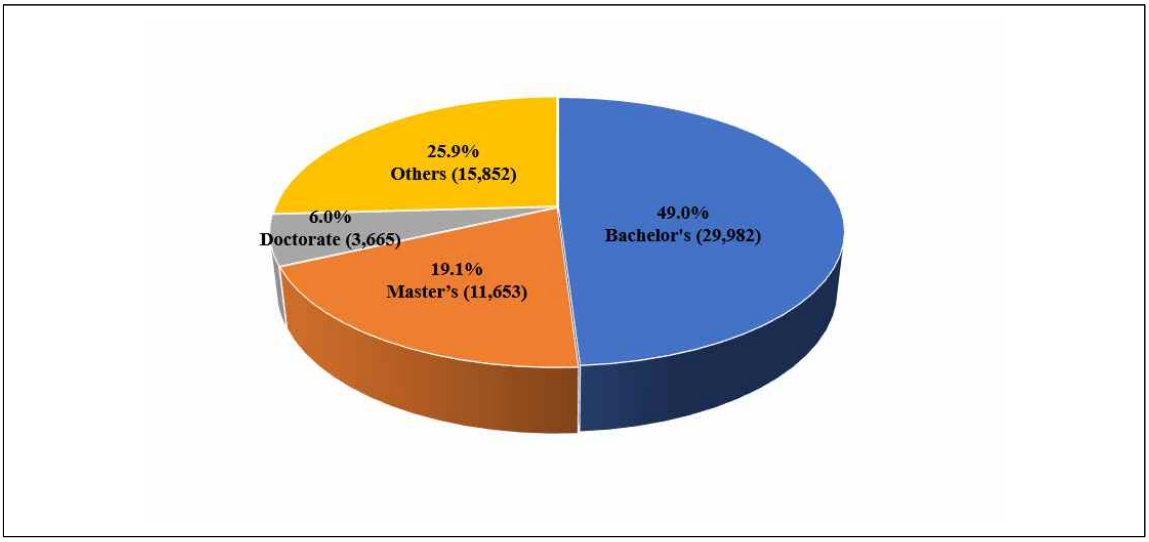
(Unit: %)



2) Manpower Status by Academic Degree

○ Among the bioindustry manpower in 2022, workers with bachelor's degree were the largest in number, reaching 29,982 persons (49%). Others ranked second with 15,852 workers (25.9%), followed by 11,653 workers with master's degree (19.1%) and 3,665 workers with doctorate degree (6%).

<Figure 2-9> Bioindustry's Academic Degree Proportion of Workers of 2022



<Table 2-4> 2022 Bioindustry's Distribution of Academic Degree

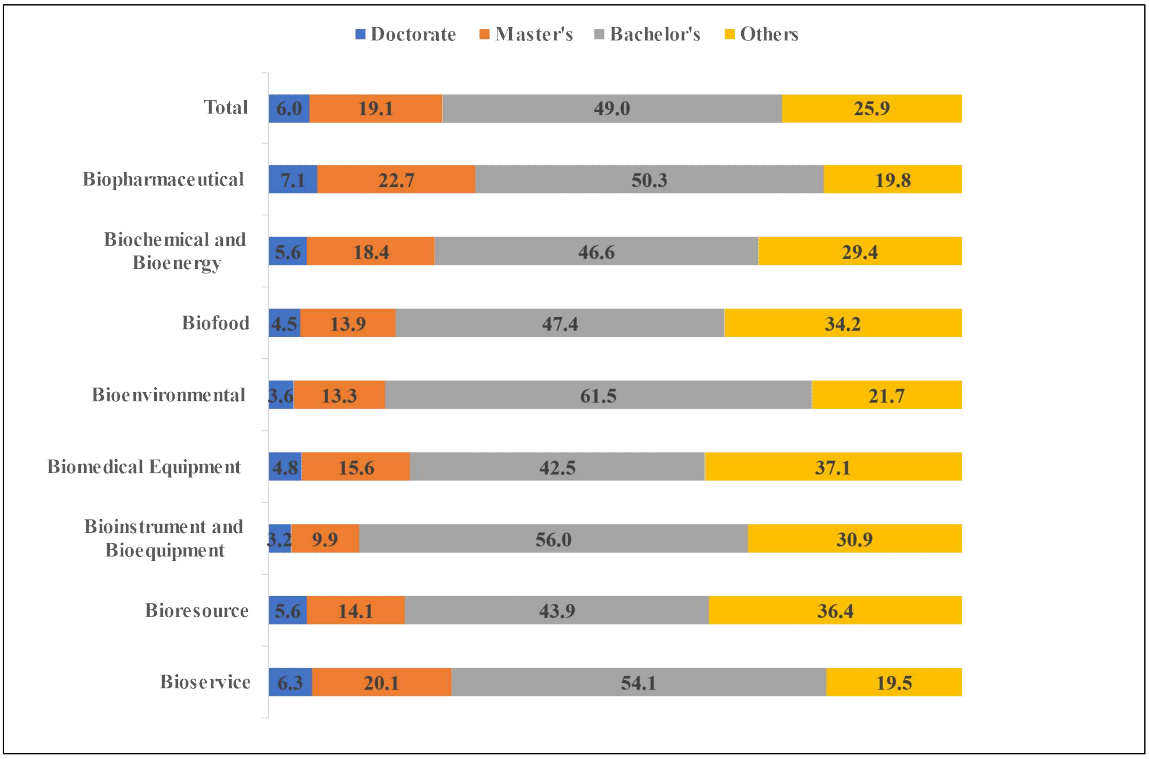
(Unit: persons, %)

Industrial Category		Doctorate	Master's	Bachelor's	Others	Total	Distribution Ratio
Total	**No. of Employees**	**3,665**	**11,653**	**29,982**	**15,852**	**61,152**	**100.0**
	Percentage	**6.0**	**19.1**	**49.0**	**25.9**	**100.0**	
Biopharmaceutical		1,860	5,914	13,127	5,176	26,077	42.6
Biochemical and Bioenergy		393	1,287	3,260	2,054	6,994	11.4
Biofood		345	1,061	3,619	2,614	7,639	12.5
Bioenvironmental		32	119	551	194	896	1.5
Biomedical Equipment		445	1,437	3,905	3,407	9,194	15.0
Bioinstrument and Bioequipment		57	176	994	548	1,775	2.9
Bioresource		61	155	482	399	1,097	1.8
Bioservice		472	1,504	4,044	1,460	7,480	12.2

○ The proportion of elite manpower such as workers with master's and doctorate degree was 25.1% in total. The proportions of elite manpower were relatively high in the biopharmaceutical industry (29.8%) and the bioservice industry (26.4%).

<Figure 2-10> Bioindustry's Academic Degree Proportion of 2022

(Unit: %)



3) Manpower Distribution by Area

○ As of 2022, the number of manpower in the bioindustry was highest in Gyeonggi Province with 18,242 persons, accounting for 29.8%. Next followed Seoul (12,106), Chungbuk (8,691), and Incheon (6,113).

<Table 2-5> 2022 Bioindustry's Manpower Distribution by Area

(Unit: persons, %)

Area		Doctorate	Master's	Bachelor's	Others	Total	Distribution Ratio
Total	**No. of Employees**	**3,665**	**11,653**	**29,982**	**15,852**	**61,152**	**100.0**
	Percentage	**6.0**	**19.1**	**49.0**	**25.9**	**100.0**	
Seoul		816	2,857	7,260	1,173	12,106	19.8
Busan		14	32	139	40	225	0.4
Incheon		344	1,177	3,140	1,452	6,113	10.0
Daegu		31	105	704	642	1,482	2.4
Gwangju		8	21	43	4	76	0.1
Daejeon		295	683	1,418	403	2,799	4.6
Ulsan		49	196	707	337	1,289	2.1
Sejong		8	73	160	87	328	0.5
Gyeonggi		1,252	3,711	7,953	5,326	18,242	29.8
Gangwon		186	516	1,372	1,137	3,211	5.3
Chungbuk		403	1,444	4,125	2,719	8,691	14.2
Chungnam		93	291	829	814	2,027	3.3
Jeonbuk		39	120	499	467	1,125	1.8
Jeonnam		28	88	613	191	920	1.5
Gyeongbuk		61	193	545	778	1,577	2.6
Gyeongnam		29	95	350	119	593	1.0
Jeju		9	51	125	163	348	0.6

B. Recent Trend of Bioindustry Manpower Status

1) 2020–2022 Bioindustry's Trend of Manpower Status

① Bioindustry's Trend of Manpower Status

○ As of 2022, the number of manpower in the bioindustry was 61,152, an increase of 4,434 workers (7.8%) compared to 2021.

○ For the past three years, from 2020 to 2022, the number of manpower in the bioindustry has continued to increase by 8.1%.

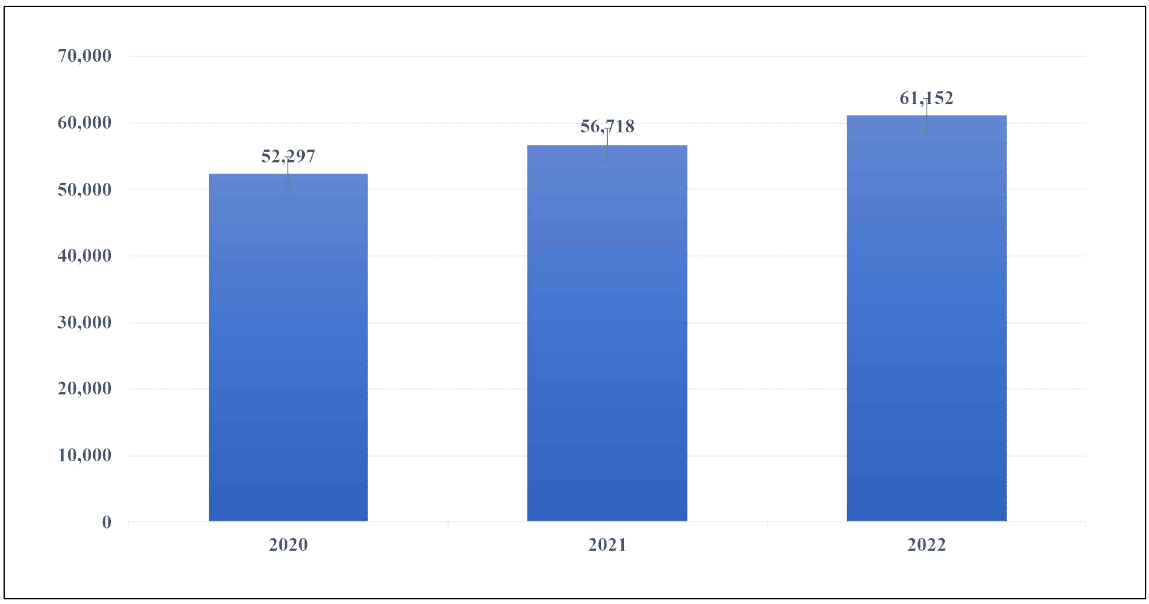
<Table 2-6> 2020–2022 Bioindustry's Change in Manpower

(Unit: persons, %)

Classification	2020	2021	2022	Annual Average Rate of Change
No. of Employees	52,297	56,718	61,152	8.1
Rate of Change	7.4	8.5	7.8	

<Figure 2-11> 2020–2022 Bioindustry's Trend of Manpower

(Unit: persons)



② Bioindustry's Trend in Academic Degree of Manpower

○ Compared to 2021, the number of bioindustry workers in 2022 with doctorate degree, master's degree, bachelor's degree, and other degrees increased by 12.8%, 11.4%, 7%, and 5.7%, respectively. Compared to 2021, workers with bachelor's degree increased the most by number, at 1,972, and workers with doctorate degree increased the most by ratio, at 12.8%.

○ From 2020 to 2022, the number of employees with an academic degree (bachelor's, master's, doctorate, and other degrees) showed steady increase. Workers with doctorate degree, master's degree, bachelor's degree, and other degrees increased by 11.6%, 9.6%, 8.1%, and 6.5%, respectively.

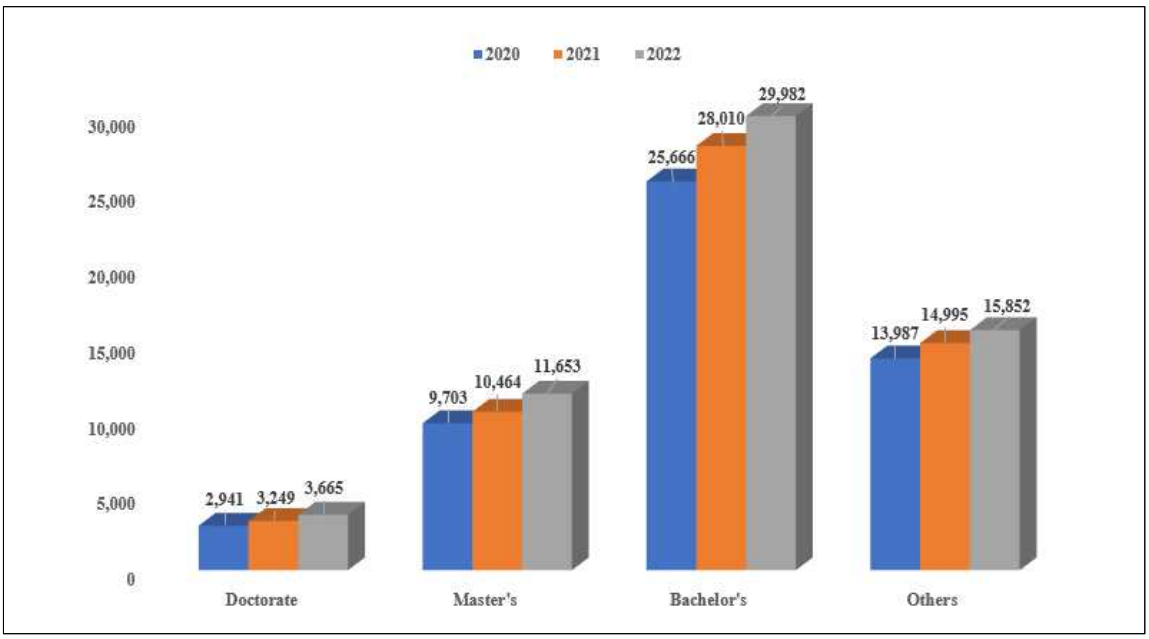
<Table 2-7> 2020–2022 Bioindustry's Trend in Academic Degree of Manpower

(Unit: persons, %)

Degree	2020		2021		2022		Year-Over-Year Change		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	**52,297**	**100**	**56,718**	**100**	**61,152**	**100**	**4,434**	**7.8**	**8.1**
Doctorate	2,941	5.6	3,249	5.7	3,665	6.0	416	12.8	11.6
Master's	9,703	18.6	10,464	18.4	11,653	19.1	1,189	11.4	9.6
Bachelor's	25,666	49.1	28,010	49.4	29,982	49.0	1,972	7.0	8.1
Others	13,987	26.7	14,995	26.4	15,852	25.9	857	5.7	6.5

<Figure 2-12> 2020–2022 Bioindustry's Trend in Academic Degree of Manpower

(Unit: persons)



2) 2018–2022 Bioindustry's Trend of Manpower

① Bioindustry's Trend of Manpower Status

○ For the past five years, from 2018 to 2022, the number of manpower in the bioindustry has continued to increase by 7.1%.

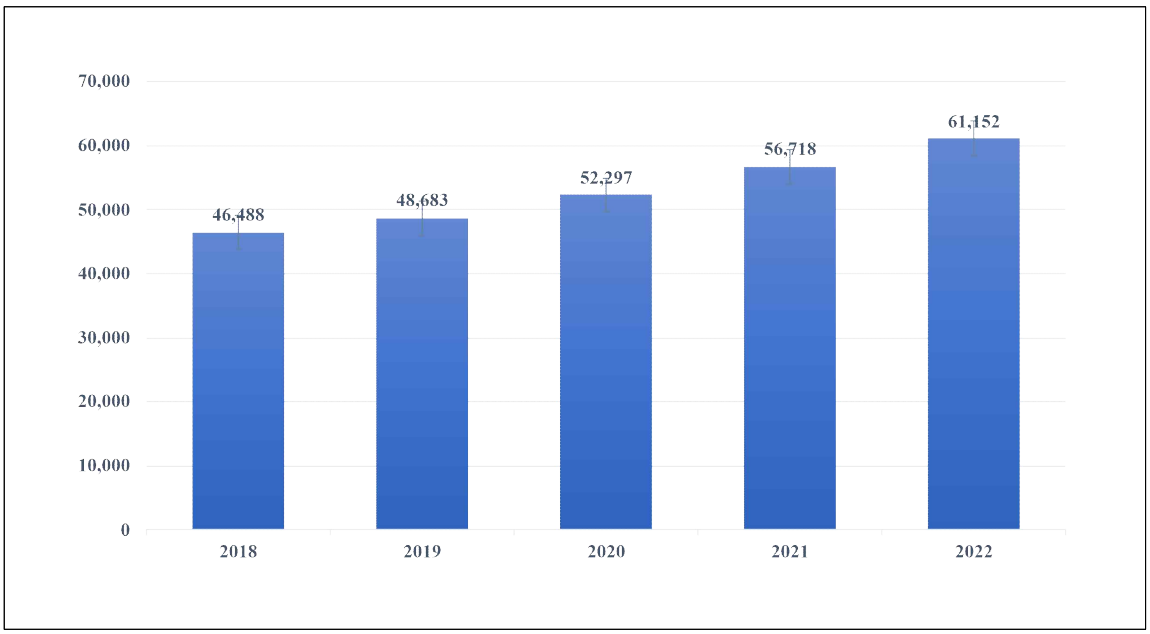
<Table 2-8> 2018–2022 Bioindustry's Change in Manpower

(Unit: persons, %)

Classification	2018	2019	2020	2021	2022	Annual Average Rate of Change
No. of Employees	46,488	48,683	52,297	56,718	61,152	7.1
Rate of Change	3.5	4.7	7.4	8.5	7.8	

<Figure 2-13> 2018–2022 Bioindustry's Trend of Manpower

(Unit: persons)



② Bioindustry's Trend in Academic Degree of Manpower

○ From 2018 to 2022, the number of employees with an academic degree (bachelor's, master's, or doctorate) showed steady increase. Workers with bachelor's degree, other degrees, doctorate degree, and master's degree increased by 7.6%, 7%, 6.5%, and 6.1%, respectively.

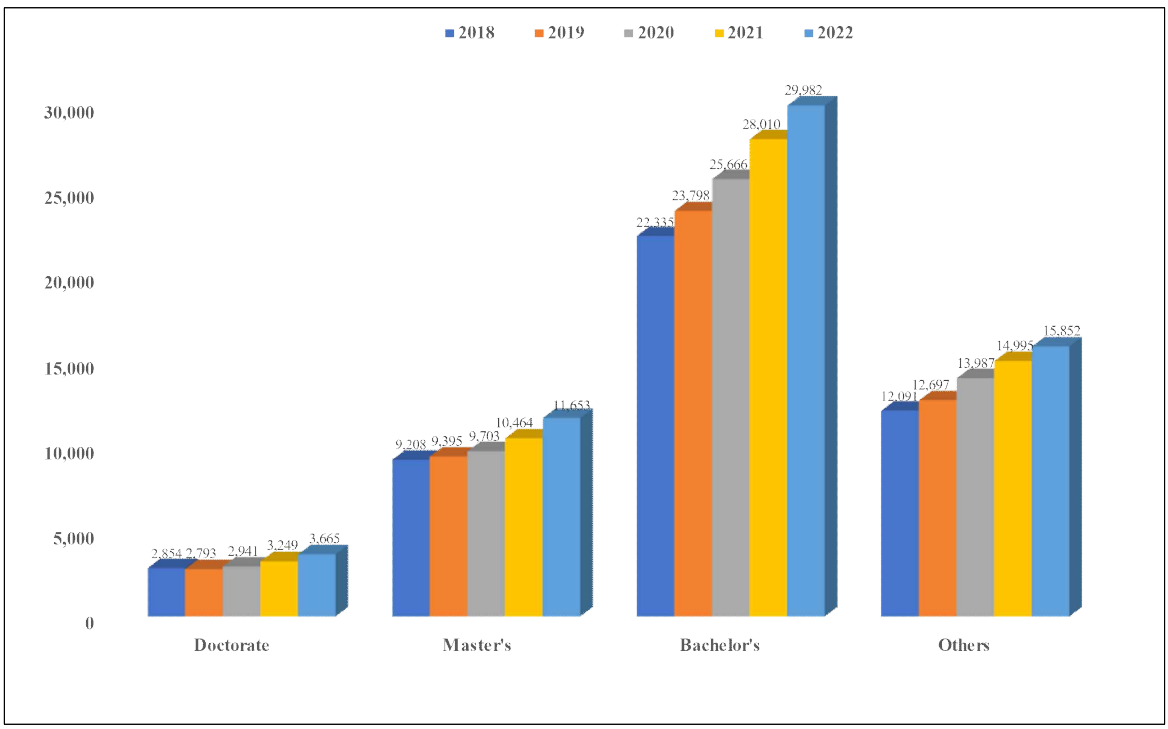
<Table 2-9> 2018–2022 Bioindustry's Trend in Academic Degree of Manpower

(Unit: persons, %)

Degree	2018		2019		2020		2021		2022		Year-Over-Year Change		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	**46,488**	**100.0**	**48,683**	**100**	**52,297**	**100.0**	**56,718**	**100.0**	**61,152**	**100**	**4,434**	**7.8**	**7.1**
Doctorate	2,854	6.1	2,793	5.7	2,941	5.6	3,249	5.7	3,665	6.0	416	12.8	6.5
Master's	9,208	19.8	9,395	19.3	9,703	18.6	10,464	18.4	11,653	19.1	1,189	11.4	6.1
Bachelor's	22,335	48.0	23,798	48.9	25,666	49.1	28,010	49.4	29,982	49.0	1,972	7.0	7.6
Others	12,091	26.0	12,697	26.1	13,987	26.7	14,995	26.4	15,852	25.9	857	5.7	7.0

<Figure 2-14> 2018–2022 Bioindustry's Trend in Academic Degree of Manpower

(Unit: persons)



3 Investment Status of Bioindustry

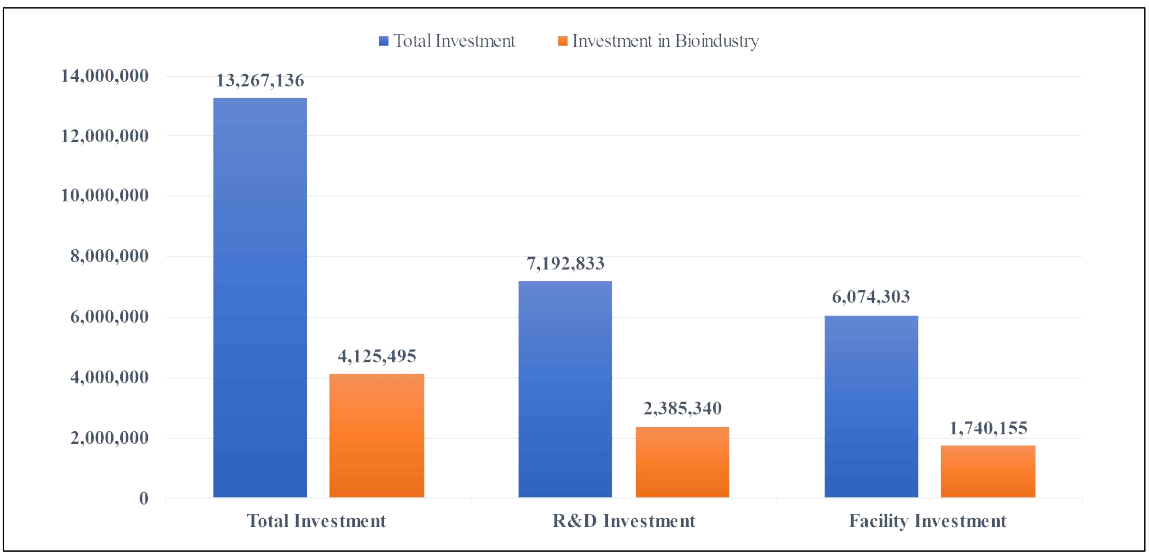
A. Bioindustry's Investment Status of 2022

○ The total amount of investments in bioindustry companies in 2022 was KRW 13,267.1 billion, and the total investment cost turned out to be 31.1% of the total investment fee reaching KRW 4,125.5 billion.

○ The R&D cost in the bioindustry turned out to be 33.2% of the total cost reaching KRW 2,385.3 billion, and the facility investment cost took 28.6% of the total cost of KRW 1,740.2 billion.

<Figure 2-15> 2022 Total Investment Cost and Investment in Bioindustry

(Unit: KRW 1 million)



○ Among the bioindustries, the total investment was highest in the biopharmaceutical industry with KRW 1,905.7 billion (46.2%), followed by the bioservice with KRW 1,282.1 billion (31.1%) and the biomedical equipment with KRW 567.5 billion (13.8%). These three core bioindustries took 91.0% of the total investment cost.

○ Comparing the size of R&D cost by bioindustry, the biopharmaceutical industry was the largest with KRW 1,605.7 billion (67.3%), followed by the biomedical equipment with KRW 246.4 billion (10.3%) and the bioservice with KRW 244.2 billion (10.2%). These three core bioindustries took 87.9% of the total R&D cost.

○ The average R&D cost per bioindustry company was highest in the biopharmaceutical industry with KRW 4.5 billion, followed by the bioservice with KRW 2.2 billion and the biomedical equipment with KRW 2.0 billion.

○ The total facility investment cost by bioindustry was highest in the bioservice industry with KRW 1,037.9 billion (59.7%), followed by the biomedical equipment with KRW 321.1 billion (18.5%).

○ The average facility investment cost per bioindustry company was highest in the bioservice with KRW 9.4 billion, followed by the biomedical equipment with KRW 2.7 billion and the biopharmaceutical with KRW 0.85 billion.

<Table 2-10> 2022 Bioindustry's Size of Investment

(Unit: companies, KRW 1 million)

Industrial Category	No. of Companies	No. of Respondents	R&D Investment		Facility Investment		Total Investment	
			Total	Average	Total	Average	Total	Average
Total	**1,089**	**1,080**	**2,385,340**	**2,209**	**1,740,155**	**1,611**	**4,125,495**	**3,820**
Biopharmaceutical	362	355	1,605,698	4,523	300,008	845	1,905,706	5,368
Biochemical and Bioenergy	201	201	135,178	673	42,863	213	178,041	886
Biofood	168	168	112,216	668	30,088	179	142,304	847
Bioenvironmental	56	55	8,794	160	2,066	38	10,860	197
Biomedical Equipment	121	121	246,440	2,037	321,068	2,653	567,507	4,690
Bioinstrument and Bioequipment	55	54	22,554	418	4,877	90	27,431	508
Bioresource	15	15	10,258	684	1,263	84	11,521	768
Bioservice	111	111	244,203	2,200	1,037,922	9,351	1,282,125	11,551

○ The size of total investment in bioindustries was highest in the order of Incheon KRW 1,363.5 billion (33.1%), Gyeonggi KRW 1,334.9 billion (32.4%), and Seoul KRW 475.8 billion (11.5%). The top three regions account for 76.9% of the total investment.

○ The size of overall R&D investment was highest in the order of Gyeonggi (38.6%), Seoul (17.5%), and Incheon (12.4%), while the facility investment was highest in the order of Incheon (61.3%), Gyeonggi (23.8%), and Chungbuk (4.1%).

○ The average size of R&D investment was highest in Incheon with KRW 9.3 billion, and the facility investment was also highest in Incheon with KRW 33.3 billion.

<Table 2-11> 2022 Bioindustry's Size of Investment by Area

(Unit: companies, KRW 1 million)

Area	No. of Companies	No. of Respondents	R&D Investment		Facility Investment		Total Investment	
			Total	Average	Total	Average	Total	Average
Total	**1,089**	**1,080**	**2,385,340**	**2,229**	**1,740,155**	**1,631**	**4,125,495**	**3,856**
Seoul	266	259	416,868	1,610	58,977	228	475,845	1,837
Busan	13	12	2,931	244	363	30	3,294	275
Incheon	32	32	296,525	9,266	1,066,989	33,343	1,363,514	42,610
Daegu	15	15	11,660	777	10,176	678	21,836	1,456
Gwangju	8	8	3,188	399	189	24	3,377	422
Daejeon	87	87	167,723	1,928	40,234	462	207,957	2,390
Ulsan	9	9	28,107	3,123	3,713	413	31,820	3,536
Sejong	4	4	4,316	1,079	998	250	5,314	1,329
Gyeonggi	358	357	921,117	2,580	413,777	1,159	1,334,894	3,739
Gangwon	45	45	104,450	2,321	17,893	398	122,343	2,719
Chungbuk	85	85	313,324	3,686	71,987	847	385,311	4,533
Chungnam	41	41	29,278	714	5,735	140	35,013	854
Jeonbuk	32	32	17,815	557	8,479	265	26,294	822
Jeonnam	34	34	10,423	307	9,233	272	19,656	578
Gyeongbuk	25	25	44,619	1,785	9,904	396	54,523	2,181
Gyeongnam	28	28	9,164	327	6,393	228	15,557	556
Jeju	7	7	3,832	547	15,115	2,159	18,947	2,707

B. Recent Trend of Investment Status

1) 2020–2022 Bioindustry's Trend of Investment

○ The annual average growth rate of investment in the bioindustry for the past three years is 21.6%.
○ The R&D and facility investments increased by 7.1% and 56.8%, respectively.

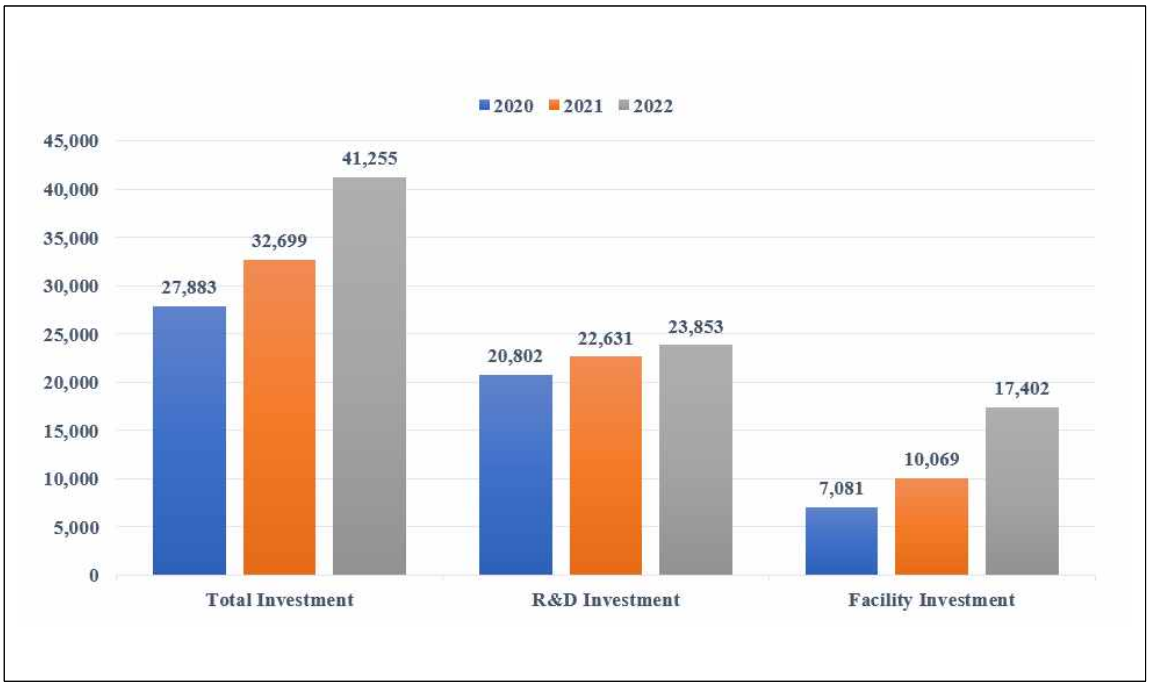
<Table 2-12> 2020–2022 Bioindustry's Trend of Investment

(Unit: KRW 100 million, %)

Area		2020	2021	2022	Annual Average Rate of Change
Total Investment	Amount	27,883	32,699	41,255	21.6
	Rate of Change	7.5	17.3	26.2	
R&D Investment	Amount	20,802	22,631	23,853	7.1
	Rate of Change	13.1	8.8	5.4	
Facility Investment	Amount	7,081	10,069	17,402	56.8
	Rate of Change	-6.0	42.2	72.8	

<Figure 2-16> 2020–2022 Bioindustry Investment Trend

(Unit: KRW 100 million)



○ Looking at the trend of the overall size of investments in bioindustries in 2022 over the past three years, investments significantly increased in the bioservice and the biomedical equipment industries by 117.4% and 46.5%, respectively; however, there was a decrease in the bioenvironmental, biofood, bioresource, and biochemical and bioenergy industries by 30%, 12.6%, 9.6%, and 3.9%, respectively.

<Table 2-13> 2020–2022 Bioindustry's Trend in Overall Size of Investment

(Unit: KRW 1 million, %)

Industrial Category	2020		2021		2022		Year-Over-Year Change	Annual Average Rate of Change
	Investment Amount	Distribution Ratio	Investment Amount	Distribution Ratio	Investment Amount	Distribution Ratio		
Total	**2,788,305**	**100.0**	**3,269,942**	**100.0**	**4,125,495**	**100.0**	**26.2**	**21.6**
Biopharmaceutical	1,809,555	64.9	1,822,435	55.7	1,905,706	46.2	4.6	2.6
Biochemical and Bioenergy	192,793	6.9	208,646	6.4	178,041	4.3	-14.7	-3.9
Biofood	186,206	6.7	151,734	4.6	142,304	3.4	-6.2	-12.6
Bioenvironmental	22,155	0.8	16,764	0.5	10,860	0.3	-35.2	-30.0
Biomedical Equipment	264,241	9.5	304,018	9.3	567,507	13.8	86.7	46.5
Bioinstrument and Bioequipment	27,985	1.0	31,809	1.0	27,431	0.7	-13.8	-1.0
Bioresource	14,099	0.5	13,857	0.4	11,521	0.3	-16.9	-9.6
Bioservice	271,271	9.7	720,679	22.0	1,282,125	31.1	77.9	117.4

○ For the past three years, the R&D investment cost has increased in the biomedical equipment and bioservice industries by 27.8% and 23.6%, respectively, but decreased in the bioenvironmental and bioresource industries by 18.7% and 7.5%, respectively.

○ For the past three years, the facility investment cost has increased in the bioservice and biomedical equipment industries by 205.1% and 68.3%, respectively, but decreased in the bioenvironmental and biofood industries by 51.7% and 40.3%, respectively.

○ Both the bioenvironmental and bioresource industries showed a decreasing trend in both R&D investment and facility investment costs.

<Table 2-14> 2020–2022 Bioindustry's Trend of R&D and Facility Investment Cost

(Unit: KRW 1 million, %)

Industrial Category	2020		2021		2022		Year-Over- Year Change		Annual Average Rate of Change	
	R&D	Facility	R&D	Facility	R&D	Facility	R&D	Facility	R&D	Facility
Total	**2,080,205**	**708,100**	**2,263,081**	**1,006,861**	**2,385,340**	**1,740,155**	**5.4**	**72.8**	**7.1**	**56.8**
Biopharmaceutical	1,492,979	316,576	1,533,534	288,901	1,605,698	300,008	4.7	3.8	3.7	-2.7
Biochemical and Bioenergy	130,423	62,370	165,921	42,725	135,178	42,863	-18.5	0.3	1.8	-17.1
Biofood	101,674	84,532	120,419	31,315	112,216	30,088	-6.8	-3.9	5.1	-40.3
Bioenvironmental	13,291	8,864	12,027	4,737	8,794	2,066	-26.9	-56.4	-18.7	-51.7
Biomedical Equipment	150,872	113,369	187,802	116,216	246,440	321,068	31.2	176.3	27.8	68.3
Bioinstrument and Bioequipment	19,179	8,806	22,649	9,160	22,554	4,877	-0.4	-46.8	8.4	-25.6
Bioresource	11,986	2,113	12,509	1,348	10,258	1,263	-18.0	-6.3	-7.5	-22.7
Bioservice	159,801	111,470	208,220	512,459	244,203	1,037,922	17.3	102.5	23.6	205.1

2) 2018–2022 Bioindustry's Trend of Investment

○ Total investment in the bioindustry has been on a steady rise over the past five years by 14.5%, a 26.2% increase year on year.
○ The R&D investment and the facility investment increased by 8.9% and 25.5%, respectively·

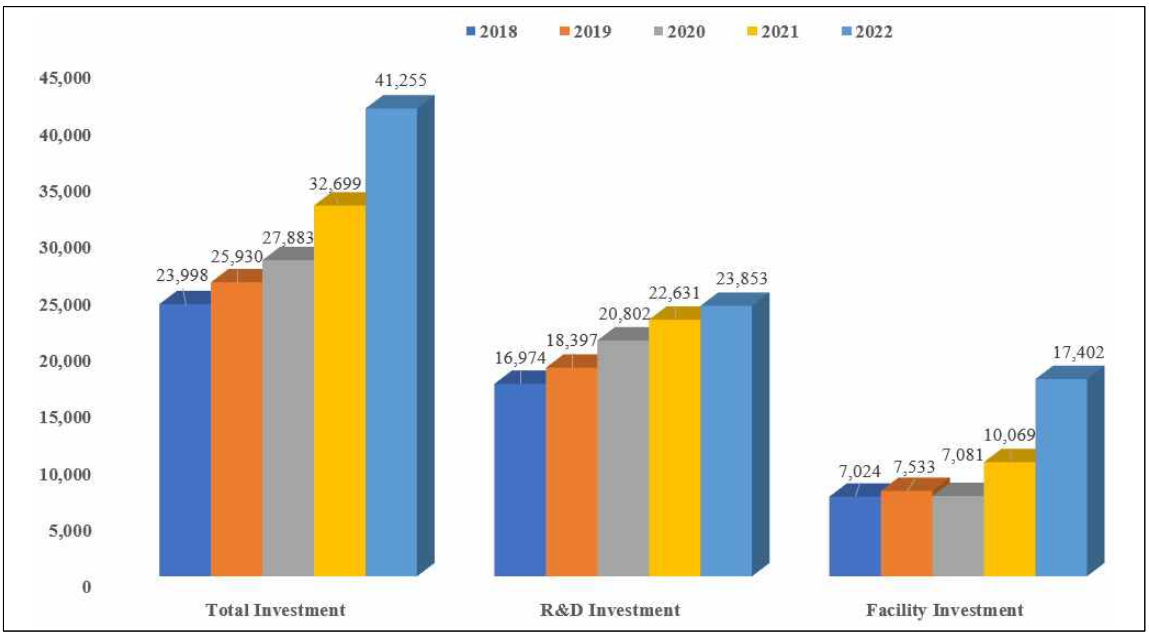
<Table 2-15> 2018–2022 Bioindustry's Trend of Investment

(Unit: KRW 100 million, %)

Classification		2018	2019	2020	2021	2022	Annual Average Rate of Change
Total Investment	Amount	23,998	25,930	27,883	32,699	41,255	14.5
	Rate of Change	8.3	8.1	7.5	17.3	26.2	
R&D Investment	Amount	16,974	18,397	20,802	22,631	23,853	8.9
	Rate of Change	13.4	8.4	13.1	8.8	5.4	
Facility Investment	Amount	7,024	7,533	7,081	10,069	17,402	25.5
	Rate of Change	-2.3	7.2	-6.0	42.2	72.8	

<Figure 2-17> 2018–2022 Bioindustry Investment Trend

(Unit: KRW 100 million)



○ The biopharmaceutical industry has consistently accounted for more than 50% of all investments in the bioindustry since 2018, but it dropped down to 46.2% in 2022.

○ Compared to the previous year, the biomedical equipment industry and bioservice industry have increased significantly by 86.7% and 77.9%, respectively. On the other hand, the bioenvironmental industry has experienced the largest decrease, with a decline of 35.2%.

<Table 2-16> 2018–2022 Bioindustry's Trend in Overall Size of Investment

(Unit: KRW 1 million, %)

Industrial Category	2018		2019		2020		2021		2022		Year-Over-Year Change	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	**2,399,846**	**100.0**	**2,592,954**	**100.0**	**2,788,305**	**100.0**	**3,269,942**	**100.0**	**4,125,495**	**100.0**	**26.2**	**14.5**
Biopharmaceutical	1,536,020	64.0	1,694,527	65.4	1,809,555	64.9	1,822,435	55.7	1,905,706	46.2	4.6	5.5
Biochemical and Bioenergy	219,180	9.1	246,320	9.5	192,793	6.9	208,646	6.4	178,041	4.3	-14.7	-5.1
Biofood	210,377	8.8	211,224	8.1	186,206	6.7	151,734	4.6	142,304	3.4	-6.2	-9.3
Bioenvironmental	17,168	0.7	20,411	0.8	22,155	0.8	16,764	0.5	10,860	0.3	-35.2	-10.8
Biomedical Equipment	165,315	6.9	156,733	6.0	264,241	9.5	304,018	9.3	567,507	13.8	86.7	36.1
Bioinstrument and Bioequipment	9,042	0.4	15,741	0.6	27,985	1.0	31,809	1.0	27,431	0.7	-13.8	32.0
Bioresource	12,091	0.5	13,571	0.5	14,099	0.5	13,857	0.4	11,521	0.3	-16.9	-1.2
Bioservice	230,653	9.6	234,427	9.0	271,271	9.7	720,679	22.0	1,282,125	31.1	77.9	53.5

○ The annual average rate of change in R&D investment over the past five years was highest in the bioservice industry with an increase of 30.7%, followed by the biomedical equipment (29%) and the bioinstrument and bioequipment (27%). On the other hand, the average rate of change for the bioenvironmental industry decreased by 7.1%.

○ The annual average rate of change in facility investment was highest in the bioinstrument and bioequipment industry with 89.2%, followed by the bioservice (63%) and biomedical equipment (43.3%). On the other hand, the biofood and bioenvironmental industries have experienced the largest decrease at 22.5% and 21.2%, respectively.

<Table 2-17> 2018–2022 Bioindustry's Trend of R&D and Facility Investment Cost

(Unit: KRW 100 million, %)

Industrial Category	2018		2019		2020		2021		2022		Year-Over-Year Change		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	**16,974**	**7,024**	**18,397**	**7,533**	**20,802**	**7,081**	**22,631**	**10,069**	**23,853**	**17,402**	**5.4**	**72.8**	**8.9**	**25.5**
Biopharmaceutical	12,174	3,186	13,116	3,829	14,930	3,166	15,335	2,889	16,057	3,000	4.7	3.8	7.2	-1.5
Biochemical and Bioenergy	1,495	696	1,473	990	1,304	624	1,659	427	1,352	429	-18.5	0.3	-2.5	-11.4
Biofood	1,269	835	1,291	821	1,017	845	1,204	313	1,122	301	-6.8	-3.9	-3.0	-22.5
Bioenvironmental	118	54	132	72	133	89	120	47	88	21	-26.9	-56.4	-7.1	-21.2
Biomedical Equipment	891	762	1,019	549	1,509	1,134	1,878	1,162	2,464	3,211	31.2	176.3	29.0	43.3
Bioinstrument and Bioequipment	87	4	131	27	192	88	226	92	226	49	0.4	-46.8	27.0	89.2
Bioresource	102	18	111	25	120	21	125	13	103	13	-18.0	-6.3	0.0	-9.1
Bioservice	837	1,469	1,123	1,221	1,598	1,115	2,082	5,125	2,442	10,379	17.3	102.5	30.7	63.0

4 Cooperation with Other Organizations

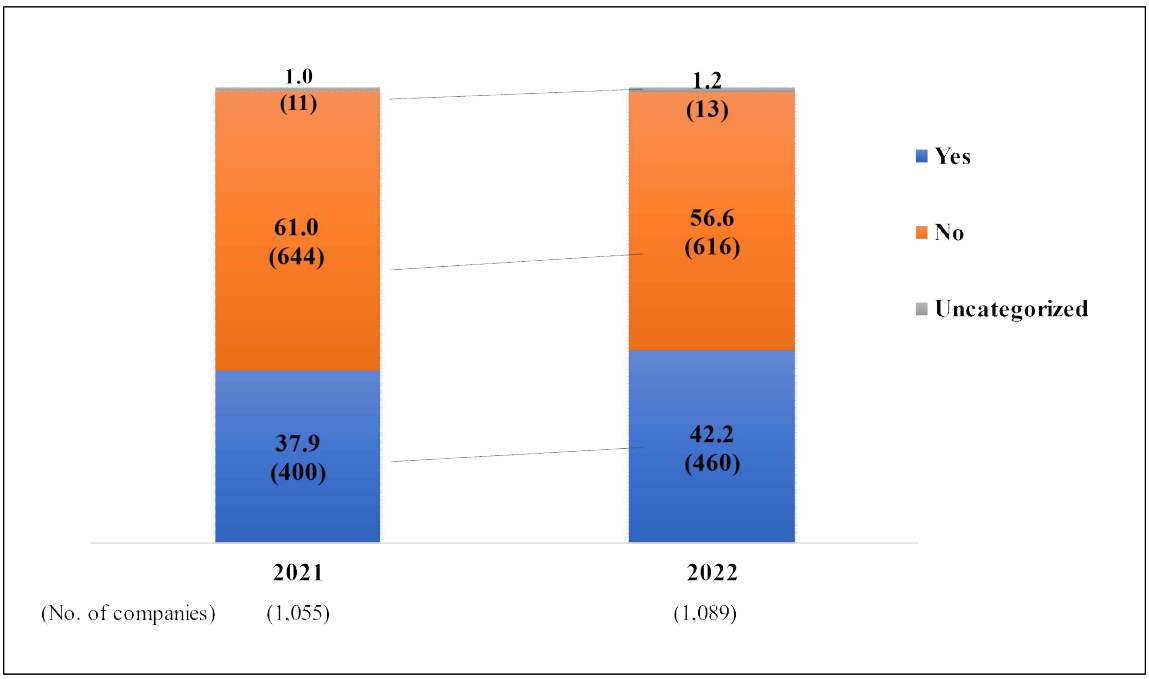
A. Cooperation Type

1) Cooperative Relationship with Other Organizations

○ Out of a total of 1,089 companies, 460 companies had cooperative relationships with other organizations, accounting for 42.2%. Of 1,076 companies excluding the uncategorized companies, 42.8% had cooperative relationships with other organizations.

<Figure 2-18> Cooperative Relationship with Other Organizations

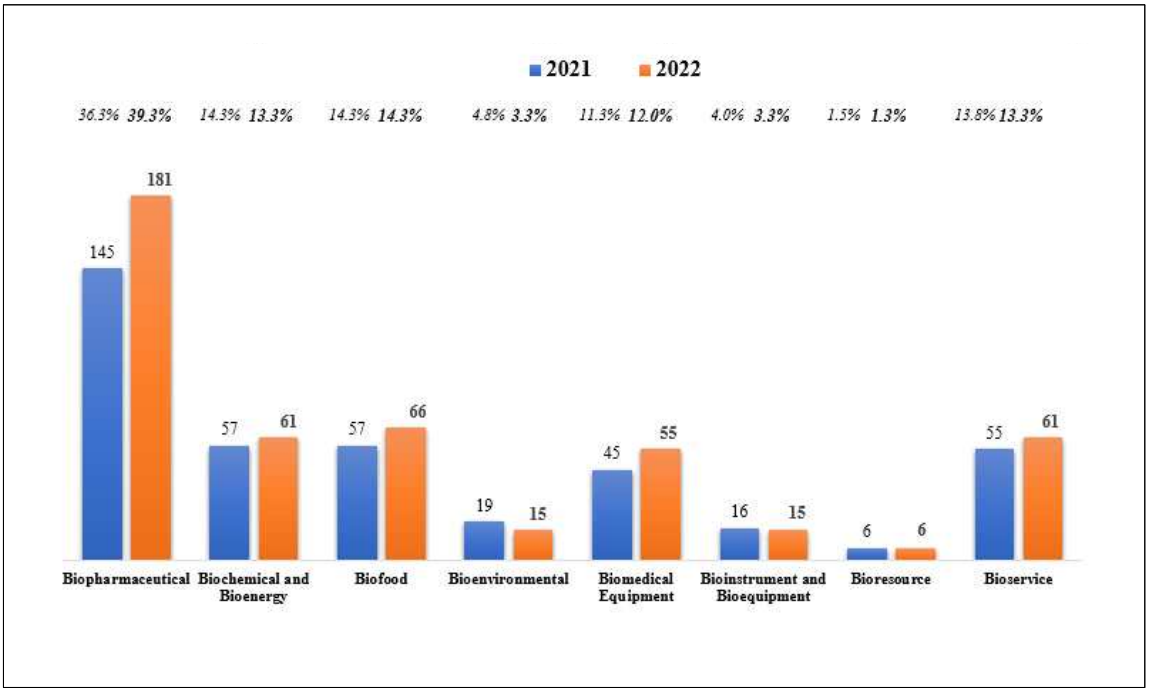
(Unit: % (total no. of companies))



○ By bioindustrial category, the biopharmaceutical (181 companies), biofood (66), biochemical and bioenergy (61), and bioservice industry (61) had the most cooperative relationships, totaling 369, which was 80.2% of 460 companies.

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

(Unit: companies)

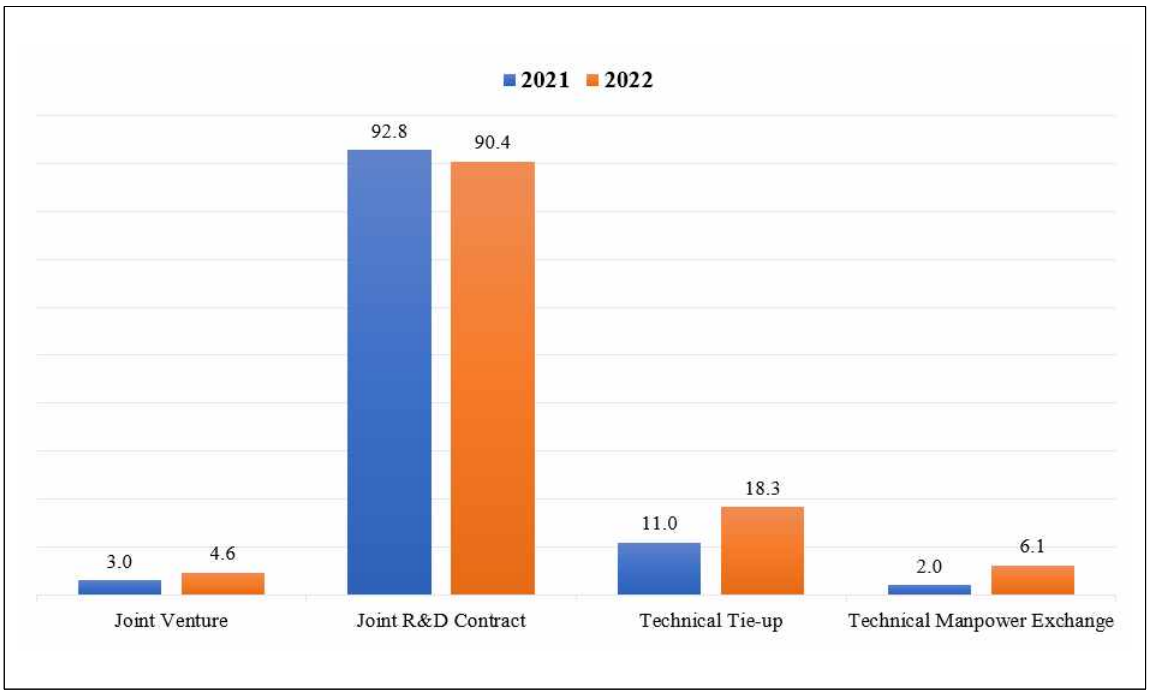


2) Types of Cooperative Relationship with Other Organizations

○ When surveyed 460 companies for the types of cooperation taken on, joint R&D contracts were most common at 90.4%, followed by technology tie-up and licensing (18.3%), joint venture (4.6%), and domestic and international technical manpower exchange (6.1%).

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

(Unit: %)



* The above chart shows the responses from companies that hold cooperative relationships (2021: 400 companies; 2022: 460 companies). Multiple responses accepted.

3) Number of Cooperation Cases by Cooperative Relationship Type

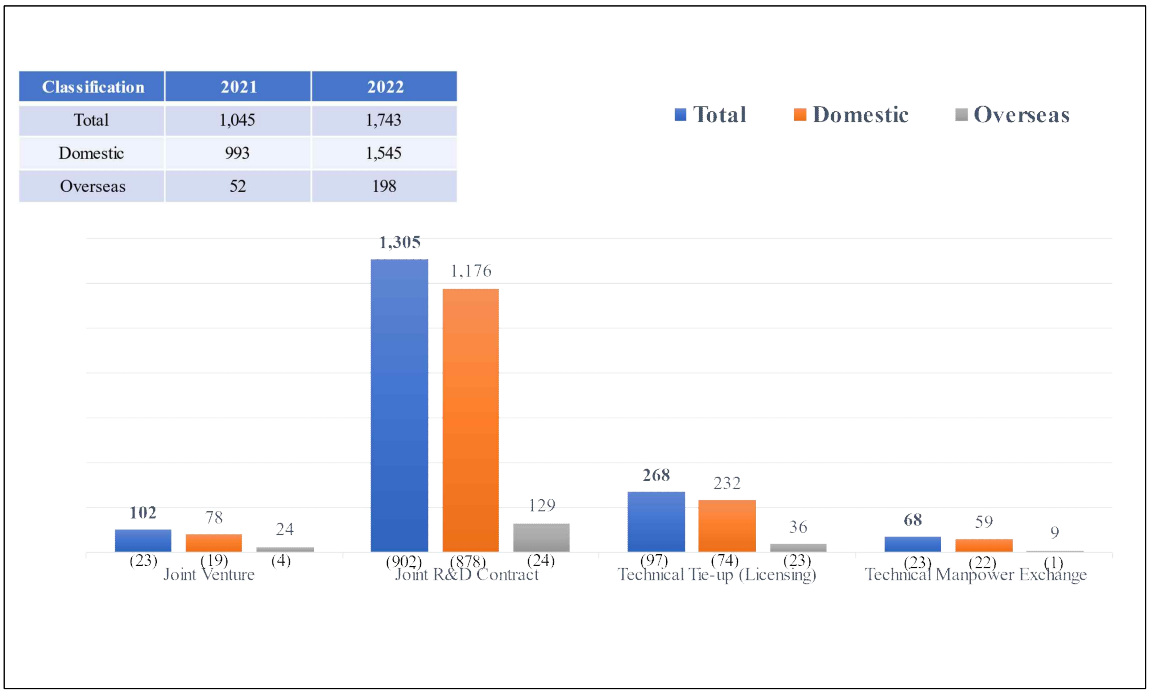
○ The number of cooperative relationships among 460 companies totaled 1,743 cases, with 1,545 cases in Korea (88.6%) and 198 cases abroad (12.8%).

○ Among the types of cooperative relations, the largest number of cases was joint R&D contracts, with 1,305 cases consisting of 1,176 in Korea and 129 abroad.

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

(Unit: cases)

Classification	2021	2022
Total	1,045	1,743
Domestic	993	1,545
Overseas	52	198



* The above chart shows the responses from companies that hold cooperative relationships (2021: 400 companies; 2022: 460 companies). Multiple responses accepted.
* The figures in parentheses are based on the year 2021.

○ The number of cooperation cases by bioindustrial category and by cooperation type was 851 in the biopharmaceutical industry, accounting for 48.8% of the total of 1,743 cases.

○ The biochemical and bioenergy industries and the bioservice industry had 256 cases (14.7%) and 196 cases (11.2%), respectively, accounting for 74.7% of the total number of cooperation cases.

<Table 2-18> No. of Cooperation Cases by Bioindustrial Category and Cooperation Type

(Unit: cases)

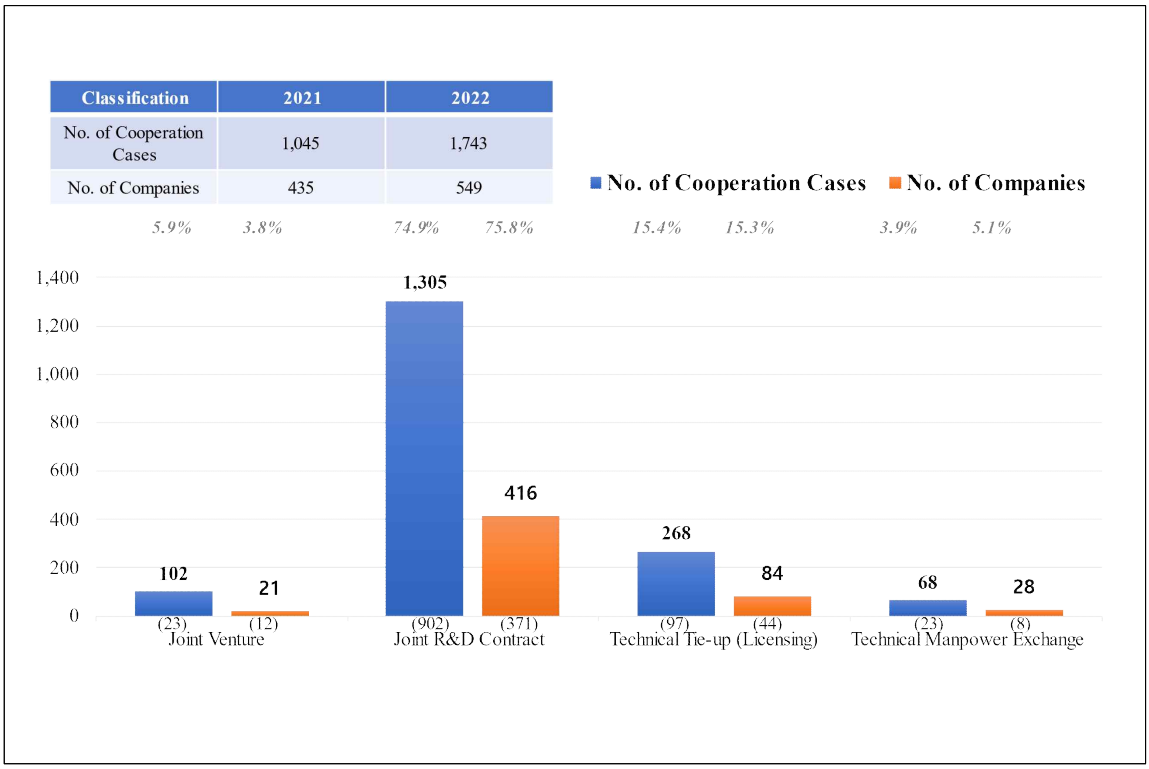
Industrial Category	2021		2022		Cooperation Type			
	Total		Total		Joint Venture	Joint R&D Contract	Technical Tie-up (Licensing)	Technical Manpower Exchange
Total	**1,045**	**(100.0%)**	**1,743**	**(100.0%)**	**102**	**1,305**	**268**	**68**
Biopharmaceutical	384	(36.7%)	851	(48.8%)	59	575	192	25
Biochemical and Bioenergy	159	(15.2%)	256	(14.7%)	17	209	13	17
Biofood	130	(12.4%)	184	(10.6%)	13	152	15	4
Bioenvironmental	28	(2.7%)	33	(1.9%)	-	30	3	-
Biomedical Equipment	107	(10.2%)	169	(9.7%)	10	119	25	15
Bioinstrument and Bioequipment	45	(4.3%)	31	(1.8%)	1	28	-	2
Bioresource	24	(2.3%)	23	(1.3%)	-	22	1	-
Bioservice	168	(16.1%)	196	(11.2%)	2	170	19	5

4) Number of Partners by Cooperative Relationship Type

○ Among the types of cooperation, 416 companies (75.8%) 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 1,305. It was found that companies holding joint R&D contracts conducted 3.1 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 (2021: 400 companies; 2022: 460 companies). Multiple responses accepted.
* The figures in parentheses are based on the year 2021.

○ The biopharmaceutical industry had the most number of partners at 222 (40.4%), followed by biofood industry (14.6%), biochemical and bioenergy, and bioservice (13.1%).

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

(Unit: companies)

Industrial Category	2021		2022		Cooperation Type			
	Total		Total		Joint Venture	Joint R&D Contract	Technical Tie-up (Licensing)	Technical Manpower Exchange
Total	**435**	**(100.0%)**	**549**	**(100.0%)**	**21**	**416**	**84**	**28**
Biopharmaceutical	162	(37.2%)	222	(40.4%)	9	162	41	10
Biochemical and Bioenergy	61	(14.0%)	72	(13.1%)	2	59	7	4
Biofood	61	(14.0%)	80	(14.6%)	4	60	12	4
Bioenvironmental	20	(4.6%)	16	(2.9%)	0	14	2	0
Biomedical Equipment	50	(11.5%)	64	(11.7%)	3	46	10	5
Bioinstrument and Bioequipment	17	(3.9%)	16	(2.9%)	1	14	0	1
Bioresource	6	(1.4%)	7	(1.3%)	0	6	1	0
Bioservice	58	(13.3%)	72	(13.1%)	2	55	11	4

B. Cooperation Stages

1) Number of Cooperation Cases by Cooperation Stage

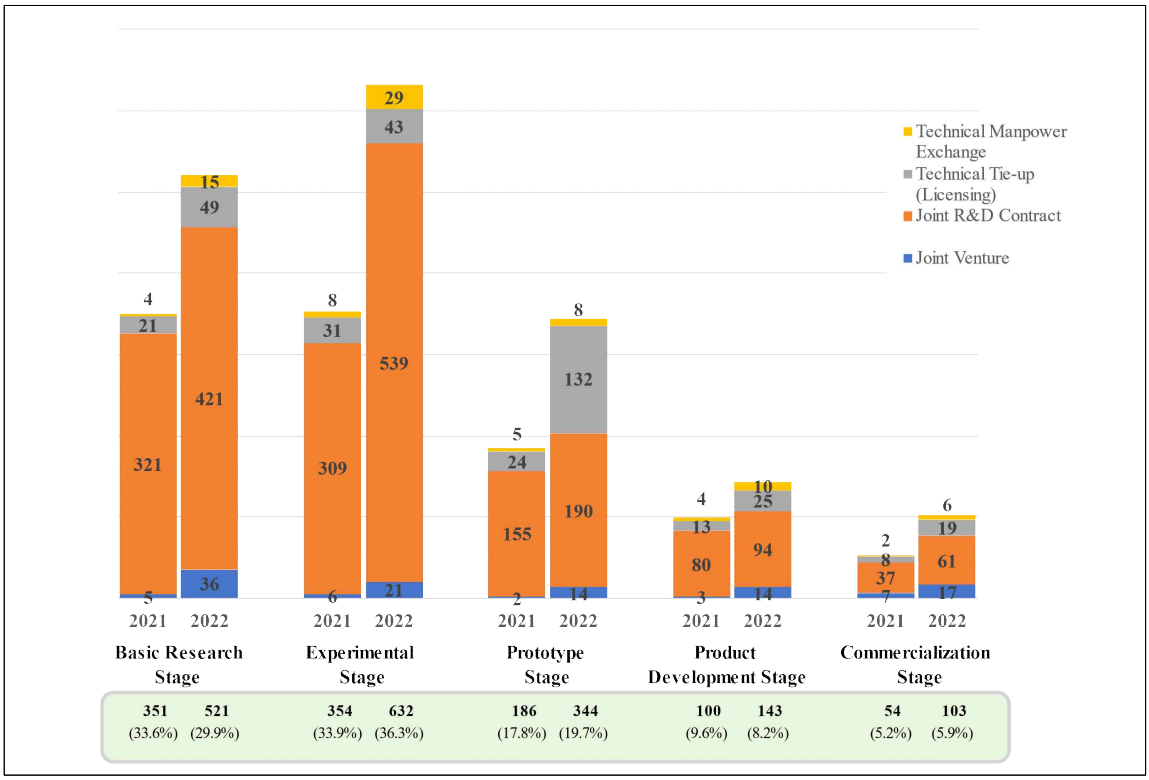
○ As per cooperation stage, the experimental stage has the largest proportion at 36.3% (632 cases) out of a total of 1,743 cases. It was followed by the basic research stage at 29.9% (521 cases).

○ The commercialization stage, which is the final stage, showed a low ratio of 5.9% (103 cases), indicating that companies have cooperation with mainly other institutions at the initial stage of the project.

○ Compared to the previous year, the number of collaborations has increased in all stages, including basic research, experimental, prototype, product development, and commercialization stages.

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

(Unit: cases)



* The above chart shows the responses from companies that hold cooperative relationships (2021: 400 companies; 2022: 460 companies). Multiple responses accepted.

<Table 2-20> 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 2021	**1,045**	**993**	**19**	**878**	**74**	**22**	**52**	**4**	**24**	**23**	**1**
Total of 2022	**1,743**	**1,545**	**78**	**1,176**	**232**	**59**	**198**	**24**	**129**	**36**	**9**
Basic Research Stage	521	454	25	375	40	14	67	11	46	9	1
Experimental Stage	632	585	20	504	37	24	47	1	35	6	5
Prototype Stage	344	313	12	170	124	7	31	2	20	8	1
Product Development Stage	143	119	11	82	17	9	24	3	12	8	1
Commercialization Stage	103	74	10	45	14	5	29	7	16	5	1

○ By bioindustrial category in 2022, the bioenvironmental industry (11 cases) had the greatest number of cooperation cases in the basic research stage, whereas the industries other than bioenvironmental, bioinstrument and bioequipment, and bioservice industries cooperated more in the experimental stage.

<Table 2-21> 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	Experimental	Prototype	Product Development	Commercialization	Total	
Total	**1,089**	**460**	**521**	**632**	**344**	**143**	**103**	**1,743**	**(100%)**
Biopharmaceutical	362	181	277	321	192	35	26	851	(48.8%)
Biochemical and Bioenergy	201	61	73	85	46	32	20	256	(14.7%)
Biofood	168	66	47	69	27	25	16	184	(10.6%)
Bioenvironmental	56	15	11	6	6	1	9	33	(1.9%)
Biomedical Equipment	121	55	39	61	29	24	16	169	(9.7%)
Bioinstrument and Bioequipment	55	15	7	9	12	2	1	31	(1.8%)
Bioresource	15	6	4	18	-	1	-	23	(1.3%)
Bioservice	111	61	63	63	32	23	15	196	(11.2%)

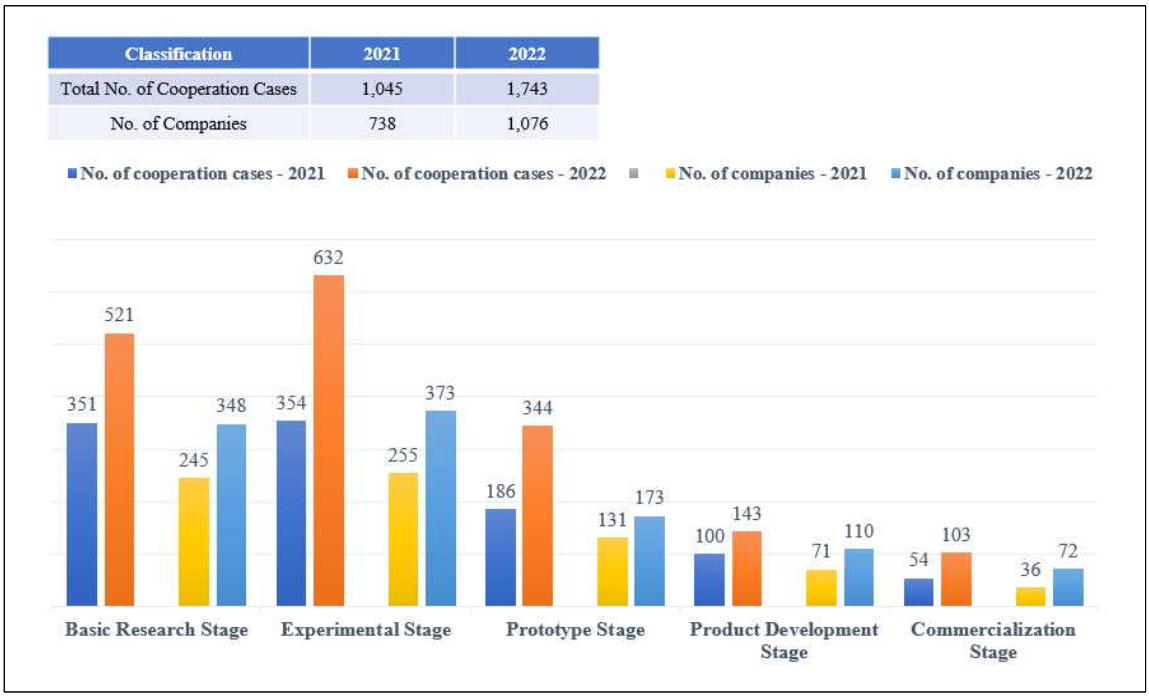
2) Number of Partners by Cooperation Stage

○ Including companies that provided multiple responses, the total number of partners by cooperation stage was 1,076, with 373 companies in the experimental stage, making up the largest part at 34.7%.

○ Compared to the previous year, the number of partners increased in all stages, including basic research, experimental, prototype, product development, and commercialization.

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

(Unit: cases, companies)



* The above chart shows the responses from companies that hold cooperative relationships (2021: 400 companies; 2022: 460 companies). Multiple responses accepted.

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

(Unit: cases, companies, %)

Classification		Total	Basic Research	Experimental	Prototype	Product Development	Commercialization
No. of Cooperation Cases	Domestic	1,545	454	585	313	119	74
	Overseas	198	67	47	31	24	29
Total (cases)		**1,743**	**521**	**632**	**344**	**143**	**103**
Percentage (%)		100.0	29.9	36.3	19.7	8.2	5.9
No. of Companies	Domestic	962	312	345	156	94	55
	Overseas	114	36	28	17	16	17
Total (companies)		**1,076**	**348**	**373**	**173**	**110**	**72**
Percentage (%)		100.0	32.3	34.7	16.1	10.2	6.7

○ The number of partners by bioindustrial category and cooperation stage was 759 in the biopharmaceutical (42.1%), biochemical and bioenergy (15.0%), and bioservice (13.5%) industries, accounting for 70.5% of the total.

○ The biopharmaceutical (180 companies), bioservice (48) and bioenvironmental (10) industries had relatively higher number of partners during the basic research stage.

<Table 2-23> No. of Partners by Bioindustrial Category and Cooperation

(Unit: companies)

Industrial Category	2021		2022		Cooperation Stage				
	Total		Total		Basic Research	Experimental	Prototype	Product Development	Commercialization
Total	**738**	**(100.0%)**	**1,076**	**(100.0%)**	**348**	**373**	**173**	**110**	**72**
Biopharmaceutical	265	(35.9%)	453	(42.1%)	180	167	60	29	17
Biochemical and Bioenergy	113	(15.3%)	161	(15.0%)	43	56	32	20	10
Biofood	91	(12.3%)	131	(12.2%)	30	46	20	22	13
Bioenvironmental	23	(3.1%)	25	(2.3%)	10	4	6	1	4
Biomedical Equipment	85	(11.5%)	127	(11.8%)	28	41	25	19	14
Bioinstrument and Bioequipment	32	(4.3%)	23	(2.1%)	5	9	6	2	1
Bioresource	10	(1.4%)	11	(1.0%)	4	6	-	1	-
Bioservice	119	(16.1%)	145	(13.5%)	48	44	24	16	13

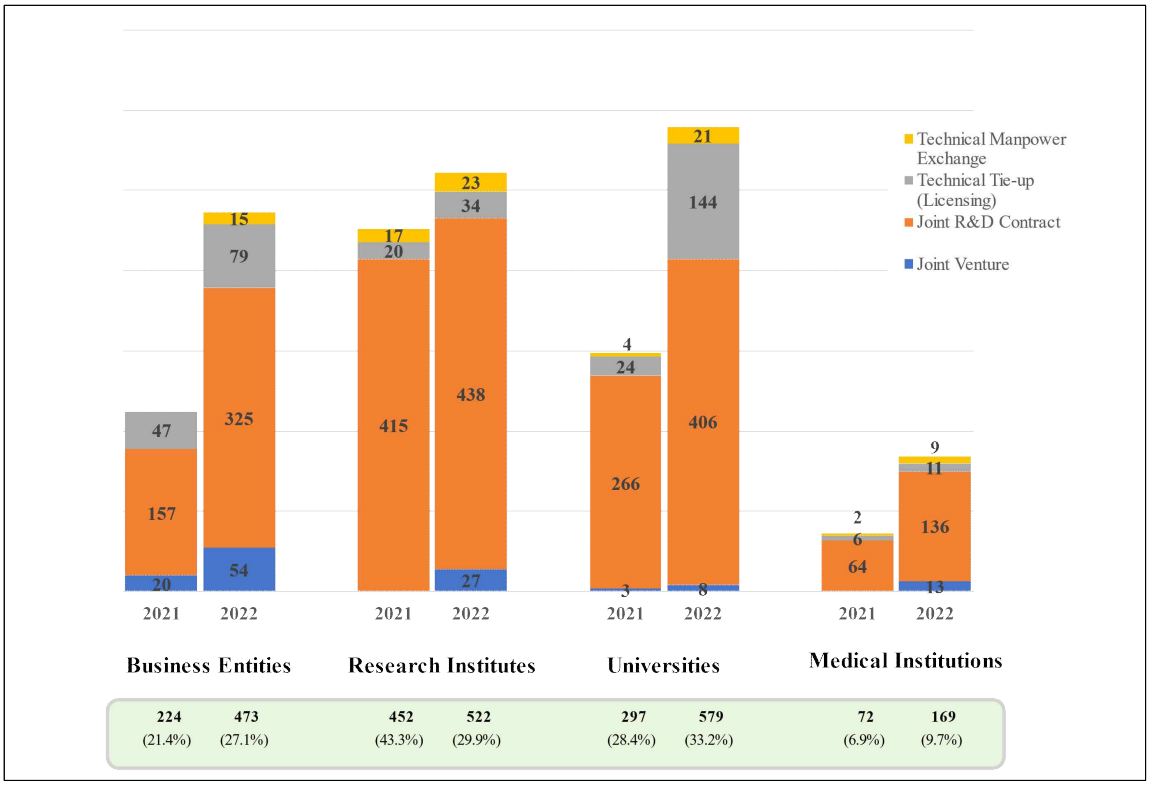
C. Cooperating Organizations

1) Number of Cooperation Cases by Cooperating Organization

○ Of the total of 1,743 cooperation cases, 579 (33.2%) were with universities, followed by 522 (29.9%) with research institutes, 473 (27.1%) with business entities, and 169 (9.7%) 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 (2021: 400 companies; 2022: 460 companies). Multiple responses accepted.

<Table 2-24> No. of Cooperation Cases by Cooperating Organization

(Unit: cases)

Industrial Category	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	**1,743**	**1,545**	**78**	**1,176**	**232**	**59**	**198**	**24**	**129**	**36**	**9**
Business Entities	473	367	40	265	51	11	106	14	60	28	4
SMEs and Venture Companies	334	260	36	183	33	8	74	11	38	23	2
Middle-standing Companies	76	67	3	51	10	3	9	1	5	2	1
Large Enterprises	63	40	1	31	8	-	23	2	17	3	1
Research Institutes	522	504	24	428	29	23	18	3	10	5	-
Government-funded Research Institutes	443	432	14	378	23	17	11	2	5	4	-
Private Research Institutes	79	72	10	50	6	6	7	1	5	1	-
Universities	579	553	7	388	142	16	26	1	18	2	5
Medical Institutions	169	121	7	95	10	9	48	6	41	1	-

○ By bioindustrial 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 2-25> 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	**1,089**	**460**	**473**	**522**	**579**	**169**	**1,743**	(100.0%)
Biopharmaceutical	362	181	238	183	354	76	851	(48.8%)
Biochemical and Bioenergy	201	61	52	115	50	39	256	(14.7%)
Biofood	168	66	64	47	69	4	184	(10.6%)
Bioenvironmental	56	15	12	12	9	-	33	(1.9%)
Biomedical Equipment	121	55	57	57	35	20	169	(9.7%)
Bioinstrument and Bioequipment	55	15	7	16	8	-	31	(1.8%)
Bioresource	15	6	-	12	11	-	23	(1.3%)
Bioservice	111	61	43	80	43	30	196	(11.2%)

2) Number of Partners by Cooperating Organization

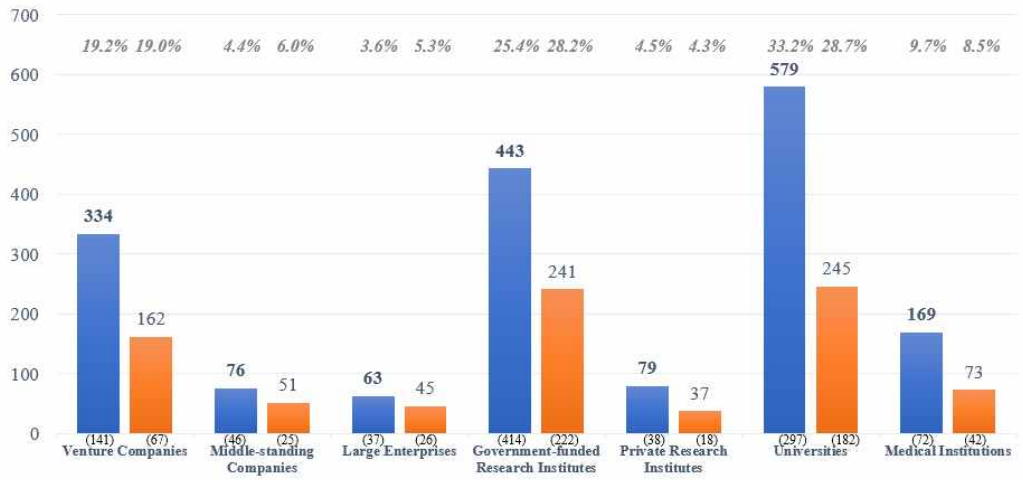
○ Including companies that provided multiple responses, the total number of partners by cooperating organization was 854, with 245 cooperation cases with universities, making up the largest part at 28.7%.

○ In descending order, there were cooperation cases with government-funded research institutions (241 cases, 28.2%), followed by SMEs and venture companies (162 cases, 19.0%), medical institutions (73 cases, 8.5%), middle-standing companies (51 cases, 6.0%), large enterprises (45 cases, 5.3%), and private research institutions (37 cases, 4.3%).

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

(Unit: cases, companies)

Classification	2021	2022
No. of Cooperation Cases	1,045	1,743
No. of Companies	582	854



* The above chart shows the responses from companies that hold cooperative relationships (2021: 400 companies; 2022: 460 companies). Multiple responses accepted.
* The figures in parentheses are based on the year 2021.

○ By bioindustrial category, the biopharmaceutical, biochemical and bioenergy, bioservice, and biomedical equipment industries occupy 42.5%, 13.7%, 13.3%, and 12.5%, respectively, accounting for 82.1% of the total.

○ For most companies, cooperation with research institutions is prominent. However, in the biopharmaceutical industry (128 cases), cooperation with business entities is high, and in the biofood industry (34 cases), cooperation with both business entities and universities is notably high.

<Table 2-26> 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	**1,089**	**460**	**258**	**278**	**245**	**73**	**854**	**(100.0%)**
Biopharmaceutical	362	181	128	96	103	36	363	(42.5%)
Biochemical and Bioenergy	201	61	27	57	30	3	117	(13.7%)
Biofood	168	66	34	30	34	4	102	(11.9%)
Bioenvironmental	56	15	6	9	9	-	24	(2.8%)
Biomedical Equipment	121	55	31	37	26	13	107	(12.5%)
Bioinstrument and Bioequipment	55	15	4	9	7	-	20	(2.3%)
Bioresource	15	6	-	2	5	-	7	(0.8%)
Bioservice	111	61	28	38	31	17	114	(13.3%)

3) Status of Cooperative Relationships by Type and Institution

<Table 2-27> 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	Domestic	78	36	3	1	14	10	7	7
		Overseas	24	11	1	2	2	1	1	6
		Subtotal	102	47	4	3	16	11	8	13
	No. of Companies	Domestic	27	15	1	1	2	2	4	2
		Overseas	10	3	1	2	1	1	1	1
		Subtotal	37	18	2	3	3	3	5	3
Joint R&D Contract	Total	Domestic	1,176	183	51	31	378	50	388	95
		Overseas	129	38	5	17	5	5	18	41
		Subtotal	1,305	221	56	48	383	55	406	136
	No. of Companies	Domestic	607	95	30	21	203	24	180	54
		Overseas	56	15	4	11	5	4	11	6
		Subtotal	663	110	34	32	208	28	191	60
Technical Tie-up (Licensing)	Total	Domestic	232	33	10	8	23	6	142	10
		Overseas	36	23	2	3	4	1	2	1
		Subtotal	268	56	12	11	27	7	144	11
	No. of Companies	Domestic	94	18	9	6	19	4	32	6
		Overseas	23	10	2	3	4	1	2	1
		Subtotal	117	28	11	9	23	5	34	7
Domestic and International Technical Manpower Exchange	Total	Domestic	59	8	3	-	17	6	16	9
		Overseas	9	2	1	1	-	-	5	-
		Subtotal	68	10	4	1	17	6	21	9
	No. of Companies	Domestic	29	5	3	-	7	1	10	3
		Overseas	8	1	1	1	-	-	5	-
		Subtotal	37	6	4	1	7	1	15	3
Total Cooperation Cases			1,743	334	76	63	443	79	579	169
Percentage			100.0	19.2	4.4	3.6	25.4	4.5	33.2	9.7
Companies in Total			854	162	51	45	241	37	245	73
Percentage			100.0	19.0	6.0	5.3	28.2	4.3	28.7	8.5

4) No. of Cooperations by Scale of Workers and Cooperating Organizations

○ Bio-companies with 1 to 49 employees cooperated with research institutes the most 286 cases in total (276 cases in Korea).

○ Bio-companies with at least 1,000 employees cooperated with research institutes the most, showing 58 cases (56 cases in Korea) in 2022.

<Table 2-28> 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**	**1,743**	**473**	**334**	**76**	**63**	**522**	**443**	**79**	**579**	**169**
	1–49	791	225	158	38	29	286	254	32	212	68
	50–299	410	149	126	13	10	137	114	23	88	36
	300–999	366	62	33	13	16	41	34	7	248	15
	1,000 or more	176	37	17	12	8	58	41	17	31	50
Domestic	**Total**	**1,545**	**367**	**260**	**67**	**40**	**504**	**432**	**72**	**553**	**121**
	1–49	716	176	127	33	16	276	249	27	198	66
	50–299	361	110	92	11	7	134	112	22	84	33
	300–999	349	51	28	11	12	38	32	6	246	14
	1,000 or more	119	30	13	12	5	56	39	17	25	8
Overseas	**Total**	**198**	**106**	**74**	**9**	**23**	**18**	**11**	**7**	**26**	**48**
	1–49	75	49	31	5	13	10	5	5	14	2
	50–299	49	39	34	2	3	3	2	1	4	3
	300–999	17	11	5	2	4	3	2	1	2	1
	1,000 or more	57	7	4	-	3	2	2	-	6	42

* Conducted for 686 companies with 1 to 49 employees, 282 companies with 50 to 299 employees, 74 companies with 300 to 999 employees, and 33 companies with more than 1,000 employees.
* Excluded companies with unknown size of employees

5 Supply and Demand Status of Bioindustry

A. Bioindustry's Supply and Demand Status of 2022

○ The total supply and demand size of the domestic bioindustry in 2022 is KRW 27,712.3 billion, increased by KRW 1,545.8 billion (5.9%) year-over-year.

○ The production scale was KRW 23,465.7 billion (84.7%), and the size of import was KRW 4,246.6 billion (15.3%).

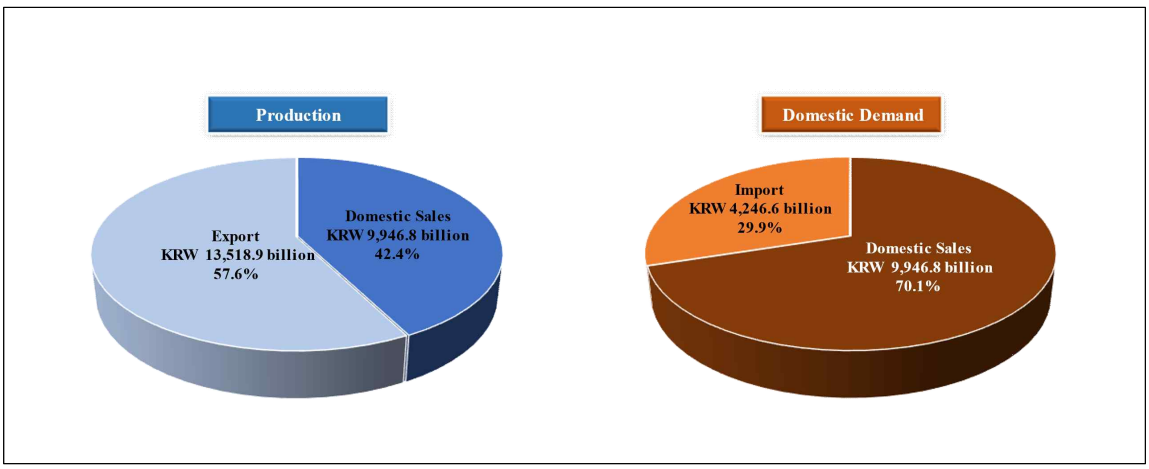
○ The size of domestic demand was KRW 14,193.4 billion (51.2%), and the size of export was KRW 13.518.9 billion (48.8%).

<Table 2-29> 2020–2022 Bioindustry's Trend of Supply and Demand

(Unit: KRW 100 million, %)

Year	Supply				Total	Demand			
	Production		Import			Domestic Demand		Export	
	Amount	Distribution Ratio	Amount	Distribution Ratio		Amount	Distribution Ratio	Amount	Distribution Ratio
2020	171,983	87.6	24,305	12.4	196,288	95,776	48.8	100,512	51.2
2021	213,971	81.8	47,693	18.2	261,665	141,521	54.1	120,144	45.9
2022	**234,657**	**84.7**	**42,466**	**15.3**	**277,123**	**141,934**	**51.2**	**135,189**	**48.8**
Annual Average Rate of Change	16.8		32.2		18.8	21.7		16.0	

<Figure 2-27> 2022 Bioindustry's Size of Production and Domestic Demand



○ For the production scale in the bioindustry, the biomedical equipment, biopharmaceutical, and biofood industries accounted for KRW 5,676.7 billion (24.2%), KRW 5,630.3 billion (24.0%), and KRW 4,652.4 billion (19.8%), respectively, accounting for a majority, 68% of the total production.

○ In the domestic market, the biopharmaceutical (KRW 5,326.8 billion, 37.5%), biochemical and bioenergy (KRW 3,587.0 billion, 25.3%), and biofood (KRW 1,903.6 billion, 13.4%) made up 76.2%.

<Table 2-30> 2022 Bioindustry's Status of Production and Domestic Demand

(Unit: KRW 1 million, %)

Industrial Category	Production				Domestic Demand			
	Domestic Sales	Export	Total	Distribution Ratio	Domestic Sales	Import	Total	Distribution Ratio
Total	**9,946,826**	**13,518,899**	**23,465,725**	**100.0**	**9,946,826**	**4,246,577**	**14,193,403**	**100.0**
Biopharmaceutical	1,889,422	3,740,830	5,630,252	24.0	1,889,422	3,437,414	5,326,835	37.5
Biochemical and Bioenergy	3,241,308	400,359	3,641,667	15.5	3,241,308	345,680	3,586,988	25.3
Biofood	1,821,489	2,830,911	4,652,400	19.8	1,821,489	82,067	1,903,556	13.4
Bioenvironmental	71,896	204	72,100	0.3	71,896	142	72,038	0.5
Biomedical Equipment	1,815,253	3,861,487	5,676,740	24.2	1,815,253	63,906	1,879,160	13.2
Bioinstrument and Bioequipment	149,436	53,859	203,295	0.9	149,436	292,629	442,065	3.1
Bioresource	83,026	11,504	94,530	0.4	83,026	21,795	104,821	0.7
Bioservice	874,996	2,619,747	3,494,743	14.9	874,996	2,944	877,940	6.2

○ As for production scale and domestic demand by area, Gyeonggi had the highest production scale at 42% (KRW 9,853.9 billion), and Seoul had the highest domestic demand at 32% (KRW 4,535.4 billion).

<Table 2-31> 2022 Bioindustry's Status of Production and Domestic Demand by Area

(Unit: KRW 1 million, %)

Area	Production				Domestic Demand			
	Domestic Sales	Export	Total	Distribution Ratio	Domestic Sales	Import	Total	Distribution Ratio
Total	**9,946,826**	**13,518,899**	**23,465,725**	**100.0**	**9,946,826**	**4,246,577**	**14,193,403**	**100.0**
Seoul	1,024,651	546,690	1,571,341	6.7	1,024,651	3,510,774	4,535,425	32.0
Busan	5,008	2,428	7,436	0.0	5,008	2,745	7,753	0.1
Incheon	237,596	4,756,696	4,994,292	21.3	237,596	3,488	241,084	1.7
Daegu	60,488	52,734	113,222	0.5	60,488	3	60,491	0.4
Gwangju	2,701	129	2,830	0.0	2,701	158	2,859	0.0
Daejeon	323,002	88,712	411,714	1.8	323,002	33,191	356,194	2.5
Ulsan	1,624,423	5,125	1,629,548	6.9	1,624,423	208,368	1,832,791	12.9
Sejong	2,517	0	2,517	0.0	2,517	0	2,517	0.0
Gyeonggi	3,429,146	6,424,787	9,853,933	42.0	3,429,146	298,018	3,727,164	26.3
Gangwon	237,150	475,651	712,801	3.0	237,150	11,463	248,613	1.8
Chungbuk	1,500,706	706,046	2,206,752	9.4	1,500,706	83,194	1,583,900	11.2
Chungnam	152,975	84,510	237,485	1.0	152,975	25,002	177,977	1.3
Jeonbuk	281,299	80,235	361,534	1.5	281,299	21,106	302,405	2.1
Jeonnam	474,908	20,917	495,825	2.1	474,908	13,217	488,125	3.4
Gyeongbuk	445,773	243,536	689,309	2.9	445,773	1,957	447,730	3.2
Gyeongnam	135,397	21,777	157,174	0.7	135,397	33,762	169,159	1.2
Jeju	9,086	8,927	18,013	0.1	9,086	129	9,215	0.1

B. Recent Trend of Supply and Demand Status

1) 2020–2022 Trend of Supply and Demand Status

○ The size of production and domestic demand in the bioindustries continued to grow between 2020 and 2022.

○ The annual average rate of change in the supply and demand, production, and domestic demand since 2020 marked 18.8.%, 16.8%, and 21.7%, respectively.

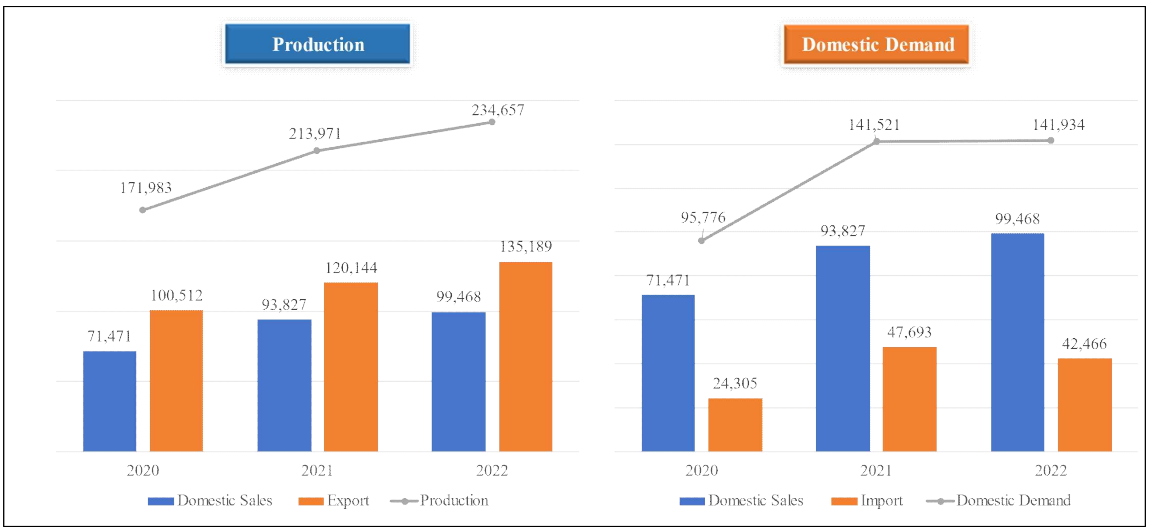
<Table 2-32> 2020–2022 Bioindustry's Trend of Production and Domestic Demand

(Unit: KRW 100 million, %)

Classification		2020	2021	2022	Annual Average Rate of Change
Supply and Demand (Production + Import)	Amount	196,288	261,665	277,123	18.8
	Rate of Change	33.3	33.3	5.9	
Production (Domestic Sales + Export)	Amount	171,983	213,971	234,657	16.8
	Rate of Change	35.9	24.4	9.7	
Domestic Demand (Domestic Sales + Import)	Amount	95,776	141,521	141,934	21.7
	Rate of Change	17.0	47.8	0.3	

<Figure 2-28> 2020–2022 Bioindustry's Trend of Production and Domestic Demand

(Unit: KRW 100 million)



○ In 2022, production increased by 9.7% YoY, and the bioservice industry showed the highest growth rate at 32.6%.

○ The biomedical equipment industry, which has the highest share in total production, increased by 2.3% YoY and showed an annual average growth of 20.7%, followed by the biopharmaceutical industry, which decreased by 2.5% YoY, but demonstrating a trend of annual average growth of 7%.

○ In 2022, domestic demand increased by 0.3% YoY, and the biomedical equipment industry showed the highest growth rate at 60.3%, whereas bioservice showed 31.4% reduction rate.

<Table 2-33> 2020–2022 Bioindustry's Trend of Supply and Demand by Category

(Unit: KRW 100 million, %)

Industrial Category	Production					Domestic Demand				
	2020	2021	2022	Year-Over-Year Change	Annual Average Rate of Change	2020	2021	2022	Year-Over-Year Change	Annual Average Rate of Change
Total	**171,983**	**213,971**	**234,657**	**9.7**	**16.8**	**95,776**	**141,521**	**141,934**	**0.3**	**21.7**
Biopharmaceutical	49,174	57,760	56,303	-2.5	7.0	35,158	63,923	53,268	-16.7	23.1
Biochemical and Bioenergy	21,253	29,309	36,417	24.2	30.9	20,036	28,672	35,870	25.1	33.8
Biofood	40,925	41,529	46,524	12.0	6.6	17,824	19,022	19,036	0.1	3.3
Bioenvironmental	663	691	721	4.4	4.3	664	692	720	4.2	4.2
Biomedical Equipment	38,976	55,501	56,767	2.3	20.7	9,074	11,725	18,792	60.3	43.9
Bioinstrument and Bioequipment	1,722	1,901	2,033	7.0	8.7	3,334	3,675	4,421	20.3	15.2
Bioresource	1,211	928	945	1.8	-11.6	1,292	1,008	1,048	4.0	-9.9
Bioservice	18,058	26,353	34,947	32.6	39.1	8,395	12,804	8,779	-31.4	2.3

2) 2018–2022 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 22% and the domestic demand also grew with an annual average of 18.9%.

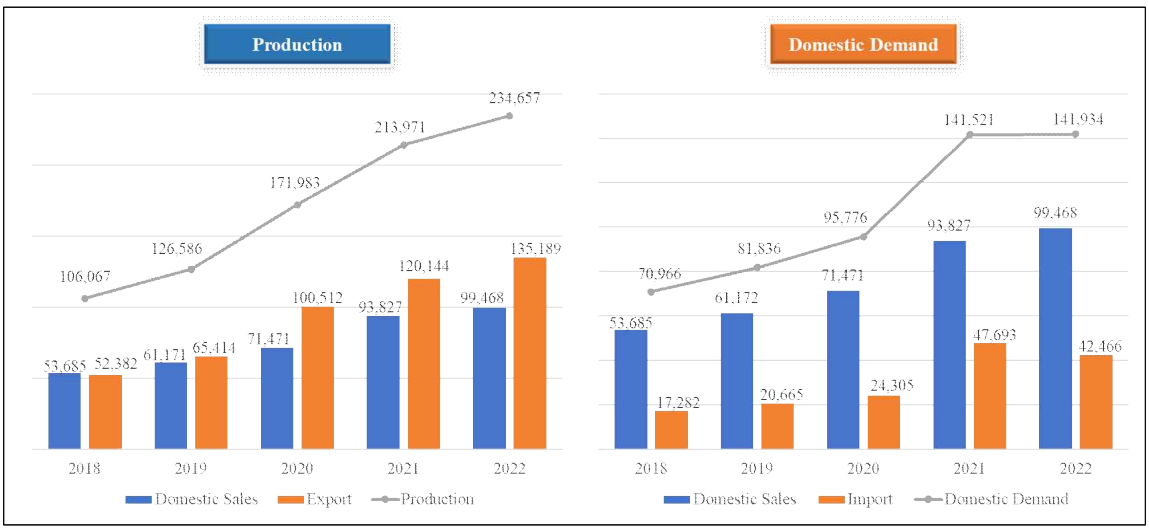
<Table 2-34> 2018–2022 Bioindustry's Trend of Supply and Demand

(Unit: KRW 100 million, %)

Classification		2018	2019	2020	2021	2022	Annual Average Rate of Change
Supply and Demand (Production + Import)	Amount	123,348	147,250	196,288	261,665	277,123	22.4
	Rate of Change	5.3	19.4	33.3	33.3	5.9	
Production (Domestic Sales + Export)	Amount	106,067	126,586	171,983	213,971	234,657	22.0
	Rate of Change	4.5	19.3	35.9	24.4	9.7	
Domestic Demand (Domestic Sales + Import)	Amount	70,966	81,836	95,776	141,521	141,934	18.9
	Rate of Change	8.4	15.3	17.0	47.8	0.3	

<Figure 2-29> 2018-2022 Bioindustry's Trend of Production and Domestic Demand

(Unit: KRW 100 million)



<Table 2-35> 2018–2022 Bioindustry's Trend of Supply and Demand by Category

(Unit: KRW 100 million, %)

Industrial Category	Production							Domestic Demand						
	2018	2019	2020	2021	2022	Year-Over-Year Change	Annual Average Rate of Change	2018	2019	2020	2021	2022	Year-Over-Year Change	Annual Average Rate of Change
Total	**106,067**	**126,586**	**171,983**	**213,971**	**234,657**	**9.7**	**22.0**	**70,966**	**81,836**	**95,776**	**141,521**	**141,934**	**0.3**	**18.9**
Biopharmaceutical	35,101	42,246	49,174	57,760	56,303	-2.5	12.5	29,793	32,623	35,158	63,923	53,268	-16.7	15.6
Biochemical and Bioenergy	17,916	18,561	21,253	29,309	36,417	24.2	19.4	18,083	18,412	20,036	28,672	35,870	25.1	18.7
Biofood	31,015	39,903	40,925	41,529	46,524	12.0	10.7	12,947	16,385	17,824	19,022	19,036	0.1	10.1
Bioenvironmental	577	557	663	691	721	4.4	5.7	562	552	664	692	720	4.2	6.4
Biomedical Equipment	8,482	10,438	38,976	55,501	56,767	2.3	60.8	2,714	3,638	9,074	11,725	18,792	60.3	62.2
Bioinstrument and Bioequipment	889	1,105	1,722	1,901	2,033	7.0	23.0	1,240	2,455	3,334	3,675	4,421	20.3	37.4
Bioresource	1,785	1,257	1,211	928	945	1.8	-14.7	1,793	1,308	1,292	1,008	1,048	4.0	-12.6
Bioservice	10,302	12,519	18,058	26,353	34,947	32.6	35.7	3,834	6,464	8,395	12,804	8,779	-31.4	23.0

6 Domestic Sales Status of Bioindustry

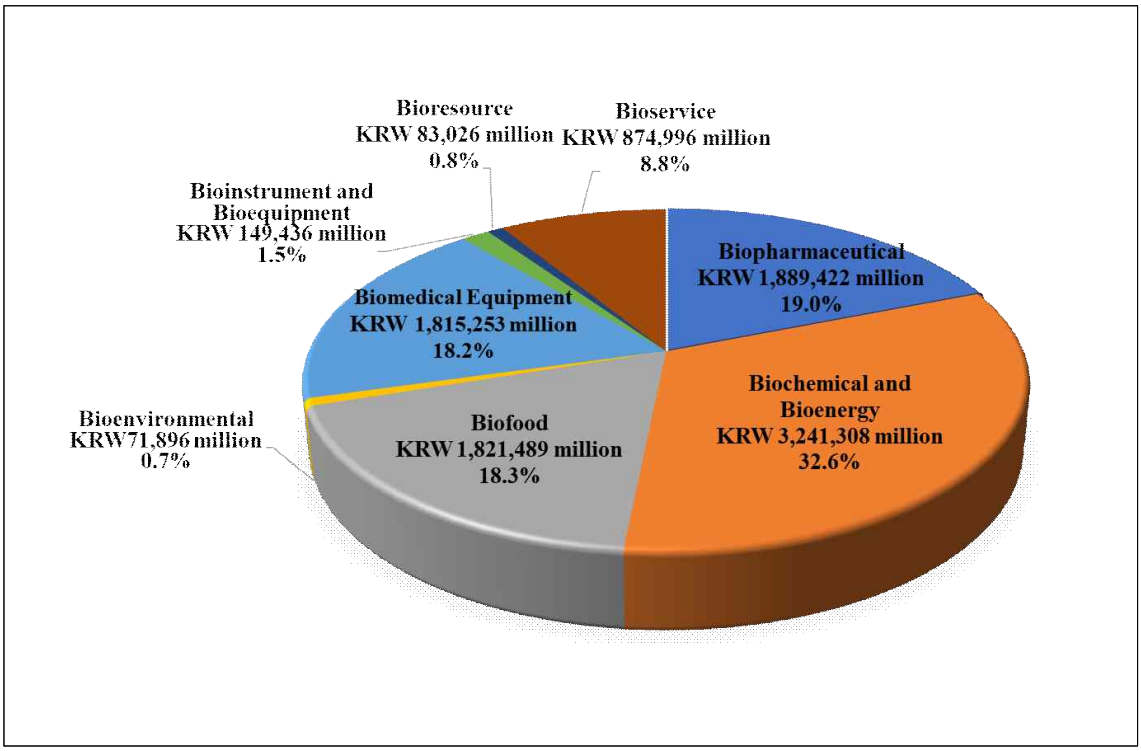
A. Domestic Sales Status of 2022

○ The size of bioindustry's domestic sales in 2022 reached KRW 9,946.8 billion, and the biochemical and bioenergy industry took the largest proportion among them with KRW 3,241.3 billion (32.6%).

○ The following largest industries were the biopharmaceutical with KRW 1,889.4 billion (19%) and biofood with KRW 1,821.5 billion (18.3%).

○ Domestic sales of the bioindustry in 2022 accounted for 69.9% of the total market in three industries: biochemical and bioenergy, biopharmaceutical, and biofood.

<Figure 2-30> 2022 Bioindustry's Size of Domestic Sales by Category



○ <Table 2-36> 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 25.6% of the total bioindustry with KRW 2,542.4 billion.

○ The following largest products were in-vitro diagnostics (16%), feed additives (9.2%), and functional health foods (5.9%) in order. A total of 17 products make up at least 1.0% of the domestic sales.

<Table 2-36> 2022 Main Bioproduct's Size of Domestic Sales

(Unit: KRW 1 million, %)

Rank	Code	Product Name	Domestic Sales	Distribution Ratio
1	2060	Biofuels	2,542,363	25.6
2	5020	In-vitro diagnostics	1,595,641	16.0
3	3050	Feed additives	919,031	9.2
4	3010	Functional health foods	586,682	5.9
5	1060	Blood products	536,255	5.4
6	1030	Vaccines	469,706	4.7
7	2040	Biocosmetics and home & personal care chemicals	441,015	4.4
8	1000	Other biopharmaceuticals	361,794	3.6
9	8030	Clinical/non-clinical R&D services	250,887	2.5
10	5000	Other biomedical equipment	219,554	2.2
11	3030	Food additives	212,966	2.1
12	8010	Bio-consignment production and procuration services	210,330	2.1
13	8020	Bio-diagnostic and analytical services	189,110	1.9
14	1040	Hormones	152,170	1.5
15	2050	Biological agrochemicals and fertilizers	122,082	1.2
16	1050	Therapeutic antibodies and cytokines	115,231	1.2
17	8040	Other R&D services	109,721	1.1

B. Recent Trend of Domestic Sales Status

1) 2020–2022 Trend of Domestic Sales Status

○ The size of bioindustry's domestic sales in 2022 was KRW 9,946.8 billion, which increased by KRW 564.1 billion (6.0%) from KRW 9,382.7 billion in 2021.

○ The annual average growth rate of bioindustry's domestic sales for the past three years is 18%.

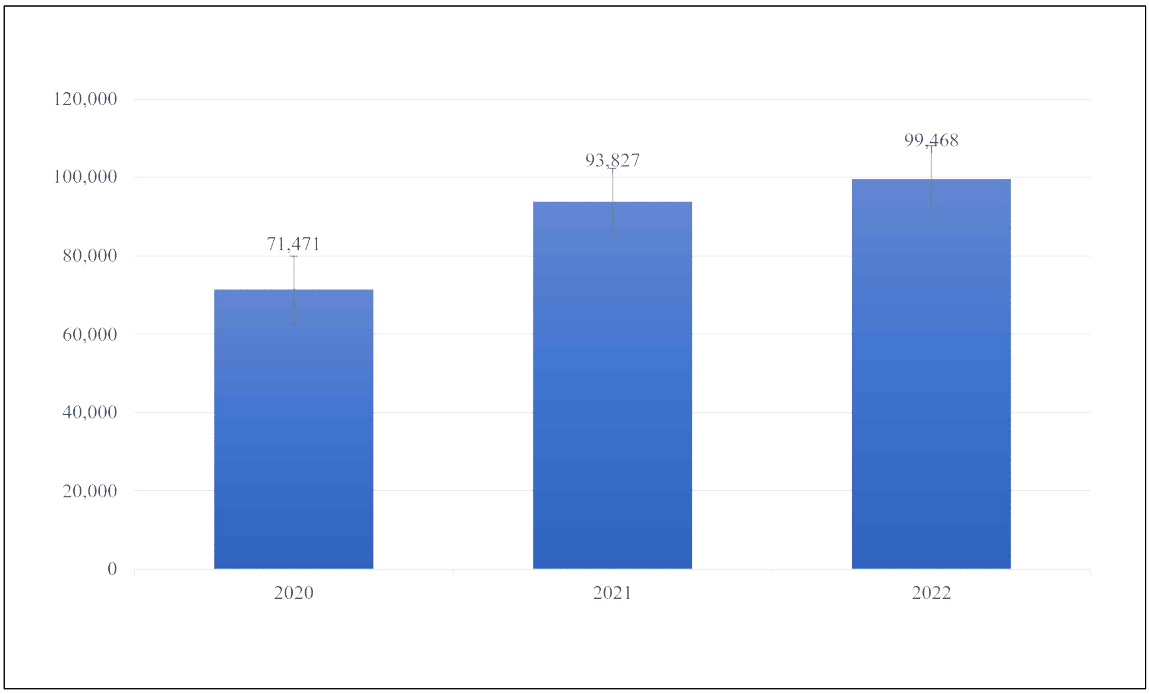
<Table 2-37> 2020–2022 Bioindustry's Trend of Domestic Sales

(Unit: KRW 100 million, %)

Classification		2020	2021	2022	Annual Average Rate of Change
Domestic Sales	Amount	71,471	93,827	99,468	18.0
	Rate of Change	16.8	31.3	6.0	

<Figure 2-31> 2020–2022 Bioindustry's Trend of Domestic Sales

(Unit: KRW 100 million)



○ The biochemical and bioenergy industry accounts for the largest part at 32.6% of the entire bioindustry.

○ The biochemical and bioenergy industry was the largest segment in the entire bioindustry in 2022 which increased by 26% YoY. The biomedical equipment industry also increased by 62.9% YoY while the biopharmaceutical industry and the bioservice industry decreased by 19% and 31.5%, respectively, compared to the previous year.

○ Over the recent three years, the average annual growth rates have shown significant increase in the biochemical and bioenergy industry at 34.1% and the biomedical equipment industry at 45.3%. In contrast, the bioresource industry demonstrates a decreasing trend at 12.8%.

<Table 2-38> 2020–2022 Bioindustry's Trend of Domestic Sales by Category

(Unit: KRW 100 million, %)

Industrial Category	2020		2021		2022		Year-Over-Year Change		Annual Average Rate of Change
	Domestic Sales	Distribution Ratio	Domestic Sales	Distribution Ratio	Domestic Sales	Distribution Ratio	Domestic Sales	Rate of Change	
Total	**71,471**	**100.0**	**93,827**	**100.0**	**99,468**	**100.0**	**5,641**	**6.0**	**18.0**
Biopharmaceutical	16,703	23.4	23,313	24.8	18,894	19.0	-4,419	-19.0	6.4
Biochemical and Bioenergy	18,013	25.2	25,726	27.4	32,413	32.6	6,687	26.0	34.1
Biofood	16,782	23.5	17,967	19.1	18,215	18.3	248	1.4	4.2
Bioenvironmental	662	0.9	690	0.7	719	0.7	29	4.2	4.2
Biomedical Equipment	8,603	12.0	11,145	11.9	18,153	18.2	7,008	62.9	45.3
Bioinstrument and Bioequipment	1,245	1.7	1,393	1.5	1,494	1.5	101	7.2	9.6
Bioresource	1,093	1.5	815	0.9	830	0.8	15	1.9	-12.8
Bioservice	8,371	11.7	12,778	13.6	8,750	8.8	-4,028	-31.5	2.2

2) 2018–2022 Trend of Domestic Sales Status

○ The size of domestic sales increased by 16.7% annually over the past five years.

○ It has grown steadily since 2018 and surpassed KRW 6 trillion in 2019 and KRW 9 trillion in 2021.

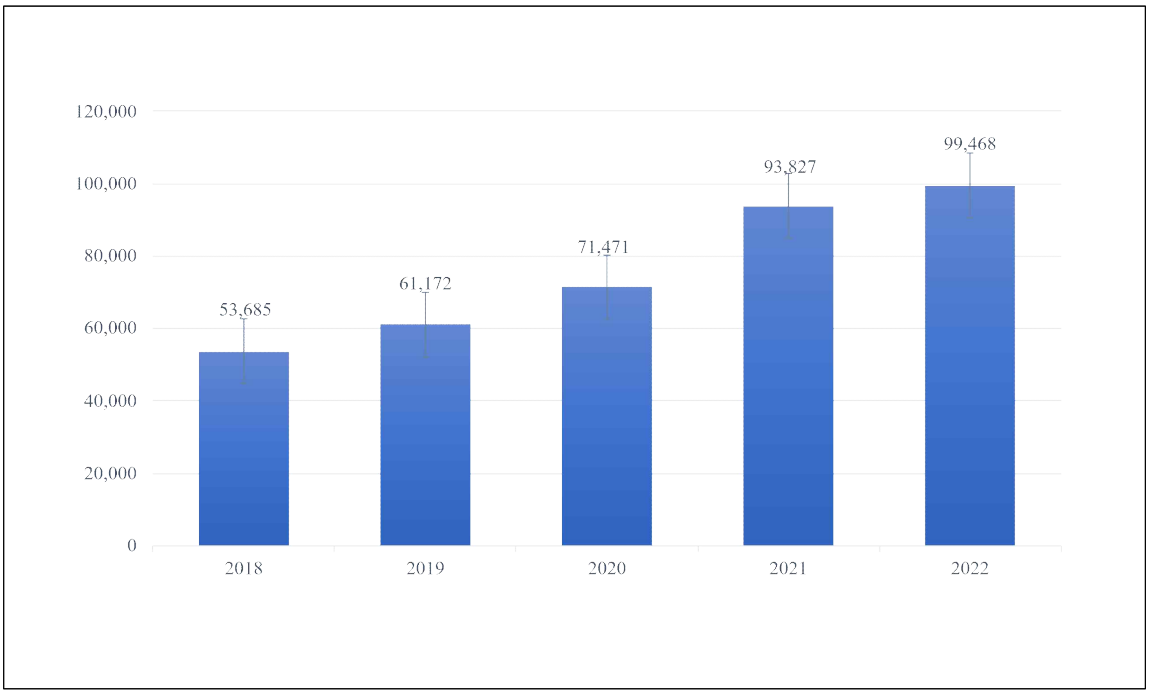
<Table 2-39> 2018–2022 Bioindustry's Trend of Domestic Sales

(Unit: KRW 100 million, %)

Classification		2018	2019	2020	2021	2022	Annual Average Rate of Change
Domestic Sales	Amount	53,685	61,172	71,471	93,827	99,468	16.7
	Rate of Change	7.9	13.9	16.8	31.3	6.0	

<Figure 2-32> 2018–2022 Bioindustry's Trend of Domestic Sales

(Unit: KRW 100 million)



<Table 2-40> 2018–2022 Bioindustry's Trend of Domestic Sales by Category

(Unit: KRW 100 million, %)

Industrial Category	2018		2019		2020		2021		2022		Year-Over-Year Change		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	**53,685**	**100.0**	**61,172**	**100.0**	**71,471**	**100.0**	**93,827**	**100.0**	**99,468**	**100.0**	**5,641**	**6.0**	**16.7**
Biopharmaceutical	15,699	29.2	16,180	26.5	16,703	23.4	23,313	24.8	18,894	19.0	-4,419	-19.0	4.7
Biochemical and Bioenergy	16,825	31.3	17,356	28.4	18,013	25.2	25,726	27.4	32,413	32.6	6,687	26.0	17.8
Biofood	12,447	23.2	15,818	25.9	16,782	23.5	17,967	19.1	18,215	18.3	248	1.4	10.0
Bioenvironmental	560	1.0	551	0.9	662	0.9	690	0.7	719	0.7	29	4.2	6.4
Biomedical Equipment	2,211	4.1	3,095	5.1	8,603	12.0	11,145	11.9	18,153	18.2	7,008	62.9	69.3
Bioinstrument and Bioequipment	585	1.1	701	1.1	1,245	1.7	1,393	1.5	1,494	1.5	101	7.2	26.4
Bioresource	1,549	2.9	1,041	1.7	1,093	1.5	815	0.9	830	0.8	15	1.9	-14.4
Bioservice	3,809	7.1	6,430	10.5	8,371	11.7	12,778	13.6	8,750	8.8	-4,028	-31.5	23.1

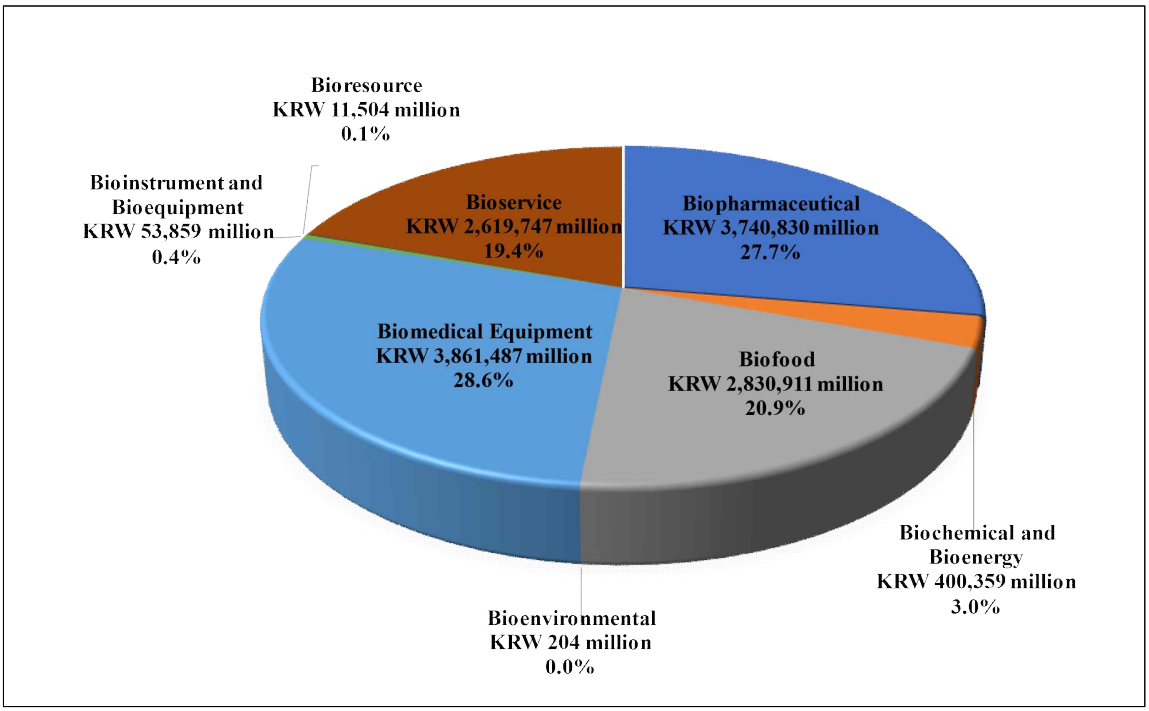
7 Export Status of Bioindustry

A. Export Status of 2022

○ The bioindustry's size of exports in 2022 reached KRW 13,518.9 billion.

○ According to the bioindustry's size of export by bioindustrial category, the biomedical equipment was the highest with KRW 3,861.5 billion (28.6%), followed by the biopharmaceutical with KRW 3,740.8 billion, making up 27.7%.

<Figure 2-33> 2022 Bioindustry's Size of Export by Category



○ Among domestic bioproducts, biotechnologies, and bioservices, <Table 2-41> shows domestic bioproducts whose export proportion was 1.0% or more according to the size, with 9 products showing an export of 1.0% or more.

○ In-vitro diagnostics ranked the highest amount of export with KRW 3,561.4 billion (26.3%), followed by therapeutic antibodies and cytokines (19.4%), bio-consignment production and procuration services (18.5%), feed additives (16.1%), and food additives (4.3%). Two of the five largest export products are biofood products.

<Table 2-41> 2022 Main Bioproduct's Export

(Unit: KRW 1 million, %)

Rank	Code	Product Name	Export Amount	Distribution Ratio
1	5020	In-vitro diagnostics	3,561,400	26.3
2	1050	Therapeutic antibodies and cytokines	2,626,490	19.4
3	8010	Bio-consignment production and procuration services	2,504,483	18.5
4	3050	Feed additives	2,170,535	16.1
5	3030	Food additives	585,442	4.3
6	1000	Other biopharmaceuticals	489,131	3.6
7	5000	Other biomedical equipment	300,086	2.2
8	1030	Vaccines	261,307	1.9
9	2060	Biofuels	223,891	1.7

B. Recent Trend of Export Status

1) 2020–2022 Trend of Export

○ The export size of the domestic bioindustry in 2022 was KRW 13,518.9 billion, which increased by KRW 1,504.5 billion (12.5%) from 2021.

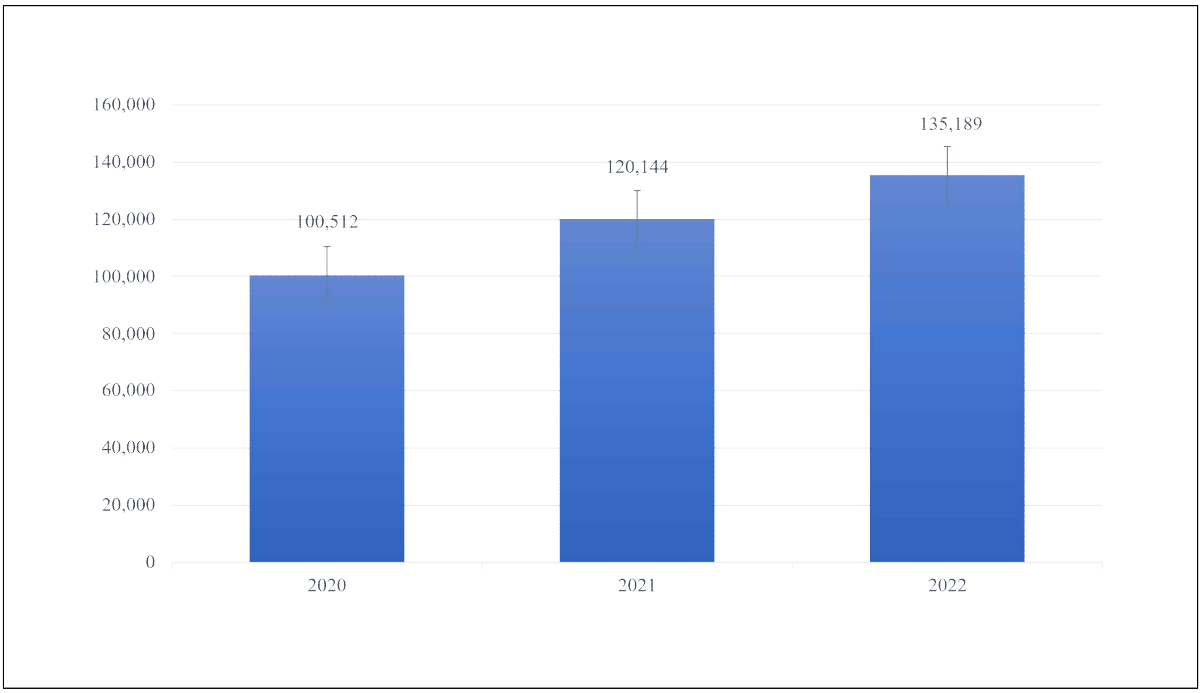
<Table 2-42> 2020–2022 Bioindustry's Trend of Export

(Unit: KRW 100 million, %)

Classification		2020	2021	2022	Annual Average Rate of Change
Export	Amount	100,512	120,144	135,189	16.0
	Rate of Change	53.7	19.5	12.5	

<Figure 2-34> 2020–2022 Bioindustry's Trend of Export

(Unit: KRW 100 million)



○ The amount of exports in the biomedical equipment industry accounted for the largest proportion at KRW 3,861.5 billion, which decreased by KRW 574.1 billion (12.9%) from 2021. On the other hand, the bioenvironmental industry (207.5%) and the bioservice industry (93%) have shown significant increases.

○ Over the past three years from 2020 to 2022, the bioservice industry experienced the largest annual average growth at 64.4%, while the bioresource industry decreased by 1.2%.

<Table 2-43> 2020–2022 Bioindustry's Trend of Export by Category

(Unit: KRW 100 million, %)

Industrial Category	2020		2021		2022		Year-Over-Year Change		Annual Average Rate of Change
	Export Amount	Distribution Ratio	Export Amount	Distribution Ratio	Export Amount	Distribution Ratio	Export Amount	Rate of Change	
Total	**100,512**	**100.0**	**120,144**	**100.0**	**135,189**	**100.0**	**15,045**	**12.5**	**16.0**
Biopharmaceutical	32,471	32.3	34,447	28.7	37,408	27.7	2,961	8.6	7.3
Biochemical and Bioenergy	3,240	3.2	3,583	3.0	4,004	3.0	420	11.7	11.2
Biofood	24,143	24.0	23,562	19.6	28,309	20.9	4,747	20.1	8.3
Bioenvironmental	1	0.0	1	0.0	2	0.0	1	207.5	34.9
Biomedical Equipment	30,374	30.2	44,356	36.9	38,615	28.6	-5,741	-12.9	12.8
Bioinstrument and Bioequipment	477	0.5	507	0.4	539	0.4	32	6.2	6.3
Bioresource	118	0.1	113	0.1	115	0.1	2	1.6	-1.2
Bioservice	9,688	9.6	13,575	11.3	26,197	19.4	12,623	93.0	64.4

2) 2018–2022 Trend of Export

○ The trend of export continuously grew over the past five years, reaching an annual average increase of 26.7%. The export amount increased by 12.5% YoY.

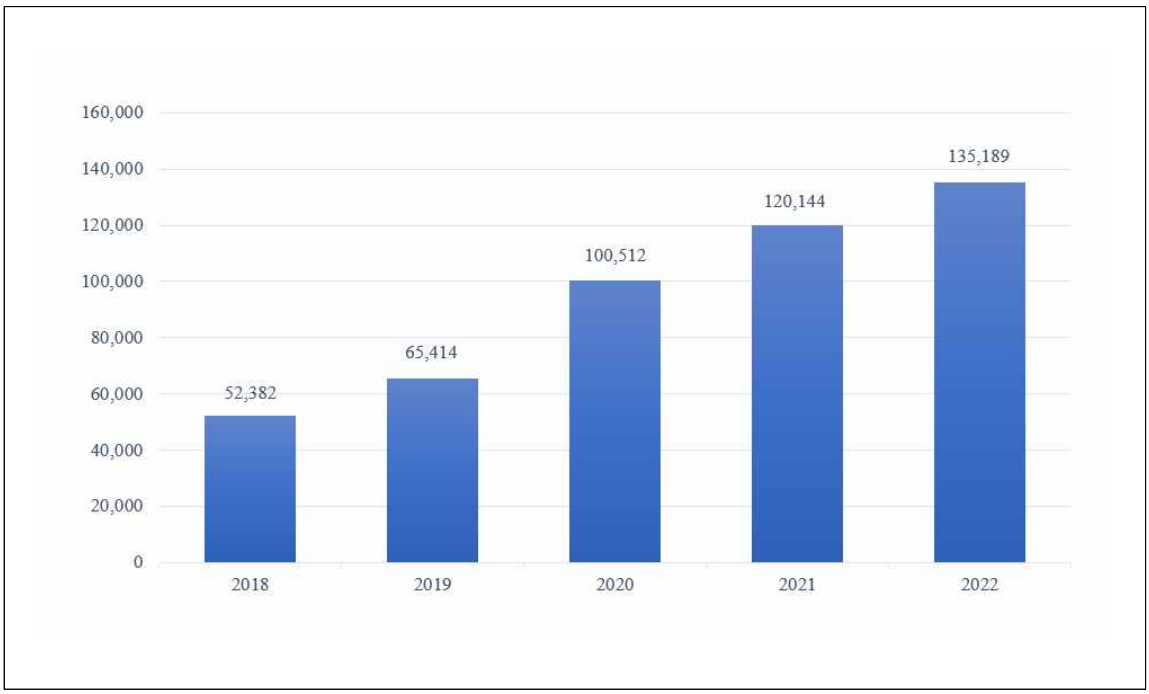
<Table 2-44> 2018–2022 Bioindustry's Trend of Export

(Unit: KRW 100 million, %)

Classification		2018	2019	2020	2021	2022	Annual Average Rate of Change
Export	Amount	52,382	65,414	100,512	120,144	135,189	26.7
	Rate of Change	1.4	24.9	53.7	19.5	12.5	

<Figure 2-35> 2018–2022 Bioindustry's Trend of Export

(Unit: KRW 100 million)



<Table 2-45> 2018–2022 Bioindustry's Trend of Export by Category

(Unit: KRW 100 million, %)

Industrial Category	2018		2019		2020		2021		2022		Year-Over-Year Change		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	**52,382**	**100.0**	**65,414**	**100.0**	**100,512**	**100.0**	**120,144**	**100.0**	**135,189**	**100.0**	**15,045**	**12.5**	**26.7**
Biopharmaceutical	19,401	37.0	26,066	39.8	32,471	32.3	34,447	28.7	37,408	27.7	2,961	8.6	17.8
Biochemical and Bioenergy	1,091	2.1	1,205	1.8	3,240	3.2	3,583	3.0	4,004	3.0	421	11.7	38.4
Biofood	18,568	35.4	24,085	36.8	24,143	24.0	23,562	19.6	28,309	20.9	4,747	20.1	11.1
Bioenvironmental	16	0.0	6	0.0	1	0.0	1	0.0	2	0.0	1	100.0	-40.6
Biomedical Equipment	6,271	12.0	7,343	11.2	30,374	30.2	44,356	36.9	38,615	28.6	-5,741	-12.9	57.5
Bioinstrument and Bioequipment	305	0.6	405	0.6	477	0.5	507	0.4	539	0.4	32	6.3	15.3
Bioresource	236	0.5	216	0.3	118	0.1	113	0.1	115	0.1	2	1.8	-16.5
Bioservice	6,493	12.4	6,089	9.3	9,688	9.6	13,575	11.3	26,197	19.4	12,622	93.0	41.7

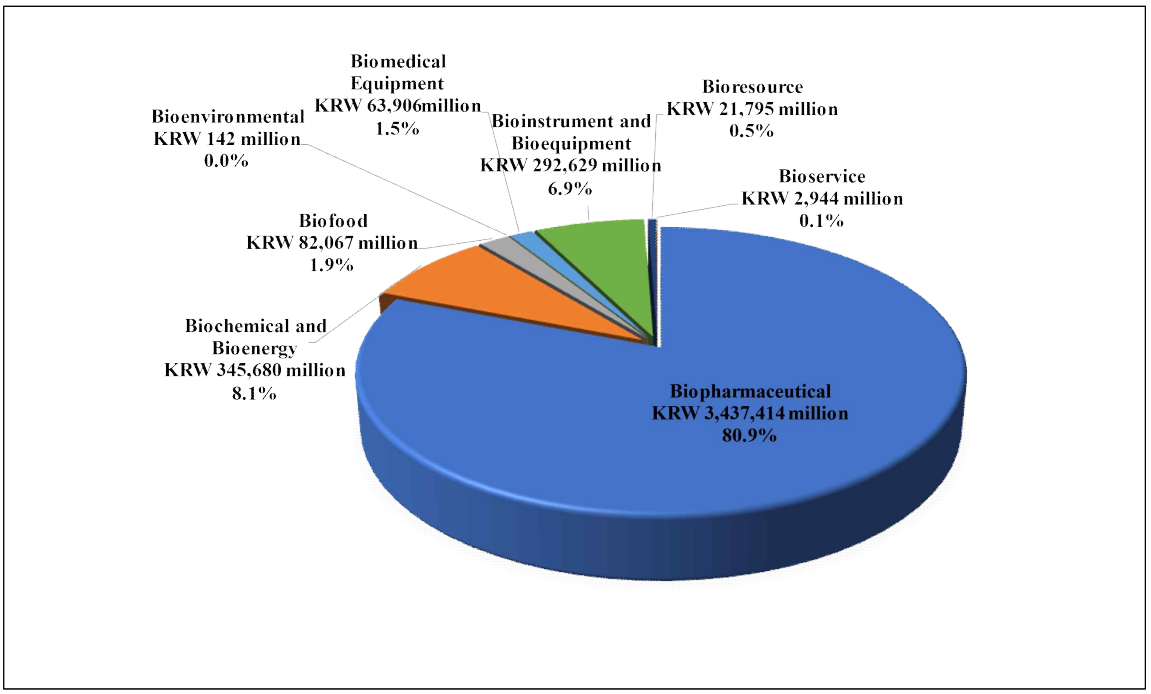
8 Import Status of Bioindustry

A. Import Status of 2022

○ The bioindustry's size of imports in 2022 reached KRW 4,246.6 billion.

○ Comparing the size of imports by bioindustry, the biopharmaceutical industry accounted for 80.9% of the total imports, which accounts for the majority of the industry.

<Figure 2-36> 2022 Bioindustry's Size of Import by Category



○ In 2022, the number of items with 1.0% or higher import ratio from domestic bioproducts, biotechnologies, and bioservices was 11.

○ Of the total import amount, gene therapeutics occupied the most with KRW 1,151.6 billion (27.1%), followed by therapeutic antibodies and cytokines with KRW 1,038.7 billion (24.5%) and vaccines with KRW 467.3 billion (11.0%).

○ The amount of imports of the top 5 imported items made up 77.2% of the total import amount.

<Table 2-46> 2022 Main Bioproduct's Import

(Unit: KRW 1 million, %)

Rank	Code	Product Name	Import Amount	Distribution Ratio
1	1080	Gene therapeutics	1,151,635	27.1
2	1050	Therapeutic antibodies and cytokines	1,038,712	24.5
3	1030	Vaccines	467,327	11.0
4	1040	Hormones	380,852	9.0
5	2060	Biofuels	236,328	5.6
6	6000	Other bioinstruments and bioequipment	213,161	5.0
7	1060	Blood products	197,430	4.6
8	1000	Other biopharmaceuticals	139,796	3.3
9	6030	Multi-functional and other bioanalysis instruments	58,649	1.4
10	3010	Functional health foods	58,603	1.4
11	2030	Enzymes and reagents for research	58,359	1.4

B. Recent Trend of Import Status

1) 2020–2022 Bioindustry's Trend of Import

○ The amount of imports in the domestic bioindustry in 2022 was KRW 4,246.6 billion, which decreased by KRW 522.7 billion (11%) from KRW 4,769.3 billion in 2021.

○ The import size has grown by 32.2% annually over the past three years

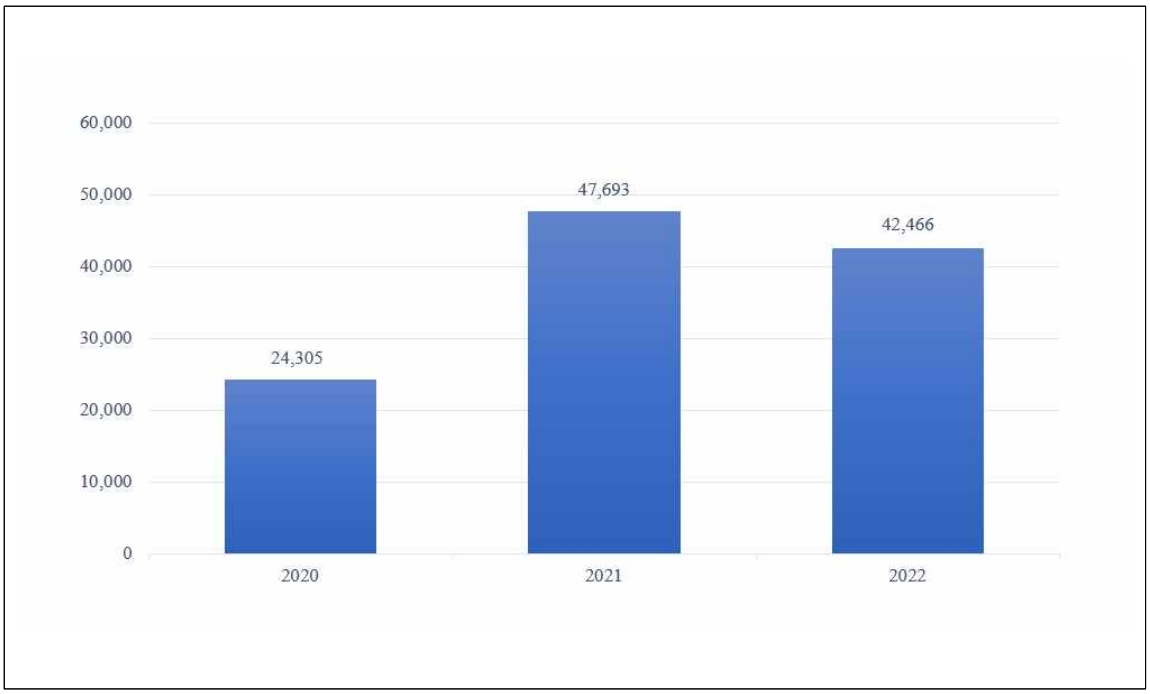
<Table 2-47> 2020–2022 Bioindustry's Trend of Import

(Unit: KRW 100 million, %)

Classification		2020	2021	2022	Annual Average Rate of Change
Import	Amount	24,305	47,693	42,466	32.2
	Rate of Change	17.6	96.2	-11.0	

<Figure 2-37> 2020–2022 Bioindustry's Trend of Import

(Unit: KRW 100 million)



<Table 2-48> 2020–2022 Bioindustry's Trend of Import by Category

(Unit: KRW 100 million, %)

Industrial Category	2020		2021		2022		Year-Over-Year Change		Annual Average Rate of Change
	Import Amount	Distribution Ratio	Import Amount	Distribution Ratio	Import Amount	Distribution Ratio	Import Amount	Rate of Change	
Total	**24,305**	**100.0**	**47,693**	**100.0**	**42,466**	**100.0**	**-5,228**	**-11.0**	**32.2**
Biopharmaceutical	18,455	75.9	40,610	85.1	34,374	80.9	-6,236	-15.4	36.5
Biochemical and Bioenergy	2,022	8.3	2,945	6.2	3,457	8.1	511	17.4	30.7
Biofood	1,042	4.3	1,055	2.2	821	1.9	-234	-22.2	-11.2
Bioenvironmental	2	0.0	1	0.0	1	0.0	0	-4.5	-7.9
Biomedical Equipment	471	1.9	580	1.2	639	1.5	59	10.1	16.5
Bioinstrument and Bioequipment	2,089	8.6	2,282	4.8	2,926	6.9	645	28.2	18.4
Bioresource	199	0.8	193	0.4	218	0.5	25	12.9	4.6
Bioservice	25	0.1	26	0.1	29	0.1	3	13.3	8.9

2) 2018–2022 Bioindustry's Trend of Import

○ The import size in the domestic bioindustry has continued to increase at an annual average growth rate of 25.2% for the past five years.

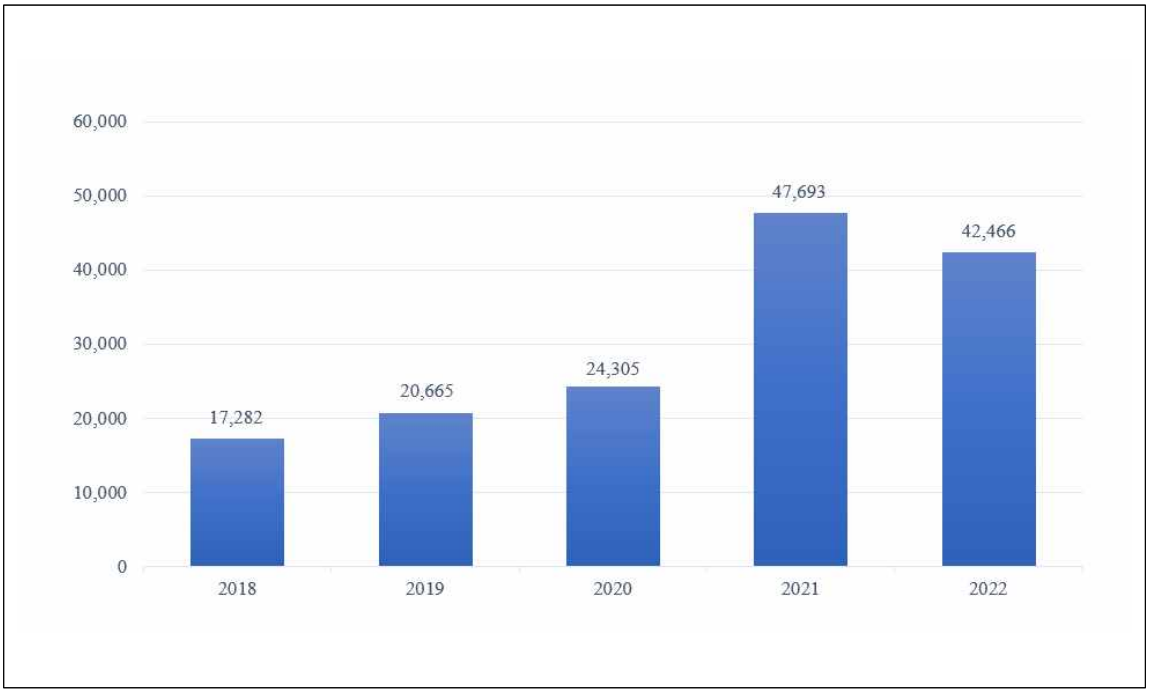
<Table 2-49> 2018–2022 Bioindustry's Trend of Import

(Unit: KRW 100 million, %)

Classification		2018	2019	2020	2021	2022	Annual Average Rate of Change
Import	Amount	17,282	20,665	24,305	47,693	42,466	25.2
	Rate of Change	10.1	19.6	17.6	96.2	-11.0	

<Figure 2-38> 2018–2022 Bioindustry's Trend of Import

(Unit: KRW 100 million)



<Table 2-50> 2018–2022 Bioindustry's Trend of Import by Category

(Unit: KRW 100 million, %)

Industrial Category	2018		2019		2020		2021		2022		Year-Over-Year Change		Annual Average Rate of Change
	Import Amount	Distribution Ratio	Import Amount	Distribution Ratio	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**	**24,305**	**100.0**	**47,693**	**100.0**	**42,466**	**100.0**	**-5,228**	**-11.0**	**25.2**
Biopharmaceutical	14,093	81.6	16,443	79.6	18,455	75.9	40,610	85.1	34,374	80.9	-6,236	-15.4	25.0
Biochemical and Bioenergy	1,258	7.3	1,056	5.1	2,022	8.3	2,945	6.2	3,457	8.1	511	17.4	28.7
Biofood	500	2.9	567	2.7	1,042	4.3	1,055	2.2	821	1.9	-234	-22.2	13.2
Bioenvironmental	2	0.0	1	0.0	2	0.0	1	0.0	1	0.0	0	-4.5	-7.8
Biomedical Equipment	504	2.9	543	2.6	471	1.9	580	1.2	639	1.5	59	10.1	6.1
Bioinstrument and Bioequipment	655	3.8	1,754	8.5	2,089	8.6	2,282	4.8	2,926	6.9	645	28.2	45.4
Bioresource	245	1.4	267	1.3	199	0.8	193	0.4	218	0.5	25	12.9	-2.8
Bioservice	24	0.1	34	0.2	25	0.1	26	0.1	29	0.1	3	13.3	4.8

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		**1,089**	**266**	**13**	**32**	**15**	**8**	**87**	**9**	**4**	**358**	**45**	**85**	**41**	**32**	**34**	**25**	**28**	**7**
Core Industries	Biopharmaceutical	362	130	3	14	3	0	21	1	0	128	10	28	11	2	2	5	3	1
	Biochemical and Bioenergy	201	23	3	5	6	1	23	6	1	48	9	15	10	13	13	10	12	3
	Biofood	168	17	2	0	2	3	8	0	2	48	10	24	14	11	9	5	10	3
	Bioenvironmental	56	4	4	4	2	1	3	2	0	18	4	2	1	1	6	2	2	0
	Biomedical Equipment	121	32	1	3	0	1	11	0	0	45	9	9	4	1	1	3	1	0
	Bioinstrument and Bioequipment	55	9	0	1	0	0	9	0	1	30	1	2	1	0	1	0	0	0
	Bioresource	15	2	0	0	0	0	2	0	0	6	0	2	0	1	2	0	0	0
	Bioservice	111	49	0	5	2	2	10	0	0	35	2	3	0	3	0	0	0	0
Total Number of Workers	1 – 49	686	160	12	20	11	8	57	5	1	209	27	50	28	25	28	19	21	5
	50 – 299	282	71	1	7	2	0	24	2	1	108	12	21	9	5	6	4	7	2
	300 – 999	74	19	0	3	1	0	2	1	1	28	5	10	3	1	0	0	0	0
	1,000 or more	33	3	0	2	1	0	4	1	1	13	1	4	1	1	0	1	0	0
	Unknown	14	13	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0
By Area	Seoul	266	266	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	Busan	13	-	13	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	Incheon	32	-	-	32	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	Daegu	15	-	-	-	15	-	-	-	-	-	-	-	-	-	-	-	-	-
	Gwangju	8	-	-	-	-	8	-	-	-	-	-	-	-	-	-	-	-	-
	Daejeon	87	-	-	-	-	-	87	-	-	-	-	-	-	-	-	-	-	-
	Ulsan	9	-	-	-	-	-	-	9	-	-	-	-	-	-	-	-	-	-
	Sejong	4	-	-	-	-	-	-	-	4	-	-	-	-	-	-	-	-	-
	Gyeonggi	358	-	-	-	-	-	-	-	-	358	-	-	-	-	-	-	-	-
	Gangwon	45	-	-	-	-	-	-	-	-	-	45	-	-	-	-	-	-	-
	Chungbuk	85	-	-	-	-	-	-	-	-	-	-	85	-	-	-	-	-	-
	Chungnam	41	-	-	-	-	-	-	-	-	-	-	-	41	-	-	-	-	-
	Jeonbuk	32	-	-	-	-	-	-	-	-	-	-	-	-	32	-	-	-	-
	Jeonnam	34	-	-	-	-	-	-	-	-	-	-	-	-	-	34	-	-	-
	Gyeongbuk	25	-	-	-	-	-	-	-	-	-	-	-	-	-	-	25	-	-
	Gyeongnam	28	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	28	-
	Jeju	7	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	7

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

Classification		No. of Companies	Single-unit Enterprise	Multi-unit Enterprise	Unknown
Total		**1,089**	**557**	**524**	**8**
Core Industries	Biopharmaceutical	362	167	188	7
	Biochemical and Bioenergy	201	111	90	0
	Biofood	168	76	92	0
	Bioenvironmental	56	31	25	0
	Biomedical Equipment	121	62	59	0
	Bioinstrument and Bioequipment	55	34	20	1
	Bioresource	15	9	6	0
	Bioservice	111	67	44	0
Total Number of Workers	1 – 49	686	440	246	0
	50 – 299	282	98	183	1
	300 – 999	74	11	63	0
	1,000 or more	33	2	31	0
	Unknown	14	6	1	7
By Area	Seoul	266	162	97	7
	Busan	13	6	7	0
	Incheon	32	19	13	0
	Daegu	15	3	12	0
	Gwangju	8	7	1	0
	Daejeon	87	49	38	0
	Ulsan	9	3	6	0
	Sejong	4	1	3	0
	Gyeonggi	358	173	184	1
	Gangwon	45	21	24	0
	Chungbuk	85	31	54	0
	Chungnam	41	15	26	0
	Jeonbuk	32	16	16	0
	Jeonnam	34	18	16	0
	Gyeongbuk	25	12	13	0
	Gyeongnam	28	17	11	0
	Jeju	7	4	3	0

<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		**1,089**	**625**	**378**	**71**	**24**	**178**	**68**	**253**
Core Industries	Biopharmaceutical	362	217	82	10	8	85	39	69
	Biochemical and Bioenergy	201	90	71	15	0	16	14	66
	Biofood	168	89	72	13	2	22	11	36
	Bioenvironmental	56	26	27	8	0	0	0	19
	Biomedical Equipment	121	87	62	10	3	28	2	21
	Bioinstrument and Bioequipment	55	28	22	7	1	6	0	19
	Bioresource	15	7	4	1	1	2	1	5
	Bioservice	111	81	38	7	9	19	1	18
Total Number of Workers	1 – 49	686	462	240	48	17	26	1	161
	50 – 299	282	157	133	21	7	123	16	53
	300 – 999	74	6	5	2	0	25	24	23
	1,000 or more	33	0	0	0	0	4	27	2
	Unknown	14	0	0	0	0	0	0	14
By Area	Seoul	266	157	60	8	7	39	8	84
	Busan	13	7	3	0	0	2	0	5
	Incheon	32	18	10	1	0	5	2	7
	Daegu	15	9	4	1	0	1	2	3
	Gwangju	8	5	3	0	0	0	0	2
	Daejeon	87	63	41	6	2	13	5	16
	Ulsan	9	2	1	0	0	1	3	3
	Sejong	4	2	0	0	0	0	2	0
	Gyeonggi	358	217	135	21	9	72	32	56
	Gangwon	45	31	24	4	2	11	1	7
	Chungbuk	85	39	33	10	3	20	4	19
	Chungnam	41	16	11	3	0	4	4	13
	Jeonbuk	32	15	14	3	0	2	3	8
	Jeonnam	34	21	16	9	0	4	1	8
	Gyeongbuk	25	9	7	4	1	1	1	11
	Gyeongnam	28	10	11	0	0	3	0	11
	Jeju	7	4	5	1	0	0	0	0

<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		**1,089**	**625**	**378**	**71**	**409**
Core Industries	Biopharmaceutical	362	217	82	10	138
	Biochemical and Bioenergy	201	90	71	15	97
	Biofood	168	89	72	13	62
	Bioenvironmental	56	26	27	8	27
	Biomedical Equipment	121	87	62	10	27
	Bioinstrument and Bioequipment	55	28	22	7	21
	Bioresource	15	7	4	1	7
	Bioservice	111	81	38	7	30
Total Number of Workers	1 – 49	686	462	240	48	201
	50 – 299	282	157	133	21	93
	300 – 999	74	6	5	2	68
	1,000 or more	33	0	0	0	33
	Unknown	14	0	0	0	14
By Area	Seoul	266	157	60	8	110
	Busan	13	7	3	0	7
	Incheon	32	18	10	1	15
	Daegu	15	9	4	1	5
	Gwangju	8	5	3	0	3
	Daejeon	87	63	41	6	22
	Ulsan	9	2	1	0	7
	Sejong	4	2	0	0	2
	Gyeonggi	358	217	135	21	113
	Gangwon	45	31	24	4	12
	Chungbuk	85	39	33	10	38
	Chungnam	41	16	11	3	24
	Jeonbuk	32	15	14	3	13
	Jeonnam	34	21	16	9	11
	Gyeongbuk	25	9	7	4	13
	Gyeongnam	28	10	11	0	13
	Jeju	7	4	5	1	1

<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		**1,089**	**24**	**178**	**68**	**819**
Core Industries	Biopharmaceutical	362	8	85	39	230
	Biochemical and Bioenergy	201	0	16	14	171
	Biofood	168	2	22	11	133
	Bioenvironmental	56	0	0	0	56
	Biomedical Equipment	121	3	28	2	88
	Bioinstrument and Bioequipment	55	1	6	0	48
	Bioresource	15	1	2	1	11
	Bioservice	111	9	19	1	82
Total Number of Workers	1 – 49	686	17	26	1	642
	50 – 299	282	7	123	16	136
	300 – 999	74	0	25	24	25
	1,000 or more	33	0	4	27	2
	Unknown	14	0	0	0	14
By Area	Seoul	266	7	39	8	212
	Busan	13	0	2	0	11
	Incheon	32	0	5	2	25
	Daegu	15	0	1	2	12
	Gwangju	8	0	0	0	8
	Daejeon	87	2	13	5	67
	Ulsan	9	0	1	3	5
	Sejong	4	0	0	2	2
	Gyeonggi	358	9	72	32	245
	Gangwon	45	2	11	1	31
	Chungbuk	85	3	20	4	58
	Chungnam	41	0	4	4	33
	Jeonbuk	32	0	2	3	27
	Jeonnam	34	0	4	1	29
	Gyeongbuk	25	1	1	1	22
	Gyeongnam	28	0	3	0	25
	Jeju	7	0	0	0	7

<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		**1,089**	**5**	**79**	**55**	**53**	**180**	**157**	**166**	**180**	**214**
Core Industries	Biopharmaceutical	362	4	43	24	20	42	20	39	51	119
	Biochemical and Bioenergy	201	0	13	9	8	43	32	36	36	24
	Biofood	168	1	16	11	8	36	41	24	13	18
	Bioenvironmental	56	0	2	2	5	13	17	9	6	2
	Biomedical Equipment	121	0	2	4	3	20	16	20	39	17
	Bioinstrument and Bioequipment	55	0	0	3	7	9	12	9	11	4
	Bioresource	15	0	2	1	1	0	3	3	4	1
	Bioservice	111	0	1	1	1	17	16	26	20	29
Total Number of Workers	1 – 49	686	0	7	13	17	112	108	114	134	181
	50 – 299	282	2	33	23	27	57	41	42	34	23
	300 – 999	74	2	23	18	6	9	6	4	5	1
	1,000 or more	33	1	15	0	1	1	2	5	4	4
	Unknown	14	0	1	1	2	1	0	1	3	5
By Area	Seoul	266	1	16	14	18	44	24	31	51	67
	Busan	13	0	1	0	0	0	4	4	1	3
	Incheon	32	0	1	2	1	3	3	2	11	9
	Daegu	15	0	2	0	0	1	3	3	1	5
	Gwangju	8	0	0	0	0	1	1	1	1	4
	Daejeon	87	0	6	3	1	19	11	16	13	18
	Ulsan	9	0	1	0	1	1	0	1	2	3
	Sejong	4	0	1	0	0	1	0	0	2	0
	Gyeonggi	358	4	31	17	13	51	49	58	59	76
	Gangwon	45	0	2	0	3	12	7	10	7	4
	Chungbuk	85	0	8	4	10	18	20	6	10	9
	Chungnam	41	0	5	6	2	11	7	4	4	2
	Jeonbuk	32	0	3	2	1	4	6	5	4	7
	Jeonnam	34	0	1	1	0	2	10	12	6	2
	Gyeongbuk	25	0	0	1	2	4	3	7	5	3
	Gyeongnam	28	0	1	4	1	7	5	6	2	2
	Jeju	7	0	0	1	0	1	4	0	1	0

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

Classification		No. of Companies	Male	Female
Total		**1,089**	**970**	**119**
Core Industries	Biopharmaceutical	362	324	38
	Biochemical and Bioenergy	201	172	29
	Biofood	168	155	13
	Bioenvironmental	56	48	8
	Biomedical Equipment	121	113	8
	Bioinstrument and Bioequipment	55	50	5
	Bioresource	15	13	2
	Bioservice	111	95	16
Total Number of Workers	1 – 49	686	599	87
	50 – 299	282	261	21
	300 – 999	74	70	4
	1,000 or more	33	31	2
	Unknown	14	9	5
By Area	Seoul	266	222	44
	Busan	13	10	3
	Incheon	32	28	4
	Daegu	15	11	4
	Gwangju	8	7	1
	Daejeon	87	80	7
	Ulsan	9	9	0
	Sejong	4	3	1
	Gyeonggi	358	328	30
	Gangwon	45	42	3
	Chungbuk	85	78	7
	Chungnam	41	41	0
	Jeonbuk	32	31	1
	Jeonnam	34	29	5
	Gyeongbuk	25	22	3
	Gyeongnam	28	23	5
	Jeju	7	6	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		**1,089**	**686**	**282**	**74**	**33**	**14**
Core Industries	Biopharmaceutical	362	185	102	45	16	14
	Biochemical and Bioenergy	201	152	34	8	7	0
	Biofood	168	110	42	10	6	0
	Bioenvironmental	56	45	10	0	1	0
	Biomedical Equipment	121	70	44	5	2	0
	Bioinstrument and Bioequipment	55	41	14	0	0	0
	Bioresource	15	9	5	1	0	0
	Bioservice	111	74	31	5	1	0
Total Number of Workers	1 – 49	686	686	0	0	0	0
	50 – 299	282	0	282	0	0	0
	300 – 999	74	0	0	74	0	0
	1,000 or more	33	0	0	0	33	0
	Unknown	14	0	0	0	0	14
By Area	Seoul	266	160	71	19	3	13
	Busan	13	12	1	0	0	0
	Incheon	32	20	7	3	2	0
	Daegu	15	11	2	1	1	0
	Gwangju	8	8	0	0	0	0
	Daejeon	87	57	24	2	4	0
	Ulsan	9	5	2	1	1	0
	Sejong	4	1	1	1	1	0
	Gyeonggi	358	209	108	28	13	0
	Gangwon	45	27	12	5	1	0
	Chungbuk	85	50	21	10	4	0
	Chungnam	41	28	9	3	1	0
	Jeonbuk	32	25	5	1	1	0
	Jeonnam	34	28	6	0	0	0
	Gyeongbuk	25	19	4	0	1	1
	Gyeongnam	28	21	7	0	0	0
	Jeju	7	5	2	0	0	0

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

Classification		No. of Companies	No. of Respondents	Total No. of Workers		Male		Female	
				Total	Average	Total	Average	Total	Average
Total		**1,089**	**1,075**	**251,366**	**234**	**181,719**	**169**	**69,647**	**65**
Core Industries	Biopharmaceutical	362	348	82,355	237	51,360	148	30,995	89
	Biochemical and Bioenergy	201	201	101,849	507	90,000	448	11,849	59
	Biofood	168	168	35,346	210	22,310	133	13,036	78
	Bioenvironmental	56	56	4,737	85	3,471	62	1,266	23
	Biomedical Equipment	121	121	11,517	95	6,024	50	5,493	45
	Bioinstrument and Bioequipment	55	55	2,480	45	1,722	31	758	14
	Bioresource	15	15	1,133	76	719	48	414	28
	Bioservice	111	111	11,949	108	6,113	55	5,836	53
Total Number of Workers	1 – 49	686	686	11,599	17	6,911	10	4,688	7
	50 – 299	282	282	32,482	115	19,777	70	12,705	45
	300 – 999	74	74	38,776	524	25,087	339	13,689	185
	1,000 or more	33	33	168,509	5,106	129,944	3,938	38,565	1,169
	Unknown	14	0						
By Area	Seoul	266	253	23,981	95	13,790	55	10,191	40
	Busan	13	13	263	20	173	13	90	7
	Incheon	32	32	9,853	308	5,712	179	4,141	129
	Daegu	15	15	2,613	174	1,867	124	746	50
	Gwangju	8	8	86	11	51	6	35	4
	Daejeon	87	87	16,365	188	12,513	144	3,852	44
	Ulsan	9	9	2,525	281	2,071	230	454	50
	Sejong	4	4	3,161	790	2,117	529	1,044	261
	Gyeonggi	358	358	135,302	378	108,383	303	26,919	75
	Gangwon	45	45	7,403	165	5,051	112	2,352	52
	Chungbuk	85	85	33,955	399	20,322	239	13,633	160
	Chungnam	41	41	4,681	114	3,577	87	1,104	27
	Jeonbuk	32	32	7,016	219	3,417	107	3,599	112
	Jeonnam	34	34	1,205	35	802	24	403	12
	Gyeongbuk	25	24	1,626	68	1,003	42	623	26
	Gyeongnam	28	28	921	33	619	22	302	11
	Jeju	7	7	410	59	251	36	159	23

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

Classification		No. of Companies	Capital		
			No. of Respondents	Total	Average
Total		**1,089**	**1,032**	**11,578,122**	**11,219**
Core Industries	Biopharmaceutical	362	346	4,931,851	14,254
	Biochemical and Bioenergy	201	181	3,890,850	21,496
	Biofood	168	162	1,219,497	7,528
	Bioenvironmental	56	53	58,228	1,099
	Biomedical Equipment	121	116	631,560	5,444
	Bioinstrument and Bioequipment	55	53	68,469	1,292
	Bioresource	15	14	156,392	11,171
	Bioservice	111	107	621,275	5,806
Total Number of Workers	1 – 49	686	638	1,339,392	2,099
	50 – 299	282	279	3,539,615	12,687
	300 – 999	74	74	2,138,699	28,901
	1,000 or more	33	33	4,518,161	136,914
	Unknown	14	8	42,255	5,282
By Area	Seoul	266	249	2,157,726	8,666
	Busan	13	10	71,635	7,164
	Incheon	32	31	769,440	24,821
	Daegu	15	14	82,050	5,861
	Gwangju	8	8	2,505	313
	Daejeon	87	84	1,562,854	18,605
	Ulsan	9	9	215,186	23,910
	Sejong	4	4	19,221	4,805
	Gyeonggi	358	344	4,105,489	11,935
	Gangwon	45	44	537,861	12,224
	Chungbuk	85	83	1,274,179	15,352
	Chungnam	41	36	313,965	8,721
	Jeonbuk	32	31	209,592	6,761
	Jeonnam	34	33	117,707	3,567
	Gyeongbuk	25	22	82,747	3,761
	Gyeongnam	28	23	44,358	1,929
	Jeju	7	7	11,607	1,658

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

Classification		No. of Companies	Ratio of Net Worth	
			No. of Respondents	Average
Total		**1,089**	**1,028**	**31**
Core Industries	Biopharmaceutical	362	345	26
	Biochemical and Bioenergy	201	180	43
	Biofood	168	162	37
	Bioenvironmental	56	53	51
	Biomedical Equipment	121	115	27
	Bioinstrument and Bioequipment	55	53	51
	Bioresource	15	14	42
	Bioservice	111	106	5
Total Number of Workers	1 – 49	686	634	16
	50 – 299	282	279	55
	300 – 999	74	74	58
	1,000 or more	33	33	63
	Unknown	14	8	49
By Area	Seoul	266	247	8
	Busan	13	10	50
	Incheon	32	31	26
	Daegu	15	14	51
	Gwangju	8	8	62
	Daejeon	87	83	33
	Ulsan	9	9	59
	Sejong	4	4	55
	Gyeonggi	358	344	36
	Gangwon	45	44	48
	Chungbuk	85	82	42
	Chungnam	41	36	51
	Jeonbuk	32	31	21
	Jeonnam	34	33	54
	Gyeongbuk	25	22	42
	Gyeongnam	28	23	37
	Jeju	7	7	47

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

Classification		No. of Companies	Net income / Net loss		
			No. of Respondents	Total	Average
Total		**1,089**	**1,033**	**7,309,029**	**7,076**
Core Industries	Biopharmaceutical	362	346	-3,079,248	-8,900
	Biochemical and Bioenergy	201	181	7,807,330	43,134
	Biofood	168	162	530,545	3,275
	Bioenvironmental	56	54	40,073	742
	Biomedical Equipment	121	116	1,469,984	12,672
	Bioinstrument and Bioequipment	55	53	78,914	1,489
	Bioresource	15	14	-9,177	-656
	Bioservice	111	107	470,608	4,398
Total Number of Workers	1 – 49	686	639	-6,760,556	-10,580
	50 – 299	282	279	-900,573	-3,228
	300 – 999	74	74	1,132,367	15,302
	1,000 or more	33	33	13,771,091	417,306
	Unknown	14	8	66,700	8,338
By Area	Seoul	266	249	61,339	246
	Busan	13	11	-35,201	-3,200
	Incheon	32	31	1,535,130	49,520
	Daegu	15	14	-27,684	-1,977
	Gwangju	8	8	-5,488	-686
	Daejeon	87	84	2,814,328	33,504
	Ulsan	9	9	218,316	24,257
	Sejong	4	4	-98,389	-24,597
	Gyeonggi	358	344	-810,725	-2,357
	Gangwon	45	44	100,940	2,294
	Chungbuk	85	83	3,225,654	38,863
	Chungnam	41	36	194,032	5,390
	Jeonbuk	32	31	71,190	2,296
	Jeonnam	34	33	5,750	174
	Gyeongbuk	25	22	118,194	5,372
	Gyeongnam	28	23	-62,252	-2,707
	Jeju	7	7	3,895	556

<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: Doctorate		Researchers: Master's		Researchers: Bachelor's		Researchers: Other	
				Total	Average	Total	Average	Total	Average	Total	Average	Total	Average	Total	Average
Total		**1,089**	**1,074**	**61,152**	**57**	**19,325**	**18**	**3,208**	**3**	**8,578**	**8**	**7,110**	**7**	**429**	**0**
Core Industries	Biopharmaceutical	362	348	26,077	75	9,019	26	1,631	5	4,392	13	2,800	8	196	1
	Biochemical and Bioenergy	201	200	6,994	35	2,343	12	364	2	1,117	6	798	4	64	0
	Biofood	168	168	7,639	45	1,768	11	312	2	812	5	608	4	36	0
	Bioenvironmental	56	56	896	16	330	6	31	1	98	2	201	4	0	0
	Biomedical Equipment	121	121	9,194	76	2,182	18	367	3	954	8	831	7	30	0
	Bioinstrument and Bioequipment	55	55	1,775	32	377	7	50	1	127	2	188	3	12	0
	Bioresource	15	15	1,097	73	260	17	51	3	100	7	106	7	3	0
	Bioservice	111	111	7,480	67	3,046	27	402	4	978	9	1,578	14	88	1
Total Number of Workers	1 – 49	686	686	10,387	15	4,697	7	986	1	1,824	3	1,810	3	77	0
	50 – 299	282	281	21,817	78	6,624	24	984	4	2,762	10	2,813	10	65	0
	300 – 999	74	74	13,566	183	3,841	52	622	8	1,685	23	1,433	19	101	1
	1,000 or more	33	33	15,382	466	4,163	126	616	19	2,307	70	1,054	32	186	6
	Unknown	14	0	-	-	-	-	-	-	-	-	-	-	-	-
By Area	Seoul	266	253	12,106	48	4,633	18	696	3	1,959	8	1,877	7	101	0
	Busan	13	13	225	17	62	5	13	1	24	2	24	2	1	0
	Incheon	32	32	6,113	191	1,664	52	270	8	733	23	610	19	51	2
	Daegu	15	15	1,482	99	276	18	26	2	77	5	142	9	31	2
	Gwangju	8	8	76	10	49	6	8	1	21	3	20	3	0	0
	Daejeon	87	87	2,799	32	1,342	15	268	3	571	7	483	6	20	0
	Ulsan	9	9	1,289	143	283	31	45	5	143	16	77	9	18	2
	Sejong	4	4	328	82	127	32	8	2	73	18	36	9	10	3
	Gyeonggi	358	358	18,242	51	6,626	19	1,166	3	3,016	8	2,341	7	103	0
	Gangwon	45	45	3,211	71	753	17	144	3	338	8	267	6	4	0
	Chungbuk	85	85	8,691	102	2,061	24	340	4	998	12	664	8	59	1
	Chungnam	41	41	2,027	49	424	10	71	2	211	5	140	3	2	0
	Jeonbuk	32	32	1,125	35	239	7	33	1	89	3	93	3	24	1
	Jeonnam	34	34	920	27	220	6	24	1	55	2	138	4	3	0
	Gyeongbuk	25	24	1,577	66	332	14	60	3	157	7	113	5	2	0
	Gyeongnam	28	27	593	22	152	6	28	1	68	3	56	2	0	0
	Jeju	7	7	348	50	82	12	8	1	45	6	29	4	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: Doctorate		Production Workers: Master's		Production Workers: Bachelor's		Production Workers: Others	
				Total	Average	Total	Average	Total	Average	Total	Average	Total	Average	Total	Average
Total		**1,089**	**1,074**	**61,152**	**57**	**18,828**	**18**	**56**	**0**	**815**	**1**	**6,471**	**6**	**11,486**	**11**
Core Industries	Biopharmaceutical	362	348	26,077	75	7,055	20	28	0	383	1	2,845	8	3,799	11
	Biochemical and Bioenergy	201	200	6,994	35	2,368	12	4	0	34	0	650	3	1,680	8
	Biofood	168	168	7,639	45	3,180	19	5	0	45	0	974	6	2,156	13
	Bioenvironmental	56	56	896	16	339	6	0	0	5	0	162	3	172	3
	Biomedical Equipment	121	121	9,194	76	2,795	23	2	0	90	1	803	7	1,900	16
	Bioinstrument and Bioequipment	55	55	1,775	32	533	10	1	0	18	0	124	2	390	7
	Bioresource	15	15	1,097	73	335	22	3	0	20	1	79	5	233	16
	Bioservice	111	111	7,480	67	2,223	20	13	0	220	2	834	8	1,156	10
Total Number of Workers	1 – 49	686	686	10,387	15	2,003	3	8	0	34	0	687	1	1,274	2
	50 – 299	282	281	21,817	78	6,543	23	13	0	201	1	2,099	7	4,230	15
	300 – 999	74	74	13,566	183	4,170	56	12	0	204	3	1,149	16	2,805	38
	1,000 or more	33	33	15,382	466	6,112	185	23	1	376	11	2,536	77	3,177	96
	Unknown	14	0	-	-	-	-	-	-	-	-	-	-	-	-
By Area	Seoul	266	253	12,106	48	1,053	4	6	0	79	0	418	2	550	2
	Busan	13	13	225	17	23	2	0	0	0	0	3	0	20	2
	Incheon	32	32	6,113	191	3,114	97	9	0	217	7	1,591	50	1,297	41
	Daegu	15	15	1,482	99	494	33	0	0	3	0	165	11	326	22
	Gwangju	8	8	76	10	4	1	0	0	0	0	2	0	2	0
	Daejeon	87	87	2,799	32	646	7	4	0	44	1	276	3	322	4
	Ulsan	9	9	1,289	143	448	50	2	0	19	2	164	18	263	29
	Sejong	4	4	328	82	164	41	0	0	0	0	89	22	75	19
	Gyeonggi	358	358	18,242	51	4,966	14	13	0	192	1	1,486	4	3,275	9
	Gangwon	45	45	3,211	71	1,455	32	0	0	38	1	391	9	1,026	23
	Chungbuk	85	85	8,691	102	3,461	41	17	0	201	2	1,118	13	2,125	25
	Chungnam	41	41	2,027	49	914	22	1	0	9	0	178	4	726	18
	Jeonbuk	32	32	1,125	35	573	18	3	0	5	0	180	6	385	12
	Jeonnam	34	34	920	27	263	8	0	0	0	0	110	3	153	5
	Gyeongbuk	25	24	1,577	66	823	34	1	0	0	0	135	6	687	29
	Gyeongnam	28	27	593	22	259	10	0	0	7	0	146	5	106	4
	Jeju	7	7	348	50	168	24	0	0	1	0	19	3	148	21

<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: Doctorate		Other Positions: Master's		Other Positions: Bachelor's		Other Positions: Others	
				Total	Average	Total	Average	Total	Average	Total	Average	Total	Average	Total	Average
Total		**1,089**	**1,074**	**61,152**	**57**	**22,999**	**21**	**401**	**0**	**2,260**	**2**	**16,401**	**15**	**3,937**	**4**
Core Industries	Biopharmaceutical	362	348	26,077	75	10,003	29	201	1	1,139	3	7,482	22	1,181	3
	Biochemical and Bioenergy	201	200	6,994	35	2,283	11	25	0	136	1	1,812	9	310	2
	Biofood	168	168	7,639	45	2,691	16	28	0	204	1	2,037	12	422	3
	Bioenvironmental	56	56	896	16	227	4	1	0	16	0	188	3	22	0
	Biomedical Equipment	121	121	9,194	76	4,217	35	76	1	393	3	2,271	19	1,477	12
	Bioinstrument and Bioequipment	55	55	1,775	32	865	16	6	0	31	1	682	12	146	3
	Bioresource	15	15	1,097	73	502	33	7	0	35	2	297	20	163	11
	Bioservice	111	111	7,480	67	2,211	20	57	1	306	3	1,632	15	216	2
Total Number of Workers	1 – 49	686	686	10,387	15	3,687	5	84	0	260	0	2,994	4	349	1
	50 – 299	282	281	21,817	78	8,650	31	89	0	691	2	6,658	24	1,212	4
	300 – 999	74	74	13,566	183	5,555	75	145	2	872	12	3,978	54	560	8
	1,000 or more	33	33	15,382	466	5,107	155	83	3	437	13	2,771	84	1,816	55
	Unknown	14	0	-	-	-	-	-	-	-	-	-	-	-	-
By Area	Seoul	266	253	12,106	48	6,420	25	114	0	819	3	4,965	20	522	2
	Busan	13	13	225	17	140	11	1	0	8	1	112	9	19	1
	Incheon	32	32	6,113	191	1,335	42	65	2	227	7	939	29	104	3
	Daegu	15	15	1,482	99	712	47	5	0	25	2	397	26	285	19
	Gwangju	8	8	76	10	23	3	0	0	0	0	21	3	2	0
	Daejeon	87	87	2,799	32	811	9	23	0	68	1	659	8	61	1
	Ulsan	9	9	1,289	143	558	62	2	0	34	4	466	52	56	6
	Sejong	4	4	328	82	37	9	0	0	0	0	35	9	2	1
	Gyeonggi	358	358	18,242	51	6,650	19	73	0	503	1	4,126	12	1,948	5
	Gangwon	45	45	3,211	71	1,003	22	42	1	140	3	714	16	107	2
	Chungbuk	85	85	8,691	102	3,169	37	46	1	245	3	2,343	28	535	6
	Chungnam	41	41	2,027	49	689	17	21	1	71	2	511	12	86	2
	Jeonbuk	32	32	1,125	35	313	10	3	0	26	1	226	7	58	2
	Jeonnam	34	34	920	27	437	13	4	0	33	1	365	11	35	1
	Gyeongbuk	25	24	1,577	66	422	18	0	0	36	2	297	12	89	4
	Gyeongnam	28	27	593	22	182	7	1	0	20	1	148	5	13	0
	Jeju	7	7	348	50	98	14	1	0	5	1	77	11	15	2

<Table 3> Investment Status of Bioindustry

<Table 3-1> Investment Status of Bioindustry (Unit: KRW 1 million)

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		**1,089**	**1,080**	**7,192,833**	**6,660**	**6,074,303**	**5,624**	**13,267,136**	**12,284**	**2,385,340**	**2,209**	**1,740,155**	**1,611**	**4,125,495**	**3,820**
Core Industries	Biopharmaceutical	362	355	3,673,793	10,349	2,320,048	6,535	5,993,841	16,884	1,605,698	4,523	300,008	845	1,905,706	5,368
	Biochemical and Bioenergy	201	201	2,330,472	11,594	1,617,350	8,047	3,947,822	19,641	135,178	673	42,863	213	178,041	886
	Biofood	168	168	222,186	1,323	391,926	2,333	614,112	3,655	112,216	668	30,088	179	142,304	847
	Bioenvironmental	56	55	13,330	242	35,718	649	49,048	892	8,794	160	2,066	38	10,860	197
	Biomedical Equipment	121	121	397,802	3,288	526,133	4,348	923,935	7,636	246,440	2,037	321,068	2,653	567,507	4,690
	Bioinstrument and Bioequipment	55	54	30,177	559	53,281	987	83,458	1,546	22,554	418	4,877	90	27,431	508
	Bioresource	15	15	35,947	2,396	2,691	179	38,638	2,576	10,258	684	1,263	84	11,521	768
	Bioservice	111	111	489,126	4,407	1,127,156	10,155	1,616,282	14,561	244,203	2,200	1,037,922	9,351	1,282,125	11,551
Total Number of Workers	1 – 49	686	685	685,814	1,001	208,639	305	894,453	1,306	495,326	723	69,734	102	565,060	825
	50 – 299	282	281	1,416,258	5,040	746,872	2,658	2,163,130	7,698	769,579	2,739	205,314	731	974,893	3,469
	300 – 999	74	74	867,824	11,727	499,878	6,755	1,367,702	18,482	360,808	4,876	109,676	1,482	470,484	6,358
	1,000 or more	33	33	4,199,690	127,263	4,616,830	139,904	8,816,520	267,167	757,212	22,946	1,353,347	41,011	2,110,559	63,956
	Unknown	14	7	23,247	3,321	2,084	298	25,331	3,619	2,416	345	2,084	298	4,500	643
By Area	Seoul	266	259	1,050,713	4,057	290,826	1,123	1,341,539	5,180	416,868	1,610	58,977	228	475,845	1,837
	Busan	13	12	4,689	391	7,556	630	12,245	1,020	2,931	244	363	30	3,294	275
	Incheon	32	32	488,710	15,272	1,112,536	34,767	1,601,246	50,039	296,525	9,266	1,066,989	33,343	1,363,514	42,610
	Daegu	15	15	105,506	7,034	23,197	1,546	128,703	8,580	11,660	777	10,176	678	21,836	1,456
	Gwangju	8	8	4,205	526	534	67	4,739	592	3,188	399	189	24	3,377	422
	Daejeon	87	87	507,090	5,829	432,877	4,976	939,967	10,804	167,723	1,928	40,234	462	207,957	2,390
	Ulsan	9	9	57,734	6,415	6,081	676	63,815	7,091	28,107	3,123	3,713	413	31,820	3,536
	Sejong	4	4	48,391	12,098	13,691	3,423	62,082	15,521	4,316	1,079	998	250	5,314	1,329
	Gyeonggi	358	357	3,933,367	11,018	2,323,042	6,507	6,256,409	17,525	921,117	2,580	413,777	1,159	1,334,894	3,739
	Gangwon	45	45	126,548	2,812	99,177	2,204	225,725	5,016	104,450	2,321	17,893	398	122,343	2,719
	Chungbuk	85	85	618,753	7,279	1,499,130	17,637	2,117,883	24,916	313,324	3,686	71,987	847	385,311	4,533
	Chungnam	41	41	91,112	2,222	34,917	852	126,029	3,074	29,278	714	5,735	140	35,013	854
	Jeonbuk	32	32	48,018	1,501	65,565	2,049	113,583	3,549	17,815	557	8,479	265	26,294	822
	Jeonnam	34	34	14,779	435	21,845	643	36,624	1,077	10,423	307	9,233	272	19,656	578
	Gyeongbuk	25	25	70,541	2,822	65,177	2,607	135,718	5,429	44,619	1,785	9,904	396	54,523	2,181
	Gyeongnam	28	28	11,271	403	28,840	1,030	40,111	1,433	9,164	327	6,393	228	15,557	556
	Jeju	7	7	11,406	1,629	49,312	7,045	60,718	8,674	3,832	547	15,115	2,159	18,947	2,707

<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		**1,089**	**460**	**21**	**416**	**84**	**28**	**616**	**13**
Core Industries	Biopharmaceutical	362	181	9	162	41	10	172	9
	Biochemical and Bioenergy	201	61	2	59	7	4	138	2
	Biofood	168	66	4	60	12	4	102	0
	Bioenvironmental	56	15	0	14	2	0	41	0
	Biomedical Equipment	121	55	3	46	10	5	64	2
	Bioinstrument and Bioequipment	55	15	1	14	0	1	40	0
	Bioresource	15	6	0	6	1	0	9	0
	Bioservice	111	61	2	55	11	4	50	0
Total Number of Workers	1 – 49	686	277	5	258	42	15	406	3
	50 – 299	282	126	8	108	27	6	155	1
	300 – 999	74	37	4	31	14	6	36	1
	1,000 or more	33	20	4	19	1	1	13	0
	Unknown	14	0	0	0	0	0	6	8
By Area	Seoul	266	108	4	94	19	8	149	9
	Busan	13	3	0	3	0	0	10	0
	Incheon	32	13	0	11	4	3	19	0
	Daegu	15	9	1	8	4	1	6	0
	Gwangju	8	5	0	4	1	0	3	0
	Daejeon	87	45	2	42	5	4	42	0
	Ulsan	9	5	0	5	0	0	4	0
	Sejong	4	1	0	1	0	0	3	0
	Gyeonggi	358	164	10	150	28	9	193	1
	Gangwon	45	21	1	19	5	1	23	1
	Chungbuk	85	29	2	26	6	1	55	1
	Chungnam	41	15	0	14	3	0	25	1
	Jeonbuk	32	9	0	7	5	0	23	0
	Jeonnam	34	11	0	11	2	1	23	0
	Gyeongbuk	25	5	0	5	0	0	20	0
	Gyeongnam	28	11	1	10	1	0	17	0
	Jeju	7	6	0	6	1	0	1	0

<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		**1,089**	**460**	**21**	**78**	**25**	**20**	**12**	**11**	**10**
Core Industries	Biopharmaceutical	362	181	9	46	21	11	7	4	3
	Biochemical and Bioenergy	201	61	2	10	1	6	1	2	-
	Biofood	168	66	4	13	1	2	2	3	5
	Bioenvironmental	56	15	0	-	-	-	-	-	-
	Biomedical Equipment	121	55	3	7	1	-	2	2	2
	Bioinstrument and Bioequipment	55	15	1	1	-	1	-	-	-
	Bioresource	15	6	0	-	-	-	-	-	-
	Bioservice	111	61	2	1	1	-	-	-	-
Total Number of Workers	1 – 49	686	277	5	14	2	2	3	4	3
	50 – 299	282	126	8	16	3	3	2	3	5
	300 – 999	74	37	4	11	3	8	-	-	-
	1,000 or more	33	20	4	37	17	7	7	4	2
	Unknown	14	0	0	-	-	-	-	-	-
By Area	Seoul	266	108	4	8	2	2	1	2	1
	Busan	13	3	0	-	-	-	-	-	-
	Incheon	32	13	0	-	-	-	-	-	-
	Daegu	15	9	1	5	-	5	-	-	-
	Gwangju	8	5	0	-	-	-	-	-	-
	Daejeon	87	45	2	2	-	2	-	-	-
	Ulsan	9	5	0	-	-	-	-	-	-
	Sejong	4	1	0	-	-	-	-	-	-
	Gyeonggi	358	164	10	32	18	6	3	2	3
	Gangwon	45	21	1	10	1	1	2	2	4
	Chungbuk	85	29	2	20	4	4	6	4	2
	Chungnam	41	15	0	-	-	-	-	-	-
	Jeonbuk	32	9	0	-	-	-	-	-	-
	Jeonnam	34	11	0	-	-	-	-	-	-
	Gyeongbuk	25	5	0	-	-	-	-	-	-
	Gyeongnam	28	11	1	1	-	-	-	1	-
	Jeju	7	6	0	-	-	-	-	-	-

Classification		No. of Companies	With Cooperative Relationship	No. of Respondents (Joint Venture)	Overseas					
					Total	Basic Research	Experimental	Prototype	Product Development	Commercialization
Total		**1,089**	**460**	**21**	**24**	**11**	**1**	**2**	**3**	**7**
Core Industries	Biopharmaceutical	362	181	9	13	11	1	1	-	-
	Biochemical and Bioenergy	201	61	2	7	-	-	1	1	5
	Biofood	168	66	4	-	-	-	-	-	-
	Bioenvironmental	56	15	0	-	-	-	-	-	-
	Biomedical Equipment	121	55	3	3	-	-	-	1	2
	Bioinstrument and Bioequipment	55	15	1	-	-	-	-	-	-
	Bioresource	15	6	0	-	-	-	-	-	-
	Bioservice	111	61	2	1	-	-	-	1	-
Total Number of Workers	1 – 49	686	277	5	10	-	-	1	3	6
	50 – 299	282	126	8	1	-	-	-	-	1
	300 – 999	74	37	4	-	-	-	-	-	-
	1,000 or more	33	20	4	13	11	1	1	-	-
	Unknown	14	0	0	-	-	-	-	-	-
By Area	Seoul	266	108	4	8	-	-	1	2	5
	Busan	13	3	0	-	-	-	-	-	-
	Incheon	32	13	0	-	-	-	-	-	-
	Daegu	15	9	1	-	-	-	-	-	-
	Gwangju	8	5	0	-	-	-	-	-	-
	Daejeon	87	45	2	-	-	-	-	-	-
	Ulsan	9	5	0	-	-	-	-	-	-
	Sejong	4	1	0	-	-	-	-	-	-
	Gyeonggi	358	164	10	15	11	1	1	1	1
	Gangwon	45	21	1	-	-	-	-	-	-
	Chungbuk	85	29	2	1	-	-	-	-	1
	Chungnam	41	15	0	-	-	-	-	-	-
	Jeonbuk	32	9	0	-	-	-	-	-	-
	Jeonnam	34	11	0	-	-	-	-	-	-
	Gyeongbuk	25	5	0	-	-	-	-	-	-
	Gyeongnam	28	11	1	-	-	-	-	-	-
	Jeju	7	6	0	-	-	-	-	-	-

Classification		No. of Companies	With Cooperative Relationship	No. of Respondents (Joint Venture)	Domestic (SMEs / Ventures)					
					Total	Basic Research	Experimental	Prototype	Product Development	Commercialization
Total		**1,089**	**460**	**21**	**36**	**10**	**11**	**4**	**5**	**6**
Core Industries	Biopharmaceutical	362	181	9	14	7	6	-	-	1
	Biochemical and Bioenergy	201	61	2	2	-	2	-	-	-
	Biofood	168	66	4	11	1	2	2	3	3
	Bioenvironmental	56	15	0	-	-	-	-	-	-
	Biomedical Equipment	121	55	3	7	1	-	2	2	2
	Bioinstrument and Bioequipment	55	15	1	1	-	1	-	-	-
	Bioresource	15	6	0	-	-	-	-	-	-
	Bioservice	111	61	2	1	1	-	-	-	-
Total Number of Workers	1 – 49	686	277	5	8	-	1	2	2	3
	50 – 299	282	126	8	14	3	3	2	3	3
	300 – 999	74	37	4	6	2	4	-	-	-
	1,000 or more	33	20	4	8	5	3	-	-	-
	Unknown	14	0	0	-	-	-	-	-	-
By Area	Seoul	266	108	4	3	1	1	-	-	1
	Busan	13	3	0	-	-	-	-	-	-
	Incheon	32	13	0	-	-	-	-	-	-
	Daegu	15	9	1	2	-	2	-	-	-
	Gwangju	8	5	0	-	-	-	-	-	-
	Daejeon	87	45	2	2	-	2	-	-	-
	Ulsan	9	5	0	-	-	-	-	-	-
	Sejong	4	1	0	-	-	-	-	-	-
	Gyeonggi	358	164	10	19	8	5	2	2	2
	Gangwon	45	21	1	9	1	1	2	2	3
	Chungbuk	85	29	2	-	-	-	-	-	-
	Chungnam	41	15	0	-	-	-	-	-	-
	Jeonbuk	32	9	0	-	-	-	-	-	-
	Jeonnam	34	11	0	-	-	-	-	-	-
	Gyeongbuk	25	5	0	-	-	-	-	-	-
	Gyeongnam	28	11	1	1	-	-	-	1	-
	Jeju	7	6	0	-	-	-	-	-	-

Classification		No. of Companies	With Cooperative Relationship	No. of Respondents (Joint Venture)	Overseas (SMEs / Ventures)					
					Total	Basic Research	Experimental	Prototype	Product Development	Commercialization
Total		**1,089**	**460**	**21**	**11**	**3**	**1**	**-**	**1**	**6**
Core Industries	Biopharmaceutical	362	181	9	4	3	1	-	-	-
	Biochemical and Bioenergy	201	61	2	5	-	-	-	-	5
	Biofood	168	66	4	-	-	-	-	-	-
	Bioenvironmental	56	15	0	-	-	-	-	-	-
	Biomedical Equipment	121	55	3	2	-	-	-	1	1
	Bioinstrument and Bioequipment	55	15	1	-	-	-	-	-	-
	Bioresource	15	6	0	-	-	-	-	-	-
	Bioservice	111	61	2	-	-	-	-	-	-
Total Number of Workers	1 – 49	686	277	5	7	-	-	-	1	6
	50 – 299	282	126	8	-	-	-	-	-	-
	300 – 999	74	37	4	-	-	-	-	-	-
	1,000 or more	33	20	4	4	3	1	-	-	-
	Unknown	14	0	0	-	-	-	-	-	-
By Area	Seoul	266	108	4	5	-	-	-	-	5
	Busan	13	3	0	-	-	-	-	-	-
	Incheon	32	13	0	-	-	-	-	-	-
	Daegu	15	9	1	-	-	-	-	-	-
	Gwangju	8	5	0	-	-	-	-	-	-
	Daejeon	87	45	2	-	-	-	-	-	-
	Ulsan	9	5	0	-	-	-	-	-	-
	Sejong	4	1	0	-	-	-	-	-	-
	Gyeonggi	358	164	10	6	3	1	-	1	1
	Gangwon	45	21	1	-	-	-	-	-	-
	Chungbuk	85	29	2	-	-	-	-	-	-
	Chungnam	41	15	0	-	-	-	-	-	-
	Jeonbuk	32	9	0	-	-	-	-	-	-
	Jeonnam	34	11	0	-	-	-	-	-	-
	Gyeongbuk	25	5	0	-	-	-	-	-	-
	Gyeongnam	28	11	1	-	-	-	-	-	-
	Jeju	7	6	0	-	-	-	-	-	-

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		**1,089**	**460**	**21**	**3**	**1**	**1**	**1**	**-**	**-**
Core Industries	Biopharmaceutical	362	181	9	-	-	-	-	-	-
	Biochemical and Bioenergy	201	61	2	3	1	1	1	-	-
	Biofood	168	66	4	-	-	-	-	-	-
	Bioenvironmental	56	15	0	-	-	-	-	-	-
	Biomedical Equipment	121	55	3	-	-	-	-	-	-
	Bioinstrument and Bioequipment	55	15	1	-	-	-	-	-	-
	Bioresource	15	6	0	-	-	-	-	-	-
	Bioservice	111	61	2	-	-	-	-	-	-
Total Number of Workers	1 – 49	686	277	5	3	1	1	1	-	-
	50 – 299	282	126	8	-	-	-	-	-	-
	300 – 999	74	37	4	-	-	-	-	-	-
	1,000 or more	33	20	4	-	-	-	-	-	-
	Unknown	14	0	0	-	-	-	-	-	-
By Area	Seoul	266	108	4	3	1	1	1	-	-
	Busan	13	3	0	-	-	-	-	-	-
	Incheon	32	13	0	-	-	-	-	-	-
	Daegu	15	9	1	-	-	-	-	-	-
	Gwangju	8	5	0	-	-	-	-	-	-
	Daejeon	87	45	2	-	-	-	-	-	-
	Ulsan	9	5	0	-	-	-	-	-	-
	Sejong	4	1	0	-	-	-	-	-	-
	Gyeonggi	358	164	10	-	-	-	-	-	-
	Gangwon	45	21	1	-	-	-	-	-	-
	Chungbuk	85	29	2	-	-	-	-	-	-
	Chungnam	41	15	0	-	-	-	-	-	-
	Jeonbuk	32	9	0	-	-	-	-	-	-
	Jeonnam	34	11	0	-	-	-	-	-	-
	Gyeongbuk	25	5	0	-	-	-	-	-	-
	Gyeongnam	28	11	1	-	-	-	-	-	-
	Jeju	7	6	0	-	-	-	-	-	-

Classification		No. of Companies	With Cooperative Relationship	No. of Respondents (Joint Venture)	Overseas (Middle-standing Companies)					
					Total	Basic Research	Experimental	Prototype	Product Development	Commercialization
Total		**1,089**	**460**	**21**	**1**	**-**	**-**	**-**	**1**	**-**
Core Industries	Biopharmaceutical	362	181	9	-	-	-	-	-	-
	Biochemical and Bioenergy	201	61	2	1	-	-	-	1	-
	Biofood	168	66	4	-	-	-	-	-	-
	Bioenvironmental	56	15	0	-	-	-	-	-	-
	Biomedical Equipment	121	55	3	-	-	-	-	-	-
	Bioinstrument and Bioequipment	55	15	1	-	-	-	-	-	-
	Bioresource	15	6	0	-	-	-	-	-	-
	Bioservice	111	61	2	-	-	-	-	-	-
Total Number of Workers	1 – 49	686	277	5	1	-	-	-	1	-
	50 – 299	282	126	8	-	-	-	-	-	-
	300 – 999	74	37	4	-	-	-	-	-	-
	1,000 or more	33	20	4	-	-	-	-	-	-
	Unknown	14	0	0	-	-	-	-	-	-
By Area	Seoul	266	108	4	1	-	-	-	1	-
	Busan	13	3	0	-	-	-	-	-	-
	Incheon	32	13	0	-	-	-	-	-	-
	Daegu	15	9	1	-	-	-	-	-	-
	Gwangju	8	5	0	-	-	-	-	-	-
	Daejeon	87	45	2	-	-	-	-	-	-
	Ulsan	9	5	0	-	-	-	-	-	-
	Sejong	4	1	0	-	-	-	-	-	-
	Gyeonggi	358	164	10	-	-	-	-	-	-
	Gangwon	45	21	1	-	-	-	-	-	-
	Chungbuk	85	29	2	-	-	-	-	-	-
	Chungnam	41	15	0	-	-	-	-	-	-
	Jeonbuk	32	9	0	-	-	-	-	-	-
	Jeonnam	34	11	0	-	-	-	-	-	-
	Gyeongbuk	25	5	0	-	-	-	-	-	-
	Gyeongnam	28	11	1	-	-	-	-	-	-
	Jeju	7	6	0	-	-	-	-	-	-

Classification		No. of Companies	With Cooperative Relationship	No. of Respondents (Joint Venture)	Domestic (Large Enterprises)					
					Total	Basic Research	Experimental	Prototype	Product Development	Commercialization
Total		**1,089**	**460**	**21**	**1**	**-**	**-**	**-**	**-**	**1**
Core Industries	Biopharmaceutical	362	181	9	-	-	-	-	-	-
	Biochemical and Bioenergy	201	61	2	-	-	-	-	-	-
	Biofood	168	66	4	1	-	-	-	-	1
	Bioenvironmental	56	15	0	-	-	-	-	-	-
	Biomedical Equipment	121	55	3	-	-	-	-	-	-
	Bioinstrument and Bioequipment	55	15	1	-	-	-	-	-	-
	Bioresource	15	6	0	-	-	-	-	-	-
	Bioservice	111	61	2	-	-	-	-	-	-
Total Number of Workers	1 – 49	686	277	5	-	-	-	-	-	-
	50 – 299	282	126	8	1	-	-	-	-	1
	300 – 999	74	37	4	-	-	-	-	-	-
	1,000 or more	33	20	4	-	-	-	-	-	-
	Unknown	14	0	0	-	-	-	-	-	-
By Area	Seoul	266	108	4	-	-	-	-	-	-
	Busan	13	3	0	-	-	-	-	-	-
	Incheon	32	13	0	-	-	-	-	-	-
	Daegu	15	9	1	-	-	-	-	-	-
	Gwangju	8	5	0	-	-	-	-	-	-
	Daejeon	87	45	2	-	-	-	-	-	-
	Ulsan	9	5	0	-	-	-	-	-	-
	Sejong	4	1	0	-	-	-	-	-	-
	Gyeonggi	358	164	10	1	-	-	-	-	1
	Gangwon	45	21	1	-	-	-	-	-	-
	Chungbuk	85	29	2	-	-	-	-	-	-
	Chungnam	41	15	0	-	-	-	-	-	-
	Jeonbuk	32	9	0	-	-	-	-	-	-
	Jeonnam	34	11	0	-	-	-	-	-	-
	Gyeongbuk	25	5	0	-	-	-	-	-	-
	Gyeongnam	28	11	1	-	-	-	-	-	-
	Jeju	7	6	0	-	-	-	-	-	-

Classification		No. of Companies	With Cooperative Relationship	No. of Respondents (Joint Venture)	Overseas (Large Enterprises)					
					Total	Basic Research	Experimental	Prototype	Product Development	Commercialization
Total		**1,089**	**460**	**21**	**2**	**-**	**-**	**-**	**1**	**1**
Core Industries	Biopharmaceutical	362	181	9	-	-	-	-	-	-
	Biochemical and Bioenergy	201	61	2	-	-	-	-	-	-
	Biofood	168	66	4	-	-	-	-	-	-
	Bioenvironmental	56	15	0	-	-	-	-	-	-
	Biomedical Equipment	121	55	3	1	-	-	-	-	1
	Bioinstrument and Bioequipment	55	15	1	-	-	-	-	-	-
	Bioresource	15	6	0	-	-	-	-	-	-
	Bioservice	111	61	2	1	-	-	-	1	-
Total Number of Workers	1 – 49	686	277	5	1	-	-	-	1	-
	50 – 299	282	126	8	1	-	-	-	-	1
	300 – 999	74	37	4	-	-	-	-	-	-
	1,000 or more	33	20	4	-	-	-	-	-	-
	Unknown	14	0	0	-	-	-	-	-	-
By Area	Seoul	266	108	4	1	-	-	-	1	-
	Busan	13	3	0	-	-	-	-	-	-
	Incheon	32	13	0	-	-	-	-	-	-
	Daegu	15	9	1	-	-	-	-	-	-
	Gwangju	8	5	0	-	-	-	-	-	-
	Daejeon	87	45	2	-	-	-	-	-	-
	Ulsan	9	5	0	-	-	-	-	-	-
	Sejong	4	1	0	-	-	-	-	-	-
	Gyeonggi	358	164	10	-	-	-	-	-	-
	Gangwon	45	21	1	-	-	-	-	-	-
	Chungbuk	85	29	2	1	-	-	-	-	1
	Chungnam	41	15	0	-	-	-	-	-	-
	Jeonbuk	32	9	0	-	-	-	-	-	-
	Jeonnam	34	11	0	-	-	-	-	-	-
	Gyeongbuk	25	5	0	-	-	-	-	-	-
	Gyeongnam	28	11	1	-	-	-	-	-	-
	Jeju	7	6	0	-	-	-	-	-	-

Classification		No. of Companies	With Cooperative Relationship	No. of Respondents (Joint Venture)	Domestic (Government-funded)					
					Total	Basic Research	Experimental	Prototype	Product Development	Commercialization
Total		**1,089**	**460**	**21**	**14**	**4**	**2**	**4**	**2**	**2**
Core Industries	Biopharmaceutical	362	181	9	14	4	2	4	2	2
	Biochemical and Bioenergy	201	61	2	-	-	-	-	-	-
	Biofood	168	66	4	-	-	-	-	-	-
	Bioenvironmental	56	15	0	-	-	-	-	-	-
	Biomedical Equipment	121	55	3	-	-	-	-	-	-
	Bioinstrument and Bioequipment	55	15	1	-	-	-	-	-	-
	Bioresource	15	6	0	-	-	-	-	-	-
	Bioservice	111	61	2	-	-	-	-	-	-
Total Number of Workers	1 – 49	686	277	5	-	-	-	-	-	-
	50 – 299	282	126	8	-	-	-	-	-	-
	300 – 999	74	37	4	-	-	-	-	-	-
	1,000 or more	33	20	4	14	4	2	4	2	2
	Unknown	14	0	0	-	-	-	-	-	-
By Area	Seoul	266	108	4	-	-	-	-	-	-
	Busan	13	3	0	-	-	-	-	-	-
	Incheon	32	13	0	-	-	-	-	-	-
	Daegu	15	9	1	-	-	-	-	-	-
	Gwangju	8	5	0	-	-	-	-	-	-
	Daejeon	87	45	2	-	-	-	-	-	-
	Ulsan	9	5	0	-	-	-	-	-	-
	Sejong	4	1	0	-	-	-	-	-	-
	Gyeonggi	358	164	10	2	2	-	-	-	-
	Gangwon	45	21	1	-	-	-	-	-	-
	Chungbuk	85	29	2	12	2	2	4	2	2
	Chungnam	41	15	0	-	-	-	-	-	-
	Jeonbuk	32	9	0	-	-	-	-	-	-
	Jeonnam	34	11	0	-	-	-	-	-	-
	Gyeongbuk	25	5	0	-	-	-	-	-	-
	Gyeongnam	28	11	1	-	-	-	-	-	-
	Jeju	7	6	0	-	-	-	-	-	-

Classification		No. of Companies	With Cooperative Relationship	No. of Respondents (Joint Venture)	Overseas (Government-funded)					
					Total	Basic Research	Experimental	Prototype	Product Development	Commercialization
Total		**1,089**	**460**	**21**	**2**	**2**	**-**	**-**	**-**	**-**
Core Industries	Biopharmaceutical	362	181	9	2	2	-	-	-	-
	Biochemical and Bioenergy	201	61	2	-	-	-	-	-	-
	Biofood	168	66	4	-	-	-	-	-	-
	Bioenvironmental	56	15	0	-	-	-	-	-	-
	Biomedical Equipment	121	55	3	-	-	-	-	-	-
	Bioinstrument and Bioequipment	55	15	1	-	-	-	-	-	-
	Bioresource	15	6	0	-	-	-	-	-	-
	Bioservice	111	61	2	-	-	-	-	-	-
Total Number of Workers	1 – 49	686	277	5	-	-	-	-	-	-
	50 – 299	282	126	8	-	-	-	-	-	-
	300 – 999	74	37	4	-	-	-	-	-	-
	1,000 or more	33	20	4	2	2	-	-	-	-
	Unknown	14	0	0	-	-	-	-	-	-
By Area	Seoul	266	108	4	-	-	-	-	-	-
	Busan	13	3	0	-	-	-	-	-	-
	Incheon	32	13	0	-	-	-	-	-	-
	Daegu	15	9	1	-	-	-	-	-	-
	Gwangju	8	5	0	-	-	-	-	-	-
	Daejeon	87	45	2	-	-	-	-	-	-
	Ulsan	9	5	0	-	-	-	-	-	-
	Sejong	4	1	0	-	-	-	-	-	-
	Gyeonggi	358	164	10	2	2	-	-	-	-
	Gangwon	45	21	1	-	-	-	-	-	-
	Chungbuk	85	29	2	-	-	-	-	-	-
	Chungnam	41	15	0	-	-	-	-	-	-
	Jeonbuk	32	9	0	-	-	-	-	-	-
	Jeonnam	34	11	0	-	-	-	-	-	-
	Gyeongbuk	25	5	0	-	-	-	-	-	-
	Gyeongnam	28	11	1	-	-	-	-	-	-
	Jeju	7	6	0	-	-	-	-	-	-

Classification		No. of Companies	With Cooperative Relationship	No. of Respondents (Joint Venture)	Domestic (Private Research)					
					Total	Basic Research	Experimental	Prototype	Product Development	Commercialization
Total		**1,089**	**460**	**21**	**10**	**2**	**2**	**2**	**4**	**-**
Core Industries	Biopharmaceutical	362	181	9	8	2	2	2	2	-
	Biochemical and Bioenergy	201	61	2	2	-	-	-	2	-
	Biofood	168	66	4	-	-	-	-	-	-
	Bioenvironmental	56	15	0	-	-	-	-	-	-
	Biomedical Equipment	121	55	3	-	-	-	-	-	-
	Bioinstrument and Bioequipment	55	15	1	-	-	-	-	-	-
	Bioresource	15	6	0	-	-	-	-	-	-
	Bioservice	111	61	2	-	-	-	-	-	-
Total Number of Workers	1 – 49	686	277	5	2	-	-	-	2	-
	50 – 299	282	126	8	-	-	-	-	-	-
	300 – 999	74	37	4	-	-	-	-	-	-
	1,000 or more	33	20	4	8	2	2	2	2	-
	Unknown	14	0	0	-	-	-	-	-	-
By Area	Seoul	266	108	4	2	-	-	-	2	-
	Busan	13	3	0	-	-	-	-	-	-
	Incheon	32	13	0	-	-	-	-	-	-
	Daegu	15	9	1	-	-	-	-	-	-
	Gwangju	8	5	0	-	-	-	-	-	-
	Daejeon	87	45	2	-	-	-	-	-	-
	Ulsan	9	5	0	-	-	-	-	-	-
	Sejong	4	1	0	-	-	-	-	-	-
	Gyeonggi	358	164	10	-	-	-	-	-	-
	Gangwon	45	21	1	-	-	-	-	-	-
	Chungbuk	85	29	2	8	2	2	2	2	-
	Chungnam	41	15	0	-	-	-	-	-	-
	Jeonbuk	32	9	0	-	-	-	-	-	-
	Jeonnam	34	11	0	-	-	-	-	-	-
	Gyeongbuk	25	5	0	-	-	-	-	-	-
	Gyeongnam	28	11	1	-	-	-	-	-	-
	Jeju	7	6	0	-	-	-	-	-	-

Classification		No. of Companies	With Cooperative Relationship	No. of Respondents (Joint Venture)	Overseas (Private Research)					
					Total	Basic Research	Experimental	Prototype	Product Development	Commercialization
Total		**1,089**	**460**	**21**	**1**	**-**	**-**	**1**	**-**	**-**
Core Industries	Biopharmaceutical	362	181	9	-	-	-	-	-	-
	Biochemical and Bioenergy	201	61	2	1	-	-	1	-	-
	Biofood	168	66	4	-	-	-	-	-	-
	Bioenvironmental	56	15	0	-	-	-	-	-	-
	Biomedical Equipment	121	55	3	-	-	-	-	-	-
	Bioinstrument and Bioequipment	55	15	1	-	-	-	-	-	-
	Bioresource	15	6	0	-	-	-	-	-	-
	Bioservice	111	61	2	-	-	-	-	-	-
Total Number of Workers	1 – 49	686	277	5	1	-	-	1	-	-
	50 – 299	282	126	8	-	-	-	-	-	-
	300 – 999	74	37	4	-	-	-	-	-	-
	1,000 or more	33	20	4	-	-	-	-	-	-
	Unknown	14	0	0	-	-	-	-	-	-
By Area	Seoul	266	108	4	1	-	-	1	-	-
	Busan	13	3	0	-	-	-	-	-	-
	Incheon	32	13	0	-	-	-	-	-	-
	Daegu	15	9	1	-	-	-	-	-	-
	Gwangju	8	5	0	-	-	-	-	-	-
	Daejeon	87	45	2	-	-	-	-	-	-
	Ulsan	9	5	0	-	-	-	-	-	-
	Sejong	4	1	0	-	-	-	-	-	-
	Gyeonggi	358	164	10	-	-	-	-	-	-
	Gangwon	45	21	1	-	-	-	-	-	-
	Chungbuk	85	29	2	-	-	-	-	-	-
	Chungnam	41	15	0	-	-	-	-	-	-
	Jeonbuk	32	9	0	-	-	-	-	-	-
	Jeonnam	34	11	0	-	-	-	-	-	-
	Gyeongbuk	25	5	0	-	-	-	-	-	-
	Gyeongnam	28	11	1	-	-	-	-	-	-
	Jeju	7	6	0	-	-	-	-	-	-

Classification		No. of Companies	With Cooperative Relationship	No. of Respondents (Joint Venture)	Domestic (Universities)					
					Total	Basic Research	Experimental	Prototype	Product Development	Commercialization
Total		**1,089**	**460**	**21**	**7**	**2**	**4**	**1**	**-**	**-**
Core Industries	Biopharmaceutical	362	181	9	4	2	1	1	-	-
	Biochemical and Bioenergy	201	61	2	3	-	3	-	-	-
	Biofood	168	66	4	-	-	-	-	-	-
	Bioenvironmental	56	15	0	-	-	-	-	-	-
	Biomedical Equipment	121	55	3	-	-	-	-	-	-
	Bioinstrument and Bioequipment	55	15	1	-	-	-	-	-	-
	Bioresource	15	6	0	-	-	-	-	-	-
	Bioservice	111	61	2	-	-	-	-	-	-
Total Number of Workers	1 – 49	686	277	5	1	1	-	-	-	-
	50 – 299	282	126	8	-	-	-	-	-	-
	300 – 999	74	37	4	5	1	4	-	-	-
	1,000 or more	33	20	4	1	-	-	1	-	-
	Unknown	14	0	0	-	-	-	-	-	-
By Area	Seoul	266	108	4	-	-	-	-	-	-
	Busan	13	3	0	-	-	-	-	-	-
	Incheon	32	13	0	-	-	-	-	-	-
	Daegu	15	9	1	3	-	3	-	-	-
	Gwangju	8	5	0	-	-	-	-	-	-
	Daejeon	87	45	2	-	-	-	-	-	-
	Ulsan	9	5	0	-	-	-	-	-	-
	Sejong	4	1	0	-	-	-	-	-	-
	Gyeonggi	358	164	10	4	2	1	1	-	-
	Gangwon	45	21	1	-	-	-	-	-	-
	Chungbuk	85	29	2	-	-	-	-	-	-
	Chungnam	41	15	0	-	-	-	-	-	-
	Jeonbuk	32	9	0	-	-	-	-	-	-
	Jeonnam	34	11	0	-	-	-	-	-	-
	Gyeongbuk	25	5	0	-	-	-	-	-	-
	Gyeongnam	28	11	1	-	-	-	-	-	-
	Jeju	7	6	0	-	-	-	-	-	-

Classification		No. of Companies	With Cooperative Relationship	No. of Respondents (Joint Venture)	Overseas (Universities)					
					Total	Basic Research	Experimental	Prototype	Product Development	Commercialization
Total		**1,089**	**460**	**21**	**1**	**-**	**-**	**1**	**-**	**-**
Core Industries	Biopharmaceutical	362	181	9	1	-	-	1	-	-
	Biochemical and Bioenergy	201	61	2	-	-	-	-	-	-
	Biofood	168	66	4	-	-	-	-	-	-
	Bioenvironmental	56	15	0	-	-	-	-	-	-
	Biomedical Equipment	121	55	3	-	-	-	-	-	-
	Bioinstrument and Bioequipment	55	15	1	-	-	-	-	-	-
	Bioresource	15	6	0	-	-	-	-	-	-
	Bioservice	111	61	2	-	-	-	-	-	-
Total Number of Workers	1 – 49	686	277	5	-	-	-	-	-	-
	50 – 299	282	126	8	-	-	-	-	-	-
	300 – 999	74	37	4	-	-	-	-	-	-
	1,000 or more	33	20	4	1	-	-	1	-	-
	Unknown	14	0	0	-	-	-	-	-	-
By Area	Seoul	266	108	4	-	-	-	-	-	-
	Busan	13	3	0	-	-	-	-	-	-
	Incheon	32	13	0	-	-	-	-	-	-
	Daegu	15	9	1	-	-	-	-	-	-
	Gwangju	8	5	0	-	-	-	-	-	-
	Daejeon	87	45	2	-	-	-	-	-	-
	Ulsan	9	5	0	-	-	-	-	-	-
	Sejong	4	1	0	-	-	-	-	-	-
	Gyeonggi	358	164	10	1	-	-	1	-	-
	Gangwon	45	21	1	-	-	-	-	-	-
	Chungbuk	85	29	2	-	-	-	-	-	-
	Chungnam	41	15	0	-	-	-	-	-	-
	Jeonbuk	32	9	0	-	-	-	-	-	-
	Jeonnam	34	11	0	-	-	-	-	-	-
	Gyeongbuk	25	5	0	-	-	-	-	-	-
	Gyeongnam	28	11	1	-	-	-	-	-	-
	Jeju	7	6	0	-	-	-	-	-	-

Classification		No. of Companies	With Cooperative Relationship	No. of Respondents (Joint Venture)	Domestic (Medical Institutions)					
					Total	Basic Research	Experimental	Prototype	Product Development	Commercialization
Total		**1,089**	**460**	**21**	**7**	**6**	**-**	**-**	**-**	**1**
Core Industries	Biopharmaceutical	362	181	9	6	6	-	-	-	-
	Biochemical and Bioenergy	201	61	2	-	-	-	-	-	-
	Biofood	168	66	4	1	-	-	-	-	1
	Bioenvironmental	56	15	0	-	-	-	-	-	-
	Biomedical Equipment	121	55	3	-	-	-	-	-	-
	Bioinstrument and Bioequipment	55	15	1	-	-	-	-	-	-
	Bioresource	15	6	0	-	-	-	-	-	-
	Bioservice	111	61	2	-	-	-	-	-	-
Total Number of Workers	1 – 49	686	277	5	-	-	-	-	-	-
	50 – 299	282	126	8	1	-	-	-	-	1
	300 – 999	74	37	4	-	-	-	-	-	-
	1,000 or more	33	20	4	6	6	-	-	-	-
	Unknown	14	0	0	-	-	-	-	-	-
By Area	Seoul	266	108	4	-	-	-	-	-	-
	Busan	13	3	0	-	-	-	-	-	-
	Incheon	32	13	0	-	-	-	-	-	-
	Daegu	15	9	1	-	-	-	-	-	-
	Gwangju	8	5	0	-	-	-	-	-	-
	Daejeon	87	45	2	-	-	-	-	-	-
	Ulsan	9	5	0	-	-	-	-	-	-
	Sejong	4	1	0	-	-	-	-	-	-
	Gyeonggi	358	164	10	6	6	-	-	-	-
	Gangwon	45	21	1	1	-	-	-	-	1
	Chungbuk	85	29	2	-	-	-	-	-	-
	Chungnam	41	15	0	-	-	-	-	-	-
	Jeonbuk	32	9	0	-	-	-	-	-	-
	Jeonnam	34	11	0	-	-	-	-	-	-
	Gyeongbuk	25	5	0	-	-	-	-	-	-
	Gyeongnam	28	11	1	-	-	-	-	-	-
	Jeju	7	6	0	-	-	-	-	-	-

Classification		No. of Companies	With Cooperative Relationship	No. of Respondents (Joint Venture	Overseas (Medical Institutions)					
					Total	Basic Research	Experimental	Prototype	Product Development	Commercialization
Total		**1,089**	**460**	**416**	**6**	**6**	**-**	**-**	**-**	**-**
Core Industries	Biopharmaceutical	362	181	162	6	6	-	-	-	-
	Biochemical and Bioenergy	201	61	59	-	-	-	-	-	-
	Biofood	168	66	60	-	-	-	-	-	-
	Bioenvironmental	56	15	14	-	-	-	-	-	-
	Biomedical Equipment	121	55	46	-	-	-	-	-	-
	Bioinstrument and Bioequipment	55	15	14	-	-	-	-	-	-
	Bioresource	15	6	6	-	-	-	-	-	-
	Bioservice	111	61	55	-	-	-	-	-	-
Total Number of Workers	1 – 49	686	277	258	-	-	-	-	-	-
	50 – 299	282	126	108	-	-	-	-	-	-
	300 – 999	74	37	31	-	-	-	-	-	-
	1,000 or more	33	20	19	6	6	-	-	-	-
	Unknown	14	0	0	-	-	-	-	-	-
By Area	Seoul	266	108	94	-	-	-	-	-	-
	Busan	13	3	3	-	-	-	-	-	-
	Incheon	32	13	11	-	-	-	-	-	-
	Daegu	15	9	8	-	-	-	-	-	-
	Gwangju	8	5	4	-	-	-	-	-	-
	Daejeon	87	45	42	-	-	-	-	-	-
	Ulsan	9	5	5	-	-	-	-	-	-
	Sejong	4	1	1	-	-	-	-	-	-
	Gyeonggi	358	164	150	6	6	-	-	-	-
	Gangwon	45	21	19	-	-	-	-	-	-
	Chungbuk	85	29	26	-	-	-	-	-	-
	Chungnam	41	15	14	-	-	-	-	-	-
	Jeonbuk	32	9	7	-	-	-	-	-	-
	Jeonnam	34	11	11	-	-	-	-	-	-
	Gyeongbuk	25	5	5	-	-	-	-	-	-
	Gyeongnam	28	11	10	-	-	-	-	-	-
	Jeju	7	6	6	-	-	-	-	-	-

<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		**1,089**	**460**	**416**	**1,176**	**375**	**504**	**170**	**82**	**45**
Core Industries	Biopharmaceutical	362	181	162	537	181	268	59	17	12
	Biochemical and Bioenergy	201	61	59	163	49	53	30	19	12
	Biofood	168	66	60	138	38	59	20	14	7
	Bioenvironmental	56	15	14	23	10	6	6	1	-
	Biomedical Equipment	121	55	46	104	30	41	14	14	5
	Bioinstrument and Bioequipment	55	15	14	27	7	5	12	2	1
	Bioresource	15	6	6	22	4	17	-	1	-
	Bioservice	111	61	55	162	56	55	29	14	8
Total Number of Workers	1 – 49	686	277	258	614	228	224	90	47	25
	50 – 299	282	126	108	289	93	119	51	20	6
	300 – 999	74	37	31	205	34	138	16	9	8
	1,000 or more	33	20	19	68	20	23	13	6	6
	Unknown	14	0	0	-	-	-	-	-	-
By Area	Seoul	266	108	94	241	92	90	35	15	9
	Busan	13	3	3	4	2	1	-	1	-
	Incheon	32	13	11	22	6	5	4	2	5
	Daegu	15	9	8	24	3	12	6	3	-
	Gwangju	8	5	4	11	6	5	-	-	-
	Daejeon	87	45	42	113	38	42	21	10	2
	Ulsan	9	5	5	5	3	2	-	-	-
	Sejong	4	1	1	1	-	-	-	-	1
	Gyeonggi	358	164	150	512	148	257	68	23	16
	Gangwon	45	21	19	50	12	15	12	9	2
	Chungbuk	85	29	26	58	20	25	4	6	3
	Chungnam	41	15	14	36	17	9	8	2	-
	Jeonbuk	32	9	7	26	6	14	2	4	-
	Jeonnam	34	11	11	36	10	16	3	4	3
	Gyeongbuk	25	5	5	14	6	5	-	1	2
	Gyeongnam	28	11	10	12	2	5	4	1	-
	Jeju	7	6	6	11	4	1	3	1	2

Classification		No. of Companies	With Cooperative Relationship	No. of Respondents (Joint R&D Contract)	Overseas					
					Total	Basic Research	Experimental	Prototype	Product Development	Commercialization
Total		**1,089**	**460**	**416**	**129**	**46**	**35**	**20**	**12**	**16**
Core Industries	Biopharmaceutical	362	181	162	38	19	7	9	2	1
	Biochemical and Bioenergy	201	61	59	46	17	15	5	6	3
	Biofood	168	66	60	14	3	4	2	3	2
	Bioenvironmental	56	15	14	7	1	-	-	-	6
	Biomedical Equipment	121	55	46	15	4	6	3	-	2
	Bioinstrument and Bioequipment	55	15	14	1	-	1	-	-	-
	Bioresource	15	6	6	-	-	-	-	-	-
	Bioservice	111	61	55	8	2	2	1	1	2
Total Number of Workers	1 – 49	686	277	258	49	9	16	6	7	11
	50 – 299	282	126	108	28	14	5	9	-	-
	300 – 999	74	37	31	8	3	1	1	-	3
	1,000 or more	33	20	19	44	20	13	4	5	2
	Unknown	14	0	0	-	-	-	-	-	-
By Area	Seoul	266	108	94	25	11	11	1	-	2
	Busan	13	3	3	-	-	-	-	-	-
	Incheon	32	13	11	4	1	-	1	1	1
	Daegu	15	9	8	-	-	-	-	-	-
	Gwangju	8	5	4	1	1	-	-	-	-
	Daejeon	87	45	42	10	2	5	1	2	-
	Ulsan	9	5	5	36	15	10	4	5	2
	Sejong	4	1	1	-	-	-	-	-	-
	Gyeonggi	358	164	150	19	7	7	5	-	-
	Gangwon	45	21	19	13	-	-	5	-	8
	Chungbuk	85	29	26	15	5	1	3	3	3
	Chungnam	41	15	14	-	-	-	-	-	-
	Jeonbuk	32	9	7	2	2	-	-	-	-
	Jeonnam	34	11	11	2	1	-	-	1	-
	Gyeongbuk	25	5	5	-	-	-	-	-	-
	Gyeongnam	28	11	10	2	1	1	-	-	-
	Jeju	7	6	6	-	-	-	-	-	-

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		**1,089**	**460**	**416**	**183**	**73**	**58**	**30**	**16**	**6**	**38**	**11**	**7**	**8**	**4**	**8**
Core Industries	Biopharmaceutical	362	181	162	91	43	27	13	5	3	13	4	-	8	1	-
	Biochemical and Bioenergy	201	61	59	20	7	10	1	2	-	7	2	3	-	1	1
	Biofood	168	66	60	24	5	9	4	3	3	5	1	-	-	2	2
	Bioenvironmental	56	15	14	6	3	2	1	-	-	6	1	-	-	-	5
	Biomedical Equipment	121	55	46	13	3	6	2	2	-	7	3	4	-	-	-
	Bioinstrument and Bioequipment	55	15	14	6	4	2	-	-	-	-	-	-	-	-	-
	Bioresource	15	6	6	-	-	-	-	-	-	-	-	-	-	-	-
	Bioservice	111	61	55	23	8	2	9	4	-	-	-	-	-	-	-
Total Number of Workers	1 – 49	686	277	258	103	40	34	12	13	4	17	2	3	-	4	8
	50 – 299	282	126	108	59	27	16	16	-	-	20	8	4	8	-	-
	300 – 999	74	37	31	16	4	6	2	2	2	1	1	-	-	-	-
	1,000 or more	33	20	19	5	2	2	-	1	-	-	-	-	-	-	-
	Unknown	14	0	0	-	-	-	-	-	-	-	-	-	-	-	-
By Area	Seoul	266	108	94	46	16	19	7	3	1	12	5	7	-	-	-
	Busan	13	3	3	2	2	-	-	-	-	-	-	-	-	-	-
	Incheon	32	13	11	2	1	1	-	-	-	-	-	-	-	-	-
	Daegu	15	9	8	4	1	1	2	-	-	-	-	-	-	-	-
	Gwangju	8	5	4	2	2	-	-	-	-	1	1	-	-	-	-
	Daejeon	87	45	42	22	13	6	3	-	-	2	1	-	-	1	-
	Ulsan	9	5	5	-	-	-	-	-	-	-	-	-	-	-	-
	Sejong	4	1	1	-	-	-	-	-	-	-	-	-	-	-	-
	Gyeonggi	358	164	150	65	30	14	13	4	4	4	1	-	3	-	-
	Gangwon	45	21	19	16	3	6	4	3	-	10	-	-	5	-	5
	Chungbuk	85	29	26	8	1	5	-	1	1	5	-	-	-	2	3
	Chungnam	41	15	14	1	1	-	-	-	-	-	-	-	-	-	-
	Jeonbuk	32	9	7	12	2	5	1	4	-	2	2	-	-	-	-
	Jeonnam	34	11	11	1	-	1	-	-	-	2	1	-	-	1	-
	Gyeongbuk	25	5	5	1	-	-	-	1	-	-	-	-	-	-	-
	Gyeongnam	28	11	10	-	-	-	-	-	-	-	-	-	-	-	-
	Jeju	7	6	6	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		**1,089**	**460**	**416**	**51**	**23**	**16**	**5**	**6**	**1**	**5**	**1**	**-**	**1**	**2**	**1**
Core Industries	Biopharmaceutical	362	181	162	37	17	13	4	2	1	2	1	-	-	1	-
	Biochemical and Bioenergy	201	61	59	3	1	1	-	1	-	-	-	-	-	-	-
	Biofood	168	66	60	5	-	1	1	3	-	2	-	-	1	1	-
	Bioenvironmental	56	15	14	-	-	-	-	-	-	-	-	-	-	-	-
	Biomedical Equipment	121	55	46	2	2	-	-	-	-	-	-	-	-	-	-
	Bioinstrument and Bioequipment	55	15	14	-	-	-	-	-	-	-	-	-	-	-	-
	Bioresource	15	6	6	-	-	-	-	-	-	-	-	-	-	-	-
	Bioservice	111	61	55	4	3	1	-	-	-	1	-	-	-	-	1
Total Number of Workers	1 – 49	686	277	258	27	13	8	1	4	1	3	-	-	1	2	-
	50 – 299	282	126	108	7	3	4	-	-	-	1	1	-	-	-	-
	300 – 999	74	37	31	7	4	-	1	2	-	1	-	-	-	-	1
	1,000 or more	33	20	19	10	3	4	3	-	-	-	-	-	-	-	-
	Unknown	14	0	0	-	-	-	-	-	-	-	-	-	-	-	-
By Area	Seoul	266	108	94	10	6	3	-	1	-	1	-	-	-	-	1
	Busan	13	3	3	-	-	-	-	-	-	-	-	-	-	-	-
	Incheon	32	13	11	2	-	1	-	-	1	-	-	-	-	-	-
	Daegu	15	9	8	-	-	-	-	-	-	-	-	-	-	-	-
	Gwangju	8	5	4	-	-	-	-	-	-	-	-	-	-	-	-
	Daejeon	87	45	42	5	2	1	-	2	-	2	1	-	-	1	-
	Ulsan	9	5	5	-	-	-	-	-	-	-	-	-	-	-	-
	Sejong	4	1	1	-	-	-	-	-	-	-	-	-	-	-	-
	Gyeonggi	358	164	150	25	11	8	4	2	-	-	-	-	-	-	-
	Gangwon	45	21	19	1	-	-	-	1	-	-	-	-	-	-	-
	Chungbuk	85	29	26	4	2	1	1	-	-	2	-	-	1	1	-
	Chungnam	41	15	14	2	1	1	-	-	-	-	-	-	-	-	-
	Jeonbuk	32	9	7	2	1	1	-	-	-	-	-	-	-	-	-
	Jeonnam	34	11	11	-	-	-	-	-	-	-	-	-	-	-	-
	Gyeongbuk	25	5	5	-	-	-	-	-	-	-	-	-	-	-	-
	Gyeongnam	28	11	10	-	-	-	-	-	-	-	-	-	-	-	-
	Jeju	7	6	6	-	-	-	-	-	-	-	-	-	-	-	-

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		**1,089**	**460**	**416**	**31**	**14**	**9**	**2**	**3**	**3**	**17**	**4**	**9**	**3**	**-**	**1**
Core Industries	Biopharmaceutical	362	181	162	15	11	4	-	-	-	6	2	4	-	-	-
	Biochemical and Bioenergy	201	61	59	5	2	1	-	1	1	1	-	1	-	-	-
	Biofood	168	66	60	3	-	3	-	-	-	7	2	4	1	-	-
	Bioenvironmental	56	15	14	-	-	-	-	-	-	-	-	-	-	-	-
	Biomedical Equipment	121	55	46	4	-	-	2	1	1	3	-	-	2	-	1
	Bioinstrument and Bioequipment	55	15	14	-	-	-	-	-	-	-	-	-	-	-	-
	Bioresource	15	6	6	-	-	-	-	-	-	-	-	-	-	-	-
	Bioservice	111	61	55	4	1	1	-	1	1	-	-	-	-	-	-
Total Number of Workers	1 – 49	686	277	258	14	9	2	1	1	1	10	1	6	3	-	-
	50 – 299	282	126	108	5	-	4	1	-	-	1	1	-	-	-	-
	300 – 999	74	37	31	7	4	1	-	1	1	3	2	-	-	-	1
	1,000 or more	33	20	19	5	1	2	-	1	1	3	-	3	-	-	-
	Unknown	14	0	0	-	-	-	-	-	-	-	-	-	-	-	-
By Area	Seoul	266	108	94	13	7	2	-	2	2	5	2	3	-	-	-
	Busan	13	3	3	-	-	-	-	-	-	-	-	-	-	-	-
	Incheon	32	13	11	-	-	-	-	-	-	-	-	-	-	-	-
	Daegu	15	9	8	-	-	-	-	-	-	-	-	-	-	-	-
	Gwangju	8	5	4	-	-	-	-	-	-	-	-	-	-	-	-
	Daejeon	87	45	42	1	1	-	-	-	-	2	-	2	-	-	-
	Ulsan	9	5	5	-	-	-	-	-	-	-	-	-	-	-	-
	Sejong	4	1	1	-	-	-	-	-	-	-	-	-	-	-	-
	Gyeonggi	358	164	150	9	2	5	2	-	-	6	1	3	2	-	-
	Gangwon	45	21	19	3	3	-	-	-	-	1	-	-	-	-	1
	Chungbuk	85	29	26	-	-	-	-	-	-	1	-	-	1	-	-
	Chungnam	41	15	14	2	1	1	-	-	-	-	-	-	-	-	-
	Jeonbuk	32	9	7	1	-	1	-	-	-	-	-	-	-	-	-
	Jeonnam	34	11	11	2	-	-	-	1	1	-	-	-	-	-	-
	Gyeongbuk	25	5	5	-	-	-	-	-	-	-	-	-	-	-	-
	Gyeongnam	28	11	10	-	-	-	-	-	-	2	1	1	-	-	-
	Jeju	7	6	6	-	-	-	-	-	-	-	-	-	-	-	-

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		**1,089**	**460**	**416**	**378**	**115**	**146**	**57**	**34**	**26**	**5**	**1**	**1**	**2**	**-**	**1**
Core Industries	Biopharmaceutical	362	181	162	116	42	49	20	3	2	3	1	1	1	-	-
	Biochemical and Bioenergy	201	61	59	75	21	20	15	9	10	1	-	-	1	-	-
	Biofood	168	66	60	40	8	22	3	4	3	-	-	-	-	-	-
	Bioenvironmental	56	15	14	10	4	4	1	1	-	-	-	-	-	-	-
	Biomedical Equipment	121	55	46	44	14	14	3	9	4	1	-	-	-	-	1
	Bioinstrument and Bioequipment	55	15	14	16	2	2	9	2	1	-	-	-	-	-	-
	Bioresource	15	6	6	12	2	9	-	1	-	-	-	-	-	-	-
	Bioservice	111	61	55	65	22	26	6	5	6	-	-	-	-	-	-
Total Number of Workers	1 – 49	686	277	258	224	75	87	30	17	15	2	1	-	1	-	-
	50 – 299	282	126	108	106	28	43	20	13	2	2	-	1	1	-	-
	300 – 999	74	37	31	29	8	10	5	2	4	1	-	-	-	-	1
	1,000 or more	33	20	19	19	4	6	2	2	5	-	-	-	-	-	-
	Unknown	14	0	0	-	-	-	-	-	-	-	-	-	-	-	-
By Area	Seoul	266	108	94	78	27	30	11	5	5	1	-	-	1	-	-
	Busan	13	3	3	1	-	1	-	-	-	-	-	-	-	-	-
	Incheon	32	13	11	9	3	2	2	1	1	-	-	-	-	-	-
	Daegu	15	9	8	6	-	2	3	1	-	-	-	-	-	-	-
	Gwangju	8	5	4	6	1	5	-	-	-	-	-	-	-	-	-
	Daejeon	87	45	42	47	17	19	5	4	2	2	-	1	1	-	-
	Ulsan	9	5	5	5	3	2	-	-	-	-	-	-	-	-	-
	Sejong	4	1	1	1	-	-	-	-	1	-	-	-	-	-	-
	Gyeonggi	358	164	150	143	40	51	25	15	12	1	1	-	-	-	-
	Gangwon	45	21	19	11	3	3	1	2	2	1	-	-	-	-	1
	Chungbuk	85	29	26	25	8	10	1	4	2	-	-	-	-	-	-
	Chungnam	41	15	14	8	4	2	2	-	-	-	-	-	-	-	-
	Jeonbuk	32	9	7	-	-	-	-	-	-	-	-	-	-	-	-
	Jeonnam	34	11	11	24	6	13	2	2	1	-	-	-	-	-	-
	Gyeongbuk	25	5	5	4	1	3	-	-	-	-	-	-	-	-	-
	Gyeongnam	28	11	10	8	2	2	4	-	-	-	-	-	-	-	-
	Jeju	7	6	6	2	-	1	1	-	-	-	-	-	-	-	-

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		**1,089**	**460**	**416**	**50**	**15**	**21**	**11**	**2**	**1**	**5**	**3**	**1**	**-**	**-**	**1**
Core Industries	Biopharmaceutical	362	181	162	23	10	12	1	-	-	4	2	1	-	-	1
	Biochemical and Bioenergy	201	61	59	16	3	4	8	1	-	-	-	-	-	-	-
	Biofood	168	66	60	-	-	-	-	-	-	-	-	-	-	-	-
	Bioenvironmental	56	15	14	-	-	-	-	-	-	-	-	-	-	-	-
	Biomedical Equipment	121	55	46	2	-	2	-	-	-	1	1	-	-	-	-
	Bioinstrument and Bioequipment	55	15	14	-	-	-	-	-	-	-	-	-	-	-	-
	Bioresource	15	6	6	-	-	-	-	-	-	-	-	-	-	-	-
	Bioservice	111	61	55	9	2	3	2	1	1	-	-	-	-	-	-
Total Number of Workers	1 – 49	686	277	258	23	11	5	6	1	-	4	2	1	-	-	1
	50 – 299	282	126	108	18	2	15	1	-	-	1	1	-	-	-	-
	300 – 999	74	37	31	6	2	1	1	1	1	-	-	-	-	-	-
	1,000 or more	33	20	19	3	-	-	3	-	-	-	-	-	-	-	-
	Unknown	14	0	0	-	-	-	-	-	-	-	-	-	-	-	-
By Area	Seoul	266	108	94	17	9	1	4	2	1	3	1	1	-	-	1
	Busan	13	3	3	-	-	-	-	-	-	-	-	-	-	-	-
	Incheon	32	13	11	-	-	-	-	-	-	-	-	-	-	-	-
	Daegu	15	9	8	-	-	-	-	-	-	-	-	-	-	-	-
	Gwangju	8	5	4	-	-	-	-	-	-	-	-	-	-	-	-
	Daejeon	87	45	42	5	1	1	3	-	-	-	-	-	-	-	-
	Ulsan	9	5	5	-	-	-	-	-	-	-	-	-	-	-	-
	Sejong	4	1	1	-	-	-	-	-	-	-	-	-	-	-	-
	Gyeonggi	358	164	150	17	2	15	-	-	-	2	2	-	-	-	-
	Gangwon	45	21	19	3	-	-	3	-	-	-	-	-	-	-	-
	Chungbuk	85	29	26	-	-	-	-	-	-	-	-	-	-	-	-
	Chungnam	41	15	14	4	3	1	-	-	-	-	-	-	-	-	-
	Jeonbuk	32	9	7	2	-	2	-	-	-	-	-	-	-	-	-
	Jeonnam	34	11	11	-	-	-	-	-	-	-	-	-	-	-	-
	Gyeongbuk	25	5	5	-	-	-	-	-	-	-	-	-	-	-	-
	Gyeongnam	28	11	10	1	-	1	-	-	-	-	-	-	-	-	-
	Jeju	7	6	6	1	-	-	1	-	-	-	-	-	-	-	-

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		**1,089**	**460**	**416**	**388**	**102**	**220**	**45**	**17**	**4**	**18**	**8**	**6**	**1**	**1**	**2**
Core Industries	Biopharmaceutical	362	181	162	205	41	143	13	6	2	8	8	-	-	-	-
	Biochemical and Bioenergy	201	61	59	41	14	15	6	5	1	1	-	1	-	-	-
	Biofood	168	66	60	64	24	23	12	4	1	-	-	-	-	-	-
	Bioenvironmental	56	15	14	7	3	-	4	-	-	1	-	-	-	-	1
	Biomedical Equipment	121	55	46	25	5	15	5	-	-	2	-	2	-	-	-
	Bioinstrument and Bioequipment	55	15	14	5	1	1	3	-	-	1	-	1	-	-	-
	Bioresource	15	6	6	10	2	8	-	-	-	-	-	-	-	-	-
	Bioservice	111	61	55	31	12	15	2	2	-	5	-	2	1	1	1
Total Number of Workers	1 – 49	686	277	258	166	62	67	28	8	1	11	2	5	1	1	2
	50 – 299	282	126	108	69	24	30	6	6	3	1	1	-	-	-	-
	300 – 999	74	37	31	129	7	115	6	1	-	1	-	1	-	-	-
	1,000 or more	33	20	19	24	9	8	5	2	-	5	5	-	-	-	-
	Unknown	14	0	0	-	-	-	-	-	-	-	-	-	-	-	-
By Area	Seoul	266	108	94	51	18	27	5	1	-	2	2	-	-	-	-
	Busan	13	3	3	1	-	-	-	1	-	-	-	-	-	-	-
	Incheon	32	13	11	5	2	1	2	-	-	3	-	-	1	1	1
	Daegu	15	9	8	9	1	6	1	1	-	-	-	-	-	-	-
	Gwangju	8	5	4	3	3	-	-	-	-	-	-	-	-	-	-
	Daejeon	87	45	42	27	3	14	7	3	-	2	-	2	-	-	-
	Ulsan	9	5	5	-	-	-	-	-	-	-	-	-	-	-	-
	Sejong	4	1	1	-	-	-	-	-	-	-	-	-	-	-	-
	Gyeonggi	358	164	150	204	42	145	15	2	-	4	1	3	-	-	-
	Gangwon	45	21	19	16	3	6	4	3	-	1	-	-	-	-	1
	Chungbuk	85	29	26	18	8	7	2	1	-	6	5	1	-	-	-
	Chungnam	41	15	14	19	7	4	6	2	-	-	-	-	-	-	-
	Jeonbuk	32	9	7	9	3	5	1	-	-	-	-	-	-	-	-
	Jeonnam	34	11	11	9	4	2	1	1	1	-	-	-	-	-	-
	Gyeongbuk	25	5	5	9	5	2	-	-	2	-	-	-	-	-	-
	Gyeongnam	28	11	10	2	-	1	-	1	-	-	-	-	-	-	-
	Jeju	7	6	6	6	3	-	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		**1,089**	**460**	**416**	**95**	**33**	**34**	**20**	**4**	**4**	**41**	**18**	**11**	**5**	**5**	**2**
Core Industries	Biopharmaceutical	362	181	162	50	17	20	8	1	4	2	1	1	-	-	-
	Biochemical and Bioenergy	201	61	59	3	1	2	-	-	-	36	15	10	4	5	2
	Biofood	168	66	60	2	1	1	-	-	-	-	-	-	-	-	-
	Bioenvironmental	56	15	14	-	-	-	-	-	-	-	-	-	-	-	-
	Biomedical Equipment	121	55	46	14	6	4	2	2	-	1	-	-	1	-	-
	Bioinstrument and Bioequipment	55	15	14	-	-	-	-	-	-	-	-	-	-	-	-
	Bioresource	15	6	6	-	-	-	-	-	-	-	-	-	-	-	-
	Bioservice	111	61	55	26	8	7	10	1	-	2	2	-	-	-	-
Total Number of Workers	1 – 49	686	277	258	57	18	21	12	3	3	2	1	1	-	-	-
	50 – 299	282	126	108	25	9	7	7	1	1	2	2	-	-	-	-
	300 – 999	74	37	31	11	5	5	1	-	-	1	-	-	1	-	-
	1,000 or more	33	20	19	2	1	1	-	-	-	36	15	10	4	5	2
	Unknown	14	0	0	-	-	-	-	-	-	-	-	-	-	-	-
By Area	Seoul	266	108	94	26	9	8	8	1	-	1	1	-	-	-	-
	Busan	13	3	3	-	-	-	-	-	-	-	-	-	-	-	-
	Incheon	32	13	11	4	-	-	-	1	3	1	1	-	-	-	-
	Daegu	15	9	8	5	1	3	-	1	-	-	-	-	-	-	-
	Gwangju	8	5	4	-	-	-	-	-	-	-	-	-	-	-	-
	Daejeon	87	45	42	6	1	1	3	1	-	-	-	-	-	-	-
	Ulsan	9	5	5	-	-	-	-	-	-	36	15	10	4	5	2
	Sejong	4	1	1	-	-	-	-	-	-	-	-	-	-	-	-
	Gyeonggi	358	164	150	49	21	19	9	-	-	2	1	1	-	-	-
	Gangwon	45	21	19	-	-	-	-	-	-	-	-	-	-	-	-
	Chungbuk	85	29	26	3	1	2	-	-	-	1	-	-	1	-	-
	Chungnam	41	15	14	-	-	-	-	-	-	-	-	-	-	-	-
	Jeonbuk	32	9	7	-	-	-	-	-	-	-	-	-	-	-	-
	Jeonnam	34	11	11	-	-	-	-	-	-	-	-	-	-	-	-
	Gyeongbuk	25	5	5	-	-	-	-	-	-	-	-	-	-	-	-
	Gyeongnam	28	11	10	1	-	1	-	-	-	-	-	-	-	-	-
	Jeju	7	6	6	1	-	-	-	-	1	-	-	-	-	-	-

<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		**1,089**	**460**	**84**	**232**	**40**	**37**	**124**	**17**	**14**
Core Industries	Biopharmaceutical	362	181	41	170	27	22	108	8	5
	Biochemical and Bioenergy	201	61	7	13	6	3	4	-	-
	Biofood	168	66	12	12	3	2	2	3	2
	Bioenvironmental	56	15	2	3	-	-	-	-	3
	Biomedical Equipment	121	55	10	20	2	6	8	3	1
	Bioinstrument and Bioequipment	55	15	0	-	-	-	-	-	-
	Bioresource	15	6	1	1	-	1	-	-	-
	Bioservice	111	61	11	13	2	3	2	3	3
Total Number of Workers	1 – 49	686	277	42	56	15	13	11	7	10
	50 – 299	282	126	27	50	10	18	12	8	2
	300 – 999	74	37	14	124	15	6	101	-	2
	1,000 or more	33	20	1	2	-	-	-	2	-
	Unknown	14	0	0	-	-	-	-	-	-
By Area	Seoul	266	108	19	23	3	10	3	2	5
	Busan	13	3	0	-	-	-	-	-	-
	Incheon	32	13	4	7	-	2	3	2	-
	Daegu	15	9	4	6	3	-	2	1	-
	Gwangju	8	5	1	1	-	-	1	-	-
	Daejeon	87	45	5	7	4	1	-	1	1
	Ulsan	9	5	0	-	-	-	-	-	-
	Sejong	4	1	0	-	-	-	-	-	-
	Gyeonggi	358	164	28	151	22	9	110	4	6
	Gangwon	45	21	5	8	4	3	1	-	-
	Chungbuk	85	29	6	15	1	7	3	3	1
	Chungnam	41	15	3	3	1	-	-	1	1
	Jeonbuk	32	9	5	9	2	4	1	2	-
	Jeonnam	34	11	2	1	-	1	-	-	-
	Gyeongbuk	25	5	0	-	-	-	-	-	-
	Gyeongnam	28	11	1	-	-	-	-	-	-
	Jeju	7	6	1	1	-	-	-	1	-

Classification		No. of Companies	With Cooperative Relationship	No. of Respondents (Technical Tie-Up)	Overseas					
					Total	Basic Research	Experimental	Prototype	Product Development	Commercialization
Total		**1,089**	**460**	**84**	**36**	**9**	**6**	**8**	**8**	**5**
Core Industries	Biopharmaceutical	362	181	41	22	8	2	6	2	4
	Biochemical and Bioenergy	201	61	7	-	-	-	-	-	-
	Biofood	168	66	12	3	-	-	1	2	-
	Bioenvironmental	56	15	2	-	-	-	-	-	-
	Biomedical Equipment	121	55	10	5	1	3	1	-	-
	Bioinstrument and Bioequipment	55	15	0	-	-	-	-	-	-
	Bioresource	15	6	1	-	-	-	-	-	-
	Bioservice	111	61	11	6	-	1	-	4	1
Total Number of Workers	1 – 49	686	277	42	11	1	1	2	3	4
	50 – 299	282	126	27	17	6	4	6	1	-
	300 – 999	74	37	14	8	2	1	-	4	1
	1,000 or more	33	20	1	-	-	-	-	-	-
	Unknown	14	0	0	-	-	-	-	-	-
By Area	Seoul	266	108	19	11	3	2	-	5	1
	Busan	13	3	0	-	-	-	-	-	-
	Incheon	32	13	4	3	-	-	-	-	3
	Daegu	15	9	4	1	-	-	1	-	-
	Gwangju	8	5	1	1	-	-	1	-	-
	Daejeon	87	45	5	4	3	1	-	-	-
	Ulsan	9	5	0	-	-	-	-	-	-
	Sejong	4	1	0	-	-	-	-	-	-
	Gyeonggi	358	164	28	5	2	2	-	-	1
	Gangwon	45	21	5	5	-	-	5	-	-
	Chungbuk	85	29	6	3	1	1	1	-	-
	Chungnam	41	15	3	1	-	-	-	1	-
	Jeonbuk	32	9	5	-	-	-	-	-	-
	Jeonnam	34	11	2	1	-	-	-	1	-
	Gyeongbuk	25	5	0	-	-	-	-	-	-
	Gyeongnam	28	11	1	1	-	-	-	1	-
	Jeju	7	6	1	-	-	-	-	-	-

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		**1,089**	**460**	**84**	**33**	**11**	**6**	**7**	**4**	**5**	**23**	**4**	**3**	**6**	**7**	**3**
Core Industries	Biopharmaceutical	362	181	41	21	6	6	4	1	4	13	3	-	5	2	3
	Biochemical and Bioenergy	201	61	7	3	3	-	-	-	-	-	-	-	-	-	-
	Biofood	168	66	12	3	2	-	-	1	-	1	-	-	-	1	-
	Bioenvironmental	56	15	2	-	-	-	-	-	-	-	-	-	-	-	-
	Biomedical Equipment	121	55	10	3	-	-	1	2	-	5	1	3	1	-	-
	Bioinstrument and Bioequipment	55	15	0	-	-	-	-	-	-	-	-	-	-	-	-
	Bioresource	15	6	1	-	-	-	-	-	-	-	-	-	-	-	-
	Bioservice	111	61	11	3	-	-	2	-	1	4	-	-	-	4	-
Total Number of Workers	1 – 49	686	277	42	11	2	1	2	1	5	5	-	-	-	2	3
	50 – 299	282	126	27	16	5	4	4	3	-	14	4	3	6	1	-
	300 – 999	74	37	14	6	4	1	1	-	-	4	-	-	-	4	-
	1,000 or more	33	20	1	-	-	-	-	-	-	-	-	-	-	-	-
	Unknown	14	0	0	-	-	-	-	-	-	-	-	-	-	-	-
By Area	Seoul	266	108	19	5	-	3	-	1	1	7	-	2	-	5	-
	Busan	13	3	0	-	-	-	-	-	-	-	-	-	-	-	-
	Incheon	32	13	4	-	-	-	-	-	-	3	-	-	-	-	3
	Daegu	15	9	4	4	3	-	1	-	-	-	-	-	-	-	-
	Gwangju	8	5	1	-	-	-	-	-	-	-	-	-	-	-	-
	Daejeon	87	45	5	4	3	-	-	1	-	2	2	-	-	-	-
	Ulsan	9	5	0	-	-	-	-	-	-	-	-	-	-	-	-
	Sejong	4	1	0	-	-	-	-	-	-	-	-	-	-	-	-
	Gyeonggi	358	164	28	12	3	2	3	-	4	1	1	-	-	-	-
	Gangwon	45	21	5	4	2	1	1	-	-	5	-	-	5	-	-
	Chungbuk	85	29	6	2	-	-	1	1	-	3	1	1	1	-	-
	Chungnam	41	15	3	-	-	-	-	-	-	-	-	-	-	-	-
	Jeonbuk	32	9	5	2	-	-	1	1	-	-	-	-	-	-	-
	Jeonnam	34	11	2	-	-	-	-	-	-	1	-	-	-	1	-
	Gyeongbuk	25	5	0	-	-	-	-	-	-	-	-	-	-	-	-
	Gyeongnam	28	11	1	-	-	-	-	-	-	1	-	-	-	1	-
	Jeju	7	6	1	-	-	-	-	-	-	-	-	-	-	-	-

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		**1,089**	**460**	**84**	**10**	**3**	**3**	**-**	**3**	**1**	**2**	**2**	**-**	**-**	**-**	**-**
Core Industries	Biopharmaceutical	362	181	41	6	2	2	-	2	-	2	2	-	-	-	-
	Biochemical and Bioenergy	201	61	7	1	1	-	-	-	-	-	-	-	-	-	-
	Biofood	168	66	12	1	-	-	-	1	-	-	-	-	-	-	-
	Bioenvironmental	56	15	2	-	-	-	-	-	-	-	-	-	-	-	-
	Biomedical Equipment	121	55	10	1	-	-	-	-	1	-	-	-	-	-	-
	Bioinstrument and Bioequipment	55	15	0	-	-	-	-	-	-	-	-	-	-	-	-
	Bioresource	15	6	1	-	-	-	-	-	-	-	-	-	-	-	-
	Bioservice	111	61	11	1	-	1	-	-	-	-	-	-	-	-	-
Total Number of Workers	1 – 49	686	277	42	2	2	-	-	-	-	-	-	-	-	-	-
	50 – 299	282	126	27	4	-	2	-	1	1	1	1	-	-	-	-
	300 – 999	74	37	14	2	1	1	-	-	-	1	1	-	-	-	-
	1,000 or more	33	20	1	2	-	-	-	2	-	-	-	-	-	-	-
	Unknown	14	0	0	-	-	-	-	-	-	-	-	-	-	-	-
By Area	Seoul	266	108	19	5	2	2	-	-	1	1	1	-	-	-	-
	Busan	13	3	0	-	-	-	-	-	-	-	-	-	-	-	-
	Incheon	32	13	4	-	-	-	-	-	-	-	-	-	-	-	-
	Daegu	15	9	4	1	-	-	-	1	-	-	-	-	-	-	-
	Gwangju	8	5	1	-	-	-	-	-	-	-	-	-	-	-	-
	Daejeon	87	45	5	-	-	-	-	-	-	1	1	-	-	-	-
	Ulsan	9	5	0	-	-	-	-	-	-	-	-	-	-	-	-
	Sejong	4	1	0	-	-	-	-	-	-	-	-	-	-	-	-
	Gyeonggi	358	164	28	2	1	1	-	-	-	-	-	-	-	-	-
	Gangwon	45	21	5	-	-	-	-	-	-	-	-	-	-	-	-
	Chungbuk	85	29	6	2	-	-	-	2	-	-	-	-	-	-	-
	Chungnam	41	15	3	-	-	-	-	-	-	-	-	-	-	-	-
	Jeonbuk	32	9	5	-	-	-	-	-	-	-	-	-	-	-	-
	Jeonnam	34	11	2	-	-	-	-	-	-	-	-	-	-	-	-
	Gyeongbuk	25	5	0	-	-	-	-	-	-	-	-	-	-	-	-
	Gyeongnam	28	11	1	-	-	-	-	-	-	-	-	-	-	-	-
	Jeju	7	6	1	-	-	-	-	-	-	-	-	-	-	-	-

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		**1,089**	**460**	**84**	**8**	**2**	**4**	**-**	**1**	**1**	**3**	**1**	**1**	**-**	**-**	**1**
Core Industries	Biopharmaceutical	362	181	41	7	2	3	-	1	1	3	1	1	-	-	1
	Biochemical and Bioenergy	201	61	7	-	-	-	-	-	-	-	-	-	-	-	-
	Biofood	168	66	12	-	-	-	-	-	-	-	-	-	-	-	-
	Bioenvironmental	56	15	2	-	-	-	-	-	-	-	-	-	-	-	-
	Biomedical Equipment	121	55	10	1	-	1	-	-	-	-	-	-	-	-	-
	Bioinstrument and Bioequipment	55	15	0	-	-	-	-	-	-	-	-	-	-	-	-
	Bioresource	15	6	1	-	-	-	-	-	-	-	-	-	-	-	-
	Bioservice	111	61	11	-	-	-	-	-	-	-	-	-	-	-	-
Total Number of Workers	1 – 49	686	277	42	2	-	1	-	1	-	2	-	1	-	-	1
	50 – 299	282	126	27	1	-	-	-	-	1	-	-	-	-	-	-
	300 – 999	74	37	14	5	2	3	-	-	-	1	1	-	-	-	-
	1,000 or more	33	20	1	-	-	-	-	-	-	-	-	-	-	-	-
	Unknown	14	0	0	-	-	-	-	-	-	-	-	-	-	-	-
By Area	Seoul	266	108	19	2	1	-	-	1	-	1	1	-	-	-	-
	Busan	13	3	0	-	-	-	-	-	-	-	-	-	-	-	-
	Incheon	32	13	4	-	-	-	-	-	-	-	-	-	-	-	-
	Daegu	15	9	4	-	-	-	-	-	-	-	-	-	-	-	-
	Gwangju	8	5	1	-	-	-	-	-	-	-	-	-	-	-	-
	Daejeon	87	45	5	1	-	-	-	-	1	1	-	1	-	-	-
	Ulsan	9	5	0	-	-	-	-	-	-	-	-	-	-	-	-
	Sejong	4	1	0	-	-	-	-	-	-	-	-	-	-	-	-
	Gyeonggi	358	164	28	1	-	1	-	-	-	1	-	-	-	-	1
	Gangwon	45	21	5	-	-	-	-	-	-	-	-	-	-	-	-
	Chungbuk	85	29	6	1	-	1	-	-	-	-	-	-	-	-	-
	Chungnam	41	15	3	-	-	-	-	-	-	-	-	-	-	-	-
	Jeonbuk	32	9	5	3	1	2	-	-	-	-	-	-	-	-	-
	Jeonnam	34	11	2	-	-	-	-	-	-	-	-	-	-	-	-
	Gyeongbuk	25	5	0	-	-	-	-	-	-	-	-	-	-	-	-
	Gyeongnam	28	11	1	-	-	-	-	-	-	-	-	-	-	-	-
	Jeju	7	6	1	-	-	-	-	-	-	-	-	-	-	-	-

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		**1,089**	**460**	**84**	**23**	**4**	**8**	**5**	**2**	**4**	**4**	**1**	**-**	**1**	**1**	**1**
Core Industries	Biopharmaceutical	362	181	41	8	4	4	-	-	-	1	1	-	-	-	-
	Biochemical and Bioenergy	201	61	7	4	-	2	2	-	-	-	-	-	-	-	-
	Biofood	168	66	12	5	-	1	1	1	2	2	-	-	1	1	-
	Bioenvironmental	56	15	2	2	-	-	-	-	2	-	-	-	-	-	-
	Biomedical Equipment	121	55	10	3	-	-	2	1	-	-	-	-	-	-	-
	Bioinstrument and Bioequipment	55	15	0	-	-	-	-	-	-	-	-	-	-	-	-
	Bioresource	15	6	1	-	-	-	-	-	-	-	-	-	-	-	-
	Bioservice	111	61	11	1	-	1	-	-	-	1	-	-	-	-	1
Total Number of Workers	1 – 49	686	277	42	16	2	6	3	2	3	3	1	-	1	1	-
	50 – 299	282	126	27	5	1	2	2	-	-	-	-	-	-	-	-
	300 – 999	74	37	14	2	1	-	-	-	1	1	-	-	-	-	1
	1,000 or more	33	20	1	-	-	-	-	-	-	-	-	-	-	-	-
	Unknown	14	0	0	-	-	-	-	-	-	-	-	-	-	-	-
By Area	Seoul	266	108	19	6	-	3	1	-	2	1	-	-	-	-	1
	Busan	13	3	0	-	-	-	-	-	-	-	-	-	-	-	-
	Incheon	32	13	4	2	-	1	1	-	-	-	-	-	-	-	-
	Daegu	15	9	4	-	-	-	-	-	-	-	-	-	-	-	-
	Gwangju	8	5	1	1	-	-	1	-	-	1	-	-	1	-	-
	Daejeon	87	45	5	1	1	-	-	-	-	-	-	-	-	-	-
	Ulsan	9	5	0	-	-	-	-	-	-	-	-	-	-	-	-
	Sejong	4	1	0	-	-	-	-	-	-	-	-	-	-	-	-
	Gyeonggi	358	164	28	6	3	1	1	1	-	1	1	-	-	-	-
	Gangwon	45	21	5	1	-	1	-	-	-	-	-	-	-	-	-
	Chungbuk	85	29	6	3	-	1	1	-	1	-	-	-	-	-	-
	Chungnam	41	15	3	2	-	-	-	1	1	1	-	-	-	1	-
	Jeonbuk	32	9	5	1	-	1	-	-	-	-	-	-	-	-	-
	Jeonnam	34	11	2	-	-	-	-	-	-	-	-	-	-	-	-
	Gyeongbuk	25	5	0	-	-	-	-	-	-	-	-	-	-	-	-
	Gyeongnam	28	11	1	-	-	-	-	-	-	-	-	-	-	-	-
	Jeju	7	6	1	-	-	-	-	-	-	-	-	-	-	-	-

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		**1,089**	**460**	**84**	**6**	**5**	**1**	**-**	**-**	**-**	**1**	**-**	**1**	**-**	**-**	**-**
Core Industries	Biopharmaceutical	362	181	41	3	2	1	-	-	-	1	-	1	-	-	-
	Biochemical and Bioenergy	201	61	7	1	1	-	-	-	-	-	-	-	-	-	-
	Biofood	168	66	12	-	-	-	-	-	-	-	-	-	-	-	-
	Bioenvironmental	56	15	2	-	-	-	-	-	-	-	-	-	-	-	-
	Biomedical Equipment	121	55	10	-	-	-	-	-	-	-	-	-	-	-	-
	Bioinstrument and Bioequipment	55	15	0	-	-	-	-	-	-	-	-	-	-	-	-
	Bioresource	15	6	1	-	-	-	-	-	-	-	-	-	-	-	-
	Bioservice	111	61	11	2	2	-	-	-	-	-	-	-	-	-	-
Total Number of Workers	1 – 49	686	277	42	2	2	-	-	-	-	-	-	-	-	-	-
	50 – 299	282	126	27	4	3	1	-	-	-	-	-	-	-	-	-
	300 – 999	74	37	14	-	-	-	-	-	-	1	-	1	-	-	-
	1,000 or more	33	20	1	-	-	-	-	-	-	-	-	-	-	-	-
	Unknown	14	0	0	-	-	-	-	-	-	-	-	-	-	-	-
By Area	Seoul	266	108	19	1	-	1	-	-	-	-	-	-	-	-	-
	Busan	13	3	0	-	-	-	-	-	-	-	-	-	-	-	-
	Incheon	32	13	4	-	-	-	-	-	-	-	-	-	-	-	-
	Daegu	15	9	4	-	-	-	-	-	-	-	-	-	-	-	-
	Gwangju	8	5	1	-	-	-	-	-	-	-	-	-	-	-	-
	Daejeon	87	45	5	-	-	-	-	-	-	-	-	-	-	-	-
	Ulsan	9	5	0	-	-	-	-	-	-	-	-	-	-	-	-
	Sejong	4	1	0	-	-	-	-	-	-	-	-	-	-	-	-
	Gyeonggi	358	164	28	4	4	-	-	-	-	1	-	1	-	-	-
	Gangwon	45	21	5	-	-	-	-	-	-	-	-	-	-	-	-
	Chungbuk	85	29	6	-	-	-	-	-	-	-	-	-	-	-	-
	Chungnam	41	15	3	-	-	-	-	-	-	-	-	-	-	-	-
	Jeonbuk	32	9	5	1	1	-	-	-	-	-	-	-	-	-	-
	Jeonnam	34	11	2	-	-	-	-	-	-	-	-	-	-	-	-
	Gyeongbuk	25	5	0	-	-	-	-	-	-	-	-	-	-	-	-
	Gyeongnam	28	11	1	-	-	-	-	-	-	-	-	-	-	-	-
	Jeju	7	6	1	-	-	-	-	-	-	-	-	-	-	-	-

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		**1,089**	**460**	**84**	**142**	**13**	**8**	**111**	**7**	**3**	**2**	**1**	**-**	**1**	**-**	**-**
Core Industries	Biopharmaceutical	362	181	41	122	9	5	104	4	-	2	1	-	1	-	-
	Biochemical and Bioenergy	201	61	7	4	1	1	2	-	-	-	-	-	-	-	-
	Biofood	168	66	12	2	1	-	1	-	-	-	-	-	-	-	-
	Bioenvironmental	56	15	2	1	-	-	-	-	1	-	-	-	-	-	-
	Biomedical Equipment	121	55	10	7	2	1	4	-	-	-	-	-	-	-	-
	Bioinstrument and Bioequipment	55	15	0	-	-	-	-	-	-	-	-	-	-	-	-
	Bioresource	15	6	1	1	-	1	-	-	-	-	-	-	-	-	-
	Bioservice	111	61	11	5	-	-	-	3	2	-	-	-	-	-	-
Total Number of Workers	1 – 49	686	277	42	22	7	4	6	3	2	1	-	-	1	-	-
	50 – 299	282	126	27	13	1	3	5	4	-	1	1	-	-	-	-
	300 – 999	74	37	14	107	5	1	100	-	1	-	-	-	-	-	-
	1,000 or more	33	20	1	-	-	-	-	-	-	-	-	-	-	-	-
	Unknown	14	0	0	-	-	-	-	-	-	-	-	-	-	-	-
By Area	Seoul	266	108	19	4	-	1	2	-	1	1	1	-	-	-	-
	Busan	13	3	0	-	-	-	-	-	-	-	-	-	-	-	-
	Incheon	32	13	4	5	-	1	2	2	-	-	-	-	-	-	-
	Daegu	15	9	4	1	-	-	1	-	-	1	-	-	1	-	-
	Gwangju	8	5	1	-	-	-	-	-	-	-	-	-	-	-	-
	Daejeon	87	45	5	1	-	1	-	-	-	-	-	-	-	-	-
	Ulsan	9	5	0	-	-	-	-	-	-	-	-	-	-	-	-
	Sejong	4	1	0	-	-	-	-	-	-	-	-	-	-	-	-
	Gyeonggi	358	164	28	120	9	1	105	3	2	-	-	-	-	-	-
	Gangwon	45	21	5	3	2	1	-	-	-	-	-	-	-	-	-
	Chungbuk	85	29	6	3	1	1	1	-	-	-	-	-	-	-	-
	Chungnam	41	15	3	1	1	-	-	-	-	-	-	-	-	-	-
	Jeonbuk	32	9	5	2	-	1	-	1	-	-	-	-	-	-	-
	Jeonnam	34	11	2	1	-	1	-	-	-	-	-	-	-	-	-
	Gyeongbuk	25	5	0	-	-	-	-	-	-	-	-	-	-	-	-
	Gyeongnam	28	11	1	-	-	-	-	-	-	-	-	-	-	-	-
	Jeju	7	6	1	1	-	-	-	1	-	-	-	-	-	-	-

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		**1,089**	**460**	**84**	**10**	**2**	**7**	**1**	**-**	**-**	**1**	**-**	**1**	**-**	**-**	**-**
Core Industries	Biopharmaceutical	362	181	41	3	2	1	-	-	-	-	-	-	-	-	-
	Biochemical and Bioenergy	201	61	7	-	-	-	-	-	-	-	-	-	-	-	-
	Biofood	168	66	12	1	-	1	-	-	-	-	-	-	-	-	-
	Bioenvironmental	56	15	2	-	-	-	-	-	-	-	-	-	-	-	-
	Biomedical Equipment	121	55	10	5	-	4	1	-	-	-	-	-	-	-	-
	Bioinstrument and Bioequipment	55	15	0	-	-	-	-	-	-	-	-	-	-	-	-
	Bioresource	15	6	1	-	-	-	-	-	-	-	-	-	-	-	-
	Bioservice	111	61	11	1	-	1	-	-	-	1	-	1	-	-	-
Total Number of Workers	1 – 49	686	277	42	1	-	1	-	-	-	-	-	-	-	-	-
	50 – 299	282	126	27	7	-	6	1	-	-	1	-	1	-	-	-
	300 – 999	74	37	14	2	2	-	-	-	-	-	-	-	-	-	-
	1,000 or more	33	20	1	-	-	-	-	-	-	-	-	-	-	-	-
	Unknown	14	0	0	-	-	-	-	-	-	-	-	-	-	-	-
By Area	Seoul	266	108	19	-	-	-	-	-	-	-	-	-	-	-	-
	Busan	13	3	0	-	-	-	-	-	-	-	-	-	-	-	-
	Incheon	32	13	4	-	-	-	-	-	-	-	-	-	-	-	-
	Daegu	15	9	4	-	-	-	-	-	-	-	-	-	-	-	-
	Gwangju	8	5	1	-	-	-	-	-	-	-	-	-	-	-	-
	Daejeon	87	45	5	-	-	-	-	-	-	-	-	-	-	-	-
	Ulsan	9	5	0	-	-	-	-	-	-	-	-	-	-	-	-
	Sejong	4	1	0	-	-	-	-	-	-	-	-	-	-	-	-
	Gyeonggi	358	164	28	6	2	3	1	-	-	1	-	1	-	-	-
	Gangwon	45	21	5	-	-	-	-	-	-	-	-	-	-	-	-
	Chungbuk	85	29	6	4	-	4	-	-	-	-	-	-	-	-	-
	Chungnam	41	15	3	-	-	-	-	-	-	-	-	-	-	-	-
	Jeonbuk	32	9	5	-	-	-	-	-	-	-	-	-	-	-	-
	Jeonnam	34	11	2	-	-	-	-	-	-	-	-	-	-	-	-
	Gyeongbuk	25	5	0	-	-	-	-	-	-	-	-	-	-	-	-
	Gyeongnam	28	11	1	-	-	-	-	-	-	-	-	-	-	-	-
	Jeju	7	6	1	-	-	-	-	-	-	-	-	-	-	-	-

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

Classification		No. of Companies	With Cooperative Relationships	No. of Respondents (Technical Manpower Exchange)	Domestic					
					Total	Basic Research	Experimental	Prototype	Product Development	Commercialization
Total		**1,089**	**460**	**28**	**59**	**14**	**24**	**7**	**9**	**5**
Core Industries	Biopharmaceutical	362	181	10	21	9	8	1	2	1
	Biochemical and Bioenergy	201	61	4	17	-	8	5	4	-
	Biofood	168	66	4	3	2	1	-	-	-
	Bioenvironmental	56	15	0	-	-	-	-	-	-
	Biomedical Equipment	121	55	5	13	1	5	1	3	3
	Bioinstrument and Bioequipment	55	15	1	1	-	1	-	-	-
	Bioresource	15	6	0	-	-	-	-	-	-
	Bioservice	111	61	4	4	2	1	-	-	1
Total Number of Workers	1 – 49	686	277	15	32	8	15	2	3	4
	50 – 299	282	126	6	6	3	1	1	1	-
	300 – 999	74	37	6	9	3	4	-	1	1
	1,000 or more	33	20	1	12	-	4	4	4	-
	Unknown	14	0	0	-	-	-	-	-	-
By Area	Seoul	266	108	8	16	6	4	2	3	1
	Busan	13	3	0	-	-	-	-	-	-
	Incheon	32	13	3	2	-	-	1	-	1
	Daegu	15	9	1	1	-	1	-	-	-
	Gwangju	8	5	0	-	-	-	-	-	-
	Daejeon	87	45	4	19	-	11	4	4	-
	Ulsan	9	5	0	-	-	-	-	-	-
	Sejong	4	1	0	-	-	-	-	-	-
	Gyeonggi	358	164	9	19	7	8	-	2	2
	Gangwon	45	21	1	1	1	-	-	-	-
	Chungbuk	85	29	1	1	-	-	-	-	1
	Chungnam	41	15	0	-	-	-	-	-	-
	Jeonbuk	32	9	0	-	-	-	-	-	-
	Jeonnam	34	11	1	-	-	-	-	-	-
	Gyeongbuk	25	5	0	-	-	-	-	-	-
	Gyeongnam	28	11	0	-	-	-	-	-	-
	Jeju	7	6	0	-	-	-	-	-	-

Classification		No. of Companies	With Cooperative Relationship	No. of Respondents (Technical Manpower Exchange)	Overseas					
					Total	Basic Research	Experimental	Prototype	Product Development	Commercialization
Total		**1,089**	**460**	**28**	**9**	**1**	**5**	**1**	**1**	**1**
Core Industries	Biopharmaceutical	362	181	10	4	1	2	1	-	-
	Biochemical and Bioenergy	201	61	4	-	-	-	-	-	-
	Biofood	168	66	4	1	-	1	-	-	-
	Bioenvironmental	56	15	0	-	-	-	-	-	-
	Biomedical Equipment	121	55	5	2	-	-	-	1	1
	Bioinstrument and Bioequipment	55	15	1	1	-	1	-	-	-
	Bioresource	15	6	0	-	-	-	-	-	-
	Bioservice	111	61	4	1	-	1	-	-	-
Total Number of Workers	1 – 49	686	277	15	5	-	2	1	1	1
	50 – 299	282	126	6	3	1	2	-	-	-
	300 – 999	74	37	6	1	-	1	-	-	-
	1,000 or more	33	20	1	-	-	-	-	-	-
	Unknown	14	0	0	-	-	-	-	-	-
By Area	Seoul	266	108	8	2	1	1	-	-	-
	Busan	13	3	0	-	-	-	-	-	-
	Incheon	32	13	3	1	-	1	-	-	-
	Daegu	15	9	1	-	-	-	-	-	-
	Gwangju	8	5	0	-	-	-	-	-	-
	Daejeon	87	45	4	1	-	1	-	-	-
	Ulsan	9	5	0	-	-	-	-	-	-
	Sejong	4	1	0	-	-	-	-	-	-
	Gyeonggi	358	164	9	4	-	2	-	1	1
	Gangwon	45	21	1	-	-	-	-	-	-
	Chungbuk	85	29	1	-	-	-	-	-	-
	Chungnam	41	15	0	-	-	-	-	-	-
	Jeonbuk	32	9	0	-	-	-	-	-	-
	Jeonnam	34	11	1	1	-	-	1	-	-
	Gyeongbuk	25	5	0	-	-	-	-	-	-
	Gyeongnam	28	11	0	-	-	-	-	-	-
	Jeju	7	6	0	-	-	-	-	-	-

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		**1,089**	**460**	**28**	**8**	**2**	**1**	**1**	**2**	**2**	**2**	**-**	**-**	**-**	**1**	**1**
Core Industries	Biopharmaceutical	362	181	10	-	-	-	-	-	-	-	-	-	-	-	-
	Biochemical and Bioenergy	201	61	4	-	-	-	-	-	-	-	-	-	-	-	-
	Biofood	168	66	4	1	1	-	-	-	-	-	-	-	-	-	-
	Bioenvironmental	56	15	0	-	-	-	-	-	-	-	-	-	-	-	-
	Biomedical Equipment	121	55	5	6	1	1	1	2	1	2	-	-	-	1	1
	Bioinstrument and Bioequipment	55	15	1	-	-	-	-	-	-	-	-	-	-	-	-
	Bioresource	15	6	0	-	-	-	-	-	-	-	-	-	-	-	-
	Bioservice	111	61	4	1	-	-	-	-	1	-	-	-	-	-	-
Total Number of Workers	1 – 49	686	277	15	5	-	1	-	2	2	2	-	-	-	1	1
	50 – 299	282	126	6	3	2	-	1	-	-	-	-	-	-	-	-
	300 – 999	74	37	6	-	-	-	-	-	-	-	-	-	-	-	-
	1,000 or more	33	20	1	-	-	-	-	-	-	-	-	-	-	-	-
	Unknown	14	0	0	-	-	-	-	-	-	-	-	-	-	-	-
By Area	Seoul	266	108	8	2	1	-	1	-	-	-	-	-	-	-	-
	Busan	13	3	0	-	-	-	-	-	-	-	-	-	-	-	-
	Incheon	32	13	3	-	-	-	-	-	-	-	-	-	-	-	-
	Daegu	15	9	1	-	-	-	-	-	-	-	-	-	-	-	-
	Gwangju	8	5	0	-	-	-	-	-	-	-	-	-	-	-	-
	Daejeon	87	45	4	1	-	1	-	-	-	-	-	-	-	-	-
	Ulsan	9	5	0	-	-	-	-	-	-	-	-	-	-	-	-
	Sejong	4	1	0	-	-	-	-	-	-	-	-	-	-	-	-
	Gyeonggi	358	164	9	4	-	-	-	2	2	2	-	-	-	1	1
	Gangwon	45	21	1	1	1	-	-	-	-	-	-	-	-	-	-
	Chungbuk	85	29	1	-	-	-	-	-	-	-	-	-	-	-	-
	Chungnam	41	15	0	-	-	-	-	-	-	-	-	-	-	-	-
	Jeonbuk	32	9	0	-	-	-	-	-	-	-	-	-	-	-	-
	Jeonnam	34	11	1	-	-	-	-	-	-	-	-	-	-	-	-
	Gyeongbuk	25	5	0	-	-	-	-	-	-	-	-	-	-	-	-
	Gyeongnam	28	11	0	-	-	-	-	-	-	-	-	-	-	-	-
	Jeju	7	6	0	-	-	-	-	-	-	-	-	-	-	-	-

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		**1,089**	**460**	**28**	**3**	**-**	**2**	**-**	**1**	**-**	**1**	**-**	**-**	**1**	**-**	**-**
Core Industries	Biopharmaceutical	362	181	10	2	-	1	-	1	-	1	-	-	1	-	-
	Biochemical and Bioenergy	201	61	4	1	-	1	-	-	-	-	-	-	-	-	-
	Biofood	168	66	4	-	-	-	-	-	-	-	-	-	-	-	-
	Bioenvironmental	56	15	0	-	-	-	-	-	-	-	-	-	-	-	-
	Biomedical Equipment	121	55	5	-	-	-	-	-	-	-	-	-	-	-	-
	Bioinstrument and Bioequipment	55	15	1	-	-	-	-	-	-	-	-	-	-	-	-
	Bioresource	15	6	0	-	-	-	-	-	-	-	-	-	-	-	-
	Bioservice	111	61	4	-	-	-	-	-	-	-	-	-	-	-	-
Total Number of Workers	1 – 49	686	277	15	1	-	1	-	-	-	1	-	-	1	-	-
	50 – 299	282	126	6	-	-	-	-	-	-	-	-	-	-	-	-
	300 – 999	74	37	6	2	-	1	-	1	-	-	-	-	-	-	-
	1,000 or more	33	20	1	-	-	-	-	-	-	-	-	-	-	-	-
	Unknown	14	0	0	-	-	-	-	-	-	-	-	-	-	-	-
By Area	Seoul	266	108	8	2	-	1	-	1	-	-	-	-	-	-	-
	Busan	13	3	0	-	-	-	-	-	-	-	-	-	-	-	-
	Incheon	32	13	3	-	-	-	-	-	-	-	-	-	-	-	-
	Daegu	15	9	1	-	-	-	-	-	-	-	-	-	-	-	-
	Gwangju	8	5	0	-	-	-	-	-	-	-	-	-	-	-	-
	Daejeon	87	45	4	-	-	-	-	-	-	-	-	-	-	-	-
	Ulsan	9	5	0	-	-	-	-	-	-	-	-	-	-	-	-
	Sejong	4	1	0	-	-	-	-	-	-	-	-	-	-	-	-
	Gyeonggi	358	164	9	1	-	1	-	-	-	-	-	-	-	-	-
	Gangwon	45	21	1	-	-	-	-	-	-	-	-	-	-	-	-
	Chungbuk	85	29	1	-	-	-	-	-	-	-	-	-	-	-	-
	Chungnam	41	15	0	-	-	-	-	-	-	-	-	-	-	-	-
	Jeonbuk	32	9	0	-	-	-	-	-	-	-	-	-	-	-	-
	Jeonnam	34	11	1	-	-	-	-	-	-	1	-	-	1	-	-
	Gyeongbuk	25	5	0	-	-	-	-	-	-	-	-	-	-	-	-
	Gyeongnam	28	11	0	-	-	-	-	-	-	-	-	-	-	-	-
	Jeju	7	6	0	-	-	-	-	-	-	-	-	-	-	-	-

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		**1,089**	**460**	**28**	**-**	**-**	**-**	**-**	**-**	**-**	**1**	**-**	**1**	**-**	**-**	**-**
Core Industries	Biopharmaceutical	362	181	10	-	-	-	-	-	-	1	-	1	-	-	-
	Biochemical and Bioenergy	201	61	4	-	-	-	-	-	-	-	-	-	-	-	-
	Biofood	168	66	4	-	-	-	-	-	-	-	-	-	-	-	-
	Bioenvironmental	56	15	0	-	-	-	-	-	-	-	-	-	-	-	-
	Biomedical Equipment	121	55	5	-	-	-	-	-	-	-	-	-	-	-	-
	Bioinstrument and Bioequipment	55	15	1	-	-	-	-	-	-	-	-	-	-	-	-
	Bioresource	15	6	0	-	-	-	-	-	-	-	-	-	-	-	-
	Bioservice	111	61	4	-	-	-	-	-	-	-	-	-	-	-	-
Total Number of Workers	1 – 49	686	277	15	-	-	-	-	-	-	-	-	-	-	-	-
	50 – 299	282	126	6	-	-	-	-	-	-	1	-	1	-	-	-
	300 – 999	74	37	6	-	-	-	-	-	-	-	-	-	-	-	-
	1,000 or more	33	20	1	-	-	-	-	-	-	-	-	-	-	-	-
	Unknown	14	0	0	-	-	-	-	-	-	-	-	-	-	-	-
By Area	Seoul	266	108	8	-	-	-	-	-	-	1	-	1	-	-	-
	Busan	13	3	0	-	-	-	-	-	-	-	-	-	-	-	-
	Incheon	32	13	3	-	-	-	-	-	-	-	-	-	-	-	-
	Daegu	15	9	1	-	-	-	-	-	-	-	-	-	-	-	-
	Gwangju	8	5	0	-	-	-	-	-	-	-	-	-	-	-	-
	Daejeon	87	45	4	-	-	-	-	-	-	-	-	-	-	-	-
	Ulsan	9	5	0	-	-	-	-	-	-	-	-	-	-	-	-
	Sejong	4	1	0	-	-	-	-	-	-	-	-	-	-	-	-
	Gyeonggi	358	164	9	-	-	-	-	-	-	-	-	-	-	-	-
	Gangwon	45	21	1	-	-	-	-	-	-	-	-	-	-	-	-
	Chungbuk	85	29	1	-	-	-	-	-	-	-	-	-	-	-	-
	Chungnam	41	15	0	-	-	-	-	-	-	-	-	-	-	-	-
	Jeonbuk	32	9	0	-	-	-	-	-	-	-	-	-	-	-	-
	Jeonnam	34	11	1	-	-	-	-	-	-	-	-	-	-	-	-
	Gyeongbuk	25	5	0	-	-	-	-	-	-	-	-	-	-	-	-
	Gyeongnam	28	11	0	-	-	-	-	-	-	-	-	-	-	-	-
	Jeju	7	6	0	-	-	-	-	-	-	-	-	-	-	-	-

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		**1,089**	**460**	**28**	**17**	**2**	**9**	**2**	**3**	**1**	**-**	**-**	**-**	**-**	**-**	**-**
Core Industries	Biopharmaceutical	362	181	10	-	-	-	-	-	-	-	-	-	-	-	-
	Biochemical and Bioenergy	201	61	4	9	-	5	2	2	-	-	-	-	-	-	-
	Biofood	168	66	4	-	-	-	-	-	-	-	-	-	-	-	-
	Bioenvironmental	56	15	0	-	-	-	-	-	-	-	-	-	-	-	-
	Biomedical Equipment	121	55	5	6	-	4	-	1	1	-	-	-	-	-	-
	Bioinstrument and Bioequipment	55	15	1	-	-	-	-	-	-	-	-	-	-	-	-
	Bioresource	15	6	0	-	-	-	-	-	-	-	-	-	-	-	-
	Bioservice	111	61	4	2	2	-	-	-	-	-	-	-	-	-	-
Total Number of Workers	1 – 49	686	277	15	9	2	7	-	-	-	-	-	-	-	-	-
	50 – 299	282	126	6	1	-	-	-	1	-	-	-	-	-	-	-
	300 – 999	74	37	6	1	-	-	-	-	1	-	-	-	-	-	-
	1,000 or more	33	20	1	6	-	2	2	2	-	-	-	-	-	-	-
	Unknown	14	0	0	-	-	-	-	-	-	-	-	-	-	-	-
By Area	Seoul	266	108	8	4	2	1	-	1	-	-	-	-	-	-	-
	Busan	13	3	0	-	-	-	-	-	-	-	-	-	-	-	-
	Incheon	32	13	3	-	-	-	-	-	-	-	-	-	-	-	-
	Daegu	15	9	1	-	-	-	-	-	-	-	-	-	-	-	-
	Gwangju	8	5	0	-	-	-	-	-	-	-	-	-	-	-	-
	Daejeon	87	45	4	12	-	8	2	2	-	-	-	-	-	-	-
	Ulsan	9	5	0	-	-	-	-	-	-	-	-	-	-	-	-
	Sejong	4	1	0	-	-	-	-	-	-	-	-	-	-	-	-
	Gyeonggi	358	164	9	-	-	-	-	-	-	-	-	-	-	-	-
	Gangwon	45	21	1	-	-	-	-	-	-	-	-	-	-	-	-
	Chungbuk	85	29	1	1	-	-	-	-	1	-	-	-	-	-	-
	Chungnam	41	15	0	-	-	-	-	-	-	-	-	-	-	-	-
	Jeonbuk	32	9	0	-	-	-	-	-	-	-	-	-	-	-	-
	Jeonnam	34	11	1	-	-	-	-	-	-	-	-	-	-	-	-
	Gyeongbuk	25	5	0	-	-	-	-	-	-	-	-	-	-	-	-
	Gyeongnam	28	11	0	-	-	-	-	-	-	-	-	-	-	-	-
	Jeju	7	6	0	-	-	-	-	-	-	-	-	-	-	-	-

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		**1,089**	**460**	**28**	**6**	**-**	**2**	**2**	**2**	**-**	**-**	**-**	**-**	**-**	**-**	**-**
Core Industries	Biopharmaceutical	362	181	10	-	-	-	-	-	-	-	-	-	-	-	-
	Biochemical and Bioenergy	201	61	4	6	-	2	2	2	-	-	-	-	-	-	-
	Biofood	168	66	4	-	-	-	-	-	-	-	-	-	-	-	-
	Bioenvironmental	56	15	0	-	-	-	-	-	-	-	-	-	-	-	-
	Biomedical Equipment	121	55	5	-	-	-	-	-	-	-	-	-	-	-	-
	Bioinstrument and Bioequipment	55	15	1	-	-	-	-	-	-	-	-	-	-	-	-
	Bioresource	15	6	0	-	-	-	-	-	-	-	-	-	-	-	-
	Bioservice	111	61	4	-	-	-	-	-	-	-	-	-	-	-	-
Total Number of Workers	1 – 49	686	277	15	-	-	-	-	-	-	-	-	-	-	-	-
	50 – 299	282	126	6	-	-	-	-	-	-	-	-	-	-	-	-
	300 – 999	74	37	6	-	-	-	-	-	-	-	-	-	-	-	-
	1,000 or more	33	20	1	6	-	2	2	2	-	-	-	-	-	-	-
	Unknown	14	0	0	-	-	-	-	-	-	-	-	-	-	-	-
By Area	Seoul	266	108	8	-	-	-	-	-	-	-	-	-	-	-	-
	Busan	13	3	0	-	-	-	-	-	-	-	-	-	-	-	-
	Incheon	32	13	3	-	-	-	-	-	-	-	-	-	-	-	-
	Daegu	15	9	1	-	-	-	-	-	-	-	-	-	-	-	-
	Gwangju	8	5	0	-	-	-	-	-	-	-	-	-	-	-	-
	Daejeon	87	45	4	6	-	2	2	2	-	-	-	-	-	-	-
	Ulsan	9	5	0	-	-	-	-	-	-	-	-	-	-	-	-
	Sejong	4	1	0	-	-	-	-	-	-	-	-	-	-	-	-
	Gyeonggi	358	164	9	-	-	-	-	-	-	-	-	-	-	-	-
	Gangwon	45	21	1	-	-	-	-	-	-	-	-	-	-	-	-
	Chungbuk	85	29	1	-	-	-	-	-	-	-	-	-	-	-	-
	Chungnam	41	15	0	-	-	-	-	-	-	-	-	-	-	-	-
	Jeonbuk	32	9	0	-	-	-	-	-	-	-	-	-	-	-	-
	Jeonnam	34	11	1	-	-	-	-	-	-	-	-	-	-	-	-
	Gyeongbuk	25	5	0	-	-	-	-	-	-	-	-	-	-	-	-
	Gyeongnam	28	11	0	-	-	-	-	-	-	-	-	-	-	-	-
	Jeju	7	6	0	-	-	-	-	-	-	-	-	-	-	-	-

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		**1,089**	**460**	**28**	**16**	**5**	**6**	**2**	**1**	**2**	**5**	**1**	**4**	**-**	**-**	**-**
Core Industries	Biopharmaceutical	362	181	10	10	4	3	1	1	1	2	1	1	-	-	-
	Biochemical and Bioenergy	201	61	4	1	-	-	1	-	-	-	-	-	-	-	-
	Biofood	168	66	4	2	1	1	-	-	-	1	-	1	-	-	-
	Bioenvironmental	56	15	0	-	-	-	-	-	-	-	-	-	-	-	-
	Biomedical Equipment	121	55	5	1	-	-	-	-	1	-	-	-	-	-	-
	Bioinstrument and Bioequipment	55	15	1	1	-	1	-	-	-	1	-	1	-	-	-
	Bioresource	15	6	0	-	-	-	-	-	-	-	-	-	-	-	-
	Bioservice	111	61	4	1	-	1	-	-	-	1	-	1	-	-	-
Total Number of Workers	1 – 49	686	277	15	9	1	3	2	1	2	2	-	2	-	-	-
	50 – 299	282	126	6	2	1	1	-	-	-	2	1	1	-	-	-
	300 – 999	74	37	6	5	3	2	-	-	-	1	-	1	-	-	-
	1,000 or more	33	20	1	-	-	-	-	-	-	-	-	-	-	-	-
	Unknown	14	0	0	-	-	-	-	-	-	-	-	-	-	-	-
By Area	Seoul	266	108	8	6	1	2	1	1	1	1	1	-	-	-	-
	Busan	13	3	0	-	-	-	-	-	-	-	-	-	-	-	-
	Incheon	32	13	3	2	-	-	1	-	1	1	-	1	-	-	-
	Daegu	15	9	1	1	-	1	-	-	-	-	-	-	-	-	-
	Gwangju	8	5	0	-	-	-	-	-	-	-	-	-	-	-	-
	Daejeon	87	45	4	-	-	-	-	-	-	1	-	1	-	-	-
	Ulsan	9	5	0	-	-	-	-	-	-	-	-	-	-	-	-
	Sejong	4	1	0	-	-	-	-	-	-	-	-	-	-	-	-
	Gyeonggi	358	164	9	7	4	3	-	-	-	2	-	2	-	-	-
	Gangwon	45	21	1	-	-	-	-	-	-	-	-	-	-	-	-
	Chungbuk	85	29	1	-	-	-	-	-	-	-	-	-	-	-	-
	Chungnam	41	15	0	-	-	-	-	-	-	-	-	-	-	-	-
	Jeonbuk	32	9	0	-	-	-	-	-	-	-	-	-	-	-	-
	Jeonnam	34	11	1	-	-	-	-	-	-	-	-	-	-	-	-
	Gyeongbuk	25	5	0	-	-	-	-	-	-	-	-	-	-	-	-
	Gyeongnam	28	11	0	-	-	-	-	-	-	-	-	-	-	-	-
	Jeju	7	6	0	-	-	-	-	-	-	-	-	-	-	-	-

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		**1,089**	**460**	**28**	**9**	**5**	**4**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**
Core Industries	Biopharmaceutical	362	181	10	9	5	4	-	-	-	-	-	-	-	-	-
	Biochemical and Bioenergy	201	61	4	-	-	-	-	-	-	-	-	-	-	-	-
	Biofood	168	66	4	-	-	-	-	-	-	-	-	-	-	-	-
	Bioenvironmental	56	15	0	-	-	-	-	-	-	-	-	-	-	-	-
	Biomedical Equipment	121	55	5	-	-	-	-	-	-	-	-	-	-	-	-
	Bioinstrument and Bioequipment	55	15	1	-	-	-	-	-	-	-	-	-	-	-	-
	Bioresource	15	6	0	-	-	-	-	-	-	-	-	-	-	-	-
	Bioservice	111	61	4	-	-	-	-	-	-	-	-	-	-	-	-
Total Number of Workers	1 – 49	686	277	15	8	5	3	-	-	-	-	-	-	-	-	-
	50 – 299	282	126	6	-	-	-	-	-	-	-	-	-	-	-	-
	300 – 999	74	37	6	1	-	1	-	-	-	-	-	-	-	-	-
	1,000 or more	33	20	1	-	-	-	-	-	-	-	-	-	-	-	-
	Unknown	14	0	0	-	-	-	-	-	-	-	-	-	-	-	-
By Area	Seoul	266	108	8	2	2	-	-	-	-	-	-	-	-	-	-
	Busan	13	3	0	-	-	-	-	-	-	-	-	-	-	-	-
	Incheon	32	13	3	-	-	-	-	-	-	-	-	-	-	-	-
	Daegu	15	9	1	-	-	-	-	-	-	-	-	-	-	-	-
	Gwangju	8	5	0	-	-	-	-	-	-	-	-	-	-	-	-
	Daejeon	87	45	4	-	-	-	-	-	-	-	-	-	-	-	-
	Ulsan	9	5	0	-	-	-	-	-	-	-	-	-	-	-	-
	Sejong	4	1	0	-	-	-	-	-	-	-	-	-	-	-	-
	Gyeonggi	358	164	9	7	3	4	-	-	-	-	-	-	-	-	-
	Gangwon	45	21	1	-	-	-	-	-	-	-	-	-	-	-	-
	Chungbuk	85	29	1	-	-	-	-	-	-	-	-	-	-	-	-
	Chungnam	41	15	0	-	-	-	-	-	-	-	-	-	-	-	-
	Jeonbuk	32	9	0	-	-	-	-	-	-	-	-	-	-	-	-
	Jeonnam	34	11	1	-	-	-	-	-	-	-	-	-	-	-	-
	Gyeongbuk	25	5	0	-	-	-	-	-	-	-	-	-	-	-	-
	Gyeongnam	28	11	0	-	-	-	-	-	-	-	-	-	-	-	-
	Jeju	7	6	0	-	-	-	-	-	-	-	-	-	-	-	-

<Table 5> Size of Sales and Import in Bioindustry

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

Industry / Category		No. of Respondents (Multiple Responses)	Domestic Sales	Export Amount	Total
			Total	Total	Total
Total		**1,267**	**9,946,826**	**13,518,899**	**23,465,725**
Industry with Sales Generated	Biopharmaceutical	190	1,889,422	3,740,830	5,630,252
	Biochemical and Bioenergy	302	3,241,308	400,359	3,641,667
	Biofood	271	1,821,489	2,830,911	4,652,400
	Bioenvironmental	58	71,896	204	72,100
	Biomedical Equipment	167	1,815,253	3,861,487	5,676,740
	Bioinstrument and Bioequipment	80	149,436	53,859	203,295
	Bioresource	17	83,026	11,504	94,530
	Bioservice	182	874,996	2,619,747	3,494,743
Biopharmaceutical	1010) Bio-antibiotics	8	24,636	100,581	125,217
	1020) Biologically manufactured low-molecular medicines	2	23,166	16,425	39,591
	1030) Vaccines	20	469,706	261,307	731,013
	1040) Hormones	15	152,170	111,500	263,670
	1050) Therapeutic antibodies and cytokines	30	115,231	2,626,490	2,741,721
	1060) Blood products	4	536,255	92,296	628,551
	1070) Cell-based therapeutics	15	69,194	434	69,628
	1080) Gene therapeutics	3	179	453	632
	1090) Biological diagnostic products	1	880	0	880
	1100) Enzymes and live bacteria medicines	3	17,966	79	18,045
	1110) Biomaterial-based medicines	10	35,621	14,379	50,000
	1120) Veterinary biopharmaceuticals	35	82,624	27,755	110,379
	1000) Other biopharmaceuticals	44	361,794	489,131	850,925
	Total	190	1,889,422	3,740,830	5,630,252
Biochemical and Bioenergy	2010) Biopolymers	12	22,758	42,047	64,805
	2020) Industrial enzymes and reagents	8	21,851	1,886	23,737
	2030) Enzymes and reagents for research	44	77,800	13,406	91,206
	2040) Biocosmetics and home & personal care chemicals	93	441,015	110,002	551,017
	2050) Biological agrochemicals and fertilizers	117	122,082	8,218	130,300
	2060) Biofuels	15	2,542,363	223,891	2,766,254
	2000) Other biochemical and bioenergy products	13	13,439	908	14,347
	Total	302	3,241,308	400,359	3,641,667
Biofood	3010) Functional health foods	128	586,682	66,554	653,236
	3020) Food-grade microorganisms & enzymes	4	1,477	6,097	7,574
	3030) Food additives	26	212,966	585,442	798,408
	3040) Fermented foods	7	86,810	0	86,810
	3050) Feed additives	85	919,031	2,170,535	3,089,566
	3000) Other biofoods	21	14,523	2,283	16,806
	Total	271	1,821,489	2,830,911	4,652,400
Bioenvironmental	4010) Biological treatment agents and systems	27	19,476	161	19,637
	4020) Materials and equipment for bio-immobilization	13	27,605	0	27,605
	4030) Bioenvironmental agents and systems for treatment and recycle	10	19,970	43	20,013
	4040) Measuring apparatus and service for environmental pollution and assessment	1	1,160	0	1,160
	4000) Other bioenvironmental products and services	7	3,685	0	3,685
	Total	58	71,896	204	72,100

Industry / Category		No. of Respondents (Multiple Responses)	Domestic Sales	Export Amount	Total
			Total	Total	Total
Total		**1,267**	**9,946,826**	**13,518,899**	**23,465,725**
Biomedical Equipment	5010) Biosensors	2	58	0	58
	5020) In-vitro diagnostics	108	1,595,641	3,561,400	5,157,041
	5000) Other biomedical equipment	57	219,554	300,086	519,641
	Total	167	1,815,253	3,861,487	5,676,740
Bioinstrument and Bioequipment	6010) Gene/protein/peptide analysis, synthesis, and manufacturing instruments	8	10,924	6	10,930
	6020) Cell analysis and cultivation equipment	28	39,242	32,316	71,558
	6030) Multi-functional and other bioanalysis instruments	13	13,822	2,909	16,731
	6040) R&D and manufacturing equipment	8	17,153	8,039	25,192
	6050) Bioprocess equipment parts	2	215	0	215
	6000) Other bioinstruments and bioequipment	21	68,080	10,589	78,669
	Total	80	149,436	53,859	203,295
Bioresource	7010) Seeds and seedlings	4	55,423	8,825	64,248
	7020) Genetically modified organisms for use as food, feed or processing	1	3,044	22	3,066
	7030) Experimental animals	6	23,856	2,584	26,440
	7000) Other bioresources	6	703	72	775
	Total	17	83,026	11,504	94,530
Bioservice	8010) Bio-consignment production and procuration services	20	210,330	2,504,483	2,714,813
	8020) Bio-diagnostic and analytical services	59	189,110	74,788	263,898
	8030) Clinical/non-clinical R&D services	41	250,887	38,874	289,761
	8040) Other R&D services	45	109,721	1,602	111,322
	8050) Processing, treatment, and warehousing services	12	56,746	0	56,746
	8000) Other bioservices	5	58,202	0	58,202
	Total	182	874,996	2,619,747	3,494,743

<Table 5-2> Status of Import by Category Among Classification Scheme of Bioindustry (Unit: KRW 1 million)

Industry / Category		No. of Respondents (Multiple Responses)	Import Amount
			Total
Total		**332**	**4,246,577**
Industry Performing Imports	Biopharmaceutical	205	3,437,414
	Biochemical and Bioenergy	42	345,680
	Biofood	31	82,067
	Bioenvironmental	2	142
	Biomedical Equipment	24	63,906
	Bioinstrument and Bioequipment	21	292,629
	Bioresource	4	21,795
	Bioservice	3	2,944
Biopharmaceutical	1010) Bio-antibiotics	5	3,323
	1030) Vaccines	29	467,327
	1040) Hormones	40	380,852
	1050) Therapeutic antibodies and cytokines	70	1,038,712
	1060) Blood products	20	197,430
	1070) Cell-based therapeutics	2	29,367
	1080) Gene therapeutics	4	1,151,635
	1090) Biological diagnostic products	2	4,583
	1100) Enzymes and live bacteria medicines	2	23,614
	1120) Veterinary biopharmaceuticals	2	774
	1000) Other biopharmaceuticals	29	139,796
	Total	205	3,437,414
Biochemical and Bioenergy	2010) Biopolymers	2	468
	2020) Industrial enzymes and reagents	6	1,585
	2030) Enzymes and reagents for research	13	58,359
	2040) Biocosmetics and home & personal care chemicals	2	455
	2050) Biological agrochemicals and fertilizers	9	21,032
	2060) Biofuels	5	236,328
	2000) Other biochemical and bioenergy products	5	27,454
	Total	42	345,680
Biofood	3010) Functional health foods	13	58,603
	3020) Food-grade microorganisms & enzymes	3	3,685
	3030) Food additives	6	10,374
	3050) Feed additives	4	4,828
	3000) Other biofoods	5	4,577
	Total	31	82,067
Bioenvironmental	4010) Biological treatment agents and systems	1	13
	4000) Other bioenvironmental products and services	1	129
	Total	2	142
Biomedical Equipment	5010) Biosensors	1	39
	5020) In-vitro diagnostics	16	27,942
	5000) Other biomedical equipment	7	35,925
	Total	24	63,906
Bioinstrument and Bioequipment	6010) Gene/protein/peptide analysis, synthesis, and manufacturing instruments	3	19,328
	6020) Cell analysis and cultivation equipment	2	1,271
	6030) Multi-functional and other bioanalysis instruments	4	58,649
	6050) Bioprocess equipment parts	1	220
	6000) Other bioinstruments and bioequipment	11	213,161
	Total	21	292,629
Bioresource	7010) Seeds and seedlings	2	21,136
	7030) Experimental animals	1	517
	7000) Other bioresources	1	142
	Total	4	21,795
Bioservice	8010) Bio-consignment production and procuration services	1	2,778
	8020) Bio-diagnostic and analytical services	1	9
	8030) Clinical/non-clinical R&D services	1	158
	Total	3	2,944

<Table 6> Status of Bioindustry by Area

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

Classification		No. of Companies	No. of Respondents	Bioindustry Workers									
				Doctorate		Master's		Bachelor's		Others		Total	
				Total	Average	Total	Average	Total	Average	Total	Average	Total	Average
Total		**1,089**	**1,074**	**3,665**	**3**	**11,653**	**11**	**29,982**	**28**	**15,852**	**15**	**61,152**	**57**
Core Industries	Biopharmaceutical	362	348	1,860	5	5,914	17	13,127	38	5,176	15	26,077	75
	Biochemical and Bioenergy	201	200	393	2	1,287	6	3,260	16	2,054	10	6,994	35
	Biofood	168	168	345	2	1,061	6	3,619	22	2,614	16	7,639	45
	Bioenvironmental	56	56	32	1	119	2	551	10	194	3	896	16
	Biomedical Equipment	121	121	445	4	1,437	12	3,905	32	3,407	28	9,194	76
	Bioinstrument and Bioequipment	55	55	57	1	176	3	994	18	548	10	1,775	32
	Bioresource	15	15	61	4	155	10	482	32	399	27	1,097	73
	Bioservice	111	111	472	4	1,504	14	4,044	36	1,460	13	7,480	67
Total Number of Workers	1 – 49	686	686	1,078	2	2,118	3	5,491	8	1,700	2	10,387	15
	50 – 299	282	281	1,086	4	3,654	13	11,570	41	5,507	20	21,817	78
	300 – 999	74	74	779	11	2,761	37	6,560	89	3,466	47	13,566	183
	1,000 or more	33	33	722	22	3,120	95	6,361	193	5,179	157	15,382	466
	Unknown	14	0	-	-	-	-	-	-	-	-	-	-
By Area	Seoul	266	253	816	3	2,857	11	7,260	29	1,173	5	12,106	48
	Busan	13	13	14	1	32	2	139	11	40	3	225	17
	Incheon	32	32	344	11	1,177	37	3,140	98	1,452	45	6,113	191
	Daegu	15	15	31	2	105	7	704	47	642	43	1,482	99
	Gwangju	8	8	8	1	21	3	43	5	4	1	76	10
	Daejeon	87	87	295	3	683	8	1,418	16	403	5	2,799	32
	Ulsan	9	9	49	5	196	22	707	79	337	37	1,289	143
	Sejong	4	4	8	2	73	18	160	40	87	22	328	82
	Gyeonggi	358	358	1,252	3	3,711	10	7,953	22	5,326	15	18,242	51
	Gangwon	45	45	186	4	516	11	1,372	30	1,137	25	3,211	71
	Chungbuk	85	85	403	5	1,444	17	4,125	49	2,719	32	8,691	102
	Chungnam	41	41	93	2	291	7	829	20	814	20	2,027	49
	Jeonbuk	32	32	39	1	120	4	499	16	467	15	1,125	35
	Jeonnam	34	34	28	1	88	3	613	18	191	6	920	27
	Gyeongbuk	25	24	61	3	193	8	545	23	778	32	1,577	66
	Gyeongnam	28	27	29	1	95	4	350	13	119	4	593	22
	Jeju	7	7	9	1	51	7	125	18	163	23	348	50

Classification		No. of Companies	No. of Respondents	Researchers									
				Doctorate		Master's		Bachelor's		Others		Total	
				Total	Average	Total	Average	Total	Average	Total	Average	Total	Average
Total		**1,089**	**1,074**	**3,208**	**3**	**8,578**	**8**	**7,110**	**7**	**429**	**0**	**19,325**	**18**
Core Industries	Biopharmaceutical	362	348	1,631	5	4,392	13	2,800	8	196	1	9,019	26
	Biochemical and Bioenergy	201	200	364	2	1,117	6	798	4	64	0	2,343	12
	Biofood	168	168	312	2	812	5	608	4	36	0	1,768	11
	Bioenvironmental	56	56	31	1	98	2	201	4	0	0	330	6
	Biomedical Equipment	121	121	367	3	954	8	831	7	30	0	2,182	18
	Bioinstrument and Bioequipment	55	55	50	1	127	2	188	3	12	0	377	7
	Bioresource	15	15	51	3	100	7	106	7	3	0	260	17
	Bioservice	111	111	402	4	978	9	1,578	14	88	1	3,046	27
Total Number of Workers	1 – 49	686	686	986	1	1,824	3	1,810	3	77	0	4,697	7
	50 – 299	282	281	984	4	2,762	10	2,813	10	65	0	6,624	24
	300 – 999	74	74	622	8	1,685	23	1,433	19	101	1	3,841	52
	1,000 or more	33	33	616	19	2,307	70	1,054	32	186	6	4,163	126
	Unknown	14	0	-	-	-	-	-	-	-	-	-	-
By Area	Seoul	266	253	696	3	1,959	8	1,877	7	101	0	4,633	18
	Busan	13	13	13	1	24	2	24	2	1	0	62	5
	Incheon	32	32	270	8	733	23	610	19	51	2	1,664	52
	Daegu	15	15	26	2	77	5	142	9	31	2	276	18
	Gwangju	8	8	8	1	21	3	20	3	0	0	49	6
	Daejeon	87	87	268	3	571	7	483	6	20	0	1,342	15
	Ulsan	9	9	45	5	143	16	77	9	18	2	283	31
	Sejong	4	4	8	2	73	18	36	9	10	3	127	32
	Gyeonggi	358	358	1,166	3	3,016	8	2,341	7	103	0	6,626	19
	Gangwon	45	45	144	3	338	8	267	6	4	0	753	17
	Chungbuk	85	85	340	4	998	12	664	8	59	1	2,061	24
	Chungnam	41	41	71	2	211	5	140	3	2	0	424	10
	Jeonbuk	32	32	33	1	89	3	93	3	24	1	239	7
	Jeonnam	34	34	24	1	55	2	138	4	3	0	220	6
	Gyeongbuk	25	24	60	3	157	7	113	5	2	0	332	14
	Gyeongnam	28	27	28	1	68	3	56	2	0	0	152	6
	Jeju	7	7	8	1	45	6	29	4	0	0	82	12

Classification		No. of Companies	No. of Respondents	Production Workers									
				Doctorate		Master's		Bachelor's		Others		Total	
				Total	Average	Total	Average	Total	Average	Total	Average	Total	Average
Total		**1,089**	**1,074**	**56**	**0**	**815**	**1**	**6,471**	**6**	**11,486**	**11**	**18,828**	**18**
Core Industries	Biopharmaceutical	362	348	28	0	383	1	2,845	8	3,799	11	7,055	20
	Biochemical and Bioenergy	201	200	4	0	34	0	650	3	1,680	8	2,368	12
	Biofood	168	168	5	0	45	0	974	6	2,156	13	3,180	19
	Bioenvironmental	56	56	0	0	5	0	162	3	172	3	339	6
	Biomedical Equipment	121	121	2	0	90	1	803	7	1,900	16	2,795	23
	Bioinstrument and Bioequipment	55	55	1	0	18	0	124	2	390	7	533	10
	Bioresource	15	15	3	0	20	1	79	5	233	16	335	22
	Bioservice	111	111	13	0	220	2	834	8	1,156	10	2,223	20
Total Number of Workers	1 – 49	686	686	8	0	34	0	687	1	1,274	2	2,003	3
	50 – 299	282	281	13	0	201	1	2,099	7	4,230	15	6,543	23
	300 – 999	74	74	12	0	204	3	1,149	16	2,805	38	4,170	56
	1,000 or more	33	33	23	1	376	11	2,536	77	3,177	96	6,112	185
	Unknown	14	0	-	-	-	-	-	-	-	-	-	-
By Area	Seoul	266	253	6	0	79	0	418	2	550	2	1,053	4
	Busan	13	13	0	0	0	0	3	0	20	2	23	2
	Incheon	32	32	9	0	217	7	1,591	50	1,297	41	3,114	97
	Daegu	15	15	0	0	3	0	165	11	326	22	494	33
	Gwangju	8	8	0	0	0	0	2	0	2	0	4	1
	Daejeon	87	87	4	0	44	1	276	3	322	4	646	7
	Ulsan	9	9	2	0	19	2	164	18	263	29	448	50
	Sejong	4	4	0	0	0	0	89	22	75	19	164	41
	Gyeonggi	358	358	13	0	192	1	1,486	4	3,275	9	4,966	14
	Gangwon	45	45	0	0	38	1	391	9	1,026	23	1,455	32
	Chungbuk	85	85	17	0	201	2	1,118	13	2,125	25	3,461	41
	Chungnam	41	41	1	0	9	0	178	4	726	18	914	22
	Jeonbuk	32	32	3	0	5	0	180	6	385	12	573	18
	Jeonnam	34	34	0	0	0	0	110	3	153	5	263	8
	Gyeongbuk	25	24	1	0	0	0	135	6	687	29	823	34
	Gyeongnam	28	27	0	0	7	0	146	5	106	4	259	10
	Jeju	7	7	0	0	1	0	19	3	148	21	168	24

Classification		No. of Companies	No. of Respondents	Other Positions including Sales/Administrative									
				Doctorate		Master's		Bachelor's		Others		Total	
				Total	Average	Total	Average	Total	Average	Total	Average	Total	Average
Total		**1,089**	**1,074**	**401**	**0**	**2,260**	**2**	**16,401**	**15**	**3,937**	**4**	**22,999**	**21**
Core Industries	Biopharmaceutical	362	348	201	1	1,139	3	7,482	22	1,181	3	10,003	29
	Biochemical and Bioenergy	201	200	25	0	136	1	1,812	9	310	2	2,283	11
	Biofood	168	168	28	0	204	1	2,037	12	422	3	2,691	16
	Bioenvironmental	56	56	1	0	16	0	188	3	22	0	227	4
	Biomedical Equipment	121	121	76	1	393	3	2,271	19	1,477	12	4,217	35
	Bioinstrument and Bioequipment	55	55	6	0	31	1	682	12	146	3	865	16
	Bioresource	15	15	7	0	35	2	297	20	163	11	502	33
	Bioservice	111	111	57	1	306	3	1,632	15	216	2	2,211	20
Total Number of Workers	1 – 49	686	686	84	0	260	0	2,994	4	349	1	3,687	5
	50 – 299	282	281	89	0	691	2	6,658	24	1,212	4	8,650	31
	300 – 999	74	74	145	2	872	12	3,978	54	560	8	5,555	75
	1,000 or more	33	33	83	3	437	13	2,771	84	1,816	55	5,107	155
	Unknown	14	0										
By Area	Seoul	266	253	114	0	819	3	4,965	20	522	2	6,420	25
	Busan	13	13	1	0	8	1	112	9	19	1	140	11
	Incheon	32	32	65	2	227	7	939	29	104	3	1,335	42
	Daegu	15	15	5	0	25	2	397	26	285	19	712	47
	Gwangju	8	8	0	0	0	0	21	3	2	0	23	3
	Daejeon	87	87	23	0	68	1	659	8	61	1	811	9
	Ulsan	9	9	2	0	34	4	466	52	56	6	558	62
	Sejong	4	4	0	0	0	0	35	9	2	1	37	9
	Gyeonggi	358	358	73	0	503	1	4,126	12	1,948	5	6,650	19
	Gangwon	45	45	42	1	140	3	714	16	107	2	1,003	22
	Chungbuk	85	85	46	1	245	3	2,343	28	535	6	3,169	37
	Chungnam	41	41	21	1	71	2	511	12	86	2	689	17
	Jeonbuk	32	32	3	0	26	1	226	7	58	2	313	10
	Jeonnam	34	34	4	0	33	1	365	11	35	1	437	13
	Gyeongbuk	25	24	0	0	36	2	297	12	89	4	422	18
	Gyeongnam	28	27	1	0	20	1	148	5	13	0	182	7
	Jeju	7	7	1	0	5	1	77	11	15	2	98	14

<Table 6-2> Investment Status of Bioindustry by Area (Unit: KRW 1 million)

Classification		No. of Companies	No. of Respondents	2022											
				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		**1,089**	**1,080**	**7,192,833**	**6,660**	**6,074,303**	**5,624**	**13,267,136**	**12,284**	**2,385,340**	**2,209**	**1,740,155**	**1,611**	**4,125,495**	**3,820**
Core Industries	Biopharmaceutical	362	355	3,673,793	10,349	2,320,048	6,535	5,993,841	16,884	1,605,698	4,523	300,008	845	1,905,706	5,368
	Biochemical and Bioenergy	201	201	2,330,472	11,594	1,617,350	8,047	3,947,822	19,641	135,178	673	42,863	213	178,041	886
	Biofood	168	168	222,186	1,323	391,926	2,333	614,112	3,655	112,216	668	30,088	179	142,304	847
	Bioenvironmental	56	55	13,330	242	35,718	649	49,048	892	8,794	160	2,066	38	10,860	197
	Biomedical Equipment	121	121	397,802	3,288	526,133	4,348	923,935	7,636	246,440	2,037	321,068	2,653	567,507	4,690
	Bioinstrument and Bioequipment	55	54	30,177	559	53,281	987	83,458	1,546	22,554	418	4,877	90	27,431	508
	Bioresource	15	15	35,947	2,396	2,691	179	38,638	2,576	10,258	684	1,263	84	11,521	768
	Bioservice	111	111	489,126	4,407	1,127,156	10,155	1,616,282	14,561	244,203	2,200	1,037,922	9,351	1,282,125	11,551
Total Number of Workers	1 – 49	686	685	685,814	1,001	208,639	305	894,453	1,306	495,326	723	69,734	102	565,060	825
	50 – 299	282	281	1,416,258	5,040	746,872	2,658	2,163,130	7,698	769,579	2,739	205,314	731	974,893	3,469
	300 – 999	74	74	867,824	11,727	499,878	6,755	1,367,702	18,482	360,808	4,876	109,676	1,482	470,484	6,358
	1,000 or more	33	33	4,199,690	127,263	4,616,830	139,904	8,816,520	267,167	757,212	22,946	1,353,347	41,011	2,110,559	63,956
	Unknown	14	7	23,247	3,321	2,084	298	25,331	3,619	2,416	345	2,084	298	4,500	643
By Area	Seoul	266	259	1,050,713	4,057	290,826	1,123	1,341,539	5,180	416,868	1,610	58,977	228	475,845	1,837
	Busan	13	12	4,689	391	7,556	630	12,245	1,020	2,931	244	363	30	3,294	275
	Incheon	32	32	488,710	15,272	1,112,536	34,767	1,601,246	50,039	296,525	9,266	1,066,989	33,343	1,363,514	42,610
	Daegu	15	15	105,506	7,034	23,197	1,546	128,703	8,580	11,660	777	10,176	678	21,836	1,456
	Gwangju	8	8	4,205	526	534	67	4,739	592	3,188	399	189	24	3,377	422
	Daejeon	87	87	507,090	5,829	432,877	4,976	939,967	10,804	167,723	1,928	40,234	462	207,957	2,390
	Ulsan	9	9	57,734	6,415	6,081	676	63,815	7,091	28,107	3,123	3,713	413	31,820	3,536
	Sejong	4	4	48,391	12,098	13,691	3,423	62,082	15,521	4,316	1,079	998	250	5,314	1,329
	Gyeonggi	358	357	3,933,367	11,018	2,323,042	6,507	6,256,409	17,525	921,117	2,580	413,777	1,159	1,334,894	3,739
	Gangwon	45	45	126,548	2,812	99,177	2,204	225,725	5,016	104,450	2,321	17,893	398	122,343	2,719
	Chungbuk	85	85	618,753	7,279	1,499,130	17,637	2,117,883	24,916	313,324	3,686	71,987	847	385,311	4,533
	Chungnam	41	41	91,112	2,222	34,917	852	126,029	3,074	29,278	714	5,735	140	35,013	854
	Jeonbuk	32	32	48,018	1,501	65,565	2,049	113,583	3,549	17,815	557	8,479	265	26,294	822
	Jeonnam	34	34	14,779	435	21,845	643	36,624	1,077	10,423	307	9,233	272	19,656	578
	Gyeongbuk	25	25	70,541	2,822	65,177	2,607	135,718	5,429	44,619	1,785	9,904	396	54,523	2,181
	Gyeongnam	28	28	11,271	403	28,840	1,030	40,111	1,433	9,164	327	6,393	228	15,557	556
	Jeju	7	7	11,406	1,629	49,312	7,045	60,718	8,674	3,832	547	15,115	2,159	18,947	2,707

<Table 6-3A> Bioindustry's Domestic Sales and Export by Area (Unit: KRW 1 million)

Classification		No. of Respondents (Multiple Responses)	Domestic Sales	Export Amount	Total
			Total	Total	Total
Total		**1,267**	**9,946,826**	**13,518,899**	**23,465,725**
By Area	Seoul	197	1,024,651	546,690	1,571,341
	Busan	13	5,008	2,428	7,436
	Incheon	28	237,596	4,756,696	4,994,292
	Daegu	19	60,488	52,734	113,222
	Gwangju	6	2,701	129	2,830
	Daejeon	107	323,002	88,712	411,714
	Ulsan	8	1,624,423	5,125	1,629,548
	Sejong	2	2,517	0	2,517
	Gyeonggi	438	3,429,146	6,424,787	9,853,933
	Gangwon	73	237,150	475,651	712,801
	Chungbuk	126	1,500,706	706,046	2,206,752
	Chungnam	60	152,975	84,510	237,485
	Jeonbuk	48	281,299	80,235	361,534
	Jeonnam	46	474,908	20,917	495,825
	Gyeongbuk	33	445,773	243,536	689,309
	Gyeongnam	50	135,397	21,777	157,174
	Jeju	13	9,086	8,927	18,013
Industry with Sales Generated	Biopharmaceutical	190	1,889,422	3,740,830	5,630,252
	Biochemical and Bioenergy	302	3,241,308	400,359	3,641,667
	Biofood	271	1,821,489	2,830,911	4,652,400
	Bioenvironmental	58	71,896	204	72,100
	Biomedical Equipment	167	1,815,253	3,861,487	5,676,740
	Bioinstrument and Bioequipment	80	149,436	53,859	203,295
	Bioresource	17	83,026	11,504	94,530
	Bioservice	182	874,996	2,619,747	3,494,743
Seoul	Biopharmaceutical	26	42,034	13,629	55,663
	Biochemical and Bioenergy	36	54,647	1,547	56,194
	Biofood	19	95,867	2,247	98,114
	Bioenvironmental	4	8,560	0	8,560
	Biomedical Equipment	32	503,680	385,862	889,542
	Bioinstrument and Bioequipment	6	27,715	1,240	28,955
	Bioresource	5	3,382	94	3,476
	Bioservice	69	288,766	142,072	430,837
Busan	Biopharmaceutical	2	75	309	384
	Biochemical and Bioenergy	2	3,018	0	3,018
	Biofood	1	620	0	620
	Bioenvironmental	3	168	0	168
	Biomedical Equipment	1	31	19	50
	Bioinstrument and Bioequipment	2	515	2,099	2,614
	Bioservice	2	581	0	581
Incheon	Biopharmaceutical	9	31,170	2,548,105	2,579,274
	Biochemical and Bioenergy	8	12,313	594	12,907
	Biomedical Equipment	2	354	0	354
	Bioinstrument and Bioequipment	1	200	0	200
	Bioservice	8	193,559	2,207,997	2,401,556
Daegu	Biopharmaceutical	4	38,309	44,023	82,332
	Biochemical and Bioenergy	4	1,641	0	1,641
	Biofood	1	2,505	1,088	3,593
	Bioenvironmental	3	5,128	0	5,128
	Biomedical Equipment	3	12,600	7,623	20,223
	Bioinstrument and Bioequipment	1	150	0	150
	Bioservice	3	155	0	155
Gwangju	Biochemical and Bioenergy	1	150	0	150
	Biofood	2	1,339	0	1,339
	Bioenvironmental	1	140	129	269
	Bioservice	2	1,072	0	1,072
Daejeon	Biopharmaceutical	11	26,957	40,613	67,570
	Biochemical and Bioenergy	37	92,507	18,866	111,373
	Biofood	14	127,495	6,595	134,090
	Bioenvironmental	2	4,987	0	4,987
	Biomedical Equipment	14	37,111	21,526	58,638
	Bioinstrument and Bioequipment	15	20,867	1,111	21,978
	Bioresource	2	1,654	0	1,654
	Bioservice	12	11,424	0	11,424
Ulsan	Biochemical and Bioenergy	5	1,615,606	5,125	1,620,731
	Bioenvironmental	3	8,817	0	8,817

Classification		No. of Respondents (Multiple Responses)	Domestic Sales	Export Amount	Total
			Total	Total	Total
Total		**1,267**	**9,946,826**	**13,518,899**	**23,465,725**
Sejong	Biofood	1	2,483	0	2,483
	Bioinstrument and Bioequipment	1	34	0	34
Gyeonggi	Biopharmaceutical	71	276,246	417,499	693,745
	Biochemical and Bioenergy	79	685,899	306,808	992,707
	Biofood	76	1,008,336	2,740,404	3,748,740
	Bioenvironmental	21	34,773	0	34,773
	Biomedical Equipment	70	954,982	2,884,575	3,839,557
	Bioinstrument and Bioequipment	46	87,072	48,646	135,718
	Bioresource	6	66,155	8,152	74,307
	Bioservice	69	315,683	18,702	334,385
Gangwon	Biopharmaceutical	15	75,538	160,863	236,401
	Biochemical and Bioenergy	16	12,943	5,484	18,427
	Biofood	19	38,663	12,474	51,137
	Bioenvironmental	3	949	0	949
	Biomedical Equipment	15	106,006	295,251	401,257
	Bioinstrument and Bioequipment	2	210	220	430
	Bioservice	3	2,841	1,359	4,200
Chungbuk	Biopharmaceutical	32	1,019,593	506,763	1,526,356
	Biochemical and Bioenergy	21	50,236	22,069	72,305
	Biofood	49	221,322	9,049	230,371
	Bioenvironmental	1	460	0	460
	Biomedical Equipment	14	145,460	151,439	296,899
	Bioinstrument and Bioequipment	1	9,810	413	10,223
	Bioresource	1	4,622	0	4,622
	Bioservice	7	49,203	16,312	65,515
Chungnam	Biopharmaceutical	11	29,551	1,143	30,694
	Biochemical and Bioenergy	11	29,857	922	30,779
	Biofood	26	56,902	3,479	60,381
	Bioenvironmental	3	649	0	649
	Biomedical Equipment	7	33,688	78,965	112,653
	Bioinstrument and Bioequipment	2	2,328	0	2,328
Jeonbuk	Biopharmaceutical	1	58	0	58
	Biochemical and Bioenergy	17	98,518	27,814	126,332
	Biofood	20	173,660	23,822	197,482
	Bioenvironmental	2	323	0	323
	Biomedical Equipment	3	6,930	28,184	35,114
	Bioresource	1	0	415	415
	Bioservice	4	1,810	0	1,810
Jeonnam	Biopharmaceutical	1	771	415	1,186
	Biochemical and Bioenergy	23	448,816	4,761	453,577
	Biofood	9	7,543	12,130	19,673
	Bioenvironmental	8	6,342	32	6,374
	Biomedical Equipment	1	1,957	0	1,957
	Bioresource	2	7,213	2,842	10,055
	Bioservice	2	2,266	736	3,002
Gyeongbuk	Biopharmaceutical	3	347,162	1,373	348,535
	Biochemical and Bioenergy	16	21,471	1,810	23,281
	Biofood	8	59,402	7,752	67,154
	Bioenvironmental	1	100	0	100
	Biomedical Equipment	4	10,002	32	10,034
	Bioservice	1	7,636	232,569	240,205
Gyeongnam	Biopharmaceutical	3	1,958	2,349	4,307
	Biochemical and Bioenergy	23	108,956	371	109,327
	Biofood	19	21,460	11,005	32,465
	Bioenvironmental	3	500	43	543
	Biomedical Equipment	1	2,452	8,010	10,462
	Bioinstrument and Bioequipment	1	71	0	71
Jeju	Biopharmaceutical	1	0	3,747	3,747
	Biochemical and Bioenergy	3	4,730	4,186	8,916
	Biofood	7	3,892	866	4,758
	Bioinstrument and Bioequipment	2	464	129	593

<Table 6-3B> Status of Bioindustry's Import by Area (Unit: KRW 1 million)

Classification		No. of Respondents (Multiple Responses)	Import Amount
			Total
Total		**332**	**4,246,577**
By Area	Seoul	191	3,510,774
	Busan	1	2,745
	Incheon	3	3,488
	Daegu	1	3
	Gwangju	1	158
	Daejeon	19	33,191
	Ulsan	3	208,368
	Gyeonggi	56	298,018
	Gangwon	7	11,463
	Chungbuk	25	83,194
	Chungnam	7	25,002
	Jeonbuk	5	21,106
	Jeonnam	3	13,217
	Gyeongbuk	4	1,957
	Gyeongnam	5	33,762
	Jeju	1	129
Industry Performing Imports	Biopharmaceutical	205	3,437,414
	Biochemical and Bioenergy	42	345,680
	Biofood	31	82,067
	Bioenvironmental	2	142
	Biomedical Equipment	24	63,906
	Bioinstrument and Bioequipment	21	292,629
	Bioresource	4	21,795
	Bioservice	3	2,944
Seoul	Biopharmaceutical	171	3,322,792
	Biochemical and Bioenergy	6	55,715
	Biofood	2	40,134
	Biomedical Equipment	7	14,199
	Bioinstrument and Bioequipment	5	77,934
Busan	Biochemical and Bioenergy	1	2,745
Incheon	Biochemical and Bioenergy	1	452
	Bioinstrument and Bioequipment	1	258
	Bioservice	1	2,778
Daegu	Biopharmaceutical	1	3
Gwangju	Bioservice	1	158
Daejeon	Biopharmaceutical	3	827
	Biochemical and Bioenergy	7	7,120
	Biofood	2	225
	Biomedical Equipment	1	23,384
	Bioinstrument and Bioequipment	6	1,636
Ulsan	Biochemical and Bioenergy	2	208,355
	Bioenvironmental	1	13
Gyeonggi	Biopharmaceutical	8	15,028
	Biochemical and Bioenergy	11	32,989
	Biofood	11	16,442
	Bioenvironmental	1	129
	Biomedical Equipment	14	20,103
	Bioinstrument and Bioequipment	9	212,801
	Bioresource	1	517
	Bioservice	1	9
Gangwon	Biopharmaceutical	2	3,475
	Biochemical and Bioenergy	2	1,189
	Biofood	2	986
	Biomedical Equipment	1	5,814
Chungbuk	Biopharmaceutical	11	47,431
	Biochemical and Bioenergy	4	4,033
	Biofood	8	23,107
	Biomedical Equipment	1	407
	Bioresource	1	8,217
Chungnam	Biopharmaceutical	3	13,588
	Biochemical and Bioenergy	1	10,568
	Biofood	3	846

Classification		No. of Respondents (Multiple Responses)	Import Amount
			Total
Total		**332**	**4,246,577**
Jeonbuk	Biochemical and Bioenergy	3	20,902
	Biofood	1	62
	Bioresource	1	142
Jeonnam	Biochemical and Bioenergy	2	297
	Bioresource	1	12,920
Gyeongbuk	Biopharmaceutical	3	795
	Biochemical and Bioenergy	1	1,163
Gyeongnam	Biopharmaceutical	3	33,476
	Biochemical and Bioenergy	1	151
Jeju	Biofood	1	136

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
Veterinary biopharmaceuticals

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 Hermotherapeutics

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

Proteins, nucleic acids, polysaccharides, and other biomolecules that constitute polymer materials and biocompatible polymers, biodegradable resins (functional packaging materials), and bioplastics utilizing bio-mass

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 used to exterminate or control weeds, pests, or microorganisms that hinder the growth of crops, or biological 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 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 like makgeolli (unrefined rice wine), doenjang (soybean paste), and cheonggukjang (rich soybean 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).

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 equipment for bio-immobilization

Immobilized materials and equipment 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 recycle

Materials, equipment 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 equipment for bio-immobilization

4040 Measuring apparatus and service for environmental pollution and assessment

Equipment 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 products 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 equipment

Other biomedical components and materials that are not classified above.

6. Bioinstrument and Bioequipment Industry

Industrial activities which produce devices, equipment 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 Polymerase chain reaction (PCR), real-time PCR analyzer, DNA sequencer, DNA/RNA/peptide synthesizer

6020 Cell analysis and cultivation equipment

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

Includes Cell counter, incubator, 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, high-performance liquid chromatography (HPLC)

6040 R&D and manufacturing equipment

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

Includes Clean work station, image analyzer, filtration system, freeze dryer

6050 Bioprocess equipment parts

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

Includes Disposable bioreactor bag and mixing bag

6000 Other bioinstruments and bioequipment

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

Services involving the performance or support of contract-based clinical or non-clinical R&D, utilizing biotechnological knowledge and technology provided by the contracting party

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. 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. 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. 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 implants 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. 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. Single nucleotide polymorphism (SNP) 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 sequencing analysis

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. Gene 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. System 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

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 pathways

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

Corresponding List

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

F0. Metabolic engineering, n.e.s.

Corresponding List

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

G. Bioprocess

Processing 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 development
G102. Microbial fermentation engineering
G103. High cell density culture
G104. Algae 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 economics analysis
G508. Process analysis technology

G0. Bioprocess, 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 parasite control
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 control
H205. Experimental animal development and production
H206. Experimental 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 organism resources 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 additives 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. 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 treatment
I204. Waste treatment
I205. Environmental pollutants measurement and analysis
I206. Environmental assessment 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. 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 chip production and application
J104. Nano-bioelectronic device fabrication
J105. Nano-biosensor system
J106. Nano-bioactuator fabrication
J107. Nano-biosignal analysis

J2. Nanobiomaterial 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. Molecular target discovery

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. Nano-fluidic
J402. Nano-processing
J403. Nano-lithography
J404. Surface and interface control
J405. Nanoscale particle manipulation
J406. Nanoflow visualization & diagnosis

J0. 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 transducing
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 biochip

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

K0. 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 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 GMO

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 GMO
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. Biosafety and efficacy evaluation, n.e.s.

M. Other Biotechnology

M1. Combinatorial 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. Biotechnology, n.e.s.

Appendix 2. Survey Questionnaire

승인번호
제 115015 호

Report on Survey on Domestic Bioindustry 2022

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, 2022 to December 31, 2022.

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 Institute: KoDATA Solution Inc.
Tel.: +82-2-780-9831
Fax: +82-2-780-9828
E-mail: jg@kodatasolution.co.kr

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:				
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 2022**? (Unit: KRW)

* Capital paid by the incorporated company (headquarters) as of December 31, 2022.

KRW

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 2022**? (Unit: KRW)

Total capital

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

Equity capital

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

* 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 2022?

Number of workers (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?	12-2. **Certification (multiple responses allowed)** * as of the end of 2022
□ ① Single-unit enterprise (Businesses that do not own plants, R&D centers, or branches)	□ ① Venture company
□② Businesses that own plants, branches, R&D centers, sales offices, or branches	□ ② INNO-BIZ
	□ ③ MAIN-BIZ
	□ ④ N/A
	12-3. **Listing** * as of the end of 2022
	□ 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.

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 2021 (Jan. 1 – Dec. 31, 2022)?
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. Status of Bioindustry

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

Classification		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 10.

15. Please indicate **the manpower status of bioindustry as of the end of 2022** in your company. Please make sure to include regular and non-regular workers. (Unit: persons)

Classification	Doctorate		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 cost and facility investment costs for the entire period of 2022**.
* 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 2022. 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 2022 (Jan. 1 – Dec. 31, 2022)	Total Investment (Bioindustry + other)	10 billion | Billion | 100 million | 10 million | Million KRW	10 billion | Billion | 100 million | 10 million | Million KRW
	Investment in the Bioindustry	10 billion | Billion | 100 million | 10 million | Million KRW	10 billion | Billion | 100 million | 10 million | Million KRW

* 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 within the past year (Jan. 1 – Dec 31, 2022)?
* 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 **in the form of a joint venture**, 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.

* Cooperation stages are presented as ① basic research, ② experimental, ③ prototype, ④ product development, and ⑤ commercialization.

(Refer to page 6 for more details for each cooperation stage.)

(1) Joint Venture							
Classification	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)	(No. of cases)	(No. of cases)	(No. of cases)	(No. of cases)	(No. of cases)	(No. of cases)
	① Basic research: __ ② Experimental: __ ③ Prototype: __ ④ Product development: __ ⑤ Commercialization: __	① Basic research: __ ② Experimental: __ ③ Prototype: __ ④ Product development: __ ⑤ Commercialization: __	① Basic research: __ ② Experimental: __ ③ Prototype: __ ④ Product development: __ ⑤ Commercialization __	① Basic research: __ ② Experimental: __ ③ Prototype: __ ④ Product development: __ ⑤ Commercialization: __	① Basic research: __ ② Experimental: __ ③ Prototype: __ ④ Product development: __ ⑤ Commercialization: __	① Basic research: __ ② Experimental: __ ③ Prototype: __ ④ Product development: __ ⑤ Commercialization: __	① Basic research: __ ② Experimental: __ ③ Prototype: __ ④ Product development: __ ⑤ Commercialization: __
Overseas	(No. of cases)	(No. of cases)	(No. of cases)	(No. of cases)	(No. of cases)	(No. of cases)	(No. of cases)
	① Basic research: __ ② Experimental: __ ③ Prototype: __ ④ Product development: __ ⑤ Commercialization: __	① Basic research: __ ② Experimental: __ ③ Prototype: __ ④ Product development: __ ⑤ Commercialization: __	① Basic research: __ ② Experimental: __ ③ Prototype: __ ④ Product development: __ ⑤ Commercialization: __	① Basic research: __ ② Experimental: __ ③ Prototype: __ ④ Product development: __ ⑤ Commercialization: __	① Basic research: __ ② Experimental: __ ③ Prototype: __ ④ Product development: __ ⑤ Commercialization: __	① Basic research: __ ② Experimental: __ ③ Prototype: __ ④ Product development: __ ⑤ Commercialization: __	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 **in the form of a joint R&D contract**, 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.

* Cooperation stages are presented as ① basic research, ② experimental, ③ prototype, ④ product development, and ⑤ commercialization.

(Refer to page 6 for more details for each cooperation stage.)

(2) Joint R&D Contract							
Classification	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)	(No. of cases)	(No. of cases)	(No. of cases)	(No. of cases)	(No. of cases)	(No. of cases)
	① Basic research: __ ② Experimental: __ ③ Prototype: __ ④ Product development: __ ⑤ Commercialization: __	① Basic research: __ ② Experimental: __ ③ Prototype: __ ④ Product development: __ ⑤ Commercialization: __	① Basic research: __ ② Experimental: __ ③ Prototype: __ ④ Product development: __ ⑤ Commercialization: __	① Basic research: __ ② Experimental: __ ③ Prototype: __ ④ Product development: __ ⑤ Commercialization: __	① Basic research: __ ② Experimental: __ ③ Prototype: __ ④ Product development: __ ⑤ Commercialization: __	① Basic research: __ ② Experimental: __ ③ Prototype: __ ④ Product development: __ ⑤ Commercialization: __	① Basic research: __ ② Experimental: __ ③ Prototype: __ ④ Product development: __ ⑤ Commercialization: __
Overseas	(No. of cases)	(No. of cases)	(No. of cases)	(No. of cases)	(No. of cases)	(No. of cases)	(No. of cases)
	① Basic research: __ ② Experimental: __ ③ Prototype: __ ④ Product development: __ ⑤ Commercialization: __	① Basic research: __ ② Experimental: __ ③ Prototype: __ ④ Product development: __ ⑤ Commercialization: __	① Basic research: __ ② Experimental: __ ③ Prototype: __ ④ Product development: __ ⑤ Commercialization: __	① Basic research: __ ② Experimental: __ ③ Prototype: __ ④ Product development: __ ⑤ Commercialization: __	① Basic research: __ ② Experimental: __ ③ Prototype: __ ④ Product development: __ ⑤ Commercialization: __	① Basic research: __ ② Experimental: __ ③ Prototype: __ ④ Product development: __ ⑤ Commercialization: __	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.

* Cooperation stages are presented as ① basic research, ② experimental, ③ prototype, ④ product development, and ⑤ commercialization.
(Refer to page 6 for more details for each cooperation stage.)

(3) Technical Tie-up (Licensing)							
Classification	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.

* Cooperation stages are presented as ① basic research, ② experimental, ③ prototype, ④ product development, and ⑤ commercialization.
(Refer to page 6 for more details for each cooperation stage.)

(4) Domestic/International Technical Manpower Exchange							
Classification	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 2022 in the table below.

No.	Name (Product name, service name, transaction technology name)	Category	Classification Code	Domestic Sales (Unit: KRW 1 million)	Export		
					Export Amount (Unit: USD 1,000)	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					
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					

* 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.
* If there are more than 7 items, please indicate them on a separate sheet.

20. Please fill in the table below fo1r products, services, or trading technologies in the overseas **bioindustry** that were imported in 2022.

No.	Name (Product name, service name, transaction technology name)	Category	Classification Code	Import Amount (Unit: USD 1,000)	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) Blood products 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 equipment 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 equipment	**Bioinstrument and Bioequipment**	6010) Gene/protein/peptide analysis, synthesis, and manufacturing instruments 6020) Cell analysis and cultivation equipment 6030) Multi-functional and other bioanalysis instruments 6040) R&D and manufacturing equipment 6050) Bioprocess equipment parts 6000) Other bioinstruments and bioequipment
Bioresource	7010) Seeds and seedlings 7020) Genetically modified organisms for use as food, feed or processing 7030) Experimental animals 7000) 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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