Report on Survey of Domestic Bioindustry 2019

December 2020

MINISTRY OF TRADE, INDUSTRY & ENERGY
Korea Biotechnology Industry Organization

Table of Contents

Table of Contents

List of Tables

List of Figures

I. Survey Overview

1 Survey Overview

A. Data Sources

- Bio-Convergence Industry Division, Ministry of Trade, Industry and Energy (www.motie.go.kr)
- Statistical Sources: Korea Biotechnology Industry Organization (www.koreabio.org)

B. Type of Statistics and Authorized Number

- Type of Statistics: General·Survey Statistics
- Authorized Number: No. 115015
- Authorized Date: October 30th, 2003

C. Survey Period

- Survey Baseline Date: December 31, 2019
- Targeted Survey Period: January 1, 2019 ~ December 31, 2019
- Survey period: August 11, 2020 ~ October 30, 2020

D. Scope

- Based on the domestic biotechnology and the 'Classification Code of Bioindustry (KS J 1009, reorganized by the Korean Agency for Technology and Standards and the Ministry of Trade, Industry and Energy in January 2008 / revised in Dec. 29, 2016)' which enacted and revised the scope and definition of the bioindustry, the scope of the survey refers to domestic businesses engaged in the following activities related to biotechnology.
  - Using biotechnology as the main technology in the R&D phase
  - Using biotechnology in the manufacturing, production, and service (including R&D) phases
  - Producing machine, equipment, or plant that are used in the biotechnological process of the R&D phase or the production phasec
  - 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 2018

- 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 companies are included based on the selection of keywords in the bio area based on the Bioindustry Classification Code (KS J 1009) and the purpose of company, name of items and services handled, and the name of the research institute.

F. Survey Units

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

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

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

G. Methodology and Approach

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

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

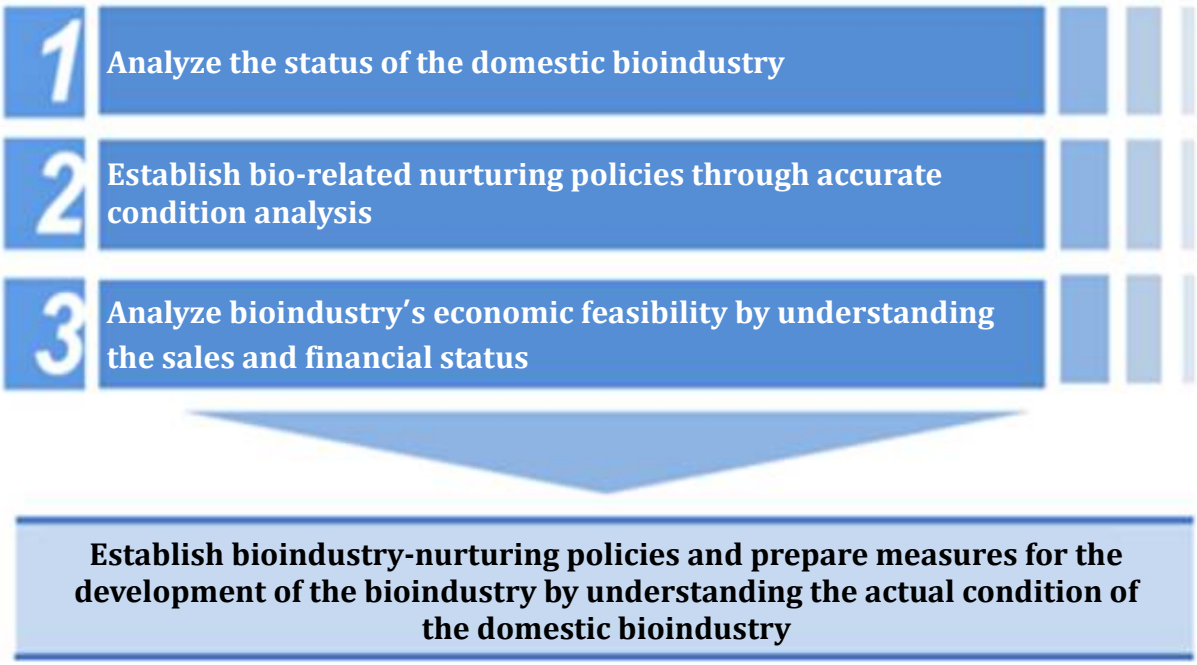
H. Announcement of Results

- Announcement Period : Once a year

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

2 Background and Purpose

- The Ministry of Trade, Industry and Energy and the Korea Biotechnology Industry Organization have been conducting a fact finding survey on the domestic bioindustry since 2003 to build groundwork for economic analysis, international comparison and establishment of related nurturing policies through analyzing the overall status of bioindustry and its actual condition.
- The "Report on Fact Finding Survey of Domestic Bioindustry Based on 2019," which was first conducted in August 2020, 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	1,238 companies (Among primarily selected 1,289 companies, 51 were excluded due to temporary/permanent close-down and other reasons)
Size of valid sample	1,003 companies (81.0% of the population)

4 Contents

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

5 Terminology

A. General Status

○ Selected Companies

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

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

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

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

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

○ Capital Ratio of Net Worth: Refers to the ratio of equity capital (total amount of capital-liabilities) on the total capital (=total amount of capital+liabilities=total assets).

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 2019. 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 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 Bioindustrys' Classification Scheme>

■ **Purpose of Classification**

○ To clarify the scope of bioindustry

- Defined companies that use biotechnology in the R&D, manufacturing, production, and service phases

○ To propose standardized evidences that can be used for bioindustry-related statistics and institutions without confusion

- Preparing industrial statistics such as profits generated from using biotechnology

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

○ To secure the connectivity with the classification scheme of international bioindustry

- Preparing groundwork for comparing and analyzing the statistical data of the international bioindustry

■ **Targets and Standard of Classification**

○ Industrial activities conducted by companies using biotechnology

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

- The functions and the market of the outputs

■ **Classification Scheme**

○ Consists of 8 upper divisions and 51 middle divisions

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

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

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

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

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

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

2) [Annex] Biotechnology Classification Code

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

<Overview of Biotechnology's Classification Scheme>

■ **Purpose of Classification**

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

■ **Target and Standard of Classification**

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

■ **Classification Scheme**

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

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

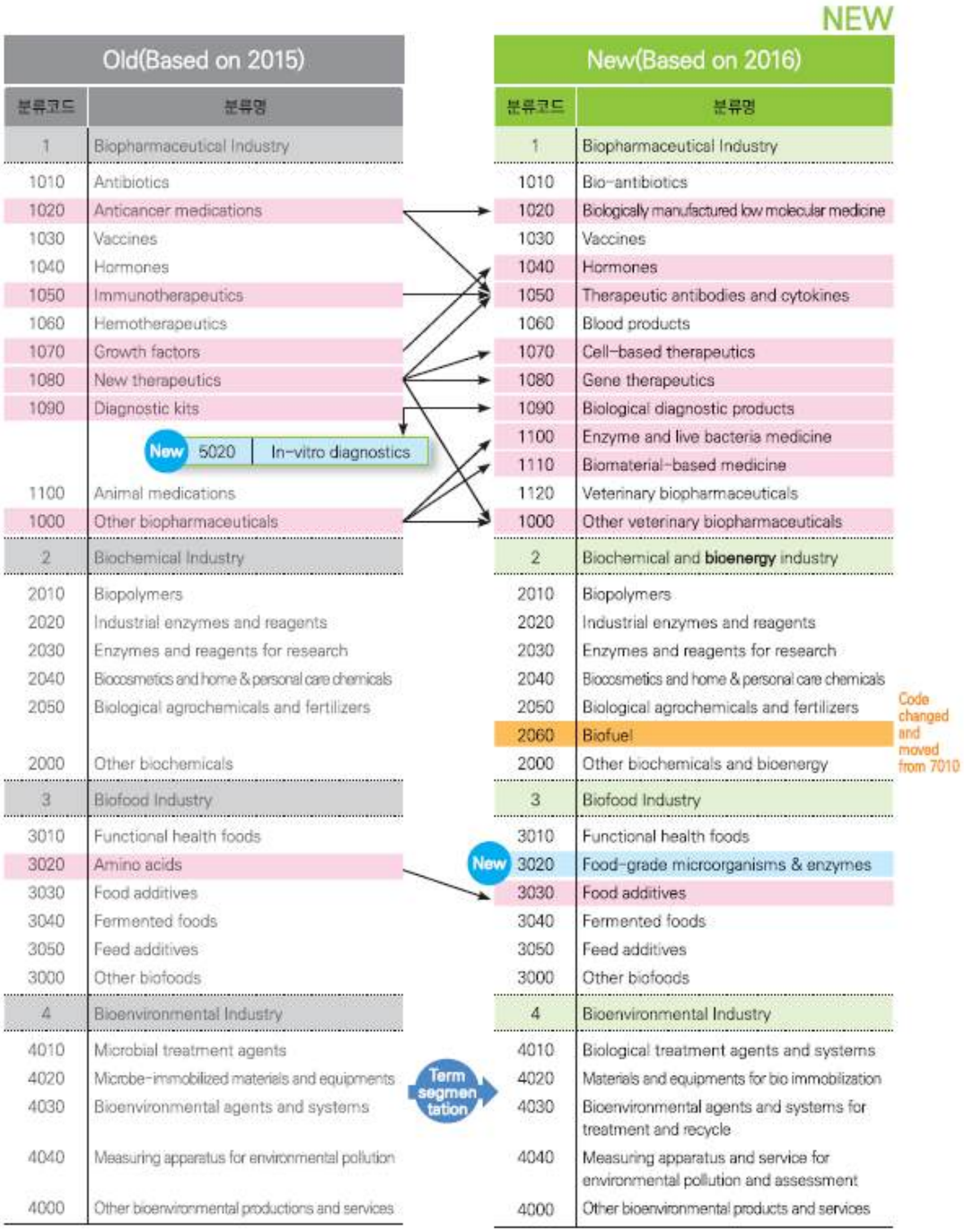
Code	Name of Technological Classification
A	**Genetic Engineering**
A1	Gene manipulation
A2	Gene expression and regulation
A3	Gene application
A4	Gene therapy
A0	Other genetic engineering, N.E.S.
B	**Protein Engineering**
B1	Protein structure analysis
B2	Protein function analysis
B3	Complex protein engineering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

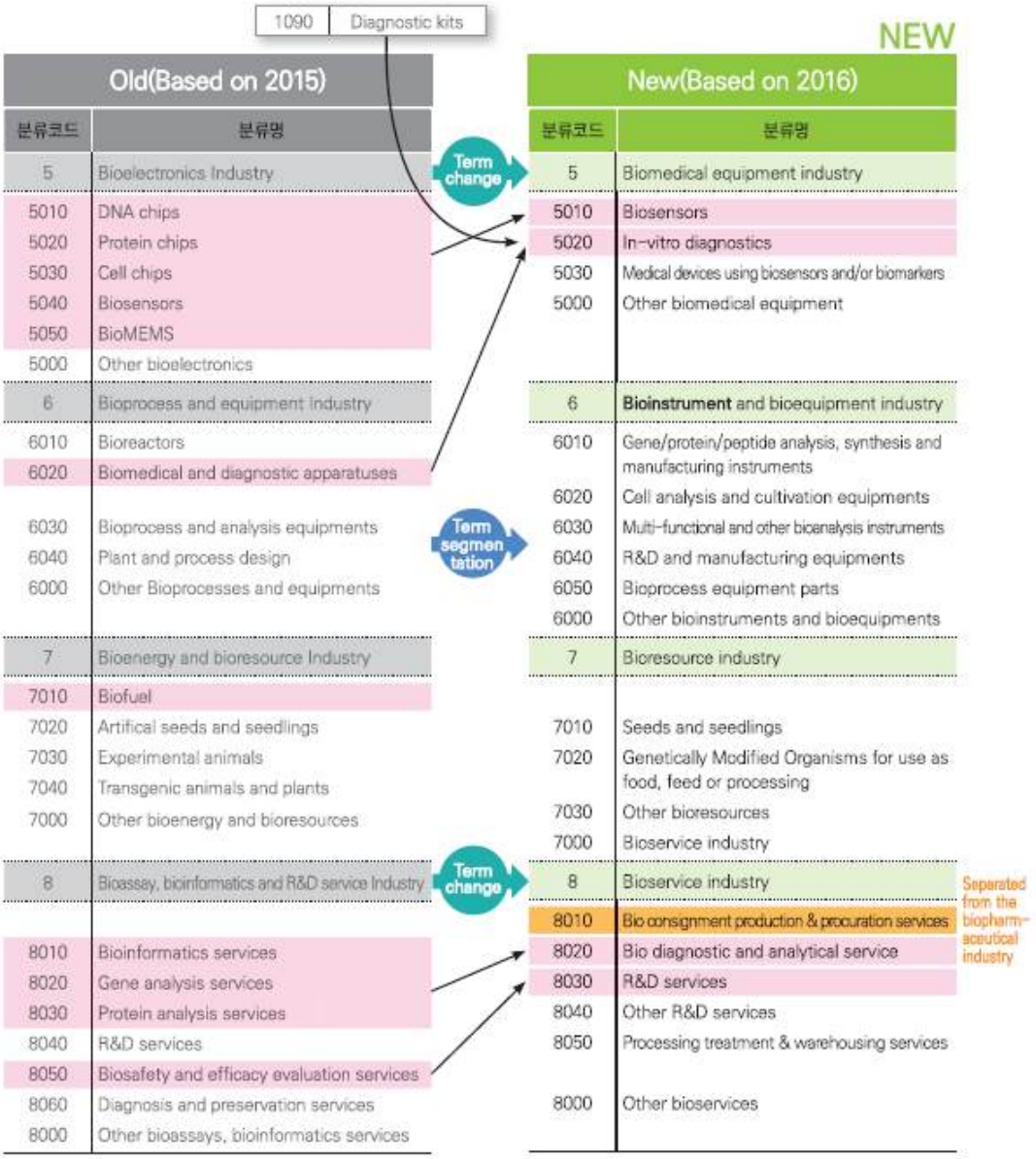
>> [Table 1-2] [Annex] Biotechnology Classification Code (Cont'd)

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

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

3) Comparison Between Old and New Classification Schemes




1090 Diagnostic kits
NEW
Old(Based on 2015)
분류코드 분류명
5 Bioelectronics Industry
5010 DNA chips
5020 Protein chips
5030 Cell chips
5040 Biosensors
5050 BioMEMS
5000 Other bioelectronics
6 Bioprocess and equipment Industry
6010 Bioreactors
6020 Biomedical and diagnostic apparatuses
6030 Bioprocess and analysis equipments
6040 Plant and process design
6000 Other Bioprocesses and equipments
7 Bioenergy and bioresource Industry
7010 Biofuel
7020 Artifical seeds and seedlings
7030 Experimental animals
7040 Transgenic animals and plants
7000 Other bioenergy and bioresources
8 Bioassay, bioinformatics and R&D service Industry
8010 Bioinformatics services
8020 Gene analysis services
8030 Protein analysis services
8040 R&D services
8050 Biosafety and efficacy evaluation services
8060 Diagnosis and preservation services
8000 Other bioassays, bioinformatics services
Term change
Term segmentation
Term change
New(Based on 2016)
분류코드 분류명
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 equipments
6030 Multi-functional and other bioanalysis instruments
6040 R&D and manufacturing equipments
6050 Bioprocess equipment parts
6000 Other bioinstruments and bioequipments
7 Bioresource industry
7010 Seeds and seedlings
7020 Genetically Modified Organisms for use as food, feed or processing
7030 Other bioresources
7000 Bioservice industry
8 Bioservice industry
8010 Bio consignment production & procuration services
8020 Bio diagnostic and analytical service
8030 R&D services
8040 Other R&D services
8050 Processing treatment & warehousing services
8000 Other bioservices
Separated from the biopharmaceutical industry

[Special Notes on Statistical Data]

1) Due to the revision of the bioindustry classification scheme (December 29, 2016), the results for 2016 may differ from the previous results.

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

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

4) 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

5) Any inquiries on this report should be contacted to the Bioindustry Policy Division of the Korea Biotechnology Industry Organization.

   (Tel.: +82-31-628-0040, 0052)

II. Key Findings

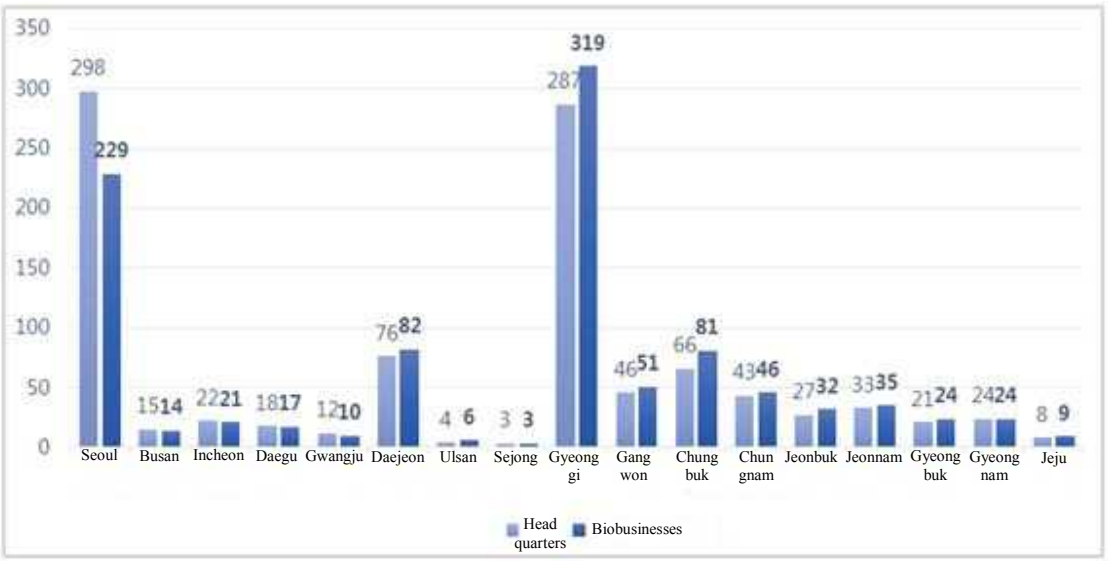
1 General Status of Bioindustry

A. Bioindustry's Distribution per Place

○ Headquarters and biobusinesses are mostly located in Seoul and Gyeonggi Province, with 298 headquarters in Seoul, 287 in Gyeonggi Province, and 229 biobusinesses in Seoul and 319 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: Gyeonggi 37.3% > Seoul 31.7% > Chungbuk 8.8%
· Biochemical and Bioenergy Industry: Gyeonggi 24.5% > Daejeon 13.5% > Seoul 12.5%
· Biofood Industry: Gyeonggi 25.7% > Chungbuk 12.0% > Seoul 10.9%
· Bioenvironmental Industry: Gyeonggi 32.3% > Jeonnam 10.8% > Gangwon 9.2%
· Biomedical Equipment Industry: Gyeonggi 34.7% > Seoul 24.2% > Daejeon 9.5%
· Bioinstrument and Bioequipment Industry: Gyeonggi 45.3% > Seoul 24.6% > Daejeon 14.0%
· Bioresource Industry: Gyeonggi 42.1% > Chungbuk 15.8% = Daejeon 15.8%
· Bioservice Industry: Seoul 49.4% > Gyeonggi 25.9% > Daejeon 9.4%

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

(Unit: companies)

Industrial Category	Total	Seoul	Busan	Incheon	Daegu	Gwangju	Daejeon	Ulsan	Sejong
Total	**1,003**	**229**	**14**	**21**	**17**	**10**	**82**	**6**	**3**
Biopharmaceutical	319	101	3	10	3	1	18		
Biochemical and Bbioenergy	192	24	4	3	2	2	26	4	1
Biofood	175	19	3		4	1	9		2
Bioenvironmental	65	4	4	4	3	2	3	2	
Biomedical Equipment	95	23			3	1	9		
Bioinstrument and Bioequipment	53	15		1	1	1	6		
Bioresource	19	1					3		
Bioservice	85	42		3	1	2	8		

Industrial Category	Gyeonggi	Gangwon	Chungbuk	Chungnam	Jeonbuk	Jeonnam	Gyeongbuk	Gyeongnam	Jeju
Total	**319**	**51**	**81**	**46**	**32**	**35**	**24**	**24**	**9**
Biopharmaceutical	119	15	28	11	2	1	4	2	1
Biochemical and Bioenergy	47	8	14	12	10	14	8	10	3
Biofood	45	11	21	15	14	11	7	8	5
Bioenvironmental	21	6	2	1	2	7	2	2	
Biomedical Equipment	33	8	8	5	1	1	2	1	
Bioinstrument and Bioequipment	24	1	2	2					
Bioresource	8		3		1	1	1	1	
Bioservice	22	2	3		2				

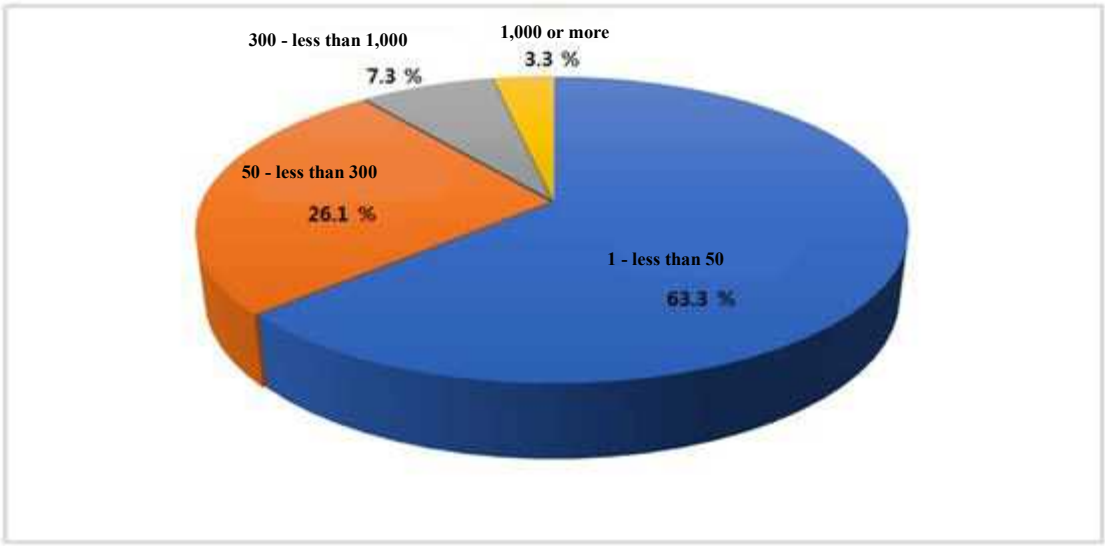
* The result analyzed the results of 1 core business that was selected for each company.
** Place of biobusinesses were analyzed in the following order: factory > R&D center > headquarters.

B. Bioindustry's Distribution per Size of Workers

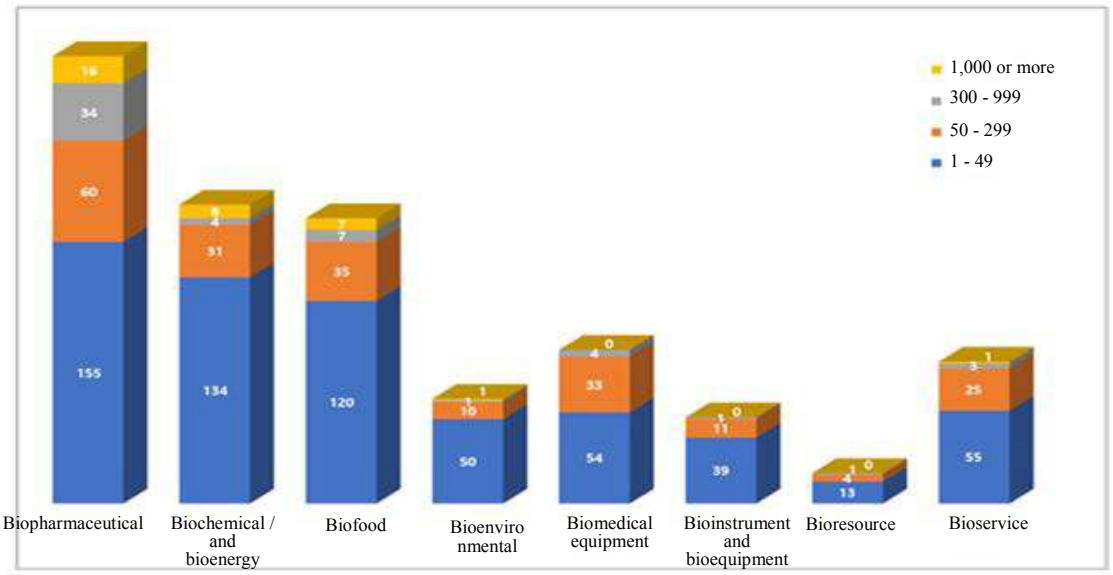
- There are 598 companies (63%) that belong to "less than 50 workers" among total size of workers (excluding 59 no response cases.)

- There were 31 companies (3.0%) with 1,000 or more employees.

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



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



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

C.Bioindustry's Distribution per Existence of Other Businesses

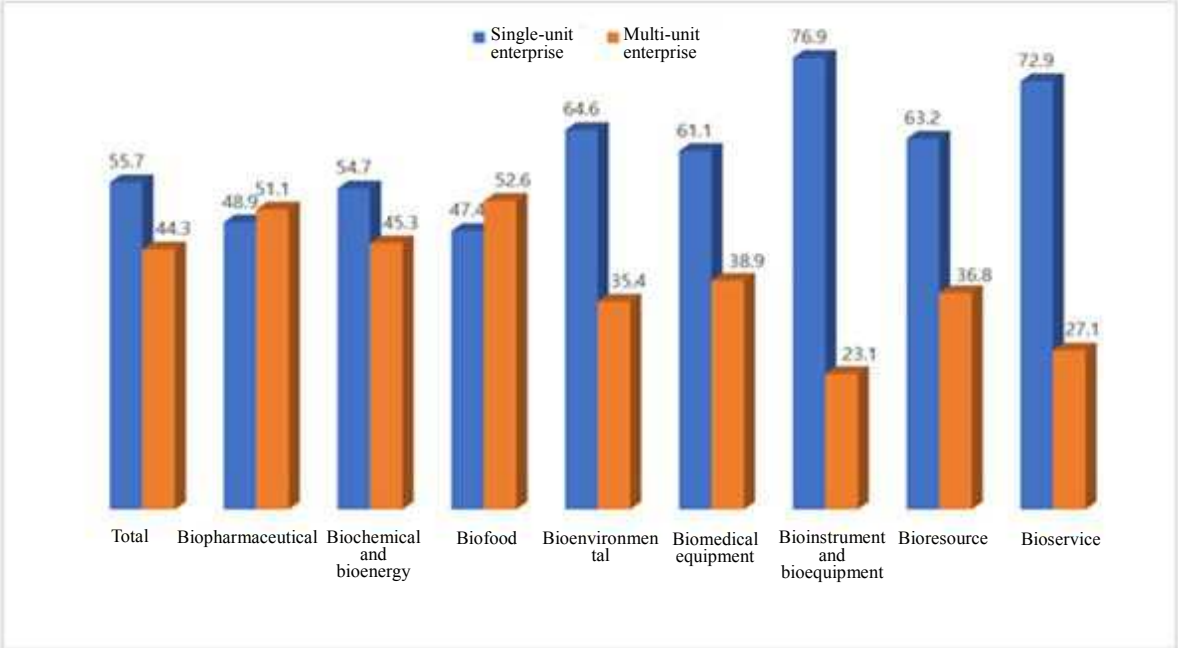
- Bioindustry's existence of other businesses refers to the existence of factories, R&D centers or branches in other location.

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

- Out of 1,003 bioindustry companies, 556 companies (55.7%) are "single-unit enterprises" and 442 companies (44.3%) are "multi-unit enterprises" (excluding 5 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 KRW10.5 billion and the ratio of net worth was 40%.

○ Companies in biochemical and bioenergy industry had higher average amount of capital reaching KRW 21.4 billion. Companies in biochemical, bioenergy, and biofood industries had higher value compared to other bioindustries with average ratio of net worth reaching 48%.

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

(Unit: companies, million KRW, %)

Industrial Category	No. of Companies	No. of Respondents	Capital			Ratio of Net Worth			
			Minimum	Maximum	Average	No. of Respondents	Minimum	Maximum	Average
Total	**1,003**	**939**	**3**	**1,488,993**	**10,530**	**900**	**-3,774**	**100**	**40**
Biopharmaceutical	319	302	13	391,406	12,542	299	-480	99	48
Biochemical and Bioenergy	192	175	3	1,488,993	21,447	164	-252	100	48
Biofood	175	163	11	368,842	7,450	157	-818	98	37
Bioenvironmental	65	60	30	10,846	1,157	56	-85	87	47
Biomedical Equipment	95	92	50	23,469	4,199	88	-270	97	39
Bioinstrument and Bioequipment	53	49	33	15,082	1,293	49	-57	96	46
Bioresource	19	17	7	114,268	11,290	16	1	94	45
Bioservice	85	81	5	165,413	5,202	71	-3,774	100	-11

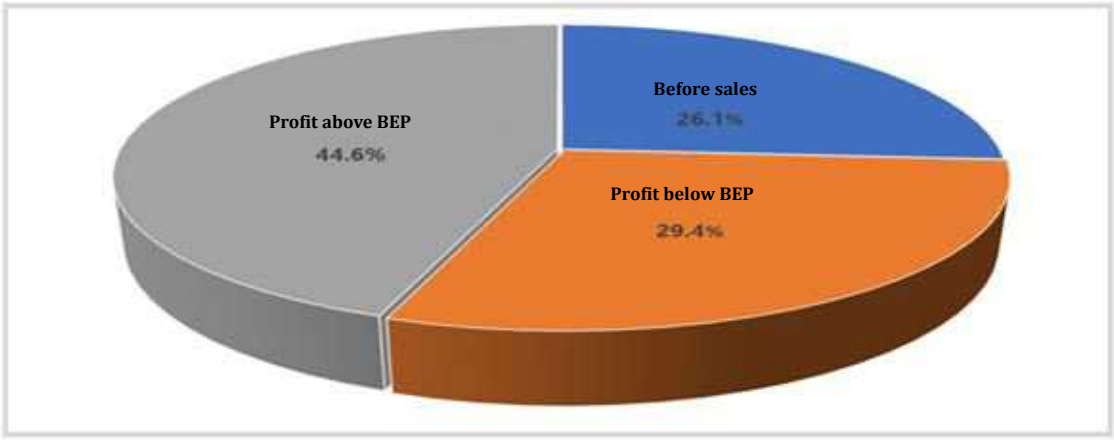
E. Type of Biobusiness' Sales Generation in Bioindustry

- The result for type of biobusiness' revenue includes responses from 848 companies out of 1,003 total participants, of which 155 were "no response."

- Out of 848 companies, 221 companies (26.1%) belonged to the phase of "before sales" in 2019, while 249 companies (29.4%) out of 627 companies that generated sales in the bioindustry were "below the break-even point (BEP)."

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

(Unit: %)

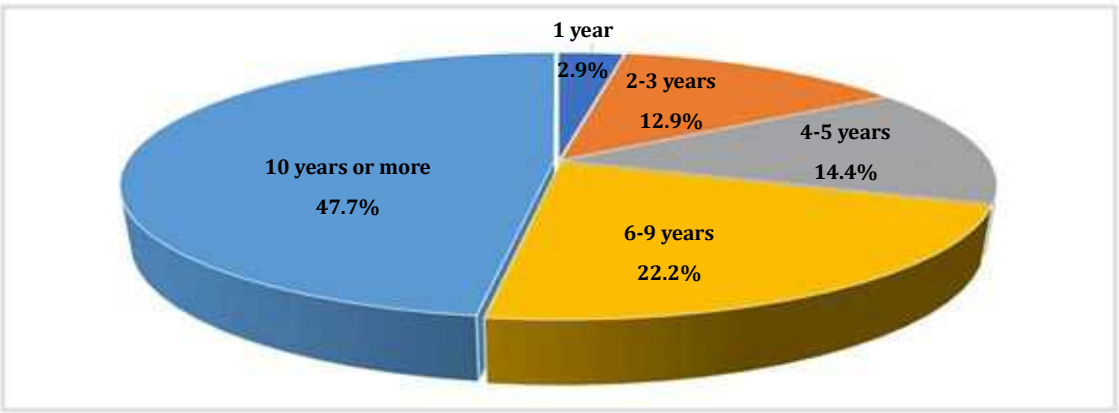


* Excluded unclassified samples.

- Out of the 848 companies that generated sales in 2019, 18 companies (2.9%) had their first sales in 2019, and 299 companies (47.7%) have generated sales for more than 10 years.

<Figure 2- 6> Bioindustry's Sales Period

(Unit: %)



2 Manpower Status of Bioindustry

A. Bioindustry's Manpower Status of 2019

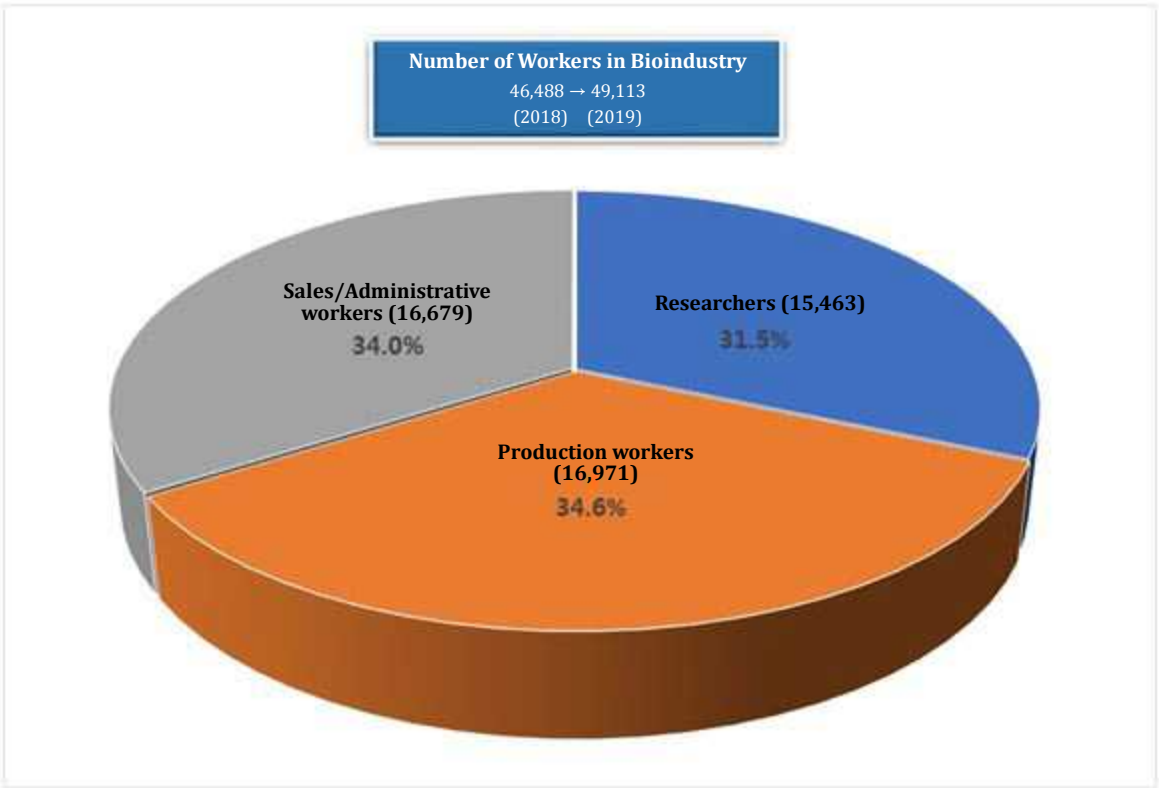
1) Manpower Status per Category

- Out of 1,003 domestic bioindustry companies in 2019, there was an increase of 2,066 workers compared to 2018, reaching a total of 49,113 workers (excluding 37 of non-responding companies). There is an average of 51 workers per company.

- Manpower of bioindustry consists of 15,463 researchers (31.4%), 16,971 production workers (34.5%), and 16,679 sales/administrative workers (33.9%).

<Figure 2-7> 2019 Bioindustry's Distribution of Manpower

(Unit: people, %)



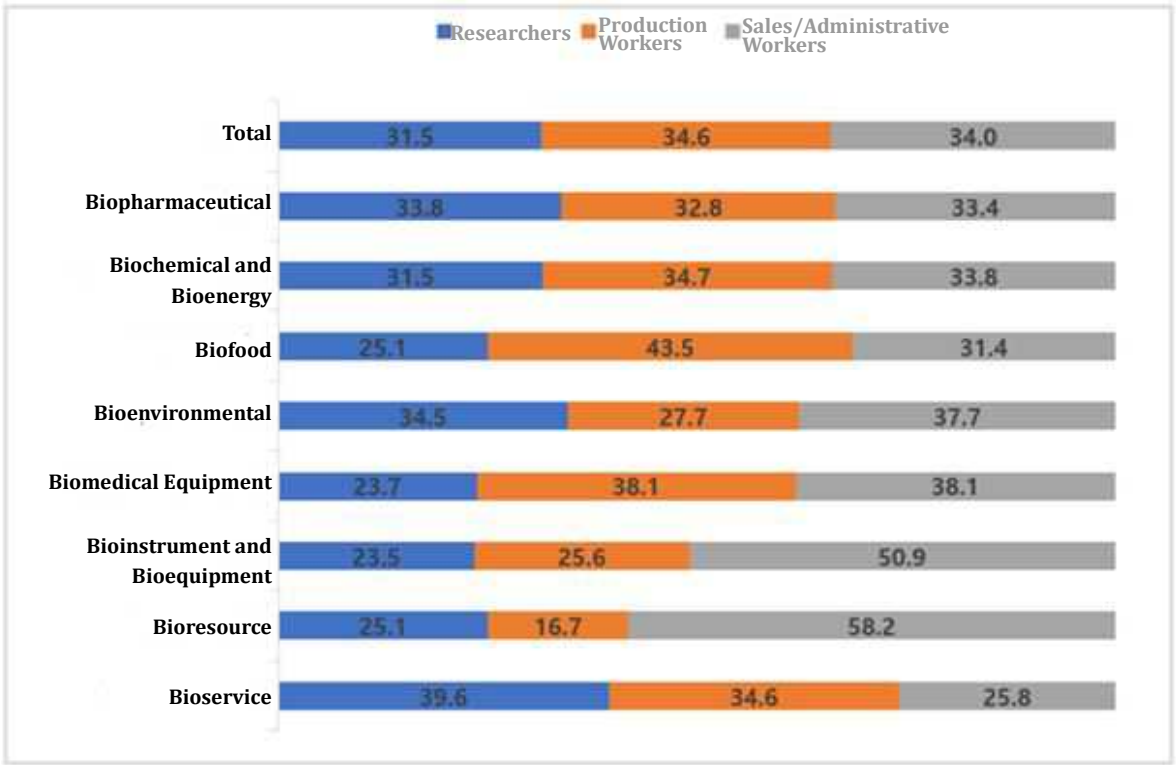
<Table 2-3> 2019 Bioindustry's Manpower Distribution

(Unit: companies, people, %)

Industrial Category		No. of Respondents	Research	Production	Sales/Administrative	Total	Distribution Ratio
Total	**No. of Employees**	**966**	**15,463**	**16,971**	**16,679**	**49,113**	**100.0**
	Distribution Ratio	**100.0**	**31.5**	**34.6**	**34.0**	**100.0**	
Biopharmaceutical		291	7,060	6,854	6,980	20,894	42.5
Biochemical and Bioenergy		187	2,117	2,328	2,272	6,717	13.7
Biofood		174	1,583	2,740	1,979	6,302	12.8
Bioenvironmental		64	370	297	404	1,071	2.2
Biomedical Equipment		95	1,276	2,053	2,053	5,382	11.0
Bioinstrument and Bioequipment		52	364	398	790	1,552	3.2
Bioresource		18	265	177	615	1,057	2.2
Bioservice		85	2,428	2,124	1,586	6,138	12.5

<Figure 2- 8> Bioindustry's Manpower Proportion of 2019

(Unit: %)

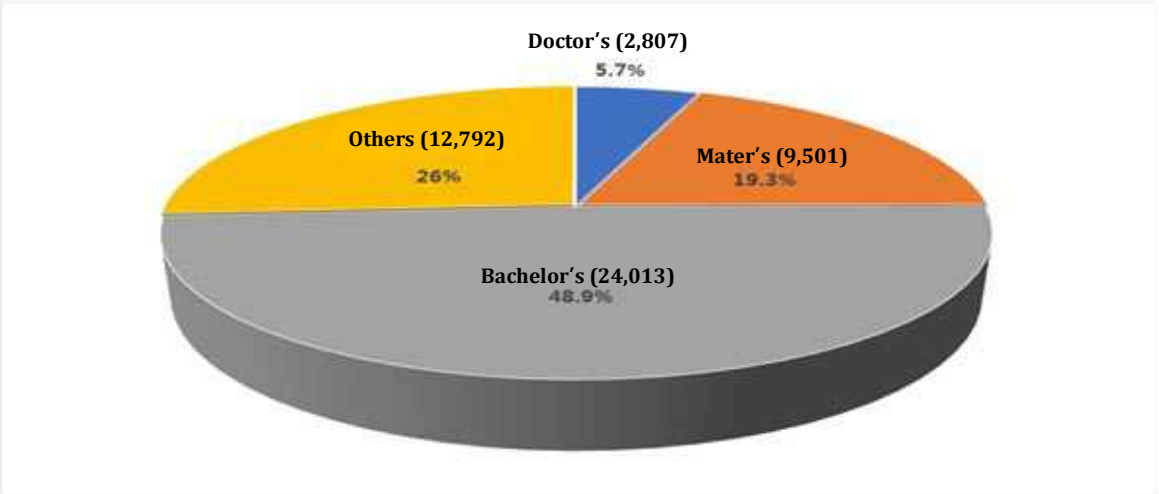


2) Manpower Status by Academic Degree

○ Among the bioindustry manpower in 2019, workers with bachelor's degree were the largest in number, reaching 24,013 people (48.9%). Workers with master's degree ranked second with 9,501 workers (19.3%), followed by 2,807 workers with doctor's degree (5.7%).

<Figure 2-9> Bioindustry's Academic Degree Proportion of Workers of 2019

(Unit: people, %)



<Table 2-4> 2019 Bioindustry's Distribution of Academic Degree

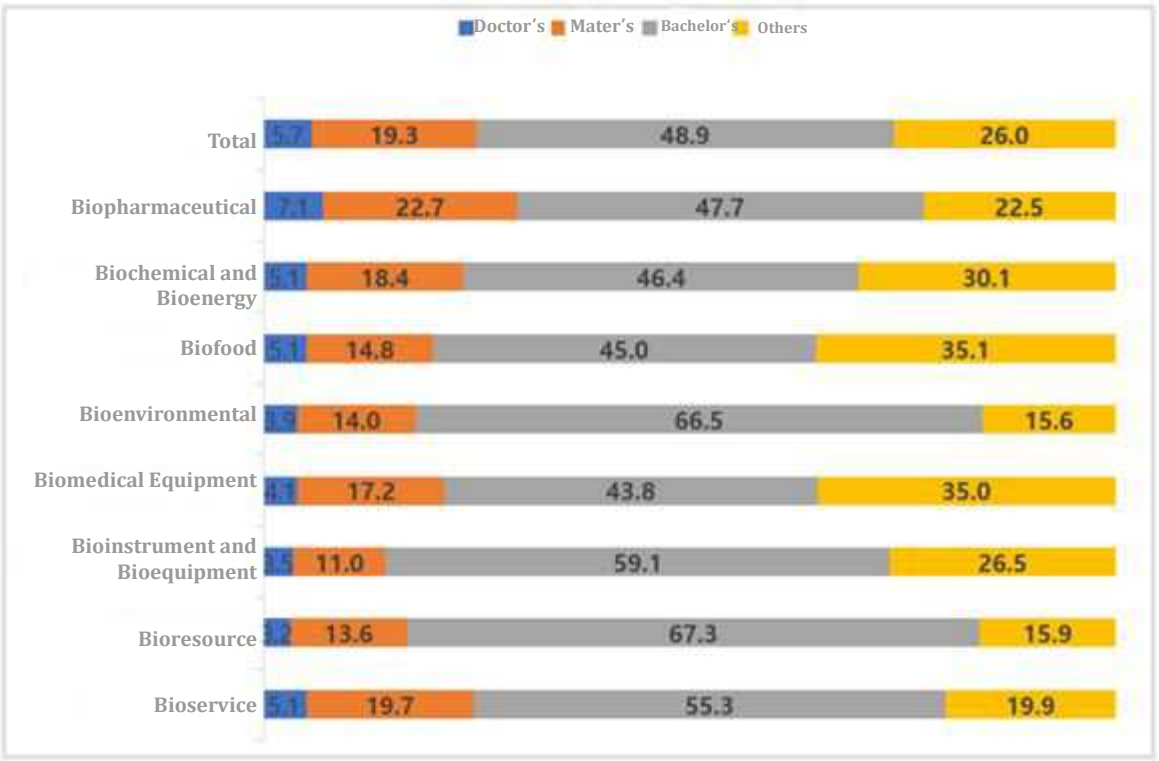
(Unit: people, %)

Industrial Category		Doctor's	Master's	Bachelor's	Others	Total	Distribution Ratio
Total	**No. of Employees**	**2,807**	**9,501**	**24,013**	**12,792**	**49,113**	**100.0**
	Distribution Ratio	**5.7**	**19.3**	**48.9**	**26.0**	**100.0**	
Biopharmaceutical		1,483	4,736	9,970	4,705	20,894	42.5
Biochemical and Bioenergy		342	1,237	3,117	2,021	6,717	13.7
Biofood		324	930	2,834	2,214	6,302	12.8
Bioenvironmental		42	150	712	167	1,071	2.2
Biomedical Equipment		218	926	2,356	1,882	5,382	11.0
Bioinstrument and Bioequipment		54	170	917	411	1,552	3.2
Bioresource		34	144	711	168	1,057	2.2
Bioservice		310	1,208	3,396	1,224	6,138	12.5

○ The proportion of elite manpower such as workers with master's and doctor's degree were relatively high in the biopharmaceutical industry (29.8%), the bioservice industry (24.7%), and the biochemical and bioenergy industry (23.5%).

<Figure 2-10> Bioindustry's Academic Degree Proportion of 2019

(Unit: %)



3) Manpower Distribution by Area

○ As of 2019, the number of manpower in the bioindustry was highest in the Gyeonggi province with 14,671 people, accounting for 29.9%. Next followed Chungbuk (8,012 people), Seoul (7,241), and Incheon (5,299).

<Table 2-5> 2019 Bioindustry's Manpower Distribution by Area

(Unit: people, %)

Area		Doctor's	Master's	Bachelor's	Others	Total	Distribution Ratio
Total	**No. of Employees**	**2,807**	**9,501**	**24,013**	**12,792**	**49,113**	**100**
	Distribution Ratio	**5.7**	**19.3**	**48.9**	**26.0**	**100.0**	
Seoul		509	1,643	4,018	1,071	7,241	14.7
Busan		14	52	132	58	256	0.5
Incheon		297	1,098	2,689	1,215	5,299	10.8
Daegu		15	61	708	680	1,464	3.0
Gwangju		6	24	32	5	67	0.1
Daejeon		211	550	1,122	362	2,245	4.6
Ulsan		25	152	640	305	1,122	2.3
Sejong		9	83	183	82	357	0.7
Gyeonggi		1,022	3,208	6,717	3,724	14,671	29.9
Gangwon		126	463	1,310	1,018	2,917	5.9
Chungbuk		330	1,407	3,816	2,459	8,012	16.3
Chungnam		102	338	817	746	2,003	4.1
Jeonbuk		44	122	527	464	1,157	2.4
Jeonnam		27	99	460	179	765	1.6
Gyeongbuk		44	115	396	238	793	1.6
Gyeongnam		16	60	323	84	483	1.0
Jeju		10	26	123	102	261	0.5

B. Recent Trend of Bioindustry Manpower Status

1) 2017~2019 Bioindustry's Trend of Manpower Status

① Bioindustry's Trend of Manpower Status

○ As of 2019, the number of manpower in the bioindustry was 49,113, an increase of 2,625 workers (5.6%) compared to 2018.

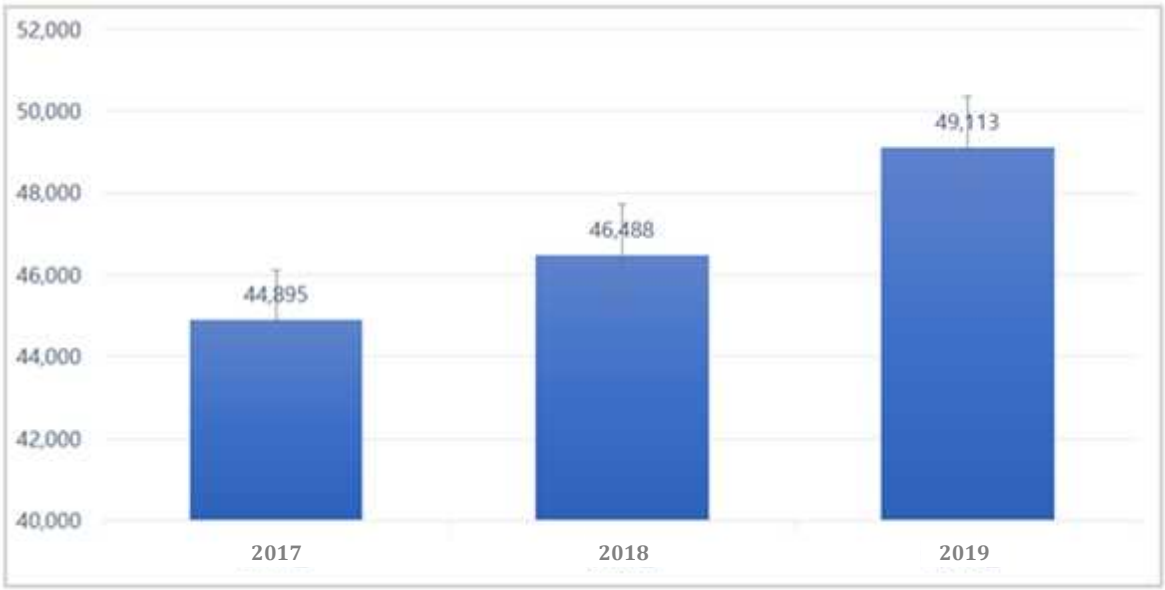
<Table 2-6> 2017~2019 Bioindustry's Change in Manpower

(Unit: people, %)

Classification	2017	2018	2019	Annual Average Rate of Change
No. of Employees	44,895	46,488	49,113	4.6
Rate of Change	8.0	3.5	5.6	

<Figure 2-11> 2017~2019 Bioindustry's Trend of Manpower

(Unit: people)



② Bioindustry's Trend in Academic Degree of Manpower

- Compared to 2018, the number of bioindustry workers in 2019 with doctor's degree decreased by 1.6%, while workers with master's, bachelor's, and others decreased by 3.2%, 7.5%, and 5.8%, respectively.
- The number of workers with bachelor's degrees increased most by 1,547 people compared to the previous year.

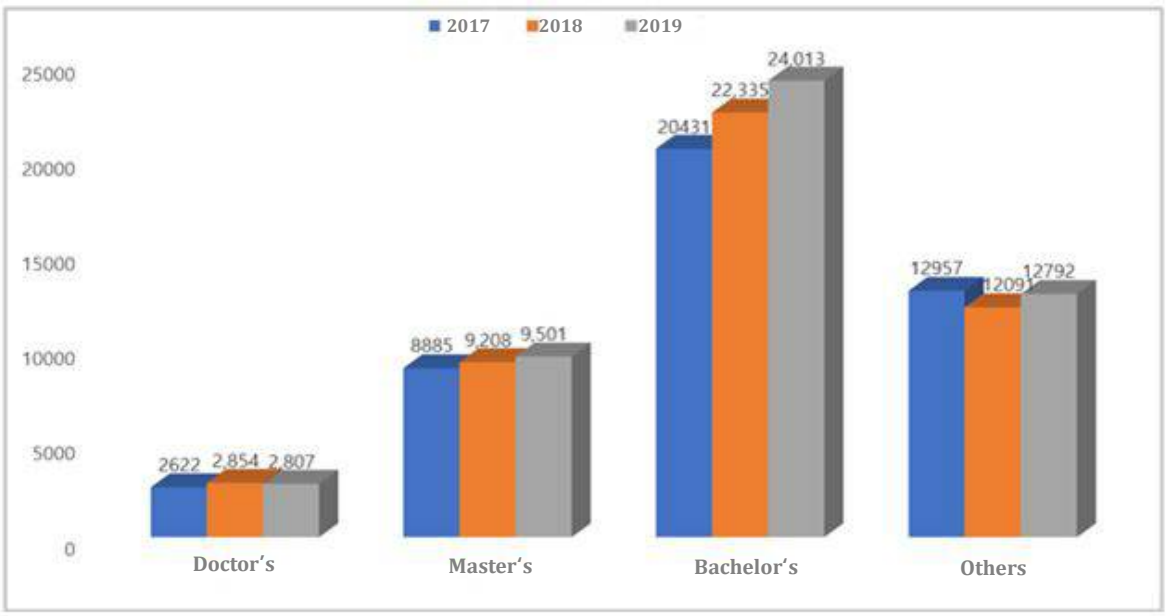
<Table 2-7> 2017~2019 Bioindustry's Trend in Academic Degree of Manpower

(Unit: people, %)

Degree	2017		2018		2019		Variation from Previous Year		Annual Average Rate of Change
	No. of Employees	Distribution Ratio	No. of Employees	Distribution Ratio	No. of Employees	Distribution Ratio	No. of Employees	Rate of Change	
Total	**44,895**	**100.0**	**46,488**	**100.0**	**49,113**	**100.0**	**2,625**	**5.6**	**4.6**
Doctor's	2,622	5.8	2,854	5.8	2,807	5.7	-47	-1.6	3.5
Master's	8,885	19.8	9,208	18.7	9,501	19.3	293	3.2	3.4
Bachelor's	20,431	45.5	22,335	45.5	24,013	48.9	1,678	7.5	8.4
Others	12,957	28.9	12,091	24.6	12,792	26.0	701	5.8	-0.6

<Figure 2-12> 2017~2019 Bioindustry's Trend in Academic Degree of Manpower

(Unit: people)



2) 2015~2019 Bioindustry's Trend of Manpower

① Bioindustry's Trend of Manpower Status

○ For the past five years, the number of manpower in the bioindustry has continued to increase by 5.1%.

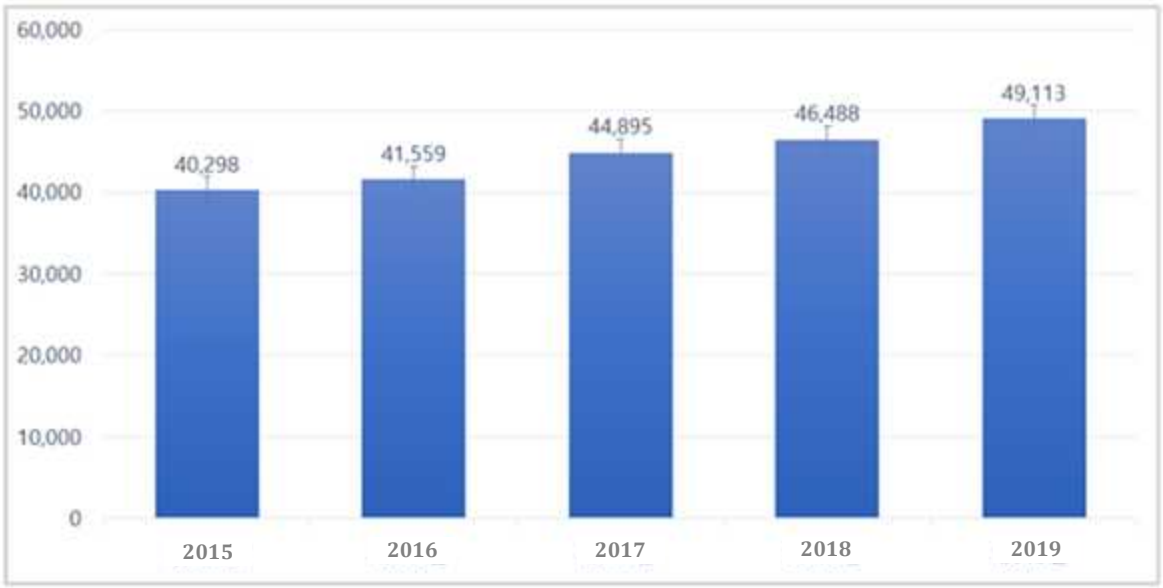
<Table 2-8> 2015~2019 Bioindustry's Change in Manpower

(Unit: people, %)

Classification	2015	2016	2017	2018	2019	Annual Average Rate of Change
No. of Employees	40,298	41,559	44,895	46,488	49,113	5.1
Rate of Change	6.6	3.1	8.0	3.5	5.6	

<Figure 2-13> 2015~2019 Bioindustry's Trend of Manpower

(Unit: people)



② Bioindustry's Trend in Academic Degree of Manpower

- From 2015 to 2019, the number of employees an academic degree (bachelor's, master's, or doctor's) showed steady increase. However, employees with doctor's degree decreased for the first time in 2019.
- The number of employees with a bachelor's degree increased by 7.5%, followed by master's (3.2%), and others (5.8%).

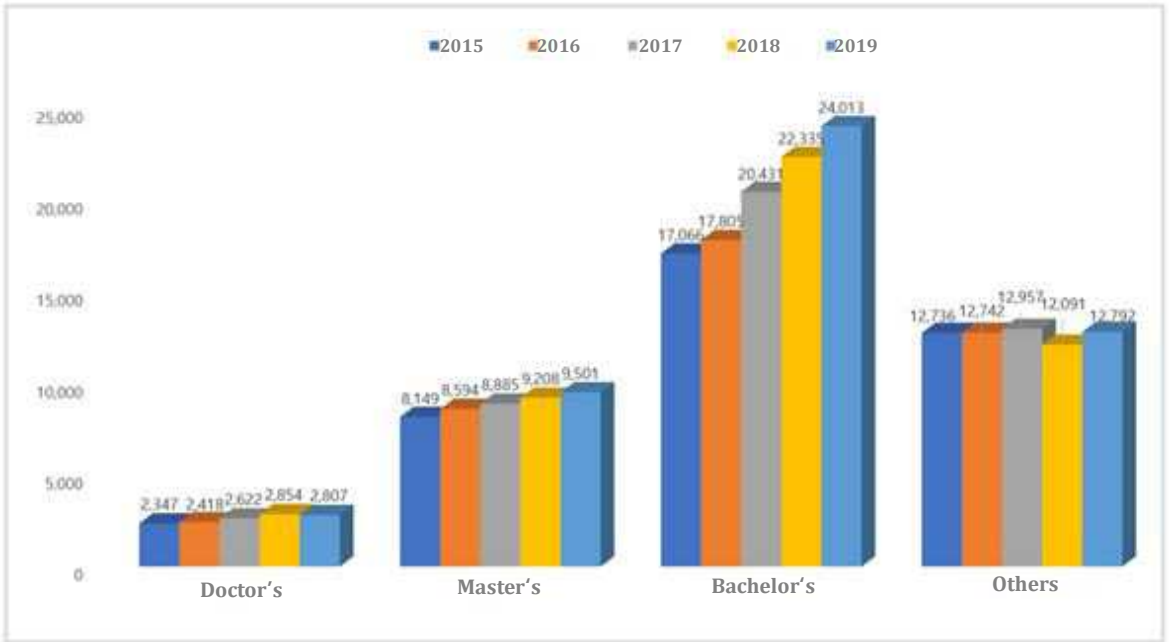
<Table 2- 9> 2015~2019 Bioindustry's Trend in Academic Degree of Manpower

(Unit: people, %)

Degree	2015		2016		2017		2018		2019		Variation from Previous Year		Annual Average Rate of Change
	No. of Employees	Distribution Ratio	No. of Employees	Distribution Ratio	No. of Employees	Distribution Ratio	No. of Employees	Distribution Ratio	No. of Employees	Distribution Ratio	No. of Employees	Rate of Change	
Total	**40,298**	**100.0**	**41,559**	**100.0**	**44,895**	**100.0**	**46,488**	**100.0**	**49,113**	**100.0**	**2,625**	**5.6**	**5.1**
Doctor's	2,347	5.8	2,418	5.8	2,622	5.8	2,854	5.8	2,807	5.7	-47	-1.6	4.6
Master's	8,149	20.2	8,594	20.7	8,885	19.8	9,208	18.7	9,501	19.3	293	3.2	3.9
Bachelor's	17,066	42.3	17,805	42.8	20,431	45.5	22,335	45.5	24,013	47.7	1,678	7.5	8.9
Others	12,736	31.6	12,742	30.7	12,957	28.9	12,091	24.6	12,792	22.5	701	5.8	0.1

<Figure 2-14> 2015~2019 Bioindustry's Trend in Academic Degree of Manpower

(Unit: people)



3 Investment Status of Bioindustry

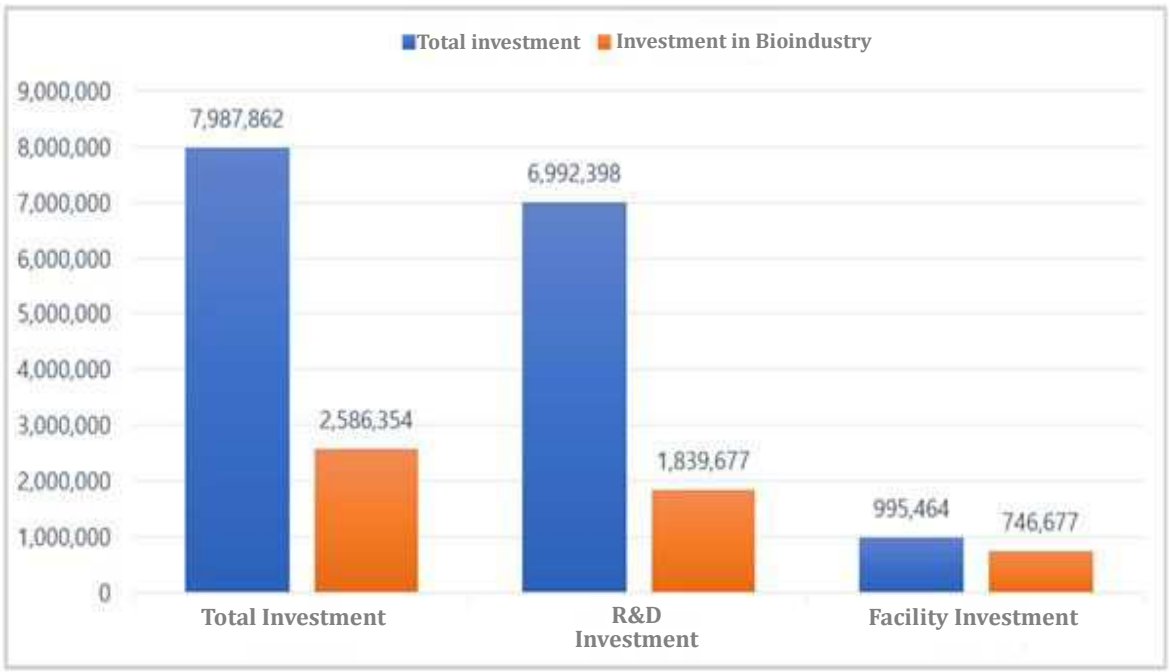
A. Bioindustry's Investment Status of 2019

- The total amount of investments in bioindustry companies in 2019 was KRW 7.988 trillion, and the total investment cost turned out to be 32.3% of the total investment fee reaching KRW2.586 trillion.

- The R&D cost in the bioindustry turned out to be 26.3% of the total cost reaching KRW 1.84 trillion, and the facility investment cost took 75% of the total cost of KRW 746.7 billion.

<Figure 2-15> 2019 Total Investment Cost and Investment in Bioindustry

(Unit: million KRW)



- Among the bioindustries, the total investment was highest in the biopharmaceutical industry with KRW 1.695 trillion (65.5%), followed by the biochemical and bioenergy with KRW 239.7 billion (9.3%), and the bioservice with KRW 234.4 billion (9.1%). These three core bioindustries took 83.9% of the total investment cost.

- Comparing the size of R&D cost by bioindustry, the biopharmaceutical industry was the largest with KRW 1.312 trillion (71.3%), followed by the biochemical and bioenergy with KRW 147.3 billion (8.0%), and the biofood with KRW 129.1 billion (7.0%). Three three core bioindustries took 86.3% 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 bioservice (KRW 1.4 billion), and biomedical equipment (KRW 1.1 billion).

- The total facility investment cost by bioindustry was highest in the biopharmaceutical industry with KRW 382.9 billion KRW (51.3%), followed by the bioservice with KRW 122.1 billion (16.3%).

- The average facility investment cost per bioindustry company was highest in the bioservice with KRW 1.5 billion, followed by the biopharmaceutical with KRW 1.3 billion.

<Table 2-10> 2019 Bioindustry's Size of Investment

(Units: companies, million KRW)

Industrial Category	No. Companies	No. of Companies	R&D Investment		Facility Investment		Total Investment	
			Total	Average	Total	Average	Total	Average
Total	**1,003**	**946**	**1,839,677**	**1,945**	**746,677**	**789**	**2,586,354**	**2,734**
Biopharmaceutical	319	292	1,311,581	4,492	382,946	1,311	1,694,527	5,803
Biochemical and Bioenergy	192	184	147,326	801	92,394	502	239,720	1,303
Biofood	175	167	129,144	773	82,080	491	211,224	1,265
Bioenvironmental	65	64	13,246	207	7,165	112	20,411	319
Biomedical Equipment	95	92	101,860	1,107	54,873	596	156,733	1,704
Bioinstrument and Bioequipment	53	49	13,087	267	2,654	54	15,741	321
Bioresource	19	18	11,084	616	2,487	138	13,571	754
Bioservice	85	80	112,349	1,404	122,078	1,526	234,427	2,930

○ The size of overall R&D investment was highest in the order of Gyeonggi, Chungbuk, and Incheon, while the facility investment was highest in the order of Gyeonggi, Incheon, and Chungbuk.

○ The average size of R&D investment was highest in Incheon with KRW 12.8 billion, and the facility investment was also highest in Incheon with KRW 9 billion.

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

(Units: companies, million KRW)

Area	No. of Companies	No. of Respondents	R&D Investment		Facility Investment		Total Investment	
			Total	Average	Total	Average	Total	Average
Total	**1,003**	**946**	**1,839,677**	**1,945**	**746,677**	**789**	**2,586,354**	**2,734**
Seoul	229	203	218,468	1,076	49,991	246	268,459	1,322
Busan	14	13	3,166	244	1,100	85	4,266	328
Incheon	21	19	243,867	12,835	170,248	8,960	414,115	21,796
Daegu	17	17	6,469	381	13,099	771	19,568	1,151
Gwangju	10	10	982	98	285	29	1,267	127
Daejeon	82	78	74,552	956	69,446	890	143,998	1,846
Ulsan	6	6	26,158	4,360	19,342	3,224	45,500	7,583
Sejong	3	3	30,322	10,107	13,803	4,601	44,125	14,708
Gyeonggi	319	303	715,454	2,361	225,849	745	941,303	3,107
Gangwon	51	49	69,034	1,409	23,551	481	92,585	1,889
Chungbuk	81	78	354,610	4,546	93,740	1,202	448,350	5,748
Chungnam	46	46	27,428	596	8,096	176	35,524	772
Jeonbuk	32	32	16,983	531	31,066	971	48,049	1,502
Jeonnam	35	33	6,942	210	6,391	194	13,333	404
Gyeongbuk	24	24	34,160	1,423	14,038	585	48,198	2,008
Gyeongnam	24	23	6,316	275	1,389	60	7,705	335
Jeju	9	9	4,766	530	5,243	583	10,009	1,112

B. Recent Trend of Investment Status

1) 2017~2019 Bioindustry's Trend of Investment

○ The annual average growth rate of investment in the bioindustry continued to increase for nearly three years, with 8.1% for R&D investment and 5.6% for facility investment.

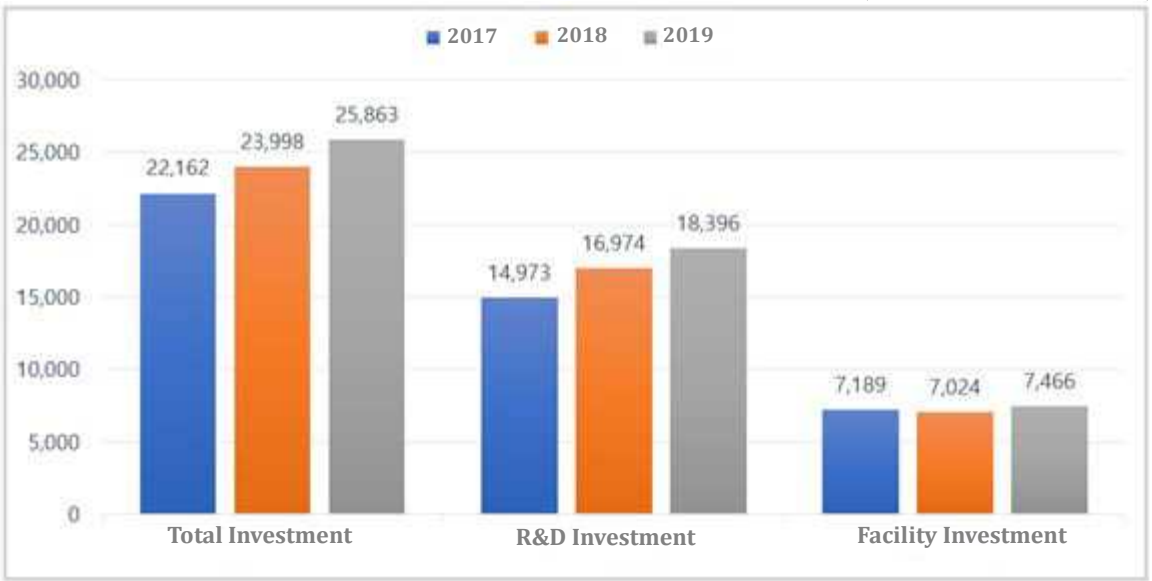
<Table 2-12> 2017~2019 Bioindustry's Trend of Investment

(Unit: 100 million KRW, %)

Classification		2017	2018	2019	Annual Average Rate of Change
Total Investment	Amount	22,162	23,998	25,864	8.0
	Distribution Ratio	8.1	8.3	7.8	
R&D Investment	Amount	14,973	16,974	18,397	10.8
	Distribution Ratio	6.1	13.4	8.4	
Facility Investment	Amount	7,189	7,024	7,467	1.9
	Distribution Ratio	12.8	-2.3	6.3	

<Figure 2-16> 2017~2019 Bioindustry Investment Trend

(Unit: 100 million KRW)



○ Compared to 2018, the overall size of investment for 2019 increased the most in the bioinstrument and bioequipment industry by 74.1%; however, there was a sharp decrease in the biomedical equipment of 5.2%.

<Table 2-13> 2017~2019 Bioindustry's Trend in Overall Size of Investment

(Unit: million KRW, %)

Classification	2017		2018		2019		Variation from Previous Year	Annual Average Rate of Change
	Investment Amount	Distribution Ratio	Investment Amount	Distribution Ratio	Investment Amount	Distribution Ratio		
Total	**2,216,223**	**100.0**	**2,399,846**	**100.0**	**2,586,354**	**100.0**	**7.8**	**8.0**
Biopharmaceutical	1,521,664	68.7	1,536,020	64.0	1,694,527	65.5	10.3	5.5
Biochemical and Bioenergy	178,700	8.1	219,180	9.1	239,720	9.3	9.4	15.8
Biofood	122,411	5.5	210,377	8.8	211,224	8.2	0.4	31.4
Bioenvironmental	11,422	0.5	17,168	0.7	20,411	0.8	18.9	33.7
Biomedical Equipment	103,341	4.7	165,315	6.9	156,733	6.1	-5.2	23.2
Bioinstrument and Bioequipment	15,098	0.7	9,042	0.4	15,741	0.6	74.1	2.1
Bioresource	25,949	1.2	12,091	0.5	13,571	0.5	12.2	-27.7
Bioservice	237,638	10.7	230,653	9.6	234,427	9.1	1.6	-0.7

○ For the past three years, the R&D investment cost has increased by 48.7% in the bioservice industry, 28.3% in the biomedical equipment, and 16.8% in the bioenvironmental. However, there was a 30.0% decrease in the bioresource industry.

○ For the past three years, the facility investment cost has increased significantly in three industries: biofood (178.6%), bioinstrument and bioequipment (10.1%), and bioenvironmental (104.9%). However, there was a decrease in the bioservice industry by 19.2%, bioresource by 13.5%, and biopharmaceutical by 3.4%, confirming that there is a large difference between the R&D investment and the facility investment.

<Table 2-14> 2017~2019 Bioindustry's Trend of R&D and Facility Investment Cost

(Unit: million KRW, %)

Industrial Category	2017		2018		2019		Variation from Previous Year		Annual Average Rate of Change	
	R&D	Facility	R&D	Facility	R&D	Facility	R&D	Facility	R&D	Facility
Total	**1,497,274**	**718,949**	**1,697,419**	**702,427**	**1,839,677**	**746,677**	**8.4**	**6.3**	**10.8**	**1.9**
Biopharmaceutical	1,110,864	410,800	1,217,383	318,637	1,311,581	382,946	7.7	20.2	8.7	-3.4
Biochemical and Bioenergy	116,610	62,090	149,539	69,641	147,326	92,394	-1.5	32.7	12.4	22.0
Biofood	111,837	10,574	126,919	83,458	129,144	82,080	1.8	-1.7	7.5	178.6
Bioenvironmental	9,716	1,706	11,810	5,358	13,246	7,165	12.2	33.7	16.8	104.9
Biomedical Equipment	61,869	41,472	89,130	76,185	101,860	54,873	14.3	-28.0	28.3	15.0
Bioinstrument and Bioeuipment	12,909	2,189	8,661	381	13,087	2,654	51.1	596.6	0.7	10.1
Bioresource	22,626	3,323	10,244	1,847	11,084	2,487	8.2	34.7	-30.0	-13.5
Bioservice	50,843	186,795	83,733	146,920	112,349	122,078	34.2	-16.9	48.7	-19.2

2) 2015~2019 Bioindustry's Trend of Investment

○ Total investment in the bioindustry has been on a steady rise over the past four years by 10.8%, a 7.8% increase compared to each previous year.

<Table 2-15> 2015~2019 Bioindustry's Trend of Investment

(Unit: 100 million KRW, %)

Classification		2015	2016	2017	2018	2019	Annual Average Rate of Change
Total Investment	Amount	17,185	20,494	22,162	23,998	25,864	10.8
	Distribution Ratio	-6.3	19.3	8.1	8.3	7.8	
R&D Investment	Amount	13,086	14,118	14,973	16,974	18,397	8.9
	Distribution Ratio	4.8	7.9	6.1	13.4	8.4	
Facility Investment	Amount	4,100	6,376	7,189	7,024	7,467	16.2
	Distribution Ratio	-30.0	55.5	12.8	-2.3	6.3	

<Figure 2-17> 2015~2019 Bioindustry Investment Trend

(Unit: 100 million KRW)

○ The biopharmaceutical industry has consistently accounted for more than 60% of investment in the bioindustry since 2015.

○ Compared to the previous year, the bioinstrument and bioequipment industry increased most by 74.1%, while the biomedical equipment industry decreased by 5.2%.

<Table 2-16> 2015~2019 Bioindustry's Trend in Overall Size of Investment

(Unit: million KRW, %)

Industrial Category	2015		2016		2017		2018		2019		Variation from Previous Year	Annual Average Rate of Change
	Investment Amount	Distribution Ratio	Investment Amount	Distribution Ratio	Investment Amount	Distribution Ratio	Investment Amount	Distribution Ratio	Investment Amount	Distribution Ratio		
Total	**1,718,520**	**100.0**	**2,049,417**	**100.0**	**2,216,223**	**100.0**	**2,399,846**	**100.0**	**2,586,354**	**100.0**	**7.8**	**10.8**
Biopharmaceutical	1,344,870	78.3	1,253,438	61.2	1,525,964	68.9	1,536,020	64.0	1,694,527	65.5	10.3	5.9
Biochemical and Bioenergy	137,158	8.0	162,176	7.9	178,397	8.0	219,180	9.1	239,720	9.3	9.4	15.0
Biofood	100,891	5.9	113,818	5.6	122,904	5.5	210,377	8.8	211,224	8.2	0.4	20.3
Bioenvironmental	10,976	0.6	10,874	0.5	11,622	0.5	17,168	0.7	20,411	0.8	18.9	16.8
Biomedical Equipment	23,851	1.4	122,189	6.0	98,489	4.4	165,315	6.9	156,733	6.1	-5.2	60.1
Bioinstrument and Bioequipment	19,916	1.2	15,525	0.8	14,881	0.7	9,042	0.4	15,741	0.6	74.1	-5.7
Bioresource	25,120	1.5	25,288	1.2	25,504	1.2	12,091	0.5	13,571	0.5	12.2	-14.3
Bioservice	55,738	3.2	346,109	16.9	238,462	10.8	230,653	9.6	234,427	9.1	1.6	43.2

* Due to changes in classification in 2016 onwards, some of the time series data in certain industries needs attention.

○ The annual average rate of change in R&D investment for the past five years was highest in the biomedical equipment industry with an increase of 45.4%, followed by the bioservice (31.6%), and the bioenvironmental (9.4%). The bioresource industry was decreased by 14.8%.

○ The annual average rate of change in facility investment was highest in the biomedical equipment industry with 165.8%, followed by the bioservice (60.7%) and the biochemical and bioenergy (49.5%). The bioresource industry slightly decreased by 11.6%.

<Table 2-17> 2015~2019 Bioindustry's Trend of R&D and Facility Investment Cost

(Unit: 100 million KRW, %)

Industrial Category	2015		2016		2017		2018		2019		Variation from Previous Year		Annual Average Rate of Change	
	R&D	Facility	R&D	Facility	R&D	Facility	R&D	Facility	R&D	Facility	R&D	Facility	R&D	Facility
Total	**13,086**	**4,100**	**14,118**	**6,376**	**14,973**	**7,189**	**16,974**	**7,024**	**18,397**	**7,467**	**8.4**	**6.3**	**8.9**	**16.2**
Biopharmaceutical	9,934	3,515	10,455	2,080	11,150	4,109	12,173	3,186	13,116	3,829	7.7	20.2	7.2	2.2
Biochemica and Bioenergy	1,187	185	1,137	485	1,165	619	1,495	696	1,473	923	-1.5	32.7	5.5	49.5
Biofood	877	132	1,043	95	1,121	108	1,269	834	1,291	821	1.8	-1.7	10.1	57.9
Bioenvironmental	92	18	92	17	99	17	118	53	132	72	12.2	33.7	9.4	41.4
Biomedical Equipment	228	11	561	661	572	413	891	761	1,019	549	14.3	-28.0	45.4	165.8
Bioinstrument and Bioequipment	184	16	120	36	127	22	86	3	131	27	51.1	596.6	-8.1	14.0
Bioresource	211	41	223	30	222	33	102	18	111	25	8.2	34.7	-14.8	-11.6
Bioservice	374	183	489	2,972	517	1,868	837	1,469	1,123	1,221	34.2	-16.9	31.6	60.7

* Due to changes in classification in 2016 onwards, some of the time series data in certain industries needs attention.

4 Cooperation with Other Organizations

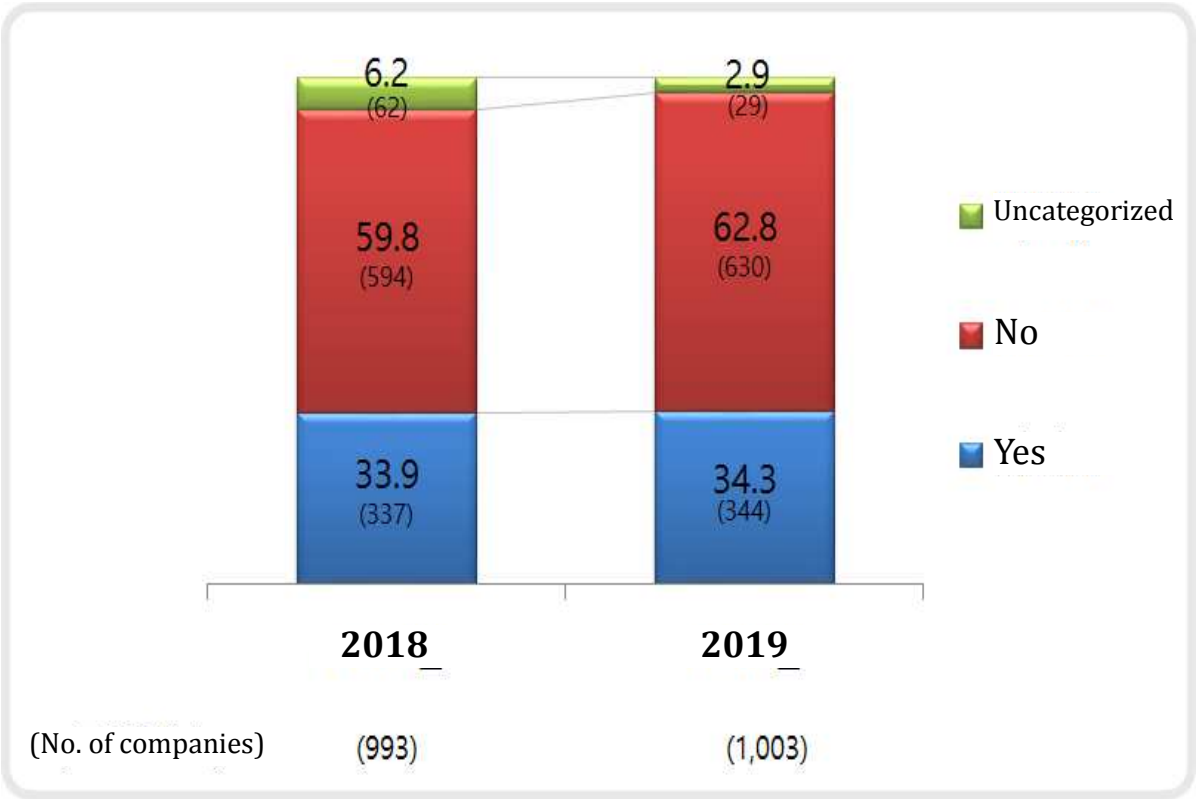
A. Cooperation Types

1) Cooperative Relationship with Other Organizations

○ Out of the total 1,003 companies, 344 companies had cooperative relationships with other organizations as of 2019, accounting for the ratio of 34.3%.

<Figure 2-18> Cooperative Relationship with Other Organizations

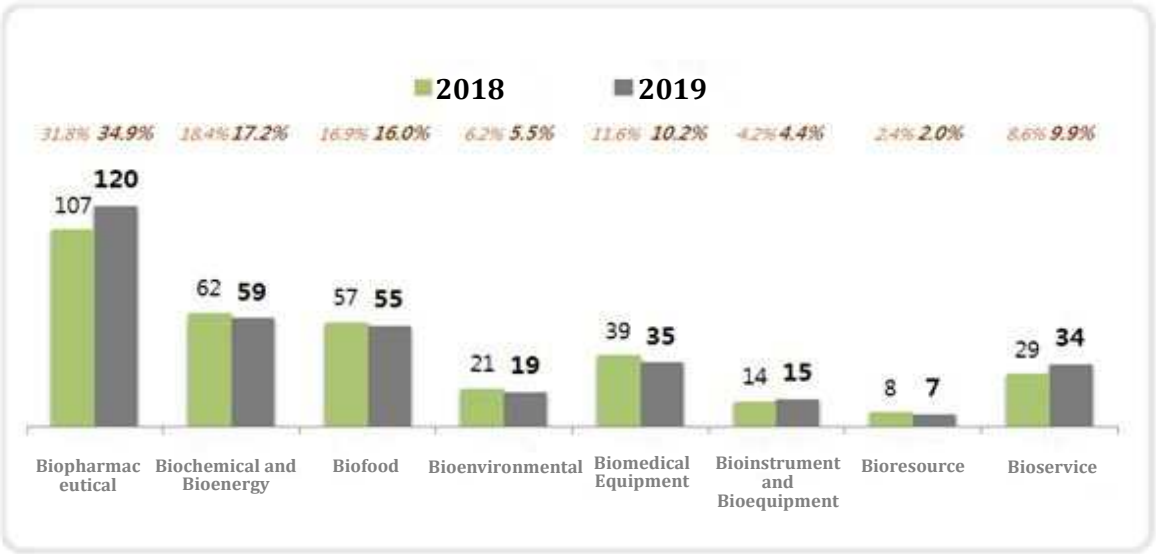
(Unit: % (total no. of companies))



○ According to bioindustries, cooperative relationship was established in large numbers in the order of biopharmaceutical, biochemical and bioenergy, and biofood. The total number of cooperative relationships in the three industries was 234, accounting for 68.0% of 344 companies holding cooperative relationships.

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

(Unit: companies)



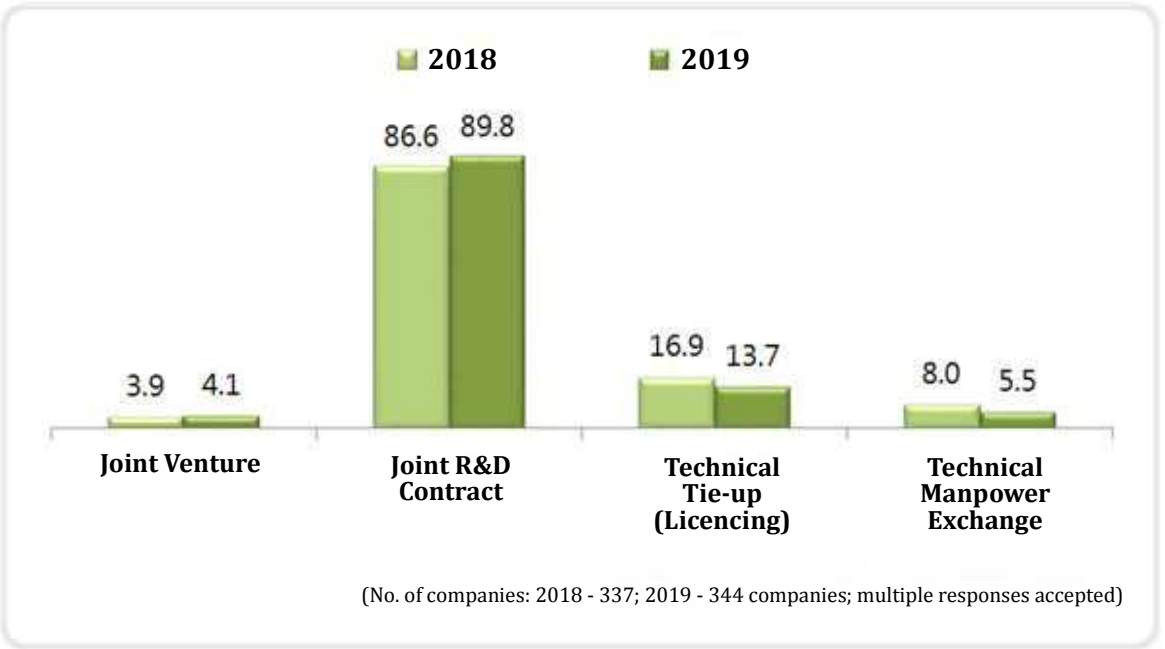
* The above chart shows the responses from companies that hold cooperative relationships (2018: 337 companies; 2019: 344 companies). Multiple responses accepted.

2) Types of Cooperative Relationship with Other Organizations

○ For the type of cooperation identified based on the 344 responding companies, joint R&D contracts were most common at 89.8%, followed by technology tie-up and licensing (13.7%) and domestic technical manpower exchange (5.5%).

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

(Unit: %)



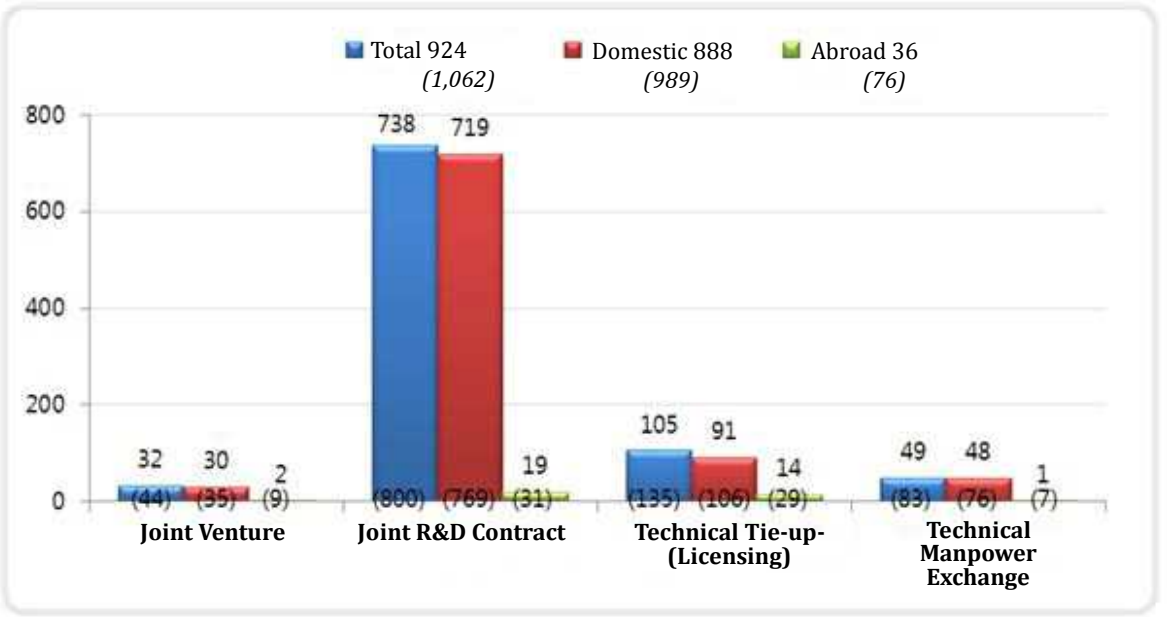
3) Number of Cooperation Cases by Cooperative Relationship Type

○ The number of cooperative relationships among 344 companies totaled 924 cases, with 888 cases in Korea (96.1%) and 36 cases abroad (3.9%).

○ Among the types of cooperative relations, the largest number of cases was joint R&D contracts, with 719 in Korea and 19 abroad.

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

(Unit: case)



* The above chart shows the responses from companies that hold cooperative relationships (2018: 337 companies; 2019: 344 companies). Multiple responses accepted.
* The numbers in parentheses are the results for 2018.

- The number of cooperation cases by bioindustrial category and by cooperation type was 376 in the biopharmaceutical industry, accounting for 40.7% of the total of 924 cases.
- Other than that, the biochemical and bioenergy industry had 154 cases (16.7%) while the biofood with 129 cases (14.0%). The three Industrys account for 71.4% of the total cases.

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

(Unit: cases)

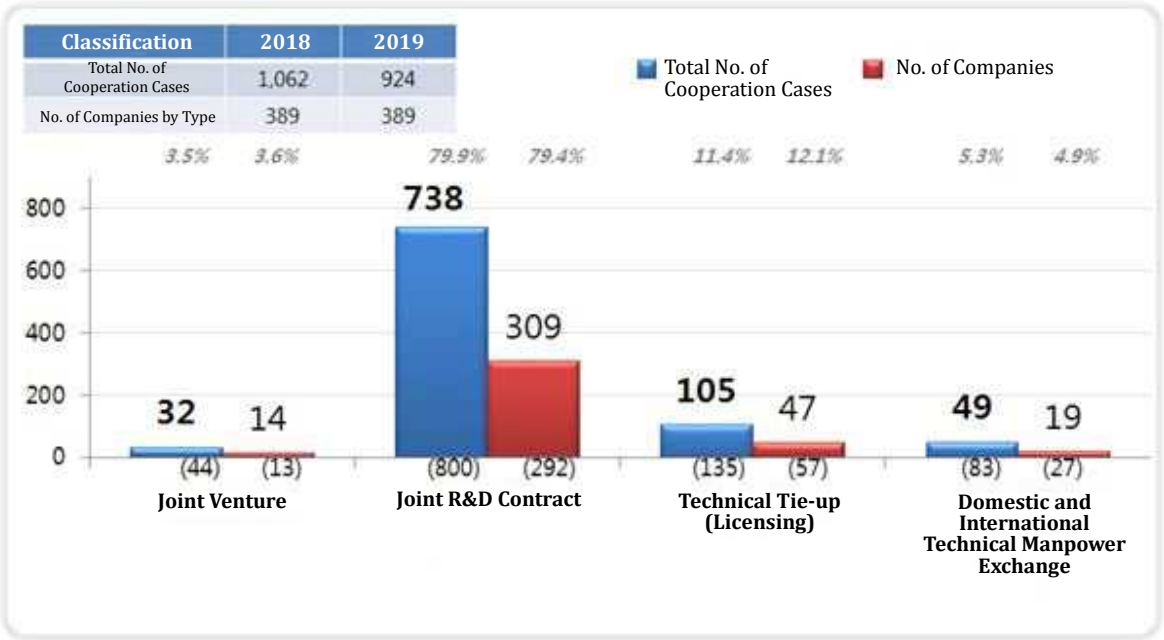
Industrial Category	2018	2019	Cooperation Type			
	Total	Total	Joint Venture	Joint R&D Contract	Technical Tie-up (Licensing)	Technical Manpower Exchange
Total	**1,062 (100.0%)**	**924 (100.0%)**	**32**	**738**	**105**	**49**
Biopharmaceutical	349 (32.9%)	376 (40.7%)	18	289	60	9
Biochemical and Bioenergy	174 (16.4%)	154 (16.7%)	2	120	15	17
Biofood	222 (20.9%)	129 (14.0%)	1	114	7	7
Bioenvironmental	35 (3.3%)	27 (2.9%)	-	23	3	1
Biomedical Equipment	126 (11.9%)	89 (9.6%)	10	61	15	3
Bioinstrument and Bioequipment	68 (6.4%)	54 (5.8%)	1	42	-	11
Bioresource	32 (3.0%)	23 (2.5%)	-	23	-	-
Bioservice	56 (5.3%)	72 (7.8%)	-	66	5	1

4) Number of Partners by Cooperative Relationship Type

○ Among the types of cooperation, 309 companies have established a joint R&D contract relationships and the number of cooperation cases was found to be 738. It is identified that the average number of companies holding joint R&D contracts is 2.4 companies.

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

(Units: cases; companies)



* The above chart shows the responses from companies that hold cooperative relationships (2018: 337 companies; 2019: 344 companies). Multiple response accepted.

* The numbers in parentheses are the results for 2018.

○ The biopharmaceutical industry has the highest number of companies with cooperative relationships with144 companies, followed by the biochemical and bioenergy and the biofood.

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

(Unit: companies)

Industrial Category	2018		2019		Type of cooperative relationship			
	Total		Total		Joint Venture	Joint R&D Contract	Technical Tie-up (Licensing)	Technical Manpower Exchange
Total	**389**	**(100.0%)**	**389**	**(100.0%)**	**14**	**309**	**47**	**19**
Biopharmaceutical	130	(33.4%)	144	(37.0%)	10	102	26	6
Biochemical and Bioenergy	72	(18.5%)	67	(17.2%)	1	54	8	4
Biofood	65	(16.7%)	60	(15.4%)	1	50	4	5
Bioenvironmental	23	(5.9%)	21	(5.4%)	-	18	2	1
Biomedical Equipment	42	(10.8%)	37	(9.5%)	1	32	3	1
Bioinstrument and Bioequipment	17	(4.4%)	17	(4.4%)	1	15	-	1
Bioresource	8	(2.1%)	7	(1.8%)	-	7	-	-
Bioservice	32	(8.2%)	36	(9.3%)	-	31	4	1

B. Cooperation Stage

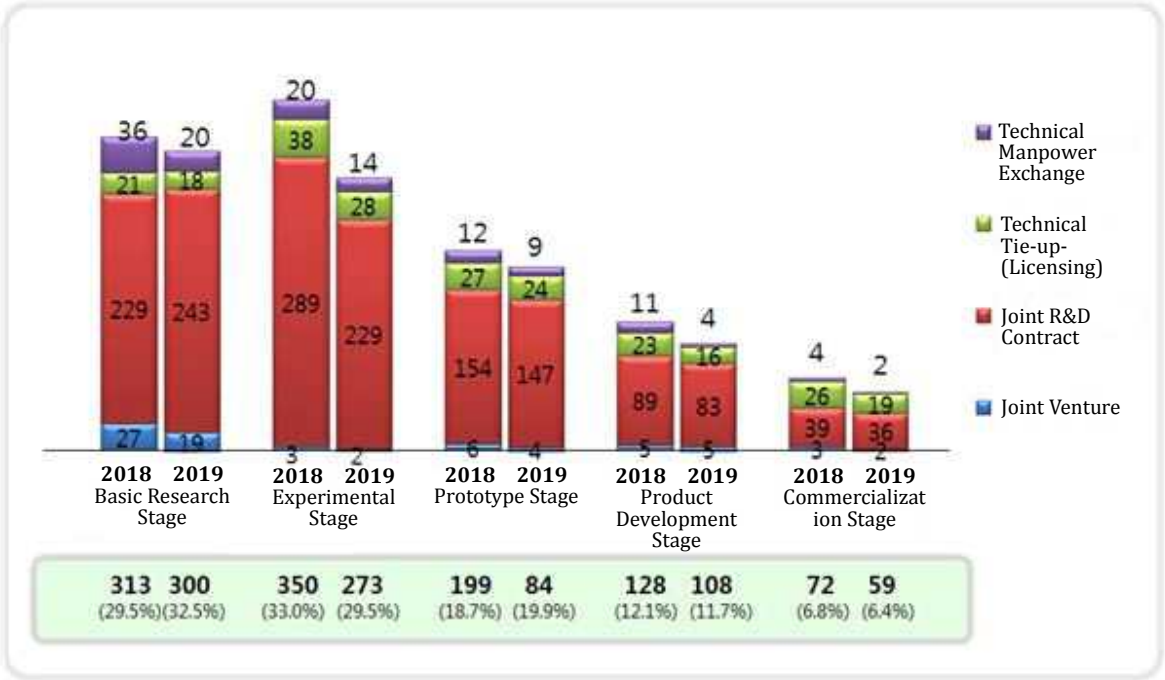
1) Number of Cooperation Cases by Cooperation Stage

- As per cooperation stage, the basic research stage has the largest proportion at 32.5% (300 cases) out of a total of 924 cases. It was followed by the experiment stage at 29.5% (273 cases).

- The commercialization stage, the final stage, showed a low ratio of 6.4% (59 cases), indicating that companies have cooperation with mainly other institutions at the initial stage of the project.

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

(Unit: cases)



* The above chart shows the responses from companies that hold cooperative relationships (2018: 337 companies; 2019: 344 companies). Multiple responses accepted.

<Table 2- 20> No. of Cooperation Cases by Cooperation Stage

(Unit: case)

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 2018	**1,062**	**986**	**35**	**769**	**106**	**76**	**76**	**9**	**31**	**29**	**7**
Total of 2019	**924**	**888**	**30**	**719**	**91**	**48**	**36**	**2**	**19**	**14**	**1**
Basic Research Stage	300	299	19	243	17	20	1	-	-	1	-
Experiment Stage	273	270	2	227	28	13	3	-	2	-	1
Prototype Stage	184	163	2	136	16	9	21	2	11	8	-
Product Development Stage	108	100	5	77	14	4	8	-	6	2	-
Commercialization Stage	59	56	2	36	16	2	3	-	-	3	-

○ By bioindustrial classification, the biopharmaceutical industry and the biochemical and bioenergy industry had the highest numbers of cooperation cases in the basic research stage in 2019, while the biofood industry and the biomedical device industry had conducted more cooperation in the experimental stage.

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

(Unit: cases)

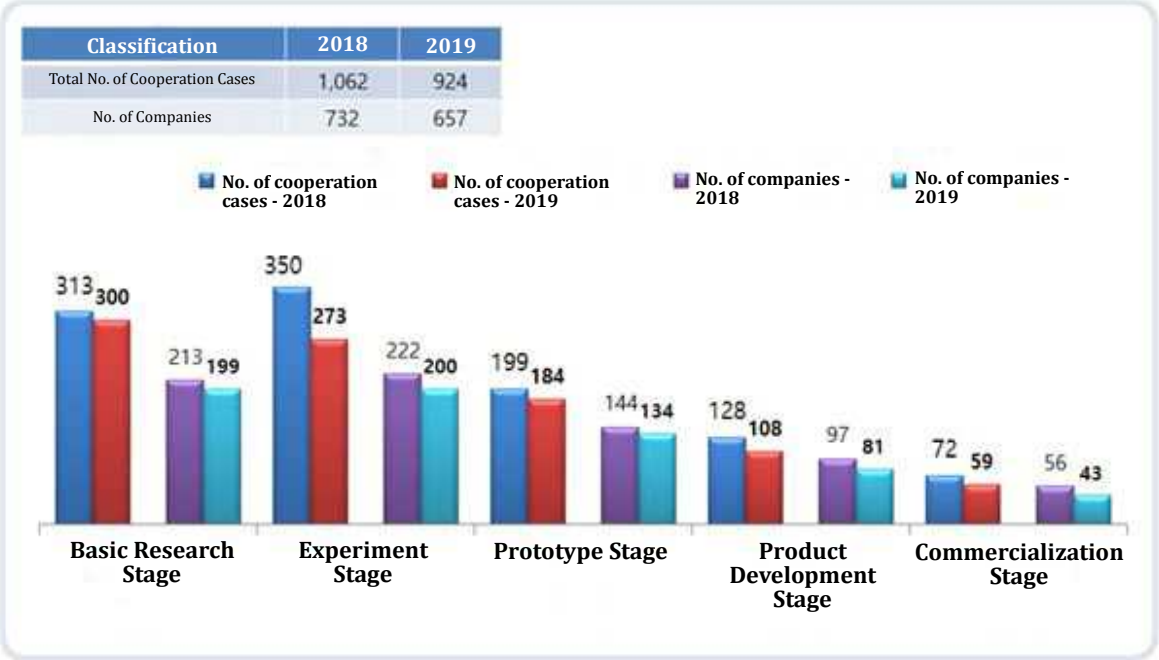
Industrial Category	Total No. of Companies	Companies with Cooperative Relationships	Cooperation Stage					
			Basic Research Stage	Experiment Stage	Prototype Stage	Product Development Stage	Commercialization Stage	Total
Total	**1,003**	**344**	**300**	**273**	**184**	**108**	**59**	**924 (100.0%)**
Biopharmaceutical	319	120	137	115	76	34	14	376 (40.7%)
Biochemical and Bioenergy	192	59	45	40	30	24	15	154 (16.7%)
Biofood	175	55	32	44	23	21	9	129 (14.0%)
Bioenvironmental	65	19	13	6	5	-	3	27 (2.9%)
Biomedical Equipment	95	35	24	26	17	16	6	89 (9.6%)
Bioinstrument and Bioequipment	53	15	24	10	8	5	7	54 (5.8%)
Bioresource	19	7	2	16	2	3	-	23 (2.5%)
Bioservice	85	34	23	16	23	5	5	72 (7.8%)

2) Number of Partners by Cooperation Stage

○ A total of 657 companies have a cooperative relationship at each stage, including those with multiple responses, with 200 companies (30.4%) in the experiment stage and 199 companies (30.3%) in the basic research stage.

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

(Units: cases; companies)



* The above chart shows the responses from companies that hold cooperative relationships (2018: 337 companies; 2019: 344 companies). Multiple responses accepted.

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

(Units: cases; companies)

Classification		Total	Basic Research	Experimental	Prototype	Product Development	Commercialization
No. of Cases	Domestic	888	299	270	163	100	56
	Overseas	36	1	3	21	8	3
Total		**924**	**300**	**273**	**184**	**108**	**59**
Percentage (%)		100.0	32.5	29.5	19.9	11.7	6.4
No. of Companies	Domestic	636	198	197	124	77	40
	Overseas	21	1	3	10	4	3
Sum (company)		**657**	**199**	**200**	**134**	**81**	**43**
Percentage (%)		100.0	30.3	30.4	20.4	12.3	6.5

- The number of partners by bioindustrial category and cooperation stage was 474 in the biopharmaceutical, biochemical and bioenergy, and biofood industries, accounting for 72.1% of the total.
- The biopharmaceutical industry has a large number of companies in the basic research stage, and the biochemical and bioenergy, and the biofood have relatively large numbers of companies in the experiment stage.

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

(Unit: companies)

Industrial Category	2018	2019	Cooperation Stage				
	Total	Total	Basic Research	Experimental	Prototype	Product Development	Commercialization
Total	**732 (100.0%)**	**657 (100.0%)**	**199**	**200**	**134**	**81**	**43**
Biopharmaceutical	248 (33.9%)	272 (41.4%)	93	87	54	25	13
Biochemical and Bioenergy	132 (18.0%)	115 (17.5%)	32	33	21	19	10
Biofood	119 (16.3%)	87 (13.2%)	21	30	17	13	6
Bioenvironmental	28 (3.8%)	22 (3.3%)	10	5	5	-	2
Biomedical Equipment	78 (10.7%)	65 (9.9%)	14	17	16	12	6
Bioinstrument and Bioequipment	58 (7.9%)	29 (4.4%)	11	7	4	5	2
Bioresource	24 (3.3%)	12 (1.8%)	2	6	2	2	-
Bioservice	45 (6.1%)	55 (8.4%)	16	15	15	5	4

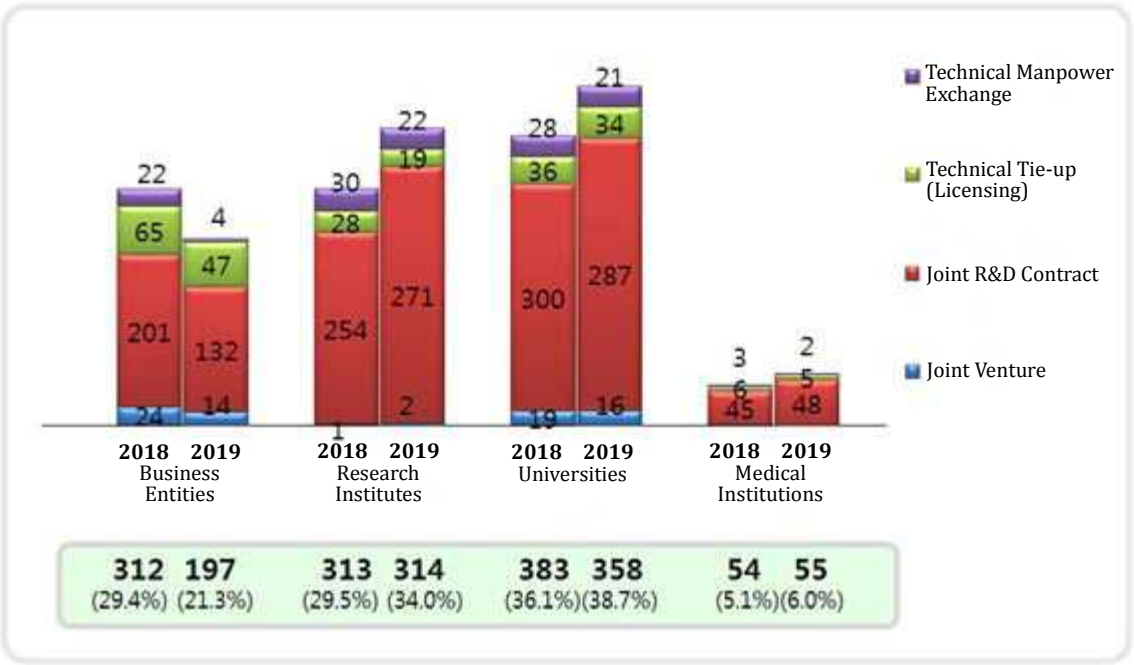
C. Cooperating Organization

1) Number of Cooperation Cases by Cooperating Organization

○ By cooperating organization, there were 358 cases (38.7%) with universities, 314 cases (34%) with research institutes, and 197 cases (21.3%) with business entities out of the total of 924 cases.

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

(Unit: cases)



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

(Unit: cases)

Classification	Total Cooperative Relationships	Domestic					Overseas				
		Total	Joint Venture	Joint R&D	Technical Tie-up	Technical Manpower Exchange	Total	Joint Venture	Joint R&D	Technical Tie-up	Technical Manpower Exchange
Total	924	888	30	719	91	48	36	2	19	14	1
Business Entities	197	168	13	117	34	4	29	1	15	13	-
SMEs and Venture Companies	131	106	8	70	24	4	25	1	14	10	-
Midle-standing Companies	34	33	4	25	4	-	1	-	-	1	-
Large Enterprises	32	29	1	22	6	-	3	-	1	2	-
Research Institutes	314	312	2	270	18	22	2	-	1	1	-
Government-invested Research Institutes	277	275	2	244	16	13	2	-	1	1	-
Private Research Institutes	37	37	-	26	2	9	-	-	-	-	-
Universities	358	354	15	285	34	20	4	1	2	-	1
Medical Institutions	55	54	-	47	5	2	1	-	1	-	-

○ By bioindustial category, the biopharmaceutical and the biofood industries have large numbers of cooperation cases with universities, while 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)

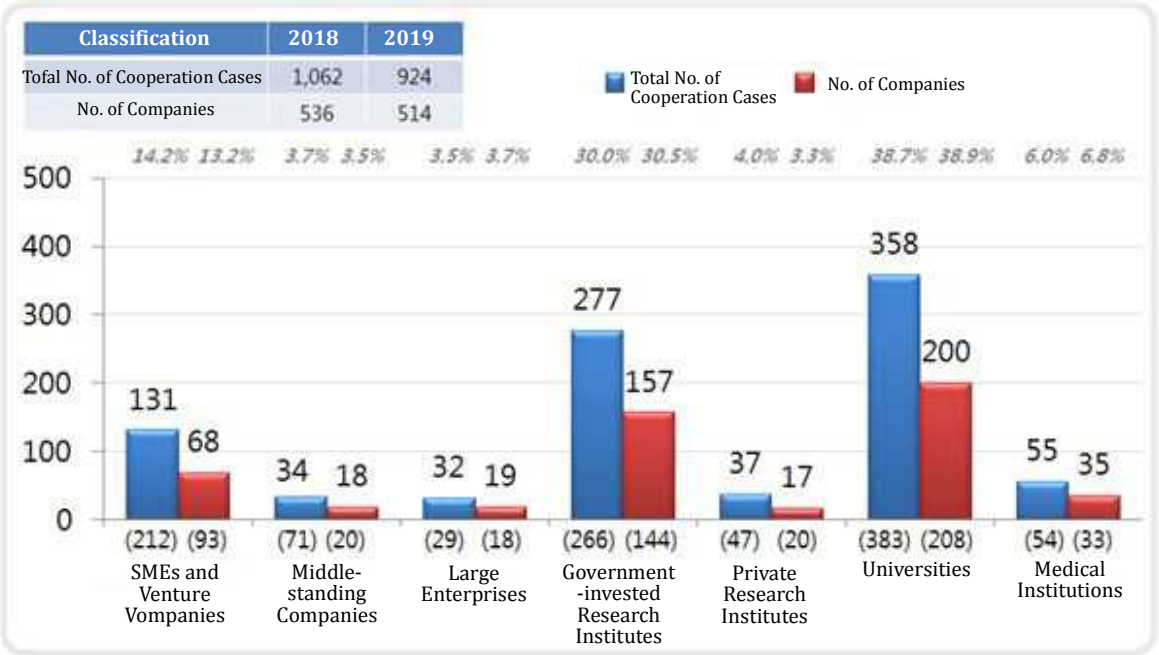
Industrial Category	Total Companies	Companies with Cooperative Relationships	Cooperating Organization				
			Business Entities	Research Institutes	Universities	Medical Institutions	Total
Total	**1,003**	**344**	**197**	**314**	**358**	**55**	**924 (100.0%)**
Biopharmaceutical	319	120	128	82	140	26	376 (40.7%)
Biochemical and bioenergy	192	59	27	75	51	1	154 (16.7%)
Biofood	175	55	13	46	69	1	129 (14.0%)
Bioenvironmental	65	19	3	14	10	-	27 (2.9%)
Biomedical Equipment	95	35	11	28	36	14	89 (9.6%)
Bioinstrument and Bioequipment	53	15	6	27	16	5	54 (5.8%)
Bioresource	19	7	1	14	8	-	23 (2.5%)
Bioservice	85	34	8	28	28	8	72 (7.8%)

2) Number of Partners by Cooperating Organization

○ Among the cooperating organizations, there are 200 bio-companies that are holding cooperative relationships with universities, with an average of 1.8 cases per company.

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

(Units: cases, companies)



* The above chart shows the responses from companies that hold cooperative relationships (2018: 337 companies; 2019: 344 companies). Multiple responses accepted.

* The numbers in parentheses are the results for 2018.

○ By bioindustry Industry, the number of companies and universities in the biopharmaceutical industry includes a relatively large number of companies that have cooperated with companies and universities, and the biofood industry with universities.

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

(Unit: companies)

Industrial Category	Total Companies	Companies with Cooperative Relationships	Cooperating Organization				
			Business Entities	Research Institutes	Universities	Medical Institutions	Total
Total	**1,003**	**344**	**105**	**174**	**200**	**35**	**514 (100.0%)**
Biopharmaceutical	319	120	65	53	77	17	212 (41.2%)
Biochemical and Bioenergy	192	59	17	34	33	1	85 (16.5%)
Biofood	175	55	4	27	35	1	67 (13.0%)
Bioenvironmental	65	19	2	10	9	-	21 (4.1%)
Biomedical Equipment	95	35	7	16	18	9	50 (9.7%)
Bioinstrument and Bioequipment	53	15	3	13	6	3	25 (4.9%)
Bioresource	19	7	1	3	4	-	8 (1.6%)
Bioservice	85	34	6	18	18	4	46 (8.9%)

<Table 2-27> Domestic and Overseas Cooperative Relationships and Cooperating Organizations

(Unit: cases, unit, %)

Classification			Total	Venture Companies	Middle-standing Companies	Large Enterprises	Government-invested Research Institutes	Private Research Institutes	Universities	Medical Institution
Joint Venture	Total Investments	Domestic	30	8	4	1	2	-	15	-
		Overseas	2	1	-	-	-	-	1	-
		Subtotal	32	9	4	1	2	-	16	-
	No. of Companies	Domestic	17	5	3	1	2	-	6	-
		Overseas	1	-	-	-	-	1	-	-
		Subtotal	19	6	3	1	2		7	
Joint R&D Contract	Total Investments	Domestic	719	70	25	22	244	26	285	47
		Overseas	19	14	-	1	1	-	2	1
		Subtotal	738	84	25	23	245	26	287	48
	No. of Companies	Domestic	396	36	11	12	136	14	156	31
		Overseas	9	4	-	1	1	-	2	1
		Subtotal	405	40	11	13	137	14	158	32
Technical Tie-up Licensing	Total Investments	Domestic	91	24	4	6	16	2	34	5
		Overseas	14	10	1	2	1	-	-	-
		Subtotal	105	34	5	8	17	2	34	5
	No. of Companies	Domestic	55	15	3	4	11	1	20	1
		Overseas	7	4	1	1	1	-	-	-
		Subtotal	62	19	4	5	12	1	20	1
Technical Manpower Exchange	Total Investments	Domestic	48	4	-	-	13	9	20	2
		Overseas	1	-	-	-	-	-	1	-
		Subtotal	49	4	-	-	13	9	21	2
	No. of Companies	Domestic	27	3	-	-	6	2	14	2
		Overseas	1	-	-	-	-	-	1	-
		Subtotal	28	3	-	-	6	2	15	2
Total Cooperation Cases			**924**	**131**	**34**	**32**	**277**	**37**	**358**	**55**
Percentage			**100.0**	**14.2**	**3.7**	**3.5**	**30.0**	**4.0**	**38.7**	**6.0**
Companies in Total			**514**	**68**	**18**	**19**	**157**	**17**	**200**	**35**
Percentage			**100.0**	**13.2**	**3.5**	**3.7**	**30.5**	**3.3**	**38.9**	**6.8**

3) Cooperating Organizations by Scale of Workers

○ The bio-companies of all sizes have the largest number of collaboration cases with universities.

<Table 2-28> Cooperating Organizations by Scale of Workers

(Unit: cases)

Classification		Total Cooperative Relationships	Company				Research institution			Universities	Medical Institutions
			Total	SMEs and Venture Companies	Middle-standin Companies	Large Enterprises	Total	Government-funded Research Institutes	Private Research Institutes		
Total	**Total**	**924**	**197**	**131**	**34**	**32**	**314**	**277**	**37**	**358**	**55**
	1 - 49	428	77	51	12	14	150	130	20	174	27
	50 - 299	258	56	40	8	8	93	89	4	93	16
	300 - 999	124	27	18	3	6	34	30	4	53	10
	1,000 or more	80	19	4	11	4	35	26	9	26	-
Domestic	**Total**	**888**	**168**	**106**	**33**	**29**	**312**	**275**	**37**	**354**	**54**
	1 - 49	412	62	36	12	14	149	129	20	174	27
	50 - 299	254	52	36	8	8	93	89	4	93	16
	300 - 999	116	23	15	2	6	33	29	4	51	9
	1,000 or more	76	16	4	11	1	35	26	9	25	-
Overseas	**Total**	**36**	**29**	**25**	**1**	**3**	**2**	**2**	**-**	**4**	**1**
	1 - 49	16	15	15	-	-	1	1	-	-	-
	50 - 299	4	4	4	-	-	-	-	-	-	-
	300 - 999	8	4	3	1	-	1	1	-	2	1
	1,000 or more	4	3	-	-	3	-	-	-	1	-

* 1 to 49 workers: 598 companies, 50 to 299 workers: 246 companies, 300 to 999 workers: 69 companies, and 1,000 or more: 31 companies.
* Excluded companies with unknown size of workers.

5 Supply and Demand Status of Bioindustry

A. Bioindustry's Supply and Demand Status of 2019

○ The scale of supply and demand for the bioindustry in 2019 was KRW 14.288 trillion, an increase of 10.4% over the past three years.

○ The production scale was KRW 12.324 trillion accounting for 86.3% of the total supply. The size of imports was KRW 1.946 trillion (13.7%).

○ The total size of domestic demand was KRW 7.575 trillion accounting for 53% of total supply and KRW 600 million (45.5%). The total size of exports was KRW 6.712 trillion (47%).

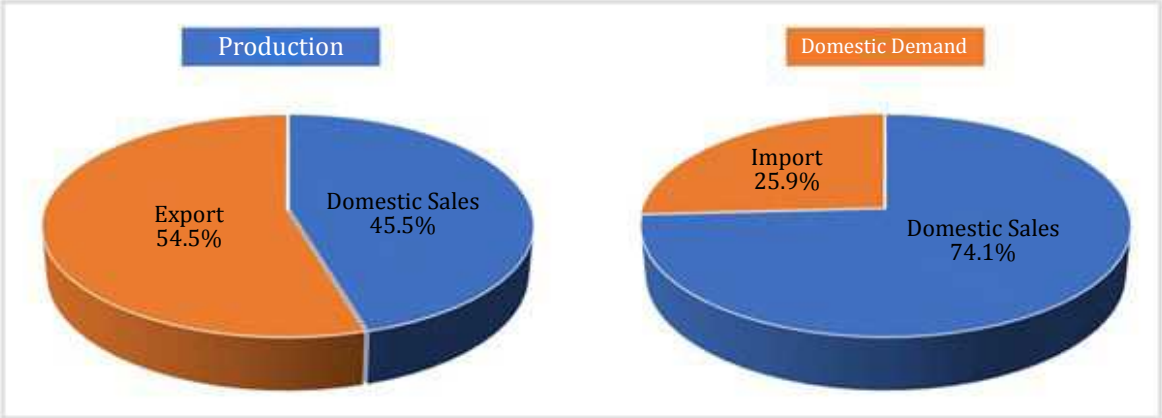
<Table 2-29> 2017~2019 Bioindustry's Trend of Supply and Demand

(Unit: 100 million KRW, %)

Year	Supply				Total	Demand			
	Production		Import			Domestic Demand		Export	
	Amount	Distribution Ratio	Amount	Distribution Ratio		Amount	Distribution Ratio	Amount	Distribution Ratio
2017	101,457	86.6	15,693	13.4	117,150	65,466	55.9	51,684	44.1
2018	106,067	86.0	17,282	14.0	123,348	70,966	57.5	52,382	42.5
2019	**123,235**	**86.3**	**19,644**	**13.7**	**142,880**	**75,756**	**53.0**	**67,124**	**47.0**
Annual Average Rate of Change	**10.2**		**11.9**		**10.4**	**7.6**		**14.0**	

<Figure 2-27> 2019 Bioindustry's Size of Production and Domestic Demand

(Unit: %)



○ For the production scale in the bioindustry, the biopharmaceutical industry accounted for KRW 4.239 trillion (34.4%) and the biofood for KRW 3.687 trillion (29.9%), with the two industries accounting for 64.3% of the total production.

○ In the domestic market, the biopharmaceutical industry (KRW 3.268 trillion, 43.1%) and the biochemical and bioenergy industry (KRW 1.84 trillion, 24.3%) together accounted for 67.4% of the total demand.

<Table 2-30> 2019 Bioindustry's Status of Production and Domestic Demand

(Unit: million KRW, %)

Classification	Production				Domestic Demand			
	Domestic Sales	Export	Total	Distribution Ratio	Domestic Sales	Import	Total	Distribution Ratio
Total	**5,611,134**	**6,712,371**	**12,323,505**	**100.0**	**5,611,134**	**1,964,445**	**7,575,579**	**100.0**
Biopharmaceutical	1,623,645	2,615,212	4,238,857	34.4	1,623,645	1,644,278	3,267,923	43.1
Biochemical and Bioenergy	1,734,048	121,067	1,855,115	15.1	1,734,048	105,573	1,839,621	24.3
Biofood	1,278,821	2,407,803	3,686,624	29.9	1,278,821	56,652	1,335,473	17.6
Bioenvironmental	55,068	633	55,701	0.5	55,068	148	55,216	0.7
Biomedical Equipment	268,614	684,941	953,555	7.7	268,614	54,316	322,930	4.3
Bioinstrument and Bioeuipment	71,213	36,554	107,767	0.9	71,213	73,389	144,602	1.9
Bioresource	154,293	24,429	178,722	1.5	154,293	26,712	181,005	2.4
Bioservice	425,432	821,734	1,247,166	10.1	425,432	3,378	428,810	5.7

○ The size of supply and domestic demand in Gyeonggi Province occupies 40.1% and 27.2%, respectively, and is the highest compared to other provinces.

<Table 2-31> 2019 Bioindustry's Status of Production and Domestic Demand by Area

(Unit: million KRW, %)

Area	Production				Domestic Demand			
	Domestic Sales	Export	Total	Distribution Ratio	Domestic Sales	Import	Total	Distribution Ratio
Total	**5,611,134**	**6,712,371**	**12,323,505**	**100.0**	**5,611,134**	**1,964,445**	**7,575,579**	**100.0**
Seoul	387,666	177,298	564,964	4.6	387,666	1,615,816	2,003,482	26.4
Busan	5,164	8,600	13,764	0.1	5,164	1,632	6,796	0.1
Incheon	61,591	2,388,519	2,450,110	19.9	61,591	5,963	67,554	0.9
Daegu	53,427	45,233	98,660	0.8	53,427	-	53,433	0.7
Gwangju	2,663	-	2,663	0.0	2,663	103	2,766	0.0
Daejeon	130,678	31,728	162,406	1.3	130,678	3,943	134,621	1.8
Ulsan	617,174	5,490	622,664	5.1	617,174	443	617,617	8.2
Sejong	1,287	-	1,287	0.0	1,287	-	1,287	0.0
Gyeonggi	1,948,943	2,996,648	4,945,591	40.1	1,948,943	111,011	2,059,954	27.2
Gangwon	187,629	294,880	482,509	3.9	187,629	26,111	213,740	2.8
Chungbuk	1,342,715	612,597	1,955,312	15.9	1,342,715	150,105	1,492,820	19.7
Chungnam	154,582	11,271	165,853	1.3	154,582	12,837	167,419	2.2
Jeonbuk	219,542	48,737	268,279	2.2	219,542	210	219,752	2.9
Jeonnam	235,607	21,457	257,064	2.1	235,607	20,457	256,064	3.4
Gyeongbuk	211,848	51,347	263,195	2.1	211,848	4,121	215,969	2.9
Gyeongnam	37,861	12,341	50,202	0.4	37,861	11,571	49,432	0.7
Jeju	12,757	6,225	18,982	0.2	12,757	117	12,874	0.2

B. Recent Trend of Supply and Demand Status

1) 2017~2019 Trend of Supply and Demand Status

○ Bioindustry's trend of production between 2017 and 2019 continues to increase.

○ For the annual average rate of change since 2017, the supply and demand marked 10.4%, production 10.2%, and domestic demand 7.6%.

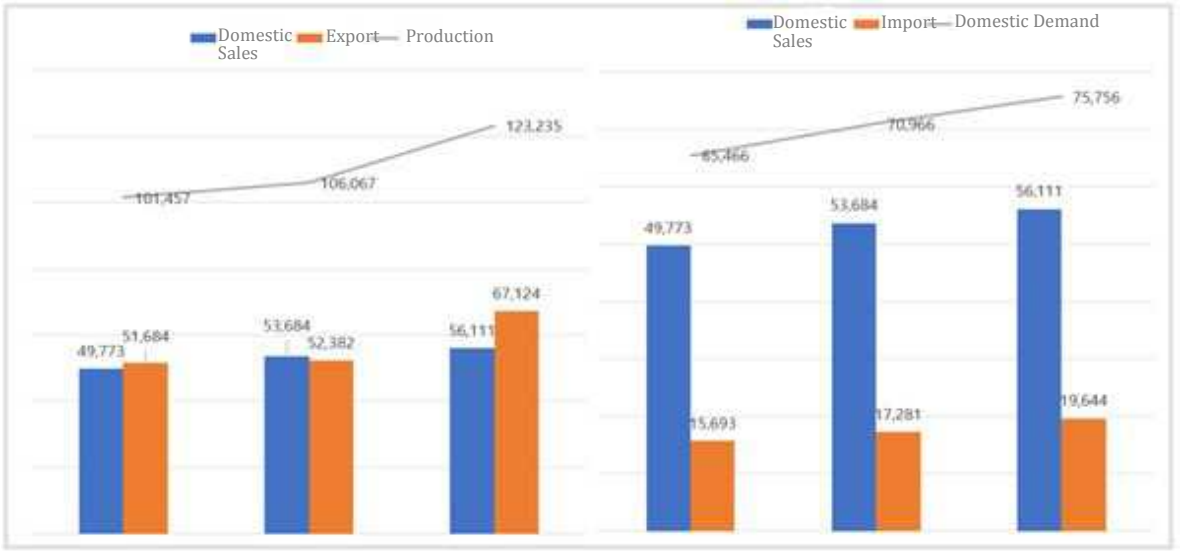
<Table 2-32> 2017~2019 Bioindustry's Trend of Production and Domestic Demand

(Unit: 100 million KRW, %)

Classification		2017	2018	2019	Annual Average Rate of Change
Supply and Demand (Production + Import)	Investment Amount	117,150	123,348	142,880	10.4
	Distribution Ratio	9.3	5.3	15.8	
Production (Domestic Sales + Export)	Investment Amount	101,457	106,067	123,235	10.2
	Distribution Ratio	9.6	4.5	16.2	
Domestic Demand (Domestic Sales + Export)	Investment Amount	65,466	70,966	75,756	7.6
	Distribution Ratio	7.5	8.4	6.7	

<Figure 2-28> 2017~2019 Bioindustry's Trend of Production and Domestic Demand

(Unit: 100 million KRW)



○ The production industry in 2019 increased by 16.2% compared to 2018, with the growth rate of the bioinstrument and bioequipment industry increasing by 21.2%, the bioservice by 21.1%, and the biopharmaceutical by 20.8%

○ The domestic demand in 2019 increased by 6.7% compared to 2018, and increased in all industries except for the bioenvironmental industry.

<Table 2-33> 2017~2019 Bioindustry's Trend of Supply and Demand by Category

(Unit: 100 million KRW, %)

Industrial Category	Production					Domestic Demand				
	2017	2018	2019	Variation from Previous Year	Annual Average Rate of Change	2017	2018	2019	Variation from Previous Year	Annual Average Rate of Change
Total	**101,457**	**106,067**	**123,235**	**16.2**	**10.2**	**65,466**	**70,966**	**75,756**	**6.7**	**7.6**
Biopharmaceutical	35,044	35,101	42,389	20.8	10.0	29,287	29,793	32,679	9.7	5.6
Biochemical and Bioenergy	15,945	17,916	18,551	3.5	7.9	15,644	18,083	18,396	1.7	8.4
Biofood	31,241	31,015	36,866	18.9	8.6	12,659	12,947	13,355	3.1	2.7
Bioenvironmental	462	576	557	-3.4	9.8	460	562	552	-1.8	9.5
Biomedical Equipment	7,771	8,482	9,536	12.4	10.8	1,963	2,714	3,229	19.0	28.3
Bioinstrument and Bioequipment	1,130	889	1,078	21.2	-2.3	1,174	1,240	1,446	16.6	11.0
Bioresource	1,711	1,785	1,787	0.1	2.2	1,561	1,793	1,810	0.9	7.7
Bioservice	8,153	10,302	12,472	21.1	23.7	2,718	3,834	4,288	11.9	25.6

2) 2015~2019 Trend of Supply and Demand

○ Bioindustry's trend of supply and demand over the past five years (2015–2019) can be summarized as follows: the production scale showed steady increase with 9.7% annual average rate of change, and the domestic demand also continued to grow since 2015, showing an annual average of 6.2%.

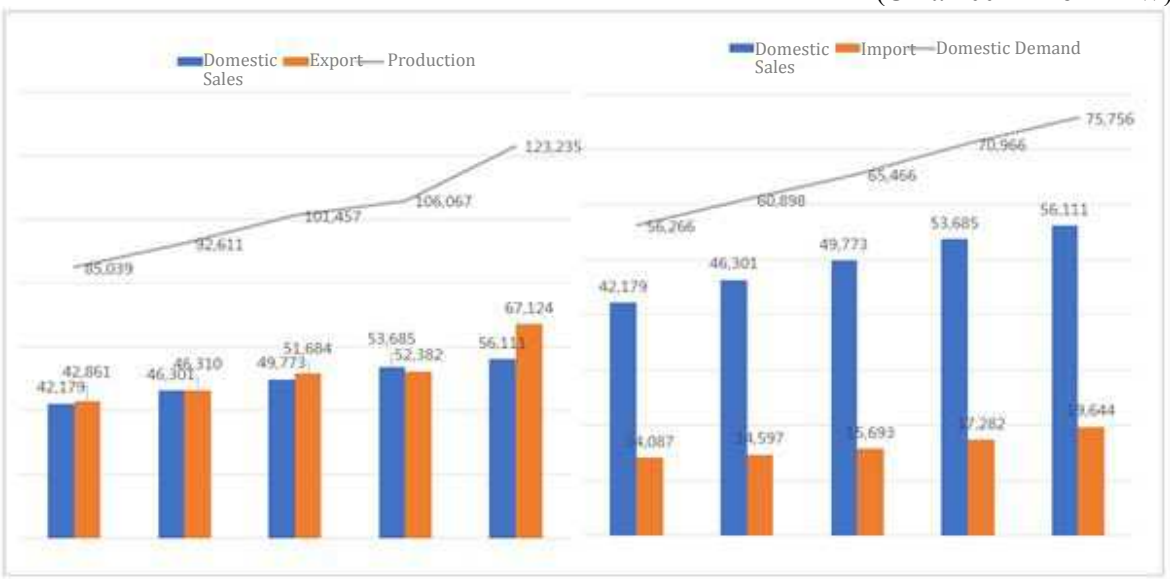
<Table 2-34> 2015~2019 Bioindustry's Trend of Supply and Demand

(Unit: 100 million KRW, %)

Classification		2015	2016	2017	2018	2019	Annual Average Rate of Change
Supply and Demand (Production + Import)	Investment Amount	99,126	107,208	117,150	123,348	142,880	9.6
	Distribution Ratio	10.0	8.2	9.3	5.3	15.8	
Production (Domestic Sales + Export)	Investment Amount	85,039	92,611	101,457	106,067	123,235	9.7
	Distribution Ratio	11.8	8.9	9.6	4.5	16.2	
Domestic Demand (Domestic Sales + Import)	Investment Amount	56,266	60,898	65,466	70,966	75,756	7.7
	Distribution Ratio	0.4	8.2	7.5	8.4	6.7	

<Figure 2-29> 2015~2019 Bioindustry's Trend of Production and Domestic Demand

(Unit: 100 million KRW)



<Table 2-35> 2015~2019 Bioindustry's Trend of Supply and Demand by Category
(Unit: 100 million KRW, %)

Industrial Category	Production							Domestic Demand						
	2015	2016	2017	2018	2019	Variation from Previous Year	Annual Average Rate of Change	2015	2016	2017	2018	2019	Variation from Previous Year	Annual Average Rate of Change
Total	**85,039**	**92,611**	**101,457**	**106,067**	**123,235**	**16.2**	**9.7**	**56,266**	**60,898**	**65,466**	**70,966**	**75,756**	**6.7**	**7.7**
Biopharmaceutical	34,639	33,576	35,044	35,101	42,389	20.8	5.2	27,550	28,384	29,287	29,793	32,679	9.7	4.4
Biochemical and Bioenergy	5,737	13,335	15,944	17,916	18,551	3.5	34.1	5,262	12,836	15,644	18,083	18,396	1.7	36.7
Biofood	32,174	29,192	31,241	31,015	36,866	18.9	3.5	13,279	12,342	12,659	12,947	13,355	3.1	0.1
Bioenvironmental	306	295	462	577	557	-3.4	16.1	304	293	460	562	552	-1.8	16.1
Biomedical Equipment	1,602	7,477	7,771	8,482	9,536	12.4	56.2	315	1,897	1,963	2,714	3,229	19.0	78.9
Bioinstrument and Bioequipment	1,626	1,199	1,130	889	1,078	21.2	-9.8	1,428	1,163	1,174	1,240	1,446	16.6	0.3
Bioresource	6,468	1,691	1,711	1,785	1,787	0.1	-27.5	6,083	1,529	1,561	1,793	1,810	0.9	-26.1
Bioservice	2,487	5,848	8,153	10,302	12,472	21.1	49.6	2,043	2,455	2,718	3,834	4,288	11.9	20.4

* Due to changes in classification in 2016 onwards, some of the time series data in certain industries needs attention.

6 Domestic Sales of Bioindustry

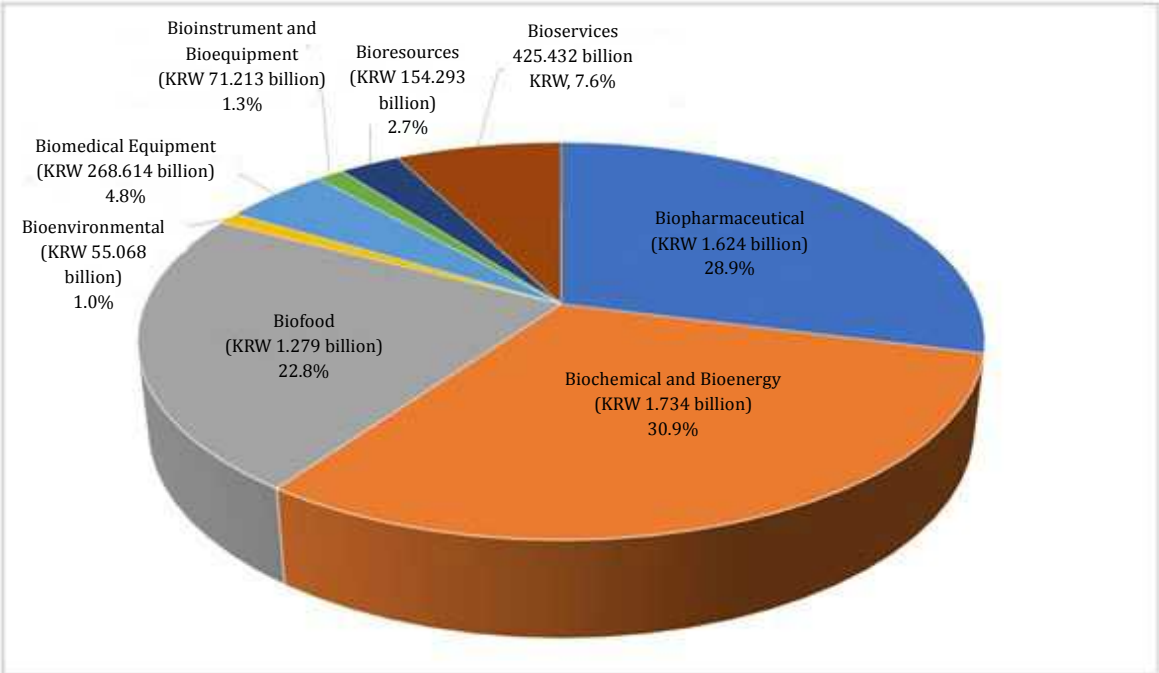
A. Bioindustry's Domestic Sales Status of 2019

- The size of bioindustry's domestic sales in 2019 reached KRW 5.611 trillion, and the biochemical and bioenergy industry took the largest proportion among them with KRW 1.734 trillion (30.9%).

- The following largest industries were the biopharmaceutical industry which accounted for KRW 1.624 trillion (28.9%), followed by the biofood with KRW 1.279 billion (22.8%).

- Domestic sales of the bioindustry in 2019 accounted for 82.6% of the total market in three industries: biopharmaceutical, biochemical and bioenergy, and biofood.

<Figure 2-30> 2019 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. Biofuel's size of domestic sales took 20.7% of the total bioindustry with KRW 1.161 trillion.

○ The following largest bioproducts were feed additives (11.7%), other biopharmaceuticals (7.0%), biocosmetics and household chemicals (6.9%), and he (6.9%). Among the top 5 bioproducts, two items belonged to the biopharmaceutical and the biochemical and bioenergy industries.

<Table 2-36> 2019 Main Bioproduct's Size of Domestic Sales

(Unit: million KRW, %)

Rank	Code	Product Name	Domestic Sales	Distribution Ratio
1	2060	Biofuels	1,160,483	20.7
2	3050	Feed additives	655,230	11.7
3	1000	Other biopharmaceuticals	391,369	7.0
4	2040	Biocosmetics and home & personal care chemicals	389,638	6.9
5	1060	Blood products	386,898	6.9
6	1030	Vaccines	369,464	6.6
7	3010	Functional health foods	338,070	6.0
8	3030	Food additives	177,055	3.2
9	8030	Clinical/non-clinical R&D services	171,968	3.1
10	1040	Hormones	160,729	2.9
11	5020	In-vitro diagnostics	146,514	2.6
12	7010	Seeds and seedlings	128,152	2.3
13	5000	Other biomedical equipments	121,821	2.2
14	8020	Bio-diagnostic and analytical services	107,958	1.9
15	1120	Veterinary biopharmaceuticals	104,507	1.9
16	2050	Biological agrochemicals and fertilizers	96,092	1.7
17	3040	Fermented foods	86,773	1.5
18	1070	Cell-based therapeutics	68,623	1.2
19	1050	Therapeutic antibodies and cytokines	66,784	1.2

B. Recent Trend of Domestic Sales Status

1) 2017~2019 Trend of Domestic Sales Status

○ The size of bioindustry's domestic sales in 2019 was KRW 5.611 trillion, which was an increase of KRW 242.7 billion (4.5%) from KRW 5.369 trillion in 2018.

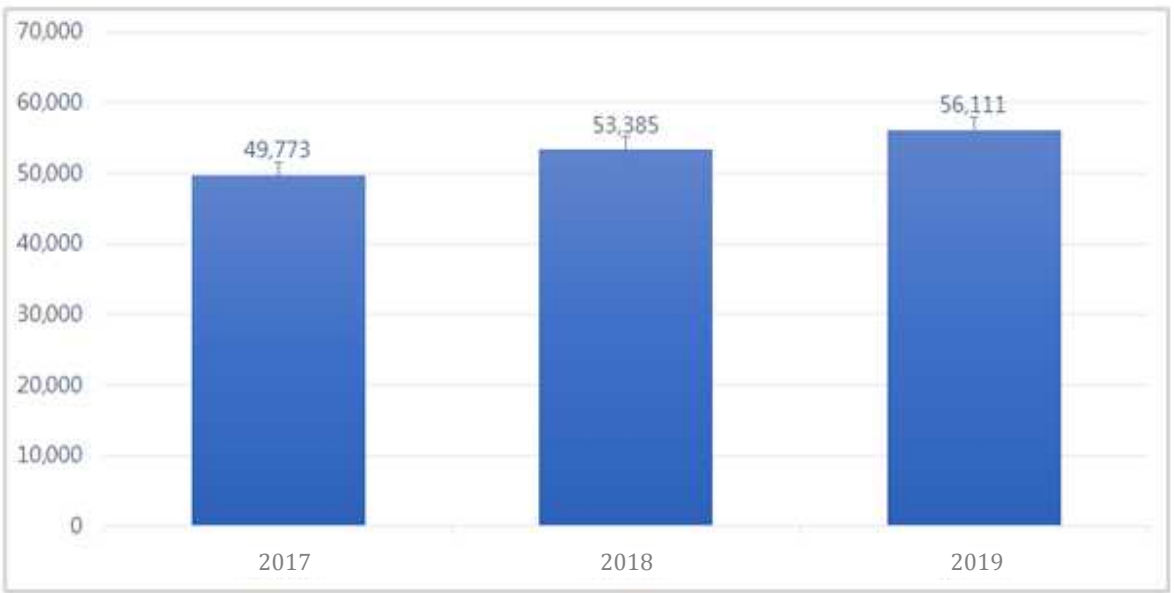
<Table 2-37> 2017~2019 Bioindustry's Trend of Domestic Sales

(Unit: 100 million KRW, %)

Classification		2017	2018	2019	Annual Average Rate of Change
Domestic Sales	Amount	49,773	53,385	56,111	6.2
	Distribution Ratio	7.5	7.9	4.5	

<Figure 2-31> 2017~2019 Bioindustry's Trend of Domestic Sales

(Unit: 100 million KRW)



○ The biochemical and bioenergy industry takes the largest proportion, accounting for 30.9% of the bioindustry's domestic sales. There was an increase of 3.1% compared to 2018.

○ Compared to the previous year, the bioinstrument and bioequipment industry grew by 21.8%, the biomedical equipment by 21.5%, and the bioservice by 11.7%.

○ The bioenvironmental industry and the bioresource industry decreased slightly by 1.7% and 0.4%, respectively, compared to the previous year.

<Table 2-38> 2017~2019 Bioindustry's Trend of Domestic Sales by Category

(Unit: million KRW, %)

Industrial Category	2017		2018		2019		Variation from Previous Year		Annual Average Rate of Change
	Domestic Sales	Distribution Ratio	Domestic Sales	Distribution Ratio	Domestic Sales	Distribution Ratio	Domestic Sales	Rate of Change	
Total	**4,977,316**	**100.0**	**5,368,455**	**100.0**	**5,611,134**	**100.0**	**242,679**	**4.5**	**6.2**
Biopharmaceutical	1,588,228	31.9	1,569,930	29.2	1,623,645	28.9	53,715	3.4	1.1
Biochemical and Bioenergy	1,481,088	29.8	1,682,536	31.3	1,734,048	30.9	51,512	3.1	8.2
Biofood	1,219,862	24.5	1,244,683	23.2	1,278,821	22.8	34,138	2.7	2.4
Bioenvironmental	45,824	0.9	56,011	1.0	55,068	1.0	-943	-1.7	9.6
Biomedical Equipment	164,090	3.3	221,062	4.1	268,614	4.8	47,552	21.5	27.9
Bioinstrument and Bioequipment	66,024	1.3	58,464	1.1	71,213	1.3	12,749	21.8	3.9
Bioresource	149,787	3.0	154,862	2.9	154,293	2.7	-569	-0.4	1.5
Bioservice	262,413	5.3	380,907	7.1	425,432	7.6	44,525	11.7	27.3

2) 2015~2019 Trend of Domestic Sales

○ The size of domestic sales increased by 7.4% annually over the past five years.

○ It has grown steadily since 2015 and reached over KRW 5.5 trillion in 2019.

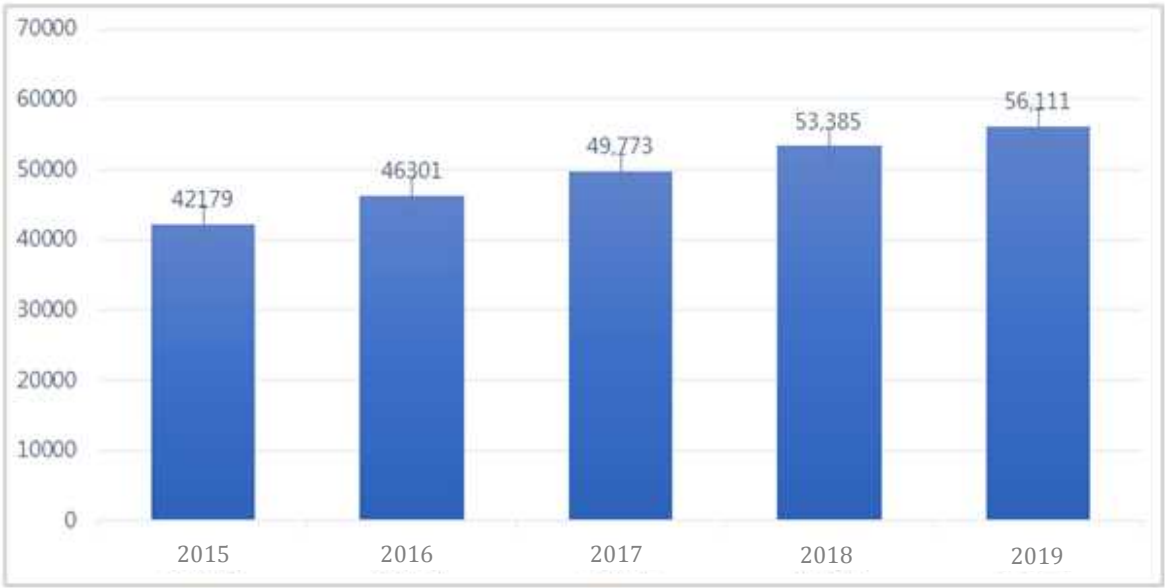
<Table 2-39> 2015~2019 Summary of Bioindustry's Trend of Domestic Sales

(Unit: 100 million KRW, %)

Classification		2015	2016	2017	2018	2019	Annual Average Rate of Change
Domestic Sales	Amount	42,179	46,301	49,773	53,385	56,111	7.4
	Rate of Change	0.4	9.8	7.5	7.9	4.5	

<Figure 2-32> 2015~2019 Bioindustry's Trend of Domestic Sales

(Unit: 100 million KRW)



<Table 2-40> 2015~2019 Bioindustry's Trend of Domestic Sales by Category

(Unit: 100 million KRW, %)

Classification	2015		2016		2017		2018		2019		Variation from Previous Year		Annual Average Rate of Change
	Domestic Sales	Distribution Ratio	Domestic Sales	Distribution Ratio	Domestic Sales	Distribution Ratio	Domestic Sales	Distribution Ratio	Domestic Sales	Distribution Ratio	Domestic Sales	Rate of Change	
Total	**4,217,863**	**100**	**4,630,133**	**100**	**4,977,316**	**100**	**5,368,455**	**100**	**5,611,134**	**100**	**242,679**	**4.5**	**7.4**
Biopharmaceutical	1,534,788	36.4	1,599,859	34.6	1,588,228	31.9	1,569,930	29.2	1,623,645	28.9	53,715	3.4	1.4
Biochemical and Bioenergy	438,539	10.4	1,194,963	25.8	1,481,088	29.8	1,682,536	31.3	1,734,048	30.9	51,512	3.1	41.0
Biofood	1,291,411	30.6	1,193,010	25.8	1,219,862	24.5	1,244,683	23.2	1,278,821	22.8	34,138	2.7	-0.2
Bioenvironmental	30,311	0.7	29,047	0.6	45,824	0.9	56,011	1.0	55,068	1.0	-943	-1.7	16.1
Biomedical Equipment	30,774	0.7	157,381	3.4	164,090	3.3	221,062	4.1	268,614	4.8	47,552	21.5	71.9
Bioinstrument and Bioequipment	89,044	2.1	63,815	1.4	66,024	1.3	58,464	1.1	71,213	1.3	12,749	21.8	-5.4
Bioresource	600,073	14.2	147,400	3.2	149,787	3.0	154,862	2.9	154,293	2.7	-569	-0.4	-28.8
Bioservice	202,923	4.8	244,658	5.3	262,413	5.3	380,907	7.1	425,432	7.6	44,525	11.7	20.3

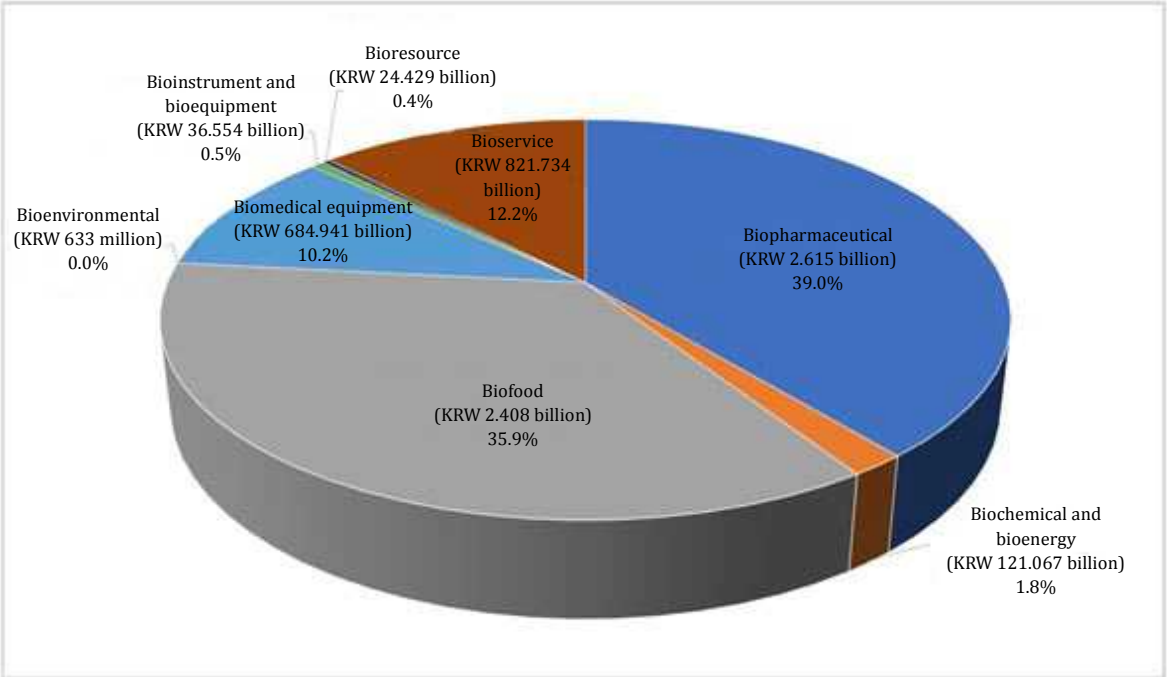
* Due to changes in classification in 2016 onwards, some of the time series data in certain industries needs attention.

7 Export Status of Bioindustry

A. Bioindustry's Export Status of 2019

- The size of bioindustry's export in 2019 reached KRW 6.712 trillion.
- According to the bioindustry's size of export by category, the biopharmaceutical industry accounted for the largest amount with KRW 2.615 billion (39.0%), followed by the biofood with KRW 2.4 trillion, accounting for 35.9%.

<Figure 2-33> 2019 Bioindustry's Size of Export by Category



○ Among domestic bioproducts, biotechnologies, and bioservices, [Table 2-41] shows domestic bioproducts whose export proportion were 1.0% or more according to the size, with 13 products showing an export of 1.0% or more.

○ Feed additives ranked the highest amount of export with KRW 1.835 trillion (27.3%), followed by therapeutic antibodies and cytokines with KRW 1.722 billion (25.7%) and bio-consignment production and procuration services with KRW 728.1 billion (10.8%).

<Table 2-41> 2019 Main Bioproduct's Export

(Unit: million KRW, %)

Rank	Code	Product Name	Exports	Distribution Ratio
1	3050	Feed additives	1,835,096	27.3
2	1050	Therapeutic antibodies and cytokines	1,722,329	25.7
3	8010	Bio-consignment production and procuration services	728,144	10.8
4	3030	Food additives	531,012	7.9
5	5020	In-vitro diagnostics	480,173	7.2
6	1030	Vaccines	259,385	3.9
7	1000	Other biopharmaceuticals	251,438	3.7
8	5000	Other biomedical equipments	204,746	3.1
9	1060	Blood products	140,042	2.1
10	1010	Bio-antibiotics	100,845	1.5
11	1040	Hormones	97,068	1.4
12	8020	Bio-diagnostic and analytical services	71,875	1.1
13	2040	Biocosmetics and home & personal care chemicals	66,527	1.0

B. Recent Trend of Export Status

1) Changes in exports between 2017 and 2019

○ The export scale of the domestic bioindustry was 6.7124 trillion KRW, up 1.4741 trillion KRW (28.1%) from 2018.

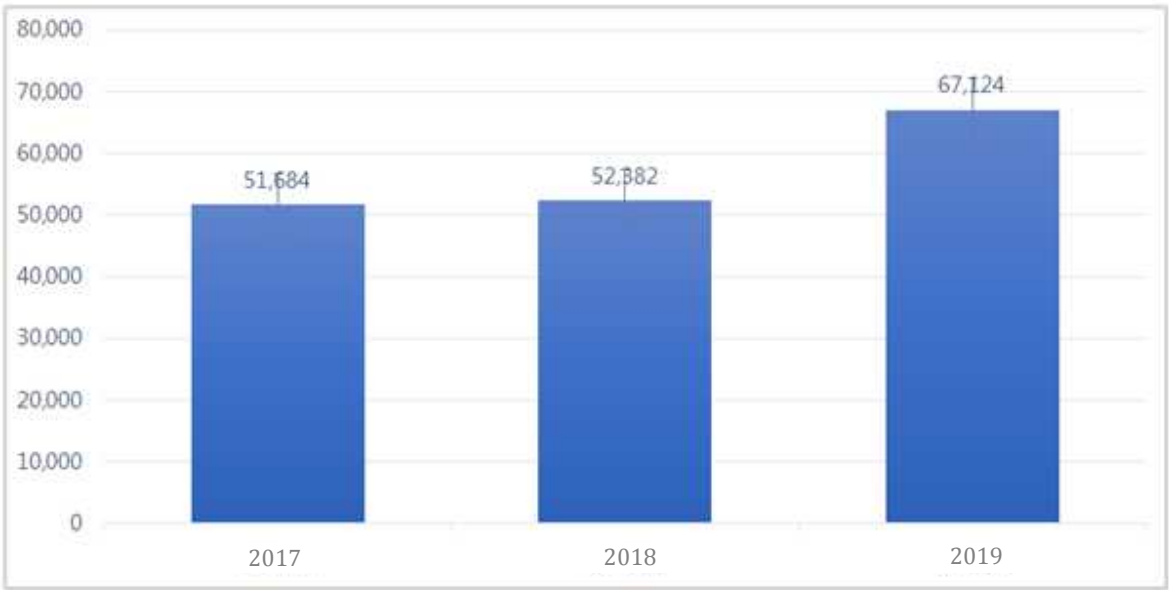
<Table 2-42> 2017~2019 Bioindustry's Trend of Export

(Unit: 100 million KRW, %)

Classification		2017	2018	2019	Annual Average Rate of Change
Export	Amount	51,684	52,382	67,124	14.0
	Rate of Change	11.6	1.4	28.1	

<Figure 2-34> 2017~2019 Bioindustry's Trend of Export

(Unit: 100 million KRW)



○ The amount of exports in the biopharmaceutical industry accounted for the largest proportion at KRW 2.615 trillion, an increase of up 675.1 billion KRW (34.8%) from 2018.

○ Exports in the bioenvironmental industry decreased significantly to 61.5% compared to the previous year.

<Table 2-43> 2017~2019 Bioindustry's Trend of Export by Category

(Unit: million KRW, %)

Industrial Category	2017		2018		2019		Variation from Previous Year		Annual Average Rate of Change
	Amount of Export	Distribution Ratio	Amount of Export	Distribution Ratio	Amount of Export	Distribution Ratio	Amount of Export	Rate of Change	
Total	**5,168,353**	**100**	**5,238,209**	**100**	**6,712,371**	**100**	**1,474,162**	**28.1**	**14.0**
Biopharmaceutical	1,916,177	37.1	1,940,141	37.0	2,615,212	39.0	675,070	34.8	16.8
Biochemical and Bioenergy	113,362	2.2	109,073	2.1	121,067	1.8	11,994	11.0	3.3
Biofood	1,904,254	36.8	1,856,837	35.4	2,407,803	35.9	550,966	29.7	12.4
Bioenvironmental	412	0.0	1,645	0.0	633	0.0	-1,012	-61.5	24.0
Biomedical Equipment	612,988	11.9	627,091	12.0	684,941	10.2	57,850	9.2	5.7
Bioinstrument and Bioequipment	46,945	0.9	30,468	0.6	36,554	0.5	6,085	20.0	-11.8
Bioresource	21,320	0.4	23,649	0.5	24,429	0.4	780	3.3	7.0
Bioservice	552,896	10.7	649,306	12.4	821,734	12.2	172,429	26.6	21.9

2) 2015~2019 Trend of Export

○ The total size of export in the bioindustry has continued to grow by 11.9% over the past five years, and has risen significantly to 28.1% compared to the previous year.

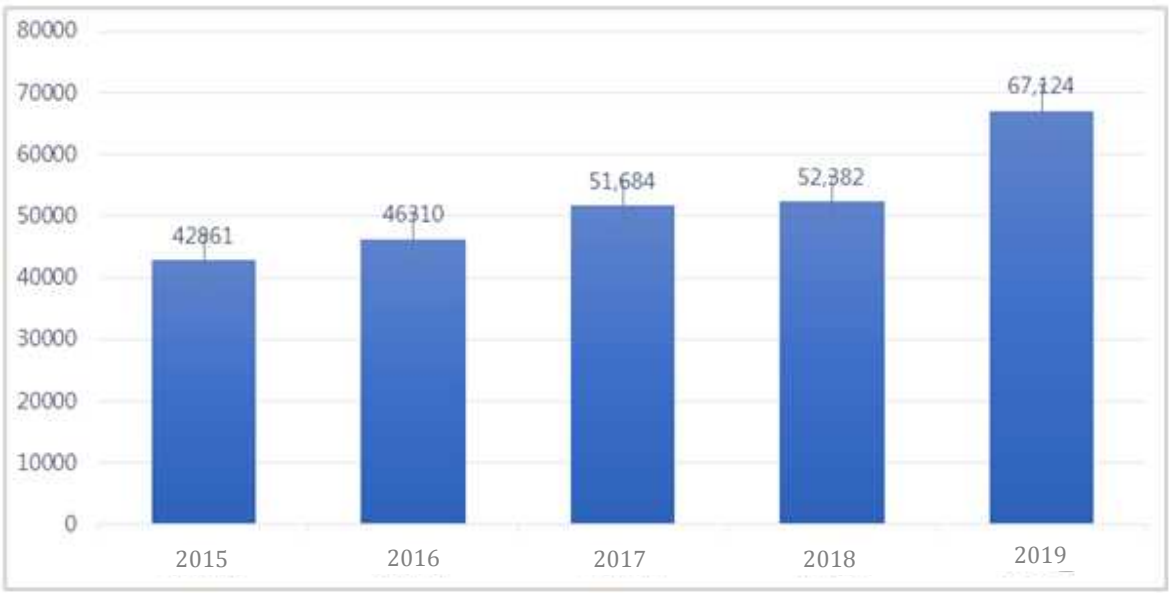
<Table 2-44> 2015~2019 Summary of Bioindustry's Trend of Export

(Unit: 100 million KRW, %)

Classification		2015	2016	2017	2018	2019	Annual Average Rate of Change
Export	Amount	42,861	46,310	51,684	52,382	67,124	11.9
	Distribution Ratio	25.9	8.0	11.6	1.4	28.1	

<Figure 2-35> 2015~2019 Bioindustry's Trend of Export

(Unit: 100 million KRW)



<Table 2-45> 2015~2019 Bioindustry's Trend of Export by Category

(Unit: million KRW, %)

Industrial Category	2015		2016		2017		2018		2019		Variation from Previous Year		Annual Average Rate of Change
	Amount of Export	Distribution Ratio	Amount of Export	Distribution Ratio	Amount of Export	Distribution Ratio	Amount of Export	Distribution Ratio	Amount of Export	Distribution Ratio	Amount of Export	Rate of Change	
Total	**4,286,059**	**100**	**4,631,006**	**100**	**5,168,353**	**100**	**5,238,209**	**100**	**6,712,371**	**100**	**1,474,162**	**28.1**	**11.9**
Biopharmaceutical	1,929,129	45	1,757,736	38.0	1,916,177	37.1	1,940,141	37.0	2,615,212	39.0	675,070	34.8	7.9
Biochemical and Bioenergy	135,203	3.2	138,493	3.0	113,362	2.2	109,073	2.1	121,067	1.8	11,994	11.0	-2.7
Biofood	1,925,962	44.9	1,726,230	37.3	1,904,254	36.8	1,856,837	35.4	2,407,803	35.9	550,966	29.7	5.7
Bioenvironmental	303	0	432	0.0	412	0.0	1,645	0.0	633	0.0	-1,012	-61.5	20.2
Biomedical Equipment	129,425	3	590,285	12.7	612,988	11.9	627,091	12.0	684,941	10.2	57,850	9.2	51.7
Bioinstrument and Bioequipment	73,548	1.7	56,036	1.2	46,945	0.9	30,468	0.6	36,554	0.5	6,085	20.0	-16.0
Bioresource	46,741	1.1	21,685	0.5	21,320	0.4	23,649	0.5	24,429	0.4	780	3.3	-15.0
Bioservice	45,749	1.1	340,109	7.3	552,896	10.7	649,306	12.4	821,734	12.2	172,429	26.6	105.9

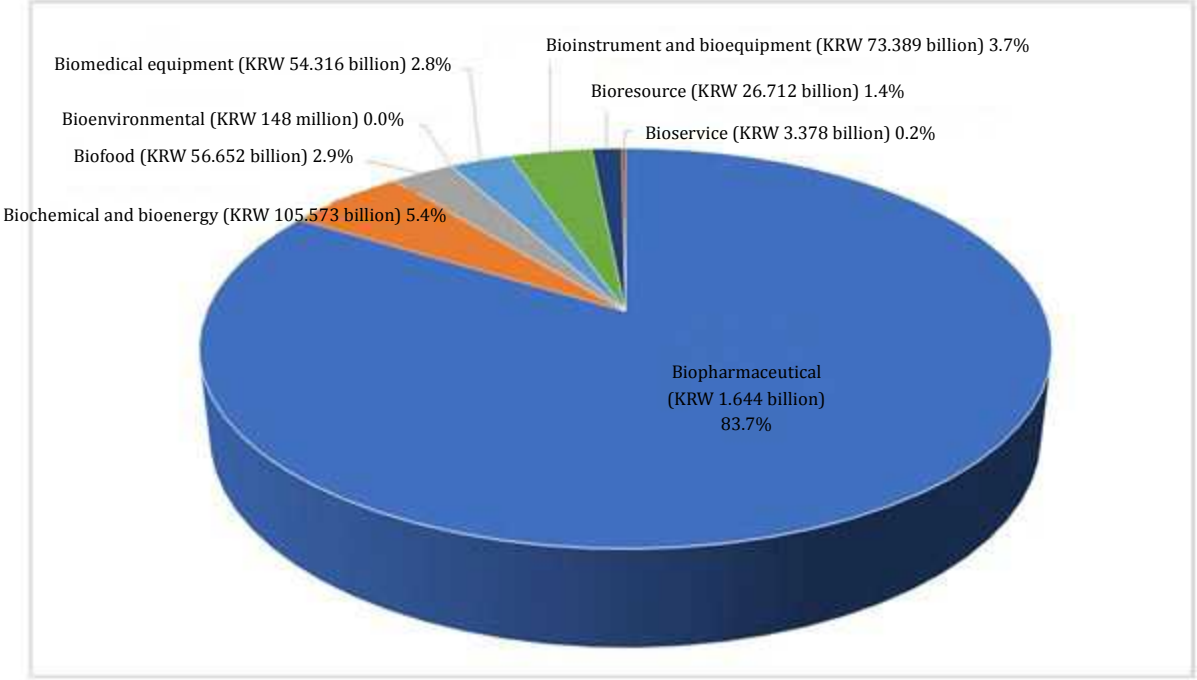
* Due to changes in classification in 2016 onwards, some of the time series data in certain industries needs attention.

8 Import Status of Bioindustry

A. Bioindustry's Import Status of 2019

- The size of bioindustry's imports in 2019 reached KRW 1.964 trillion.
- Comparing the size of imports by bioindustry, the biopharmaceutical industry accounted for 83.7% of total imports, which accounts for the majority of the industry.

<Figure 2-36> 2019 Bioindustry's Size of Import by Category



○ 13 products had more than 1.0% of imports among domestic bioproducts and biotechnologies and bioservices in 2019.

○ Among the total imports, therapeutic antibodies and cytokines accounted for 34.1% of the total at KRW 670.2 billion, followed by vaccines at KRW 300.5 billion (15.3%) and hormones and hemotherapeutics at 15.1% and 13.7%, respectively.

○ Of all top 5 imported items were products from the biopharmaceutical industry, which accounted for 82.7% of the total import amount.

<Table 2-46> 2019 Main Bioproduct's Import

(Unit: million KRW, %)

Rank	Code	Product Name	Imports	Distribution Ratio
1	1050	Therapeutic antibodies and cytokines	670,218	34.1
2	1030	Vaccines	300,458	15.3
3	1040	Hormones	296,288	15.1
4	1060	Blood products	268,202	13.7
5	1000	Other biopharmaceuticals	89,898	4.6
6	5020	In-vitro diagnostics	52,324	2.7
7	6030	Multi-functional and other bioanalysis instruments	49,137	2.5
8	2030	Enzymes and reagents for research	46,392	2.4
9	3010	Functional health foods	41,515	2.1
10	7010	Seeds and seedlings	26,215	1.3
11	2000	Other biochemical and bioenergy products	23,192	1.2
12	6000	Other bioinstruments and bioequipments	22,024	1.1
13	2020	Industrial enzymes and reagents	19,181	1.0

B. Recent Trend of Import Status

1) 2017~2019 Bioindustry's Trend of Import

○ The amount of imports in the domestic bioindustry were KRW 1.964 trillion, which was an increase of KRW 236.2 billion (13.7%) compared to KRW 1.728 trillion in 2018.

○ The import scale has grown by 11.9% annually over the past three years

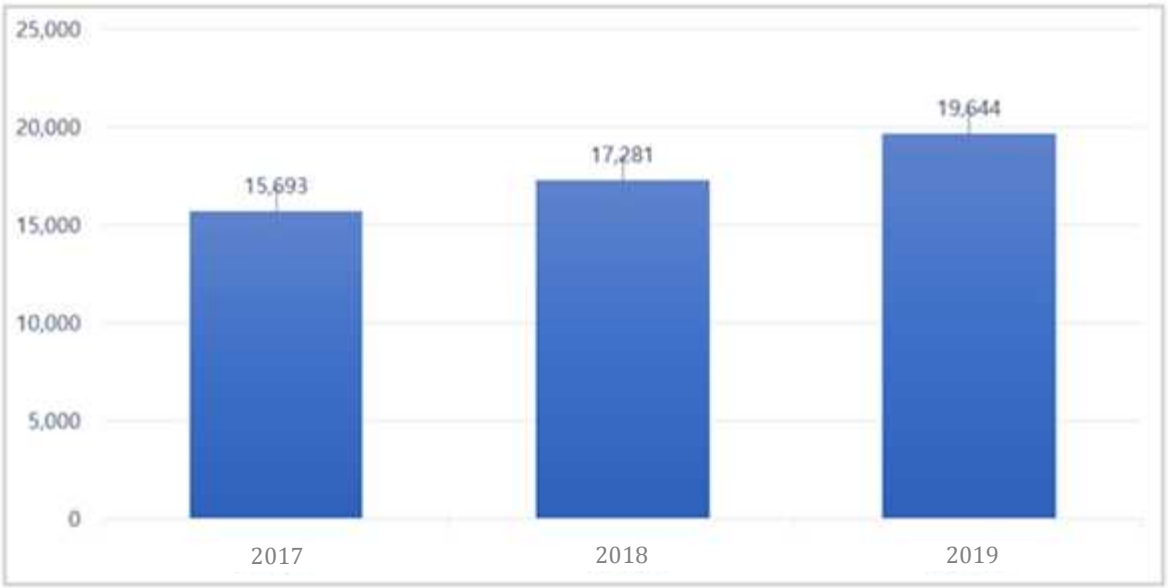
<Table 2-47> 2017~2019 Summary of bioindustry's Trend of Import

(Unit: 100 million KRW, %)

Classification		2017	2018	2019	Annual Average Rate of Change
Import	Amount	15,693	17,281	19,644	11.9
	Rate of Change	7.5	10.1	13.7	

<Figure 2-37> 2017~2019 Bioindustry's Trend of Import

(Unit: 100 million KRW)



<Table 2-48> 2017~2019 Bioindustry's Trend of Import by Category

(Unit: million KRW, %)

Industrial Category	2017		2018		2019		Variation from Previous Year		Annual Average Rate of Change
	Amount of Import	Distribution Ratio	Amount of Import	Distribution Ratio	Amount of Import	Distribution Ratio	Amount of Import	Rate of Change	
Total	**1,569,303**	**100**	**1,728,167**	**100.0**	**1,964,445**	**100.0**	**236,278**	**13.7**	**11.9**
Biopharmaceutical	1,340,432	85.4	1,409,331	81.6	1,644,278	83.7	234,947	16.7	10.8
Biochemical and Bioenergy	83,288	5.3	125,808	7.3	105,573	5.4	-20,235	-16.1	12.6
Biofood Industry	46,050	2.9	50,011	2.9	56,652	2.9	6,641	13.3	10.9
Bioenvironmental	220	0.0	197	0.0	148	0.0	-49	-24.9	-18.0
Biomedical Device	32,229	2.1	50,372	2.9	54,316	2.8	3,944	7.8	29.8
Bioinstrument and Bioequipment	51,406	3.3	65,547	3.8	73,389	3.7	7,842	12.0	19.5
Bioresource	6,301	0.4	24,457	1.4	26,712	1.4	2,255	9.2	105.9
Bioservice	9,377	0.6	2,444	0.1	3,378	0.2	934	38.2	-40.0

2) 2015~2019 Bioindustry's Trend of Import

○ The import size in the domestic bioindustry has continued to increase at an annual average of 8.7% for the past five years.

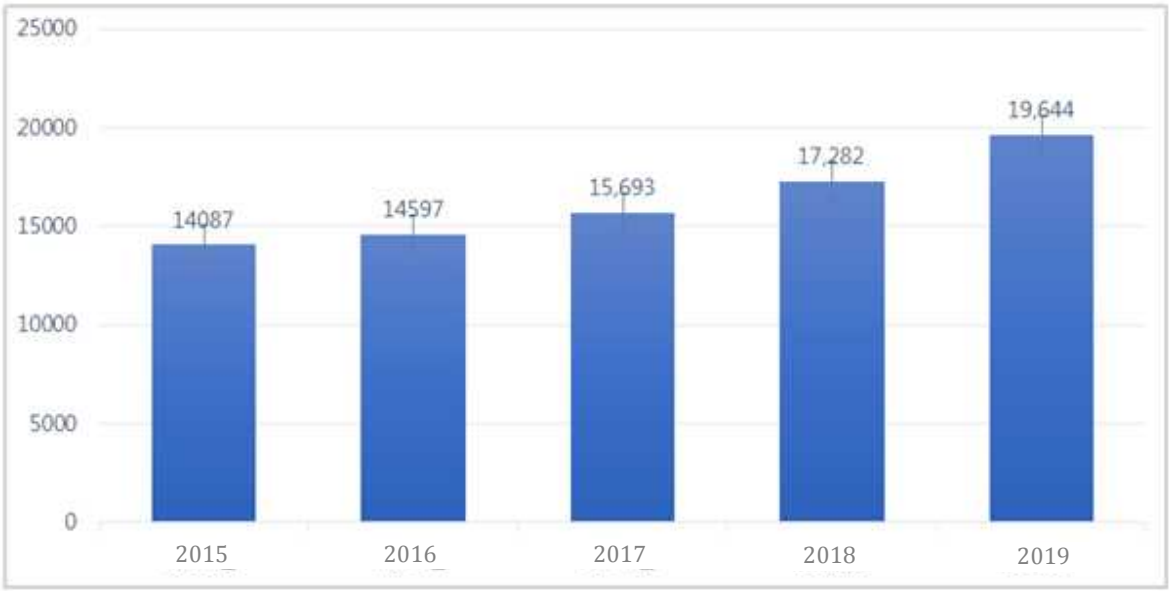
<Table 2-49> 2015~2019 Summary of Bioindustry's Trend of Import by Category

(Unit: 100 million KRW, %)

Classification		2015	2016	2017	2018	2019	Annual Average Rate of Change
Import	Amount	14,087	14,597	15,693	17,282	19,644	8.7
	Rate of Change	0.6	3.6	7.5	10.1	13.7	

<Figure 2-38> 2015~2019 Bioindustry's Trend of Import

(Unit: 100 million KRW)



<Table 2-50> 2015~2019 Bioindustry's Trend of Import by Category

(Unit: million KRW, %)

Industrial Category	2015		2016		2017		2018		2019		Variation from Previous Year		Annual Average Rate of Change
	Amount of Import	Distribution Ratio	Amount of Import	Distribution Ratio	Amount of Import	Distribution Ratio	Amount of Import	Distribution Ratio	Amount of Import	Distribution Ratio	Amount of Import	Distribution Ratio	
Total	**1,408,699**	**100**	**1,459,669**	**100**	**1,569,303**	**100**	**1,728,167**	**100**	**1,964,445**	**100**	**236,278**	**13.7**	**8.7**
Biopharmaceutical	1,220,247	86.6	1,238,512	84.8	1,340,432	85.4	1,409,331	81.6	1,644,278	83.7	234,947	16.7	7.7
Biochemical and Bioenergy	87,710	6.2	88,629	6.1	83,288	5.3	125,808	7.3	105,573	5.4	-20,235	-16.1	4.7
Biofood	36,514	2.6	41,187	2.8	46,050	2.9	50,011	2.9	56,652	2.9	6,641	13.3	11.6
Bioenvironmental	119	0	225	0.0	220	0.0	197	0.0	148	0.0	-49	-24.9	5.6
Biomedical Equipment	770	0.1	32,279	2.2	32,229	2.1	50,372	2.9	54,316	2.8	3,944	7.8	189.8
Bioinstrument and Bioequipment	53,781	3.8	52,484	3.6	51,406	3.3	65,547	3.8	73,389	3.7	7,842	12.0	8.1
Bioresource	8,194	0.6	5,481	0.4	6,301	0.4	24,457	1.4	26,712	1.4	2,255	9.2	34.4
Bioservice	1,364	0.1	872	0.1	9,377	0.6	2,444	0.1	3,378	0.2	934	38.2	25.4

* Due to changes in classification in 2016 onwards, some of the time series data in certain industries needs attention.

III.Statistical Tables

Table of Contents

<Table 1> General Status of Company

<Table 1-1> Distribution by Geography (Unit: companies)

Classification		No. of Companies	Seoul	Busan	Incheon	Daegu	Gwangju	Daejeon	Ulsan	Sejong	Gyeonggi	Gangwon	Chungbuk	Chungnam	Jeonbuk	Jeonnam	Gyeongbuk	Gyeongnam	Jeju
Total		**1,003**	**229**	**14**	**21**	**17**	**10**	**82**	**6**	**3**	**319**	**51**	**81**	**46**	**32**	**35**	**24**	**24**	**9**
Core Industries	Biopharmaceutical	319	101	3	10	3	1	18	-	-	119	15	28	11	2	1	4	2	1
	Biochemical and Bioenergy	192	24	4	3	2	2	26	4	1	47	8	14	12	10	14	8	10	3
	Biofood	175	19	3	-	4	1	9	-	2	45	11	21	15	14	11	7	8	5
	Bioenvironmental	65	4	4	4	3	2	3	2	-	21	6	2	1	2	7	2	2	-
	Biomedical Equipment	95	23	-	-	3	1	9	-	-	33	8	8	5	1	1	2	1	-
	Bioinstrument and Bioequipment	53	15	-	1	1	1	6	-	-	24	1	2	2	-	-	-	-	-
	Bioresource	19	1	-	-	-	-	3	-	-	8	-	3	-	1	1	1	1	-
	Bioservice	85	42	-	3	1	2	8	-	-	22	2	3	-	2	-	-	-	-
Total Number of Workers	1 - 49	598	131	10	10	12	8	55	2	-	170	31	45	30	26	26	17	18	7
	50 - 299	246	55	3	6	3	-	17	3	1	93	11	21	10	4	8	4	5	2
	300 - 999	69	16	-	2	1	-	2	-	-	29	4	10	4	-	-	1	-	-
	1,000 or more	31	4	-	2	1	-	4	-	2	12	1	3	1	1	-	-	-	-
	Unknown	59	23	1	1	-	2	4	1	-	15	4	2	1	1	1	2	1	-
By Area	Seoul	229	229	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	Busan	14	-	14	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	Incheon	21	-	-	21	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	Daegu	17	-	-	-	17	-	-	-	-	-	-	-	-	-	-	-	-	-
	Gwangju	10	-	-	-	-	10	-	-	-	-	-	-	-	-	-	-	-	-
	Daejeon	82	-	-	-	-	-	82	-	-	-	-	-	-	-	-	-	-	-
	Ulsan	6	-	-	-	-	-	-	6	-	-	-	-	-	-	-	-	-	-
	Sejong	3	-	-	-	-	-	-	-	3	-	-	-	-	-	-	-	-	-
	Gyeonggi	319	-	-	-	-	-	-	-	-	319	-	-	-	-	-	-	-	-
	Gangwon	51	-	-	-	-	-	-	-	-	-	51	-	-	-	-	-	-	-
	Chungbuk	81	-	-	-	-	-	-	-	-	-	-	81	-	-	-	-	-	-
	Chungnam	46	-	-	-	-	-	-	-	-	-	-	-	46	-	-	-	-	-
	Jeonbuk	32	-	-	-	-	-	-	-	-	-	-	-	-	32	-	-	-	-
	Jeonnam	35	-	-	-	-	-	-	-	-	-	-	-	-	-	35	-	-	-
	Gyeongbuk	24	-	-	-	-	-	-	-	-	-	-	-	-	-	-	24	-	-
	Gyeongnam	24	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	24	-
	Jeju	9	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	9

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

Classification		No. of Companies	Single-unit Enterprise	Multiple-unit Enterprise	Unknown
Total		**1,003**	**556**	**442**	**5**
Core Industries	Biopharmaceutical	319	154	161	4
	Biochemical and Bioenergy	192	105	87	-
	Biofood	175	83	92	-
	Bioenvironmental	65	42	23	-
	Biomedical Equipment	95	58	37	-
	Bioinstrument and Bioequipment	53	40	12	1
	Bioresource	19	12	7	-
	Bioservice	85	62	23	-
Total Number of Workers	1 - 49	598	413	185	-
	50 - 299	246	85	161	-
	300 - 999	69	12	56	1
	1,000 or more	31	2	29	-
	Unknown	59	44	11	4
By Area	Seoul	229	157	68	4
	Busan	14	8	6	-
	Incheon	21	17	4	-
	Daegu	17	10	7	-
	Gwangju	10	8	2	-
	Daejeon	82	50	32	-
	Ulsan	6	2	4	-
	Sejong	3	1	2	-
	Gyeonggi	319	160	158	1
	Gangwon	51	27	24	-
	Chungbuk	81	33	48	-
	Chungnam	46	18	28	-
	Jeonbuk	32	15	17	-
	Jeonnam	35	18	17	-
	Gyeongbuk	24	14	10	-
	Gyeongnam	24	14	10	-
	Jeju	9	4	5	-

<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		1,003	516	316	56	34	149	72	277
Core Industries	Biopharmaceutical	319	147	72	8	13	75	44	82
	Biochemical and Bioenergy	192	94	67	15	2	15	12	61
	Biofood	175	82	62	10	4	16	13	49
	Bioenvironmental	65	32	29	6	-	-	1	24
	Biomedical Equipment	95	66	39	9	5	20	-	18
	Bioinstrument and Bioequipment	53	24	16	4	-	5	-	21
	Bioresource	19	10	4	-	1	2	1	5
	Bioservice	85	61	27	4	9	16	1	17
Total Number of Workers	1 - 49	598	382	194	33	22	28	3	159
	50 - 299	246	118	110	21	12	95	14	54
	300 - 999	69	3	5	1	-	21	25	20
	1,000 or more	31	-	-	-	-	1	27	3
	Unknown	59	13	7	1	-	4	3	41
By Area	Seoul	229	110	52	7	13	28	12	90
	Busan	14	7	3	1	-	2	-	5
	Incheon	21	8	3	1	-	4	2	7
	Daegu	17	11	5	1	-	1	2	4
	Gwangju	10	5	2	-	-	-	-	4
	Daejeon	82	61	32	3	2	11	5	13
	Ulsan	6	1	1	-	-	1	3	1
	Sejong	3	1	-	-	-	-	2	-
	Gyeonggi	319	166	104	16	9	63	33	70
	Gangwon	51	31	23	4	3	9	1	11
	Chungbuk	81	39	28	9	4	18	4	18
	Chungnam	46	16	14	1	-	5	5	15
	Jeonbuk	32	17	12	4	1	2	2	10
	Jeonnam	35	21	14	7	-	2	1	8
	Gyeongbuk	24	10	7	2	2	-	-	11
	Gyeongnam	24	9	13	-	-	3	-	6
	Jeju	9	3	3	-	-	-	-	4

<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		1,003	516	316	56	396
Core Industries	Biopharmaceutical	319	147	72	8	147
	Biochemical and Bioenergy	192	94	67	15	80
	Biofood	175	82	62	10	70
	Bioenvironmental	65	32	29	6	25
	Biomedical Equipment	95	66	39	9	22
	Bioinstrument and Bioequipment	53	24	16	4	22
	Bioresource	19	10	4		8
	Bioservice	85	61	27	4	22
Total Number of Workers	1 - 49	598	382	194	33	167
	50 - 299	246	118	110	21	91
	300 - 999	69	3	5	1	63
	1,000 or more	31	-	-	-	31
	Unknown	59	13	7	1	44
By Area	Seoul	229	110	52	7	107
	Busan	14	7	3	1	6
	Incheon	21	8	3	1	12
	Daegu	17	11	5	1	6
	Gwangju	10	5	2	-	4
	Daejeon	82	61	32	3	18
	Ulsan	6	1	1	-	5
	Sejong	3	1	-	-	2
	Gyeonggi	319	166	104	16	122
	Gangwon	51	31	23	4	15
	Chungbuk	81	39	28	9	33
	Chungnam	46	16	14	1	22
	Jeonbuk	32	17	12	4	13
	Jeonnam	35	21	14	7	9
	Gyeongbuk	24	10	7	2	11
	Gyeongnam	24	9	13	-	7
	Jeju	9	3	3	-	4

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

Classification		No. of Companies	KONEX-listed Companies	KOSDAQ-listed Companies	Listed companies	N/A or Unknown
Total		**1,003**	**34**	**149**	**72**	**748**
Core Industries	Biopharmaceutical	319	13	75	44	187
	Biochemical and Bioenergy	192	2	15	12	163
	Biofood	175	4	16	13	142
	Bioenvironmental	65	-	-	1	64
	Biomedical Equipment	95	5	20	-	70
	Bioinstruments and Bioequipment	53	-	5	-	48
	Bioresource	19	1	2	1	15
	Bioservice	85	9	16	1	59
Total Number of Workers	1 - 49	598	22	28	3	545
	50 - 299	246	12	95	14	125
	300 - 999	69	-	21	25	23
	1,000 or more	31	-	1	27	3
	Unknown	59	-	4	3	52
By Area	Seoul	229	13	28	12	176
	Busan	14	-	2	-	12
	Incheon	21	-	4	2	15
	Daegu	17	-	1	2	14
	Gwangju	10	-	-	-	10
	Daejeon	82	2	11	5	64
	Ulsan	6	-	1	3	2
	Sejong	3	-	-	2	1
	Gyeonggi	319	9	63	33	214
	Gangwon	51	3	9	1	38
	Chungbuk	81	4	18	4	55
	Chungnam	46	-	5	5	36
	Jeonbuk	32	1	2	2	27
	Jeonnam	35	-	2	1	32
	Gyeongbuk	24	2	-	-	22
	Gyeongnam	24	-	3	-	21
	Jeju	9	-	-	-	9

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

Classification		No. of Companies	Before 1950	1951 - 1980	1981 - 1990	1991 - 1995	1996 - 2000	2001 - 2005	2006 - 2010	2011 - 2015	After 2016
Total		**1,003**	**5**	**91**	**66**	**52**	**211**	**164**	**167**	**155**	**92**
Core Industries	Biopharmaceutical	319	4	49	33	22	50	30	39	48	44
	Biochemical and Bioenergy	192	-	14	11	7	48	30	38	35	9
	Biofood	175	1	20	9	9	46	42	21	15	12
	Bioenvironmental	65	-	3	2	5	15	22	9	6	3
	Biomedical Equipment	95	-	2	4	2	22	14	19	25	7
	Bioinstruments and Bioequipment	53	-	-	3	6	12	10	10	10	2
	Bioresource	19	-	2	1	1	1	4	5	3	2
	Bioservice	85	-	1	3	-	17	12	26	13	13
Total Number of Workers	1 - 49	598	-	10	18	16	120	114	116	122	82
	50 - 299	246	2	37	25	24	62	37	39	16	4
	300 - 999	69	2	24	18	5	8	3	3	4	2
	1,000 or more	31	1	16	1	1	-	2	4	4	2
	Unknown	59	-	4	4	6	21	8	5	9	2
By Area	Seoul	229	1	19	17	19	50	26	32	44	21
	Busan	14	-	1	1	-	-	4	4	2	2
	Incheon	21	-	2	2	1	3	2	2	7	2
	Daegu	17	-	3	-	-	2	3	4	2	3
	Gwangju	10	-	-	-	-	2	3	1	-	4
	Daejeon	82	-	7	3	1	22	12	17	12	8
	Ulsan	6	-	1	-	-	1	-	1	2	1
	Sejong	3	-	1	-	-	1	-	-	1	-
	Gyeonggi	319	4	34	23	13	61	45	58	48	33
	Gangwon	51	-	2	-	3	16	9	11	6	4
	Chungbuk	81	-	7	6	9	17	20	6	10	6
	Chungnam	46	-	7	7	2	13	7	5	5	-
	Jeonbuk	32	-	3	1	1	6	7	4	4	6
	Jeonnam	35	-	2	1	1	3	11	12	5	-
	Gyeongbuk	24	-	-	1	1	6	5	5	4	2
	Gyeongnam	24	-	2	3	1	8	4	5	1	-
	Jeju	9	-	-	1	-	-	6	-	2	-

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

Classification		No. of Companies	Male	Female	Unknown
Total		**1,003**	**885**	**112**	**6**
Core Industries	Biopharmaceutical	319	285	31	3
	Biochemical and Bioenergy	192	163	27	2
	Biofood	175	164	11	-
	Bioenvironmental	65	53	12	-
	Biomedical Equipment	95	84	11	-
	Bioinstruments and Bioequipment	53	49	3	1
	Bioresource	19	16	3	-
	Bioservice	85	71	14	-
Total Number of Workers	1 - 49	598	517	80	1
	50 - 299	246	225	20	1
	300 - 999	69	67	1	1
	1,000 or more	31	30	1	-
	Unknown	59	46	10	3
By Area	Seoul	229	184	40	5
	Busan	14	12	2	-
	Incheon	21	17	4	-
	Daegu	17	14	3	-
	Gwangju	10	10	-	-
	Daejeon	82	72	10	-
	Ulsan	6	5	1	-
	Sejong	3	3	-	-
	Gyeonggi	319	294	25	-
	Gangwon	51	48	3	-
	Chungbuk	81	74	6	1
	Chungnam	46	44	2	-
	Jeonbuk	32	28	4	-
	Jeonnam	35	32	3	-
	Gyeongbuk	24	22	2	-
	Gyeongnam	24	19	5	-
	Jeju	9	7	2	-

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

Classification		No. of Companies	1 - 49	50 - 299	300 - 999	1,000 or more	Unknown
Total		**1,003**	**598**	**246**	**69**	**31**	**59**
Core Industries	Biopharmaceutical	319	133	97	48	14	27
	Biochemical and Bioenergy	192	134	31	4	8	15
	Biofood	175	120	35	7	7	6
	Bioenvironmental	65	50	10	1	1	3
	Biomedical Equipment	95	54	33	4	-	4
	Bioinstruments and Bioequipment	53	39	11	1	-	2
	Bioresource	19	13	4	1	-	1
	Bioservice	85	55	25	3	1	1
Total Number of Workers	1 - 49	598	598	-	-	-	-
	50 - 299	246	-	246	-	-	-
	300 - 999	69	-	-	69	-	-
	1,000 or more	31	-	-	-	31	-
	Unknown	59	-	-	-	-	59
By Area	Seoul	229	131	55	16	4	23
	Busan	14	10	3	-	-	1
	Incheon	21	10	6	2	2	1
	Daegu	17	12	3	1	1	-
	Gwangju	10	8	-	-	-	2
	Daejeon	82	55	17	2	4	4
	Ulsan	6	2	3	-	-	1
	Sejong	3	-	1	-	2	-
	Gyeonggi	319	170	93	29	12	15
	Gangwon	51	31	11	4	1	4
	Chungbuk	81	45	21	10	3	2
	Chungnam	46	30	10	4	1	1
	Jeonbuk	32	26	4	-	1	1
	Jeonnam	35	26	8	-	-	1
	Gyeongbuk	24	17	4	1	-	2
	Gyeongnam	24	18	5	-	-	1
	Jeju	9	7	2	-	-	-

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

Classification		No. of Companies	No. of Respondents	Total No. Workers		Male		Female		Unknown	
				[Sum]	Average	Total	Average	Total	Average	Total	Average
Total		**1,003**	**944**	**237,056**	**251**	**151,708**	**161**	**47,002**	**50**	**38,346**	**41**
Core Industries	Biopharmaceutical	319	292	80,402	275	37,344	128	17,892	61	25,166	86
	Biochemical and Bioenergy	192	177	96,352	544	79,612	450	7,339	41	9,401	53
	Biofood	175	169	37,537	222	23,264	138	14,114	84	159	1
	Bioenvironmental	65	62	5,102	82	1,787	29	329	5	2,986	48
	Biomedical Equipment	95	91	6,058	67	3,333	37	2,445	27	280	3
	Bioinstruments and Bioequipment	53	51	2,319	45	1,362	27	603	12	354	7
	Bioresource	19	18	1,190	66	753	42	437	24	0	0
	Bioservice	85	84	8,096	96	4,253	51	3,843	46	0	0
Total Number of Workers	1 - 49	598	598	9,699	16	5,993	10	3,569	6	137	
	50 - 299	246	246	30,442	124	18,713	76	10,451	42	1,278	5
	300 - 999	69	69	34,083	494	20,133	292	10,148	147	3,802	55
	1,000 or more	31	31	162,832	5,253	106,869	3,447	22,834	737	33,129	1,069
	Unknown	59	0								
By Area	Seoul	229	206	25,458	124	14,243	69	9,656	47	1,559	8
	Busan	14	13	485	37	336	26	149	11	0	0
	Incheon	21	20	7,392	370	3,983	199	2,501	125	908	45
	Daegu	17	17	2,520	148	1,798	106	718	42	4	
	Gwangju	10	8	58	7	36	5	22	3	0	0
	Daejeon	82	78	14,117	181	8,295	106	2,245	29	3,577	46
	Ulsan	6	5	606	121	546	109	60	12	0	0
	Sejong	3	3	3,745	1,248	2,590	863	1,155	385	0	0
	Gyeonggi	319	304	128,617	423	99,557	327	19,491	64	9,569	31
	Gangwon	51	47	6,695	142	4,644	99	2,024	43	27	1
	Chungbuk	81	79	32,804	415	7,359	93	3,485	44	21,960	278
	Chungnam	46	45	5,351	119	3,867	86	1,454	32	30	1
	Jeonbuk	32	31	5,715	184	2,549	82	3,166	102	0	0
	Jeonnam	35	34	1,171	34	807	24	364	11	0	0
	Gyeongbuk	24	22	1,149	52	300	14	137	6	712	32
	Gyeongnam	24	23	769	33	556	24	213	9	0	0
	Jeju	9	9	404	45	242	27	162	18	0	0

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

Classification		No. of Companies	Capital		
			No. of Respondents	Total	Average
Total		**1,003**	**939**	**9,887,573**	**10,530**
Core Industries	Biopharmaceutical	319	302	3,787,620	12,542
	Biochemical and Bioenergy	192	175	3,753,273	21,447
	Biofood	175	163	1,214,304	7,450
	Bioenvironmental	65	60	69,430	1,157
	Biomedical Equipment	95	92	386,313	4,199
	Bioinstrument and Bioequipment	53	49	63,347	1,293
	Bioresources	19	17	191,933	11,290
	Bioservice	85	81	421,353	5,202
Total Size of Workers	1 - 49	598	561	1,096,249	1,954
	50 - 299	246	243	2,237,488	9,208
	300 - 999	69	69	1,267,288	18,366
	1,000 or more	31	31	4,902,208	158,136
	Unknown	59	35	384,340	10,981
By Area	Seoul	229	209	1,832,773	8,769
	Busan	14	13	52,269	4,021
	Incheon	21	21	716,189	34,104
	Daegu	17	15	78,966	5,264
	Gwangju	10	9	4,859	540
	Daejeon	82	77	1,311,124	17,028
	Ulsan	6	6	161,529	26,922
	Sejong	3	3	18,953	6,318
	Gyeonggi	319	307	3,708,680	12,080
	Gangwon	51	46	528,727	11,494
	Chungbuk	81	77	887,733	11,529
	Chungnam	46	44	297,740	6,767
	Jeonbuk	32	30	85,615	2,854
	Jeonnam	35	33	106,757	3,235
	Gyeongbuk	24	21	35,800	1,705
	Gyeongnam	24	20	46,151	2,308
	Jeju	9	8	13,708	1,714

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

Classification		No. of Companies	Ratio of Net Worth	
			No. of Respondents	Average
Total		**1,003**	**900**	**40**
Core Industries	Biopharmaceutical	319	299	48
	Biochemical and Bioenergy	192	164	48
	Biofood	175	157	37
	Bioenvironmental	65	56	47
	Biomedical Equipment	95	88	39
	Bioinstrument and Bioequipment	53	49	46
	Bioresource	19	16	45
	Bioservice	85	71	-11
Total Size of Workers	1 - 49	598	524	37
	50 - 299	246	241	59
	300 - 999	69	69	58
	1,000 or more	31	31	62
	Unknown	59	35	-86
By Area	Seoul	229	199	36
	Busan	14	11	34
	Incheon	21	20	49
	Daegu	17	15	49
	Gwangju	10	8	39
	Daejeon	82	75	49
	Ulsan	6	6	51
	Sejong	3	3	55
	Gyeonggi	319	296	40
	Gangwon	51	45	44
	Chungbuk	81	73	50
	Chungnam	46	42	51
	Jeonbuk	32	29	8
	Jeonnam	35	31	41
	Gyeongbuk	24	19	21
	Gyeongnam	24	20	48
	Jeju	9	8	28

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

Classification		No. of Companies	Net Income / Net Loss		
			No. of Respondents	Total	Average
Total		**1,003**	**891**	**5,473,232**	**6,143**
Core Industries	Biopharmaceutical	319	296	-384,492	-1,299
	Biochemical and Bioenergy	192	161	5,389,175	33,473
	Biofood	175	156	402,725	2,582
	Bioenvironmental	65	56	49,601	886
	Biomedical Equipment	95	88	-74,158	-843
	Bioinstrument and Bioequipment	53	49	13,987	285
	Bioresource	19	16	-34,595	-2,162
	Bioservice	85	69	110,989	1,609
Total Size of Workers	1 - 49	598	514	-729,269	-1,419
	50 - 299	246	242	-488,064	-2,017
	300 - 999	69	69	693,132	10,045
	1,000 or more	31	31	5,824,784	187,896
	Unknown	59	35	172,649	4,933
By Area	Seoul	229	196	-872,063	-4,449
	Busan	14	11	-222,115	-20,192
	Incheon	21	20	723,668	36,183
	Daegu	17	15	65,646	4,376
	Gwangju	10	8	-1,011	-126
	Daejeon	82	76	1,886,721	24,825
	Ulsan	6	6	73,935	12,323
	Sejong	3	3	59,012	19,671
	Gyeonggi	319	294	3,235,415	11,005
	Gangwon	51	43	20,611	479
	Chungbuk	81	72	303,128	4,210
	Chungnam	46	41	-49,622	-1,210
	Jeonbuk	32	29	226,066	7,795
	Jeonnam	35	31	-7,491	-242
	Gyeongbuk	24	19	29,993	1,579
	Gyeongnam	24	19	-5,963	-314
	Jeju	9	8	7,302	913

<Table 2> Manpower Status of Bioindustry

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

Classification		No. of Companies	No. of Respondents	Bioindustry Workers		Researchers: Total		Researchers: Doctor's		Researchers: Master's		Researchers: Bachelor's		Researchers: Other	
				Total	Average	Total	Average	Total	Average	Total	Average	Total	Average	Total	Average
Total		**1,003**	**966**	**49,113**	**51**	**15,463**	**16**	**2,446**	**3**	**6,973**	**7**	**5,681**	**6**	**363**	**0**
Core Industries	Biopharmaceutical	319	291	20,894	72	7,060	24	1,282	4	3,574	12	2,048	7	156	1
	Biochemical and Bioenergy	192	187	6,717	36	2,117	11	308	2	1,019	5	714	4	76	0
	Biofood	175	174	6,302	36	1,583	9	297	2	734	4	521	3	31	0
	Bioenvironmental	65	64	1,071	17	370	6	40	1	122	2	207	3	1	0
	Biomedical Equipment	95	95	5,382	57	1,276	13	171	2	584	6	513	5	8	0
	Bioinstrument and Bioequipment	53	52	1,552	30	364	7	49	1	124	2	183	4	8	0
	Bioresource	19	18	1,057	59	265	15	34	2	81	5	150	8	0	0
	Bioservice	85	85	6,138	72	2,428	29	265	3	735	9	1,345	16	83	1
Total Size of Workers	1 - 49	598	592	8,014	14	3,512	6	697	1	1,415	2	1,380	2	20	0
	50 - 299	246	239	18,240	76	5,227	22	679	3	2,049	9	2,389	10	110	0
	300 - 999	69	66	9,415	143	2,743	42	453	7	1,268	19	947	14	75	1
	1,000 or more	31	31	11,427	369	3,420	110	498	16	1,960	63	833	27	129	4
	Unknown	59	38	2,017	53	561	15	119	3	281	7	132	3	29	1
By Area	Seoul	229	202	7,241	36	3,120	15	444	2	1,211	6	1,419	7	46	0
	Busan	14	14	256	18	76	5	12	1	44	3	19	1	1	0
	Incheon	21	21	5,299	252	1,311	62	224	11	676	32	387	18	24	1
	Daegu	17	17	1,464	86	185	11	10	1	41	2	105	6	29	2
	Gwangju	10	10	67	7	36	4	6	1	18	2	12	1	0	0
	Daejeon	82	82	2,245	27	940	11	188	2	446	5	295	4	11	0
	Ulsan	6	6	1,122	187	186	31	21	4	98	16	47	8	20	3
	Sejong	3	3	357	119	148	49	9	3	83	28	43	14	13	4
	Gyeonggi	319	313	14,671	47	5,544	18	971	3	2,547	8	1,938	6	88	0
	Gangwon	51	49	2,917	60	572	12	91	2	276	6	204	4	1	0
	Chungbuk	81	81	8,012	99	1,979	24	266	3	968	12	658	8	87	1
	Chungnam	46	46	2,003	44	469	10	81	2	242	5	141	3	5	0
	Jeonbuk	32	32	1,157	36	262	8	40	1	93	3	105	3	24	1
	Jeonnam	35	35	765	22	225	6	20	1	74	2	129	4	2	0
	Gyeongbuk	24	23	793	34	233	10	38	2	89	4	94	4	12	1
	Gyeongnam	24	23	483	21	116	5	16	1	47	2	53	2	0	0
	Jeju	9	9	261	29	61	7	9	1	20	2	32	4	0	0

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

Classification		No. of Companies	No. of Respondents	Bioindustry Workers		Production Workers: Total		Production Workers: Doctor's		Production Workers: Master's		Production Workers: Bachelor's		Production Workers: Others	
				Total	Average	Total	Average	Total	Average	Total	Average	Total	Average	Total	Average
Total		**1,003**	**966**	**49,113**	**51**	**16,971**	**18**	**53**	**0**	**811**	**1**	**6,143**	**6**	**9,964**	**10**
Core Industries	Biopharmaceutical	319	291	20,894	72	6,854	24	30	0	405	1	2,917	10	3,502	12
	Biochemical and Bioenergy	192	187	6,717	36	2,328	12	6	0	54	0	655	4	1,613	9
	Biofood	175	174	6,302	36	2,740	16	4	0	40	0	928	5	1,768	10
	Bioenvironmental	65	64	1,071	17	297	5	1	0	6	0	169	3	121	2
	Biomedical Equipment	95	95	5,382	57	2,053	22	1	0	67	1	451	5	1,534	16
	Bioinstrument and Bioequipment	53	52	1,552	30	398	8	1	0	17	0	118	2	262	5
	Bioresource	19	18	1,057	59	177	10	0	0	1	0	41	2	135	8
	Bioservice	85	85	6,138	72	2,124	25	10	0	221	3	864	10	1,029	12
Total Number of Workers	1 - 49	598	592	8,014	14	1,668	3	4	0	52	0	570	1	1,042	2
	50 - 299	246	239	18,240	76	5,979	25	9	0	172	1	1,967	8	3,831	16
	300 - 999	69	66	9,415	143	3,592	54	11	0	232	4	986	15	2,363	36
	1,000 or more	31	31	11,427	369	5,207	168	24	1	323	10	2,465	80	2,395	77
	Unknown	59	38	2,017	53	525	14	5	0	32	1	155	4	333	9
By Area	Seoul	229	202	7,241	36	1,142	6	3	0	63	0	405	2	671	3
	Busan	14	14	256	18	36	3	1	0	0	0	6	0	29	2
	Incheon	21	21	5,299	252	2,961	141	9	0	213	10	1,628	78	1,111	53
	Daegu	17	17	1,464	86	537	32	0	0	4	0	166	10	367	22
	Gwangju	10	10	67	7	7	1	0	0	0	0	4	0	3	0
	Daejeon	82	82	2,245	27	578	7	3	0	45	1	237	3	293	4
	Ulsan	6	6	1,122	187	410	68	2	0	20	3	154	26	234	39
	Sejong	3	3	357	119	169	56	0	0	0	0	103	34	66	22
	Gyeonggi	319	313	14,671	47	4,360	14	9	0	207	1	1,231	4	2,913	9
	Gangwon	51	49	2,917	60	1,275	26	0	0	38	1	350	7	887	18
	Chungbuk	81	81	8,012	99	3,187	39	21	0	194	2	1,111	14	1,861	23
	Chungnam	46	46	2,003	44	814	18	1	0	8	0	149	3	656	14
	Jeonbuk	32	32	1,157	36	575	18	2	0	6	0	189	6	378	12
	Jeonnam	35	35	765	22	260	7	1	0	1	0	115	3	143	4
	Gyeongbuk	24	23	793	34	348	15	1	0	10	0	139	6	198	9
	Gyeongnam	24	23	483	21	216	9	0	0	1	0	138	6	77	3
	Jeju	9	9	261	29	96	11	0	0	1	0	18	2	77	9

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

Classification		No. of Companies	No. of Respondents	Bioindustry Workers		Other Positions: Total		Other Positions: Doctor's		Other Positions: Master's		Other Positions: Bachelor's		Other Positions: Others	
				Total	Average	Total	Average	Total	Average	Total	Average	Total	Average	Total	Average
Total		**1,003**	**966**	**49,113**	**51**	**16,679**	**17**	**308**	**0**	**1,717**	**2**	**12,189**	**13**	**2,465**	**3**
Core Industries	Biopharmaceutical	319	291	20,894	72	6,980	24	171	1	757	3	5,005	17	1,047	4
	Biochemical and Bioenergy	192	187	6,717	36	2,272	12	28	0	164	1	1,748	9	332	2
	Biofood	175	174	6,302	36	1,979	11	23	0	156	1	1,385	8	415	2
	Bioenvironmental	65	64	1,071	17	404	6	1	0	22	0	336	5	45	1
	Biomedical Equipment	95	95	5,382	57	2,053	22	46	0	275	3	1,392	15	340	4
	Bioinstrument and Bioequipment	53	52	1,552	30	790	15	4	0	29	1	616	12	141	3
	Bioresource	19	18	1,057	59	615	34	0	0	62	3	520	29	33	2
	Bioservice	85	85	6,138	72	1,586	19	35	0	252	3	1,187	14	112	1
Total Size of Workers	1 - 49	598	592	8,014	14	2,834	5	45	0	204	0	2,281	4	304	1
	50 - 299	246	239	18,240	76	7,034	29	61	0	554	2	5,253	22	1,166	5
	300 - 999	69	66	9,415	143	3,080	47	147	2	570	9	2,012	30	351	5
	1,000 or more	31	31	11,427	369	2,800	90	47	2	280	9	1,908	62	565	18
	Unknown	59	38	2,017	53	931	25	8	0	109	3	735	19	79	2
By Area	Seoul	229	202	7,241	36	2,979	15	62	0	369	2	2,194	11	354	2
	Busan	14	14	256	18	144	10	1	0	8	1	107	8	28	2
	Incheon	21	21	5,299	252	1,027	49	64	3	209	10	674	32	80	4
	Daegu	17	17	1,464	86	742	44	5	0	16	1	437	26	284	17
	Gwangju	10	10	67	7	24	2	0	0	6	1	16	2	2	0
	Daejeon	82	82	2,245	27	727	9	20	0	59	1	590	7	58	1
	Ulsan	6	6	1,122	187	526	88	2	0	34	6	439	73	51	9
	Sejong	3	3	357	119	40	13	0	0	0	0	37	12	3	1
	Gyeonggi	319	313	14,671	47	4,767	15	42	0	454	1	3,548	11	723	2
	Gangwon	51	49	2,917	60	1,070	22	35	1	149	3	756	15	130	3
	Chungbuk	81	81	8,012	99	2,846	35	43	1	245	3	2,047	25	511	6
	Chungnam	46	46	2,003	44	720	16	20	0	88	2	527	11	85	2
	Jeonbuk	32	32	1,157	36	320	10	2	0	23	1	233	7	62	2
	Jeonnam	35	35	765	22	280	8	6	0	24	1	216	6	34	1
	Gyeongbuk	24	23	793	34	212	9	5	0	16	1	163	7	28	1
	Gyeongnam	24	23	483	21	151	7	0	0	12	1	132	6	7	0
	Jeju	9	9	261	29	104	12	1	0	5	1	73	8	25	3

<Table 3> Investment Status of Bioindustry

(Unit: million KRW)

Classification		No. of Companies	No. of Respondents	R&D Investment		Facility Investment		Total Investment		Bio R&D Investment		Bio Facility Investment		Bio Total Investment	
				Total	Average	Total	Average	Total	Average	Total	Average	Total	Average	Total	Average
Total		**1,003**	**946**	**6,992,398**	**7,392**	**995,464**	**1,052**	**7,987,862**	**8,444**	**1,839,677**	**1,945**	**746,677**	**789**	**2,586,354**	**2,734**
Core Industries	Biopharmaceutical	319	292	3,073,595	10,526	538,507	1,844	3,612,102	12,370	1,311,581	4,492	382,946	1,311	1,694,527	5,803
	Biochemical and Bioenergy	192	184	3,397,146	18,463	146,930	799	3,544,076	19,261	147,326	801	92,394	502	239,720	1,303
	Biofood	175	167	220,786	1,322	110,222	660	331,008	1,982	129,144	773	82,080	491	211,224	1,265
	Bioenvironmental	65	64	26,812	419	11,020	172	37,832	591	13,246	207	7,165	112	20,411	319
	Biomedical Equipment	95	92	106,741	1,160	59,797	650	166,538	1,810	101,860	1,107	54,873	596	156,733	1,704
	Bioinstrument and Bioequipment	53	49	17,910	366	2,854	58	20,764	424	13,087	267	2,654	54	15,741	321
	Bioresource	19	18	26,383	1,466	2,487	138	28,870	1,604	11,084	616	2,487	138	13,571	754
	Bioservice	85	80	123,025	1,538	123,647	1,546	246,672	3,083	112,349	1,404	122,078	1,526	234,427	2,930
Total Size of Workers	1 - 49	598	584	336,069	575	123,876	212	459,945	788	282,575	484	115,221	197	397,796	681
	50 - 299	246	235	534,819	2,276	228,154	971	762,973	3,247	463,341	1,972	194,681	828	658,022	2,800
	300 - 999	69	63	592,847	9,410	197,694	3,138	790,541	12,548	311,107	4,938	151,813	2,410	462,920	7,348
	1,000 or more	31	30	5,293,836	176,461	441,798	14,727	5,735,634	191,188	745,340	24,845	284,172	9,472	1,029,512	34,317
	Unknown	59	34	234,827	6,907	3,942	116	238,769	7,023	37,314	1,097	790	23	38,104	1,121
By Area	Seoul	229	203	386,380	1,903	82,926	409	469,306	2,312	218,468	1,076	49,991	246	268,459	1,322
	Busan	14	13	3,166	244	1,226	94	4,392	338	3,166	244	1,100	85	4,266	328
	Incheon	21	19	272,057	14,319	170,748	8,987	442,805	23,306	243,867	12,835	170,248	8,960	414,115	21,796
	Daegu	17	17	86,387	5,082	16,299	959	102,686	6,040	6,469	381	13,099	771	19,568	1,151
	Gwangju	10	10	1,192	119	320	32	1,512	151	982	98	285	29	1,267	127
	Daejeon	82	78	185,830	2,382	106,475	1,365	292,305	3,748	74,552	956	69,446	890	143,998	1,846
	Ulsan	6	6	44,370	7,395	23,892	3,982	68,262	11,377	26,158	4,360	19,342	3,224	45,500	7,583
	Sejong	3	3	34,622	11,541	25,939	8,646	60,561	20,187	30,322	10,107	13,803	4,601	44,125	14,708
	Gyeonggi	319	303	4,329,555	14,289	355,258	1,172	4,684,813	15,461	715,454	2,361	225,849	745	941,303	3,107
	Gangwon	51	49	80,096	1,635	35,071	716	115,167	2,350	69,034	1,409	23,551	481	92,585	1,889
	Chungbuk	81	78	1,380,059	17,693	103,300	1,324	1,483,359	19,017	354,610	4,546	93,740	1,202	448,350	5,748
	Chungnam	46	46	97,308	2,115	12,674	276	109,982	2,391	27,428	596	8,096	176	35,524	772
	Jeonbuk	32	32	36,104	1,128	33,534	1,048	69,638	2,176	16,983	531	31,066	971	48,049	1,502
	Jeonnam	35	33	8,022	243	6,411	194	14,433	437	6,942	210	6,391	194	13,333	404
	Gyeongbuk	24	24	35,826	1,493	14,744	614	50,570	2,107	34,160	1,423	14,038	585	48,198	2,008
	Gyeongnam	24	23	6,658	289	1,404	61	8,062	351	6,316	275	1,389	60	7,705	335
	Jeju	9	9	4,766	530	5,243	583	10,009	1,112	4,766	530	5,243	583	10,009	1,112

<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		**1,003**	**344**	**14**	**309**	**47**	**19**	**630**	**29**
Core Industries	Biopharmaceutical	319	120	10	102	26	6	181	18
	Biochemical and Bioenergy	192	59	1	54	8	4	126	7
	Biofood	175	55	1	50	4	5	118	2
	Bioenvironmental	65	19	-	18	2	1	46	-
	Biomedical Equipment	95	35	1	32	3	1	59	1
	Bioinstrument and Bioequipment	53	15	1	15	-	1	38	-
	Bioresource	19	7	-	7	-	-	11	1
	Bioservice	85	34	-	31	4	1	51	-
Total Size of Workers	1 - 49	598	196	4	180	21	9	398	4
	50 - 299	246	92	5	78	12	6	153	1
	300 - 999	69	30	2	28	8	2	36	3
	1,000 or more	31	17	3	15	2	1	12	2
	Unknown	59	9	-	8	4	1	31	19
By Area	Seoul	229	73	1	65	10	2	146	10
	Busan	14	4	-	3	-	1	10	-
	Incheon	21	5	-	5	1	-	14	2
	Daegu	17	7	1	5	1	-	10	-
	Gwangju	10	4	-	4	-	-	6	-
	Daejeon	82	29	2	26	2	4	52	1
	Ulsan	6	1	-	1	-	-	4	1
	Sejong	3	1	-	1	-	-	2	-
	Gyeonggi	319	114	8	103	17	6	196	9
	Gangwon	51	28	-	25	4	1	22	1
	Chungbuk	81	27	1	24	6	2	53	1
	Chungnam	46	15	-	14	3	-	30	1
	Jeonbuk	32	10	1	8	3	1	22	-
	Jeonnam	35	11	-	11	-	-	24	-
	Gyeongbuk	24	3	-	3	-	1	19	2
	Gyeongnam	24	7	-	7	-	-	16	1
	Jeju	9	5	-	4	-	1	4	-

<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		**1,003**	**344**	**14**	**30**	**19**	**2**	**2**	**5**	**2**
Core Industries	Biopharmaceutical	319	120	10	16	8	2	1	3	2
	Biochemical and Bioenergy	192	59	1	2	-	-	1	1	-
	Biofood	175	55	1	1	1	-	-	-	-
	Bioenvironmental	65	19	-	-	-	-	-	-	-
	Biomedical Equipment	95	35	1	10	10	-	-	-	-
	Bioinstrument and Bioequipment	53	15	1	1	-	-	-	1	-
	Bioresource	19	7	-	-	-	-	-	-	-
	Bioservice	85	34	-	-	-	-	-	-	-
Total Size of Workers	1 - 49	598	196	4	4	2	-	-	2	-
	50 - 299	246	92	5	19	13	-	1	3	2
	300 - 999	69	30	2	3	2	1	-	-	-
	1,000 or more	31	17	3	4	2	1	1	-	-
	Unknown	59	9	-	-	-	-	-	-	-
By Area	Seoul	229	73	1	-	-	-	-	-	-
	Busan	14	4	-	-	-	-	-	-	-
	Incheon	21	5	-	-	-	-	-	-	-
	Daegu	17	7	1	1	1	-	-	-	-
	Gwangju	10	4	-	-	-	-	-	-	-
	Daejeon	82	29	2	3	1	-	-	-	2
	Ulsan	6	1	-	-	-	-	-	-	-
	Sejong	3	1	-	-	-	-	-	-	-
	Gyeonggi	319	114	8	24	16	2	2	4	-
	Gangwon	51	28	-	-	-	-	-	-	-
	Chungbuk	81	27	1	1	1	-	-	-	-
	Chungnam	46	15	-	-	-	-	-	-	-
	Jeonbuk	32	10	1	1	-	-	-	1	-
	Jeonnam	35	11	-	-	-	-	-	-	-
	Gyeongbuk	24	3	-	-	-	-	-	-	-
	Gyeongnam	24	7	-	-	-	-	-	-	-
	Jeju	9	5	-	-	-	-	-	-	-

Classification		No. of Companies	With Cooperative Relationship	No. of Respondents (Joint Venture)	Overseas					
					Total	Basic Research	Experimental	Prototype	Product Development	Commercialization
Total		**1,003**	**344**	**14**	**2**	**-**	**-**	**2**	**-**	**-**
Core Industries	Biopharmaceutical	319	120	10	2	-	-	2	-	-
	Biochemical and Bioenergy	192	59	1	-	-	-	-	-	-
	Biofood	175	55	1	-	-	-	-	-	-
	Bioenvironmental	65	19	-	-	-	-	-	-	-
	Biomedical Equipment	95	35	1	-	-	-	-	-	-
	Bioinstrument and Bioequipment	53	15	1	-	-	-	-	-	-
	Bioresource	19	7	-	-	-	-	-	-	-
	Bioservice	85	34	-	-	-	-	-	-	-
Total Size of Workers	1 - 49	598	196	4	-	-	-	-	-	-
	50 - 299	246	92	5	-	-	-	-	-	-
	300 - 999	69	30	2	1	-	-	1	-	-
	1,000 or more	31	17	3	1	-	-	1	-	-
	Unknown	59	9	-	-	-	-	-	-	-
By Area	Seoul	229	73	1	1	-	-	1	-	-
	Busan	14	4	-	-	-	-	-	-	-
	Incheon	21	5	-	-	-	-	-	-	-
	Daegu	17	7	1	-	-	-	-	-	-
	Gwangju	10	4	-	-	-	-	-	-	-
	Daejeon	82	29	2	-	-	-	-	-	-
	Ulsan	6	1	-	-	-	-	-	-	-
	Sejong	3	1	-	-	-	-	-	-	-
	Gyeonggi	319	114	8	1	-	-	1	-	-
	Gangwon	51	28	-	-	-	-	-	-	-
	Chungbuk	81	27	1	-	-	-	-	-	-
	Chungnam	46	15	-	-	-	-	-	-	-
	Jeonbuk	32	10	1	-	-	-	-	-	-
	Jeonnam	35	11	-	-	-	-	-	-	-
	Gyeongbuk	24	3	-	-	-	-	-	-	-
	Gyeongnam	24	7	-	-	-	-	-	-	-
	Jeju	9	5	-	-	-	-	-	-	-

Classification		No. of Companies	With Cooperative Relationship	No. of Respondents (Joint Venture)	Domestic (SMEs / Ventures)					
					Total	Basic Research	Experimental	Prototype	Product Development	Commercialization
Total		**1,003**	**344**	**14**	**8**	**5**	**2**	**-**	**1**	**-**
Core Industries	Biopharmaceutical	319	120	10	8	5	2	-	1	-
	Biochemical and Bioenergy	192	59	1	-	-	-	-	-	-
	Biofood	175	55	1	-	-	-	-	-	-
	Bioenvironmental	65	19	-	-	-	-	-	-	-
	Biomedical Equipment	95	35	1	-	-	-	-	-	-
	Bioinstrument and Bioequipment	53	15	1	-	-	-	-	-	-
	Bioresource	19	7	-	-	-	-	-	-	-
	Bioservice	85	34	-	-	-	-	-	-	-
Total Size of Workers	1 - 49	598	196	4	1	1	-	-	-	-
	50 - 299	246	92	5	2	1	-	-	1	-
	300 - 999	69	30	2	3	2	1	-	-	-
	1,000 or more	31	17	3	2	1	1	-	-	-
	Unknown	59	9	-	-	-	-	-	-	-
By Area	Seoul	229	73	1	-	-	-	-	-	-
	Busan	14	4	-	-	-	-	-	-	-
	Incheon	21	5	-	-	-	-	-	-	-
	Daegu	17	7	1	-	-	-	-	-	-
	Gwangju	10	4	-	-	-	-	-	-	-
	Daejeon	82	29	2	1	1	-	-	-	-
	Ulsan	6	1	-	-	-	-	-	-	-
	Sejong	3	1	-	-	-	-	-	-	-
	Gyeonggi	319	114	8	7	4	2	-	1	-
	Gangwon	51	28	-	-	-	-	-	-	-
	Chungbuk	81	27	1	-	-	-	-	-	-
	Chungnam	46	15	-	-	-	-	-	-	-
	Jeonbuk	32	10	1	-	-	-	-	-	-
	Jeonnam	35	11	-	-	-	-	-	-	-
	Gyeongbuk	24	3	-	-	-	-	-	-	-
	Gyeongnam	24	7	-	-	-	-	-	-	-
	Jeju	9	5	-	-	-	-	-	-	-

Classification		No. of Companies	With Cooperative Relationship	No. of Respondents (Joint Venture)	Overseas (SMEs / Ventures)					
					Total	Basic Research	Experimental	Prototype	Product Development	Commercialization
Total		**1,003**	**344**	**14**	**1**	**-**	**-**	**1**	**-**	**-**
Core Industries	Biopharmaceutical	319	120	10	1	-	-	1	-	-
	Biochemical and Bioenergy	192	59	1	-	-	-	-	-	-
	Biofood	175	55	1	-	-	-	-	-	-
	Bioenvironmental	65	19	-	-	-	-	-	-	-
	Biomedical Equipment	95	35	1	-	-	-	-	-	-
	Bioinstrument and Bioequipment	53	15	1	-	-	-	-	-	-
	Bioresource	19	7	-	-	-	-	-	-	-
	Bioservice	85	34	-	-	-	-	-	-	-
Total Size of Workers	1 - 49	598	196	4	-	-	-	-	-	-
	50 - 299	246	92	5	-	-	-	-	-	-
	300 - 999	69	30	2	1	-	-	1	-	-
	1,000 or more	31	17	3	-	-	-	-	-	-
	Unknown	59	9	-	-	-	-	-	-	-
By Area	Seoul	229	73	1	1	-	-	1	-	-
	Busan	14	4	-	-	-	-	-	-	-
	Incheon	21	5	-	-	-	-	-	-	-
	Daegu	17	7	1	-	-	-	-	-	-
	Gwangju	10	4	-	-	-	-	-	-	-
	Daejeon	82	29	2	-	-	-	-	-	-
	Ulsan	6	1	-	-	-	-	-	-	-
	Sejong	3	1	-	-	-	-	-	-	-
	Gyeonggi	319	114	8	-	-	-	-	-	-
	Gangwon	51	28	-	-	-	-	-	-	-
	Chungbuk	81	27	1	-	-	-	-	-	-
	Chungnam	46	15	-	-	-	-	-	-	-
	Jeonbuk	32	10	1	-	-	-	-	-	-
	Jeonnam	35	11	-	-	-	-	-	-	-
	Gyeongbuk	24	3	-	-	-	-	-	-	-
	Gyeongnam	24	7	-	-	-	-	-	-	-
	Jeju	9	5	-	-	-	-	-	-	-

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		**1,003**	**344**	**14**	**4**	**1**	**-**	**1**	**1**	**1**
Core Industries	Biopharmaceutical	319	120	10	2	1	-	-	-	1
	Biochemical and Bioenergy	192	59	1	2	-	-	1	1	-
	Biofood	175	55	1	-	-	-	-	-	-
	Bioenvironmental	65	19	-	-	-	-	-	-	-
	Biomedical Equipment	95	35	1	-	-	-	-	-	-
	Bioinstrument and Bioequipment	53	15	1	-	-	-	-	-	-
	Bioresource	19	7	-	-	-	-	-	-	-
	Bioservice	85	34	-	-	-	-	-	-	-
Total Size of Workers	1 - 49	598	196	4	-	-	-	-	-	-
	50 - 299	246	92	5	3	-	-	1	1	1
	300 - 999	69	30	2	-	-	-	-	-	-
	1,000 or more	31	17	3	1	1	-	-	-	-
	Unknown	59	9	-	-	-	-	-	-	-
By Area	Seoul	229	73	1	-	-	-	-	-	-
	Busan	14	4	-	-	-	-	-	-	-
	Incheon	21	5	-	-	-	-	-	-	-
	Daegu	17	7	1	1	1	-	-	-	-
	Gwangju	10	4	-	-	-	-	-	-	-
	Daejeon	82	29	2	1	-	-	-	-	1
	Ulsan	6	1	-	-	-	-	-	-	-
	Sejong	3	1	-	-	-	-	-	-	-
	Gyeonggi	319	114	8	2	-	-	1	1	-
	Gangwon	51	28	-	-	-	-	-	-	-
	Chungbuk	81	27	1	-	-	-	-	-	-
	Chungnam	46	15	-	-	-	-	-	-	-
	Jeonbuk	32	10	1	-	-	-	-	-	-
	Jeonnam	35	11	-	-	-	-	-	-	-
	Gyeongbuk	24	3	-	-	-	-	-	-	-
	Gyeongnam	24	7	-	-	-	-	-	-	-
	Jeju	9	5	-	-	-	-	-	-	-

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		**1,003**	**344**	**14**	**-**	**-**	**-**	**-**	**-**	**-**
Core Industries	Biopharmaceutical	319	120	10	-	-	-	-	-	-
	Biochemical and Bioenergy	192	59	1	-	-	-	-	-	-
	Biofood	175	55	1	-	-	-	-	-	-
	Bioenvironmental	65	19	-	-	-	-	-	-	-
	Biomedical Equipment	95	35	1	-	-	-	-	-	-
	Bioinstrument and Bioequipment	53	15	1	-	-	-	-	-	-
	Bioresource	19	7	-	-	-	-	-	-	-
	Bioservice	85	34	-	-	-	-	-	-	-
Total Size of Workers	1 - 49	598	196	4	-	-	-	-	-	-
	50 - 299	246	92	5	-	-	-	-	-	-
	300 - 999	69	30	2	-	-	-	-	-	-
	1,000 or more	31	17	3	-	-	-	-	-	-
	Unknown	59	9	-	-	-	-	-	-	-
By Area	Seoul	229	73	1	-	-	-	-	-	-
	Busan	14	4	-	-	-	-	-	-	-
	Incheon	21	5	-	-	-	-	-	-	-
	Daegu	17	7	1	-	-	-	-	-	-
	Gwangju	10	4	-	-	-	-	-	-	-
	Daejeon	82	29	2	-	-	-	-	-	-
	Ulsan	6	1	-	-	-	-	-	-	-
	Sejong	3	1	-	-	-	-	-	-	-
	Gyeonggi	319	114	8	-	-	-	-	-	-
	Gangwon	51	28	-	-	-	-	-	-	-
	Chungbuk	81	27	1	-	-	-	-	-	-
	Chungnam	46	15	-	-	-	-	-	-	-
	Jeonbuk	32	10	1	-	-	-	-	-	-
	Jeonnam	35	11	-	-	-	-	-	-	-
	Gyeongbuk	24	3	-	-	-	-	-	-	-
	Gyeongnam	24	7	-	-	-	-	-	-	-
	Jeju	9	5	-	-	-	-	-	-	-

Classification		No. of Companies	With Cooperative Relationship	No. of Respondents (Joint Venture)	Domestic (Large Enterprises)					
					Total	Basic Research	Experimental	Prototype	Product Development	Commercialization
Total		1,003	344	14	1	-	-	-	1	-
Core Industries	Biopharmaceutical	319	120	10	1	-	-	-	1	-
	Biochemical and Bioenergy	192	59	1	-	-	-	-	-	-
	Biofood	175	55	1	-	-	-	-	-	-
	Bioenvironmental	65	19	-	-	-	-	-	-	-
	Biomedical Equipment	95	35	1	-	-	-	-	-	-
	Bioinstrument and Bioequipment	53	15	1	-	-	-	-	-	-
	Bioresource	19	7	-	-	-	-	-	-	-
	Bioservice	85	34	-	-	-	-	-	-	-
Total Size of Workers	1 - 49	598	196	4	-	-	-	-	-	-
	50 - 299	246	92	5	1	-	-	-	1	-
	300 - 999	69	30	2	-	-	-	-	-	-
	1,000 or more	31	17	3	-	-	-	-	-	-
	Unknown	59	9	-	-	-	-	-	-	-
By Area	Seoul	229	73	1	-	-	-	-	-	-
	Busan	14	4	-	-	-	-	-	-	-
	Incheon	21	5	-	-	-	-	-	-	-
	Daegu	17	7	1	-	-	-	-	-	-
	Gwangju	10	4	-	-	-	-	-	-	-
	Daejeon	82	29	2	-	-	-	-	-	-
	Ulsan	6	1	-	-	-	-	-	-	-
	Sejong	3	1	-	-	-	-	-	-	-
	Gyeonggi	319	114	8	1	-	-	-	1	-
	Gangwon	51	28	-	-	-	-	-	-	-
	Chungbuk	81	27	1	-	-	-	-	-	-
	Chungnam	46	15	-	-	-	-	-	-	-
	Jeonbuk	32	10	1	-	-	-	-	-	-
	Jeonnam	35	11	-	-	-	-	-	-	-
	Gyeongbuk	24	3	-	-	-	-	-	-	-
	Gyeongnam	24	7	-	-	-	-	-	-	-
	Jeju	9	5	-	-	-	-	-	-	-

Classification		No. of Companies	With Cooperative Relationship	No. of Respondents (Joint Venture)	Overseas (Large Enterprises)					
					Total	Basic Research	Experimental	Prototype	Product Development	Commercialization
Total		1,003	344	14	-	-	-	-	-	-
Core Industries	Biopharmaceutical	319	120	10	-	-	-	-	-	-
	Biochemical and Bioenergy	192	59	1	-	-	-	-	-	-
	Biofood	175	55	1	-	-	-	-	-	-
	Bioenvironmental	65	19	-	-	-	-	-	-	-
	Biomedical Equipment	95	35	1	-	-	-	-	-	-
	Bioinstrument and Bioequipment	53	15	1	-	-	-	-	-	-
	Bioresource	19	7	-	-	-	-	-	-	-
	Bioservice	85	34	-	-	-	-	-	-	-
Total Size of Workers	1 - 49	598	196	4	-	-	-	-	-	-
	50 - 299	246	92	5	-	-	-	-	-	-
	300 - 999	69	30	2	-	-	-	-	-	-
	1,000 or more	31	17	3	-	-	-	-	-	-
	Unknown	59	9	-	-	-	-	-	-	-
By Area	Seoul	229	73	1	-	-	-	-	-	-
	Busan	14	4	-	-	-	-	-	-	-
	Incheon	21	5	-	-	-	-	-	-	-
	Daegu	17	7	1	-	-	-	-	-	-
	Gwangju	10	4	-	-	-	-	-	-	-
	Daejeon	82	29	2	-	-	-	-	-	-
	Ulsan	6	1	-	-	-	-	-	-	-
	Sejong	3	1	-	-	-	-	-	-	-
	Gyeonggi	319	114	8	-	-	-	-	-	-
	Gangwon	51	28	-	-	-	-	-	-	-
	Chungbuk	81	27	1	-	-	-	-	-	-
	Chungnam	46	15	-	-	-	-	-	-	-
	Jeonbuk	32	10	1	-	-	-	-	-	-
	Jeonnam	35	11	-	-	-	-	-	-	-
	Gyeongbuk	24	3	-	-	-	-	-	-	-
	Gyeongnam	24	7	-	-	-	-	-	-	-
	Jeju	9	5	-	-	-	-	-	-	-

Classification		No. of Companies	With Cooperative Relationship	No. of Respondents (Joint Venture)	Domestic (Government-funded)					
					Total	Basic Research	Experimental	Prototype	Product Development	Commercialization
Total		**1,003**	**344**	**14**	**2**	**1**	**-**	**-**	**1**	**-**
Core Industries	Biopharmaceutical	319	120	10	2	1	-	-	1	-
	Biochemical and Bioenergy	192	59	1	-	-	-	-	-	-
	Biofood	175	55	1	-	-	-	-	-	-
	Bioenvironmental	65	19	-	-	-	-	-	-	-
	Biomedical Equipment	95	35	1	-	-	-	-	-	-
	Bioinstrument and Bioequipment	53	15	1	-	-	-	-	-	-
	Bioresource	19	7	-	-	-	-	-	-	-
	Bioservice	85	34	-	-	-	-	-	-	-
Total Size of Workers	1 - 49	598	196	4	1	-	-	-	1	-
	50 - 299	246	92	5	1	1	-	-	-	-
	300 - 999	69	30	2	-	-	-	-	-	-
	1,000 or more	31	17	3	-	-	-	-	-	-
	Unknown	59	9	-	-	-	-	-	-	-
By Area	Seoul	229	73	1	-	-	-	-	-	-
	Busan	14	4	-	-	-	-	-	-	-
	Incheon	21	5	-	-	-	-	-	-	-
	Daegu	17	7	1	-	-	-	-	-	-
	Gwangju	10	4	-	-	-	-	-	-	-
	Daejeon	82	29	2	-	-	-	-	-	-
	Ulsan	6	1	-	-	-	-	-	-	-
	Sejong	3	1	-	-	-	-	-	-	-
	Gyeonggi	319	114	8	1	1	-	-	-	-
	Gangwon	51	28	-	-	-	-	-	-	-
	Chungbuk	81	27	1	-	-	-	-	-	-
	Chungnam	46	15	-	-	-	-	-	-	-
	Jeonbuk	32	10	1	1	-	-	-	1	-
	Jeonnam	35	11	-	-	-	-	-	-	-
	Gyeongbuk	24	3	-	-	-	-	-	-	-
	Gyeongnam	24	7	-	-	-	-	-	-	-
	Jeju	9	5	-	-	-	-	-	-	-

		No. of Companies	With Cooperative Relationship	No. of Respondents (Joint Venture)	Overseas (Government-funded)					
					Total	Basic Research	Experimental	Prototype	Product Development	Commercialization
Total		**1,003**	**344**	**14**	**-**	**-**	**-**	**-**	**-**	**-**
Core Industries	Biopharmaceutical	319	120	10	-	-	-	-	-	-
	Biochemical and Bioenergy	192	59	1	-	-	-	-	-	-
	Biofood	175	55	1	-	-	-	-	-	-
	Bioenvironmental	65	19	-	-	-	-	-	-	-
	Biomedical Equipment	95	35	1	-	-	-	-	-	-
	Bioinstrument and Bioequipment	53	15	1	-	-	-	-	-	-
	Bioresource	19	7	-	-	-	-	-	-	-
	Bioservice	85	34	-	-	-	-	-	-	-
Total Size of Workers	1 - 49	598	196	4	-	-	-	-	-	-
	50 - 299	246	92	5	-	-	-	-	-	-
	300 - 999	69	30	2	-	-	-	-	-	-
	1,000 or more	31	17	3	-	-	-	-	-	-
	Unknown	59	9	-	-	-	-	-	-	-
By Area	Seoul	229	73	1	-	-	-	-	-	-
	Busan	14	4	-	-	-	-	-	-	-
	Incheon	21	5	-	-	-	-	-	-	-
	Daegu	17	7	1	-	-	-	-	-	-
	Gwangju	10	4	-	-	-	-	-	-	-
	Daejeon	82	29	2	-	-	-	-	-	-
	Ulsan	6	1	-	-	-	-	-	-	-
	Sejong	3	1	-	-	-	-	-	-	-
	Gyeonggi	319	114	8	-	-	-	-	-	-
	Gangwon	51	28	-	-	-	-	-	-	-
	Chungbuk	81	27	1	-	-	-	-	-	-
	Chungnam	46	15	-	-	-	-	-	-	-
	Jeonbuk	32	10	1	-	-	-	-	-	-
	Jeonnam	35	11	-	-	-	-	-	-	-
	Gyeongbuk	24	3	-	-	-	-	-	-	-
	Gyeongnam	24	7	-	-	-	-	-	-	-
	Jeju	9	5	-	-	-	-	-	-	-

Classification		No. of Companies	With Cooperative Relationship	No. of Respondents (Joint Venture)	Domestic (Private Research)					
					Total	Basic Research	Experimental	Prototype	Product Development	Commercialization
Total		**1,003**	**344**	**14**	**-**	**-**	**-**	**-**	**-**	**-**
Core Industries	Biopharmaceutical	319	120	10	-	-	-	-	-	-
	Biochemical and Bioenergy	192	59	1	-	-	-	-	-	-
	Biofood	175	55	1	-	-	-	-	-	-
	Bioenvironmental	65	19	-	-	-	-	-	-	-
	Biomedical Equipment	95	35	1	-	-	-	-	-	-
	Bioinstrument and Bioequipment	53	15	1	-	-	-	-	-	-
	Bioresource	19	7	-	-	-	-	-	-	-
	Bioservice	85	34	-	-	-	-	-	-	-
Total Size of Workers	1 - 49	598	196	4	-	-	-	-	-	-
	50 - 299	246	92	5	-	-	-	-	-	-
	300 - 999	69	30	2	-	-	-	-	-	-
	1,000 or more	31	17	3	-	-	-	-	-	-
	Unknown	59	9	-	-	-	-	-	-	-
By Area	Seoul	229	73	1	-	-	-	-	-	-
	Busan	14	4	-	-	-	-	-	-	-
	Incheon	21	5	-	-	-	-	-	-	-
	Daegu	17	7	1	-	-	-	-	-	-
	Gwangju	10	4	-	-	-	-	-	-	-
	Daejeon	82	29	2	-	-	-	-	-	-
	Ulsan	6	1	-	-	-	-	-	-	-
	Sejong	3	1	-	-	-	-	-	-	-
	Gyeonggi	319	114	8	-	-	-	-	-	-
	Gangwon	51	28	-	-	-	-	-	-	-
	Chungbuk	81	27	1	-	-	-	-	-	-
	Chungnam	46	15	-	-	-	-	-	-	-
	Jeonbuk	32	10	1	-	-	-	-	-	-
	Jeonnam	35	11	-	-	-	-	-	-	-
	Gyeongbuk	24	3	-	-	-	-	-	-	-
	Gyeongnam	24	7	-	-	-	-	-	-	-
	Jeju	9	5	-	-	-	-	-	-	-

		No. of Companies	With Cooperative Relationship	No. of Respondents (Joint Venture)	Overseas (Private Research)					
					Total	Basic Research	Experimental	Prototype	Product Development	Commercialization
Total		**1,003**	**344**	**14**	**-**	**-**	**-**	**-**	**-**	**-**
Core Industries	Biopharmaceutical	319	120	10	-	-	-	-	-	-
	Biochemical and Bioenergy	192	59	1	-	-	-	-	-	-
	Biofood	175	55	1	-	-	-	-	-	-
	Bioenvironmental	65	19	-	-	-	-	-	-	-
	Biomedical Equipment	95	35	1	-	-	-	-	-	-
	Bioinstrument and Bioequipment	53	15	1	-	-	-	-	-	-
	Bioresource	19	7	-	-	-	-	-	-	-
	Bioservice	85	34	-	-	-	-	-	-	-
Total Size of Workers	1 - 49	598	196	4	-	-	-	-	-	-
	50 - 299	246	92	5	-	-	-	-	-	-
	300 - 999	69	30	2	-	-	-	-	-	-
	1,000 or more	31	17	3	-	-	-	-	-	-
	Unknown	59	9	-	-	-	-	-	-	-
By Area	Seoul	229	73	1	-	-	-	-	-	-
	Busan	14	4	-	-	-	-	-	-	-
	Incheon	21	5	-	-	-	-	-	-	-
	Daegu	17	7	1	-	-	-	-	-	-
	Gwangju	10	4	-	-	-	-	-	-	-
	Daejeon	82	29	2	-	-	-	-	-	-
	Ulsan	6	1	-	-	-	-	-	-	-
	Sejong	3	1	-	-	-	-	-	-	-
	Gyeonggi	319	114	8	-	-	-	-	-	-
	Gangwon	51	28	-	-	-	-	-	-	-
	Chungbuk	81	27	1	-	-	-	-	-	-
	Chungnam	46	15	-	-	-	-	-	-	-
	Jeonbuk	32	10	1	-	-	-	-	-	-
	Jeonnam	35	11	-	-	-	-	-	-	-
	Gyeongbuk	24	3	-	-	-	-	-	-	-
	Gyeongnam	24	7	-	-	-	-	-	-	-
	Jeju	9	5	-	-	-	-	-	-	-

Classification		No. of Companies	With Cooperative Relationship	No. of Respondents (Joint Venture)	Domestic (Universities)					
					Total	Basic Research	Experimental	Prototype	Product Development	Commercialization
Total		**1,003**	**344**	**14**	**15**	**12**	**-**	**1**	**1**	**1**
Core Industries	Biopharmaceutical	319	120	10	3	1	-	1	-	1
	Biochemical and Bioenergy	192	59	1	-	-	-	-	-	-
	Biofood	175	55	1	1	1	-	-	-	-
	Bioenvironmental	65	19	-	-	-	-	-	-	-
	Biomedical Equipment	95	35	1	10	10	-	-	-	-
	Bioinstrument and Bioequipment	53	15	1	1	-	-	-	1	-
	Bioresource	19	7	-	-	-	-	-	-	-
	Bioservice	85	34	-	-	-	-	-	-	-
Total Size of Workers	1 - 49	598	196	4	2	1	-	-	1	-
	50 - 299	246	92	5	12	11	-	-	-	1
	300 - 999	69	30	2	-	-	-	-	-	-
	1,000 or more	31	17	3	1	-	-	1	-	-
	Unknown	59	9	-	-	-	-	-	-	-
By Area	Seoul	229	73	1	-	-	-	-	-	-
	Busan	14	4	-	-	-	-	-	-	-
	Incheon	21	5	-	-	-	-	-	-	-
	Daegu	17	7	1	-	-	-	-	-	-
	Gwangju	10	4	-	-	-	-	-	-	-
	Daejeon	82	29	2	1	-	-	-	-	1
	Ulsan	6	1	-	-	-	-	-	-	-
	Sejong	3	1	-	-	-	-	-	-	-
	Gyeonggi	319	114	8	13	11	-	1	1	-
	Gangwon	51	28	-	-	-	-	-	-	-
	Chungbuk	81	27	1	1	1	-	-	-	-
	Chungnam	46	15	-	-	-	-	-	-	-
	Jeonbuk	32	10	1	-	-	-	-	-	-
	Jeonnam	35	11	-	-	-	-	-	-	-
	Gyeongbuk	24	3	-	-	-	-	-	-	-
	Gyeongnam	24	7	-	-	-	-	-	-	-
	Jeju	9	5	-	-	-	-	-	-	-

Classification		No. of Companies	With Cooperative Relationship	No. of Respondents (Joint Venture)	Overseas (Universities)					
					Total	Basic Research	Experimental	Prototype	Product Development	Commercialization
Total		**1,003**	**344**	**14**	**1**	**-**	**-**	**1**	**-**	**-**
Core Industries	Biopharmaceutical	319	120	10	1	-	-	1	-	-
	Biochemical and Bioenergy	192	59	1	-	-	-	-	-	-
	Biofood	175	55	1	-	-	-	-	-	-
	Bioenvironmental	65	19	-	-	-	-	-	-	-
	Biomedical Equipment	95	35	1	-	-	-	-	-	-
	Bioinstrument and Bioequipment	53	15	1	-	-	-	-	-	-
	Bioresource	19	7	-	-	-	-	-	-	-
	Bioservice	85	34	-	-	-	-	-	-	-
Total Size of Workers	1 - 49	598	196	4	-	-	-	-	-	-
	50 - 299	246	92	5	-	-	-	-	-	-
	300 - 999	69	30	2	-	-	-	-	-	-
	1,000 or more	31	17	3	1	-	-	1	-	-
	Unknown	59	9	-	-	-	-	-	-	-
By Area	Seoul	229	73	1	-	-	-	-	-	-
	Busan	14	4	-	-	-	-	-	-	-
	Incheon	21	5	-	-	-	-	-	-	-
	Daegu	17	7	1	-	-	-	-	-	-
	Gwangju	10	4	-	-	-	-	-	-	-
	Daejeon	82	29	2	-	-	-	-	-	-
	Ulsan	6	1	-	-	-	-	-	-	-
	Sejong	3	1	-	-	-	-	-	-	-
	Gyeonggi	319	114	8	1	-	-	1	-	-
	Gangwon	51	28	-	-	-	-	-	-	-
	Chungbuk	81	27	1	-	-	-	-	-	-
	Chungnam	46	15	-	-	-	-	-	-	-
	Jeonbuk	32	10	1	-	-	-	-	-	-
	Jeonnam	35	11	-	-	-	-	-	-	-
	Gyeongbuk	24	3	-	-	-	-	-	-	-
	Gyeongnam	24	7	-	-	-	-	-	-	-
	Jeju	9	5	-	-	-	-	-	-	-

Classification		No. of Companies	With Cooperative Relationship	No. of Respondents (Joint Venture)	Domestic (Medical Institutions)					
					Total	Basic Research	Experimental	Prototype	Product Development	Commercialization
Total		1,003	344	14	-	-	-	-	-	-
Core Industries	Biopharmaceutical	319	120	10	-	-	-	-	-	-
	Biochemical and Bioenergy	192	59	1	-	-	-	-	-	-
	Biofood	175	55	1	-	-	-	-	-	-
	Bioenvironmental	65	19	-	-	-	-	-	-	-
	Biomedical Equipment	95	35	1	-	-	-	-	-	-
	Bioinstrument and Bioequipment	53	15	1	-	-	-	-	-	-
	Bioresource	19	7	-	-	-	-	-	-	-
	Bioservice	85	34	-	-	-	-	-	-	-
Total Size of Workers	1 - 49	598	196	4	-	-	-	-	-	-
	50 - 299	246	92	5	-	-	-	-	-	-
	300 - 999	69	30	2	-	-	-	-	-	-
	1,000 or more	31	17	3	-	-	-	-	-	-
	Unknown	59	9	-	-	-	-	-	-	-
By Area	Seoul	229	73	1	-	-	-	-	-	-
	Busan	14	4	-	-	-	-	-	-	-
	Incheon	21	5	-	-	-	-	-	-	-
	Daegu	17	7	1	-	-	-	-	-	-
	Gwangju	10	4	-	-	-	-	-	-	-
	Daejeon	82	29	2	-	-	-	-	-	-
	Ulsan	6	1	-	-	-	-	-	-	-
	Sejong	3	1	-	-	-	-	-	-	-
	Gyeonggi	319	114	8	-	-	-	-	-	-
	Gangwon	51	28	-	-	-	-	-	-	-
	Chungbuk	81	27	1	-	-	-	-	-	-
	Chungnam	46	15	-	-	-	-	-	-	-
	Jeonbuk	32	10	1	-	-	-	-	-	-
	Jeonnam	35	11	-	-	-	-	-	-	-
	Gyeongbuk	24	3	-	-	-	-	-	-	-
	Gyeongnam	24	7	-	-	-	-	-	-	-
	Jeju	9	5	-	-	-	-	-	-	-

Classification		No. of Companies	With Cooperative Relationship	No. of Respondents (Joint Venture)	Overseas (Medical Institutions)					
					Total	Basic Research	Experimental	Prototype	Product Development	Commercialization
Total		1,003	344	14	-	-	-	-	-	-
Core Industries	Biopharmaceutical	319	120	10	-	-	-	-	-	-
	Biochemical and Bioenergy	192	59	1	-	-	-	-	-	-
	Biofood	175	55	1	-	-	-	-	-	-
	Bioenvironmental	65	19	-	-	-	-	-	-	-
	Biomedical Equipment	95	35	1	-	-	-	-	-	-
	Bioinstrument and Bioequipment	53	15	1	-	-	-	-	-	-
	Bioresource	19	7	-	-	-	-	-	-	-
	Bioservice	85	34	-	-	-	-	-	-	-
Total Size of Workers	1 - 49	598	196	4	-	-	-	-	-	-
	50 - 299	246	92	5	-	-	-	-	-	-
	300 - 999	69	30	2	-	-	-	-	-	-
	1,000 or more	31	17	3	-	-	-	-	-	-
	Unknown	59	9	-	-	-	-	-	-	-
By Area	Seoul	229	73	1	-	-	-	-	-	-
	Busan	14	4	-	-	-	-	-	-	-
	Incheon	21	5	-	-	-	-	-	-	-
	Daegu	17	7	1	-	-	-	-	-	-
	Gwangju	10	4	-	-	-	-	-	-	-
	Daejeon	82	29	2	-	-	-	-	-	-
	Ulsan	6	1	-	-	-	-	-	-	-
	Sejong	3	1	-	-	-	-	-	-	-
	Gyeonggi	319	114	8	-	-	-	-	-	-
	Gangwon	51	28	-	-	-	-	-	-	-
	Chungbuk	81	27	1	-	-	-	-	-	-
	Chungnam	46	15	-	-	-	-	-	-	-
	Jeonbuk	32	10	1	-	-	-	-	-	-
	Jeonnam	35	11	-	-	-	-	-	-	-
	Gyeongbuk	24	3	-	-	-	-	-	-	-
	Gyeongnam	24	7	-	-	-	-	-	-	-
	Jeju	9	5	-	-	-	-	-	-	-

<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		**1,003**	**344**	**309**	**719**	**243**	**227**	**136**	**77**	**36**
Core Industries	Biopharmaceutical	319	120	102	272	111	92	45	17	7
	Biochemical and Bioenergy	192	59	54	118	41	28	21	16	12
	Biofood	175	55	50	114	27	42	20	20	5
	Bioenvironmental	65	19	18	23	13	5	5	-	-
	Biomedical Equipment	95	35	32	61	13	19	13	13	3
	Bioinstrument and Bioequipment	53	15	15	42	13	10	8	4	7
	Bioresource	19	7	7	23	2	16	2	3	-
	Bioservice	85	34	31	66	23	15	22	4	2
Total Size of Workers	1 - 49	598	196	180	354	135	91	72	40	16
	50 - 299	246	92	78	193	48	78	28	26	13
	300 - 999	69	30	28	98	38	36	18	5	1
	1,000 or more	31	17	15	58	18	18	12	4	6
	Unknown	59	9	8	16	4	4	6	2	-
By Area	Seoul	229	73	65	133	44	51	20	9	9
	Busan	14	4	3	6	2	2	1	1	-
	Incheon	21	5	5	9	4	-	5	-	-
	Daegu	17	7	5	10	2	5	1	2	-
	Gwangju	10	4	4	5	3	-	-	1	1
	Daejeon	82	29	26	61	14	18	18	9	2
	Ulsan	6	1	1	2	-	-	-	2	-
	Sejong	3	1	1	1	-	-	-	-	1
	Gyeonggi	319	114	103	257	95	83	51	19	9
	Gangwon	51	28	25	47	10	16	11	7	3
	Chungbuk	81	27	24	59	13	19	14	8	5
	Chungnam	46	15	14	57	31	8	4	14	-
	Jeonbuk	32	10	8	21	9	4	5	2	1
	Jeonnam	35	11	11	26	7	14	4	-	1
	Gyeongbuk	24	3	3	7	-	4	-	-	3
	Gyeongnam	24	7	7	10	5	2	1	2	-
	Jeju	9	5	4	8	4	1	1	1	1

Classification		No. of Companies	With Cooperative Relationship	No. of Respondents (Joint R&D Contract)	Overseas					
					Total	Basic Research	Experimental	Prototype	Product Development	Commercialization
Total		**1,003**	**344**	**309**	**19**	**-**	**2**	**11**	**6**	**-**
Core Industries	Biopharmaceutical	319	120	102	17	-	1	11	5	-
	Biochemical and Bioenergy	192	59	54	2	-	1	-	1	-
	Biofood	175	55	50	-	-	-	-	-	-
	Bioenvironmental	65	19	18	-	-	-	-	-	-
	Biomedical Equipment	95	35	32	-	-	-	-	-	-
	Bioinstrument and Bioequipment	53	15	15	-	-	-	-	-	-
	Bioresource	19	7	7	-	-	-	-	-	-
	Bioservice	85	34	31	-	-	-	-	-	-
Total Size of Workers	1 - 49	598	196	180	8	-	-	6	2	-
	50 - 299	246	92	78	3	-	-	-	3	-
	300 - 999	69	30	28	3	-	1	2	-	-
	1,000 or more	31	17	15	1	-	1	-	-	-
	Unknown	59	9	8	4	-	-	3	1	-
By Area	Seoul	229	73	65	1	-	-	1	-	-
	Busan	14	4	3	1	-	-	-	1	-
	Incheon	21	5	5	-	-	-	-	-	-
	Daegu	17	7	5	-	-	-	-	-	-
	Gwangju	10	4	4	-	-	-	-	-	-
	Daejeon	82	29	26	1	-	1	-	-	-
	Ulsan	6	1	1	-	-	-	-	-	-
	Sejong	3	1	1	-	-	-	-	-	-
	Gyeonggi	319	114	103	6	-	-	3	3	-
	Gangwon	51	28	25	7	-	-	5	2	-
	Chungbuk	81	27	24	3	-	1	2	-	-
	Chungnam	46	15	14	-	-	-	-	-	-
	Jeonbuk	32	10	8	-	-	-	-	-	-
	Jeonnam	35	11	11	-	-	-	-	-	-
	Gyeongbuk	24	3	3	-	-	-	-	-	-
	Gyeongnam	24	7	7	-	-	-	-	-	-
	Jeju	9	5	4	-	-	-	-	-	-

Classification		No. of Companies	With Cooperative Relationship	No. of Respondents (Joint R&D Contract)	Domestic (SMEs / Ventures)						Overseas (SMEs / Ventures)					
					Total	Basic Research	Experimental	Prototype	Product Development	Commercialization	Total	Basic Research	Experimental	Prototype	Product Development	Commercialization
Total		**1,003**	**344**	**309**	**70**	**27**	**25**	**13**	**3**	**2**	**14**	**-**	**-**	**9**	**5**	**-**
Core Industries	Biopharmaceutical	319	120	102	38	14	13	9	1	1	14	-	-	9	5	-
	Biochemical and Bioenergy	192	59	54	9	5	2	-	1	1	-	-	-	-	-	-
	Biofood	175	55	50	9	2	4	3	-	-	-	-	-	-	-	-
	Bioenvironmental	65	19	18	3	3	-	-	-	-	-	-	-	-	-	-
	Biomedical Equipment	95	35	32	3	1	1	-	1	-	-	-	-	-	-	-
	Bioinstrument and Bioequipment	53	15	15	3	1	2	-	-	-	-	-	-	-	-	-
	Bioresource	19	7	7	1	-	1	-	-	-	-	-	-	-	-	-
	Bioservice	85	34	31	4	1	2	1	-	-	-	-	-	-	-	-
Total Size of Workers	1 - 49	598	196	180	26	17	7	-	1	1	7	-	-	5	2	-
	50 - 299	246	92	78	25	6	12	5	1	1	3	-	-	-	3	-
	300 - 999	69	30	28	8	1	4	2	1	-	1	-	-	1	-	-
	1,000 or more	31	17	15	2	1	1	-	-	-	-	-	-	-	-	-
	Unknown	59	9	8	9	2	1	6	-	-	3	-	-	3	-	-
By Area	Seoul	229	73	65	8	-	7	-	1	-	-	-	-	-	-	-
	Busan	14	4	3	2	2	-	-	-	-	-	-	-	-	-	-
	Incheon	21	5	5	1	1	-	-	-	-	-	-	-	-	-	-
	Daegu	17	7	5	1	1	-	-	-	-	-	-	-	-	-	-
	Gwangju	10	4	4	-	-	-	-	-	-	-	-	-	-	-	-
	Daejeon	82	29	26	3	1	-	-	1	1	-	-	-	-	-	-
	Ulsan	6	1	1	-	-	-	-	-	-	-	-	-	-	-	-
	Sejong	3	1	1	-	-	-	-	-	-	-	-	-	-	-	-
	Gyeonggi	319	114	103	31	10	10	9	1	1	6	-	-	3	3	-
	Gangwon	51	28	25	9	3	3	3	-	-	7	-	-	5	2	-
	Chungbuk	81	27	24	6	2	3	1	-	-	1	-	-	1	-	-
	Chungnam	46	15	14	2	2	-	-	-	-	-	-	-	-	-	-
	Jeonbuk	32	10	8	1	1	-	-	-	-	-	-	-	-	-	-
	Jeonnam	35	11	11	3	2	1	-	-	-	-	-	-	-	-	-
	Gyeongbuk	24	3	3	-	-	-	-	-	-	-	-	-	-	-	-
	Gyeongnam	24	7	7	2	1	1	-	-	-	-	-	-	-	-	-
	Jeju	9	5	4	1	1	-	-	-	-	-	-	-	-	-	-

Classification		No. of Companies	With Cooperative Relationship	No. of Respondents (Joint R&D Contract)	Domestic (Middle-standing Companies)						Overseas (Middle-standing Companies)					
					Total	Basic Research	Experimental	Prototype	Product Development	Commercialization	Total	Basic Research	Experimental	Prototype	Product Development	Commercialization
Total		**1,003**	**344**	**309**	**25**	**9**	**4**	**4**	**5**	**3**	**-**	**-**	**-**	**-**	**-**	**-**
Core Industries	Biopharmaceutical	319	120	102	20	9	3	4	3	1	-	-	-	-	-	-
	Biochemical and Bioenergy	192	59	54	-	-	-	-	-	-	-	-	-	-	-	-
	Biofood	175	55	50	4	-	-	-	2	2	-	-	-	-	-	-
	Bioenvironmental	65	19	18	-	-	-	-	-	-	-	-	-	-	-	-
	Biomedical Equipment	95	35	32	-	-	-	-	-	-	-	-	-	-	-	-
	Bioinstrument and Bioequipment	53	15	15	-	-	-	-	-	-	-	-	-	-	-	-
	Bioresource	19	7	7	-	-	-	-	-	-	-	-	-	-	-	-
	Bioservice	85	34	31	1	-	1	-	-	-	-	-	-	-	-	-
Total Size of Workers	1 - 49	598	196	180	12	5	-	1	3	3	-	-	-	-	-	-
	50 - 299	246	92	78	3	1	1	-	1	-	-	-	-	-	-	-
	300 - 999	69	30	28	2	1	-	-	1	-	-	-	-	-	-	-
	1,000 or more	31	17	15	8	2	3	3	-	-	-	-	-	-	-	-
	Unknown	59	9	8	-	-	-	-	-	-	-	-	-	-	-	-
By Area	Seoul	229	73	65	2	-	1	-	1	-	-	-	-	-	-	-
	Busan	14	4	3	-	-	-	-	-	-	-	-	-	-	-	-
	Incheon	21	5	5	-	-	-	-	-	-	-	-	-	-	-	-
	Daegu	17	7	5	-	-	-	-	-	-	-	-	-	-	-	-
	Gwangju	10	4	4	1	-	-	-	-	1	-	-	-	-	-	-
	Daejeon	82	29	26	-	-	-	-	-	-	-	-	-	-	-	-
	Ulsan	6	1	1	-	-	-	-	-	-	-	-	-	-	-	-
	Sejong	3	1	1	-	-	-	-	-	-	-	-	-	-	-	-
	Gyeonggi	319	114	103	16	8	3	4	1	-	-	-	-	-	-	-
	Gangwon	51	28	25	-	-	-	-	-	-	-	-	-	-	-	-
	Chungbuk	81	27	24	5	1	-	-	2	2	-	-	-	-	-	-
	Chungnam	46	15	14	-	-	-	-	-	-	-	-	-	-	-	-
	Jeonbuk	32	10	8	1	-	-	-	1	-	-	-	-	-	-	-
	Jeonnam	35	11	11	-	-	-	-	-	-	-	-	-	-	-	-
	Gyeongbuk	24	3	3	-	-	-	-	-	-	-	-	-	-	-	-
	Gyeongnam	24	7	7	-	-	-	-	-	-	-	-	-	-	-	-
	Jeju	9	5	4	-	-	-	-	-	-	-	-	-	-	-	-

Classification		No. of Companies	With Cooperative Relationship	No. of Respondents (Joint R&D Contract)	Domestic (Large Enterprises)						Overseas (Large Enterprises)					
					Total	Basic Research	Experimental	Prototype	Product Development	Commercialization	Total	Basic Research	Experimental	Prototype	Product Development	Commercialization
Total		**1,003**	**344**	**309**	**22**	**12**	**5**	**-**	**1**	**4**	**1**	**-**	**1**	**-**	**-**	**-**
Core Industries	Biopharmaceutical	319	120	102	11	9	2	-	-	-	-	-	-	-	-	-
	Biochemical and Bioenergy	192	59	54	5	3	2	-	-	-	1	-	1	-	-	-
	Biofood	175	55	50	-	-	-	-	-	-	-	-	-	-	-	-
	Bioenvironmental	65	19	18	-	-	-	-	-	-	-	-	-	-	-	-
	Biomedical Equipment	95	35	32	2	-	-	-	1	1	-	-	-	-	-	-
	Bioinstrument and Bioequipment	53	15	15	3	-	-	-	-	3	-	-	-	-	-	-
	Bioresource	19	7	7	-	-	-	-	-	-	-	-	-	-	-	-
	Bioservice	85	34	31	1	-	1	-	-	-	-	-	-	-	-	-
Total Size of Workers	1 - 49	598	196	180	9	8	1	-	-	-	-	-	-	-	-	-
	50 - 299	246	92	78	7	1	3	-	-	3	-	-	-	-	-	-
	300 - 999	69	30	28	5	2	1	-	1	1	-	-	-	-	-	-
	1,000 or more	31	17	15	1	1	-	-	-	-	1	-	1	-	-	-
	Unknown	59	9	8	-	-	-	-	-	-	-	-	-	-	-	-
By Area	Seoul	229	73	65	9	1	3	-	1	4	-	-	-	-	-	-
	Busan	14	4	3	-	-	-	-	-	-	-	-	-	-	-	-
	Incheon	21	5	5	-	-	-	-	-	-	-	-	-	-	-	-
	Daegu	17	7	5	-	-	-	-	-	-	-	-	-	-	-	-
	Gwangju	10	4	4	-	-	-	-	-	-	-	-	-	-	-	-
	Daejeon	82	29	26	1	1	-	-	-	-	1	-	1	-	-	-
	Ulsan	6	1	1	-	-	-	-	-	-	-	-	-	-	-	-
	Sejong	3	1	1	-	-	-	-	-	-	-	-	-	-	-	-
	Gyeonggi	319	114	103	6	5	1	-	-	-	-	-	-	-	-	-
	Gangwon	51	28	25	2	2	-	-	-	-	-	-	-	-	-	-
	Chungbuk	81	27	24	-	-	-	-	-	-	-	-	-	-	-	-
	Chungnam	46	15	14	2	1	1	-	-	-	-	-	-	-	-	-
	Jeonbuk	32	10	8	2	2	-	-	-	-	-	-	-	-	-	-
	Jeonnam	35	11	11	-	-	-	-	-	-	-	-	-	-	-	-
	Gyeongbuk	24	3	3	-	-	-	-	-	-	-	-	-	-	-	-
	Gyeongnam	24	7	7	-	-	-	-	-	-	-	-	-	-	-	-
	Jeju	9	5	4	-	-	-	-	-	-	-	-	-	-	-	-

Classification		No. of Companies	With Cooperative Relationship	No. of Respondents (Joint R&D Contract)	Domestic (Government-funded)						Overseas (Government-funded)					
					Total	Basic Research	Experimental	Prototype	Product Development	Commercialization	Total	Basic Research	Experimental	Prototype	Product Development	Commercialization
Total		**1,003**	**344**	**309**	**244**	**82**	**74**	**42**	**29**	**17**	**1**	**-**	**-**	**1**	**-**	**-**
Core Industries	Biopharmaceutical	319	120	102	64	28	21	10	4	1	1	-	-	1	-	-
	Biochemical and Bioenergy	192	59	54	47	12	10	10	8	7	-	-	-	-	-	-
	Biofood	175	55	50	38	9	15	6	5	3	-	-	-	-	-	-
	Bioenvironmental	65	19	18	12	9	2	1	-	-	-	-	-	-	-	-
	Biomedical Equipment	95	35	32	22	3	4	4	9	2	-	-	-	-	-	-
	Bioinstrument and Bioequipment	53	15	15	21	7	3	6	1	4	-	-	-	-	-	-
	Bioresource	19	7	7	14	2	10	1	1	-	-	-	-	-	-	-
	Bioservice	85	34	31	26	12	9	4	1	-	-	-	-	-	-	-
Total Size of Workers	1 - 49	598	196	180	119	49	28	27	11	4	1	-	-	1	-	-
	50 - 299	246	92	78	78	20	30	7	14	7	-	-	-	-	-	-
	300 - 999	69	30	28	26	9	10	6	1	-	-	-	-	-	-	-
	1,000 or more	31	17	15	20	4	6	2	2	6	-	-	-	-	-	-
	Unknown	59	9	8	1	-	-	-	1	-	-	-	-	-	-	-
By Area	Seoul	229	73	65	44	16	12	10	2	4	1	-	-	1	-	-
	Busan	14	4	3	-	-	-	-	-	-	-	-	-	-	-	-
	Incheon	21	5	5	2	1	-	1	-	-	-	-	-	-	-	-
	Daegu	17	7	5	1	1	-	-	-	-	-	-	-	-	-	-
	Gwangju	10	4	4	3	2	-	-	1	-	-	-	-	-	-	-
	Daejeon	82	29	26	24	9	7	5	2	1	-	-	-	-	-	-
	Ulsan	6	1	1	2	-	-	-	2	-	-	-	-	-	-	-
	Sejong	3	1	1	1	-	-	-	-	1	-	-	-	-	-	-
	Gyeonggi	319	114	103	91	28	28	17	12	6	-	-	-	-	-	-
	Gangwon	51	28	25	9	1	3	2	2	1	-	-	-	-	-	-
	Chungbuk	81	27	24	18	6	5	2	4	1	-	-	-	-	-	-
	Chungnam	46	15	14	15	8	3	2	2	-	-	-	-	-	-	-
	Jeonbuk	32	10	8	5	2	1	-	1	1	-	-	-	-	-	-
	Jeonnam	35	11	11	20	5	12	2	-	1	-	-	-	-	-	-
	Gyeongbuk	24	3	3	3	-	2	-	-	1	-	-	-	-	-	-
	Gyeongnam	24	7	7	6	3	1	1	1	-	-	-	-	-	-	-
	Jeju	9	5	4	-	-	-	-	-	-	-	-	-	-	-	-

Classification		No. of Companies	With Cooperative Relationship	No. of Respondents (Joint R&D Contract)	Domestic (Private Research)						Overseas (Private Research)					
					Total	Basic Research	Experimental	Prototype	Product Development	Commercialization	Total	Basic Research	Experimental	Prototype	Product Development	Commercialization
Total		**1,003**	**344**	**309**	**26**	**8**	**8**	**5**	**5**	**-**	**-**	**-**	**-**	**-**	**-**	**-**
Core Industries	Biopharmaceutical	319	120	102	4	2	2	-	-	-	-	-	-	-	-	-
	Biochemical and Bioenergy	192	59	54	12	6	2	3	1	-	-	-	-	-	-	-
	Biofood	175	55	50	4	-	-	-	4	-	-	-	-	-	-	-
	Bioenvironmental	65	19	18	-	-	-	-	-	-	-	-	-	-	-	-
	Biomedical Equipment	95	35	32	4	-	3	1	-	-	-	-	-	-	-	-
	Bioinstrument and Bioequipment	53	15	15	1	-	1	-	-	-	-	-	-	-	-	-
	Bioresource	19	7	7	-	-	-	-	-	-	-	-	-	-	-	-
	Bioservice	85	34	31	1	-	-	1	-	-	-	-	-	-	-	-
Total Size of Workers	1 - 49	598	196	180	15	3	6	1	5	-	-	-	-	-	-	-
	50 - 299	246	92	78	4	1	2	1	-	-	-	-	-	-	-	-
	300 - 999	69	30	28	4	4	-	-	-	-	-	-	-	-	-	-
	1,000 or more	31	17	15	3	-	-	3	-	-	-	-	-	-	-	-
	Unknown	59	9	8	-	-	-	-	-	-	-	-	-	-	-	-
By Area	Seoul	229	73	65	5	3	2	-	-	-	-	-	-	-	-	-
	Busan	14	4	3	-	-	-	-	-	-	-	-	-	-	-	-
	Incheon	21	5	5	-	-	-	-	-	-	-	-	-	-	-	-
	Daegu	17	7	5	-	-	-	-	-	-	-	-	-	-	-	-
	Gwangju	10	4	4	-	-	-	-	-	-	-	-	-	-	-	-
	Daejeon	82	29	26	6	-	2	3	1	-	-	-	-	-	-	-
	Ulsan	6	1	1	-	-	-	-	-	-	-	-	-	-	-	-
	Sejong	3	1	1	-	-	-	-	-	-	-	-	-	-	-	-
	Gyeonggi	319	114	103	3	2	1	-	-	-	-	-	-	-	-	-
	Gangwon	51	28	25	3	-	2	1	-	-	-	-	-	-	-	-
	Chungbuk	81	27	24	1	-	-	1	-	-	-	-	-	-	-	-
	Chungnam	46	15	14	8	3	1	-	4	-	-	-	-	-	-	-
	Jeonbuk	32	10	8	-	-	-	-	-	-	-	-	-	-	-	-
	Jeonnam	35	11	11	-	-	-	-	-	-	-	-	-	-	-	-
	Gyeongbuk	24	3	3	-	-	-	-	-	-	-	-	-	-	-	-
	Gyeongnam	24	7	7	-	-	-	-	-	-	-	-	-	-	-	-
	Jeju	9	5	4	-	-	-	-	-	-	-	-	-	-	-	-

Classification		No. of Companies	With Cooperative Relationship	No. of Respondents (Joint R&D Contract)	Domestic (Universities)						Overseas (Universities)					
					Total	Basic Research	Experimental	Prototype	Product Development	Commercialization	Total	Basic Research	Experimental	Prototype	Product Development	Commercialization
Total		**1,003**	**344**	**309**	**285**	**89**	**96**	**59**	**32**	**9**	**2**	**-**	**1**	**-**	**1**	**-**
Core Industries	Biopharmaceutical	319	120	102	110	39	41	18	9	3	1	-	1	-	-	-
	Biochemical and Bioenergy	192	59	54	44	15	11	8	6	4	1	-	-	-	1	-
	Biofood	175	55	50	58	16	22	11	9	-	-	-	-	-	-	-
	Bioenvironmental	65	19	18	8	1	3	4	-	-	-	-	-	-	-	-
	Biomedical Equipment	95	35	32	22	5	10	6	1	-	-	-	-	-	-	-
	Bioinstrument and Bioequipment	53	15	15	10	4	2	2	2	-	-	-	-	-	-	-
	Bioresource	19	7	7	8	-	5	1	2	-	-	-	-	-	-	-
	Bioservice	85	34	31	25	9	2	9	3	2	-	-	-	-	-	-
Total Size of Workers	1 - 49	598	196	180	148	44	42	36	18	8	-	-	-	-	-	-
	50 - 299	246	92	78	65	15	28	11	10	1	-	-	-	-	-	-
	300 - 999	69	30	28	44	19	16	8	1	-	1	-	1	-	-	-
	1,000 or more	31	17	15	24	10	8	4	2	-	-	-	-	-	-	-
	Unknown	59	9	8	4	1	2	-	1	-	1	-	-	-	1	-
By Area	Seoul	229	73	65	50	20	21	6	3	-	-	-	-	-	-	-
	Busan	14	4	3	4	-	2	1	1	-	1	-	-	-	1	-
	Incheon	21	5	5	5	2	-	3	-	-	-	-	-	-	-	-
	Daegu	17	7	5	5	-	3	1	1	-	-	-	-	-	-	-
	Gwangju	10	4	4	1	1	-	-	-	-	-	-	-	-	-	-
	Daejeon	82	29	26	23	3	8	7	5	-	-	-	-	-	-	-
	Ulsan	6	1	1	-	-	-	-	-	-	-	-	-	-	-	-
	Sejong	3	1	1	-	-	-	-	-	-	-	-	-	-	-	-
	Gyeonggi	319	114	103	91	32	34	18	5	2	-	-	-	-	-	-
	Gangwon	51	28	25	23	4	7	5	5	2	-	-	-	-	-	-
	Chungbuk	81	27	24	26	3	11	8	2	2	1	-	1	-	-	-
	Chungnam	46	15	14	30	17	3	2	8	-	-	-	-	-	-	-
	Jeonbuk	32	10	8	11	3	3	5	-	-	-	-	-	-	-	-
	Jeonnam	35	11	11	3	-	1	2	-	-	-	-	-	-	-	-
	Gyeongbuk	24	3	3	4	-	2	-	-	2	-	-	-	-	-	-
	Gyeongnam	24	7	7	2	1	-	-	1	-	-	-	-	-	-	-
	Jeju	9	5	4	7	3	1	1	1	1	-	-	-	-	-	-

Classification		No. of Companies	With Cooperative Relationship	No. of Respondents (Joint R&D Contract)	Domestic (Medical Institutions)						Overseas (Medical Institutions)					
					Total	Basic Research	Experimental	Prototype	Product Development	Commercialization	Total	Basic Research	Experimental	Prototype	Product Development	Commercialization
Total		**1,003**	**344**	**309**	**47**	**16**	**15**	**13**	**2**	**1**	**1**	**-**	**-**	**1**	**-**	**-**
Core Industries	Biopharmaceutical	319	120	102	25	10	10	4	-	1	1	-	-	1	-	-
	Biochemical and Bioenergy	192	59	54	1	-	1	-	-	-	-	-	-	-	-	-
	Biofood	175	55	50	1	-	1	-	-	-	-	-	-	-	-	-
	Bioenvironmental	65	19	18	-	-	-	-	-	-	-	-	-	-	-	-
	Biomedical Equipment	95	35	32	8	4	1	2	1	-	-	-	-	-	-	-
	Bioinstrument and Bioequipment	53	15	15	4	1	2	-	1	-	-	-	-	-	-	-
	Bioresource	19	7	7	-	-	-	-	-	-	-	-	-	-	-	-
	Bioservice	85	34	31	8	1	-	7	-	-	-	-	-	-	-	-
Total Size of Workers	1 - 49	598	196	180	25	9	7	7	2	-	-	-	-	-	-	-
	50 - 299	246	92	78	11	4	2	4	-	1	-	-	-	-	-	-
	300 - 999	69	30	28	9	2	5	2	-	-	1	-	-	1	-	-
	1,000 or more	31	17	15	-	-	-	-	-	-	-	-	-	-	-	-
	Unknown	59	9	8	2	1	1	-	-	-	-	-	-	-	-	-
By Area	Seoul	229	73	65	15	4	5	4	1	1	-	-	-	-	-	-
	Busan	14	4	3	-	-	-	-	-	-	-	-	-	-	-	-
	Incheon	21	5	5	1	-	-	1	-	-	-	-	-	-	-	-
	Daegu	17	7	5	3	-	2	-	1	-	-	-	-	-	-	-
	Gwangju	10	4	4	-	-	-	-	-	-	-	-	-	-	-	-
	Daejeon	82	29	26	4	-	1	3	-	-	-	-	-	-	-	-
	Ulsan	6	1	1	-	-	-	-	-	-	-	-	-	-	-	-
	Sejong	3	1	1	-	-	-	-	-	-	-	-	-	-	-	-
	Gyeonggi	319	114	103	19	10	6	3	-	-	-	-	-	-	-	-
	Gangwon	51	28	25	1	-	1	-	-	-	-	-	-	-	-	-
	Chungbuk	81	27	24	3	1	-	2	-	-	1	-	-	1	-	-
	Chungnam	46	15	14	-	-	-	-	-	-	-	-	-	-	-	-
	Jeonbuk	32	10	8	1	1	-	-	-	-	-	-	-	-	-	-
	Jeonnam	35	11	11	-	-	-	-	-	-	-	-	-	-	-	-
	Gyeongbuk	24	3	3	-	-	-	-	-	-	-	-	-	-	-	-
	Gyeongnam	24	7	7	-	-	-	-	-	-	-	-	-	-	-	-
	Jeju	9	5	4	-	-	-	-	-	-	-	-	-	-	-	-

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

Classification		No. of Companies	With Cooperative Relationship	Companies that responded for technical alliance	Domestic					
					Total	Basic Research	Experimental	Prototype	Product Development	Commercialization
Total		**1,003**	**344**	**47**	**91**	**17**	**28**	**16**	**14**	**16**
Core Industries	Biopharmaceutical	319	120	26	48	12	18	8	7	3
	Biochemical and Bioenergy	192	59	8	14	3	4	4	2	1
	Biofood	175	55	4	7	2	-	-	1	4
	Bioenvironmental	65	19	2	3	-	-	-	-	3
	Biomedical Equipment	95	35	3	15	-	5	4	3	3
	Bioinstrument and Bioequipment	53	15	-	-	-	-	-	-	-
	Bioresource	19	7	-	-	-	-	-	-	-
	Bioservice	85	34	4	4	-	1	-	1	2
Total Size of Workers	1 - 49	598	196	21	29	6	11	3	3	6
	50 - 299	246	92	12	34	4	12	7	4	7
	300 - 999	69	30	8	13	5	4	1	-	3
	1,000 or more	31	17	2	2	-	-	-	2	-
	Unknown	59	9	4	13	2	1	5	5	-
By Area	Seoul	229	73	10	14	2	5	1	1	5
	Busan	14	4	-	-	-	-	-	-	-
	Incheon	21	5	1	4	-	2	2	-	-
	Daegu	17	7	1	1	-	-	-	-	1
	Gwangju	10	4	-	-	-	-	-	-	-
	Daejeon	82	29	2	3	1	-	-	1	1
	Ulsan	6	1	-	-	-	-	-	-	-
	Sejong	3	1	-	-	-	-	-	-	-
	Gyeonggi	319	114	17	32	9	6	7	5	5
	Gangwon	51	28	4	7	-	4	3	-	-
	Chungbuk	81	27	6	22	1	9	3	5	4
	Chungnam	46	15	3	3	2	-	-	1	-
	Jeonbuk	32	10	3	5	2	2	-	1	-
	Jeonnam	35	11	-	-	-	-	-	-	-
	Gyeongbuk	24	3	-	-	-	-	-	-	-
	Gyeongnam	24	7	-	-	-	-	-	-	-
	Jeju	9	5	-	-	-	-	-	-	-

Classification		No. of Companies	With Cooperative Relationship	No. of Respondents (Technical Tie-up)	Overseas					
					Total	Basic Research	Experimental	Prototype	Product Development	Commercialization
Total		**1,003**	**344**	**47**	**14**	**1**	**-**	**8**	**2**	**3**
Core Industries	Biopharmaceutical	319	120	26	12	1	-	8	2	1
	Biochemical and Bioenergy	192	59	8	1	-	-	-	-	1
	Biofood	175	55	4	-	-	-	-	-	-
	Bioenvironmental	65	19	2	-	-	-	-	-	-
	Biomedical Equipment	95	35	3	-	-	-	-	-	-
	Bioinstrument and Bioequipment	53	15	-	-	-	-	-	-	-
	Bioresource	19	7	-	-	-	-	-	-	-
	Bioservice	85	34	4	1	-	-	-	-	1
Total Size of Workers	1 - 49	598	196	21	8	-	-	5	2	1
	50 - 299	246	92	12	1	1	-	-	-	-
	300 - 999	69	30	8	3	-	-	1	-	2
	1,000 or more	31	17	2	2	-	-	2	-	-
	Unknown	59	9	4	-	-	-	-	-	-
By Area	Seoul	229	73	10	2	1	-	-	-	1
	Busan	14	4	-	-	-	-	-	-	-
	Incheon	21	5	1	-	-	-	-	-	-
	Daegu	17	7	1	-	-	-	-	-	-
	Gwangju	10	4	-	-	-	-	-	-	-
	Daejeon	82	29	2	-	-	-	-	-	-
	Ulsan	6	1	-	-	-	-	-	-	-
	Sejong	3	1	-	-	-	-	-	-	-
	Gyeonggi	319	114	17	2	-	-	2	-	-
	Gangwon	51	28	4	8	-	-	5	2	1
	Chungbuk	81	27	6	2	-	-	1	-	1
	Chungnam	46	15	3	-	-	-	-	-	-
	Jeonbuk	32	10	3	-	-	-	-	-	-
	Jeonnam	35	11	-	-	-	-	-	-	-
	Gyeongbuk	24	3	-	-	-	-	-	-	-
	Gyeongnam	24	7	-	-	-	-	-	-	-
	Jeju	9	5	-	-	-	-	-	-	-

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		**1,003**	**344**	**47**	**24**	**5**	**6**	**4**	**5**	**4**	**10**	**1**	**-**	**6**	**2**	**1**
Core Industries	Biopharmaceutical	319	120	26	11	4	4	1	2	-	9	1	-	6	2	-
	Biochemical and Bioenergy	192	59	8	8	1	2	2	2	1	1	-	-	-	-	1
	Biofood	175	55	4	-	-	-	-	-	-	-	-	-	-	-	-
	Bioenvironmental	65	19	2	-	-	-	-	-	-	-	-	-	-	-	-
	Biomedical Equipment	95	35	3	4	-	-	1	1	2	-	-	-	-	-	-
	Bioinstrument and Bioequipment	53	15	-	-	-	-	-	-	-	-	-	-	-	-	-
	Bioresource	19	7	-	-	-	-	-	-	-	-	-	-	-	-	-
	Bioservice	85	34	4	1	-	-	-	-	1	-	-	-	-	-	-
Total Size of Workers	1 - 49	598	196	21	6	-	2	-	2	2	8	-	-	5	2	1
	50 - 299	246	92	12	8	1	2	1	2	2	1	1	-	-	-	-
	300 - 999	69	30	8	4	2	1	1	-	-	1	-	-	1	-	-
	1,000 or more	31	17	2	-	-	-	-	-	-	-	-	-	-	-	-
	Unknown	59	9	4	6	2	1	2	1	-	-	-	-	-	-	-
By Area	Seoul	229	73	10	4	1	1	-	1	1	1	1	-	-	-	-
	Busan	14	4	-	-	-	-	-	-	-	-	-	-	-	-	-
	Incheon	21	5	1	-	-	-	-	-	-	-	-	-	-	-	-
	Daegu	17	7	1	1	-	-	-	-	1	-	-	-	-	-	-
	Gwangju	10	4	-	-	-	-	-	-	-	-	-	-	-	-	-
	Daejeon	82	29	2	2	-	-	-	1	1	-	-	-	-	-	-
	Ulsan	6	1	-	-	-	-	-	-	-	-	-	-	-	-	-
	Sejong	3	1	-	-	-	-	-	-	-	-	-	-	-	-	-
	Gyeonggi	319	114	17	11	4	3	2	2	-	-	-	-	-	-	-
	Gangwon	51	28	4	3	-	2	1	-	-	8	-	-	5	2	1
	Chungbuk	81	27	6	3	-	-	1	1	1	1	-	-	1	-	-
	Chungnam	46	15	3	-	-	-	-	-	-	-	-	-	-	-	-
	Jeonbuk	32	10	3	-	-	-	-	-	-	-	-	-	-	-	-
	Jeonnam	35	11	-	-	-	-	-	-	-	-	-	-	-	-	-
	Gyeongbuk	24	3	-	-	-	-	-	-	-	-	-	-	-	-	-
	Gyeongnam	24	7	-	-	-	-	-	-	-	-	-	-	-	-	-
	Jeju	9	5	-	-	-	-	-	-	-	-	-	-	-	-	-

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		**1,003**	**344**	**47**	**4**	**-**	**1**	**1**	**2**	**-**	**1**	**-**	**-**	**-**	**-**	**1**
Core Industries	Biopharmaceutical	319	120	26	3	-	-	1	2	-	1	-	-	-	-	1
	Biochemical and Bioenergy	192	59	8	-	-	-	-	-	-	-	-	-	-	-	-
	Biofood	175	55	4	-	-	-	-	-	-	-	-	-	-	-	-
	Bioenvironmental	65	19	2	-	-	-	-	-	-	-	-	-	-	-	-
	Biomedical Equipment	95	35	3	-	-	-	-	-	-	-	-	-	-	-	-
	Bioinstrument and Bioequipment	53	15	-	-	-	-	-	-	-	-	-	-	-	-	-
	Bioresource	19	7	-	-	-	-	-	-	-	-	-	-	-	-	-
	Bioservice	85	34	4	1	-	1	-	-	-	-	-	-	-	-	-
Total Size of Workers	1 - 49	598	196	21	-	-	-	-	-	-	-	-	-	-	-	-
	50 - 299	246	92	12	2	-	1	1	-	-	-	-	-	-	-	-
	300 - 999	69	30	8	-	-	-	-	-	-	1	-	-	-	-	1
	1,000 or more	31	17	2	2	-	-	-	2	-	-	-	-	-	-	-
	Unknown	59	9	4	-	-	-	-	-	-	-	-	-	-	-	-
By Area	Seoul	229	73	10	1	-	1	-	-	-	-	-	-	-	-	-
	Busan	14	4	-	-	-	-	-	-	-	-	-	-	-	-	-
	Incheon	21	5	1	-	-	-	-	-	-	-	-	-	-	-	-
	Daegu	17	7	1	-	-	-	-	-	-	-	-	-	-	-	-
	Gwangju	10	4	-	-	-	-	-	-	-	-	-	-	-	-	-
	Daejeon	82	29	2	-	-	-	-	-	-	-	-	-	-	-	-
	Ulsan	6	1	-	-	-	-	-	-	-	-	-	-	-	-	-
	Sejong	3	1	-	-	-	-	-	-	-	-	-	-	-	-	-
	Gyeonggi	319	114	17	1	-	-	1	-	-	-	-	-	-	-	-
	Gangwon	51	28	4	-	-	-	-	-	-	-	-	-	-	-	-
	Chungbuk	81	27	6	2	-	-	-	2	-	1	-	-	-	-	1
	Chungnam	46	15	3	-	-	-	-	-	-	-	-	-	-	-	-
	Jeonbuk	32	10	3	-	-	-	-	-	-	-	-	-	-	-	-
	Jeonnam	35	11	-	-	-	-	-	-	-	-	-	-	-	-	-
	Gyeongbuk	24	3	-	-	-	-	-	-	-	-	-	-	-	-	-
	Gyeongnam	24	7	-	-	-	-	-	-	-	-	-	-	-	-	-
	Jeju	9	5	-	-	-	-	-	-	-	-	-	-	-	-	-

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		**1,003**	**344**	**47**	**6**	**1**	**4**	**-**	**-**	**1**	**2**	**-**	**-**	**2**	**-**	**-**
Core Industries	Biopharmaceutical	319	120	26	6	1	4	-	-	1	2	-	-	2	-	-
	Biochemical and Bioenergy	192	59	8	-	-	-	-	-	-	-	-	-	-	-	-
	Biofood	175	55	4	-	-	-	-	-	-	-	-	-	-	-	-
	Bioenvironmental	65	19	2	-	-	-	-	-	-	-	-	-	-	-	-
	Biomedical Equipment	95	35	3	-	-	-	-	-	-	-	-	-	-	-	-
	Bioinstrument and Bioequipment	53	15	-	-	-	-	-	-	-	-	-	-	-	-	-
	Bioresource	19	7	-	-	-	-	-	-	-	-	-	-	-	-	-
	Bioservice	85	34	4	-	-	-	-	-	-	-	-	-	-	-	-
Total Size of Workers	1 - 49	598	196	21	5	1	3	-	-	1	-	-	-	-	-	-
	50 - 299	246	92	12	-	-	-	-	-	-	-	-	-	-	-	-
	300 - 999	69	30	8	1	-	1	-	-	-	-	-	-	-	-	-
	1,000 or more	31	17	2	-	-	-	-	-	-	2	-	-	2	-	-
	Unknown	59	9	4	-	-	-	-	-	-	-	-	-	-	-	-
By Area	Seoul	229	73	10	1	-	-	-	-	1	-	-	-	-	-	-
	Busan	14	4	-	-	-	-	-	-	-	-	-	-	-	-	-
	Incheon	21	5	1	-	-	-	-	-	-	-	-	-	-	-	-
	Daegu	17	7	1	-	-	-	-	-	-	-	-	-	-	-	-
	Gwangju	10	4	-	-	-	-	-	-	-	-	-	-	-	-	-
	Daejeon	82	29	2	-	-	-	-	-	-	-	-	-	-	-	-
	Ulsan	6	1	-	-	-	-	-	-	-	-	-	-	-	-	-
	Sejong	3	1	-	-	-	-	-	-	-	-	-	-	-	-	-
	Gyeonggi	319	114	17	1	-	1	-	-	-	2	-	-	2	-	-
	Gangwon	51	28	4	-	-	-	-	-	-	-	-	-	-	-	-
	Chungbuk	81	27	6	1	-	1	-	-	-	-	-	-	-	-	-
	Chungnam	46	15	3	-	-	-	-	-	-	-	-	-	-	-	-
	Jeonbuk	32	10	3	3	1	2	-	-	-	-	-	-	-	-	-
	Jeonnam	35	11	-	-	-	-	-	-	-	-	-	-	-	-	-
	Gyeongbuk	24	3	-	-	-	-	-	-	-	-	-	-	-	-	-
	Gyeongnam	24	7	-	-	-	-	-	-	-	-	-	-	-	-	-
	Jeju	9	5	-	-	-	-	-	-	-	-	-	-	-	-	-

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		**1,003**	**344**	**47**	**16**	**4**	**2**	**3**	**2**	**5**	**1**	**-**	**-**	**-**	**-**	**1**
Core Industries	Biopharmaceutical	319	120	26	6	3	1	1	-	1	-	-	-	-	-	-
	Biochemical and Bioenergy	192	59	8	2	-	1	1	-	-	-	-	-	-	-	-
	Biofood	175	55	4	4	1	-	-	1	2	-	-	-	-	-	-
	Bioenvironmental	65	19	2	2	-	-	-	-	2	-	-	-	-	-	-
	Biomedical Equipment	95	35	3	2	-	-	1	1	-	-	-	-	-	-	-
	Bioinstrument and Bioequipment	53	15	-	-	-	-	-	-	-	-	-	-	-	-	-
	Bioresource	19	7	-	-	-	-	-	-	-	-	-	-	-	-	-
	Bioservice	85	34	4	-	-	-	-	-	-	1	-	-	-	-	1
Total Size of Workers	1 - 49	598	196	21	5	1	1	1	-	2	-	-	-	-	-	-
	50 - 299	246	92	12	8	2	1	2	1	2	-	-	-	-	-	-
	300 - 999	69	30	8	2	1	-	-	-	1	1	-	-	-	-	1
	1,000 or more	31	17	2	-	-	-	-	-	-	-	-	-	-	-	-
	Unknown	59	9	4	1	-	-	-	1	-	-	-	-	-	-	-
By Area	Seoul	229	73	10	2	-	-	-	-	2	1	-	-	-	-	1
	Busan	14	4	-	-	-	-	-	-	-	-	-	-	-	-	-
	Incheon	21	5	1	2	-	1	1	-	-	-	-	-	-	-	-
	Daegu	17	7	1	-	-	-	-	-	-	-	-	-	-	-	-
	Gwangju	10	4	-	-	-	-	-	-	-	-	-	-	-	-	-
	Daejeon	82	29	2	1	1	-	-	-	-	-	-	-	-	-	-
	Ulsan	6	1	-	-	-	-	-	-	-	-	-	-	-	-	-
	Sejong	3	1	-	-	-	-	-	-	-	-	-	-	-	-	-
	Gyeonggi	319	114	17	4	2	-	-	-	2	-	-	-	-	-	-
	Gangwon	51	28	4	2	-	1	1	-	-	-	-	-	-	-	-
	Chungbuk	81	27	6	3	-	-	1	1	1	-	-	-	-	-	-
	Chungnam	46	15	3	1	-	-	-	1	-	-	-	-	-	-	-
	Jeonbuk	32	10	3	1	1	-	-	-	-	-	-	-	-	-	-
	Jeonnam	35	11	-	-	-	-	-	-	-	-	-	-	-	-	-
	Gyeongbuk	24	3	-	-	-	-	-	-	-	-	-	-	-	-	-
	Gyeongnam	24	7	-	-	-	-	-	-	-	-	-	-	-	-	-
	Jeju	9	5	-	-	-	-	-	-	-	-	-	-	-	-	-

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		**1,003**	**344**	**47**	**2**	**1**	**1**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**
Core Industries	Biopharmaceutical	319	120	26	2	1	1	-	-	-	-	-	-	-	-	-
	Biochemical and Bioenergy	192	59	8	-	-	-	-	-	-	-	-	-	-	-	-
	Biofood	175	55	4	-	-	-	-	-	-	-	-	-	-	-	-
	Bioenvironmental	65	19	2	-	-	-	-	-	-	-	-	-	-	-	-
	Biomedical Equipment	95	35	3	-	-	-	-	-	-	-	-	-	-	-	-
	Bioinstrument and Bioequipment	53	15	-	-	-	-	-	-	-	-	-	-	-	-	-
	Bioresource	19	7	-	-	-	-	-	-	-	-	-	-	-	-	-
	Bioservice	85	34	4	-	-	-	-	-	-	-	-	-	-	-	-
Total Size of Workers	1 - 49	598	196	21	2	1	1	-	-	-	-	-	-	-	-	-
	50 - 299	246	92	12	-	-	-	-	-	-	-	-	-	-	-	-
	300 - 999	69	30	8	-	-	-	-	-	-	-	-	-	-	-	-
	1,000 or more	31	17	2	-	-	-	-	-	-	-	-	-	-	-	-
	Unknown	59	9	4	-	-	-	-	-	-	-	-	-	-	-	-
By Area	Seoul	229	73	10	2	1	1	-	-	-	-	-	-	-	-	-
	Busan	14	4	-	-	-	-	-	-	-	-	-	-	-	-	-
	Incheon	21	5	1	-	-	-	-	-	-	-	-	-	-	-	-
	Daegu	17	7	1	-	-	-	-	-	-	-	-	-	-	-	-
	Gwangju	10	4	-	-	-	-	-	-	-	-	-	-	-	-	-
	Daejeon	82	29	2	-	-	-	-	-	-	-	-	-	-	-	-
	Ulsan	6	1	-	-	-	-	-	-	-	-	-	-	-	-	-
	Sejong	3	1	-	-	-	-	-	-	-	-	-	-	-	-	-
	Gyeonggi	319	114	17	-	-	-	-	-	-	-	-	-	-	-	-
	Gangwon	51	28	4	-	-	-	-	-	-	-	-	-	-	-	-
	Chungbuk	81	27	6	-	-	-	-	-	-	-	-	-	-	-	-
	Chungnam	46	15	3	-	-	-	-	-	-	-	-	-	-	-	-
	Jeonbuk	32	10	3	-	-	-	-	-	-	-	-	-	-	-	-
	Jeonnam	35	11	-	-	-	-	-	-	-	-	-	-	-	-	-
	Gyeongbuk	24	3	-	-	-	-	-	-	-	-	-	-	-	-	-
	Gyeongnam	24	7	-	-	-	-	-	-	-	-	-	-	-	-	-
	Jeju	9	5	-	-	-	-	-	-	-	-	-	-	-	-	-

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		**1,003**	**344**	**47**	**34**	**6**	**9**	**8**	**5**	**6**	**-**	**-**	**-**	**-**	**-**	**-**
Core Industries	Biopharmaceutical	319	120	26	20	3	8	5	3	1	-	-	-	-	-	-
	Biochemical and Bioenergy	192	59	8	4	2	1	1	-	-	-	-	-	-	-	-
	Biofood	175	55	4	3	1	-	-	-	2	-	-	-	-	-	-
	Bioenvironmental	65	19	2	1	-	-	-	-	1	-	-	-	-	-	-
	Biomedical Equipment	95	35	3	4	-	-	2	1	1	-	-	-	-	-	-
	Bioinstrument and Bioequipment	53	15	-	-	-	-	-	-	-	-	-	-	-	-	-
	Bioresource	19	7	-	-	-	-	-	-	-	-	-	-	-	-	-
	Bioservice	85	34	4	2	-	-	-	1	1	-	-	-	-	-	-
Total Size of Workers	1 - 49	598	196	21	11	3	4	2	1	1	-	-	-	-	-	-
	50 - 299	246	92	12	11	1	3	3	1	3	-	-	-	-	-	-
	300 - 999	69	30	8	6	2	2	-	-	2	-	-	-	-	-	-
	1,000 or more	31	17	2	-	-	-	-	-	-	-	-	-	-	-	-
	Unknown	59	9	4	6	-	-	3	3	-	-	-	-	-	-	-
By Area	Seoul	229	73	10	4	-	2	1	-	1	-	-	-	-	-	-
	Busan	14	4	-	-	-	-	-	-	-	-	-	-	-	-	-
	Incheon	21	5	1	2	-	1	1	-	-	-	-	-	-	-	-
	Daegu	17	7	1	-	-	-	-	-	-	-	-	-	-	-	-
	Gwangju	10	4	-	-	-	-	-	-	-	-	-	-	-	-	-
	Daejeon	82	29	2	-	-	-	-	-	-	-	-	-	-	-	-
	Ulsan	6	1	-	-	-	-	-	-	-	-	-	-	-	-	-
	Sejong	3	1	-	-	-	-	-	-	-	-	-	-	-	-	-
	Gyeonggi	319	114	17	15	3	2	4	3	3	-	-	-	-	-	-
	Gangwon	51	28	4	2	-	1	1	-	-	-	-	-	-	-	-
	Chungbuk	81	27	6	8	1	3	1	1	2	-	-	-	-	-	-
	Chungnam	46	15	3	2	2	-	-	-	-	-	-	-	-	-	-
	Jeonbuk	32	10	3	1	-	-	-	1	-	-	-	-	-	-	-
	Jeonnam	35	11	-	-	-	-	-	-	-	-	-	-	-	-	-
	Gyeongbuk	24	3	-	-	-	-	-	-	-	-	-	-	-	-	-
	Gyeongnam	24	7	-	-	-	-	-	-	-	-	-	-	-	-	-
	Jeju	9	5	-	-	-	-	-	-	-	-	-	-	-	-	-

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		**1,003**	**344**	**47**	**5**	**-**	**5**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**
Core Industries	Biopharmaceutical	319	120	26	-	-	-	-	-	-	-	-	-	-	-	-
	Biochemical and Bioenergy	192	59	8	-	-	-	-	-	-	-	-	-	-	-	-
	Biofood	175	55	4	-	-	-	-	-	-	-	-	-	-	-	-
	Bioenvironmental	65	19	2	-	-	-	-	-	-	-	-	-	-	-	-
	Biomedical Equipment	95	35	3	5	-	5	-	-	-	-	-	-	-	-	-
	Bioinstrument and Bioequipment	53	15	-	-	-	-	-	-	-	-	-	-	-	-	-
	Bioresource	19	7	-	-	-	-	-	-	-	-	-	-	-	-	-
	Bioservice	85	34	4	-	-	-	-	-	-	-	-	-	-	-	-
Total Size of Workers	1 - 49	598	196	21	-	-	-	-	-	-	-	-	-	-	-	-
	50 - 299	246	92	12	5	-	5	-	-	-	-	-	-	-	-	-
	300 - 999	69	30	8	-	-	-	-	-	-	-	-	-	-	-	-
	1,000 or more	31	17	2	-	-	-	-	-	-	-	-	-	-	-	-
	Unknown	59	9	4	-	-	-	-	-	-	-	-	-	-	-	-
By Area	Seoul	229	73	10	-	-	-	-	-	-	-	-	-	-	-	-
	Busan	14	4	-	-	-	-	-	-	-	-	-	-	-	-	-
	Incheon	21	5	1	-	-	-	-	-	-	-	-	-	-	-	-
	Daegu	17	7	1	-	-	-	-	-	-	-	-	-	-	-	-
	Gwangju	10	4	-	-	-	-	-	-	-	-	-	-	-	-	-
	Daejeon	82	29	2	-	-	-	-	-	-	-	-	-	-	-	-
	Ulsan	6	1	-	-	-	-	-	-	-	-	-	-	-	-	-
	Sejong	3	1	-	-	-	-	-	-	-	-	-	-	-	-	-
	Gyeonggi	319	114	17	-	-	-	-	-	-	-	-	-	-	-	-
	Gangwon	51	28	4	-	-	-	-	-	-	-	-	-	-	-	-
	Chungbuk	81	27	6	5	-	5	-	-	-	-	-	-	-	-	-
	Chungnam	46	15	3	-	-	-	-	-	-	-	-	-	-	-	-
	Jeonbuk	32	10	3	-	-	-	-	-	-	-	-	-	-	-	-
	Jeonnam	35	11	-	-	-	-	-	-	-	-	-	-	-	-	-
	Gyeongbuk	24	3	-	-	-	-	-	-	-	-	-	-	-	-	-
	Gyeongnam	24	7	-	-	-	-	-	-	-	-	-	-	-	-	-
	Jeju	9	5	-	-	-	-	-	-	-	-	-	-	-	-	-

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

Classification		No. of Companies	With Cooperative Relationship	No. of Respondents (Technical Manpower Exchange)	Domestic					
					Total	Basic Research	Experimental	Prototype	Product Development	Commercialization
Total		**1,003**	**344**	**19**	**48**	**20**	**13**	**9**	**4**	**2**
Core Industries	Biopharmaceutical	319	120	6	8	5	1	1	-	1
	Biochemical and Bioenergy	192	59	4	17	1	7	4	4	1
	Biofood	175	55	5	7	2	2	3	-	-
	Bioenvironmental	65	19	1	1	-	1	-	-	-
	Biomedical Equipment	95	35	1	3	1	2	-	-	-
	Bioinstrument and Bioequipment	53	15	1	11	11	-	-	-	-
	Bioresource	19	7	-	-	-	-	-	-	-
	Bioservice	85	34	1	1	-	-	1	-	-
Total Size of Workers	1 - 49	598	196	9	25	15	6	3	-	1
	50 - 299	246	92	6	8	5	1	2	-	-
	300 - 999	69	30	2	2	-	1	-	-	1
	1,000 or more	31	17	1	12	-	4	4	4	-
	Unknown	59	9	1	1	-	1	-	-	-
By Area	Seoul	229	73	2	12	12	-	-	-	-
	Busan	14	4	1	2	-	1	1	-	-
	Incheon	21	5	-	-	-	-	-	-	-
	Daegu	17	7	-	-	-	-	-	-	-
	Gwangju	10	4	-	-	-	-	-	-	-
	Daejeon	82	29	4	17	1	7	4	4	1
	Ulsan	6	1	-	-	-	-	-	-	-
	Sejong	3	1	-	-	-	-	-	-	-
	Gyeonggi	319	114	6	8	4	2	2	-	-
	Gangwon	51	28	1	3	1	2	-	-	-
	Chungbuk	81	27	2	2	1	-	-	-	1
	Chungnam	46	15	-	-	-	-	-	-	-
	Jeonbuk	32	10	1	2	-	-	2	-	-
	Jeonnam	35	11	-	-	-	-	-	-	-
	Gyeongbuk	24	3	1	1	-	1	-	-	-
	Gyeongnam	24	7	-	-	-	-	-	-	-
	Jeju	9	5	1	1	1	-	-	-	-

Classification		No. of Companies	With Cooperative Relationship	No. of Respondents (Technical Manpower Exchange)	Overseas					
					Total	Basic Research	Experimental	Prototype	Product Development	Commercialization
Total		**1,003**	**344**	**19**	**1**	**-**	**1**	**-**	**-**	**-**
Core Industries	Biopharmaceutical	319	120	6	1	-	1	-	-	-
	Biochemical and Bioenergy	192	59	4	-	-	-	-	-	-
	Biofood	175	55	5	-	-	-	-	-	-
	Bioenvironmental	65	19	1	-	-	-	-	-	-
	Biomedical Equipment	95	35	1	-	-	-	-	-	-
	Bioinstrument and Bioequipment	53	15	1	-	-	-	-	-	-
	Bioresource	19	7	-	-	-	-	-	-	-
	Bioservice	85	34	1	-	-	-	-	-	-
Total Size of Workers	1 - 49	598	196	9	-	-	-	-	-	-
	50 - 299	246	92	6	-	-	-	-	-	-
	300 - 999	69	30	2	1	-	1	-	-	-
	1,000 or more	31	17	1	-	-	-	-	-	-
	Unknown	59	9	1	-	-	-	-	-	-
By Area	Seoul	229	73	2	-	-	-	-	-	-
	Busan	14	4	1	-	-	-	-	-	-
	Incheon	21	5	-	-	-	-	-	-	-
	Daegu	17	7	-	-	-	-	-	-	-
	Gwangju	10	4	-	-	-	-	-	-	-
	Daejeon	82	29	4	-	-	-	-	-	-
	Ulsan	6	1	-	-	-	-	-	-	-
	Sejong	3	1	-	-	-	-	-	-	-
	Gyeonggi	319	114	6	1	-	1	-	-	-
	Gangwon	51	28	1	-	-	-	-	-	-
	Chungbuk	81	27	2	-	-	-	-	-	-
	Chungnam	46	15	-	-	-	-	-	-	-
	Jeonbuk	32	10	1	-	-	-	-	-	-
	Jeonnam	35	11	-	-	-	-	-	-	-
	Gyeongbuk	24	3	1	-	-	-	-	-	-
	Gyeongnam	24	7	-	-	-	-	-	-	-
	Jeju	9	5	1	-	-	-	-	-	-

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		**1,003**	**344**	**19**	**4**	**2**	**1**	**-**	**-**	**1**	**-**	**-**	**-**	**-**	**-**	**-**
Core Industries	Biopharmaceutical	319	120	6	1	1	-	-	-	-	-	-	-	-	-	-
	Biochemical and Bioenergy	192	59	4	1	-	-	-	-	1	-	-	-	-	-	-
	Biofood	175	55	5	-	-	-	-	-	-	-	-	-	-	-	-
	Bioenvironmental	65	19	1	-	-	-	-	-	-	-	-	-	-	-	-
	Biomedical Equipment	95	35	1	2	1	1	-	-	-	-	-	-	-	-	-
	Bioinstrument and Bioequipment	53	15	1	-	-	-	-	-	-	-	-	-	-	-	-
	Bioresource	19	7	-	-	-	-	-	-	-	-	-	-	-	-	-
	Bioservice	85	34	1	-	-	-	-	-	-	-	-	-	-	-	-
Total Size of Workers	1 - 49	598	196	9	3	1	1	-	-	1	-	-	-	-	-	-
	50 - 299	246	92	6	1	1	-	-	-	-	-	-	-	-	-	-
	300 - 999	69	30	2	-	-	-	-	-	-	-	-	-	-	-	-
	1,000 or more	31	17	1	-	-	-	-	-	-	-	-	-	-	-	-
	Unknown	59	9	1	-	-	-	-	-	-	-	-	-	-	-	-
By Area	Seoul	229	73	2	-	-	-	-	-	-	-	-	-	-	-	-
	Busan	14	4	1	-	-	-	-	-	-	-	-	-	-	-	-
	Incheon	21	5	-	-	-	-	-	-	-	-	-	-	-	-	-
	Daegu	17	7	-	-	-	-	-	-	-	-	-	-	-	-	-
	Gwangju	10	4	-	-	-	-	-	-	-	-	-	-	-	-	-
	Daejeon	82	29	4	1	-	-	-	-	1	-	-	-	-	-	-
	Ulsan	6	1	-	-	-	-	-	-	-	-	-	-	-	-	-
	Sejong	3	1	-	-	-	-	-	-	-	-	-	-	-	-	-
	Gyeonggi	319	114	6	1	1	-	-	-	-	-	-	-	-	-	-
	Gangwon	51	28	1	2	1	1	-	-	-	-	-	-	-	-	-
	Chungbuk	81	27	2	-	-	-	-	-	-	-	-	-	-	-	-
	Chungnam	46	15	-	-	-	-	-	-	-	-	-	-	-	-	-
	Jeonbuk	32	10	1	-	-	-	-	-	-	-	-	-	-	-	-
	Jeonnam	35	11	-	-	-	-	-	-	-	-	-	-	-	-	-
	Gyeongbuk	24	3	1	-	-	-	-	-	-	-	-	-	-	-	-
	Gyeongnam	24	7	-	-	-	-	-	-	-	-	-	-	-	-	-
	Jeju	9	5	1	-	-	-	-	-	-	-	-	-	-	-	-

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		**1,003**	**344**	**19**	-	-	-	-	-	-	-	-	-	-	-	-
Core Industries	Biopharmaceutical	319	120	6	-	-	-	-	-	-	-	-	-	-	-	-
	Biochemical and Bioenergy	192	59	4	-	-	-	-	-	-	-	-	-	-	-	-
	Biofood	175	55	5	-	-	-	-	-	-	-	-	-	-	-	-
	Bioenvironmental	65	19	1	-	-	-	-	-	-	-	-	-	-	-	-
	Biomedical Equipment	95	35	1	-	-	-	-	-	-	-	-	-	-	-	-
	Bioinstrument and Bioequipment	53	15	1	-	-	-	-	-	-	-	-	-	-	-	-
	Bioresource	19	7	-	-	-	-	-	-	-	-	-	-	-	-	-
	Bioservice	85	34	1	-	-	-	-	-	-	-	-	-	-	-	-
Total Size of Workers	1 - 49	598	196	9	-	-	-	-	-	-	-	-	-	-	-	-
	50 - 299	246	92	6	-	-	-	-	-	-	-	-	-	-	-	-
	300 - 999	69	30	2	-	-	-	-	-	-	-	-	-	-	-	-
	1,000 or more	31	17	1	-	-	-	-	-	-	-	-	-	-	-	-
	Unknown	59	9	1	-	-	-	-	-	-	-	-	-	-	-	-
By Area	Seoul	229	73	2	-	-	-	-	-	-	-	-	-	-	-	-
	Busan	14	4	1	-	-	-	-	-	-	-	-	-	-	-	-
	Incheon	21	5	-	-	-	-	-	-	-	-	-	-	-	-	-
	Daegu	17	7	-	-	-	-	-	-	-	-	-	-	-	-	-
	Gwangju	10	4	-	-	-	-	-	-	-	-	-	-	-	-	-
	Daejeon	82	29	4	-	-	-	-	-	-	-	-	-	-	-	-
	Ulsan	6	1	-	-	-	-	-	-	-	-	-	-	-	-	-
	Sejong	3	1	-	-	-	-	-	-	-	-	-	-	-	-	-
	Gyeonggi	319	114	6	-	-	-	-	-	-	-	-	-	-	-	-
	Gangwon	51	28	1	-	-	-	-	-	-	-	-	-	-	-	-
	Chungbuk	81	27	2	-	-	-	-	-	-	-	-	-	-	-	-
	Chungnam	46	15	-	-	-	-	-	-	-	-	-	-	-	-	-
	Jeonbuk	32	10	1	-	-	-	-	-	-	-	-	-	-	-	-
	Jeonnam	35	11	-	-	-	-	-	-	-	-	-	-	-	-	-
	Gyeongbuk	24	3	1	-	-	-	-	-	-	-	-	-	-	-	-
	Gyeongnam	24	7	-	-	-	-	-	-	-	-	-	-	-	-	-
	Jeju	9	5	1	-	-	-	-	-	-	-	-	-	-	-	-

		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		**1,003**	**344**	**19**	-	-	-	-	-	-	-	-	-	-	-	-
Core Industries	Biopharmaceutical	319	120	6	-	-	-	-	-	-	-	-	-	-	-	-
	Biochemical and Bioenergy	192	59	4	-	-	-	-	-	-	-	-	-	-	-	-
	Biofood	175	55	5	-	-	-	-	-	-	-	-	-	-	-	-
	Bioenvironmental	65	19	1	-	-	-	-	-	-	-	-	-	-	-	-
	Biomedical Equipment	95	35	1	-	-	-	-	-	-	-	-	-	-	-	-
	Bioinstrument and Bioequipment	53	15	1	-	-	-	-	-	-	-	-	-	-	-	-
	Bioresource	19	7	-	-	-	-	-	-	-	-	-	-	-	-	-
	Bioservice	85	34	1	-	-	-	-	-	-	-	-	-	-	-	-
Total Size of Workers	1 - 49	598	196	9	-	-	-	-	-	-	-	-	-	-	-	-
	50 - 299	246	92	6	-	-	-	-	-	-	-	-	-	-	-	-
	300 - 999	69	30	2	-	-	-	-	-	-	-	-	-	-	-	-
	1,000 or more	31	17	1	-	-	-	-	-	-	-	-	-	-	-	-
	Unknown	59	9	1	-	-	-	-	-	-	-	-	-	-	-	-
By Area	Seoul	229	73	2	-	-	-	-	-	-	-	-	-	-	-	-
	Busan	14	4	1	-	-	-	-	-	-	-	-	-	-	-	-
	Incheon	21	5	-	-	-	-	-	-	-	-	-	-	-	-	-
	Daegu	17	7	-	-	-	-	-	-	-	-	-	-	-	-	-
	Gwangju	10	4	-	-	-	-	-	-	-	-	-	-	-	-	-
	Daejeon	82	29	4	-	-	-	-	-	-	-	-	-	-	-	-
	Ulsan	6	1	-	-	-	-	-	-	-	-	-	-	-	-	-
	Sejong	3	1	-	-	-	-	-	-	-	-	-	-	-	-	-
	Gyeonggi	319	114	6	-	-	-	-	-	-	-	-	-	-	-	-
	Gangwon	51	28	1	-	-	-	-	-	-	-	-	-	-	-	-
	Chungbuk	81	27	2	-	-	-	-	-	-	-	-	-	-	-	-
	Chungnam	46	15	-	-	-	-	-	-	-	-	-	-	-	-	-
	Jeonbuk	32	10	1	-	-	-	-	-	-	-	-	-	-	-	-
	Jeonnam	35	11	-	-	-	-	-	-	-	-	-	-	-	-	-
	Gyeongbuk	24	3	1	-	-	-	-	-	-	-	-	-	-	-	-
	Gyeongnam	24	7	-	-	-	-	-	-	-	-	-	-	-	-	-
	Jeju	9	5	1	-	-	-	-	-	-	-	-	-	-	-	-

		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		**1,003**	**344**	**19**	**13**	**4**	**4**	**2**	**2**	**1**	-	-	-	-	-	-
Core Industries	Biopharmaceutical	319	120	6	3	2	-	-	-	1	-	-	-	-	-	-
	Biochemical and Bioenergy	192	59	4	8	-	4	2	2	-	-	-	-	-	-	-
	Biofood	175	55	5	-	-	-	-	-	-	-	-	-	-	-	-
	Bioenvironmental	65	19	1	-	-	-	-	-	-	-	-	-	-	-	-
	Biomedical Equipment	95	35	1	-	-	-	-	-	-	-	-	-	-	-	-
	Bioinstrument and Bioequipment	53	15	1	2	2	-	-	-	-	-	-	-	-	-	-
	Bioresource	19	7	-	-	-	-	-	-	-	-	-	-	-	-	-
	Bioservice	85	34	1	-	-	-	-	-	-	-	-	-	-	-	-
Total Size of Workers	1 - 49	598	196	9	4	2	2	-	-	-	-	-	-	-	-	-
	50 - 299	246	92	6	2	2	-	-	-	-	-	-	-	-	-	-
	300 - 999	69	30	2	1	-	-	-	-	1	-	-	-	-	-	-
	1,000 or more	31	17	1	6	-	2	2	2	-	-	-	-	-	-	-
	Unknown	59	9	1	-	-	-	-	-	-	-	-	-	-	-	-
By Area	Seoul	229	73	2	2	2	-	-	-	-	-	-	-	-	-	-
	Busan	14	4	1	-	-	-	-	-	-	-	-	-	-	-	-
	Incheon	21	5	-	-	-	-	-	-	-	-	-	-	-	-	-
	Daegu	17	7	-	-	-	-	-	-	-	-	-	-	-	-	-
	Gwangju	10	4	-	-	-	-	-	-	-	-	-	-	-	-	-
	Daejeon	82	29	4	8	-	4	2	2	-	-	-	-	-	-	-
	Ulsan	6	1	-	-	-	-	-	-	-	-	-	-	-	-	-
	Sejong	3	1	-	-	-	-	-	-	-	-	-	-	-	-	-
	Gyeonggi	319	114	6	2	2	-	-	-	-	-	-	-	-	-	-
	Gangwon	51	28	1	-	-	-	-	-	-	-	-	-	-	-	-
	Chungbuk	81	27	2	1	-	-	-	-	1	-	-	-	-	-	-
	Chungnam	46	15	-	-	-	-	-	-	-	-	-	-	-	-	-
	Jeonbuk	32	10	1	-	-	-	-	-	-	-	-	-	-	-	-
	Jeonnam	35	11	-	-	-	-	-	-	-	-	-	-	-	-	-
	Gyeongbuk	24	3	1	-	-	-	-	-	-	-	-	-	-	-	-
	Gyeongnam	24	7	-	-	-	-	-	-	-	-	-	-	-	-	-
	Jeju	9	5	1	-	-	-	-	-	-	-	-	-	-	-	-

		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		**1,003**	**344**	**19**	**9**	**3**	**2**	**2**	**2**	**-**	**-**	**-**	**-**	**-**	**-**	**-**
Core Industries	Biopharmaceutical	319	120	6	-	-	-	-	-	-	-	-	-	-	-	-
	Biochemical and Bioenergy	192	59	4	6	-	2	2	2	-	-	-	-	-	-	-
	Biofood	175	55	5	-	-	-	-	-	-	-	-	-	-	-	-
	Bioenvironmental	65	19	1	-	-	-	-	-	-	-	-	-	-	-	-
	Biomedical Equipment	95	35	1	-	-	-	-	-	-	-	-	-	-	-	-
	Bioinstrument and Bioequipment	53	15	1	3	3	-	-	-	-	-	-	-	-	-	-
	Bioresource	19	7	-	-	-	-	-	-	-	-	-	-	-	-	-
	Bioservice	85	34	1	-	-	-	-	-	-	-	-	-	-	-	-
Total Size of Workers	1 - 49	598	196	9	3	3	-	-	-	-	-	-	-	-	-	-
	50 - 299	246	92	6	-	-	-	-	-	-	-	-	-	-	-	-
	300 - 999	69	30	2	-	-	-	-	-	-	-	-	-	-	-	-
	1,000 or more	31	17	1	6	-	2	2	2	-	-	-	-	-	-	-
	Unknown	59	9	1	-	-	-	-	-	-	-	-	-	-	-	-
By Area	Seoul	229	73	2	3	3	-	-	-	-	-	-	-	-	-	-
	Busan	14	4	1	-	-	-	-	-	-	-	-	-	-	-	-
	Incheon	21	5	-	-	-	-	-	-	-	-	-	-	-	-	-
	Daegu	17	7	-	-	-	-	-	-	-	-	-	-	-	-	-
	Gwangju	10	4	-	-	-	-	-	-	-	-	-	-	-	-	-
	Daejeon	82	29	4	6	-	2	2	2	-	-	-	-	-	-	-
	Ulsan	6	1	-	-	-	-	-	-	-	-	-	-	-	-	-
	Sejong	3	1	-	-	-	-	-	-	-	-	-	-	-	-	-
	Gyeonggi	319	114	6	-	-	-	-	-	-	-	-	-	-	-	-
	Gangwon	51	28	1	-	-	-	-	-	-	-	-	-	-	-	-
	Chungbuk	81	27	2	-	-	-	-	-	-	-	-	-	-	-	-
	Chungnam	46	15	-	-	-	-	-	-	-	-	-	-	-	-	-
	Jeonbuk	32	10	1	-	-	-	-	-	-	-	-	-	-	-	-
	Jeonnam	35	11	-	-	-	-	-	-	-	-	-	-	-	-	-
	Gyeongbuk	24	3	1	-	-	-	-	-	-	-	-	-	-	-	-
	Gyeongnam	24	7	-	-	-	-	-	-	-	-	-	-	-	-	-
	Jeju	9	5	1	-	-	-	-	-	-	-	-	-	-	-	-

	+	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		**1,003**	**344**	**19**	**20**	**10**	**5**	**5**	**-**	**-**	**1**	**-**	**1**	**-**	**-**	**-**
Core Industries	Biopharmaceutical	319	120	6	4	2	1	1	-	-	1	-	1	-	-	-
	Biochemical and Bioenergy	192	59	4	2	1	1	-	-	-	-	-	-	-	-	-
	Biofood	175	55	5	7	2	2	3	-	-	-	-	-	-	-	-
	Bioenvironmental	65	19	1	1	-	1	-	-	-	-	-	-	-	-	-
	Biomedical Equipment	95	35	1	-	-	-	-	-	-	-	-	-	-	-	-
	Bioinstrument and Bioequipment	53	15	1	5	5	-	-	-	-	-	-	-	-	-	-
	Bioresource	19	7	-	-	-	-	-	-	-	-	-	-	-	-	-
	Bioservice	85	34	1	1	-	-	1	-	-	-	-	-	-	-	-
Total Size of Workers	1 - 49	598	196	9	13	8	2	3	-	-	-	-	-	-	-	-
	50 - 299	246	92	6	5	2	1	2	-	-	-	-	-	-	-	-
	300 - 999	69	30	2	1	-	1	-	-	-	1	-	1	-	-	-
	1,000 or more	31	17	1	-	-	-	-	-	-	-	-	-	-	-	-
	Unknown	59	9	1	1	-	1	-	-	-	-	-	-	-	-	-
By Area	Seoul	229	73	2	6	6	-	-	-	-	-	-	-	-	-	-
	Busan	14	4	1	2	-	1	1	-	-	-	-	-	-	-	-
	Incheon	21	5	-	-	-	-	-	-	-	-	-	-	-	-	-
	Daegu	17	7	-	-	-	-	-	-	-	-	-	-	-	-	-
	Gwangju	10	4	-	-	-	-	-	-	-	-	-	-	-	-	-
	Daejeon	82	29	4	2	1	1	-	-	-	-	-	-	-	-	-
	Ulsan	6	1	-	-	-	-	-	-	-	-	-	-	-	-	-
	Sejong	3	1	-	-	-	-	-	-	-	-	-	-	-	-	-
	Gyeonggi	319	114	6	5	1	2	2	-	-	1	-	1	-	-	-
	Gangwon	51	28	1	-	-	-	-	-	-	-	-	-	-	-	-
	Chungbuk	81	27	2	1	1	-	-	-	-	-	-	-	-	-	-
	Chungnam	46	15	-	-	-	-	-	-	-	-	-	-	-	-	-
	Jeonbuk	32	10	1	2	-	-	2	-	-	-	-	-	-	-	-
	Jeonnam	35	11	-	-	-	-	-	-	-	-	-	-	-	-	-
	Gyeongbuk	24	3	1	1	-	1	-	-	-	-	-	-	-	-	-
	Gyeongnam	24	7	-	-	-	-	-	-	-	-	-	-	-	-	-
	Jeju	9	5	1	1	1	-	-	-	-	-	-	-	-	-	-

		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		**1,003**	**344**	**19**	**2**	**1**	**1**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**
Core Industries	Biopharmaceutical	319	120	6	-	-	-	-	-	-	-	-	-	-	-	-
	Biochemical and Bioenergy	192	59	4	-	-	-	-	-	-	-	-	-	-	-	-
	Biofood	175	55	5	-	-	-	-	-	-	-	-	-	-	-	-
	Bioenvironmental	65	19	1	-	-	-	-	-	-	-	-	-	-	-	-
	Biomedical Equipment	95	35	1	1	-	1	-	-	-	-	-	-	-	-	-
	Bioinstrument and Bioequipment	53	15	1	1	1	-	-	-	-	-	-	-	-	-	-
	Bioresource	19	7	-	-	-	-	-	-	-	-	-	-	-	-	-
	Bioservice	85	34	1	-	-	-	-	-	-	-	-	-	-	-	-
Total Size of Workers	1 - 49	598	196	9	2	1	1	-	-	-	-	-	-	-	-	-
	50 - 299	246	92	6	-	-	-	-	-	-	-	-	-	-	-	-
	300 - 999	69	30	2	-	-	-	-	-	-	-	-	-	-	-	-
	1,000 or more	31	17	1	-	-	-	-	-	-	-	-	-	-	-	-
	Unknown	59	9	1	-	-	-	-	-	-	-	-	-	-	-	-
By Area	Seoul	229	73	2	1	1	-	-	-	-	-	-	-	-	-	-
	Busan	14	4	1	-	-	-	-	-	-	-	-	-	-	-	-
	Incheon	21	5	-	-	-	-	-	-	-	-	-	-	-	-	-
	Daegu	17	7	-	-	-	-	-	-	-	-	-	-	-	-	-
	Gwangju	10	4	-	-	-	-	-	-	-	-	-	-	-	-	-
	Daejeon	82	29	4	-	-	-	-	-	-	-	-	-	-	-	-
	Ulsan	6	1	-	-	-	-	-	-	-	-	-	-	-	-	-
	Sejong	3	1	-	-	-	-	-	-	-	-	-	-	-	-	-
	Gyeonggi	319	114	6	-	-	-	-	-	-	-	-	-	-	-	-
	Gangwon	51	28	1	1	-	1	-	-	-	-	-	-	-	-	-
	Chungbuk	81	27	2	-	-	-	-	-	-	-	-	-	-	-	-
	Chungnam	46	15	-	-	-	-	-	-	-	-	-	-	-	-	-
	Jeonbuk	32	10	1	-	-	-	-	-	-	-	-	-	-	-	-
	Jeonnam	35	11	-	-	-	-	-	-	-	-	-	-	-	-	-
	Gyeongbuk	24	3	1	-	-	-	-	-	-	-	-	-	-	-	-
	Gyeongnam	24	7	-	-	-	-	-	-	-	-	-	-	-	-	-
	Jeju	9	5	1	-	-	-	-	-	-	-	-	-	-	-	-

<Table 5> Size of Sales and Imports in Bioindustry

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

Industry / Category		No. of Respondents (Multiple Responses)	Domestic Sales	Exports	Total
			Total	Total	Total
Total		**1,171**	**5,611,134**	**6,712,371**	**12,323,505**
Industry with Sales Generated	Biopharmaceutical	193	1,623,645	2,615,212	4,238,857
	Biochemical and Bioenergy	268	1,734,048	121,067	1,855,115
	Biofood	276	1,278,821	2,407,803	3,686,624
	Bioenvironment	58	55,068	633	55,701
	Biomedical Equipment	144	268,614	684,941	953,555
	Bioinstrument and Bioequipment	57	71,213	36,554	107,767
	Bioresource	21	154,293	24,429	178,722
	Bioservice	154	425,432	821,734	1,247,166
Biopharmaceutical	1000) Other biopharmaceuticals	41	391,369	251,438	642,807
	1010) Bio-antibiotics	9	25,359	100,845	126,204
	1020) Biologically manufactured low-molecular medicine	2	151	75	226
	1030) Vaccines	22	369,464	259,385	628,849
	1040) Hormones	21	160,729	97,068	257,797
	1050) Therapeutic antibodies and cytokines	28	66,784	1,722,329	1,789,113
	1060) Blood products	4	386,898	140,042	526,940
	1070) Cell-based therapeutics	16	68,623	1,412	70,035
	1080) Gene therapeutics	6	2,274	361	2,635
	1100) Enzymes and live bacteria medicines	2	15,516	50	15,566
	1110) Biomaterial-based medicines	11	31,971	14,715	46,686
	1120) Veterinary biopharmaceuticals	31	104,507	27,491	131,998
	Total	193	1,623,645	2,615,212	4,238,857
Biochemical and Bioenergy	2000) Other biochemical and bioenergy products	13	9,363	605	9,968
	2010) Biopolymers	11	22,440	32,088	54,528
	2020) Industrial enzymes and reagents	5	7,604	6,290	13,894
	2030) Enzymes and reagents for research	41	48,428	9,411	57,839
	2040) Biocosmetics and home & personal care chemicals	81	389,638	66,527	456,165
	2050) Biological agrochemicals and fertilizers	99	96,092	655	96,747
	2060) Biofuels	18	1,160,483	5,490	1,165,973
	Total	268	1,734,048	121,067	1,855,115
Biofood	3000) Other biofoods	21	21,652	2,605	24,257
	3010) Functional health foods	133	338,070	39,090	377,160
	3020) Food-grade microorganisms & enzymes	1	41	0	41
	3030) Food additives	29	177,055	531,012	708,067
	3040) Fermented foods	8	86,773	0	86,773
	3050) Feed additives	84	655,230	1,835,096	2,490,326
	Total	276	1,278,821	2,407,803	3,686,624
Bioenvironmental	4000) Other bioenvironmental products and services	4	2,585	0	2,585
	4010) Biological treatment agents and systems	29	16,726	143	16,869
	4020) Materials and equipments for bio-immobilization	16	23,537	0	23,537
	4030) Bioenvironmental agents and systems for treatment and recycling	7	11,014	490	11,504
	4040) Measuring apparatus and service for environmental pollution and assessment	2	1,206	0	1,206
	Total	58	55,068	633	55,701

Industry / Category		No. of Respondents (Multiple Responses)	Domestic Sales	Exports	Total
			Total	Total	Total
Total		**1,171**	**5,611,134**	**6,712,371**	**12,323,505**
Biomedical Equipment	5000) Other biomedical equipments	49	121,821	204,746	326,567
	5010) Biosensors	5	279	21	300
	5020) In vitro diagnostics	90	146,514	480,173	626,687
	Total	144	268,614	684,941	953,555
Bioinstrument and Bioequipment	6000) Other bioinstruments and bioequipments	14	9,028	3,063	12,091
	6010) Gene/protein/peptide analysis, synthesis, and manufacturing instruments	5	568	1	569
	6020) Cell analysis and cultivation equipments	15	18,447	28,067	46,514
	6030) Multi-functional and other bioanalysis instruments	15	28,523	1,667	30,190
	6040) R&D and manufacturing equipments	6	14,519	3,756	18,275
	6050) Bioprocess equipment parts	2	128	0	128
	Total	57	71,213	36,554	107,767
Bioresource	7000) Other bioresources	7	924	111	1,035
	7010) Seeds and seedlings	7	128,152	21,335	149,487
	7020) Genetically Modified Organisms for use as food, feed or processing	2	3,209	34	3,243
	7030) Experimental animals	5	22,008	2,949	24,957
	Total	21	154,293	24,429	178,722
Bioservice	8000) Other bioservices	1	41	0	41
	8010) Bio-consignment production and procuration services	11	52,584	728,144	780,728
	8020) Bio-diagnostic and analytical services	53	107,958	71,875	179,833
	8030) Clinical/non-clinical R&D services	39	171,968	11,118	183,086
	8040) Other R&D services	39	45,989	8,095	54,084
	8050) Processing, treatment, and warehousing services	11	46,892	2,501	49,393
	Total	154	425,432	821,734	1,247,166

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

Industry / Category		No. of Respondents (Multiple Responses)	Imports
			Total
Total		311	1,964,445
Industry Performing Imports	Biopharmaceutical	191	1,644,278
	Biochemical and Bioenergy	40	105,573
	Biofood	39	56,652
	Bioenvironmental	3	148
	Biomedical Equipment	16	54,316
	Bioinstrument and Bioequipment	15	73,389
	Bioresource	4	26,712
	Bioservice	3	3,378
Biopharmaceutical Biochemical and Bioenergy	1000) Other biopharmaceuticals	29	89,898
	1010) Bio-antibiotics	4	2,121
	1030) Vaccines	36	300,458
	1040) Hormones	36	296,288
	1050) Therapeutic antibodies and cytokines	63	670,218
	1060) Blood products	17	268,202
	1090) Biological diagnostic products	3	5,909
	1100) Enzymes and live bacteria medicines	1	10,494
	1120) Veterinary biopharmaceuticals	2	688
	Total	191	1,644,278
	2000) Other biochemical and bioenergy products	6	23,192
	2010) Biopolymers	1	245
	2020) Industrial enzymes and reagents	5	19,181
	2030) Enzymes and reagents for research	15	46,392
	2040) Biocosmetics and home & personal care chemicals	2	492
	2050) Biological agrochemicals and fertilizers	7	9,125
	2060) Biofuels	4	6,947
	Total	40	105,573
Biofood	3000) Other biofoods	6	4,283
	3010) Functional health foods	19	41,515
	3020) Food-grade microorganisms & enzymes	2	458
	3030) Food additives	6	6,272
	3050) Feed additives	6	4,124
	Total	39	56,652
Bioenvironmental	4000) Other bioenvironmental products and services	2	136
	4010) Biological treatment agents and systems	1	12
	Total	3	148
Biomedical Equipment	5000) Other biomedical equipments	3	1,961
	5010) Biosensors	1	31
	5020) In-vitro diagnostics	12	52,324
	Total	16	54,316
Bioinstrument and Bioequipment	6000) Other bioinstruments and bioequipments	9	22,024
	6010) Gene/protein/peptide analysis, synthesis, and manufacturing instruments	1	1,072
	6020) Cell analysis and cultivation equipments	1	1,156
	6030) Multi-functional and other bioanalysis instruments	4	49,137
	Total	15	73,389
Bioresources	7000) Other bioresources	1	135
	7010) Seeds and seedlings	2	26,215
	7030) Experimental animals	1	361
	Total	4	26,712
Bioservice	8010) Bio-consignment production and procuration services	2	3,372
	8020) Bio-diagnostic and analytical services	1	6
	Total	3	3,378

<Table 6> Status of Bioindustry by Area

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

		No. of Companies	No. of Respondents	Bio Industry workers									
				Doctor's		Master's		Bachelor's		Others		Total	
				Total	Average	Total	Average	Total	Average	Total	Average	Total	Average
Total		**1,003**	**966**	**2,807**	**3**	**9,501**	**10**	**24,013**	**25**	**12,792**	**13**	**49,113**	**51**
Core Industries	Biopharmaceutical	319	291	1,483	5	4,736	16	9,970	34	4,705	16	20,894	72
	Biochemical and Bioenergy	192	187	342	2	1,237	7	3,117	17	2,021	11	6,717	36
	Biofood	175	174	324	2	930	5	2,834	16	2,214	13	6,302	36
	Bioenvironmental	65	64	42	1	150	2	712	11	167	3	1,071	17
	Biomedical Equipment	95	95	218	2	926	10	2,356	25	1,882	20	5,382	57
	Bioinstrument and Bioequipment	53	52	54	1	170	3	917	18	411	8	1,552	30
	Bioresource	19	18	34	2	144	8	711	40	168	9	1,057	59
	Bioservice	85	85	310	4	1,208	14	3,396	40	1,224	14	6,138	72
Total Size of Workers	1 - 49	598	592	746	1	1,671	3	4,231	7	1,366	2	8,014	14
	50 - 299	246	239	749	3	2,775	12	9,609	40	5,107	21	18,240	76
	300 - 999	69	66	611	9	2,070	31	3,945	60	2,789	42	9,415	143
	1,000 or more	31	31	569	18	2,563	83	5,206	168	3,089	100	11,427	369
	Unknown	59	38	132	3	422	11	1,022	27	441	12	2,017	53
By Area	Seoul	229	202	509	3	1,643	8	4,018	20	1,071	5	7,241	36
	Busan	14	14	14	1	52	4	132	9	58	4	256	18
	Incheon	21	21	297	14	1,098	52	2,689	128	1,215	58	5,299	252
	Daegu	17	17	15	1	61	4	708	42	680	40	1,464	86
	Gwangju	10	10	6	1	24	2	32	3	5	1	67	7
	Daejeon	82	82	211	3	550	7	1,122	14	362	4	2,245	27
	Ulsan	6	6	25	4	152	25	640	107	305	51	1,122	187
	Sejong	3	3	9	3	83	28	183	61	82	27	357	119
	Gyeonggi	319	313	1,022	3	3,208	10	6,717	21	3,724	12	14,671	47
	Gangwon	51	49	126	3	463	9	1,310	27	1,018	21	2,917	60
	Chungbuk	81	81	330	4	1,407	17	3,816	47	2,459	30	8,012	99
	Chungnam	46	46	102	2	338	7	817	18	746	16	2,003	44
	Jeonbuk	32	32	44	1	122	4	527	16	464	15	1,157	36
	Jeonnam	35	35	27	1	99	3	460	13	179	5	765	22
	Gyeongbuk	24	23	44	2	115	5	396	17	238	10	793	34
	Gyeongnam	24	23	16	1	60	3	323	14	84	4	483	21
	Jeju	9	9	10	1	26	3	123	14	102	11	261	29

		No. of Companies	No. of Respondents	Researchers									
				Doctor's		Master's		Bachelor's		Others		Total	
				Total	Average	Total	Average	Total	Average	Total	Average	Total	Average
Total		**1,003**	**966**	**2,446**	**3**	**6,973**	**7**	**5,681**	**6**	**363**		**15,463**	**16**
Core Industries	Biopharmaceutical	319	291	1,282	4	3,574	12	2,048	7	156	1	7,060	24
	Biochemical and Bioenergy	192	187	308	2	1,019	5	714	4	76	-	2,117	11
	Biofood	175	174	297	2	734	4	521	3	31	-	1,583	9
	Bioenvironmental	65	64	40	1	122	2	207	3	1	-	370	6
	Biomedical Equipment	95	95	171	2	584	6	513	5	8	-	1,276	13
	Bioinstrument and Bioequipment	53	52	49	1	124	2	183	4	8	-	364	7
	Bioresource	19	18	34	2	81	5	150	8	0	0	265	15
	Bioservice	85	85	265	3	735	9	1,345	16	83	1	2,428	29
Total Size of Workers	1 - 49	598	592	697	1	1,415	2	1,380	2	20	-	3,512	6
	50 - 299	246	239	679	3	2,049	9	2,389	10	110	-	5,227	22
	300 - 999	69	66	453	7	1,268	19	947	14	75	1	2,743	42
	1,000 or more	31	31	498	16	1,960	63	833	27	129	4	3,420	110
	Unknown	59	38	119	3	281	7	132	3	29	1	561	15
By Area	Seoul	229	202	444	2	1,211	6	1,419	7	46	-	3,120	15
	Busan	14	14	12	1	44	3	19	1	1	-	76	5
	Incheon	21	21	224	11	676	32	387	18	24	1	1,311	62
	Daegu	17	17	10	1	41	2	105	6	29	2	185	11
	Gwangju	10	10	6	1	18	2	12	1	0	0	36	4
	Daejeon	82	82	188	2	446	5	295	4	11	-	940	11
	Ulsan	6	6	21	4	98	16	47	8	20	3	186	31
	Sejong	3	3	9	3	83	28	43	14	13	4	148	49
	Gyeonggi	319	313	971	3	2,547	8	1,938	6	88	-	5,544	18
	Gangwon	51	49	91	2	276	6	204	4	1	-	572	12
	Chungbuk	81	81	266	3	968	12	658	8	87	1	1,979	24
	Chungnam	46	46	81	2	242	5	141	3	5	-	469	10
	Jeonbuk	32	32	40	1	93	3	105	3	24	1	262	8
	Jeonnam	35	35	20	1	74	2	129	4	2	-	225	6
	Gyeongbuk	24	23	38	2	89	4	94	4	12	1	233	10
	Gyeongnam	24	23	16	1	47	2	53	2	0	0	116	5
	Jeju	9	9	9	1	20	2	32	4	0	0	61	7

		No. of Companies	No. of Respondents	Production Workers									
				Doctor's		Master's		Bachelor's		Others		Total	
				Total	Average	Total	Average	Total	Average	Total	Average	Total	Average
Total		**1,003**	**966**	**53**	**-**	**811**	**1**	**6,143**	**6**	**9,964**	**10**	**16,971**	**18**
Core Industries	Biopharmaceutical	319	291	30	-	405	1	2,917	10	3,502	12	6,854	24
	Biochemical and Bioenergy	192	187	6	-	54	-	655	4	1,613	9	2,328	12
	Biofood	175	174	4	-	40	-	928	5	1,768	10	2,740	16
	Bioenvironmental	65	64	1	-	6	-	169	3	121	2	297	5
	Biomedical Equipment	95	95	1	-	67	1	451	5	1,534	16	2,053	22
	Bioinstrument and Bioequipment	53	52	1	-	17	-	118	2	262	5	398	8
	Bioresource	19	18	0	0	1	-	41	2	135	8	177	10
	Bioservice	85	85	10	-	221	3	864	10	1,029	12	2,124	25
Total Size of Workers	1 - 49	598	592	4	-	52	-	570	1	1,042	2	1,668	3
	50 - 299	246	239	9	-	172	1	1,967	8	3,831	16	5,979	25
	300 - 999	69	66	11	-	232	4	986	15	2,363	36	3,592	54
	1,000 or more	31	31	24	1	323	10	2,465	80	2,395	77	5,207	168
	Unknown	59	38	5	-	32	1	155	4	333	9	525	14
By Area	Seoul	229	202	3	-	63	-	405	2	671	3	1,142	6
	Busan	14	14	1	-	0	0	6	-	29	2	36	3
	Incheon	21	21	9	-	213	10	1,628	78	1,111	53	2,961	141
	Daegu	17	17	0	0	4	-	166	10	367	22	537	32
	Gwangju	10	10	0	0	0	0	4	-	3	-	7	1
	Daejeon	82	82	3	-	45	1	237	3	293	4	578	7
	Ulsan	6	6	2	-	20	3	154	26	234	39	410	68
	Sejong	3	3	0	0	0	0	103	34	66	22	169	56
	Gyeonggi	319	313	9	-	207	1	1,231	4	2,913	9	4,360	14
	Gangwon	51	49	0	0	38	1	350	7	887	18	1,275	26
	Chungbuk	81	81	21	-	194	2	1,111	14	1,861	23	3,187	39
	Chungnam	46	46	1	-	8	-	149	3	656	14	814	18
	Jeonbuk	32	32	2	-	6	-	189	6	378	12	575	18
	Jeonnam	35	35	1	-	1	-	115	3	143	4	260	7
	Gyeongbuk	24	23	1	-	10	-	139	6	198	9	348	15
	Gyeongnam	24	23	0	0	1	-	138	6	77	3	216	9
	Jeju	9	9	0	0	1	-	18	2	77	9	96	11

		No. of Companies	No. of Respondents	Other Positions including Sales/Administrative									
				Doctor's		Master's		Bachelor's		Others		Total	
				Total	Average	Total	Average	Total	Average	Total	Average	Total	Average
Total		**1,003**	**966**	**308**	**-**	**1,717**	**2**	**12,189**	**13**	**2,465**	**3**	**16,679**	**17**
Core Industries	Biopharmaceutical	319	291	171	1	757	3	5,005	17	1,047	4	6,980	24
	Biochemical and Bioenergy	192	187	28	-	164	1	1,748	9	332	2	2,272	12
	Biofood	175	174	23	-	156	1	1,385	8	415	2	1,979	11
	Bioenvironmental	65	64	1	-	22	-	336	5	45	1	404	6
	Biomedical Equipment	95	95	46	-	275	3	1,392	15	340	4	2,053	22
	Bioinstrument and Bioequipment	53	52	4	-	29	1	616	12	141	3	790	15
	Bioresource	19	18	0	0	62	3	520	29	33	2	615	34
	Bioservice	85	85	35	-	252	3	1,187	14	112	1	1,586	19
Total Size of Workers	1 - 49	598	592	45	-	204	-	2,281	4	304	1	2,834	5
	50 - 299	246	239	61	-	554	2	5,253	22	1,166	5	7,034	29
	300 - 999	69	66	147	2	570	9	2,012	30	351	5	3,080	47
	1,000 or more	31	31	47	2	280	9	1,908	62	565	18	2,800	90
	Unknown	59	38	8	-	109	3	735	19	79	2	931	25
By Area	Seoul	229	202	62	-	369	2	2,194	11	354	2	2,979	15
	Busan	14	14	1	-	8	1	107	8	28	2	144	10
	Incheon	21	21	64	3	209	10	674	32	80	4	1,027	49
	Daegu	17	17	5	-	16	1	437	26	284	17	742	44
	Gwangju	10	10	0	0	6	1	16	2	2	-	24	2
	Daejeon	82	82	20	-	59	1	590	7	58	1	727	9
	Ulsan	6	6	2	-	34	6	439	73	51	9	526	88
	Sejong	3	3	0	0	0	0	37	12	3	1	40	13
	Gyeonggi	319	313	42	-	454	1	3,548	11	723	2	4,767	15
	Gangwon	51	49	35	1	149	3	756	15	130	3	1,070	22
	Chungbuk	81	81	43	1	245	3	2,047	25	511	6	2,846	35
	Chungnam	46	46	20	-	88	2	527	11	85	2	720	16
	Jeonbuk	32	32	2	-	23	1	233	7	62	2	320	10
	Jeonnam	35	35	6	-	24	1	216	6	34	1	280	8
	Gyeongbuk	24	23	5	-	16	1	163	7	28	1	212	9
	Gyeongnam	24	23	0	0	12	1	132	6	7	-	151	7
	Jeju	9	9	1	-	5	1	73	8	25	3	104	12

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

		No. of Companies	No. of Respondents	2019											
				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		**1,003**	**946**	**6,992,398**	**7,392**	**995,464**	**1,052**	**7,987,862**	**8,444**	**1,839,677**	**1,945**	**746,677**	**789**	**2,586,354**	**2,734**
Core Industries	Biopharmaceutical	319	292	3,073,595	10,526	538,507	1,844	3,612,102	12,370	1,311,581	4,492	382,946	1,311	1,694,527	5,803
	Biochemical and Bioenergy	192	184	3,397,146	18,463	146,930	799	3,544,076	19,261	147,326	801	92,394	502	239,720	1,303
	Biofood	175	167	220,786	1,322	110,222	660	331,008	1,982	129,144	773	82,080	491	211,224	1,265
	Bioenvironmental	65	64	26,812	419	11,020	172	37,832	591	13,246	207	7,165	112	20,411	319
	Biomedical Equipment	95	92	106,741	1,160	59,797	650	166,538	1,810	101,860	1,107	54,873	596	156,733	1,704
	Bioinstrument and Bioequipment	53	49	17,910	366	2,854	58	20,764	424	13,087	267	2,654	54	15,741	321
	Bioresource	19	18	26,383	1,466	2,487	138	28,870	1,604	11,084	616	2,487	138	13,571	754
	Bioservice	85	80	123,025	1,538	123,647	1,546	246,672	3,083	112,349	1,404	122,078	1,526	234,427	2,930
Total Size of Workers	1 - 49	598	584	336,069	575	123,876	212	459,945	788	282,575	484	115,221	197	397,796	681
	50 - 299	246	235	534,819	2,276	228,154	971	762,973	3,247	463,341	1,972	194,681	828	658,022	2,800
	300 - 999	69	63	592,847	9,410	197,694	3,138	790,541	12,548	311,107	4,938	151,813	2,410	462,920	7,348
	1,000 or more	31	30	5,293,836	176,461	441,798	14,727	5,735,634	191,188	745,340	24,845	284,172	9,472	1,029,512	34,317
	Unknown	59	34	234,827	6,907	3,942	116	238,769	7,023	37,314	1,097	790	23	38,104	1,121
By Area	Seoul	229	203	386,380	1,903	82,926	409	469,306	2,312	218,468	1,076	49,991	246	268,459	1,322
	Busan	14	13	3,166	244	1,226	94	4,392	338	3,166	244	1,100	85	4,266	328
	Incheon	21	19	272,057	14,319	170,748	8,987	442,805	23,306	243,867	12,835	170,248	8,960	414,115	21,796
	Daegu	17	17	86,387	5,082	16,299	959	102,686	6,040	6,469	381	13,099	771	19,568	1,151
	Gwangju	10	10	1,192	119	320	32	1,512	151	982	98	285	29	1,267	127
	Daejeon	82	78	185,830	2,382	106,475	1,365	292,305	3,748	74,552	956	69,446	890	143,998	1,846
	Ulsan	6	6	44,370	7,395	23,892	3,982	68,262	11,377	26,158	4,360	19,342	3,224	45,500	7,583
	Sejong	3	3	34,622	11,541	25,939	8,646	60,561	20,187	30,322	10,107	13,803	4,601	44,125	14,708
	Gyeonggi	319	303	4,329,555	14,289	355,258	1,172	4,684,813	15,461	715,454	2,361	225,849	745	941,303	3,107
	Gangwon	51	49	80,096	1,635	35,071	716	115,167	2,350	69,034	1,409	23,551	481	92,585	1,889
	Chungbuk	81	78	1,380,059	17,693	103,300	1,324	1,483,359	19,017	354,610	4,546	93,740	1,202	448,350	5,748
	Chungnam	46	46	97,308	2,115	12,674	276	109,982	2,391	27,428	596	8,096	176	35,524	772
	Jeonbuk	32	32	36,104	1,128	33,534	1,048	69,638	2,176	16,983	531	31,066	971	48,049	1,502
	Jeonnam	35	33	8,022	243	6,411	194	14,433	437	6,942	210	6,391	194	13,333	404
	Gyeongbuk	24	24	35,826	1,493	14,744	614	50,570	2,107	34,160	1,423	14,038	585	48,198	2,008
	Gyeongnam	24	23	6,658	289	1,404	61	8,062	351	6,316	275	1,389	60	7,705	335
	Jeju	9	9	4,766	530	5,243	583	10,009	1,112	4,766	530	5,243	583	10,009	1,112

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

		No. of Respondents (Multiple Responses)	Domestic Sales	Exports	Total
			Total	Total	Total
Total		**1,171**	**5,611,134**	**6,712,371**	**12,323,505**
By Area	Seoul	173	387,666	177,298	564,964
	Busan	13	5,164	8,600	13,764
	Incheon	17	61,591	2,388,519	2,450,110
	Daegu	21	53,427	45,233	98,660
	Gwangju	8	2,663	0	2,663
	Daejeon	83	130,678	31,728	162,406
	Ulsan	8	617,174	5,490	622,664
	Sejong	1	1,287	0	1,287
	Gyeonggi	369	1,948,943	2,996,648	4,945,591
	Gangwon	80	187,629	294,880	482,509
	Chungbuk	152	1,342,715	612,597	1,955,312
	Chungnam	67	154,582	11,271	165,853
	Jeonbuk	54	219,542	48,737	268,279
	Jeonnam	45	235,607	21,457	257,064
	Gyeongbuk	27	211,848	51,347	263,195
	Gyeongnam	40	37,861	12,341	50,202
	Jeju	13	12,757	6,225	18,982
Industry with Sales Generated	Biopharmaceutical	193	1,623,645	2,615,212	4,238,857
	Biochemical and Bioenergy	268	1,734,048	121,067	1,855,115
	Biofood	276	1,278,821	2,407,803	3,686,624
	Bioenvironment	58	55,068	633	55,701
	Biomedical Equipmental	144	268,614	684,941	953,555
	Bioinstrument and Bioequipment	57	71,213	36,554	107,767
	Bioresource	21	154,293	24,429	178,722
	Bioservice	154	425,432	821,734	1,247,166
Seoul	Biopharmaceutical	24	63,476	12,725	76,201
	Biochemical and Bioenergy	29	21,079	750	21,829
	Biofood	14	13,176	112	13,288
	Bioenvironmental	3	7,522	0	7,522
	Biomedical Equipment	22	39,832	57,414	97,246
	Bioinstrument and Bioequipment	7	4,751	1,131	5,882
	Bioresource	7	3,609	145	3,754
	Bioservice	67	234,221	105,022	339,243
Busan	Biopharmaceutical	1	0	8,579	8,579
	Biochemical and Bioenergy	4	2,371	0	2,371
	Biofood	3	2,170	0	2,170
	Bioenvironmental	3	192	0	192
	Bioservice	2	431	21	452
Incheon	Biopharmaceutical	9	2,500	1,684,441	1,686,941
	Biochemical and Bioenergy	3	6,980	350	7,330
	Bioinstrument and Bioequipment	1	100	0	100
	Bioservice	4	52,011	703,729	755,740
Daegu	Biopharmaceutical	6	39,422	38,921	78,343
	Biochemical and Bioenergy	2	480	0	480
	Biofood	2	651	587	1,238
	Bioenvironmental	3	4,545	0	4,545
	Biomedical Equipment	4	7,951	5,725	13,676
	Bioinstrument and Bioequipment	1	140	0	140
	Bioservice	3	238	0	238
Gwangju	Biochemical and Bioenergy	1	60	0	60
	Biofood	1	738	0	738
	Bioenvironmental	2	115	0	115
	Biomedical Equipment	1	793	0	793
	Bioresource	1	50	0	50
	Bioservice	2	907	0	907
Daejeon	Biopharmaceutical	6	27,761	17,046	44,807
	Biochemical and Bioenergy	34	75,975	9,110	85,085
	Biofood	13	6,165	414	6,579
	Bioenvironmental	2	4,250	0	4,250
	Biomedical Equipment	8	4,384	2,693	7,077
	Bioinstrument and Bioequipment	8	7,216	2,448	9,664
	Bioresource	3	1,837	0	1,837
	Bioservice	9	3,090	17	3,107
Ulsan	Biochemical and Bioenergy	6	611,226	5,490	616,716
	Bioenvironmental	2	5,948	0	5,948

		No. of Respondents (Multiple Responses)	Domestic Sales	Exports	Total
			Total	Total	Total
Total		**1,171**	**5,611,134**	**6,712,371**	**12,323,505**
Sejong	Biofood	1	1,287	0	1,287
Gyeonggi	Biopharmaceutical	65	214,986	256,345	471,331
	Biochemical and Bioenergy	67	609,403	69,735	679,138
	Biofood	74	772,377	2,351,227	3,123,604
	Bioenvironmental	20	23,712	128	23,840
	Biomedical Equipment	57	90,413	272,142	362,555
	Bioinstrument and Bioequipment	32	47,778	30,175	77,953
	Bioresource	4	84,971	12,312	97,283
	Bioservice	50	105,303	4,585	109,888
Gangwon	Biopharmaceutical	22	74,061	86,476	160,537
	Biochemical and Bioenergy	8	3,758	636	4,394
	Biofood	23	44,435	7,333	51,768
	Bioenvironmental	5	1,058	0	1,058
	Biomedical Equipment	18	62,984	199,837	262,821
	Bioinstrument and Bioequipment	2	290	598	888
	Bioservice	2	1,043	0	1,043
Chungbuk	Biopharmaceutical	37	1,012,572	458,471	1,471,043
	Biochemical and Bioenergy	28	71,601	24,809	96,410
	Biofood	51	169,517	4,759	174,276
	Bioenvironmental	1	459	0	459
	Biomedical Equipment	22	47,427	113,513	160,940
	Bioinstrument and Bioequipment	1	6,000	350	6,350
	Bioresource	2	9,262	2,819	12,081
	Bioservice	10	25,877	7,876	33,753
Chungnam	Biopharmaceutical	12	29,627	898	30,525
	Biochemical and Bioenergy	14	25,060	0	25,060
	Biofood	28	41,581	4,138	45,719
	Bioenvironmental	1	16	0	16
	Biomedical Equipment	6	9,360	4,383	13,743
	Bioinstrument and Bioequipment	5	4,938	1,852	6,790
	Bioresource	1	44,000	0	44,000
Jeonbuk	Biopharmaceutical	2	1,425	0	1,425
	Biochemical and Bioenergy	16	63,197	249	63,446
	Biofood	25	150,866	18,155	169,021
	Bioenvironmental	5	536	0	536
	Biomedical Equipment	2	2,636	28,196	30,832
	Bioresource	1	0	2,137	2,137
	Bioservice	3	882	0	882
Jeonnam	Biopharmaceutical	1	620	291	911
	Biochemical and Bioenergy	24	210,177	1,853	212,030
	Biofood	7	5,730	11,306	17,036
	Bioenvironmental	9	6,015	505	6,520
	Biomedical Equipment	1	1,096	0	1,096
	Bioresource	1	10,540	7,017	17,557
	Bioservice	2	1,429	485	1,914
Gyeongbuk	Biopharmaceutical	4	151,747	44,816	196,563
	Biochemical and Bioenergy	11	14,581	115	14,696
	Biofood	8	44,408	6,018	50,426
	Bioenvironmental	1	100	0	100
	Biomedical Equipment	2	988	397	1,385
	Bioservice	1	24	0	24
Gyeongnam	Biopharmaceutical	3	3,545	6,201	9,746
	Biochemical and Bioenergy	18	13,360	3,526	16,886
	Biofood	17	19,606	1,972	21,578
	Bioenvironmental	1	600	0	600
	Biomedical Equipment	1	750	641	1,391
Jeju	Biopharmaceutical	1	1,903	0	1,903
	Biochemical and Bioenergy	3	4,740	4,443	9,183
	Biofood	9	6,114	1,781	7,895

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

		No. of Respondents (Multiple Responses)	Imports
			Total
Total		**311**	**1,964,445**
By Area	Seoul	172	1,615,816
	Busan	1	1,632
	Incheon	5	5,963
	Daegu	1	6
	Gwangju	1	103
	Daejeon	15	3,943
	Ulsan	2	443
	Sejong	0	
	Gyeonggi	60	111,011
	Gangwon	8	26,111
	Chungbuk	23	150,105
	Chungnam	7	12,837
	Jeonbuk	4	210
	Jeonnam	4	20,457
	Gyeongbuk	4	4,121
	Gyeongnam	3	11,571
	Jeju	1	117
Industry Performing Imports	Biopharmaceutical	191	1,644,278
	Biochemical and Bioenergy	40	105,573
	Biofood	39	56,652
	Bioenvironmental	3	148
	Biomedical Equipment	16	54,316
	Bioinstrument and Bioequipment	15	73,389
	Bioresource	4	26,712
	Bioservice	3	3,378
Seoul	Biopharmaceutical	152	1,448,248
	Biochemical and Bioenergy	7	63,026
	Biofood	3	17,018
	Biomedical Equipment	6	36,730
	Bioinstrument and Bioequipment	4	50,794
Busan	Biochemical and Bioenergy	1	1,632
Incheon	Biopharmaceutical	2	2,209
	Biochemical and Bioenergy	1	245
	Bioinstrument and Bioequipment	1	207
	Bioservice	1	3,302
Daegu	Biofood	1	6
Daejeon	Biopharmaceutical	1	103
	Biochemical and Bioenergy	3	213
	Biofood	7	1,124
	Bioinstrument and Bioequipment	3	1,927
Ulsan	Biochemical and Bioenergy	2	680
	Bioenvironmental	1	431
Sejong	Bioinstrument and Bioequipment	1	12
Gyeonggi	Biopharmaceutical	14	48,648
	Biochemical and Bioenergy	11	24,554
	Biofood	15	13,743
	Bioenvironmental	2	136
	Biomedical Equipment	7	1,783
	Bioinstrument and Bioequipment	8	21,708
	Bioresource	1	361
	Bioservice	2	76
Gangwon	Biopharmaceutical	2	2,650
	Biochemical and Bioenergy	1	280
	Biofood	3	7,734
	Biomedical Equipment	2	15,447
Chungbuk	Biopharmaceutical	9	124,156
	Biochemical and Bioenergy	3	4,063
	Biofood	9	15,411
	Biomedical Equipment	1	356
	Bioresource	1	6,120

		No. of Respondents (Multiple Responses)	Imports
			Total
Total		**311**	**1,964,445**
Chungnam	Biopharmaceutical	3	6,685
	Biochemical and Bioenergy	1	5,514
	Biofood	3	639
Jeonbuk	Biochemical and Bioenergy	1	12
	Biofood	2	63
	Bioresource	1	135
Jeonnam	Biochemical and Bioenergy	3	361
	Bioresource	1	20,096
Gyeongbuk	Biopharmaceutical	3	2,851
	Biochemical and Bioenergy	1	1,269
Gyeongnam	Biopharmaceutical	1	8,509
	Biochemical and Bioenergy	2	3,062
Jeju	Biofood	1	117

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 or biopharmaceuticals for animals.

1020 Biologically manufactured low-molecular medicine

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 DNAvaccines and animal 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 acitivities to cure cancer, virus infections, and immunological diseases.

1060 Blood products

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

Not Products are categorized by implantation to patient such as naked DNA, naked RNA, various virus vecors, and alleogenic stem cells.

1090 Biological diagnostic products

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

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

1100 Enzymes and live bacteria medicines

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

1110 Biomaterial-based medicines

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

Includes
Placenta medicines and hyaluronic acid products

1120 Veterinary biopharmaceuticals

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

Includes
Veterinary vaccines and veterinary live bacteria medicines

Exception
Feed additives

1000 Other biopharmaceuticals

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

2. Biochemical and bioenergy industry

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

2010 Biopolymers

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

Exception Cell therapeutic products and gene therapeutics

2020 Industrial enzymes and reagents

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

2030 Enzymes and reagents for research

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

2040 Biocosmetics and home & personal care chemicals

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

2050 Biological agrochemicals and fertilizers

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

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

2060 Biofuels

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

2000 Other biochemical and bioenergy products

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

Not 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 Ac.t")

3020 Food-grade microorganisms & enzymes

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

Exception Functional health foods

3030 Food additives

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

Exception Functional health foods

3040 Fermented foods

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

Exception Functional health foods

3050 Feed additives

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

Exception Feed ingredients (single ingredients)

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 bioderivates 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, and animals) for environmental cleanup, reducing/preventing environmental pollution and environmental restoration, including construction and installation services associated with selling such products.

4020 Materials and equipments for bio-immobilization

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

4030 Bioenvironmental agents and systems for treatment and recycling

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

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

4040 Measuring apparatus and service for environmental pollution and assessment

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

Exception Biosensors

4000 Other bioenvironmental 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 biomarks as its contrast medium.

Includes Medical instrumets that utilize biomarkers and biosensors.

5000 Other biomedical equipments

Other biomedical components and materials that are not classified above

6. Bioinstrument and bioequipment industry

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

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

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

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

6020 Cell analysis and cultivation equipments

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

Includes Cell counter, incubator, and bioreactor

6030 Multi-functional and other bioanalysis instruments

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

Includes Spectrophotometer, plate reader, and HPLC

6040 R&D and manufacturing equipments

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

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

6050 Bioprocess equipment parts

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

Includes Disposable bioreactor bag and mixing bag

6000 Other bioinstruments and bioequipments

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

7. Bioresource industry

Industrial activities of utilizing organisms (e.g., microorganisms, plants, animals, and virus) or their derivatives (e.g., tissue, cell, nucleic acids, proteins, and 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.

Not Includes both land and marine aquatic organisms and are classified as food, feed, and processing.

7030 Experimental animals

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

7000 Other bioresources

Other bioresources that are not classified above

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

8. Bioservice industry

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

8010 Bio-consignment production and procuration services

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

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

8020 Bio-diagnostic and analytical services

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

8030 Clinical/non-clinical R&D services

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

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

8040 Other R&D services

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

8050 Processing, and 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 and expansion.

Includes

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

[Appendix] Biotechnology Classification Code

A. Genetic engineering

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

A1. Gene manipulation

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

Corresponding List

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

A2. Gene expression and regulation

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

Corresponding List

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

A209. RNA interference

A3. Gene application

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

Corresponding List

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

A4. Gene therapy

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

Corresponding List

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

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

B. Protein engineering

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

B1. Protein structure analysis

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

Corresponding List

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

B2. Protein function analysis

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

Corresponding List

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

B3. Complex protein engineering

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

Corresponding List

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

B4. Peptide engineering

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

Corresponding List

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

B5. Protein application

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

Corresponding List

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

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

C. Other macromolecule engineering

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

C1. Lipid engineering

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

Corresponding List

C101. Functional lipid development

C2. Carbohydrate engineering

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

Corresponding List

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

C0. Other macromolecule engineering

D. Therapeutic cell and tissue engineering

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

D1. Therapeutic cell utilization

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

Corresponding List

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

D2. Bioenvironment regulation

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

Corresponding List

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

D3. Functional biomaterial development

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

Corresponding List

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

D4. Cell engineering

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

Corresponding List

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

D5. Tissue engineering

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

Corresponding List

D501. Tissue assays
D502. Tissue microencapsulation
D503. Tissue manipulation
D504. Tissue culture

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

E. System biology and bioinformatics

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

E1. Gene sequence analysis

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

Corresponding List

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

E2. Functional genomics

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

Corresponding List

E201. Proteome-related technology
E202. Genetic functional network analysis E203. Comparative genomics
E204. Pharmacogenomics
E205. Toxicogenomics
E206. Gene targeting
E207. Transcriptomics
E208. Genotyping
E209. Haplotype profiling
E210. Genome-wide gene trapping
E211. Inverse genomics

E3. Proteomics

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

Corresponding List

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

E4. Bioinformatics

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

Corresponding List

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

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

F. Metabolic engineering

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

F1. Metabolite production

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

Corresponding List

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

F2. Applications of metabolic engineering

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

Corresponding List

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

F3. Understanding the metabolism and metabolic pathway

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

Corresponding List

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

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

Corresponding List

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

G. Bioprocess

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

G1. Fermentation engineering

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

Corresponding List

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

G2. Cell culture engineering

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

Corresponding List

G201. Animal cell culture engineering
G202. Plant cell culture engineering
G203. Insect cell culture engineering
G204. Cell line development
G205. Media development and optimization
G206. Immobilized cell culture technology
G207. Continuous/Perfusion cell culture technology

G3. Biotransformation

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

Corresponding List

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

G4. Bioseparation engineering

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

Corresponding List

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

G5. Industrialization

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

Corresponding List

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

G0. Other Bioprocesses, N.E.S.

Corresponding List

G001. Bioleaching
G002. Cryopreservation

H. Bioresource production and utilization

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

H1. Plant resource utilization technology

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

Corresponding List

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

H2. Animal resource utilization technology

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

Corresponding List

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

H3. Microbial resource utilization technology

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

Corresponding List

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

H4. Insect resource utilization technology

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

Corresponding List

H401. Functional insects and their material utilization
H402. Utilization of insect organs and insect cell lines
H403. Preservation of insect resource and search for its application
H404. Utilization of insect-based microorganisms

H5. Marine/freshwater organism technology

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

Corresponding List

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

H6. Food engineering

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

Corresponding List

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

H7. Biomaterializing technology

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

Corresponding List

H701. Metabolism-enhancing biomaterial screening
H702. Biomaterial production and utilization
H703. Biomaterial functionality evaluation
H704. Biomaterial separation and purification
H705. Biomimetry
H706. Molecular high-throughput screening

H8. Biodiversity conservation

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

Corresponding List

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

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

Corresponding List

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

I. Environmental biotechnology and bioenergy technology

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

I1. Clean technology

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

Corresponding List

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

I2. Environmental pollution control and management technology

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

Corresponding List

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

I3. Bioenergy technology

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

Corresponding List

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

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

J. Nanobiotechnology

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

J1. Nano-biodevice fabrication

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

Corresponding List

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

J2. 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 nanobiochip
J203. Hybrid nanomaterial manufacturing
J204. Bio-nanoparticle manufacturing
J205. Bio-nanomaterial thin film fabrication

J3. Nano drug delivery system

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

Corresponding List

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

J4. BioNEMaster's (Nanoelectromechanical systems), nano-LOC (lab-on-a-chip)

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

Corresponding List

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

J0. Nanobiotechnology, N.E.S.

K. Bioelectronics engineering

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

K1. Biosensor fabrication

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

Corresponding List

K101. Biomaterial immobilization
K102. Sensor array fabrication
K103. Biomolecule recognition analysis
K104. Sensor system design
K105. Signal detection and transduction
K106. Remote transmission

K2. Bioelectronic device fabrication

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

Corresponding List

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

K3. Biochip fabrication

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

Corresponding List

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

K4. Microfluidics

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

Corresponding List

K401. Plastic microfabrication
K402. Microfluidics transport
K403. Low Reynolds number flow
K404. Multiscale flow simulation
K405. Microflow driving & manipulation
K406. Micro/nano scale particle manipulation
K407. Microflow visualization & diagnosis

K0. Bioelectronics, N.E.S.

L. Biosafety and efficacy evaluation

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

L1. Safety evaluation

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

Corresponding List

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

L2. Safety management

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

Corresponding List

L201. Safety management
L202. HACCP (hazard analysis critical control points)
L203. Safety management of 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. Other biosafety and efficacy evaluation, N.E.S.

M. Other biotechnology

M1. Combinational biology

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

Corresponding List

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

M2. Drug delivery

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

Corresponding List

M201. Controlled release formulation
M202. Biomaterials for drug delivery
M203. Structure manipulation and property analysis
M204. Carrier development
M205. Molecular target discovery

M3. Immunotherapy

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

Corresponding List

M301. Immunomodulator
M302. Immunotherapeutics
M303. Targeted immunotherapy

M0. Other biotechnology, N.E.S.

Appendix 2. Survey Questionnaire

승인번호
제 115015 호

Survey on Domestic Bioindustry 2019

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, 2019 to December 31, 2019.

Please note that your response will be used as a basis for the government's bioindustry-related policies and industrial development of the country. Please fill out each item as accurately and faithfully as possible.

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

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

산업통상자원부

koreaBio 한국바이오협회

Ⅰ. General Information

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

Ⅱ. General Status of Company

9. How much is your company's capital **as of the end of 2019**? (Unit: KRW)

Trillion	100 billion	10 billion	Billion	100 million	10 million	Million

* Capital paid by the incorporated company (headquarters) as of December 31, 2019.

10. How much is your total and equity capital **as of the end of 2019**? (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 2019?

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

* Nunber 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 2019
☐ 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 2019
	☐ ① KONEX-listed company
	☐ ② KOSDAQ-listed company
	☐ ③ Listed company
	☐ ④ N/A

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

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

13. How much is your company's net income or net loss as of year 2019 (Jan 1 – Dec 31, 2019) ?
Please fill in **the sum of each item as shown on your income statement**. (Unit: KRW)

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

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

Ⅲ. Bioindustry

14. Please select **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**.

		Biopharmaceutical	Biochemical and Bioenergy	Biofood	Bioenvironment	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 1> with the Bioindustry Classification Scheme on page 11.
* For a detailed explanation of the definition and classification scheme for each industry, refer to the explanation in <Example 2> with the Bioindustry Classification Scheme on pages 12-17.

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

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

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

16. Please fill in your company's **R&D and facility investment costs for the entire period of 2019**. (Unit: KRW)
* This is the total expenditure that your company may have invested in R&D activities for product and technology development for the entire period of 2019. 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 2019 (Jan 1 – Dec 31, 2019)	Total Investment (Bioindustry + other)	10 billion	Billion	100 million	10 million	Million	10 billion	Billion	100 million	10 million	Million
		(Unit: KRW)					(Unit: KRW)				
	Investment in the Bioindustry	10 billion	Billion	100 million	10 million	Million	10 billion	Billion	100 million	10 million	Million
		(Unit: KRW)					(Unit: 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, R& centers, universities, or medical institutions)** in the bioindustry in between the year (Jan 1 – Dec 31, 2019)?

* 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, R&D centers, universities, or medical institutions)**? **(Multiple responses allowed)**

* Example: In the case of a cooperative relationship in the form of a "joint venture" with an R&D center 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.

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

(1) Joint Venture

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

17-3. Please select the **organization(s)** which you have agreed for a cooperative relationship **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, ② prototype, ④ product development, and ⑤ commercialization (refer to page 6 for more details for each cooperation stage.)

(2) Joint R&D Contract

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

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

* Select a cooperative organization first, then fill in the status of the cooperation stage for each organization.
* Cooperation stages are presented as ① basic research, ② experimental, ② prototype, ④ product development, and ⑤ commercialization (refer to page 6 for more details for each cooperation stage.)

(3) Technical Tie-up (Licensing)							
	Companies			R&D Centers		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: __

17-5. 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 institution first, then fill in the status of the cooperation stage for each cooperative institution.
* Cooperation stages are presented as ① basic research stage, ② experimental stage, ② prototype stage, ④ productization stage, and ⑤ commercialization stage.
(Refer to page 6 for the detailed explanation of each cooperation stage)

(4) Domestic/International Technical Manpower Exchange							
Classification	Companies			R&D Centers		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: __

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 2019 in the table below.

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

* Intermediate products among the corresponding items include raw materials, intermediates, bulk, etc.
* For classification codes, refer to <Example> Bioindustry Classification Scheme on page 11.
* 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 for products, services, or trading technologies in the overseas **bioindustry** that were imported in 2019.

No.	Name (Product name, service name, transaction technology name)	Category	Classification Code	Amount of Import (Unit: thousand USD, CIF)	Name of the Country Imported From	Proportion of Imports by Country (%)
Example)	OOOO	☑ Finished product □ Intermediate product □ Service □ Technology	1 0 1 0	1,000	USA Europe	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				
8		□ Finished product □ Intermediate product □ Service □ Technology				
9		□ 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 Scheme on page 11.
* 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		Industry	Code	Industry	Classification code
Biopharmaceutical	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) Enzymes and live bacteria medicines 1110) Biomaterial-based mediciness 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 2070) Other biochemical and bioenergy products	**Biofood**	3010) Functional health foods 3020) Food-grade microorganisms & enzymessdd 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 equipments	**Bioinstrument and Bioequipment**	6010) Gene/protein/peptide analysis, synthesis, and manufacturing instruments 6020) Cell analysis and cultivation equipments 6030) Multi-functional and other bioanalysis instruments 6040) R&D and manufacturing equipments 6050) Bioprocess equipment parts 6000) Other bioinstruments and bioequipments
Bioresource	7010) Seeds and seedlings 7020) Genetically Modified Organisms for use as food, feed or processing 7030) Experimental animals 7040) Other bioresources	**Bioservice**	8010) Bio-consignment production and procuration services 8020) Bio-diagnostic and analytical services 8030) Clinical/non-clinical R&D services 8040) Other R&D services 8050) Processing, treatment, and warehousing services 8000) Other bioservices		

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