

Report on Survey of Domestic Bioindustry 2021

December 2022

**MINISTRY OF TRADE, INDUSTRY & ENERGY
Korea Biotechnology Industry Organization**

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I. Survey Overview



1 Survey Overview

A. Data Sources

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

B. Type of Statistics and Authorized Number

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

C. Survey Period

- Survey Baseline Date: December 31, 2021
- Targeted Survey Period: January 1, 2021 – December 31, 2021
- Survey Period: June 7, 2022 – October 6, 2022

D. Scope

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

E. Survey Targets

- Primary Selection: Companies based on the Key Findings in 2020
- Secondary Selection: Identification of new companies
 - Stage 1: Companies designated and extracted by Korea Standard Industry Classification (KSIC) linked to the Bioindustry Classification Code (KS J 1009)
 - Stage 2: Check whether the major keywords of the bio area are included based on the selection of keywords in the bio area based on the Bioindustry Classification Code (KS J 1009) and the purpose of company, name of items and services handled, and the name of the research institute.

F. Survey Units

- The survey units refer to companies that sell products or services which went through the production process of value-adding after the assembled capital equipment or raw materials were bought under the control of the entrepreneur.
- The survey units include public enterprises (state-owned enterprises, public enterprises), public - private companies, the private companies (private enterprises, collective enterprises, partnership, joint venture, anonymous company, Co., Ltd., Co., Ltd., co-operatives).
- In case the company has more than two businesses, the survey unit included the sum of the corresponding business' results and received the responses based on the bioindustry results among the overall industrial activities.

G. Methodology and Approach

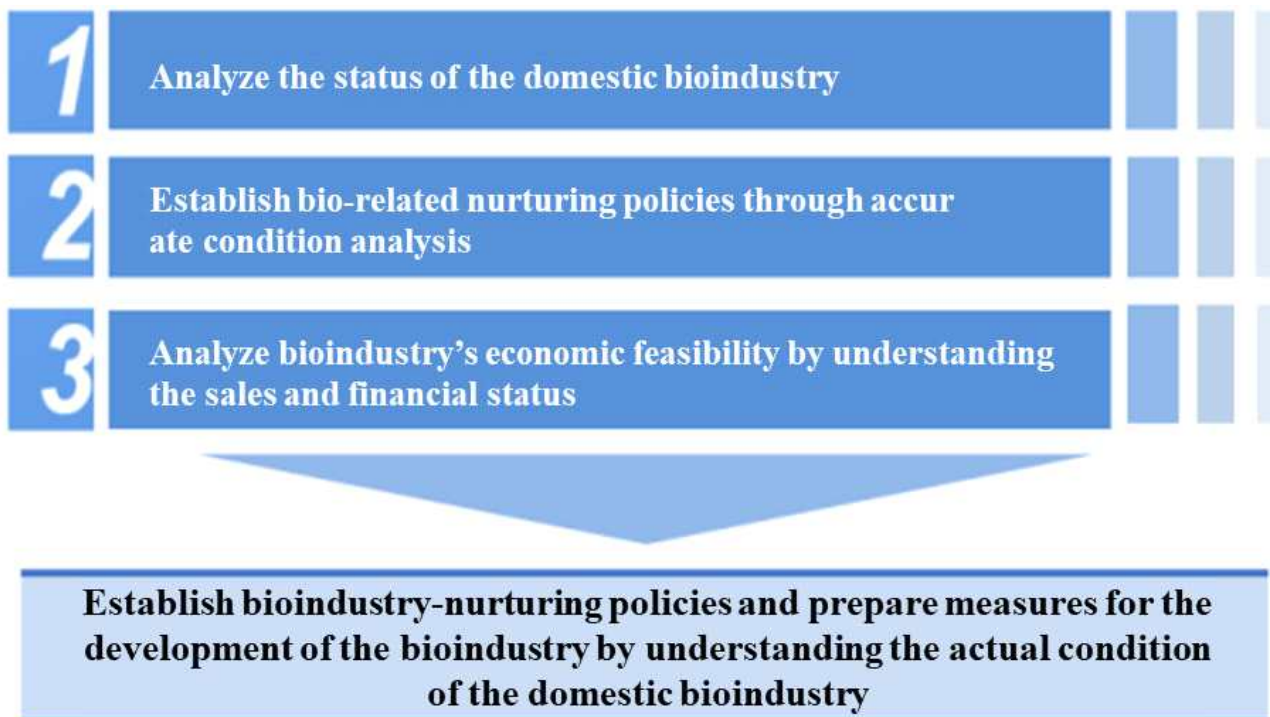
- Survey Methodology: Via mail, fax, e-mail, telephone, face-to-face interview
- Survey Approach: Researcher → Research Company → Korea Biotechnology Industry Organization → Ministry of Trade, Industry and Energy

H. Announcement of Results

- Announcement Period: Once a year
- Form of Announcement: Publication of the Report on Survey of Domestic Bioindustry

2 Background and Purpose

- The Ministry of Trade, Industry and Energy and the Korea Biotechnology Industry Organization have been conducting a fact finding survey on the domestic bioindustry since 2003 to build groundwork for economic analysis, international comparison and establishment of related nurturing policies through analyzing the overall status of bioindustry and its actual condition.
- The "Report on Survey of Domestic Bioindustry Based on 2021," which was first conducted in June 2022, 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	1,281 companies (Among primarily selected 1,362 companies, 81 were excluded due to temporary/permanent close-down and other reasons)
Size of valid sample	1,055 companies (82.4% of the population)

4 Contents

Category	Main Contents of the Survey
Company Information	<ul style="list-style-type: none"> - Name of Company, Name of Representative - Business Registration Number, Corporate-Parent (Group) Name - Phone, Establishment Date - Address - Respondent Information
General Status	<ul style="list-style-type: none"> - Capital, Capital Ratio of Net Worth - Number of Workers - Existence of exclusive business, type of company, place of business - Items in income statement (sales, cost of sales, selling/management expenses, non-operating income/expenses, income tax expenses, etc.)
Status of Bioindustry	<ul style="list-style-type: none"> - Core business - Manpower status - R&D and facility investment costs - Cooperation with other organizations - Phase of growth - Period resulted in sales - Product, service, commerce technology (resulted in sales, export/import)

5 Terminology

A. General Status

- Selected Companies
 - ① Venture company: Refers to companies certified as a venture company by meeting the requirements of venture capital investment, investment in R&D, companies developing new technologies, and technology assessment companies according to the “Act on Special Measures for the Promotion of Venture Businesses.”
 - ② INNO-BIZ: Refers to companies certified as a “Small and Medium-sized Business with Innovative Technology” after being evaluated of its technological competitiveness and internal stability through R&D.
 - ③ MAIN-BIZ: Refers to companies certified as a “Small and Medium-sized Business with Innovative Management” after being evaluated of its innovative activities and capabilities in overall management.
 - ④ Listed Company: Refers to companies that are qualified buy or sell the issued stocks in stock markets such as KOSDAQ and KONEX.
- Capital: Refers to the current amount of capital that is paid by the corporation (headquarters).
- Capital Ratio of Net Worth: Refers to the total amount of capital and is equal to "total capital."

B. Manpower Status

- Received responses from three groups among bioindustry workers: research, production, and others including sales/administrative.
 - ① Research: Refers to the R&D personnel in the bioindustry.
 - ② Production: includes production, facilities and quality management personnel in the bioindustry other than Research
 - 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 2021. It includes selling expenses in the income statement and the manufacturing statement, current development and research expenses for management, and land and equipment acquisition costs related to R&D in the balance sheet.
 - ① R&D Cost: Includes in-house R&D costs (labor costs, material costs, and other expenses), subcontracted R&D costs, technology introduction costs, etc.
 - ② Facility Investment Cost: Includes machinery and equipment, land, and building acquisition costs.
- Generation of Sales
 - ① Sales of finished products directly produced by the company.
 - ② Sales of finished products manufactured by outsourced companies after supplying raw materials or half-finished products.
 - ③ Refers to the generation of revenue resulting from provision of services and transfer of technology. It includes both domestic sales and export activities.

D. Definition of Bioindustry Classification Scheme

1) [KS J 1009] Bioindustry Classification Code

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

<Overview of Bioindustry Classification Scheme>

■ Purpose of Classification

- To clarify the scope of bioindustry
 - Defined companies that use biotechnology in the R&D, manufacturing, production and service phases
- To propose standardized evidences that can be used for bioindustry-related statistics and institutions without confusion
 - Preparing industrial statistics such as profits generated from using biotechnology
- To build groundwork for analysis such as economic structure, industrial structure relationship with other industries
- To secure the connectivity with the classification scheme of international bioindustry
 - Preparing groundwork for comparing and analyzing the statistical data of the international bioindustry

■ Targets and Standard of Classification

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

■ Classification Scheme

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

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

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

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

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

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

2) [Annex] Biotechnology Classification Code

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

<Overview of Biotechnology Classification Scheme>

■ Purpose of Classification

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

■ Target and Standard of Classification

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

■ Classification Scheme

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

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

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

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

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

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

[Special Notes on Statistical Data]

- 1) The missing values (no response, not sure, and none of the above) were excluded from the statistical calculation (statistical analysis was conducted based on 100% with the missing values excluded).
- 2) The sum of detail items and the total sum may not be identical as all the statistical values are rounded values.
- 3) This report calculates down to one place of decimals and related symbols are as the following:
 - 「-」 : none of the above
 - 「0.0」: less than the unit
- 4) Any inquiries on this report should be contacted to the Korea Bio-Economy Research Center of the Korea Biotechnology Industry Organization.
(Tel: +82-31-628-0040, 0020)

II. Key Findings



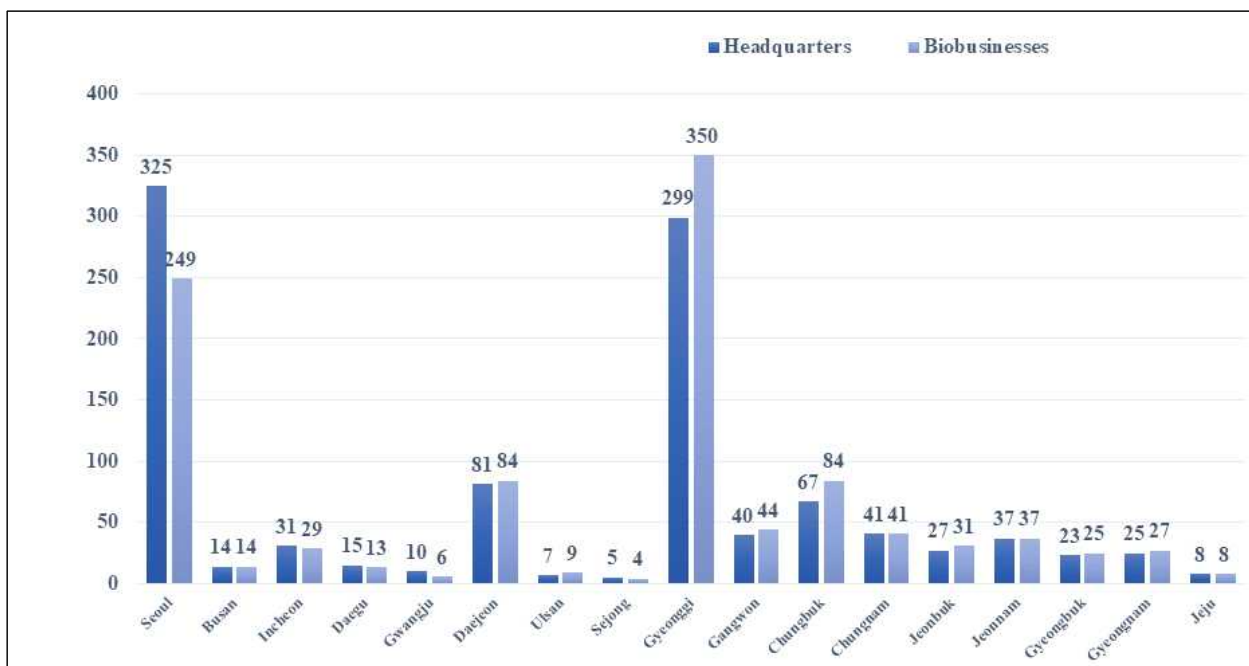
1 General Status of Bioindustry

A. Bioindustry's Distribution per Place

- Headquarters and biobusinesses are mostly located in Seoul and Gyeonggi Province, with 325 headquarters in Seoul, 299 in Gyeonggi Province, and 249 biobusinesses in Seoul and 350 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 36.6% > Seoul 34.2% > Chungbuk 8.1%
 - Biochemical and Bioenergy Industry: Gyeonggi 23.9% > Daejeon 11.9% > Seoul 10.9%
 - Biofood Industry: Gyeonggi 27.4% > Chungbuk 13.7% > Seoul 10.3%
 - Bioenvironmental Industry: Gyeonggi 35.5% > Jeonnam 11.3% > Seoul/Incheon/Busan/Gangwon 6.5%
 - Biomedical Equipment Industry: Gyeonggi 38.5% > Seoul 25.7% > Daejeon 9.2%
 - Bioinstrument and Bioequipment Industry: Gyeonggi 52.7% > Seoul 18.2% > Daejeon 16.4%
 - Bioresource Industry: Gyeonggi 46.7% > Seoul/Daejeon/Chungbuk 13.3% > Jeonbuk/Jeonnam 6.7%
 - Bioservice Industry: Seoul 48.6% > Gyeonggi 30.5% > Daejeon 7.6%

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

(Unit: companies)

Industrial Category	Total	Seoul	Busan	Incheon	Daegu	Gwangju	Daejeon	Ulsan	Sejong
Total	1,055	249	14	29	13	6	84	9	4
Biopharmaceutical	333	114	3	13	2	-	19	1	-
Biochemical and Bioenergy	201	22	3	6	4	1	24	6	1
Biofood	175	18	3	-	2	1	9	-	2
Bioenvironmental	62	4	4	4	3	1	3	2	-
Biomedical Equipment	109	28	1	2	-	1	10	-	-
Bioinstrument and Bioequipment	55	10	-	1	1	-	9	-	1
Bioresource	15	2	-	-	-	-	2	-	-
Bioservice	105	51	-	3	1	2	8	-	-
Industrial Category	Gyeonggi	Gangwon	Chungbuk	Chungnam	Jeonbuk	Jeonnam	Gyeongbuk	Gyeongnam	Jeju
Total	350	44	84	41	31	37	25	27	8
Biopharmaceutical	122	11	27	11	1	1	4	3	1
Biochemical and Bioenergy	48	8	15	10	12	15	10	12	4
Biofood	48	10	24	15	12	12	7	9	3
Bioenvironmental	22	4	2	1	1	7	2	2	-
Biomedical Equipment	42	8	9	3	1	1	2	1	-
Bioinstrument and Bioequipment	29	1	2	1	-	-	-	-	-
Bioresource	7	-	2	-	1	1	-	-	-
Bioservice	32	2	3	-	3	-	-	-	-

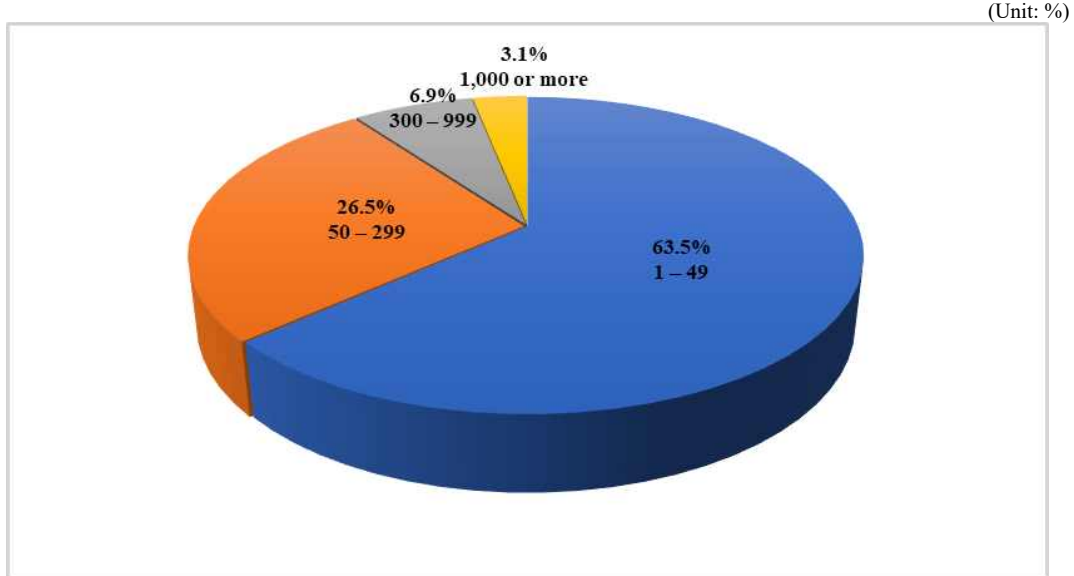
* The result analyzed the results of 1 core business that was selected for each company.

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

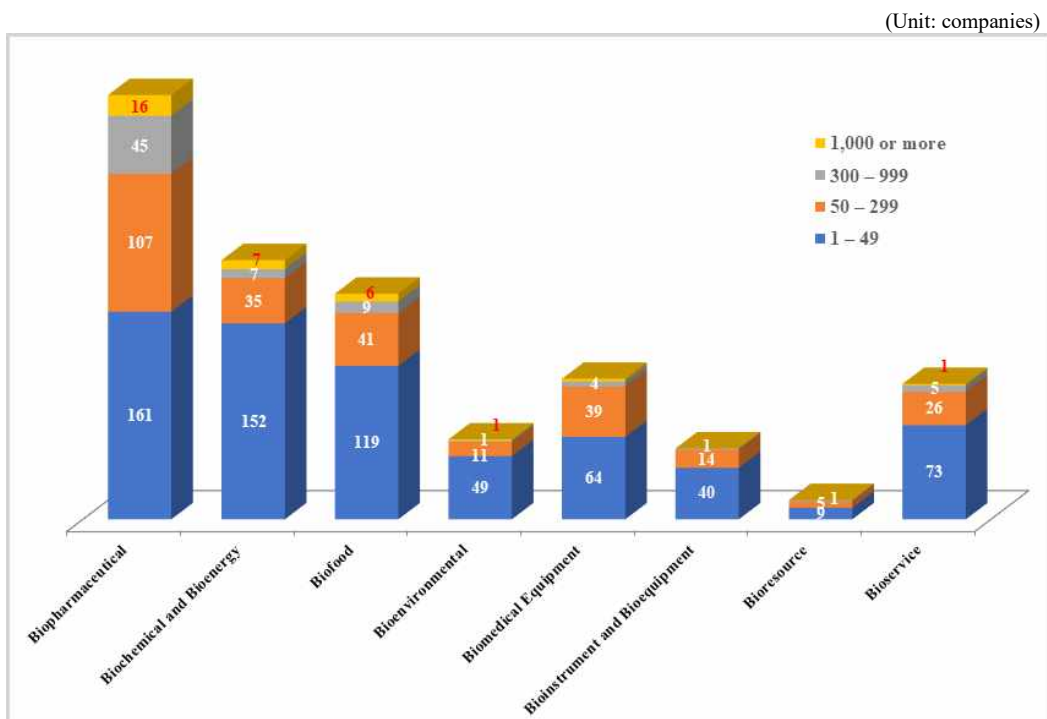
B. Bioindustry's Distribution per Size of Workers

- There are 667 companies (63.5%) that belong to "less than 50 workers" among total size of workers (excluding 4 unclassified companies.)
- There were 33 companies (3.1%) 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



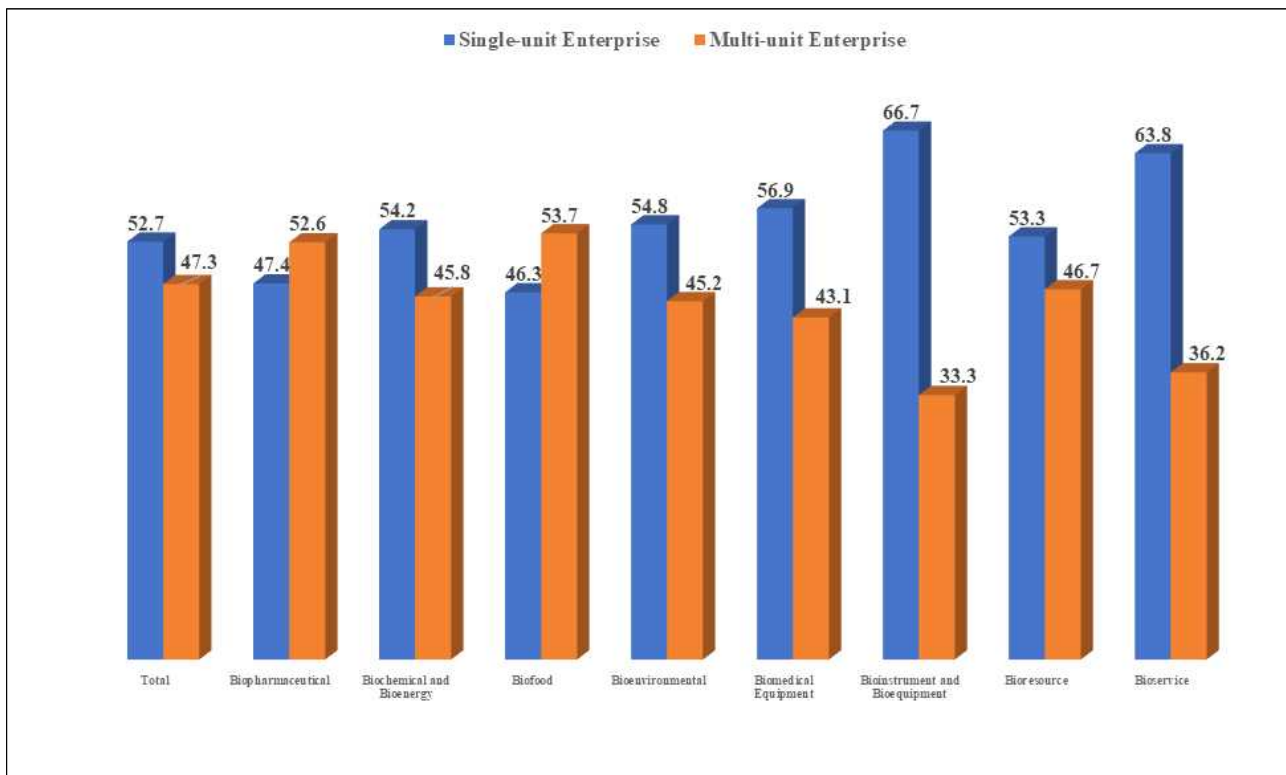
* Companies that did not have information on the size of workers were excluded from the statistical data.

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

- Bioindustry's existence of other businesses refers to the existence of plants, R&D centers or branches in other location.
- Companies that do not have factories, R&D centers, or branches in other locations are categorized as "single-unit enterprise," while companies that have plants, branches, R&D centers, stores in other locations are categorized as "multi-unit enterprise."
- Out of 1,055 bioindustry companies, 552 companies (52.7%) are "single-unit enterprises" and 496 companies (47.3%) are "multi-unit enterprises" (excluding 7 unclassified companies.)

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

(Unit: %)



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

D. Bioindustry's Financial Analysis

- The average capital of all bioindustry companies was surveyed as KRW 11.3 billion and the ratio of net worth was 38%.
- Companies in biochemical and bioenergy industry had higher average amount of capital reaching KRW 21.3 billion. Companies in bioenvironmental industry and companies in biomedical equipment industry had higher value compared to other bioindustries with average ratio of net worth reaching 50% and 49%, respectively.

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

(Unit: companies, million KRW, %)

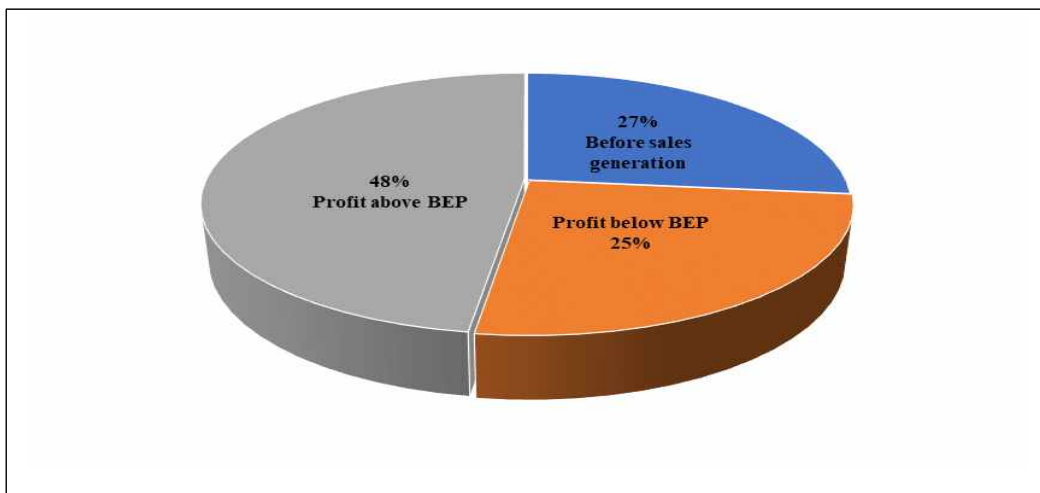
Industrial Category	No. of Companies	Capital				Ratio of Net Worth			
		No. of Respondents	Minimum	Maximum	Average	No. of Respondents	Minimum	Maximum	Average
Total	1,055	985	3	1,488,993	11,283	969	-1,678	100	38
Biopharmaceutical	333	316	8	391,406	14,820	315	-850	100	38
Biochemical and Bioenergy	201	183	3	1,488,993	21,344	179	-806	98	43
Biofood	175	160	50	368,842	7,516	158	-457	97	40
Bioenvironmental	62	56	30	10,846	1,340	55	-103	88	50
Biomedical Equipment	109	103	50	51,636	4,933	101	-157	95	49
Bioinstrument and Bioequipment	55	53	40	13,400	1,254	52	-151	100	45
Bioresource	15	13	129	59,286	11,379	13	-127	93	40
Bioservice	105	101	5	165,413	5,193	96	-1,678	100	-2

E. Type of Biobusiness' Sales Generation in Bioindustry

- The result for type of biobusiness' revenue includes responses from 966 companies out of 1,055 total participants, of which 89 were "no response."
- Out of 966 companies, 258 companies (26.7%) belonged to the phase of "before sales" in 2021, while 247 companies (25.6%) out of 708 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: %)

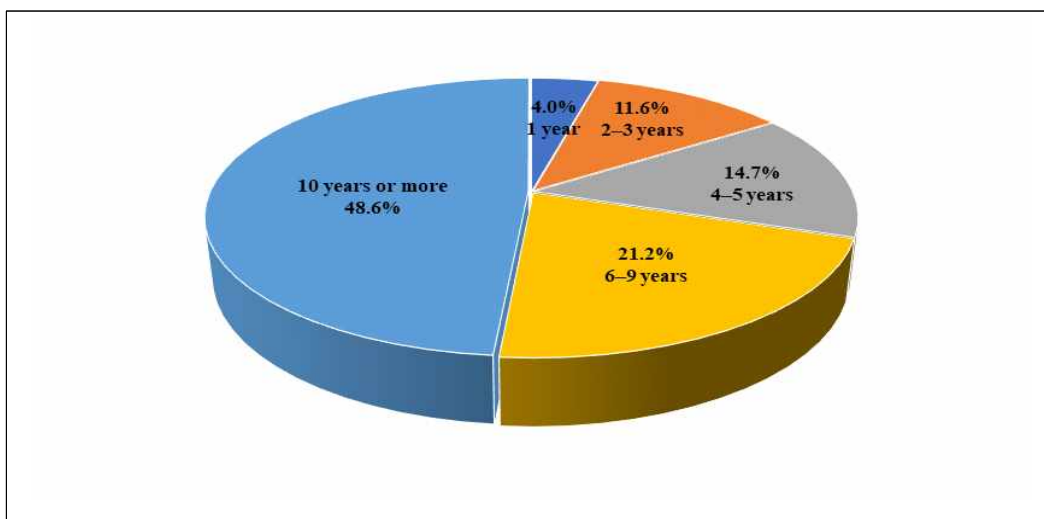


* Excluded unclassified samples.

- Out of the companies that generated sales in 2021, 28 companies (4.0%) had their first sales in 2021, and 344 companies (48.6%) have generated sales for more than 10 years.

<Figure 2-6> Bioindustry's Sales Period

(Unit: %)



2 Manpower Status in Bioindustry

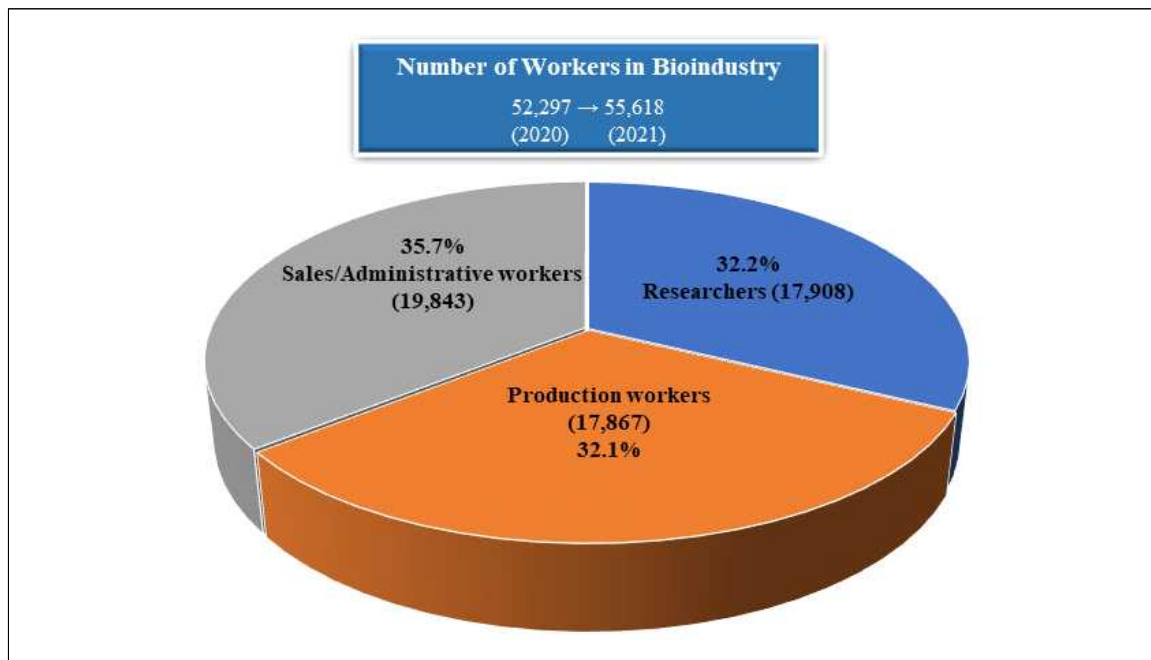
A. Manpower Status of 2021

1) Manpower Status per Category

- As a result of responses from 1,037 companies out of 1,055 domestic bioindustry companies in 2021, of which 18 were “no response,” there was an increase of 3,321 workers compared to 2020, reaching a total of 55,618 workers, and an average of 54 workers per company.
- Manpower of bioindustry consists of 17,908 researchers (32.2%), 17,867 production workers (32.1%), and 19,843 sales/administrative workers (35.7%).

<Figure 2-7> 2021 Bioindustry's Distribution of Manpower

(Unit: persons, %)



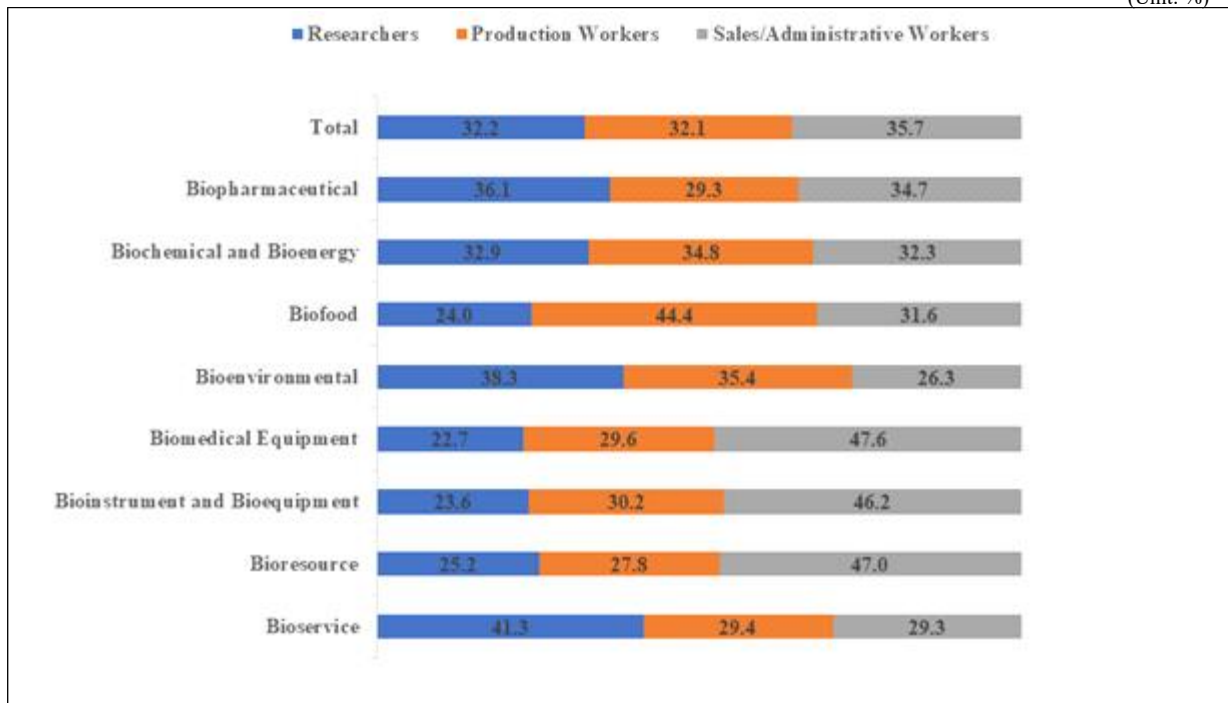
<Table 2-3> 2021 Bioindustry's Manpower Distribution

(Unit: companies, persons, %)

Industrial Category		No. of Respondents	Researchers	Production Workers	Sales/Administrative Workers	Total	Distribution Ratio
Total	No. of Employees	1,037	17,908	17,867	19,843	55,618	100.0
	Percentage	100.0	32.2	32.1	35.7	100.0	
Biopharmaceutical		333	7,879	6,395	7,570	21,844	39.3
Biochemical and Bioenergy		201	2,289	2,423	2,244	6,956	12.5
Biofood		175	1,748	3,232	2,305	7,285	13.1
Bioenvironmental		62	356	329	244	929	1.7
Biomedical Equipment		109	1,898	2,473	3,975	8,346	15.0
Bioinstrument and Bioequipment		55	443	567	866	1,876	3.4
Bioresource		15	265	292	493	1,050	1.9
Bioservice		105	3,030	2,156	2,146	7,332	13.2

<Figure 2-8> Bioindustry's Manpower Proportion of 2021

(Unit: %)

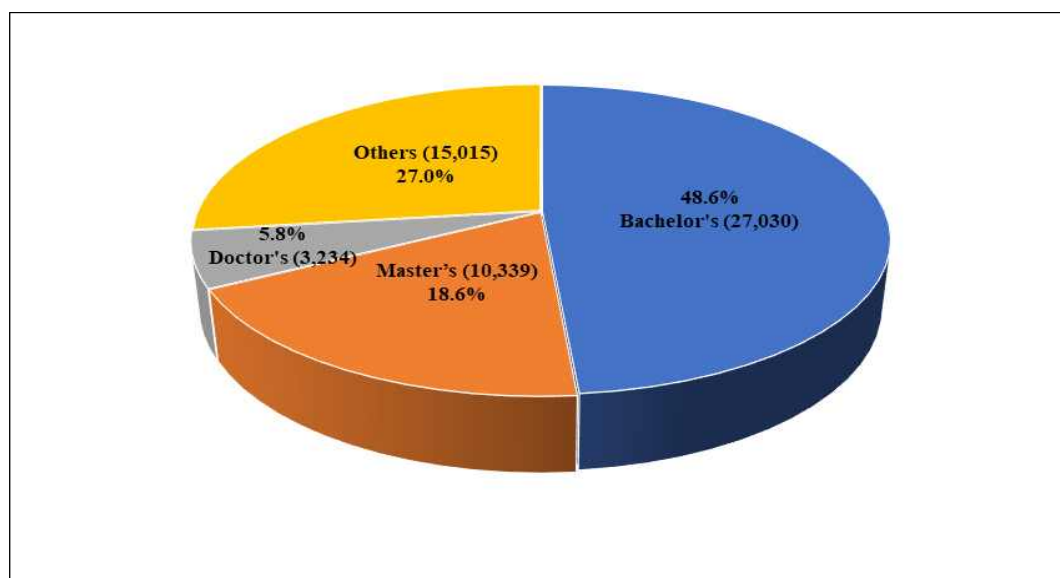


2) Manpower Status by Academic Degree

- Among the bioindustry manpower in 2021, workers with bachelor's degree were the largest in number, reaching 27,030 persons (48.6%). Others ranked second with 15,015 workers (27.0%), followed by 10,339 workers with master's degree (18.6%) and 3,234 workers with doctor's degree (5.8%).

<Figure 2-9> Bioindustry's Academic Degree Proportion of Workers of 2021

(Unit: persons, %)



<Table 2- 4> 2021 Bioindustry's Distribution of Academic Degree

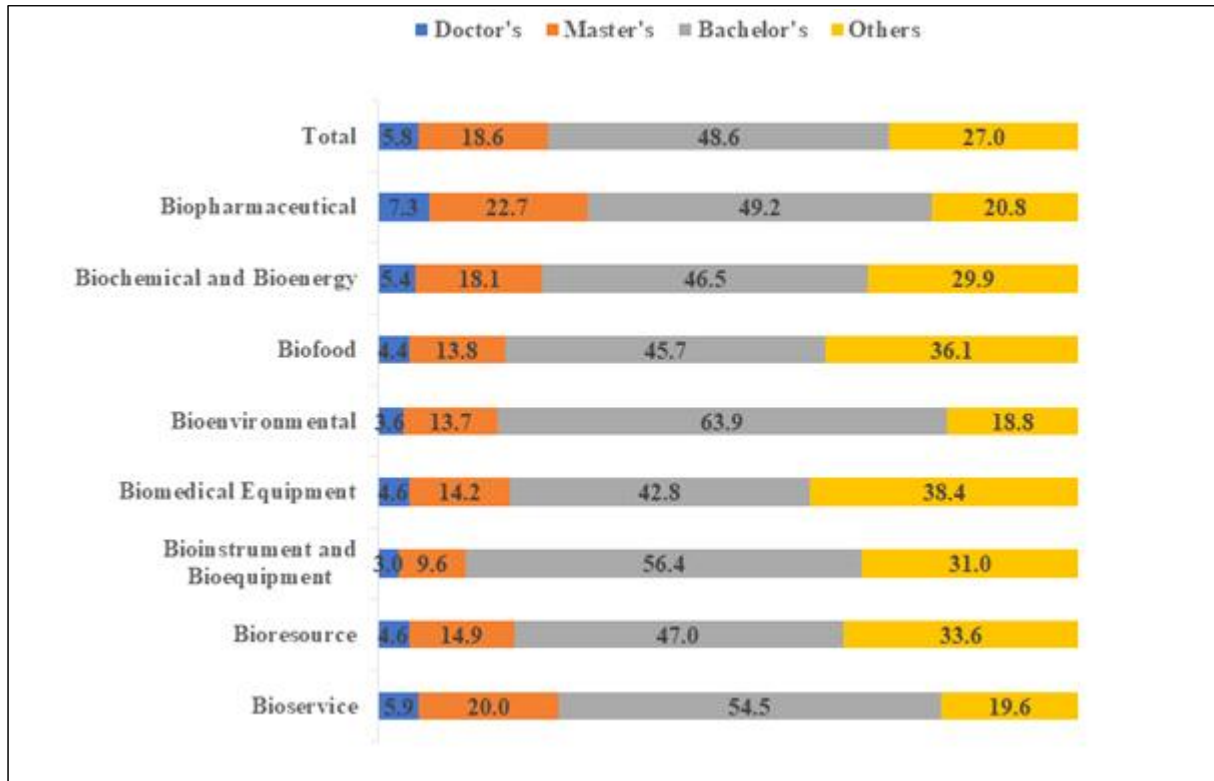
(Unit: persons, %)

Industrial Category		Doctor's	Master's	Bachelor's	Others	Total	Distribution Ratio
Total	No. of Employees	3,234	10,339	27,030	15,015	55,618	100.0
	Percentage	5.8	18.6	48.6	27.0	100.0	
Biopharmaceutical		1,585	4,955	10,751	4,553	21,844	39.3
Biochemical and Bioenergy		378	1,259	3,236	2,083	6,956	12.5
Biofood		322	1,006	3,330	2,627	7,285	13.1
Bioenvironmental		33	127	594	175	929	1.7
Biomedical Equipment		380	1,188	3,573	3,205	8,346	15.0
Bioinstrument and Bioequipment		56	181	1,058	581	1,876	3.4
Bioresource		48	156	493	353	1,050	1.9
Bioservice		432	1,467	3,995	1,438	7,332	13.2

- The proportion of elite manpower such as workers with master’s and doctor’s degree was 24.4% in total. The proportions of elite manpower were relatively high in the biopharmaceutical industry (29.9%) and the bioservice industry (25.9%).

<Figure 2-10> Bioindustry's Academic Degree Proportion of 2021

(Unit: %)



3) Manpower Distribution by Area

- As of 2021, the number of manpower in the bioindustry was highest in Gyeonggi Province with 17,996 persons, accounting for 32.4%. Next followed Chungbuk (8,603 persons), Seoul (8,852), and Incheon (5,931).

<Table 2- 5> 2021 Bioindustry's Manpower Distribution by Area

(Unit: persons, %)

Area		Doctor's	Master's	Bachelor's	Others	Total	Distribution Ratio
Total	No. of Employees	3,234	10,339	27,030	15,015	55,618	100.0
	Percentage	5.8	18.6	48.6	27.0	100.0	
Seoul		663	1,995	5,027	1,167	8,852	15.9
Busan		15	32	156	41	244	0.4
Incheon		331	1,168	3,002	1,430	5,931	10.7
Daegu		16	48	711	641	1,416	2.5
Gwangju		7	20	37	4	68	0.1
Daejeon		248	611	1,397	384	2,640	4.7
Ulsan		48	195	711	340	1,294	2.3
Sejong		8	73	160	87	328	0.6
Gyeonggi		1,145	3,613	7,981	5,257	17,996	32.4
Gangwon		164	481	1,290	1,151	3,086	5.5
Chungbuk		389	1,438	4,111	2,665	8,603	15.5
Chungnam		87	300	797	785	1,969	3.5
Jeonbuk		34	115	501	459	1,109	2.0
Jeonnam		25	91	477	191	784	1.4
Gyeongbuk		18	37	229	179	463	0.8
Gyeongnam		27	100	338	148	613	1.1
Jeju		9	22	105	86	222	0.4

B. Recent Trend of Bioindustry Manpower Status

1) 2019–2021 Bioindustry’s Trend of Manpower Status

① Bioindustry’s Trend of Manpower Status

- As of 2021, the number of manpower in the bioindustry was 55,618, an increase of 3,321 workers (6.4%) compared to 2020.

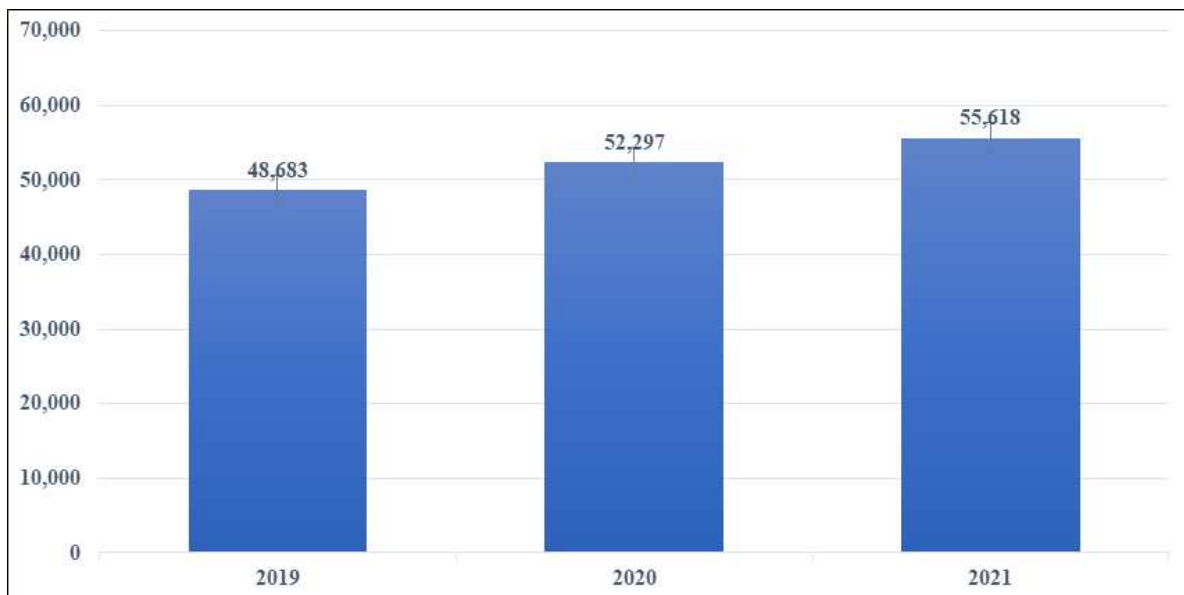
<Table 2-6> 2019–2021 Bioindustry’s Change in Manpower

(Unit: persons, %)

Classification	2019	2020	2021	Annual Average Rate of Change
No. of Employees	48,683	52,297	55,618	6.9
Rate of Change	4.7	7.4	6.4	

<Figure 2-11> 2019–2021 Bioindustry's Trend of Manpower

(Unit: persons)



② **Bioindustry's Trend in Academic Degree of Manpower**

- Compared to 2020, the number of bioindustry workers in 2021 with doctor’s degree, master’s degree, and bachelor’s degree increased by 10.0%, 6.6%, and 5.3%, respectively. Compared to 2020, workers with bachelor's degree increased the most by number, at 1,364, and workers with doctor’s degree increased the most by ratio, at 10.0%.
- As for sales and administrative workers, the increase was by 1,028 workers, which was a 7.3% rise.

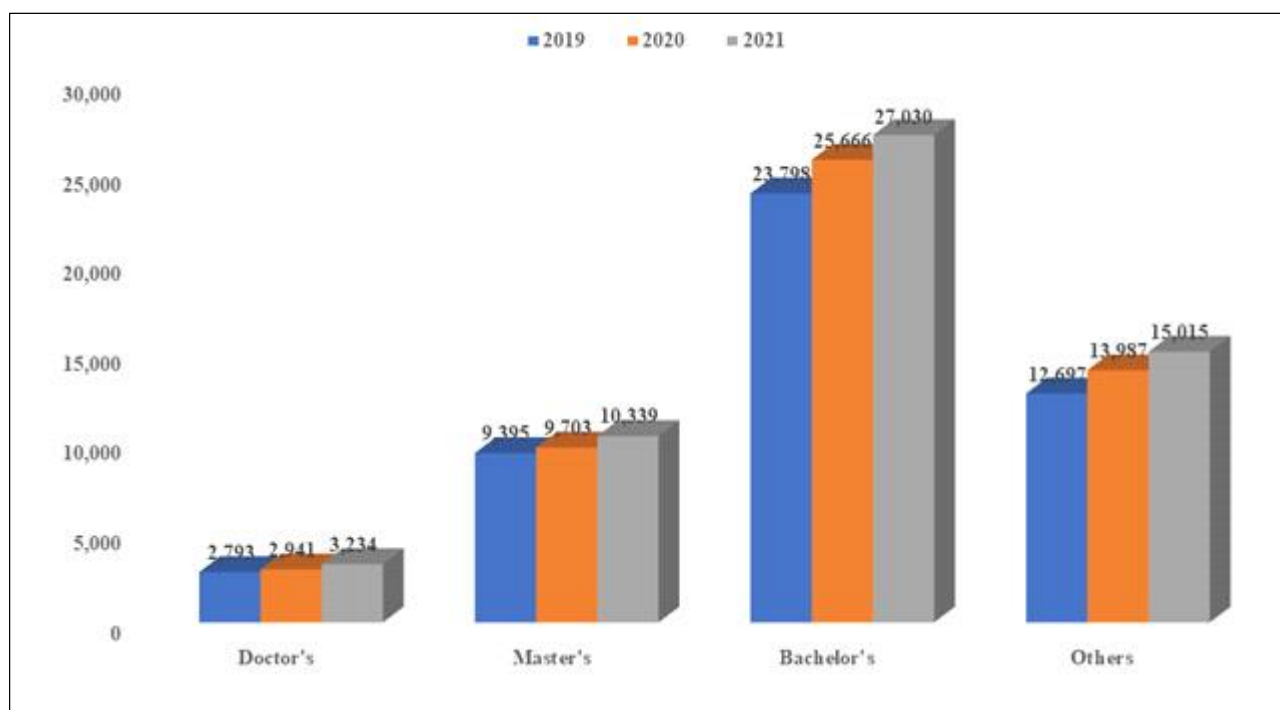
<Table 2-7> 2019–2021 Bioindustry's Trend in Academic Degree of Manpower

(Unit: persons, %)

Degree	2019		2020		2021		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	48,683	100	52,297	100.0	55,618	100.0	3,321	6.4	6.9
Doctor's	2,793	5.7	2,941	5.6	3,234	5.8	293	10.0	7.6
Master's	9,395	19.3	9,703	18.6	10,339	18.6	636	6.6	4.9
Bachelor's	23,798	48.9	25,666	49.1	27,030	48.6	1,364	5.3	6.6
Others	12,697	26.1	13,987	26.7	15,015	27.0	1,028	7.3	8.7

<Figure 2-12> 2019–2021 Bioindustry's Trend in Academic Degree of Manpower

(Unit: persons)



2) 2017–2021 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 5.5%.

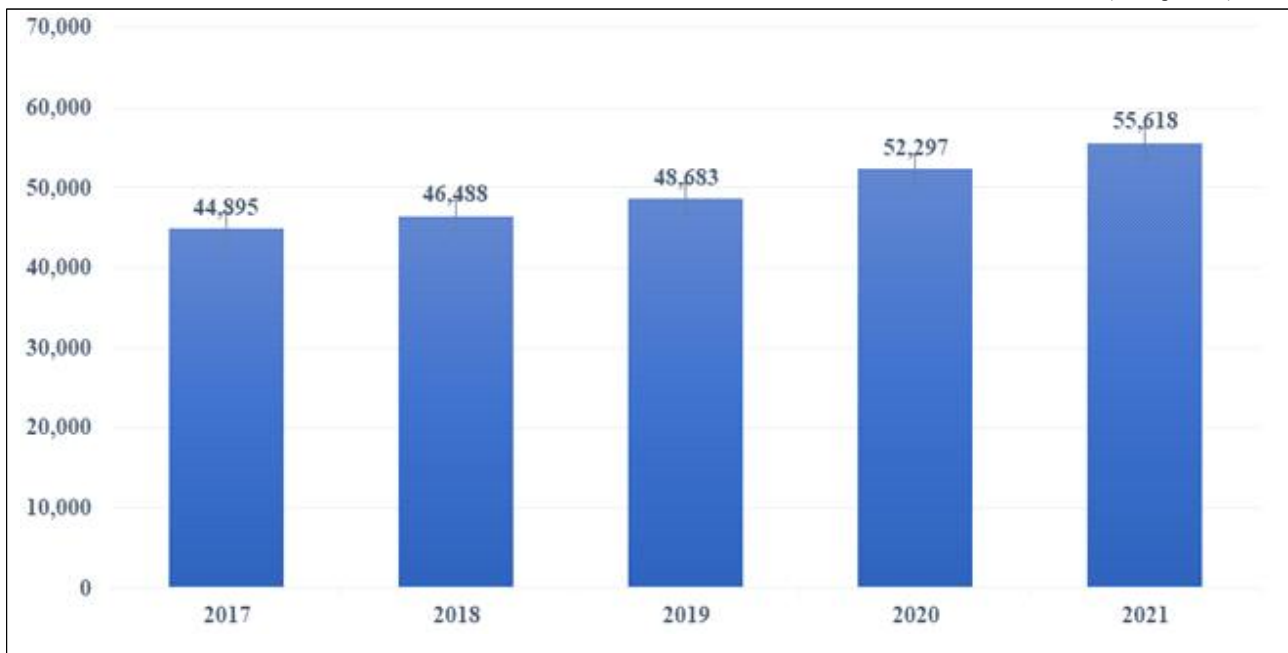
<Table 2-8> 2017–2021 Bioindustry's Change in Manpower

(Unit: persons, %)

Classification	2017	2018	2019	2020	2021	Annual Average Rate of Change
No. of Employees	44,895	46,488	48,683	52,297	55,618	5.5
Rate of Change	8	3.5	4.7	7.4	6.4	

<Figure 2-13> 2017–2021 Bioindustry's Trend of Manpower

(Unit: persons)



② **Bioindustry's Trend in Academic Degree of Manpower**

- From 2017 to 2021, the number of employees with an academic degree (bachelor's, master's, or doctor's) showed steady increase. Workers with bachelor's degree, doctor's degree, and master's degree increased by 7.2%, 5.4%, and 3.9%, respectively.

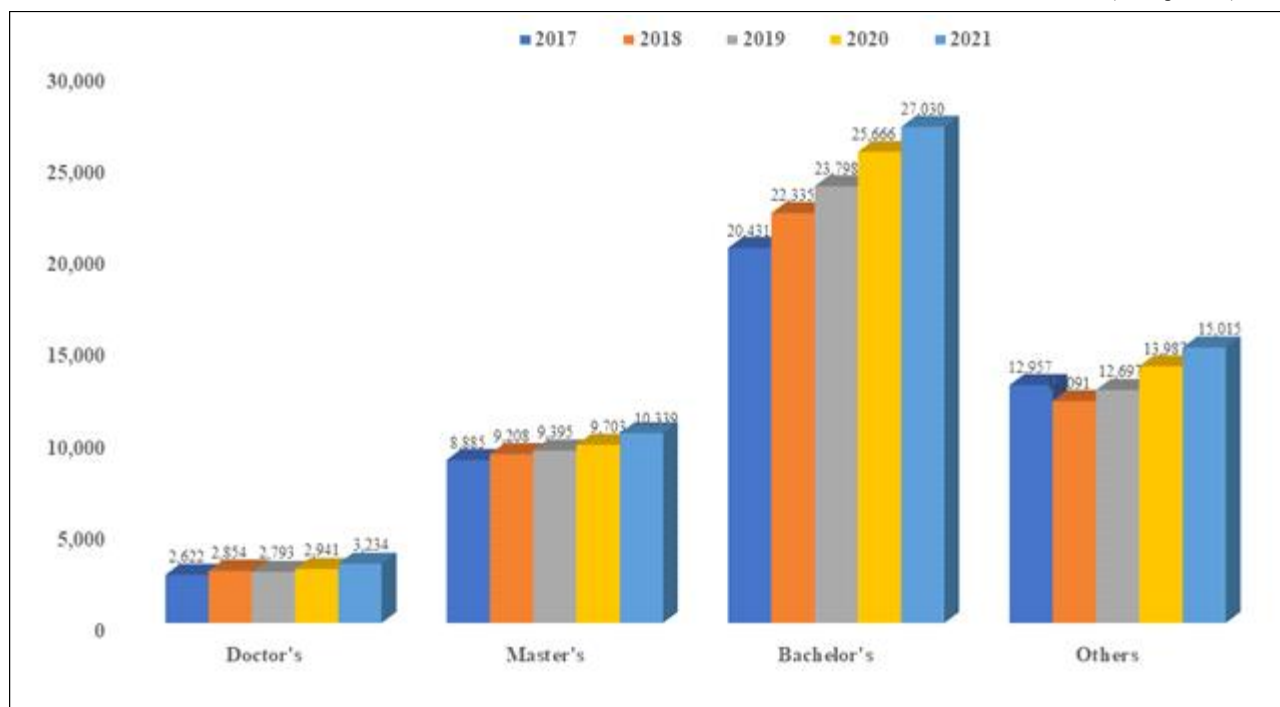
<Table 2-9> 2017–2021 Bioindustry's Trend in Academic Degree of Manpower

(Unit: persons, %)

Degree	2017		2018		2019		2020		2021		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	44,895	100.0	46,488	100.0	48,683	100	52,297	100.0	55,618	100.0	3,321	6.4	5.5
Doctor's	2,622	5.8	2,854	5.8	2,793	5.7	2,941	5.6	3,234	5.8	293	10.0	5.4
Master's	8,885	19.8	9,208	18.7	9,395	19.3	9,703	18.6	10,339	18.6	636	6.6	3.9
Bachelor's	20,431	45.5	22,335	45.5	23,798	48.9	25,666	49.1	27,030	48.6	1,364	5.3	7.2
Others	12,957	28.9	12,091	24.6	12,697	26.1	13,987	26.7	15,015	27.0	1,028	7.3	3.8

<Figure 2-14> 2017–2021 Bioindustry's Trend in Academic Degree of Manpower

(Unit: persons)



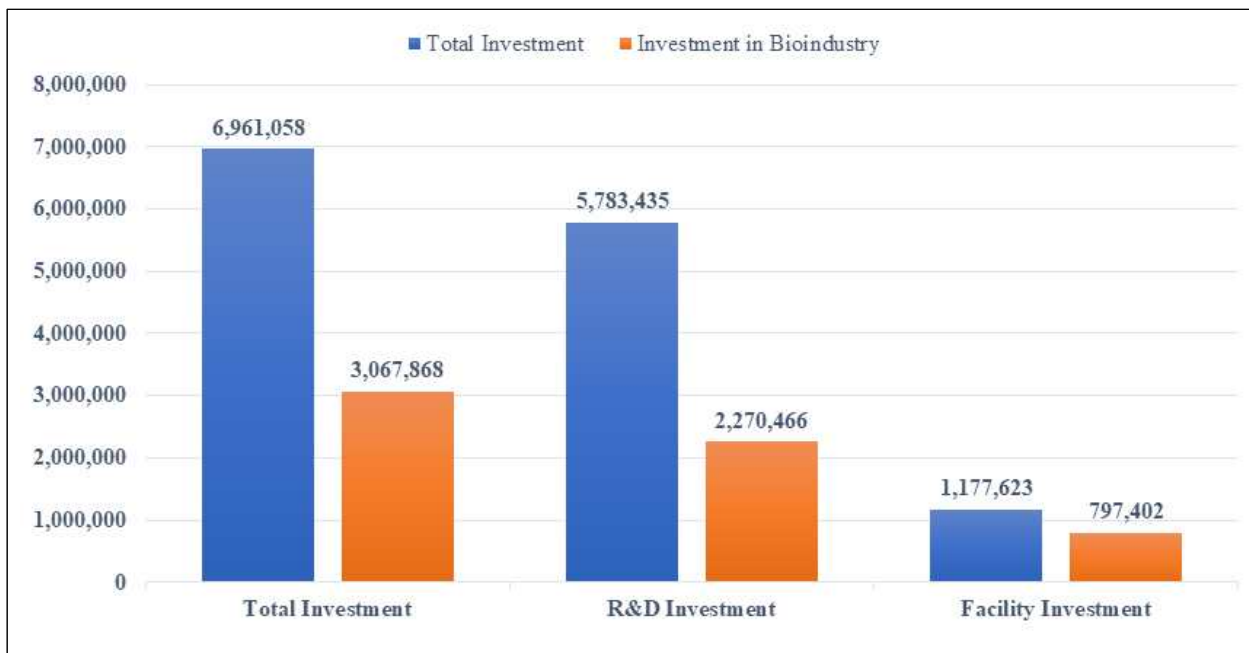
3 Investment Status of Bioindustry

A. Bioindustry's Investment Status of 2021

- The total amount of investments in bioindustry companies in 2021 was KRW 6,961.1 billion, and the total investment cost turned out to be 44.1% of the total investment fee reaching KRW 3,679 billion.
- The R&D cost in the bioindustry turned out to be 39.3% of the total cost reaching KRW 2,270.5 billion, and the facility investment cost took 67.7% of the total cost of KRW 797.4 billion

<Figure 2-15> 2021 Total Investment Cost and Investment in Bioindustry

(Unit: million KRW)



- Among the bioindustries, the total investment was highest in the biopharmaceutical industry with KRW 1,822.6 billion (59.4%), followed by the bioservice with KRW 509.1 billion (16.6%) and the biomedical equipment with KRW 304.1 billion (9.9%). These three core bioindustries took 85.9% of the total investment cost.
- Comparing the size of R&D cost by bioindustry, the biopharmaceutical industry was the largest with KRW 1,533.7 billion (67.6%), followed by the bioservice with KRW 207 billion (9.1%) and the biomedical equipment with KRW 187.9 billion (8.3%). These three core bioindustries took 84.9% of the total R&D cost.

- The average R&D cost per bioindustry company was highest in the biopharmaceutical industry with KRW 4.9 billion, followed by the bioservice with KRW 2.0 billion and the biomedical equipment with KRW 1.8 billion.
- The total facility investment cost by bioindustry was highest in the bioservice industry with KRW 302.1 billion (37.9%), followed by the biopharmaceutical with KRW 288.9 billion (36.2%)
- The average facility investment cost per bioindustry company was highest in the bioservice with KRW 2,880 million, followed by the biomedical equipment with KRW 1,100 million and the biopharmaceutical with KRW 930 million.

<Table 2-10> 2021 Bioindustry's Size of Investment

(Unit: companies, million KRW)

Industrial Category	No. of Companies	No. of Respondents	R&D Investment		Facility Investment		Total Investment	
			Total	Average	Total	Average	Total	Average
Total	1,055	1,023	2,270,466	2,219	797,402	779	3,067,868	2,999
Biopharmaceutical	333	310	1,533,702	4,947	288,901	932	1,822,603	5,879
Biochemical and Bioenergy	201	200	171,532	858	42,725	214	214,257	1,071
Biofood	175	173	121,053	700	31,315	181	152,368	881
Bioenvironmental	62	60	14,103	235	5,637	94	19,740	329
Biomedical Equipment	109	106	187,851	1,772	116,216	1,096	304,067	2,869
Bioinstrument and Bioequipment	55	54	22,672	420	9,160	170	31,832	589
Bioresource	15	15	12,509	834	1,348	90	13,857	924
Bioservice	105	105	207,044	1,972	302,100	2,877	509,144	4,849

- The size of total investment in bioindustries was highest in the order of Gyeonggi (KRW 1,120 billion, 36.5%), Incheon (KRW 608.6 billion, 19.8%), and Chungbuk (KRW 384.6 billion, 12.5%). The top three regions account for 68.9% of the total investment.
- The size of overall R&D investment was highest in the order of Gyeonggi (38.6%), Seoul (15.4%), and Chungbuk (14.0%), while the facility investment was highest in the order of Incheon (42.9%), Gyeonggi (30.6%), and Chungbuk (8.4%).
- The average size of R&D investment was highest in Incheon with KRW 9.19 billion, and the facility investment was also highest in Incheon with KRW 11.8 billion.

<Table 2-11> 2021 Bioindustry's Size of Investment by Area

(Unit: companies, million KRW)

Area	No. of Companies	No. of Respondents	R&D Investment		Facility Investment		Total Investment	
			Total	Average	Total	Average	Total	Average
Total	1,055	1,023	2,270,466	2,219	797,402	779	3,067,868	2,999
Seoul	249	229	349,958	1,528	30,831	135	380,789	1,663
Busan	14	12	3,038	253	270	23	3,308	276
Incheon	29	29	266,488	9,189	342,149	11,798	608,637	20,987
Daegu	13	12	7,208	601	4,320	360	11,528	961
Gwangju	6	6	1,117	186	725	121	1,842	307
Daejeon	84	84	164,780	1,962	44,175	526	208,955	2,488
Ulsan	9	9	26,862	2,985	720	80	27,582	3,065
Sejong	4	3	4,310	1,437	3,000	1,000	7,310	2,437
Gyeonggi	350	346	876,356	2,533	243,619	704	1,119,975	3,237
Gangwon	44	43	100,522	2,338	14,039	326	114,561	2,664
Chungbuk	84	82	317,991	3,878	66,587	812	384,578	4,690
Chungnam	41	41	40,410	986	5,720	140	46,130	1,125
Jeonbuk	31	31	29,205	942	8,800	284	38,005	1,226
Jeonnam	37	37	9,103	246	9,320	252	18,423	498
Gyeongbuk	25	24	56,050	2,335	10,962	457	67,012	2,792
Gyeongnam	27	27	13,784	511	6,915	256	20,699	767
Jeju	8	8	3,284	411	5,250	656	8,534	1,067

B. Recent Trend of Investment Status

1) 2019–2021 Bioindustry’s Trend of Investment

- The annual average growth rate of investment in the bioindustry for the past three years is 8.8%.
 - The R&D and facility investments increased by 11.1% and 2.9%, respectively.

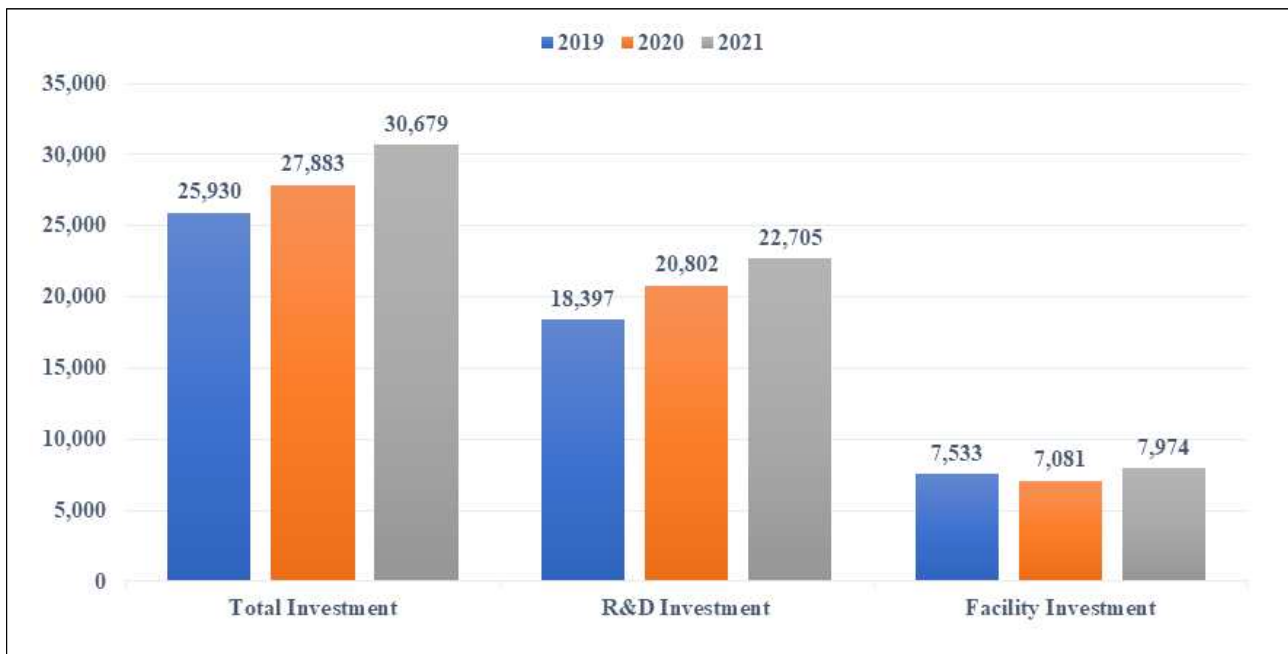
<Table 2-12> 2019–2021 Bioindustry’s Trend of Investment

(Unit: 100 million KRW, %)

Classification		2019	2020	2021	Annual Average Rate of Change
Total Investment	Amount	25,930	27,883	30,679	8.8
	Rate of Change	8.1	7.5	10.0	
R&D Investment	Amount	18,397	20,802	22,705	11.1
	Rate of Change	8.4	13.1	9.1	
Facility Investment	Amount	7,533	7,081	7,974	2.9
	Rate of Change	7.2	-6.0	12.6	

<Figure 2-16> 2019–2021 Bioindustry Investment Trend

(Unit: 100 million KRW)



- Looking at the trend of the overall size of investments in bioindustries in 2021 over the past three years, investments significantly increased in the bioservice and the bioinstrument and equipment industries by 47.4% and 42.2%, respectively; however, there was a sharp decrease in the biofood and biochemical and energy industries by 15.1% and 6.7%, respectively.

<Table 2-13> 2019–2021 Bioindustry’s Trend in Overall Size of Investment

(Unit: million KRW, %)

Classification	2019		2020		2021		Variation from Previous Year	Annual Average Rate of Change
	Investment Amount	Distribution Ratio	Investment Amount	Distribution Ratio	Investment Amount	Distribution Ratio		
Total	2,592,954	100	2,788,305	100.0	3,067,868	100.0	10.0	8.8
Biopharmaceutical	1,694,527	65.4	1,809,555	64.9	1,822,603	59.4	0.7	3.7
Biochemical and Bioenergy	246,320	9.5	192,793	6.9	214,257	7.0	11.1	-6.7
Biofood	211,224	8.1	186,206	6.7	152,368	5.0	-18.2	-15.1
Bioenvironmental	20,411	0.8	22,155	0.8	19,740	0.6	-10.9	-1.7
Biomedical Equipment	156,733	6	264,241	9.5	304,067	9.9	15.1	39.3
Bioinstrument and Bioequipment	15,741	0.6	27,985	1.0	31,832	1.0	13.7	42.2
Bioresource	13,571	0.5	14,099	0.5	13,857	0.5	-1.7	1.0
Bioservice	234,427	9	271,271	9.7	509,144	16.6	87.7	47.4

- For the past three years, the R&D investment cost has increased in the biomedical equipment, bioservice, and bioinstrument and bioequipment industries by 35.8%, and 31.6%, respectively, but decreased in the biofood industry by 3.2%.
- The facility investment cost in the past three years showed a significant increase in the bioinstrument and bioequipment industry, with a 85.8% spike.
- The biochemical and bioenergy and bioresource industries experienced an increase in R&D investment cost but a decrease in facility investment cost by 34.3% and 26.4%, respectively.

<Table 2-14> 2019–2021 Bioindustry’s Trend of R&D and Facility Investment Cost

(Unit: million KRW, %)

Industrial Category	2019		2020		2021		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	1,839,677	753,277	2,080,205	708,100	2,270,466	797,402	9.1	12.6	11.1	2.9
Bio pharmaceutical	1,311,581	382,946	1,492,979	316,576	1,533,702	288,901	2.7	-8.7	8.1	-13.1
Biochemical and Bioenergy	147,326	98,994	130,423	62,370	171,532	42,725	31.5	-31.5	7.9	-34.3
Biofood	129,144	82,080	101,674	84,532	121,053	31,315	19.1	-63.0	-3.2	-38.2
Bioenvironmental	13,246	7,165	13,291	8,864	14,103	5,637	6.1	-36.4	3.2	-11.3
Biomedical Equipment	101,860	54,873	150,872	113,369	187,851	116,216	24.5	2.5	35.8	45.5
Bioinstrument and Bioequipment	13,087	2,654	19,179	8,806	22,672	9,160	18.2	4.0	31.6	85.8
Bioresource	11,084	2,487	11,986	2,113	12,509	1,348	4.4	-36.2	6.2	-26.4
Bioservice	112,349	122,078	159,801	111,470	207,044	302,100	29.6	171.0	35.8	57.3

2) 2017–2021 Bioindustry’s Trend of Investment

- Total investment in the bioindustry has been on a steady rise over the past five years by 8.5%, a 10.0% increase year on year.
- The R&D investment and the facility investment increased by 11.0% and 2.6%, respectively.

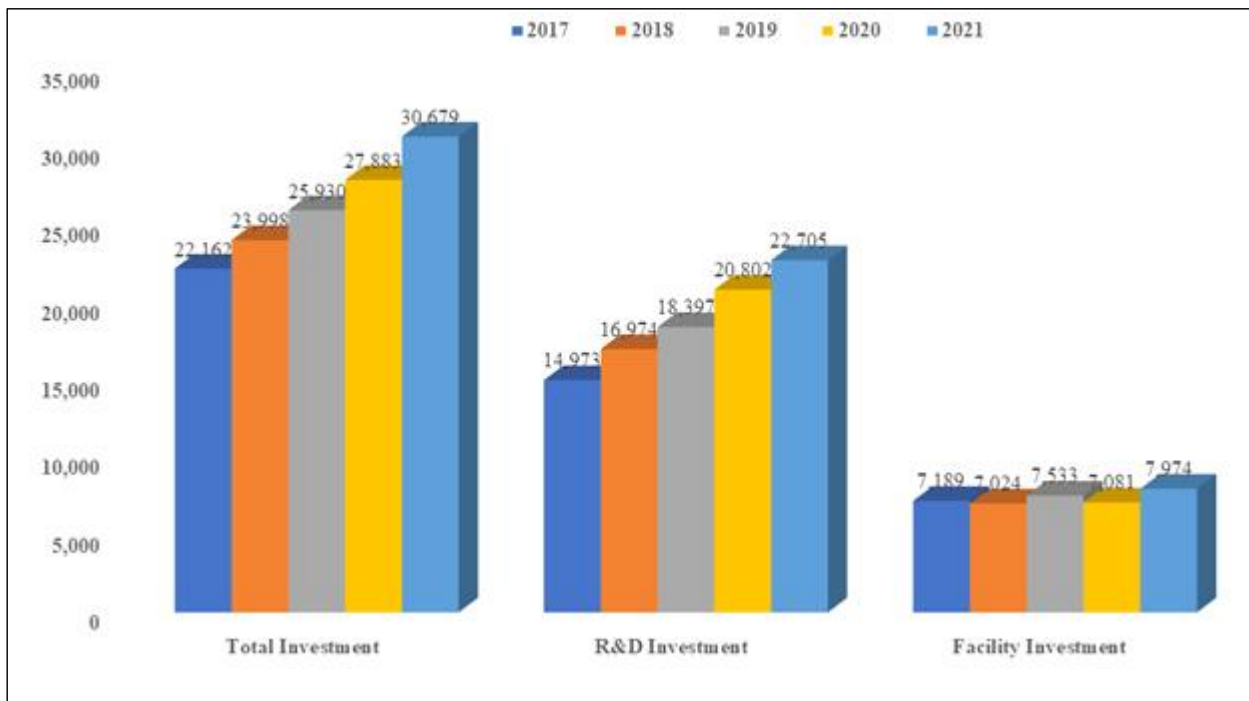
<Table 2-15> 2017–2021 Bioindustry’s Trend of Investment

(Unit: 100 million KRW, %)

Classification		2017	2018	2019	2020	2021	Annual Average Rate of Change
Total Investment	Amount	22,162	23,998	25,930	27,883	30,679	8.5
	Rate of Change	8.1	8.3	8.1	7.5	10.0	
R&D Investment	Amount	14,973	16,974	18,397	20,802	22,705	11.0
	Rate of Change	6.1	13.4	8.4	13.1	9.1	
Facility Investment	Amount	7,189	7,024	7,533	7,081	7,974	2.6
	Rate of Change	12.8	-2.3	7.2	-6.0	12.6	

<Figure 2-17> 2017–2021 Bioindustry Investment Trend

(Unit: 100 million KRW)



- The biopharmaceutical industry has consistently accounted for more than 60% of all investments in the bioindustry since 2016, but it slightly dropped down to 59.4% in 2021.
- Compared to the previous year, the size of investment in the bioservice industry greatly increased by 87.7% and that in the biomedical equipment industry grew by 15.1%. Conversely, the size of investment in the biofood and bioenvironment industries decreased by 18.2% and 10.9%, respectively.

<Table 2-16> 2017–2021 Bioindustry’s Trend in Overall Size of Investment

(Unit: million KRW, %)

Industrial Category	2017		2018		2019		2020		2021		Variation from Previous Year	Annual Average Rate of Change
	Investment Amount	Distribution Ratio	Investment Amount	Distribution Ratio	Investment Amount	Distribution Ratio	Investment Amount	Distribution Ratio	Investment Amount	Distribution Ratio		
Total	2,216,223	100.0	2,399,846	100.0	2,592,954	100.0	2,788,305	100.0	3,067,868	100.0	10.0	8.5
Biopharmaceutical	1,521,664	68.7	1,536,020	64.0	1,694,527	65.4	1,809,555	64.9	1,822,603	59.4	0.7	4.6
Biochemical and Bioenergy	178,700	8.1	219,180	9.1	246,320	9.5	192,793	6.9	214,257	7.0	11.1	4.6
Biofood	122,411	5.5	210,377	8.8	211,224	8.1	186,206	6.7	152,368	5.0	-18.2	5.6
Bioenvironmental	11,422	0.5	17,168	0.7	20,411	0.8	22,155	0.8	19,740	0.6	-10.9	14.7
Biomedical Equipment	103,341	4.7	165,315	6.9	156,733	6.0	264,241	9.5	304,067	9.9	15.1	31.0
Bioinstrument and Bioequipment	15,098	0.7	9,042	0.4	15,741	0.6	27,985	1.0	31,832	1.0	13.7	20.5
Bioresource	25,949	1.2	12,091	0.5	13,571	0.5	14,099	0.5	13,857	0.5	-1.7	-14.5
Bioservice	237,638	10.7	230,653	9.6	234,427	9.0	271,271	9.7	509,144	16.6	87.7	21.0

- The annual average rate of change in R&D investment over the past five years was highest in the bioservice industry with an increase of 42.1%, followed by the biomedical equipment (32%) and the bioinstrument and bioequipment (15.1%). On the other hand, the average rate of change for the bioresource decreased by 13.8%.
- The annual average rate of change in facility investment was highest in the bioinstrument and bioequipment industry with 43%, followed by the bioenvironmental (34.8%) and biofood (31.2%). Conversely, the average rate of change for biopharmaceuticals and biochemical and bioenergy industries, which previously had an ascending tendency, decreased by 8.4% and 8.9%, respectively. The bioresource industry displayed a decrease in facility investment as well by 20.2%.

<Table 2-17> 2017–2021 Bioindustry’s Trend of R&D and Facility Investment Cost

(Unit: 100 million KRW, %)

Industrial Category	2017		2018		2019		2020		2021		Variation from Previous Year		Annual Average Rate of Change	
	R&D	Facility	R&D	Facility	R&D	Facility	R&D	Facility	R&D	Facility	R&D	Facility	R&D	Facility
Total	14,973	7,189	16,974	7,024	18,397	7,533	20,802	7,081	22,705	7,974	9.1	12.6	11.0	2.6
Bio pharmaceutical	11,109	4,108	12,174	3,186	13,116	3,829	14,930	3,166	15,337	2,889	2.7	-8.7	8.4	-8.4
Biochemical and Bioenergy	1,166	621	1,495	696	1,473	990	1,304	624	1,715	427	31.5	-31.6	10.1	-8.9
Biofood	1,118	106	1,269	835	1,291	821	1,017	845	1,211	313	19.1	-63.0	2.0	31.2
Bioenvironmental	97	17	118	54	132	72	133	89	141	56	6.0	-37.1	9.8	34.8
Biomedical Equipment	619	415	891	762	1,019	549	1,509	1,134	1,879	1,162	24.5	2.5	32.0	29.4
Bioinstrument and Bioequipment	129	22	87	4	131	27	192	88	227	92	18.2	4.5	15.1	43.0
Bioresource	226	33	102	18	111	25	120	21	125	13	4.2	-38.1	-13.8	-20.2
Bioservice	508	1,868	837	1,469	1,123	1,221	1,598	1,115	2,070	3,021	29.5	170.9	42.1	12.8

4 Cooperation with Other Organizations

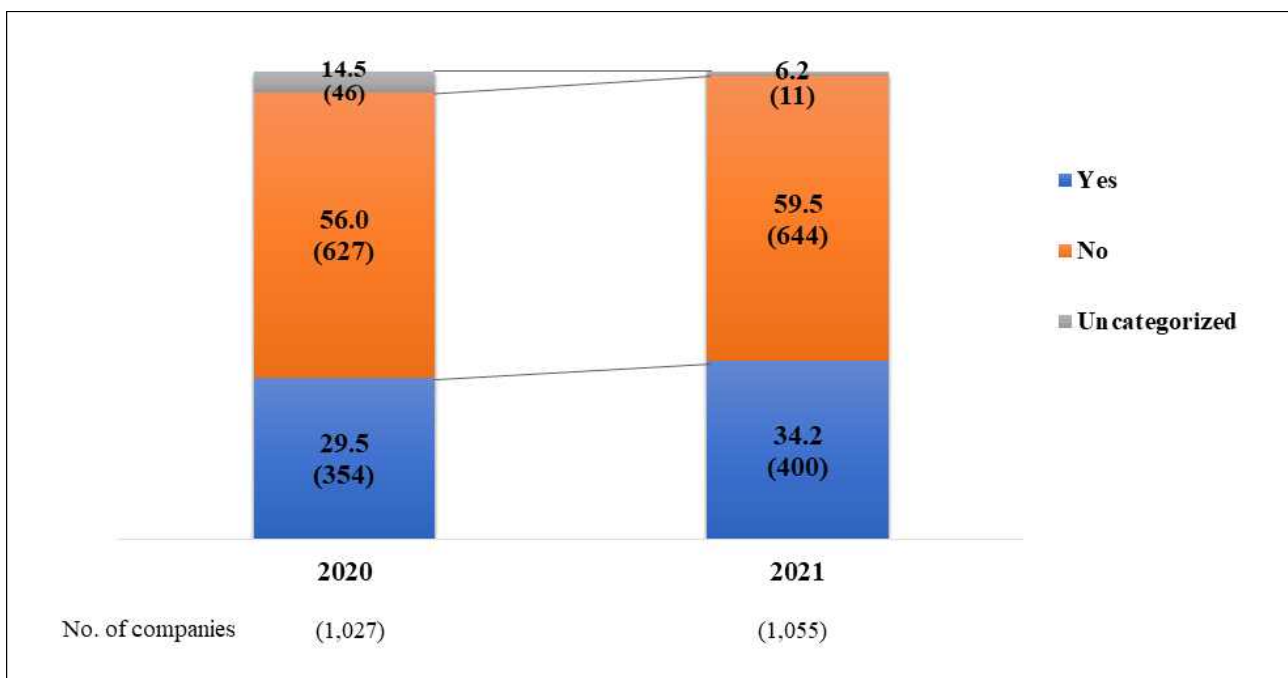
A. Cooperation Types

1) Cooperative Relationship with Other Organizations

- Of the 1,055 companies, 400 (37.9%) companies had cooperative relationships with other organizations, and of the 1,044 companies, excluding the uncategorized, 38.3% had cooperative relationships with other organizations.

<Figure 2-18> Cooperative Relationship with Other Organizations

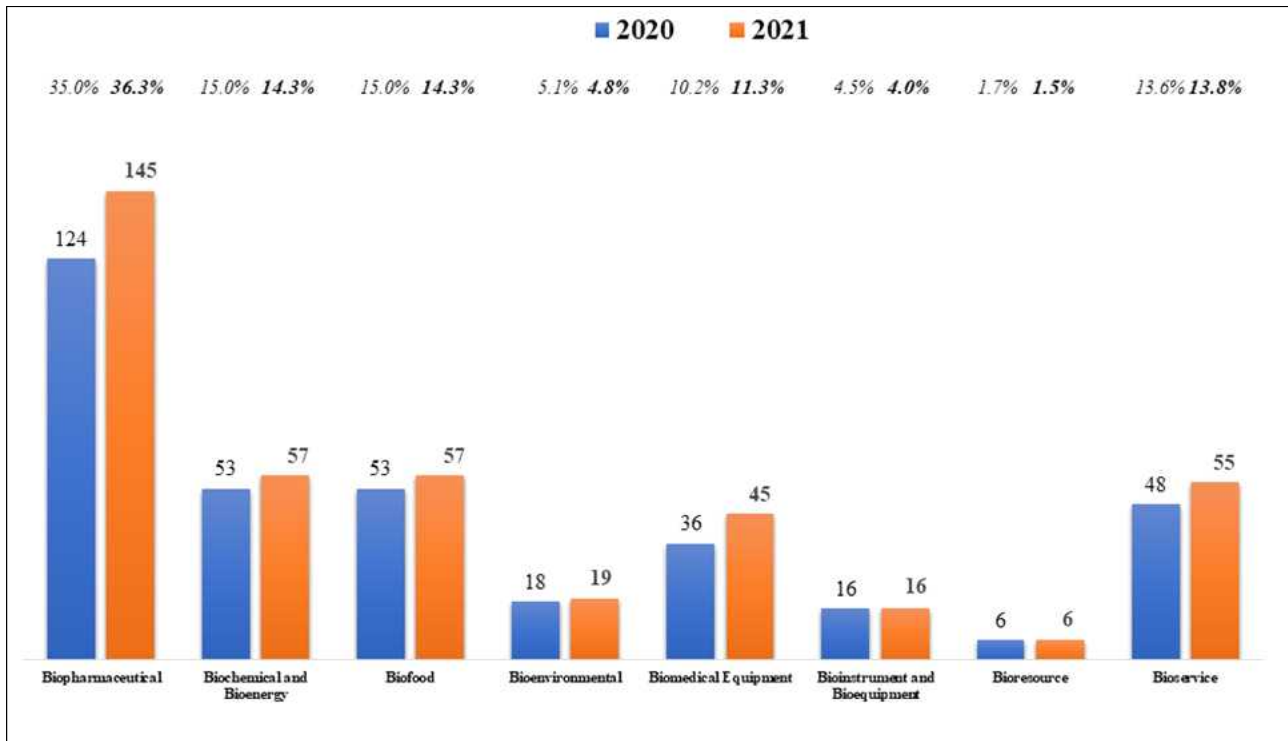
(Unit: % (total no. of companies))



- According to bioindustries, the biopharmaceutical (145 companies), biofood (57), and biochemical and bioenergy (57) had the most cooperative relationships, totaling 259, which was 64.8% of 363 companies.

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

(Unit: companies)

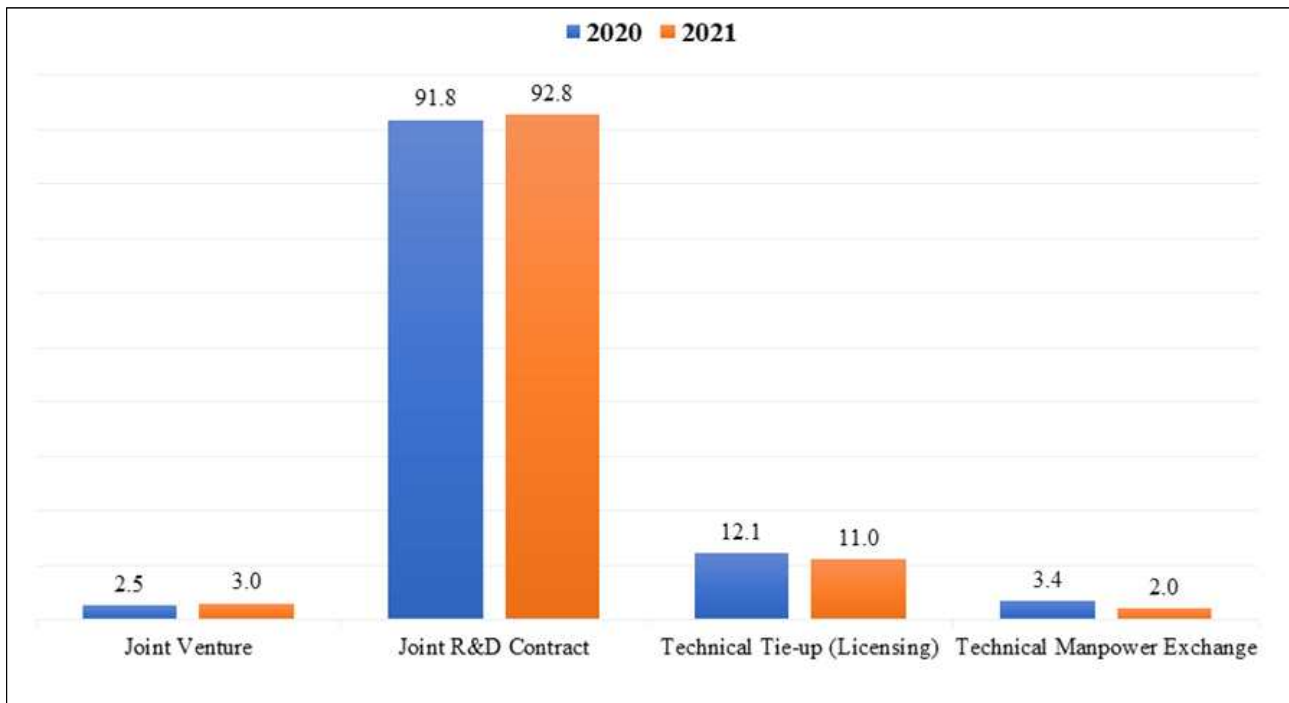


2) Types of Cooperative Relationship with Other Organizations

- When surveyed 400 companies for the types of cooperation taken on, joint R&D contracts were most common at 92.8%, followed by technology tie-up and licensing (11.1%), joint venture (3.0%), and domestic and international technical manpower exchange (2.0%).

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

(Unit: %)



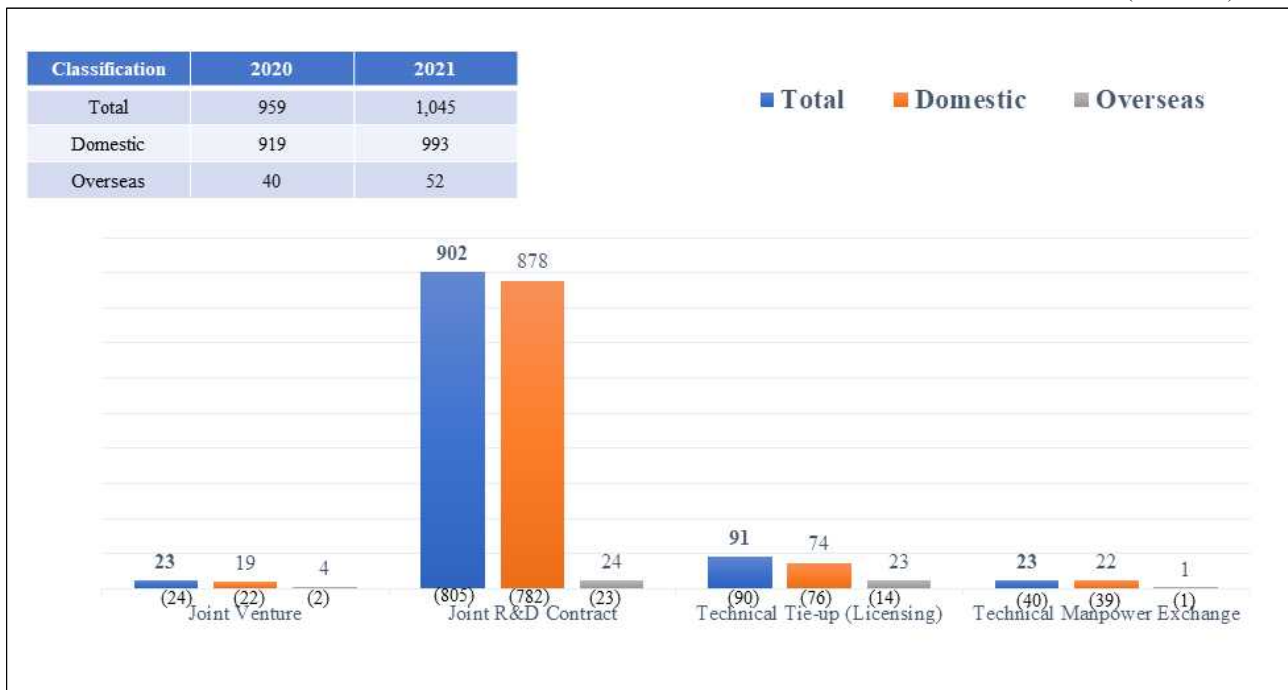
* The above chart shows the responses from companies that hold cooperative relationships (2020: 354 companies; 2021: 400 companies). Multiple responses accepted.

3) Number of Cooperation Cases by Cooperative Relationship Type

- The number of cooperative relationships among 400 companies totaled 1,045 cases, with 993 cases in Korea (95.0%) and 52 cases abroad (5.0%).
- Among the types of cooperative relations, the largest number of cases was joint R&D contracts, with 902 cases consisting of 878 in Korea and 24 abroad.

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

(Unit: cases)



* The above chart shows the responses from companies that hold cooperative relationships (2020: 354 companies; 2021: 400 companies). Multiple responses accepted.

* The figures in parentheses are based on the year 2020.

- The number of cooperation cases by bioindustrial category and by cooperation type was 384 in the biopharmaceutical industry, accounting for 36.7% of the total of 980 cases.
- The bioservice and biochemical and bioenergy industries had 168 (16.1%) and 159 (15.2%) cases of cooperations, respectively, accounting for 68.7% of the total number of cooperation cases.

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

(Unit: cases)

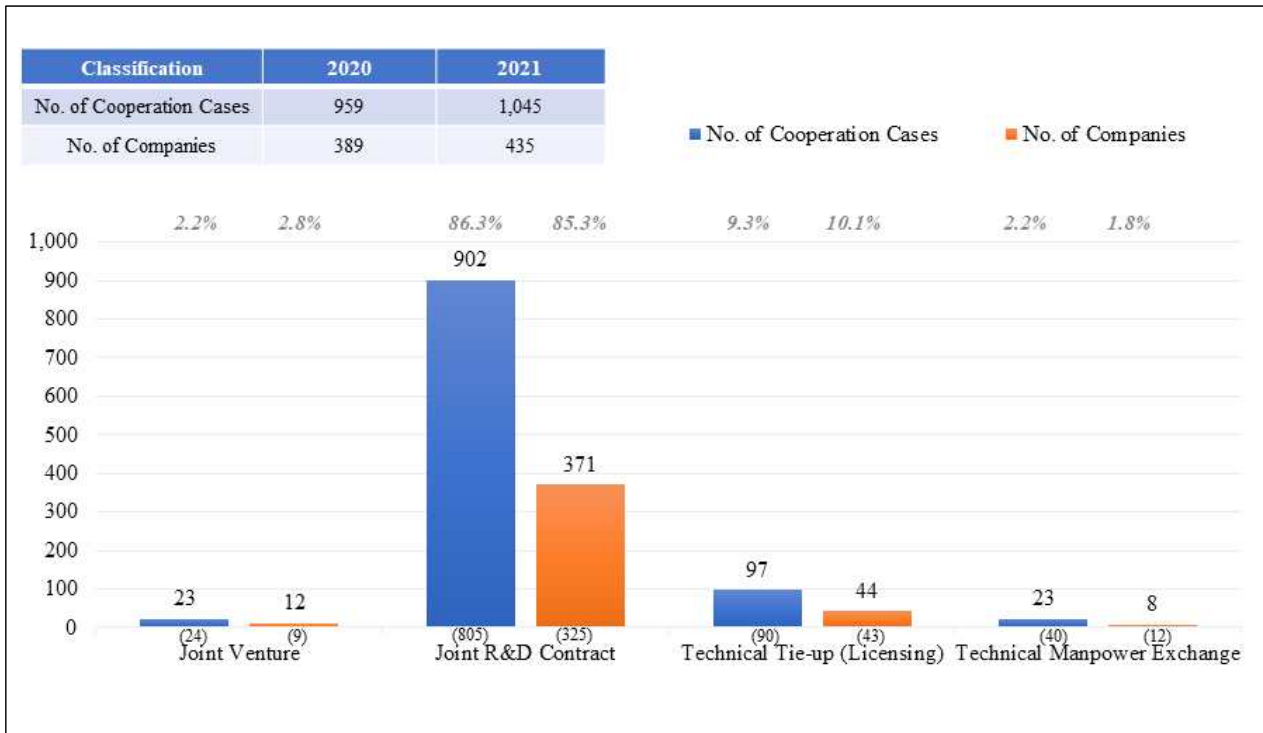
Industrial Category	2020		2021		Cooperation Type			
	Total		Total		Joint Venture	Joint R&D Contract	Technical Tie-up (Licensing)	Technical Manpower Exchange
Total	959	(100.0%)	1,045	(100.0%)	23	902	97	23
Biopharmaceutical	322	(33.6%)	384	(36.7%)	8	316	55	5
Biochemical and Bioenergy	154	(16.1%)	159	(15.2%)	6	134	5	14
Biofood	122	(12.7%)	130	(12.4%)	3	123	4	-
Bioenvironmental	26	(2.7%)	28	(2.7%)	-	25	3	-
Biomedical Equipment	102	(10.6%)	107	(10.2%)	4	81	20	2
Bioinstrument and Bioequipment	45	(4.7%)	45	(4.3%)	1	44	-	-
Bioresource	23	(2.4%)	24	(2.3%)	-	24	-	-
Bioservice	165	(17.2%)	168	(16.1%)	1	155	10	2

4) Number of Partners by Cooperative Relationship Type

- Among the types of cooperation, 371 companies (92.0%) have established a joint R&D contract relationship, which makes up the largest part, and the number of joint R&D cases was found to be 902. It was found that companies holding joint R&D contracts conducted 2.4 joint R&D cases on average.

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

(Unit: cases; companies)



* The above chart shows the responses from companies that hold cooperative relationships (2020: 354 companies; 2021: 400 companies). Multiple responses accepted.

* The figures in parentheses are based on the year 2020.

- The biopharmaceutical industry had the most number of partners at 162 (37.2%), followed by biochemical and bioenergy and biofood at 14.0%.

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

(Unit: companies)

Industrial Category	2020		2021		Cooperation Type			
	Total		Total		Joint Venture	Joint R&D Contract	Technical Tie-up (Licensing)	Technical Manpower Exchange
Total	389	(100.0%)	435	(100.0%)	12	371	44	8
Biopharmaceutical	142	(36.5%)	162	(37.2%)	4	131	24	3
Biochemical and Bioenergy	57	(14.7%)	61	(14.0%)	1	56	2	2
Biofood	55	(14.1%)	61	(14.0%)	3	54	4	-
Bioenvironmental	19	(4.9%)	20	(4.6%)	-	18	2	-
Biomedical Equipment	41	(10.5%)	50	(11.5%)	2	39	7	2
Bioinstrument and Bioequipment	17	(4.4%)	17	(3.9%)	1	16	-	-
Bioresource	6	(1.5%)	6	(1.4%)	-	6	-	-
Bioservice	52	(13.4%)	58	(13.3%)	1	51	5	1

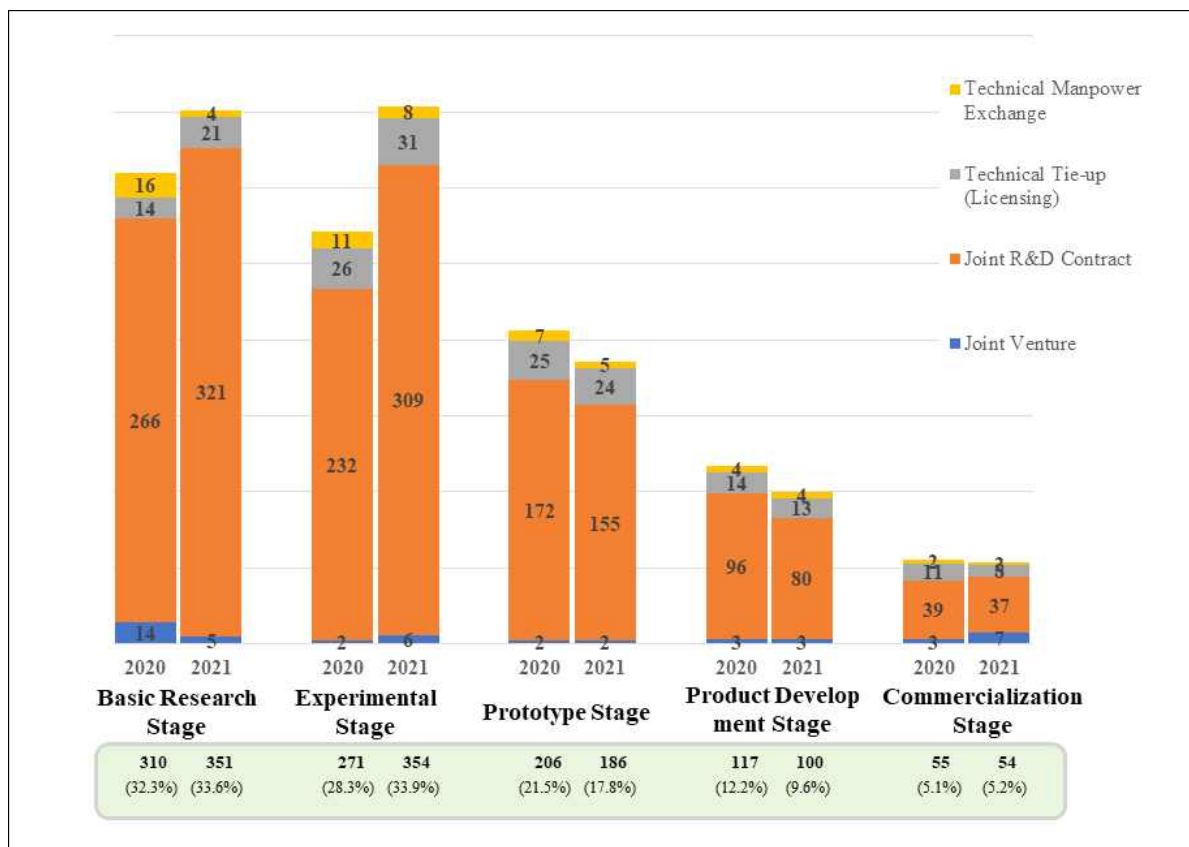
B. Cooperation Stages

1) Number of Cooperation Cases by Cooperation Stage

- As per cooperation stage, the experimental stage has the largest proportion at 33.9% (351 cases) out of a total of 1,045 cases. It was followed by the basic research stage at 33.6% (351 cases).
- The commercialization stage, which is the final stage, showed a low ratio of 5.2% (54 cases), indicating that companies have cooperation with mainly other institutions at the initial stage of the project.
- Compared to previous year, the numbers of cooperation cases for basic research and experimental stages increased but decreased for prototype, product development and commercialization stages.

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

(Unit: cases)



* The above chart shows the responses from companies that hold cooperative relationships (2020: 354 companies; 2021: 400 companies). Multiple responses accepted.

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

(Unit: cases)

Classification	Total Cooperative Relationships	Domestic					Overseas				
		Total	Joint Venture	Joint R&D	Technical Tie-up	Technical Manpower Exchange	Total	Joint Venture	Joint R&D	Technical Tie-up	Technical Manpower Exchange
Total of 2020	959	919	22	782	76	39	40	2	23	14	1
Total of 2021	1,045	993	19	878	74	22	52	4	24	23	1
Basic Research	351	335	5	311	15	4	16	-	10	6	-
Experimental Stage	354	349	5	307	30	7	5	1	2	1	1
Prototype Stage	186	165	1	144	15	5	21	1	11	9	-
Product Development Stage	100	94	2	80	8	4	6	1	-	5	-
Commercialization Stage	54	50	6	36	6	2	4	1	1	2	-

- By bioindustrial classification, the biopharmaceutical industry (162 cases), the bioservice (61), and the bioenvironmental (10) had the greatest numbers of cooperation cases in the basic research stage in 2021, whereas the biochemical and bioenergy (46) and the biomedical equipment (36) cooperated more in the experimental stage.

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

(Unit: cases)

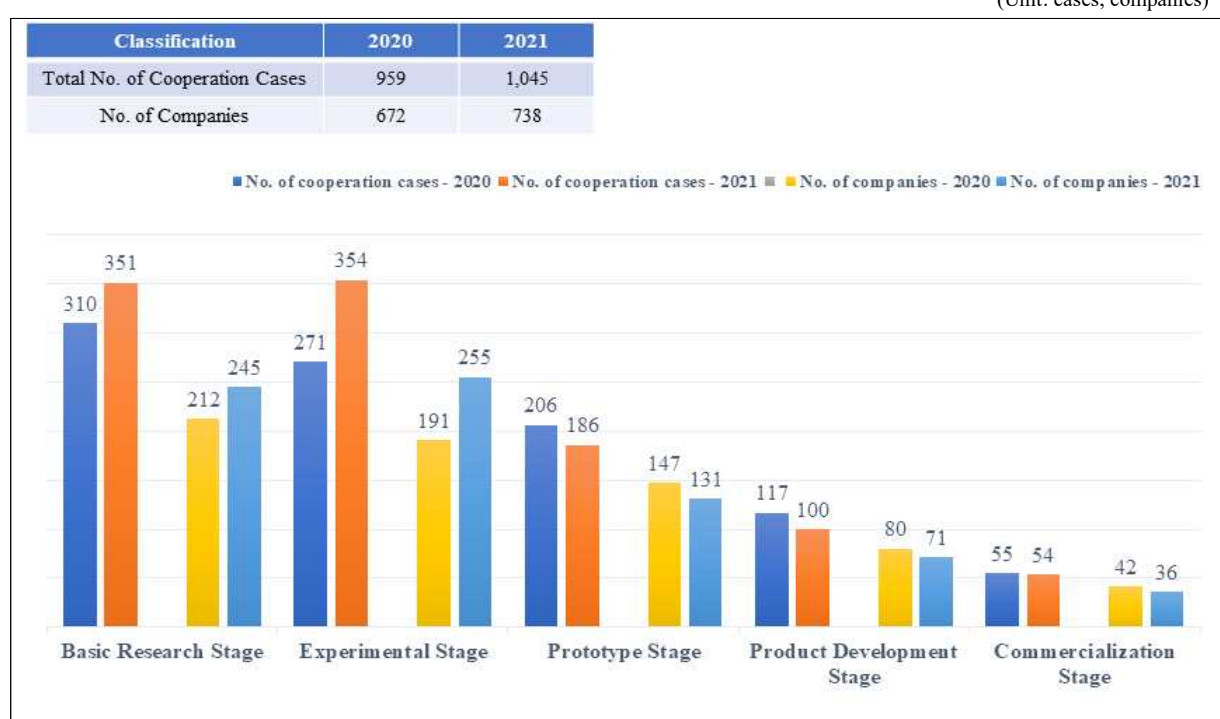
Industrial Category	Total No. of Companies	Companies with Cooperative Relationships	Cooperation Stage					Total	
			Basic Research	Experimental	Prototype	Product Development	Commercialization		
Total	1,055	400	351	354	186	100	54	1,045	(100.0%)
Biopharmaceutical	333	145	162	131	66	21	4	384	(36.7%)
Biochemical and Bioenergy	201	57	44	46	31	20	18	159	(15.2%)
Biofood	175	57	32	59	18	14	7	130	(12.4%)
Bioenvironmental	62	19	10	7	8	-	3	28	(2.7%)
Biomedical Equipment	109	45	30	36	19	14	8	107	(10.2%)
Bioinstrument and Bioequipment	55	16	9	13	18	5	-	45	(4.3%)
Bioresource	15	6	3	18	-	3	-	24	(2.3%)
Bioservice	105	55	61	44	26	23	14	168	(16.1%)

2) Number of Partners by Cooperation Stage

- Including companies that provided multiple responses, the total number of partners by cooperation stage was 738, and of those, there were most number of partners for the experimental stage with 255 partner companies, accounting for 34.6%.
- Compared to the previous year, the number of partners increased in the basic research and experimental stages but decreased in the prototype, product development and commercialization stages.

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

(Unit: cases; companies)



* The above chart shows the responses from companies that hold cooperative relationships (2020: 354 companies; 2021: 400 companies). Multiple responses accepted.

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

(Unit: cases; companies; %)

Classification		Total	Basic Research	Experimental	Prototype	Product Development	Commercialization
No. of Cooperation Cases	Domestic	993	335	349	165	94	50
	Overseas	52	16	5	21	6	4
Total (cases)		1,045	351	354	186	100	54
Percentage (%)		100	33.6	33.9	17.8	9.6	5.2
No. of Companies	Domestic	705	234	250	121	68	32
	Overseas	33	11	5	10	3	4
Total (companies)		738	245	255	131	71	36
Percentage (%)		100	33.2	34.6	17.8	9.6	4.9

- The number of partners by bioindustrial category and cooperation stage was 497 for the biopharmaceutical (35.9%), bioservice (16.1%) and biochemical and bioenergy (15.3%), accounting for 67.3% of the total.
- The biopharmaceutical (106 companies), biochemical and bioenergy (32) and bioservice (44) had relatively higher number of partners during the basic research stage.

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

(Unit: companies)

Industrial Category	2020		2021		Cooperation Stage				
	Total		Total		Basic Research	Experimental	Prototype	Product Development	Commercialization
Total	672	(100.0%)	738	(100.0%)	245	255	131	71	36
Biopharmaceutical	233	(34.7%)	265	(35.9%)	106	98	42	16	3
Biochemical and Bioenergy	113	(16.8%)	113	(15.3%)	32	38	21	13	9
Biofood	81	(12.1%)	91	(12.3%)	22	38	14	12	5
Bioenvironmental	21	(3.1%)	23	(3.1%)	9	5	7	-	2
Biomedical Equipment	76	(11.3%)	85	(11.5%)	23	28	16	11	7
Bioinstrument and Bioequipment	31	(4.6%)	32	(4.3%)	6	10	11	5	-
Bioresource	9	(1.3%)	10	(1.4%)	3	5	-	2	-
Bioservice	55	(8.2%)	119	(16.1%)	44	33	20	12	10

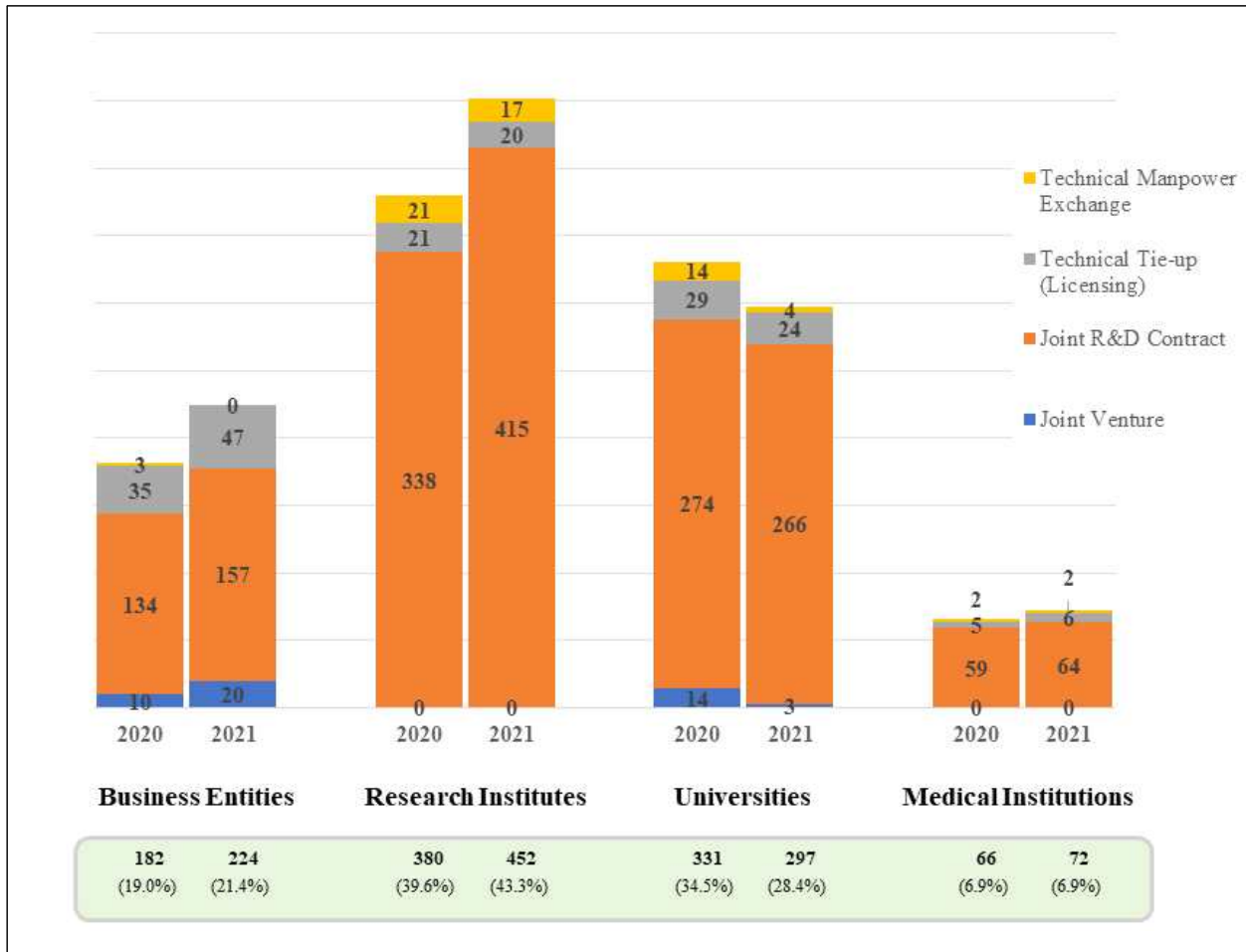
C. Cooperating Organizations

1) Number of Cooperation Cases by Cooperating Organization

- Out of the total 980 cooperation cases, 387 (39.5%) were with research institutes, followed by 333 (34.0%) with universities, 190 (19.4%) with business entities, and 70 (7.1%) with medical institutions.

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

(Unit: cases)



* The above chart shows the responses from companies that hold cooperative relationships (2020: 354 companies; 2021: 400 companies). Multiple responses accepted.

<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	1,045	993	19	878	74	22	52	4	24	23	1
Business Entities	224	185	17	143	25	-	39	3	14	22	-
SMEs and Venture Companies	141	110	9	86	15	-	31	1	11	19	-
Middle-standing Companies	46	44	6	34	4	-	2	-	1	1	-
Large Enterprises	37	31	2	23	6	-	6	2	2	2	-
Research Institutes	452	448	-	412	19	17	4	-	3	1	-
Government-funded Research Institutes	414	412	-	387	14	11	2	-	1	1	-
Private Research Institutes	38	36	-	25	5	6	2	-	2	-	-
Universities	297	289	2	260	24	3	8	1	6	-	1
Medical Institutions	72	71	-	63	6	2	1	-	1	-	-

- If broken down by bioindustrial category, the biofood had more cooperation cases with universities, whereas biopharmaceuticals and biochemical and bioenergy had relatively more cooperation with research institutes.

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

(Unit: cases)

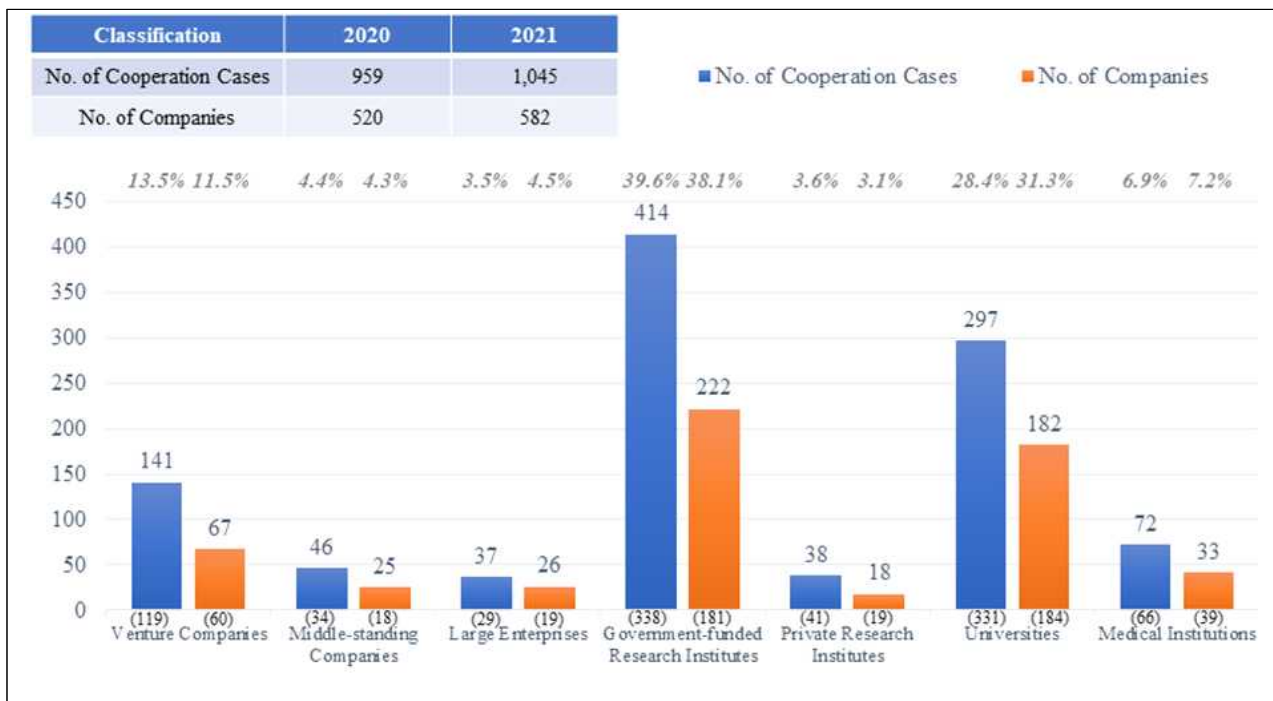
Industrial Category	Total No. of Companies	Companies with Cooperative Relationships	Cooperating Organization					Total	
			Business Entities	Research Institutes	Universities	Medical Institutions			
Total	1,055	400	224	452	297	72	1045	(100.0%)	
Biopharmaceutical	333	145	120	128	104	32	384	(36.7%)	
Biochemical and Bioenergy	201	57	17	94	47	1	159	(15.2%)	
Biofood	175	57	31	48	51	-	130	(12.4%)	
Bioenvironmental	62	19	2	17	9	-	28	(2.7%)	
Biomedical Equipment	109	45	21	46	27	13	107	(10.2%)	
Bioinstrument and Bioequipment	55	16	4	22	15	4	45	(4.3%)	
Bioresource	15	6	-	14	10	-	24	(2.3%)	
Bioservice	105	55	29	83	34	22	168	(16.1%)	

2) Number of Partners by Cooperating Organization

- Of the total of 1,045 cases, cooperation cases with government-funded research institutes were the most common with 414 cases accounting for 39.6%, followed by universities (297 cases, 28.4%), SMEs and venture companies (141 cases, 13.5%), medical institutions (72 cases, 6.9%), middle-standing companies (46 cases, 4.4%), private research institutes (38 cases, 3.6%), and large enterprises (27 cases, 3.5%) in order.
- It was found that a total of 297 cooperation cases were conducted with universities.

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

(Unit: cases; companies)



* The above chart shows the responses from companies that hold cooperative relationships (2020: 354 companies; 2021: 400 companies). Multiple responses accepted.

* The figures in parentheses are based on the year 2020.

- By bioindustrial field, the biopharmaceutical, bioservice, and biochemical and bioenergy industries occupy 36.8%, 15.1% and 13.9% of the total number of partners, respectively, accounting for 65.8% of the total.
- Most companies cooperated with research institutes. Especially, the biopharmaceutical, biochemical and bioenergy, and bioservice industries had 73, 41, and 39 cases, respectively, where the top three areas with most partners had research institutes as their foremost cooperating organization type.

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

(Unit: companies)

Industrial Category	Total No. of Companies	Companies with Cooperative Relationships	Cooperating Organization				Total	
			Business Entities	Research Institutes	Universities	Medical Institutions		
Total	1,045	400	118	240	182	42	582	(100.0%)
Biopharmaceutical	384	145	55	73	66	20	214	(36.8%)
Biochemical and Bioenergy	159	57	10	41	29	1	81	(13.9%)
Biofood	130	57	18	29	26	-	73	(12.5%)
Bioenvironmental	28	19	1	13	8	-	22	(3.8%)
Biomedical Equipment	107	45	15	31	20	8	74	(12.7%)
Bioinstrument and Bioequipment	45	16	3	11	7	2	23	(4.0%)
Bioresource	24	6	-	3	4	-	7	(1.2%)
Bioservice	168	55	16	39	22	11	88	(15.1%)

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

(Unit: cases; units; %)

Classification		Total	Venture Companies	Middle-standing Companies	Large Enterprises	Government-funded Research Institutes	Private Research Institutes	Universities	Medical Institutions	
Joint Venture	Total Investments	Domestic	19	9	6	2	-	-	2	-
		Overseas	4	1	-	2	-	-	1	-
		Subtotal	23	10	6	4	-	-	3	-
	No. of Companies	Domestic	11	5	2	2	-	-	2	-
		Overseas	4	1	-	2	-	-	1	-
		Subtotal	15	6	2	4	-	-	3	-
Joint R&D Contract	Total Investments	Domestic	878	86	34	23	387	25	260	63
		Overseas	24	11	1	2	1	2	6	1
		Subtotal	902	97	35	25	388	27	266	64
	No. of Companies	Domestic	484	40	18	15	205	13	156	37
		Overseas	13	5	1	2	1	1	2	1
		Subtotal	497	45	19	17	206	14	158	38
Technical Tie-up (Licensing)	Total Investments	Domestic	74	15	4	6	14	5	24	6
		Overseas	23	19	1	2	1	-	-	-
		Subtotal	97	34	5	8	15	5	24	6
	No. of Companies	Domestic	48	7	3	4	11	3	17	3
		Overseas	12	9	1	1	1	-	-	-
		Subtotal	60	16	4	5	12	3	17	3
Domestic and International Technical Manpower Exchange	Total Investments	Domestic	22	-	-	-	11	6	3	2
		Overseas	1	-	-	-	-	-	1	-
		Subtotal	23	-	-	-	11	6	4	2
	No. of Companies	Domestic	9	-	-	-	4	1	3	1
		Overseas	1	-	-	-	-	-	1	-
		Subtotal	10	0	0	0	4	1	4	1
Total Cooperation Cases		1,045	141	46	37	414	38	297	72	
Percentage		100	13.5	4.4	3.5	39.6	3.6	28.4	6.9	
Companies in Total		582	67	25	26	222	18	182	42	
Percentage		100	11.5	4.3	4.5	38.1	3.1	31.3	7.2	

3) Cooperating Organizations by Scale of Workers

- Bio-companies with 1 to 49 employees cooperated with research institutes the most (269 cases in total, 267 cases at home).
- Bio-companies with at least 1,000 employees cooperated with research institutes the most, showing 34 cases (34 cases in Korea) in 2021.

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

(Unit: cases)

Classification	Total Cooperative Relationships	Business Entities				Research Institutes			Universities	Medical Institutions	
		Total	SMEs and Venture Companies	Middle-standing Companies	Large Enterprises	Total	Government-funded Research Institutes	Private Research Institutes			
Total	Total	1,043	223	140	46	37	452	414	38	296	72
	1 - 49	541	86	43	25	18	269	250	19	156	30
	50 - 299	300	87	75	6	6	113	109	4	73	27
	300 - 999	113	28	17	4	7	36	30	6	36	13
	1,000 or more	89	22	5	11	6	34	25	9	31	2
Domestic	Total	991	184	109	44	31	448	412	36	288	71
	1 - 49	538	85	43	25	17	267	250	17	156	30
	50 - 299	271	59	51	4	4	112	108	4	73	27
	300 - 999	102	21	10	4	7	35	29	6	34	12
	1,000 or more	80	19	5	11	3	34	25	9	25	2
Overseas	Total	52	39	31	2	6	4	2	2	8	1
	1 - 49	3	1	-	-	1	2	-	2	-	-
	50 - 299	29	28	24	2	2	1	1	-	-	-
	300 - 999	11	7	7	-	-	1	1	-	2	1
	1,000 or more	9	3	-	-	3	-	-	-	6	-

* Conducted for 519 companies with 1 to 49 employees, 218 companies with 50 to 299 employees, 67 companies with 300 to 999 employees, and 30 companies with more than 1,000 employees.

* Excluded companies with unknown size of employees

5 Supply and Demand Status of Bioindustry

A. Bioindustry's Supply and Demand Status of 2021

- In 2021, the total supply and demand status of bioindustry was KRW 25,767.6 billion, which was an increase by KRW 6,138.7 billion or 31.3% year-over-year (YoY).
- The production scale was KRW 20,998.3 billion (81.5%), and the size of import was KRW 4,769.2 billion (18.5%).
- The size of domestic demand was KRW 13,907.7 billion (54.0%), and the size of export was KRW 11,859.8 billion (46.0%).

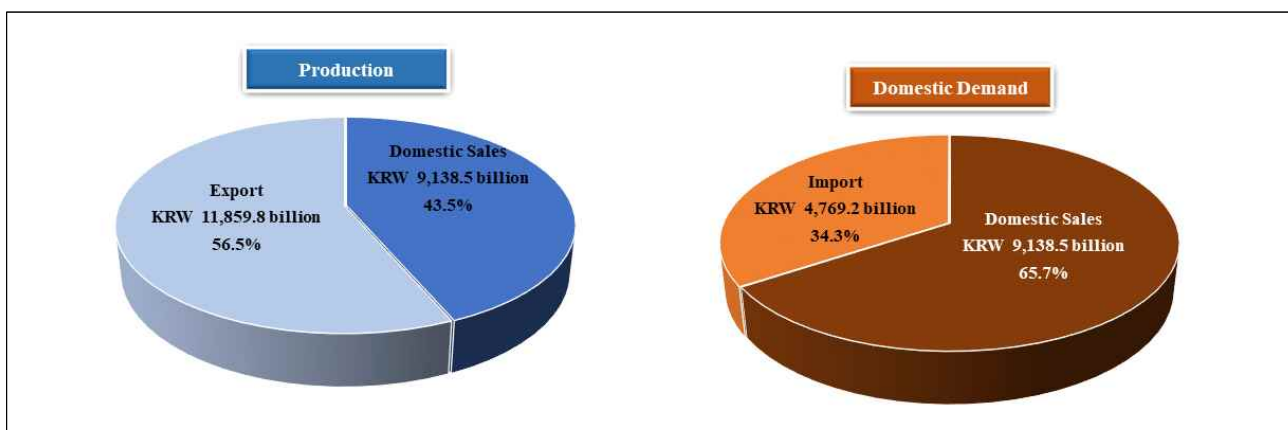
<Table 2-29> 2019–2021 Bioindustry's Trend of Supply and Demand

(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
2019	126,586	86.0	20,665	14.0	147,250	81,836	55.6	65,414	44.4
2020	171,983	87.6	24,305	12.4	196,288	95,776	48.8	100,512	51.2
2021	209,983	81.5	47,692	18.5	257,676	139,077	54.0	118,598	46.0
Annual Average Rate of Change	28.8		51.9		32.3	30.4		34.6	

<Figure 2-27> 2021 Bioindustry's Size of Production and Domestic Demand

(Unit: %)



- For the production scale in the bioindustry, the biopharmaceutical, biomedical equipment, and biofood industries accounted for KRW 5,838.5 billion (27.8%), KRW 5,279.3 billion (25.1%), and KRW 4,193.7 billion (20.0%), respectively, accounting for a majority, 72.9% of the total production.
- In the domestic market, the biopharmaceutical (KRW 6,397.9 billion, 46.0%), biochemical and bioenergy (KRW 2,680.1 billion, 19.3%), and biofood (KRW 1,946.3 billion, 14.0%) made up 79.3%.

<Table 2-30> 2021 Bioindustry's Status of Production and Domestic Demand

(Unit: million KRW, %)

Industrial Category	Production				Domestic Demand			
	Domestic Sales	Export	Total	Distribution Ratio	Domestic Sales	Import	Total	Distribution Ratio
Total	9,138,461	11,859,846	20,998,307	100.0	9,138,461	4,769,249	13,907,710	100.0
Biopharmaceutical	2,331,985	3,506,493	5,838,478	27.8	2,331,985	4,065,908	6,397,893	46.0
Biochemical and Bioenergy	2,390,566	360,302	2,750,868	13.1	2,390,566	289,582	2,680,148	19.3
Biofood	1,840,776	2,352,874	4,193,650	20.0	1,840,776	105,495	1,946,271	14.0
Bioenvironmental	69,026	66	69,092	0.3	69,026	149	69,175	0.5
Biomedical Equipment	1,058,324	4,220,932	5,279,256	25.1	1,058,324	58,034	1,116,358	8.0
Bioinstrument and Bioequipment	140,327	50,631	190,958	0.9	140,327	228,178	368,505	2.6
Bioresource	80,913	11,324	92,237	0.4	80,913	19,306	100,219	0.7
Bioservice	1,226,544	1,357,224	2,583,768	12.3	1,226,544	2,598	1,229,142	8.8

- As for production scale and domestic demand by area, Gyeonggi had the highest production scale at 41.2% (KRW 8,654.4 billion), and Seoul had the highest domestic demand at 38.5% (KRW 5,351.1 billion)

<Table 2-31> 2021 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	9,138,461	11,859,846	20,998,307	100.0	9,138,461	4,769,249	13,907,710	100
Seoul	1,301,243	676,733	1,977,976	9.4	1,301,243	4,049,817	5,351,060	38.5
Busan	5,979	1,889	7,868	0.0	5,979	2,432	8,411	0.1
Incheon	409,933	3,562,488	3,972,421	18.9	409,933	12,131	422,064	3.0
Daegu	48,288	41,447	89,735	0.4	48,288	6	48,294	0.3
Gwangju	1,859	0	1,859	0.0	1,859	132	1,991	0.0
Daejeon	443,708	88,941	532,649	2.5	443,708	26,354	470,062	3.4
Ulsan	1,076,005	6,522	1,082,527	5.2	1,076,005	184,574	1,260,579	9.1
Sejong	1,822	0	1,822	0.0	1,822	-	1,822	0.0
Gyeonggi	2,620,312	6,034,092	8,654,404	41.2	2,620,312	321,988	2,942,300	21.2
Gangwon	220,726	356,251	576,977	2.7	220,726	33,612	254,338	1.8
Chungbuk	1,382,728	680,121	2,062,849	9.8	1,382,728	70,196	1,452,924	10.4
Chungnam	158,954	61,065	220,019	1.0	158,954	16,022	174,976	1.3
Jeonbuk	289,350	58,096	347,446	1.7	289,350	2,287	291,637	2.1
Jeonnam	292,503	22,314	314,817	1.5	292,503	11,707	304,210	2.2
Gyeongbuk	845,389	241,333	1,086,722	5.2	845,389	19,879	865,268	6.2
Gyeongnam	30,537	24,026	54,563	0.3	30,537	17,998	48,535	0.3
Jeju	9,125	4,527	13,652	0.1	9,125	114	9,239	0.1

B. Recent Trend of Supply and Demand Status

1) 2019–2021 Trend of Supply and Demand Status

- The size of production and domestic demand in the bioindustries continued to grow between 2019 and 2021.
- The annual average rate of change in the supply and demand, production, and domestic demand since 2019 marked 32.3%, 28.8%, and 30.4%, respectively.

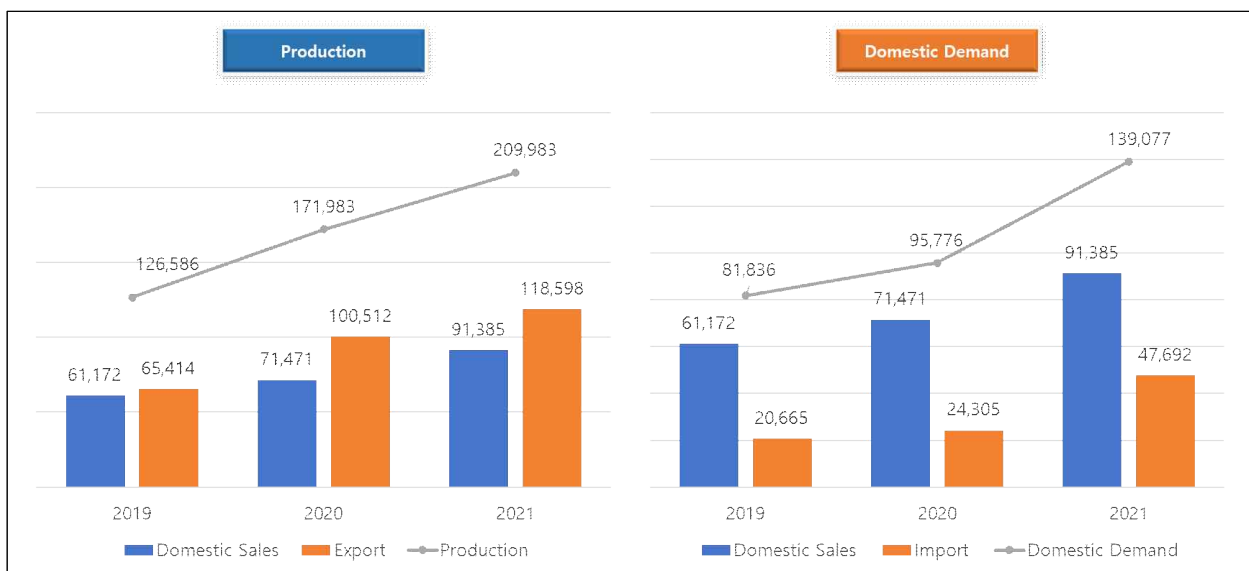
<Table 2-32> 2019–2021 Bioindustry’s Trend of Production and Domestic Demand

(Unit: 100 million KRW, %)

Classification		2019	2020	2021	Annual Average Rate of Change
Supply and Demand (Production + Import)	Amount	147,250	196,288	257,676	32.3
	Rate of Change	19.4	33.3	31.3	
Production (Domestic Sales + Export)	Amount	126,586	171,983	209,983	28.8
	Rate of Change	19.3	35.9	22.1	
Domestic Demand (Domestic Sales + Export)	Amount	81,836	95,776	139,077	30.4
	Rate of Change	15.3	17.0	45.2	

<Figure 2-28> 2019–2021 Bioindustry's Trend of Production and Domestic Demand

(Unit: 100 million KRW)



- In 2021, production increased by 22.1% YoY, and the bioservice industry showed the highest growth rate at 43.1%.
- The biopharmaceutical industry, which makes up the largest part in the total production, increased by 18.7% YoY, whereas the bioresource industry decreased by 23.9%.
- The domestic demand in 2021 increased by 45.2% YoY, and the biopharmaceutical and bioservice industries displayed the highest increases, 82.0% and 46.4%, respectively, and the bioresource industry decreased by 22.4%.

<Table 2-33> 2019–2021 Bioindustry's Trend of Supply and Demand by Category

(Unit: 100 million KRW, %)

Industrial Category	Production					Domestic Demand				
	2019	2020	2021	Variation from Previous Year	Annual Average Rate of Change	2019	2020	2021	Variation from Previous Year	Annual Average Rate of Change
Total	126,586	171,983	209,983	22.1	28.8	81,836	95,776	139,077	45.2	30.4
Biopharmaceutical	42,246	49,174	58,385	18.7	17.6	32,623	35,158	63,979	82.0	40.0
Biochemical and Bioenergy	18,561	21,253	27,509	29.4	21.7	18,412	20,036	26,801	33.8	20.6
Biofood	39,903	40,925	41,937	2.5	2.5	16,385	17,824	19,463	9.2	9.0
Bioenvironmental	557	663	691	4.2	11.4	552	664	692	4.2	12.0
Biomedical Equipment	10,438	38,976	52,793	35.5	124.9	3,638	9,074	11,164	23.0	75.2
Bioinstrument and Bioequipment	1,105	1,721	1,910	11.0	31.5	2,455	3,334	3,685	10.5	22.5
Bioresource	1,257	1,211	922	-23.9	-14.4	1,308	1,292	1,002	-22.4	-12.5
Bioservice	12,519	18,058	25,838	43.1	43.7	6,464	8,395	12,291	46.4	37.9

2) 2017–2021 Trend of Supply and Demand Status

- The trend of supply and demand of the bioindustries over the past five years can be summarized as follows: the production scale showed a steady increase at 19.9% and the domestic demand also grew with an annual average of 20.7%.

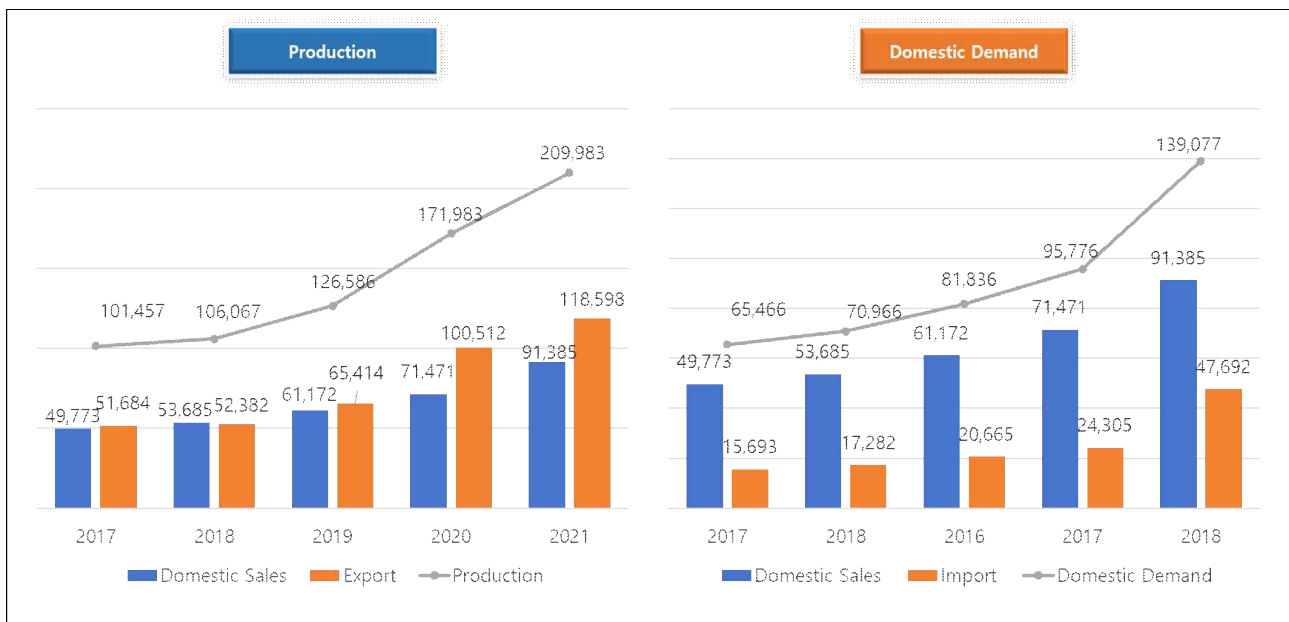
<Table 2-34> 2017–2021 Bioindustry’s Trend of Supply and Demand

(Unit: 100 million KRW, %)

Classification		2017	2018	2019	2020	2021	Annual Average Rate of Change
Supply and Demand (Production + Import)	Amount	117,150	123,348	147,250	196,288	257,676	21.8
	Rate of Change	9.3	5.3	19.4	33.3	31.3	
Production (Domestic Sales + Export)	Amount	101,457	106,067	126,586	171,983	209,983	19.9
	Rate of Change	9.6	4.5	19.3	35.9	22.1	
Domestic Demand (Domestic Sales + Import)	Amount	65,466	70,966	81,836	95,776	139,077	20.7
	Rate of Change	7.5	8.4	15.3	17.0	45.2	

<Figure 2-29> 2017–2021 Bioindustry's Trend of Production and Domestic Demand

(Unit: 100 million KRW)



<Table 2-35> 2017–2021 Bioindustry's Trend of Supply and Demand by Category

(Unit: 100 million KRW, %)

Industrial Category	Production							Domestic Demand						
	2017	2018	2019	2020	2021	Variation from Previous Year	Annual Average Rate of Change	2017	2018	2019	2020	2021	Variation from Previous Year	Annual Average Rate of Change
Total	101,457	106,067	126,586	171,983	209,983	22.1	19.9	65,466	70,966	81,836	95,776	139,077	45.2	20.7
Biopharmaceutical	35,044	35,101	42,246	49,174	58,385	18.7	13.6	29,287	29,793	32,623	35,158	63,979	82.0	21.6
Biochemical and Bioenergy	15,944	17,916	18,561	21,253	27,509	29.4	14.6	15,644	18,083	18,412	20,036	26,801	33.8	14.4
Biofood	31,241	31,015	39,903	40,925	41,937	2.5	7.6	12,659	12,947	16,385	17,824	19,463	9.2	11.4
Bioenvironmental	462	577	557	663	691	4.2	10.6	460	562	552	664	692	4.2	10.7
Biomedical Equipment	7,771	8,482	10,438	38,976	52,793	35.5	61.4	1,963	2,714	3,638	9,074	11,164	23.0	54.4
Bioinstrument and Bioequipment	1,130	889	1,105	1,721	1,910	11.0	14.0	1,174	1,240	2,455	3,334	3,685	10.5	33.1
Bioresource	1,711	1,785	1,257	1,211	922	-23.9	-14.3	1,561	1,793	1,308	1,292	1,002	-22.4	-10.5
Bioservice	8,153	10,302	12,519	18,058	25,838	43.1	33.4	2,718	3,834	6,464	8,395	12,291	46.4	45.8

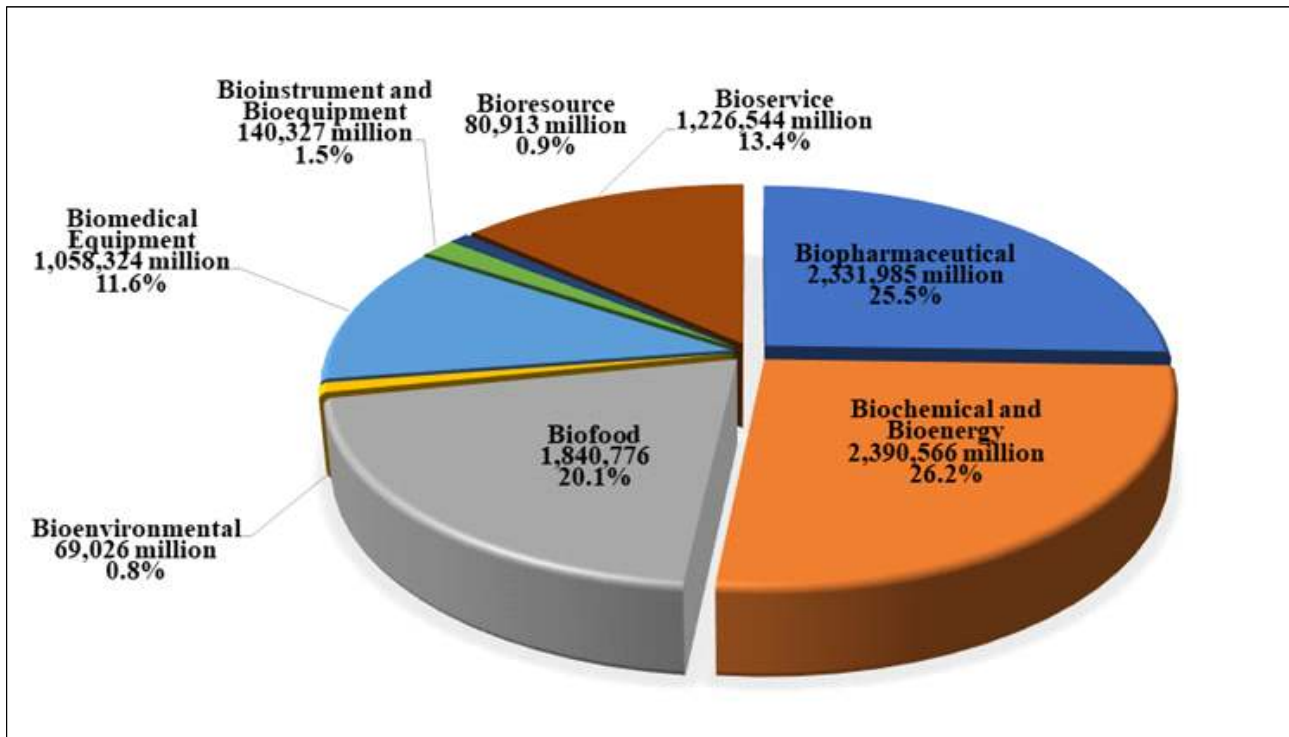
6 Domestic Sales Status of Bioindustry

A. Domestic Sales Status of 2021

- The size of bioindustry's domestic sales in 2021 reached KRW 9,138.5 billion, and the biochemical and bioenergy industry took the largest proportion among them with KRW 2,390.6 billion (26.2%).
- The following largest industries were the biopharmaceutical with KRW 2,332.0 billion (25.5%) and biofood with KRW 1,840.8 billion (20.1%).
- Domestic sales of the bioindustry in 2021 accounted for 71.8% of the total market in three industries: biochemical and bioenergy, biopharmaceutical, and biofood.

<Figure 2-30> 2021 Bioindustry's Size of Domestic Sales by Category

(Unit: million KRW, %)



- <Table 2-36> shows the domestic bioproducts that have more than 1.0% domestic sales among 51 domestic bioproducts and bioservices, in the order of size. The size of domestic sales of biofuels accounted for 18.2% of the total bioindustry with KRW 1,661.1 billion.
- The following largest bioproducts were feed additives (10.9%), in-vitro diagnostics (9.8%), and vaccines (7.8%) in order. A total of 18 products make up at least 1.0% of the domestic sales.

<Table 2-36> 2021 Main Bioproduct's Size of Domestic Sales

(Unit: million KRW, %)

Rank	Code	Product Name	Domestic Sales	Distribution Ratio
1	2060	Biofuels	1,661,059	18.2
2	3050	Feed additives	999,585	10.9
3	5020	In-vitro diagnostics	894,431	9.8
4	1030	Vaccines	710,210	7.8
5	8010	Bio-consignment production and procurement services	663,142	7.3
6	3010	Functional health foods	564,455	6.2
7	2040	Biocosmetics and home & personal care chemicals	429,766	4.7
8	1000	Other biopharmaceuticals	409,815	4.5
9	1060	Hemotherapeutics	402,088	4.4
10	1080	Gene therapeutics	350,992	3.8
11	8030	Clinical/non-clinical R&D services	219,444	2.4
12	3030	Food additives	182,802	2.0
13	5000	Other biomedical equipments	163,383	1.8
14	1040	Hormones	145,746	1.6
15	8020	Bio-diagnostic and analytical services	142,321	1.6
16	2050	Biological agrochemicals and fertilizers	113,739	1.2
17	2030	Enzymes and reagents for research	112,477	1.2
18	8040	Other R&D services	95,910	1.0

B. Recent Trend of Domestic Sales Status

1) 2019–2021 Trend of Domestic Sales Status

- The size of bioindustry’s domestic sales in 2021 was KRW 9,138.5 billion, which increased by KRW 1,991.3 billion (27.9%) from KRW 7,147.1 billion in 2020.
- The annual average growth rate of bioindustry’s domestic sales for the past three years is 22.2%.

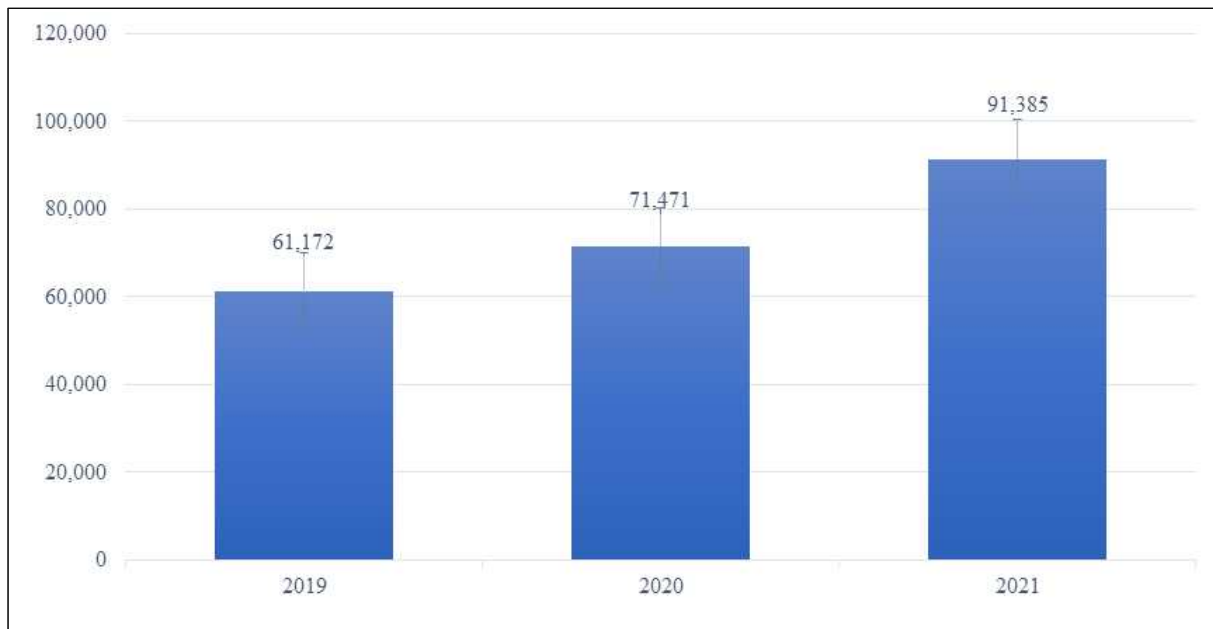
<Table 2-37> 2019–2021 Bioindustry’s Trend of Domestic Sales

(Unit: 100 million KRW, %)

Classification		2019	2020	2021	Annual Average Rate of Change
Domestic Sales	Amount	61,172	71,471	91,385	
	Rate of Change	13.9	16.8	27.9	

<Figure 2-31> 2019–2021 Bioindustry's Trend of Domestic Sales

(Unit: 100 million KRW)



- The biochemical and energy industry accounts for the largest part at 26.2% of the entire bioindustry.
- The biochemical and bioenergy industry was the largest segment in the entire bioindustry in 2021 and grew by 32.7% YoY. The biopharmaceutical industry grew by 39.6% YoY, occupying 25.2%. The biofood industry also grew by 9.7% YoY, occupying 20.1%.
- Compared to 2020, the bioservice industry grew the most (46.5%), whereas the bioresource shrunk by 26.0%.

<Table 2-38 > 2019–2021 Bioindustry’s Trend of Domestic Sales by Category

(Unit: 100 million KRW, %)

Industrial Category	2019		2020		2021		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	61,172	100.0	71,471	100.0	91,385	100.0	19,914	27.9	22.2
Bio pharmaceutical	16,180	26.5	16,703	23.4	23,320	25.5	6,617	39.6	20.1
Biochemical and Bioenergy	17,356	28.4	18,013	25.2	23,906	26.2	5,893	32.7	17.4
Biofood	15,818	25.9	16,782	23.5	18,408	20.1	1,626	9.7	7.9
Bioenvironmental	551	0.9	662	0.9	690	0.8	28	4.2	11.9
Biomedical Equipment	3,095	5.1	8,603	12.0	10,583	11.6	1,980	23.0	84.9
Bioinstrument and Bioequipment	701	1.1	1,245	1.7	1,403	1.5	158	12.7	41.5
Bioresource	1,041	1.7	1,093	1.5	809	0.9	-284	-26.0	-11.8
Bioservice	6,430	10.5	8,371	11.7	12,265	13.4	3,894	46.5	38.1

2) 2017–2021 Trend of Domestic Sales Status

- The size of domestic sales increased by 16.4% annually over the past five years.
- It has grown steadily since 2017 and surpassed KRW 5 trillion in 2018 and KRW 9 trillion in 2021.

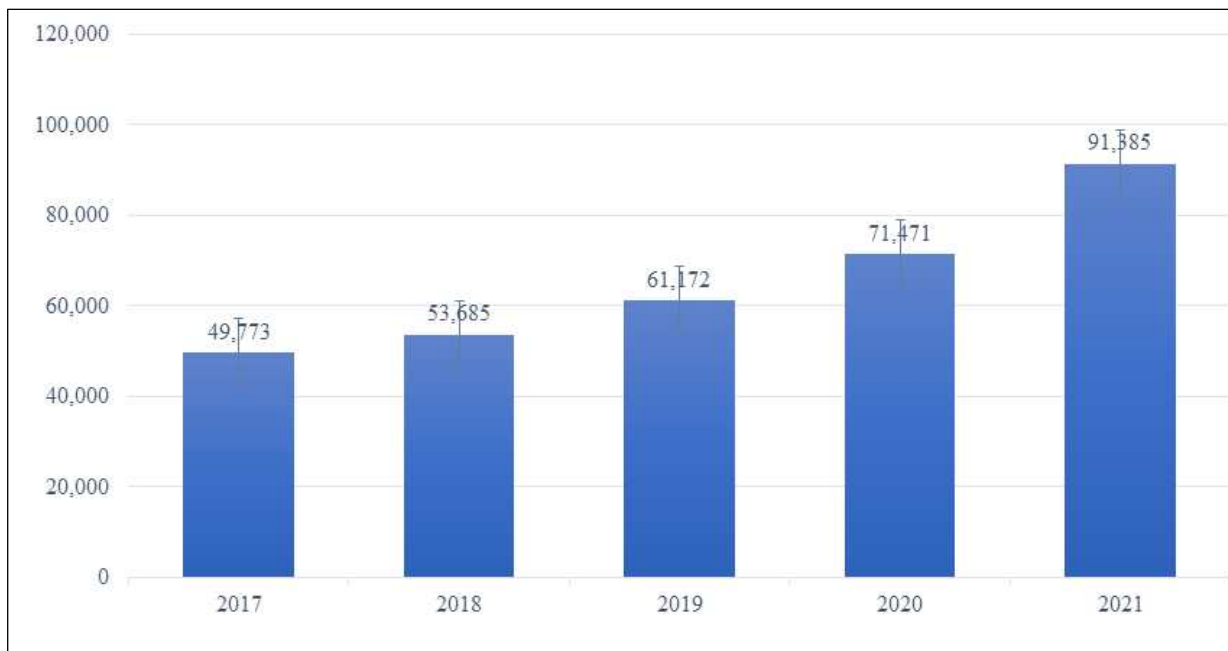
<Table 2-39> 2017–2021 Bioindustry’s Trend of Domestic Sales

(Unit: 100 million KRW, %)

Classification		2017	2018	2019	2020	2021	Annual Average Rate of Change
Domestic Sales	Amount	49,773	53,685	61,172	71,471	91,385	16.4
	Rate of Change	7.5	7.9	13.9	16.8	27.9	

<Figure 2-32> 2017–2021 Bioindustry's Trend of Domestic Sales

(Unit: 100 million KRW)



<Table 2-40> 2017–2021 Bioindustry’s Trend of Domestic Sales by Category

(Unit: 100 million KRW, %)

Industrial Category	2017		2018		2019		2020		2021		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	49,773	100.0	53,685	100.0	61,172	100.0	71,471	100.0	91,385	100.0	19,914	27.9	16.4
Biopharmaceutical	15,882	31.9	15,699	29.2	16,180	26.1	16,703	23.4	23,320	25.5	6,617	39.6	10.1
Biochemistry and Bioenergy	14,811	29.8	16,825	31.3	17,356	29.4	18,013	25.2	23,906	26.2	5,893	32.7	12.7
Biofood	12,199	24.5	12,447	23.2	15,818	25.5	16,782	23.5	18,408	20.1	1,626	9.7	10.8
Bioenvironmental	458	0.9	560	1.0	551	0.9	662	0.9	690	0.8	28	4.2	10.8
Biomedical Equipment	1,641	3.3	2,211	4.1	3,095	5.0	8,603	12.0	10,583	11.6	1,980	23.0	59.4
Bioinstrument and Bioequipment	660	1.3	585	1.1	701	1.1	1,245	1.7	1,403	1.5	158	12.7	20.7
Bioresource	1,498	3.0	1,549	2.9	1,041	1.7	1,093	1.5	809	0.9	-284	-26.0	-14.3
Bioservice	2,624	5.3	3,809	7.1	6,430	10.4	8,371	11.7	12,265	13.4	3,894	46.5	47.0

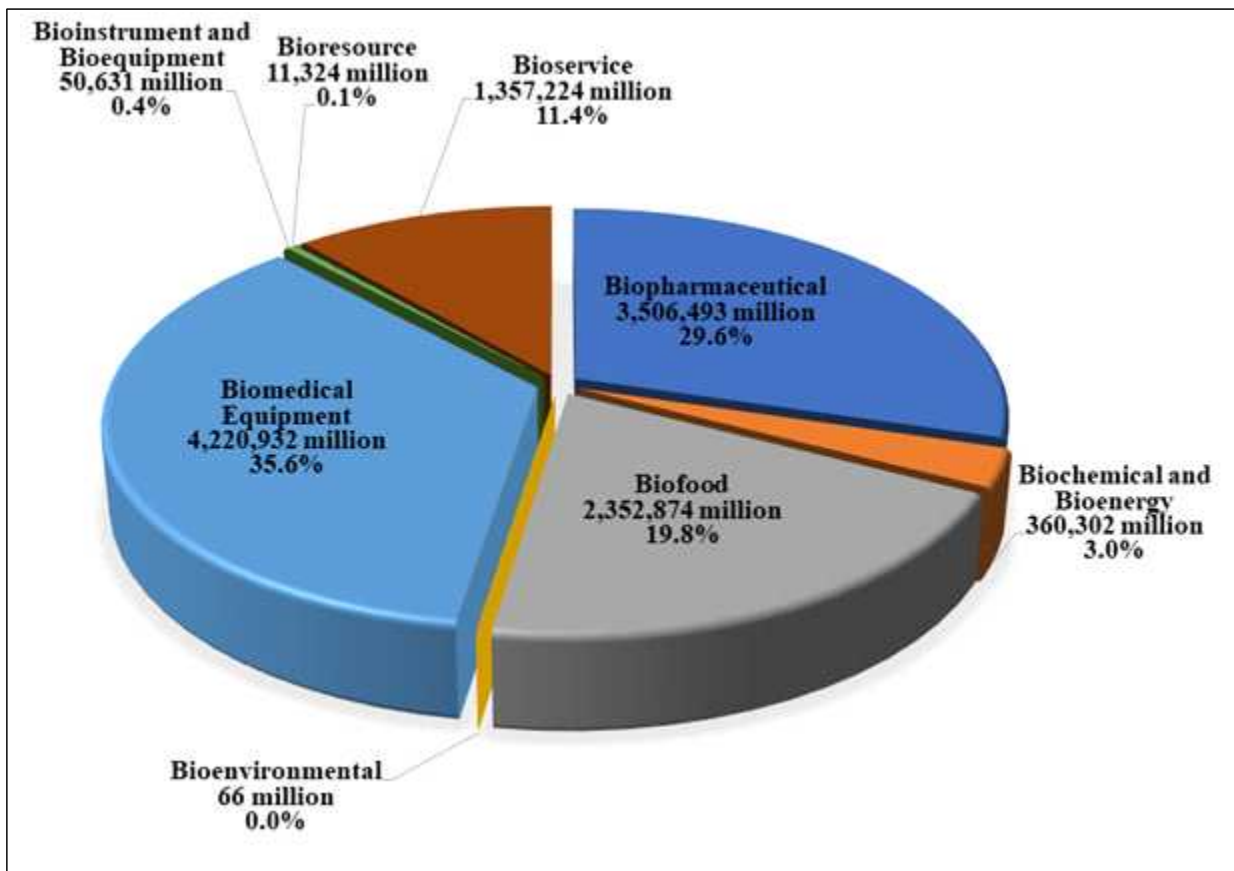
7 Export Status of Bioindustry

A. Export Status of 2021

- The bioindustry's size of exports in 2021 reached KRW 11,859.8 billion.
- According to the bioindustry's size of export by category, the biomedical equipment was the highest with KRW 4,220.9 billion (35.6%), followed by the biopharmaceutical with KRW 3,506.5 billion, making up 29.6%.

<Figure 2-33> 2021 Bioindustry's Size of Export by Category

(Unit: million KRW, %)



- Among domestic bioproducts, biotechnologies, and bioservices, <Table 2-41> shows domestic bioproducts whose export proportion was 1.0% or more according to the size, with 10 products showing an export of 1.0% or more.
- In-vitro diagnostics ranked the highest amount of export with KRW 3,994.2 billion (33.7%), followed by therapeutic antibodies and cytokines (20.1%), feed additives (15.0%), bio-consignment production and procurement services (10.5%), and food additives (4.3%). Two of the five largest export products are biofood products.

<Table 2-41> 2021 Main Bioproduct's Export

(Unit: million KRW, %)

Rank	Code	Product Name	Export Amount	Distribution Ratio
1	5020	In-vitro diagnostics	3,994,246	33.7
2	1050	Therapeutic antibodies and cytokines	2,386,092	20.1
3	3050	Feed additives	1,780,588	15.0
4	8010	Bio-consignment production and procurement services	1,251,025	10.5
5	3030	Food additives	515,312	4.3
6	1030	Vaccines	451,601	3.8
7	1000	Other biopharmaceuticals	297,136	2.5
8	5000	Other biomedical equipments	211,649	1.8
9	2060	Biofuels	192,204	1.6
10	1060	Hemotherapeutics	144,393	1.2

B. Recent Trend of Export Status

1) 2019–2021 Trend of Export

- The export size of the domestic bioindustry in 2021 was KRW 11,859.8 billion, which increased by KRW 1,808.6 billion (18.0%) from 2020.

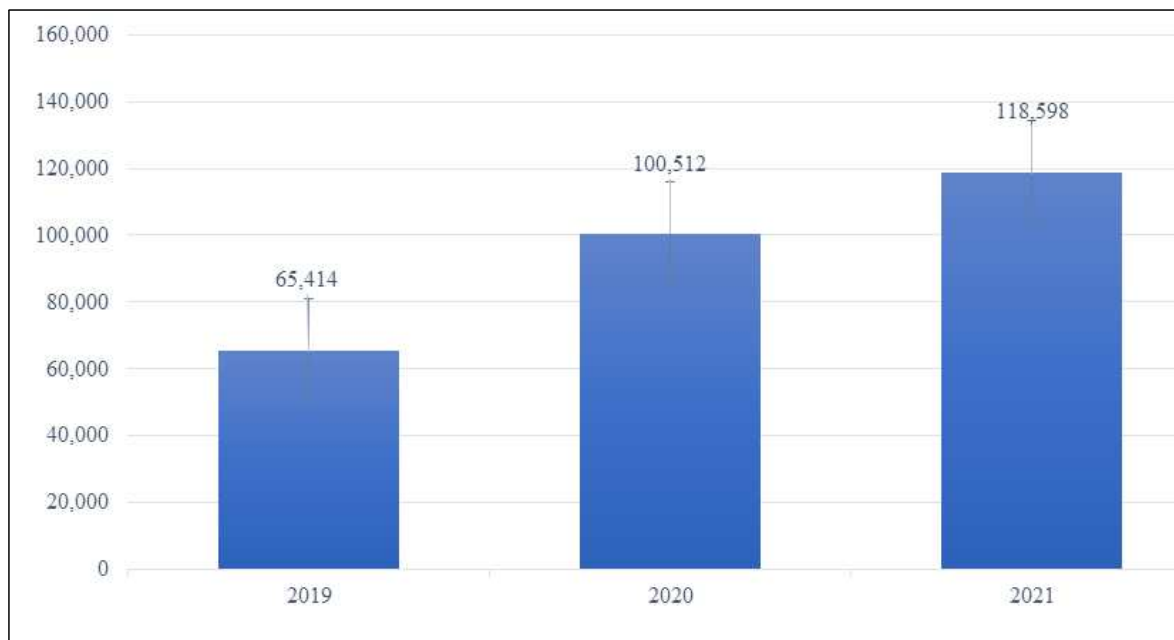
<Table 2-42> 2019–2021 Bioindustry’s Trend of Export

(Unit: 100 million KRW, %)

Classification		2019	2020	2021	Annual Average Rate of Change
Export	Amount	65,414	100,512	118,598	34.6
	Rate of Change	24.9	53.7	18.0	

<Figure 2-34> 2019–2021 Bioindustry's Trend of Export

(Unit: 100 million KRW)



- The amount of exports in the biomedical equipment industry accounted for the largest proportion at KRW 4,220.9 billion, which was an increase by KRW 1,183.5 billion (39.0%) from 2020. On the other hand, exports in the bioenvironmental and bioresource industries decreased by KRW 100 million (-100.0%) and KRW 500 million (-4.2%), respectively.
- Exports grew the most in the bioservice industry (40.1%) and decreased the most in the bioenvironmental industry (-100.0%) compared to the previous year.

<Table 2-43> 2019–2021 Bioindustry’s Trend of Export by Category

(Unit: 100 million KRW, %)

Industrial Category	2019		2020		2021		Variation from Previous Year		Annual Average Rate of Change
	Export Amount	Distribution Ratio	Export Amount	Distribution Ratio	Export Amount	Distribution Ratio	Export Amount	Rate of Change	
Total	65,414	100.0	100,512	100.0	118,598	100.0	18,086	18.0	34.6
Biopharmaceutical	26,066	39.8	32,471	32.3	35,065	29.6	2,594	8.0	16.0
Biochemical and Bioenergy	1,205	1.8	3,240	3.2	3,603	3.0	363	11.2	72.9
Biofood	24,085	36.8	24,143	24.0	23,529	19.8	-614	-2.5	-1.2
Bioenvironmental	6	0.0	1	0.0	0	0.0	-1	-100.0	-100.0
Biomedical Equipment	7,343	11.2	30,374	30.2	42,209	35.6	11,835	39.0	139.8
Bioinstrument and Bioequipment	405	0.6	477	0.5	506	0.4	29	6.1	11.8
Bioresource	216	0.3	118	0.1	113	0.1	-5	-4.2	-27.7
Bioservice	6,089	9.3	9,688	9.6	13,572	11.4	3,884	40.1	49.3

2) 2017–2021 Trend of Export

- The trend of export continuously grew over the past five years, reaching an annual average increase of 23.1%. The export amount increased by 18.0% YoY.

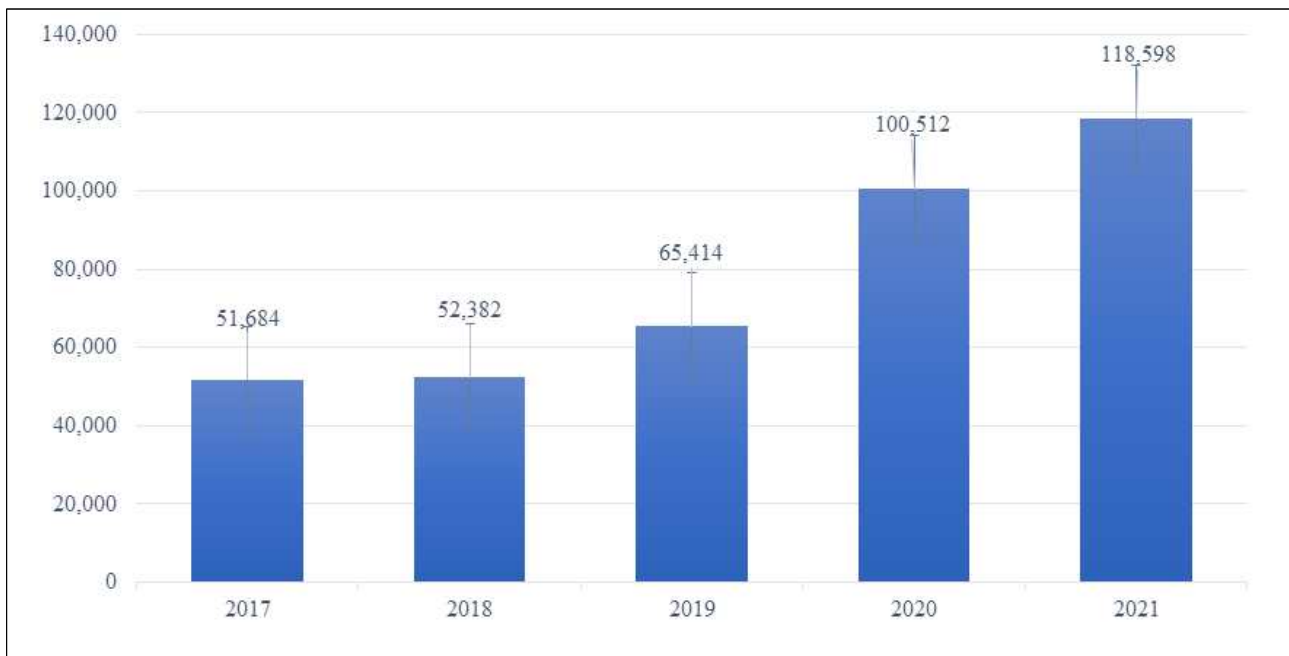
<Table 2-44> 2017–2021 Bioindustry’s Trend of Export

(Unit: 100 million KRW, %)

Classification		2017	2018	2019	2020	2021	Annual Average Rate of Change
Export	Amount	51,684	52,382	65,414	100,512	118,598	23.1
	Rate of Change	11.6	1.4	24.9	53.7	18.0	

<Figure 2-35> 2017–2021 Bioindustry's Trend of Export

(Unit: 100 million KRW)



<Table 2-45> 2017–2021 Bioindustry’s Trend of Export by Category

(Unit: 100 million KRW, %)

Industrial Category	2017		2018		2019		2020		2021		Variation from Previous Year		Annual Average Rate of Change
	Export Amount	Distribution Ratio	Export Amount	Distribution Ratio	Export Amount	Distribution Ratio	Export Amount	Distribution Ratio	Export Amount	Distribution Ratio	Export Amount	Rate of Change	
Total	51,684	100.0	52,382	100.0	65,414	100.0	100,512	100.0	118,598	100.0	18,086	18.0	23.1
Biopharmaceutical	19,162	37.1	19,401	29.2	26,066	39.8	32,471	32.3	35,065	29.6	2,594	8.0	16.3
Biochemical and Bioenergy	1,134	2.2	1,091	31.3	1,205	1.8	3,240	3.2	3,603	3.0	363	11.2	33.5
Biofood	19,043	36.8	18,568	23.2	24,085	36.8	24,143	24.0	23,529	19.8	-614	-2.5	5.4
Bioenvironmental	4	0	16	1	6	0.0	1	0.0	0	0.0	-1	-100.0	-100.0
Biomedical Equipment	6,130	11.9	6,271	4.1	7,343	11.2	30,374	30.2	42,209	35.6	11,835	39.0	62.0
Bioinstrument and Bioequipment	469	0.9	305	1.1	405	0.6	477	0.5	506	0.4	29	6.1	1.9
Bioresource	213	0.4	236	2.9	216	0.3	118	0.1	113	0.1	-5	-4.2	-14.7
Bioservice	5,529	10.7	6,493	7.1	6,089	9.3	9,688	9.6	13,572	11.4	3,884	40.1	25.2

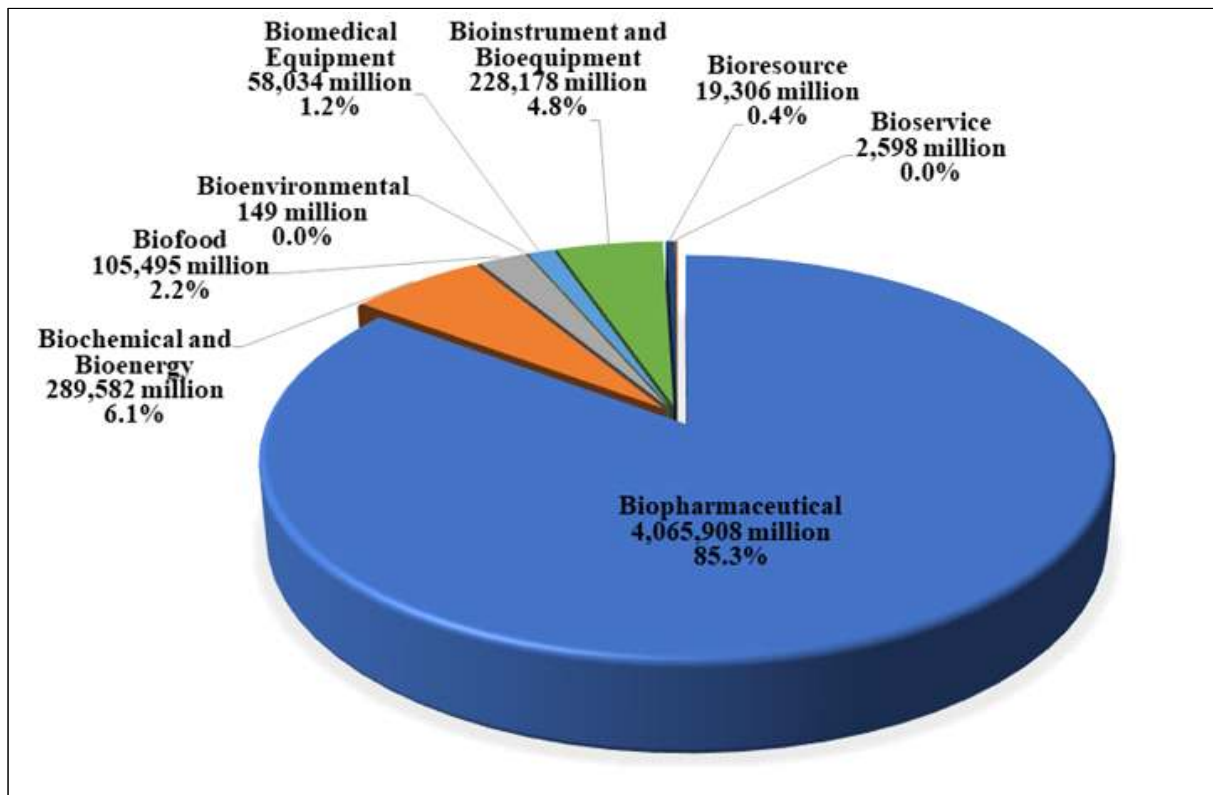
8 Import Status of Bioindustry

A. Import Status of 2021

- The bioindustry's size of imports in 2021 reached KRW 4,769.2 billion.
- Comparing the size of imports by bioindustry, the biopharmaceutical industry accounted for 85.3% of the total imports, which accounts for the majority of the industry.

<Figure 2-36> 2021 Bioindustry's Size of Import by Category

(Unit: million KRW, %)



- In 2021, the number of items with 1.0% or higher import ratio from domestic bioproducts, biotechnologies, and bioservices was 11.
- Of the total import amount, gene therapeutics occupied the most at KRW 2.159.0 billion (45.3%), followed by therapeutic antibodies and cytokines with KRW 927.4 billion (19.4%), which was the largest in 2020, vaccines with KRW 325.6 billion (6.8%), hormones with KRW 320.8 billion (6.7%), and biofuel with KRW 196.8 billion (4.1%).
- The amount of imports of the top 5 imported items made up 82.6% of the total import amount.

<Table 2-46> 2021 Main Bioproduct's Import

(Unit: million KRW, %)

Rank	Code	Product Name	Import Amount	Distribution Ratio
1	1080	Gene therapeutics	2,158,959	45.3
2	1050	Therapeutic antibodies and cytokines	927,436	19.4
3	1030	Vaccines	325,570	6.8
4	1040	Hormones	320,819	6.7
5	2060	Biofuels	196,823	4.1
6	1060	Hemotherapeutics	175,339	3.7
7	6000	Other bioinstruments and bioequipments	143,966	3.0
8	1000	Other biopharmaceuticals	126,986	2.7
9	3010	Functional health foods	86,960	1.8
10	6030	Multi-functional and other bioanalysis instruments	51,975	1.1
11	2030	Enzymes and reagents for research	49,918	1.0

B. Recent Trend of Import Status

1) 2019–2021 Bioindustry’s Trend of Import

- The amount of imports in the domestic bioindustry in 2021 was KRW 4,769.2 billion, which was a significant increase of KRW 2,338.7 billion (96.2%) from the total import of KRW 2,430.5 billion in 2020.
- The import size has grown by 51.9% annually over the past three years

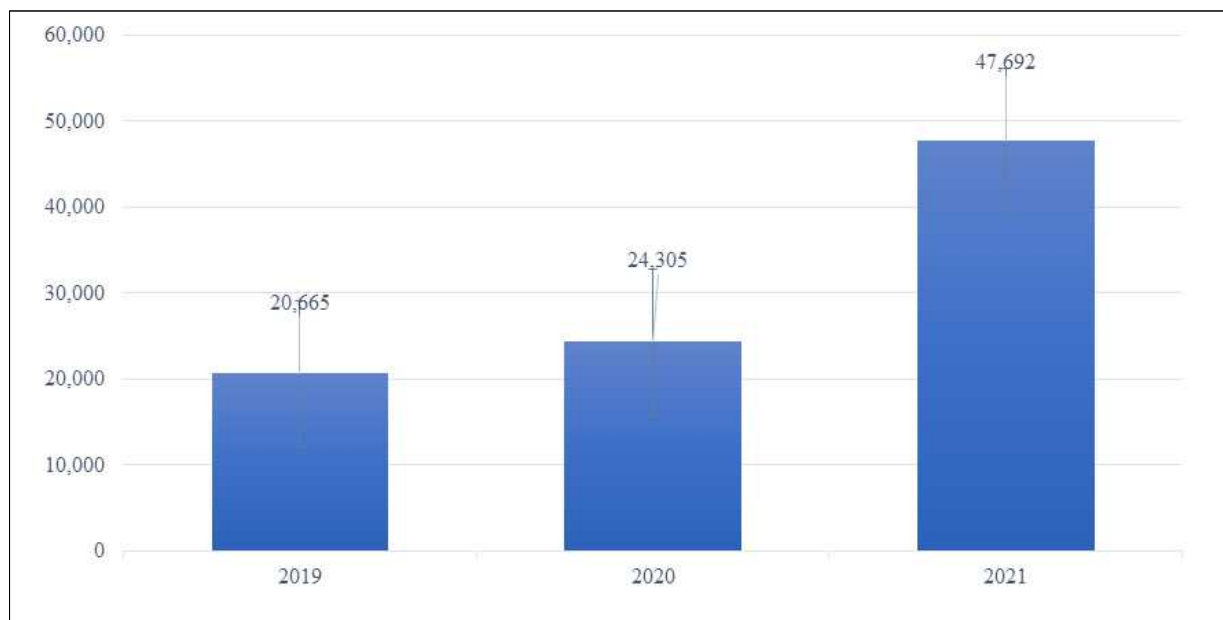
<Table 2-47> 2019–2021 Bioindustry’s Trend of Import

(Unit: 100 million KRW, %)

Classification		2019	2020	2021	Annual Average Rate of Change
Import	Amount	20,665	24,305	47,692	
	Rate of Change	19.6	17.6	96.2	

<Figure 2-37> 2019–2021 Bioindustry's Trend of Import

(Unit: 100 million KRW)



<Table 2-48> 2019–2021 Bioindustry’s Trend of Import by Category

(Unit: 100 million KRW, %)

Industrial Category	2019		2020		2021		Variation from Previous Year		Annual Average Rate of Change
	Import Amount	Distribution Ratio	Import Amount	Distribution Ratio	Import Amount	Distribution Ratio	Import Amount	Rate of Change	
Total	20,665	100.0	24,305	100.0	47,692	100.0	23,387	96.2	51.9
Biopharmaceutical	16,443	79.6	18,455	75.9	40,659	85.3	22,204	120.3	57.2
Biochemical and Bioenergy	1,056	5.1	2,022	8.3	2,896	6.1	874	43.2	65.6
Biofood	567	2.7	1,042	4.3	1,055	2.2	13	1.2	36.4
Bioenvironmental	1	0.0	2	0.0	1	0.0	-1	-50.0	0.0
Biomedical Equipment	543	2.6	471	1.9	580	1.2	109	23.1	3.4
Bioinstrument and Bioequipment	1,754	8.5	2,089	8.6	2,282	4.8	193	9.2	14.1
Bioresource	267	1.3	199	0.8	193	0.4	-6	-3.0	-15.0
Bioservice	34	0.2	25	0.1	26	0.1	1	4.0	-12.6

2) 2017–2021 Bioindustry’s Trend of Import

- The import size in the domestic bioindustry has continued to increase at an annual average growth rate of 32.0% for the past five years.

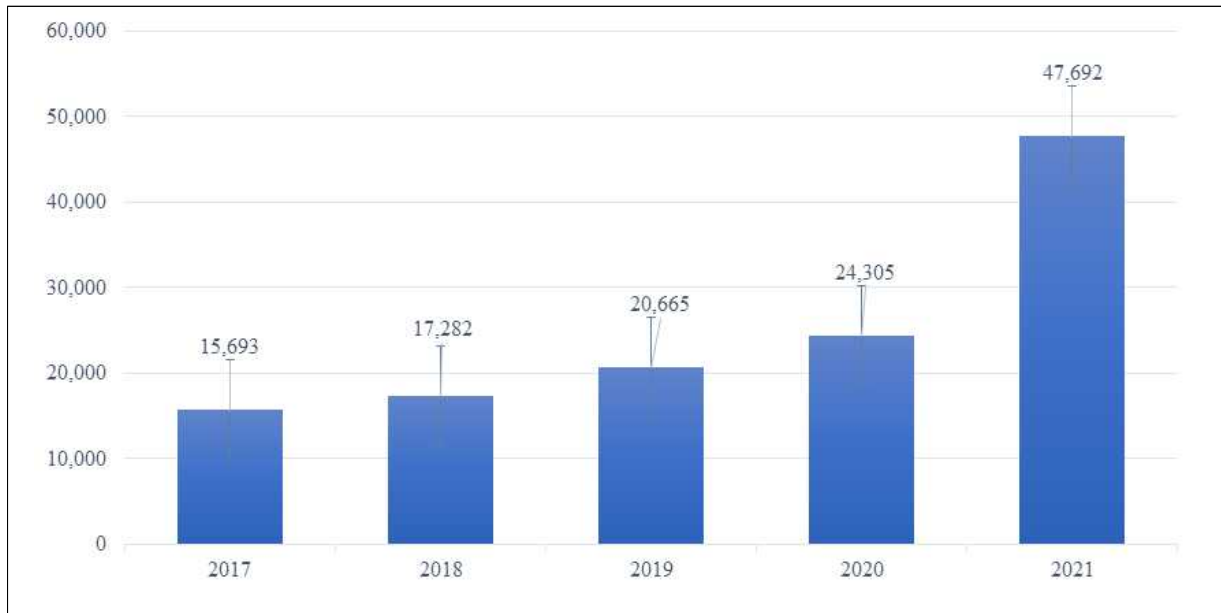
<Table 2-49> 2017-2021 Bioindustry’s Trend of Import

(Unit: 100 million KRW, %)

Classification		2017	2018	2019	2020	2021	Annual Average Rate of Change
Import	Amount	15,693	17,282	20,665	24,305	47,692	32.0
	Rate of Change	7.5	10.1	19.6	17.6	96.2	

<Figure 2-38> 2017-2021 Bioindustry's Trend of Import

(Unit: 100 million KRW)



<Table 2-50> 2017-2021 Bioindustry's Trend of Import by Category

(Unit: 100 million KRW, %)

Industrial Category	2017		2018		2019		2020		2021		Variation from Previous Year		Annual Average Rate of Change
	Import Amount	Distribution Ratio	Import Amount	Distribution Ratio	Import Amount	Distribution Ratio	Import Amount	Distribution Ratio	Import Amount	Distribution Ratio	Import Amount	Rate of Change	
Total	15,693	100.0	17,282	100.0	20,665	100.0	24,305	100.0	47,692	100.0	23,387	96.2	32.0
Bio pharmaceutical	13,404	82.8	14,093	82.8	16,443	79.6	18,455	75.9	40,659	85.3	22,204	120.3	32.0
Biochemical and Bioenergy	833	7.0	1,258	7.0	1,056	5.1	2,022	8.3	2,896	6.1	874	43.2	36.5
Biofood	461	2.8	500	2.8	567	2.7	1,042	4.3	1,055	2.2	13	1.2	23.0
Bioenvironmental	2	0.0	2	0.0	1	0.0	2	0.0	1	0.0	-1	-50.0	-15.9
Biomedical Equipment	322	2.2	504	2.2	543	2.6	471	1.9	580	1.2	109	23.1	15.8
Bioinstrument and Bioequipment	514	3.8	655	3.8	1,754	8.5	2,089	8.6	2,282	4.8	193	9.2	45.2
Bioresource	63	1.4	245	1.4	267	1.3	199	0.8	193	0.4	-6	-3.0	32.3
Bioservice	94	0.0	24	0.0	34	0.2	25	0.1	26	0.1	1	4.0	-27.5

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<Table 1> General Status of Company**<Table 1-1> Distribution by Geography**

Classification		No. of Companies	Seoul	Busan	Incheon	Daegu	Gwangju	Daejeon	Ulsan	Sejong	Gyeonggi	Gangwon	Chungbuk	Chungnam	Jeonbuk	Jeonnam	Gyeongbuk	Gyeongnam	Jeju
Total		1,055	249	14	29	13	6	84	9	4	350	44	84	41	31	37	25	27	8
Core Industries	Biopharmaceutical	333	114	3	13	2		19	1		122	11	27	11	1	1	4	3	1
	Biochemical and Bioenergy	201	22	3	6	4	1	24	6	1	48	8	15	10	12	15	10	12	4
	Biofood	175	18	3		2	1	9		2	48	10	24	15	12	12	7	9	3
	Bioenvironmental	62	4	4	4	3	1	3	2		22	4	2	1	1	7	2	2	
	Biomedical Equipment	109	28	1	2		1	10			42	8	9	3	1	1	2	1	
	Bioinstrument and Bioequipment	55	10		1	1		9		1	29	1	2	1					
	Bioresource	15	2					2			7		2		1	1			
	Bioservice	105	51		3	1	2	8			32	2	3		3				
Total Number of Workers	1 - 49	667	155	12	18	9	6	58	4	1	201	27	47	29	25	30	19	20	6
	50 - 299	278	68	2	6	2		20	3	1	107	12	23	8	5	7	5	7	2
	300 - 999	73	20		2	1		2	1	1	28	4	10	3			1		
	1,000 or more	33	3		2	1		4	1	1	14	1	4	1	1				
	Unknown	4	3		1														
By Area	Seoul	249	249																
	Busan	14		14															
	Incheon	29			29														
	Daegu	13				13													
	Gwangju	6					6												
	Daejeon	84						84											
	Ulsan	9							9										
	Sejong	4								4									
	Gyeonggi	350									350								
	Gangwon	44										44							
	Chungbuk	84											84						
	Chungnam	41												41					
	Jeonbuk	31													31				
	Jeonnam	37														37			
	Gyeongbuk	25															25		
	Gyeongnam	27																27	
Jeju	8																	8	

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

Classification		No. of Companies	Single-unit enterprise	Multi-unit enterprise	Unknown
Total		1,055	552	496	7
Core Industries	Biopharmaceutical	333	155	172	6
	Biochemical and Bioenergy	201	109	92	
	Biofood	175	81	94	
	Bioenvironmental	62	34	28	
	Biomedical Equipment	109	62	47	
	Bioinstrument and Bioequipment	55	36	18	1
	Bioresource	15	8	7	
	Bioservice	105	67	38	
Total Number of Workers	1 - 49	667	439	228	
	50 - 299	278	98	179	1
	300 - 999	73	13	57	3
	1,000 or more	33	1	32	
	Unknown	4	1		3
By Area	Seoul	249	162	82	5
	Busan	14	6	8	
	Incheon	29	18	10	1
	Daegu	13	5	8	
	Gwangju	6	5	1	
	Daejeon	84	51	33	
	Ulsan	9	3	6	
	Sejong	4	1	3	
	Gyeonggi	350	166	183	1
	Gangwon	44	21	23	
	Chungbuk	84	32	52	
	Chungnam	41	17	24	
	Jeonbuk	31	14	17	
	Jeonnam	37	19	18	
	Gyeongbuk	25	13	12	
	Gyeongnam	27	15	12	
Jeju	8	4	4		

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

Classification		No. of Companies	Venture Companies	INNO-BIZ	MAIN-BIZ	KONEX-listed Companies	KOSDAQ-listed Companies	Listed Companies	N/A or Unknown
Total		1,055	628	368	68	24	169	68	237
Core Industries	Biopharmaceutical	333	196	72	6	7	78	40	68
	Biochemical and Bioenergy	201	100	73	19		17	13	60
	Biofood	175	95	72	13	2	22	11	38
	Bioenvironmental	62	31	28	8			1	20
	Biomedical Equipment	109	86	61	11	4	25	1	14
	Bioinstrument and Bioequipment	55	29	23	5	1	7		18
	Bioresource	15	9	3		1	2	1	4
	Bioservice	105	82	36	6	9	18	1	15
Total Number of Workers	1 - 49	667	455	230	45	16	26	3	154
	50 - 299	278	162	130	21	8	116	15	53
	300 - 999	73	8	8	2		22	23	25
	1,000 or more	33	2				4	27	2
	Unknown	4	1				1		3
By Area	Seoul	249	157	58	7	9	34	7	79
	Busan	14	8	2	1		2		5
	Incheon	29	17	9			4	2	5
	Daegu	13	7	4	1		1	2	4
	Gwangju	6	4	2					2
	Daejeon	84	64	37	3	2	13	5	12
	Ulsan	9	2	1			1	3	3
	Sejong	4	2					2	
	Gyeonggi	350	211	131	23	7	70	34	53
	Gangwon	44	34	25	3	2	10	1	5
	Chungbuk	84	42	34	11	3	19	3	20
	Chungnam	41	18	12	2		4	4	11
	Jeonbuk	31	15	13	4		2	3	8
	Jeonnam	37	24	17	9		4	1	7
	Gyeongbuk	25	10	7	3	1	1	1	11
	Gyeongnam	27	9	11			4		11
Jeju	8	4	5	1				1	

<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		1,055	628	368	68	337
Core Industries	Biopharmaceutical	333	196	72	6	123
	Biochemical and Bioenergy	201	100	73	19	78
	Biofood	175	95	72	13	56
	Bioenvironmental	62	31	28	8	21
	Biomedical Equipment	109	86	61	11	16
	Bioinstrument and Bioequipment	55	29	23	5	18
	Bioresource	15	9	3		6
	Bioservice	105	82	36	6	19
Total Number of Workers	1 - 49	667	455	230	45	157
	50 - 299	278	162	130	21	84
	300 - 999	73	8	8	2	62
	1,000 or more	33	2			31
	Unknown	4	1			3
By Area	Seoul	249	157	58	7	87
	Busan	14	8	2	1	6
	Incheon	29	17	9		9
	Daegu	13	7	4	1	6
	Gwangju	6	4	2		2
	Daejeon	84	64	37	3	17
	Ulsan	9	2	1		7
	Sejong	4	2			2
	Gyeonggi	350	211	131	23	100
	Gangwon	44	34	25	3	8
	Chungbuk	84	42	34	11	31
	Chungnam	41	18	12	2	17
	Jeonbuk	31	15	13	4	11
	Jeonnam	37	24	17	9	8
	Gyeongbuk	25	10	7	3	12
	Gyeongnam	27	9	11		13
	Jeju	8	4	5	1	1

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

Classification		No. of Companies	KONEX-listed Companies	KOSDAQ-listed Companies	Listed Companies	N/A or Unknown
Total		1,055	24	169	68	794
Core Industries	Biopharmaceutical	333	7	78	40	208
	Biochemical and Bioenergy	201		17	13	171
	Biofood	175	2	22	11	140
	Bioenvironmental	62			1	61
	Biomedical Equipment	109	4	25	1	79
	Bioinstrument and Bioequipment	55	1	7		47
	Bioresource	15	1	2	1	11
	Bioservice	105	9	18	1	77
Total Number of Workers	1 - 49	667	16	26	3	622
	50 - 299	278	8	116	15	139
	300 - 999	73		22	23	28
	1,000 or more	33		4	27	2
	Unknown	4		1		3
By Area	Seoul	249	9	34	7	199
	Busan	14		2		12
	Incheon	29		4	2	23
	Daegu	13		1	2	10
	Gwangju	6				6
	Daejeon	84	2	13	5	64
	Ulsan	9		1	3	5
	Sejong	4			2	2
	Gyeonggi	350	7	70	34	239
	Gangwon	44	2	10	1	31
	Chungbuk	84	3	19	3	59
	Chungnam	41		4	4	33
	Jeonbuk	31		2	3	26
	Jeonnam	37		4	1	32
	Gyeongbuk	25	1	1	1	22
	Gyeongnam	27		4		23
	Jeju	8				8

<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		1,055	5	80	55	54	186	157	164	170	184
Core Industries	Biopharmaceutical	333	4	42	24	20	43	20	37	51	92
	Biochemical and Bioenergy	201		13	10	8	45	31	36	38	20
	Biofood	175	1	17	10	9	39	43	23	13	20
	Bioenvironmental	62		3	2	5	13	19	10	7	3
	Biomedical Equipment	109		2	4	3	20	14	20	31	15
	Bioinstrument and Bioequipment	55			3	7	9	11	10	11	4
	Bioresource	15		2	1	1		3	3	4	1
Bioservice	105		1	1	1	17	16	25	15	29	
Total Number of Workers	1 - 49	667		8	16	17	116	112	115	131	152
	50 - 299	278	2	34	19	29	62	39	41	28	24
	300 - 999	73	2	22	20	7	7	4	3	5	3
	1,000 or more	33	1	16		1	1	2	5	4	3
	Unknown	4								2	2
By Area	Seoul	249	1	14	14	18	43	24	30	47	58
	Busan	14		1				4	5	1	3
	Incheon	29		1	2	1	3	3	2	10	7
	Daegu	13		2			1	3	3	1	3
	Gwangju	6					1	1	1		3
	Daejeon	84		6	3	1	21	11	15	13	14
	Ulsan	9		1		1	1		1	2	3
	Sejong	4		1			1			2	
	Gyeonggi	350	4	34	17	13	53	50	59	56	64
	Gangwon	44		2		3	12	6	10	7	4
	Chungbuk	84		7	4	10	18	20	6	10	9
	Chungnam	41		5	6	2	12	6	4	4	2
	Jeonbuk	31		3	2	1	4	6	4	4	7
	Jeonnam	37		2	1	1	3	10	12	6	2
	Gyeongbuk	25			1	2	4	4	7	4	3
	Gyeongnam	27		1	4	1	8	5	5	2	1
	Jeju	8			1		1	4		1	1

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

Classification		No. of Companies	Male	Female
Total		1,055	946	109
Core Industries	Biopharmaceutical	333	301	32
	Biochemical and Bioenergy	201	175	26
	Biofood	175	164	11
	Bioenvironmental	62	53	9
	Biomedical Equipment	109	101	8
	Bioinstrument and Bioequipment	55	49	6
	Bioresource	15	14	1
	Bioservice	105	89	16
Total Number of Workers	1 - 49	667	583	84
	50 - 299	278	257	21
	300 - 999	73	71	2
	1,000 or more	33	32	1
	Unknown	4	3	1
By Area	Seoul	249	211	38
	Busan	14	11	3
	Incheon	29	24	5
	Daegu	13	10	3
	Gwangju	6	6	
	Daejeon	84	78	6
	Ulsan	9	9	
	Sejong	4	3	1
	Gyeonggi	350	321	29
	Gangwon	44	41	3
	Chungbuk	84	77	7
	Chungnam	41	41	
	Jeonbuk	31	30	1
	Jeonnam	37	32	5
	Gyeongbuk	25	22	3
	Gyeongnam	27	23	4
	Jeju	8	7	1

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

Classification		No. of Companies	1 - 49	50 - 299	300 - 999	1,000 or more	Unknown
Total		1,055	667	278	73	33	4
Core Industries	Biopharmaceutical	333	161	107	45	16	4
	Biochemical and Bioenergy	201	152	35	7	7	
	Biofood	175	119	41	9	6	
	Bioenvironmental	62	49	11	1	1	
	Biomedical Equipment	109	64	39	4	2	
	Bioinstrument and Bioequipment	55	40	14	1		
	Bioresource	15	9	5	1		
Bioservice	105	73	26	5	1		
Total Number of Workers	1 - 49	667	667				
	50 - 299	278		278			
	300 - 999	73			73		
	1,000 or more	33				33	
	Unknown	4					4
By Area	Seoul	249	155	68	20	3	3
	Busan	14	12	2			
	Incheon	29	18	6	2	2	1
	Daegu	13	9	2	1	1	
	Gwangju	6	6				
	Daejeon	84	58	20	2	4	
	Ulsan	9	4	3	1	1	
	Sejong	4	1	1	1	1	
	Gyeonggi	350	201	107	28	14	
	Gangwon	44	27	12	4	1	
	Chungbuk	84	47	23	10	4	
	Chungnam	41	29	8	3	1	
	Jeonbuk	31	25	5		1	
	Jeonnam	37	30	7			
	Gyeongbuk	25	19	5	1		
	Gyeongnam	27	20	7			
Jeju	8	6	2				

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

Classification		No. of Companies	No. of Respondents	Total No. of Workers		Male		Female		Unknown	
				Total	Average	Total	Average	Total	Average	Total	Average
Total		1,055	1,051	245,378	233	156,889	149	50,301	48	38,188	36
Core Industries	Biopharmaceutical	333	329	82,858	252	37,144	113	18,555	56	27,159	83
	Biochemical and Bioenergy	201	201	99,931	497	83,556	416	8,740	43	7,635	38
	Biofood	175	175	33,411	191	21,451	123	11,960	68	0	0
	Bioenvironmental	62	62	5,225	84	1,879	30	360	6	2,986	48
	Biomedical Equipment	109	109	10,314	95	5,451	50	4,863	45	0	0
	Bioinstrument and Bioequipment	55	55	2,564	47	1,529	28	627	11	408	7
	Bioresource	15	15	1,164	78	701	47	463	31	0	0
Bioservice	105	105	9,911	94	5,178	49	4,733	45	0	0	
Total workers Scale	1 - 49	667	667	11,080	17	6,643	10	4,437	7	0	0
	50 - 299	278	278	32,692	118	19,799	71	11,837	43	1,056	4
	300 - 999	73	73	38,074	522	21,554	295	10,831	148	5,689	78
	1,000 or more	33	33	163,532	4,956	108,893	3,300	23,196	703	31,443	953
	Unknown	4	0								
By Area	Seoul	249	246	23,491	95	11,516	47	7,496	30	4,479	18
	Busan	14	14	254	18	175	13	79	6	0	0
	Incheon	29	28	7,920	283	4,286	153	2,726	97	908	32
	Daegu	13	13	2,470	190	1,790	138	680	52	0	0
	Gwangju	6	6	70	12	39	7	31	5	0	0
	Daejeon	84	84	15,944	190	12,127	144	3,817	45	0	0
	Ulsan	9	9	2,560	284	947	105	144	16	1,469	163
	Sejong	4	4	3,242	811	2,142	536	1,100	275	0	0
	Gyeonggi	350	350	133,953	383	102,209	292	22,541	64	9,203	26
	Gangwon	44	44	7,274	165	5,034	114	2,240	51	0	0
	Chungbuk	84	84	34,015	405	8,348	99	4,250	51	21,417	255
	Chungnam	41	41	4,479	109	3,520	86	959	23	0	0
	Jeonbuk	31	31	5,751	186	2,575	83	3,176	102	0	0
	Jeonnam	37	37	1,231	33	818	22	413	11	0	0
	Gyeongbuk	25	25	1,213	49	345	14	156	6	712	28
	Gyeongnam	27	27	1,152	43	797	30	355	13	0	0
Jeju	8	8	359	45	221	28	138	17	0	0	

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

Classification		No. of Companies	Capital		
			No. of Respondents	Total	Average
Total		1,055	985	11,113,423	11,283
Core Industries	Biopharmaceutical	333	316	4,682,975	14,820
	Biochemical and Bioenergy	201	183	3,905,926	21,344
	Biofood	175	160	1,202,502	7,516
	Bioenvironmental	62	56	75,022	1,340
	Biomedical Equipment	109	103	508,110	4,933
	Bioinstrument and Bioequipment	55	53	66,455	1,254
	Bioresource	15	13	147,923	11,379
	Bioservice	105	101	524,510	5,193
Total Number of Workers	1 - 49	667	605	1,536,875	2,540
	50 - 299	278	273	3,067,003	11,234
	300 - 999	73	72	1,919,518	26,660
	1,000 or more	33	33	4,578,439	138,741
	Unknown	4	2	11,588	5,794
By Area	Seoul	249	227	2,162,389	9,526
	Busan	14	10	70,773	7,077
	Incheon	29	27	739,224	27,379
	Daegu	13	12	77,520	6,460
	Gwangju	6	6	2,295	383
	Daejeon	84	80	1,461,246	18,266
	Ulsan	9	9	215,073	23,897
	Sejong	4	4	19,221	4,805
	Gyeonggi	350	336	4,120,358	12,263
	Gangwon	44	44	525,582	11,945
	Chungbuk	84	78	975,950	12,512
	Chungnam	41	35	281,663	8,048
	Jeonbuk	31	30	181,856	6,062
	Jeonnam	37	35	115,208	3,292
	Gyeongbuk	25	22	80,362	3,653
Gyeongnam	27	23	73,146	3,180	
Jeju	8	7	11,557	1,651	

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

Classification		No. of Companies	Ratio of Net Worth	
			No. of Respondents	Average
Total		1,055	969	38
Core Industries	Biopharmaceutical	333	315	38
	Biochemical and Bioenergy	201	179	43
	Biofood	175	158	40
	Bioenvironmental	62	55	50
	Biomedical Equipment	109	101	49
	Bioinstrument and Bioequipment	55	52	45
	Bioresource	15	13	40
	Bioservice	105	96	-2
Total Number of Workers	1 - 49	667	589	26
	50 - 299	278	273	55
	300 - 999	73	72	56
	1,000 or more	33	33	61
	Unknown	4	2	49
By Area	Seoul	249	224	23
	Busan	14	10	47
	Incheon	29	27	38
	Daegu	13	12	46
	Gwangju	6	5	56
	Daejeon	84	80	35
	Ulsan	9	8	49
	Sejong	4	4	62
	Gyeonggi	350	329	41
	Gangwon	44	43	48
	Chungbuk	84	78	47
	Chungnam	41	34	52
	Jeonbuk	31	28	26
	Jeonnam	37	35	55
	Gyeongbuk	25	22	38
Gyeongnam	27	23	37	
Jeju	8	7	44	

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

Classification		No. of Companies	Net Income / Net Loss		
			No. of Respondents	Total	Average
Total		1,055	966	12,840,860	13,293
Core Industries	Biopharmaceutical	333	313	3,262,742	10,424
	Biochemical and Bioenergy	201	178	6,080,537	34,160
	Biofood	175	158	859,700	5,441
	Bioenvironmental	62	55	107,838	1,961
	Biomedical Equipment	109	100	2,121,855	21,219
	Bioinstrument and Bioequipment	55	51	66,909	1,312
	Bioresource	15	13	-30,101	-2,315
	Bioservice	105	98	371,380	3,790
Total Number of Workers	1 - 49	667	586	-899,578	-1,535
	50 - 299	278	273	58,289	214
	300 - 999	73	72	1,990,492	27,646
	1,000 or more	33	33	11,721,795	355,206
	Unknown	4	2	-30,138	-15,069
By Area	Seoul	249	222	884,152	3,983
	Busan	14	10	-27,394	-2,739
	Incheon	29	27	1,186,766	43,954
	Daegu	13	12	-143,648	-11,971
	Gwangju	6	6	-5,082	-847
	Daejeon	84	80	3,943,355	49,292
	Ulsan	9	8	499,276	62,410
	Sejong	4	4	-15,993	-3,998
	Gyeonggi	350	328	3,052,563	9,307
	Gangwon	44	43	97,651	2,271
	Chungbuk	84	78	2,837,762	36,382
	Chungnam	41	34	64,208	1,888
	Jeonbuk	31	28	125,147	4,470
	Jeonnam	37	35	12,192	348
	Gyeongbuk	25	21	326,000	15,524
	Gyeongnam	27	23	-4,670	-203
Jeju	8	7	8,575	1,225	

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

Classification		No. of Companies	No. of Respondents	Bioindustry Workers		Researchers: Total		Researchers: Doctor's		Researchers: Master's		Researchers: Bachelor's		Researchers: Other	
				Total	Average	Total	Average	Total	Average	Total	Average	Total	Average	Total	Average
Total		1,055	1,037	55,618	54	17,908	17	2,854	3	7,793	8	6,886	7	375	-
Core Industries	Biopharmaceutical	333	315	21,844	69	7,879	25	1,398	4	3,813	12	2,522	8	146	-
	Biochemical and Bioenergy	201	201	6,956	35	2,289	11	350	2	1,086	5	793	4	60	-
	Biofood	175	175	7,285	42	1,748	10	297	2	791	5	629	4	31	-
	Bioenvironmental	62	62	929	15	356	6	32	1	105	2	218	4	1	-
	Biomedical Equipment	109	109	8,346	77	1,898	17	307	3	786	7	777	7	28	-
	Bioinstrument and Bioequipment	55	55	1,876	34	443	8	51	1	137	2	241	4	14	-
	Bioresource	15	15	1,050	70	265	18	43	3	102	7	120	8	0	0
	Bioservice	105	105	7,332	70	3,030	29	376	4	973	9	1,586	15	95	1
Total Number of Workers	1 - 49	667	667	9,674	15	4,330	6	814	1	1,709	3	1,792	3	15	-
	50 - 299	278	271	21,014	78	6,344	23	892	3	2,509	9	2,874	11	69	-
	300 - 999	73	65	10,576	163	3,268	50	568	9	1,378	21	1,217	19	105	2
	1,000 or more	33	33	14,322	434	3,955	120	577	17	2,189	66	1,003	30	186	6
	Unknown	4	1	32	32	11	11	3	3	3	8	8	0	0	0
By Area	Seoul	249	233	8,852	38	3,822	16	584	3	1,512	6	1,670	7	56	-
	Busan	14	14	244	17	65	5	14	1	24	2	25	2	2	-
	Incheon	29	29	5,931	205	1,528	53	257	9	730	25	491	17	50	2
	Daegu	13	13	1,416	109	215	17	13	1	29	2	143	11	30	2
	Gwangju	6	6	68	11	44	7	7	1	20	3	17	3	0	0
	Daejeon	84	84	2,640	31	1,261	15	225	3	519	6	501	6	16	-
	Ulsan	9	9	1,294	144	283	31	44	5	142	16	77	9	20	2
	Sejong	4	4	328	82	127	32	8	2	73	18	36	9	10	3
	Gyeonggi	350	350	17,996	51	6,637	19	1,078	3	2,941	8	2,517	7	101	-
	Gangwon	44	44	3,086	70	696	16	125	3	323	7	248	6	0	0
	Chungbuk	84	84	8,603	102	2,018	24	329	4	977	12	650	8	62	1
	Chungnam	41	41	1,969	48	420	10	70	2	224	5	125	3	1	-
	Jeonbuk	31	31	1,109	36	237	8	30	1	86	3	100	3	21	1
	Jeonnam	37	37	784	21	238	6	18	-	69	2	148	4	3	-
	Gyeongbuk	25	23	463	20	109	5	18	1	33	1	55	2	3	-
	Gyeongnam	27	27	613	23	159	6	26	1	74	3	59	2	0	0
	Jeju	8	8	222	28	49	6	8	1	17	2	24	3	0	0

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

Classification		No. of Companies	No. of Respondents	Bioindustry Workers		Production Workers: Total		Production Workers: Doctor's		Production Workers: Master's		Production Workers: Bachelor's		Production Workers: Others	
				Total	Average	Total	Average	Total	Average	Total	Average	Total	Average	Total	Average
Total		1,055	1,037	55,618	54	17,867	17	46	-	793	1	6,190	6	10,838	10
Core Industries	Biopharmaceutical	333	315	21,844	69	6,395	20	22	-	382	1	2,677	8	3,314	11
	Biochemical and Bioenergy	201	201	6,956	35	2,423	12	5	-	44	-	647	3	1,727	9
	Biofood	175	175	7,285	42	3,232	18	3	-	40	-	1,012	6	2,177	12
	Bioenvironmental	62	62	929	15	329	5	0	0	5	-	173	3	151	2
	Biomedical Equipment	109	109	8,346	77	2,473	23	2	-	73	1	683	6	1,715	16
	Bioinstrument and Bioequipment	55	55	1,876	34	567	10	1	-	17	-	137	2	412	7
	Bioresource	15	15	1,050	70	292	19	3	-	20	1	65	4	204	14
	Bioservice	105	105	7,332	70	2,156	21	10	-	212	2	796	8	1,138	11
Total Number of Workers	1 - 49	667	667	9,674	15	1,887	3	4	-	28	-	646	1	1,209	2
	50 - 299	278	271	21,014	78	6,265	23	6	-	166	1	1,947	7	4,146	15
	300 - 999	73	65	10,576	163	4,179	64	13	-	221	3	1,122	17	2,823	43
	1,000 or more	33	33	14,322	434	5,523	167	23	1	376	11	2,464	75	2,660	81
	Unknown	4	1	32	32	13	13	0	0	2	2	11	11	0	0
By Area	Seoul	249	233	8,852	38	991	4	1	-	48	-	309	1	633	3
	Busan	14	14	244	17	38	3	0	0	0	0	18	1	20	1
	Incheon	29	29	5,931	205	3,088	106	9	-	216	7	1,587	55	1,276	44
	Daegu	13	13	1,416	109	494	38	0	0	3	-	165	13	326	25
	Gwangju	6	6	68	11	2	0	0	0	0	0	0	0	2	0
	Daejeon	84	84	2,640	31	596	7	3	-	35	-	246	3	312	4
	Ulsan	9	9	1,294	144	451	50	2	-	19	2	166	18	264	29
	Sejong	4	4	328	82	164	41	0	0	0	0	89	22	75	19
	Gyeonggi	350	350	17,996	51	4,842	14	11	-	207	1	1,417	4	3,207	9
	Gangwon	44	44	3,086	70	1,444	33	0	0	35	1	368	8	1,041	24
	Chungbuk	84	84	8,603	102	3,465	41	17	-	213	3	1,160	14	2,075	25
	Chungnam	41	41	1,969	48	872	21	0	0	4	-	164	4	704	17
	Jeonbuk	31	31	1,109	36	566	18	2	-	5	-	177	6	382	12
	Jeonnam	37	37	784	21	264	7	1	-	0	0	108	3	155	4
	Gyeongbuk	25	23	463	20	221	10	0	0	0	0	63	3	158	7
	Gyeongnam	27	27	613	23	279	10	0	0	7	-	136	5	136	5
Jeju	8	8	222	28	90	11	0	0	1	-	17	2	72	9	

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

Classification		No. of Companies	No. of Respondents	Bioindustry Workers		Other Positions: Total		Other Positions: Doctor's		Other Positions: Master's		Other Positions: Bachelor's		Other Positions: Others	
				Total	Average	Total	Average	Total	Average	Total	Average	Total	Average	Total	Average
Total		1,055	1,037	55,618	54	19,843	19	334	-	1,753	2	13,954	13	3,802	4
Core Industries	Biopharmaceutical	333	315	21,844	69	7,570	24	165	1	760	2	5,552	18	1,093	3
	Biochemical and Bioenergy	201	201	6,956	35	2,244	11	23	-	129	1	1,796	9	296	1
	Biofood	175	175	7,285	42	2,305	13	22	-	175	1	1,689	10	419	2
	Bioenvironmental	62	62	929	15	244	4	1	-	17	-	203	3	23	-
	Biomedical Equipment	109	109	8,346	77	3,975	36	71	1	329	3	2,113	19	1,462	13
	Bioinstrument and Bioequipment	55	55	1,876	34	866	16	4	-	27	-	680	12	155	3
	Bioresource	15	15	1,050	70	493	33	2	-	34	2	308	21	149	10
	Bioservice	105	105	7,332	70	2,146	20	46	-	282	3	1,613	15	205	2
Total Number of Workers	1 - 49	667	667	9,674	15	3,457	5	44	-	199	-	2,914	4	300	-
	50 - 299	278	271	21,014	78	8,405	31	74	-	634	2	6,422	24	1,275	5
	300 - 999	73	65	10,576	163	3,129	48	132	2	510	8	2,011	31	476	7
	1,000 or more	33	33	14,322	434	4,844	147	83	3	409	12	2,602	79	1,750	53
	Unknown	4	1	32	32	8	8	1	1	1	1	5	5	1	1
By Area	Seoul	249	233	8,852	38	4,039	17	78	-	435	2	3,048	13	478	2
	Busan	14	14	244	17	141	10	1	-	8	1	113	8	19	1
	Incheon	29	29	5,931	205	1,315	45	65	2	222	8	924	32	104	4
	Daegu	13	13	1,416	109	707	54	3	-	16	1	403	31	285	22
	Gwangju	6	6	68	11	22	4	0	0	0	0	20	3	2	-
	Daejeon	84	84	2,640	31	783	9	20	-	57	1	650	8	56	1
	Ulsan	9	9	1,294	144	560	62	2	-	34	4	468	52	56	6
	Sejong	4	4	328	82	37	9	0	0	0	0	35	9	2	1
	Gyeonggi	350	350	17,996	51	6,517	19	56	-	465	1	4,047	12	1,949	6
	Gangwon	44	44	3,086	70	946	22	39	1	123	3	674	15	110	3
	Chungbuk	84	84	8,603	102	3,120	37	43	1	248	3	2,301	27	528	6
	Chungnam	41	41	1,969	48	677	17	17	-	72	2	508	12	80	2
	Jeonbuk	31	31	1,109	36	306	10	2	-	24	1	224	7	56	2
	Jeonnam	37	37	784	21	282	8	6	-	22	1	221	6	33	1
	Gyeongbuk	25	23	463	20	133	6	0	0	4	-	111	5	18	1
Gyeongnam	27	27	613	23	175	6	1	-	19	1	143	5	12	-	
Jeju	8	8	222	28	83	10	1	-	4	1	64	8	14	2	

<Table 3> Investment Status of Bioindustry

<Table 3-1> 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		1,055	1,023	5,783,435	5,653	1,177,623	1,151	6,961,058	6,805	2,270,466	2,219	797,402	779	3,067,868	2,999
Core Industries	Biopharmaceutical	333	310	2,823,693	9,109	393,525	1,269	3,217,218	10,378	1,533,702	4,947	288,901	932	1,822,603	5,879
	Biochemical and Bioenergy	201	200	2,131,264	10,656	136,314	682	2,267,578	11,338	171,532	858	42,725	214	214,257	1,071
	Biofood	175	173	193,172	1,117	59,012	341	252,184	1,458	121,053	700	31,315	181	152,368	881
	Bioenvironmental	62	60	25,505	425	7,657	128	33,162	553	14,103	235	5,637	94	19,740	329
	Biomedical Equipment	109	106	288,690	2,723	268,007	2,528	556,697	5,252	187,851	1,772	116,216	1,096	304,067	2,869
	Bioinstrument and Bioequipment	55	54	29,507	546	9,160	170	38,667	716	22,672	420	9,160	170	31,832	589
	Bioresource	15	15	40,132	2,675	1,348	90	41,480	2,765	12,509	834	1,348	90	13,857	924
	Bioservice	105	105	251,472	2,395	302,600	2,882	554,072	5,277	207,044	1,972	302,100	2,877	509,144	4,849
Total Number of Workers	1 - 49	667	657	552,873	842	43,264	66	596,137	907	467,295	711	40,558	62	507,853	773
	50 - 299	278	268	1,030,862	3,847	193,062	720	1,223,924	4,567	683,114	2,549	157,693	588	840,807	3,137
	300 - 999	73	66	748,778	11,345	132,508	2,008	881,286	13,353	377,261	5,716	119,482	1,810	496,743	7,526
	1,000 or more	33	31	3,440,450	110,982	808,489	26,080	4,248,939	137,063	732,324	23,623	479,369	15,464	1,211,693	39,087
	Unknown	4	1	10,472	10,472	300	300	10,772	10,772	10,472	10,472	300	300	10,772	10,772
By Area	Seoul	249	229	674,672	2,946	36,257	158	710,929	3,104	349,958	1,528	30,831	135	380,789	1,663
	Busan	14	12	3,038	253	420	35	3,458	288	3,038	253	270	23	3,308	276
	Incheon	29	29	270,462	9,326	342,199	11,800	612,661	21,126	266,488	9,189	342,149	11,798	608,637	20,987
	Daegu	13	12	88,315	7,360	5,320	443	93,635	7,803	7,208	601	4,320	360	11,528	961
	Gwangju	6	6	3,747	625	745	124	4,492	749	1,117	186	725	121	1,842	307
	Daejeon	84	84	515,909	6,142	133,149	1,585	649,058	7,727	164,780	1,962	44,175	526	208,955	2,488
	Ulsan	9	9	48,763	5,418	800	89	49,563	5,507	26,862	2,985	720	80	27,582	3,065
	Sejong	4	3	9,627	3,209	8,000	2,667	17,627	5,876	4,310	1,437	3,000	1,000	7,310	2,437
	Gyeonggi	350	346	3,329,048	9,622	496,113	1,434	3,825,161	11,055	876,356	2,533	243,619	704	1,119,975	3,237
	Gangwon	44	43	115,416	2,684	14,039	326	129,455	3,011	100,522	2,338	14,039	326	114,561	2,664
	Chungbuk	84	82	469,293	5,723	69,140	843	538,433	6,566	317,991	3,878	66,587	812	384,578	4,690
	Chungnam	41	41	111,609	2,722	8,320	203	119,929	2,925	40,410	986	5,720	140	46,130	1,125
	Jeonbuk	31	31	50,257	1,621	11,218	362	61,475	1,983	29,205	942	8,800	284	38,005	1,226
	Jeonnam	37	37	11,535	312	10,320	279	21,855	591	9,103	246	9,320	252	18,423	498
	Gyeongbuk	25	24	56,213	2,342	11,613	484	67,826	2,826	56,050	2,335	10,962	457	67,012	2,792
	Gyeongnam	27	27	18,647	691	24,720	916	43,367	1,606	13,784	511	6,915	256	20,699	767
Jeju	8	8	6,884	861	5,250	656	12,134	1,517	3,284	411	5,250	656	8,534	1,067	

<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		1,055	400	12	371	44	8	644	11
Core Industries	Biopharmaceutical	333	145	4	131	24	3	178	10
	Biochemical and Bioenergy	201	57	1	56	2	2	143	1
	Biofood	175	57	3	54	4		118	
	Bioenvironmental	62	19		18	2		43	
	Biomedical Equipment	109	45	2	39	7	2	64	
	Bioinstrument and Bioequipment	55	16	1	16			39	
	Bioresource	15	6		6			9	
	Bioservice	105	55	1	51	5	1	50	
Total Number of Workers	1 - 49	667	246	4	233	19	4	421	
	50 - 299	278	106	4	95	15	1	171	1
	300 - 999	73	29	1	26	8	2	40	4
	1,000 or more	33	18	3	16	2	1	12	3
	Unknown	4	1		1				3
By Area	Seoul	249	94	5	85	12	2	148	7
	Busan	14	3		3			11	
	Incheon	29	10		9	1	1	18	1
	Daegu	13	7		7			6	
	Gwangju	6	3		3			3	
	Daejeon	84	37		36	2	2	47	
	Ulsan	9	4		4			4	1
	Sejong	4	1		1			3	
	Gyeonggi	350	139	5	129	14	2	211	
	Gangwon	44	21		19	3		23	
	Chungbuk	84	32	1	29	6	1	51	1
	Chungnam	41	12		12	1		28	1
	Jeonbuk	31	8		6	4		23	
	Jeonnam	37	10		10			27	
	Gyeongbuk	25	4		4			21	
	Gyeongnam	27	10	1	9	1		17	
	Jeju	8	5		5			3	

<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		1,055	400	12	19	5	5	1	2	6
Core Industries	Biopharmaceutical	333	145	4	7	4	2	1	-	-
	Biochemical and Bioenergy	201	57	1	6	1	-	-	-	5
	Biofood	175	57	3	3	-	1	-	1	1
	Bioenvironmental	62	19	-	-	-	-	-	-	-
	Biomedical Equipment	109	45	2	2	-	2	-	-	-
	Bioinstrument and Bioequipment	55	16	1	1	-	-	-	1	-
	Bioresource	15	6	-	-	-	-	-	-	-
	Bioservice	105	55	1	-	-	-	-	-	-
	Total Number of Workers	1 - 49	667	246	4	8	1	-	-	1
50 - 299		278	106	4	4	-	3	-	1	-
300 - 999		73	29	1	3	2	1	-	-	-
1,000 or more		33	18	3	4	2	1	1	-	-
Unknown		4	1	-	-	-	-	-	-	-
By Area	Seoul	249	94	5	10	2	2	-	-	6
	Busan	14	3	-	-	-	-	-	-	-
	Incheon	29	10	-	-	-	-	-	-	-
	Daegu	13	7	-	-	-	-	-	-	-
	Gwangju	6	3	-	-	-	-	-	-	-
	Daejeon	84	37	-	-	-	-	-	-	-
	Ulsan	9	4	-	-	-	-	-	-	-
	Sejong	4	1	-	-	-	-	-	-	-
	Gyeonggi	350	139	5	8	3	3	1	1	-
	Gangwon	44	21	-	-	-	-	-	-	-
	Chungbuk	84	32	1	-	-	-	-	-	-
	Chungnam	41	12	-	-	-	-	-	-	-
	Jeonbuk	31	8	-	-	-	-	-	-	-
	Jeonnam	37	10	-	-	-	-	-	-	-
	Gyeongbuk	25	4	-	-	-	-	-	-	-
	Gyeongnam	27	10	1	1	-	-	-	1	-
Jeju	8	5	-	-	-	-	-	-	-	

Classification		No. of Companies	With Cooperative Relationship	No. of Respondents (Joint Venture)	Overseas					
					Total	Basic Research	Experimental	Prototype	Product Development	Commercialization
Total		1,055	400	12	4	-	1	1	1	1
Core Industries	Biopharmaceutical	333	145	4	1	-	-	1	-	-
	Biochemical and Bioenergy	201	57	1	-	-	-	-	-	-
	Biofood	175	57	3	-	-	-	-	-	-
	Bioenvironmental	62	19	-	-	-	-	-	-	-
	Biomedical Equipment	109	45	2	2	-	1	-	-	1
	Bioinstrument and Bioequipment	55	16	1	-	-	-	-	-	-
	Bioresource	15	6	-	-	-	-	-	-	-
	Bioservice	105	55	1	1	-	-	-	1	-
	Total Number of Workers	1 - 49	667	246	4	1	-	-	-	1
50 - 299		278	106	4	2	-	1	-	-	1
300 - 999		73	29	1	-	-	-	-	-	-
1,000 or more		33	18	3	1	-	-	1	-	-
Unknown		4	1	-	-	-	-	-	-	-
By Area	Seoul	249	94	5	2	-	1	-	1	-
	Busan	14	3	-	-	-	-	-	-	-
	Incheon	29	10	-	-	-	-	-	-	-
	Daegu	13	7	-	-	-	-	-	-	-
	Gwangju	6	3	-	-	-	-	-	-	-
	Daejeon	84	37	-	-	-	-	-	-	-
	Ulsan	9	4	-	-	-	-	-	-	-
	Sejong	4	1	-	-	-	-	-	-	-
	Gyeonggi	350	139	5	1	-	-	1	-	-
	Gangwon	44	21	-	-	-	-	-	-	-
	Chungbuk	84	32	1	1	-	-	-	-	1
	Chungnam	41	12	-	-	-	-	-	-	-
	Jeonbuk	31	8	-	-	-	-	-	-	-
	Jeonnam	37	10	-	-	-	-	-	-	-
	Gyeongbuk	25	4	-	-	-	-	-	-	-
	Gyeongnam	27	10	1	-	-	-	-	-	-
Jeju	8	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		1,055	400	12	9	3	5	-	1	-
Core Industries	Biopharmaceutical	333	145	4	5	3	2	-	-	-
	Biochemical and Bioenergy	201	57	1	-	-	-	-	-	-
	Biofood	175	57	3	2	-	1	-	1	-
	Bioenvironmental	62	19	-	-	-	-	-	-	-
	Biomedical Equipment	109	45	2	2	-	2	-	-	-
	Bioinstrument and Bioequipment	55	16	1	-	-	-	-	-	-
	Bioresource	15	6	-	-	-	-	-	-	-
	Bioservice	105	55	1	-	-	-	-	-	-
Total Number of Workers	1 - 49	667	246	4	-	-	-	-	-	-
	50 - 299	278	106	4	4	-	3	-	1	-
	300 - 999	73	29	1	3	2	1	-	-	-
	1,000 or more	33	18	3	2	1	1	-	-	-
	Unknown	4	1	-	-	-	-	-	-	-
By Area	Seoul	249	94	5	2	-	2	-	-	-
	Busan	14	3	-	-	-	-	-	-	-
	Incheon	29	10	-	-	-	-	-	-	-
	Daegu	13	7	-	-	-	-	-	-	-
	Gwangju	6	3	-	-	-	-	-	-	-
	Daejeon	84	37	-	-	-	-	-	-	-
	Ulsan	9	4	-	-	-	-	-	-	-
	Sejong	4	1	-	-	-	-	-	-	-
	Gyeonggi	350	139	5	6	3	3	-	-	-
	Gangwon	44	21	-	-	-	-	-	-	-
	Chungbuk	84	32	1	-	-	-	-	-	-
	Chungnam	41	12	-	-	-	-	-	-	-
	Jeonbuk	31	8	-	-	-	-	-	-	-
	Jeonnam	37	10	-	-	-	-	-	-	-
	Gyeongbuk	25	4	-	-	-	-	-	-	-
Gyeongnam	27	10	1	1	-	-	-	1	-	
Jeju	8	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		1,055	400	12	1	-	1	-	-	-
Core Industries	Biopharmaceutical	333	145	4	-	-	-	-	-	-
	Biochemical and Bioenergy	201	57	1	-	-	-	-	-	-
	Biofood	175	57	3	-	-	-	-	-	-
	Bioenvironmental	62	19	-	-	-	-	-	-	-
	Biomedical Equipment	109	45	2	1	-	1	-	-	-
	Bioinstrument and Bioequipment	55	16	1	-	-	-	-	-	-
	Bioresource	15	6	-	-	-	-	-	-	-
	Bioservice	105	55	1	-	-	-	-	-	-
Total Number of Workers	1 - 49	667	246	4	-	-	-	-	-	-
	50 - 299	278	106	4	1	-	1	-	-	-
	300 - 999	73	29	1	-	-	-	-	-	-
	1,000 or more	33	18	3	-	-	-	-	-	-
	Unknown	4	1	-	-	-	-	-	-	-
By Area	Seoul	249	94	5	1	-	1	-	-	-
	Busan	14	3	-	-	-	-	-	-	-
	Incheon	29	10	-	-	-	-	-	-	-
	Daegu	13	7	-	-	-	-	-	-	-
	Gwangju	6	3	-	-	-	-	-	-	-
	Daejeon	84	37	-	-	-	-	-	-	-
	Ulsan	9	4	-	-	-	-	-	-	-
	Sejong	4	1	-	-	-	-	-	-	-
	Gyeonggi	350	139	5	-	-	-	-	-	-
	Gangwon	44	21	-	-	-	-	-	-	-
	Chungbuk	84	32	1	-	-	-	-	-	-
	Chungnam	41	12	-	-	-	-	-	-	-
	Jeonbuk	31	8	-	-	-	-	-	-	-
	Jeonnam	37	10	-	-	-	-	-	-	-
	Gyeongbuk	25	4	-	-	-	-	-	-	-
Gyeongnam	27	10	1	-	-	-	-	-	-	
Jeju	8	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	1,055	400	12	6	1	-	-	-	5	
Core Industries	Biopharmaceutical	333	145	4	1	1	-	-	-	-
	Biochemical and Bioenergy	201	57	1	5	-	-	-	-	5
	Biofood	175	57	3	-	-	-	-	-	-
	Bioenvironmental	62	19	-	-	-	-	-	-	-
	Biomedical Equipment	109	45	2	-	-	-	-	-	-
	Bioinstrument and Bioequipment	55	16	1	-	-	-	-	-	-
	Bioresource	15	6	-	-	-	-	-	-	-
	Bioservice	105	55	1	-	-	-	-	-	-
Total Number of Workers	1 - 49	667	246	4	5	-	-	-	-	5
	50 - 299	278	106	4	-	-	-	-	-	-
	300 - 999	73	29	1	-	-	-	-	-	-
	1,000 or more	33	18	3	1	1	-	-	-	-
	Unknown	4	1	-	-	-	-	-	-	-
By Area	Seoul	249	94	5	6	1	-	-	-	5
	Busan	14	3	-	-	-	-	-	-	-
	Incheon	29	10	-	-	-	-	-	-	-
	Daegu	13	7	-	-	-	-	-	-	-
	Gwangju	6	3	-	-	-	-	-	-	-
	Daejeon	84	37	-	-	-	-	-	-	-
	Ulsan	9	4	-	-	-	-	-	-	-
	Sejong	4	1	-	-	-	-	-	-	-
	Gyeonggi	350	139	5	-	-	-	-	-	-
	Gangwon	44	21	-	-	-	-	-	-	-
	Chungbuk	84	32	1	-	-	-	-	-	-
	Chungnam	41	12	-	-	-	-	-	-	-
	Jeonbuk	31	8	-	-	-	-	-	-	-
	Jeonnam	37	10	-	-	-	-	-	-	-
	Gyeongbuk	25	4	-	-	-	-	-	-	-
Gyeongnam	27	10	1	-	-	-	-	-	-	
Jeju	8	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	1,055	400	12	-	-	-	-	-	-	
Core Industries	Biopharmaceutical	333	145	4	-	-	-	-	-	-
	Biochemical and Bioenergy	201	57	1	-	-	-	-	-	-
	Biofood	175	57	3	-	-	-	-	-	-
	Bioenvironmental	62	19	-	-	-	-	-	-	-
	Biomedical Equipment	109	45	2	-	-	-	-	-	-
	Bioinstrument and Bioequipment	55	16	1	-	-	-	-	-	-
	Bioresource	15	6	-	-	-	-	-	-	-
	Bioservice	105	55	1	-	-	-	-	-	-
Total Number of Workers	1 - 49	667	246	4	-	-	-	-	-	-
	50 - 299	278	106	4	-	-	-	-	-	-
	300 - 999	73	29	1	-	-	-	-	-	-
	1,000 or more	33	18	3	-	-	-	-	-	-
	Unknown	4	1	-	-	-	-	-	-	-
By Area	Seoul	249	94	5	-	-	-	-	-	-
	Busan	14	3	-	-	-	-	-	-	-
	Incheon	29	10	-	-	-	-	-	-	-
	Daegu	13	7	-	-	-	-	-	-	-
	Gwangju	6	3	-	-	-	-	-	-	-
	Daejeon	84	37	-	-	-	-	-	-	-
	Ulsan	9	4	-	-	-	-	-	-	-
	Sejong	4	1	-	-	-	-	-	-	-
	Gyeonggi	350	139	5	-	-	-	-	-	-
	Gangwon	44	21	-	-	-	-	-	-	-
	Chungbuk	84	32	1	-	-	-	-	-	-
	Chungnam	41	12	-	-	-	-	-	-	-
	Jeonbuk	31	8	-	-	-	-	-	-	-
	Jeonnam	37	10	-	-	-	-	-	-	-
	Gyeongbuk	25	4	-	-	-	-	-	-	-
Gyeongnam	27	10	1	-	-	-	-	-	-	
Jeju	8	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		1,055	400	12	2	1	-	-	-	1
Core Industries	Biopharmaceutical	333	145	4	-	-	-	-	-	-
	Biochemical and Bioenergy	201	57	1	1	1	-	-	-	-
	Biofood	175	57	3	1	-	-	-	-	1
	Bioenvironmental	62	19	-	-	-	-	-	-	-
	Biomedical Equipment	109	45	2	-	-	-	-	-	-
	Bioinstrument and Bioequipment	55	16	1	-	-	-	-	-	-
	Bioresource	15	6	-	-	-	-	-	-	-
	Bioservice	105	55	1	-	-	-	-	-	-
Total Number of Workers	1 - 49	667	246	4	2	1	-	-	-	1
	50 - 299	278	106	4	-	-	-	-	-	-
	300 - 999	73	29	1	-	-	-	-	-	-
	1,000 or more	33	18	3	-	-	-	-	-	-
	Unknown	4	1	-	-	-	-	-	-	-
By Area	Seoul	249	94	5	2	1	-	-	-	1
	Busan	14	3	-	-	-	-	-	-	-
	Incheon	29	10	-	-	-	-	-	-	-
	Daegu	13	7	-	-	-	-	-	-	-
	Gwangju	6	3	-	-	-	-	-	-	-
	Daejeon	84	37	-	-	-	-	-	-	-
	Ulsan	9	4	-	-	-	-	-	-	-
	Sejong	4	1	-	-	-	-	-	-	-
	Gyeonggi	350	139	5	-	-	-	-	-	-
	Gangwon	44	21	-	-	-	-	-	-	-
	Chungbuk	84	32	1	-	-	-	-	-	-
	Chungnam	41	12	-	-	-	-	-	-	-
	Jeonbuk	31	8	-	-	-	-	-	-	-
	Jeonnam	37	10	-	-	-	-	-	-	-
	Gyeongbuk	25	4	-	-	-	-	-	-	-
Gyeongnam	27	10	1	-	-	-	-	-	-	
Jeju	8	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		1,055	400	12	2	-	-	-	1	1
Core Industries	Biopharmaceutical	333	145	4	-	-	-	-	-	-
	Biochemical and Bioenergy	201	57	1	-	-	-	-	-	-
	Biofood	175	57	3	-	-	-	-	-	-
	Bioenvironmental	62	19	-	-	-	-	-	-	-
	Biomedical Equipment	109	45	2	1	-	-	-	-	1
	Bioinstrument and Bioequipment	55	16	1	-	-	-	-	-	-
	Bioresource	15	6	-	-	-	-	-	-	-
	Bioservice	105	55	1	1	-	-	-	1	-
Total Number of Workers	1 - 49	667	246	4	1	-	-	-	1	-
	50 - 299	278	106	4	1	-	-	-	-	1
	300 - 999	73	29	1	-	-	-	-	-	-
	1,000 or more	33	18	3	-	-	-	-	-	-
	Unknown	4	1	-	-	-	-	-	-	-
By Area	Seoul	249	94	5	1	-	-	-	1	-
	Busan	14	3	-	-	-	-	-	-	-
	Incheon	29	10	-	-	-	-	-	-	-
	Daegu	13	7	-	-	-	-	-	-	-
	Gwangju	6	3	-	-	-	-	-	-	-
	Daejeon	84	37	-	-	-	-	-	-	-
	Ulsan	9	4	-	-	-	-	-	-	-
	Sejong	4	1	-	-	-	-	-	-	-
	Gyeonggi	350	139	5	-	-	-	-	-	-
	Gangwon	44	21	-	-	-	-	-	-	-
	Chungbuk	84	32	1	1	-	-	-	-	1
	Chungnam	41	12	-	-	-	-	-	-	-
	Jeonbuk	31	8	-	-	-	-	-	-	-
	Jeonnam	37	10	-	-	-	-	-	-	-
	Gyeongbuk	25	4	-	-	-	-	-	-	-
Gyeongnam	27	10	1	-	-	-	-	-	-	
Jeju	9	4	-	-	-	-	-	-	-	

Classification		No. of Companies	With Cooperative Relationship	No. of Respondents (Joint Venture)	Domestic (Government-funded)					
					Total	Basic Research	Experimental	Prototype	Product Development	Commercialization
Total		1,055	400	12	-	-	-	-	-	-
Core Industries	Biopharmaceutical	333	145	4	-	-	-	-	-	-
	Biochemical and Bioenergy	201	57	1	-	-	-	-	-	-
	Biofood	175	57	3	-	-	-	-	-	-
	Bioenvironmental	62	19	-	-	-	-	-	-	-
	Biomedical Equipment	109	45	2	-	-	-	-	-	-
	Bioinstrument and Bioequipment	55	16	1	-	-	-	-	-	-
	Bioresource	15	6	-	-	-	-	-	-	-
	Bioservice	105	55	1	-	-	-	-	-	-
Total Number of Workers	1 - 49	667	246	4	-	-	-	-	-	-
	50 - 299	278	106	4	-	-	-	-	-	-
	300 - 999	73	29	1	-	-	-	-	-	-
	1,000 or more	33	18	3	-	-	-	-	-	-
	Unknown	4	1	-	-	-	-	-	-	-
By Area	Seoul	249	94	5	-	-	-	-	-	-
	Busan	14	3	-	-	-	-	-	-	-
	Incheon	29	10	-	-	-	-	-	-	-
	Daegu	13	7	-	-	-	-	-	-	-
	Gwangju	6	3	-	-	-	-	-	-	-
	Daejeon	84	37	-	-	-	-	-	-	-
	Ulsan	9	4	-	-	-	-	-	-	-
	Sejong	4	1	-	-	-	-	-	-	-
	Gyeonggi	350	139	5	-	-	-	-	-	-
	Gangwon	44	21	-	-	-	-	-	-	-
	Chungbuk	84	32	1	-	-	-	-	-	-
	Chungnam	41	12	-	-	-	-	-	-	-
	Jeonbuk	31	8	-	-	-	-	-	-	-
	Jeonnam	37	10	-	-	-	-	-	-	-
	Gyeongbuk	25	4	-	-	-	-	-	-	-
Gyeongnam	27	10	1	-	-	-	-	-	-	
Jeju	8	5	-	-	-	-	-	-	-	

Classification		No. of Companies	With Cooperative Relationship	No. of Respondents (Joint Venture)	Overseas (Government-funded)					
					Total	Basic Research	Experimental	Prototype	Product Development	Commercialization
Total		1,055	400	12	-	-	-	-	-	-
Core Industries	Biopharmaceutical	333	145	4	-	-	-	-	-	-
	Biochemical and Bioenergy	201	57	1	-	-	-	-	-	-
	Biofood	175	57	3	-	-	-	-	-	-
	Bioenvironmental	62	19	-	-	-	-	-	-	-
	Biomedical Equipment	109	45	2	-	-	-	-	-	-
	Bioinstrument and Bioequipment	55	16	1	-	-	-	-	-	-
	Bioresource	15	6	-	-	-	-	-	-	-
	Bioservice	105	55	1	-	-	-	-	-	-
Total Number of Workers	1 - 49	667	246	4	-	-	-	-	-	-
	50 - 299	278	106	4	-	-	-	-	-	-
	300 - 999	73	29	1	-	-	-	-	-	-
	1,000 or more	33	18	3	-	-	-	-	-	-
	Unknown	4	1	-	-	-	-	-	-	-
By Area	Seoul	249	94	5	-	-	-	-	-	-
	Busan	14	3	-	-	-	-	-	-	-
	Incheon	29	10	-	-	-	-	-	-	-
	Daegu	13	7	-	-	-	-	-	-	-
	Gwangju	6	3	-	-	-	-	-	-	-
	Daejeon	84	37	-	-	-	-	-	-	-
	Ulsan	9	4	-	-	-	-	-	-	-
	Sejong	4	1	-	-	-	-	-	-	-
	Gyeonggi	350	139	5	-	-	-	-	-	-
	Gangwon	44	21	-	-	-	-	-	-	-
	Chungbuk	84	32	1	-	-	-	-	-	-
	Chungnam	41	12	-	-	-	-	-	-	-
	Jeonbuk	31	8	-	-	-	-	-	-	-
	Jeonnam	37	10	-	-	-	-	-	-	-
	Gyeongbuk	25	4	-	-	-	-	-	-	-
Gyeongnam	27	10	1	-	-	-	-	-	-	
Jeju	8	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		1,055	400	12	-	-	-	-	-	-
Core Industries	Biopharmaceutical	333	145	4	-	-	-	-	-	-
	Biochemical and Bioenergy	201	57	1	-	-	-	-	-	-
	Biofood	175	57	3	-	-	-	-	-	-
	Bioenvironmental	62	19	-	-	-	-	-	-	-
	Biomedical Equipment	109	45	2	-	-	-	-	-	-
	Bioinstrument and Bioequipment	55	16	1	-	-	-	-	-	-
	Bioresource	15	6	-	-	-	-	-	-	-
	Bioservice	105	55	1	-	-	-	-	-	-
Total Number of Workers	1 - 49	667	246	4	-	-	-	-	-	-
	50 - 299	278	106	4	-	-	-	-	-	-
	300 - 999	73	29	1	-	-	-	-	-	-
	1,000 or more	33	18	3	-	-	-	-	-	-
	Unknown	4	1	-	-	-	-	-	-	-
By Area	Seoul	249	94	5	-	-	-	-	-	-
	Busan	14	3	-	-	-	-	-	-	-
	Incheon	29	10	-	-	-	-	-	-	-
	Daegu	13	7	-	-	-	-	-	-	-
	Gwangju	6	3	-	-	-	-	-	-	-
	Daejeon	84	37	-	-	-	-	-	-	-
	Ulsan	9	4	-	-	-	-	-	-	-
	Sejong	4	1	-	-	-	-	-	-	-
	Gyeonggi	350	139	5	-	-	-	-	-	-
	Gangwon	44	21	-	-	-	-	-	-	-
	Chungbuk	84	32	1	-	-	-	-	-	-
	Chungnam	41	12	-	-	-	-	-	-	-
	Jeonbuk	31	8	-	-	-	-	-	-	-
	Jeonnam	37	10	-	-	-	-	-	-	-
	Gyeongbuk	25	4	-	-	-	-	-	-	-
Gyeongnam	27	10	1	-	-	-	-	-	-	
Jeju	8	5	-	-	-	-	-	-	-	

Classification		No. of Companies	With Cooperative Relationship	No. of Respondents (Joint Venture)	Overseas (Private Research)					
					Total	Basic Research	Experimental	Prototype	Product Development	Commercialization
Total		1,055	400	12	-	-	-	-	-	-
Core Industries	Biopharmaceutical	333	145	4	-	-	-	-	-	-
	Biochemical and Bioenergy	201	57	1	-	-	-	-	-	-
	Biofood	175	57	3	-	-	-	-	-	-
	Bioenvironmental	62	19	-	-	-	-	-	-	-
	Biomedical Equipment	109	45	2	-	-	-	-	-	-
	Bioinstrument and Bioequipment	55	16	1	-	-	-	-	-	-
	Bioresource	15	6	-	-	-	-	-	-	-
	Bioservice	105	55	1	-	-	-	-	-	-
Total Number of Workers	1 - 49	667	246	4	-	-	-	-	-	-
	50 - 299	278	106	4	-	-	-	-	-	-
	300 - 999	73	29	1	-	-	-	-	-	-
	1,000 or more	33	18	3	-	-	-	-	-	-
	Unknown	4	1	-	-	-	-	-	-	-
By Area	Seoul	249	94	5	-	-	-	-	-	-
	Busan	14	3	-	-	-	-	-	-	-
	Incheon	29	10	-	-	-	-	-	-	-
	Daegu	13	7	-	-	-	-	-	-	-
	Gwangju	6	3	-	-	-	-	-	-	-
	Daejeon	84	37	-	-	-	-	-	-	-
	Ulsan	9	4	-	-	-	-	-	-	-
	Sejong	4	1	-	-	-	-	-	-	-
	Gyeonggi	350	139	5	-	-	-	-	-	-
	Gangwon	44	21	-	-	-	-	-	-	-
	Chungbuk	84	32	1	-	-	-	-	-	-
	Chungnam	41	12	-	-	-	-	-	-	-
	Jeonbuk	31	8	-	-	-	-	-	-	-
	Jeonnam	37	10	-	-	-	-	-	-	-
	Gyeongbuk	25	4	-	-	-	-	-	-	-
Gyeongnam	27	10	1	-	-	-	-	-	-	
Jeju	8	5	-	-	-	-	-	-	-	

Classification		No. of Companies	With Cooperative Relationship	No. of Respondents (Joint Venture)	Domestic (Universities)					
					Total	Basic Research	Experimental	Prototype	Product Development	Commercialization
Total		1,055	400	12	2	-	-	1	1	-
Core Industries	Biopharmaceutical	333	145	4	1	-	-	1	-	-
	Biochemical and Bioenergy	201	57	1	-	-	-	-	-	-
	Biofood	175	57	3	-	-	-	-	-	-
	Bioenvironmental	62	19	-	-	-	-	-	-	-
	Biomedical Equipment	109	45	2	-	-	-	-	-	-
	Bioinstrument and Bioequipment	55	16	1	1	-	-	-	1	-
	Bioresource	15	6	-	-	-	-	-	-	-
	Bioservice	105	55	1	-	-	-	-	-	-
Total Number of Workers	1 - 49	667	246	4	1	-	-	-	1	-
	50 - 299	278	106	4	-	-	-	-	-	-
	300 - 999	73	29	1	-	-	-	-	-	-
	1,000 or more	33	18	3	1	-	-	1	-	-
	Unknown	4	1	-	-	-	-	-	-	-
By Area	Seoul	249	94	5	-	-	-	-	-	-
	Busan	14	3	-	-	-	-	-	-	-
	Incheon	29	10	-	-	-	-	-	-	-
	Daegu	13	7	-	-	-	-	-	-	-
	Gwangju	6	3	-	-	-	-	-	-	-
	Daejeon	84	37	-	-	-	-	-	-	-
	Ulsan	9	4	-	-	-	-	-	-	-
	Sejong	4	1	-	-	-	-	-	-	-
	Gyeonggi	350	139	5	2	-	-	1	1	-
	Gangwon	44	21	-	-	-	-	-	-	-
	Chungbuk	84	32	1	-	-	-	-	-	-
	Chungnam	41	12	-	-	-	-	-	-	-
	Jeonbuk	31	8	-	-	-	-	-	-	-
	Jeonnam	37	10	-	-	-	-	-	-	-
	Gyeongbuk	25	4	-	-	-	-	-	-	-
Gyeongnam	27	10	1	-	-	-	-	-	-	
Jeju	8	5	-	-	-	-	-	-	-	

Classification		No. of Companies	With Cooperative Relationship	No. of Respondents (Joint Venture)	Overseas (Universities)					
					Total	Basic Research	Experimental	Prototype	Product Development	Commercialization
Total		1,055	400	12	1	-	-	1	-	-
Core Industries	Biopharmaceutical	333	145	4	1	-	-	1	-	-
	Biochemical and Bioenergy	201	57	1	-	-	-	-	-	-
	Biofood	175	57	3	-	-	-	-	-	-
	Bioenvironmental	62	19	-	-	-	-	-	-	-
	Biomedical Equipment	109	45	2	-	-	-	-	-	-
	Bioinstrument and Bioequipment	55	16	1	-	-	-	-	-	-
	Bioresource	15	6	-	-	-	-	-	-	-
	Bioservice	105	55	1	-	-	-	-	-	-
Total Number of Workers	1 - 49	667	246	4	-	-	-	-	-	-
	50 - 299	278	106	4	-	-	-	-	-	-
	300 - 999	73	29	1	-	-	-	-	-	-
	1,000 or more	33	18	3	1	-	-	1	-	-
	Unknown	4	1	-	-	-	-	-	-	-
By Area	Seoul	249	94	5	-	-	-	-	-	-
	Busan	14	3	-	-	-	-	-	-	-
	Incheon	29	10	-	-	-	-	-	-	-
	Daegu	13	7	-	-	-	-	-	-	-
	Gwangju	6	3	-	-	-	-	-	-	-
	Daejeon	84	37	-	-	-	-	-	-	-
	Ulsan	9	4	-	-	-	-	-	-	-
	Sejong	4	1	-	-	-	-	-	-	-
	Gyeonggi	350	139	5	1	-	-	1	-	-
	Gangwon	44	21	-	-	-	-	-	-	-
	Chungbuk	84	32	1	-	-	-	-	-	-
	Chungnam	41	12	-	-	-	-	-	-	-
	Jeonbuk	31	8	-	-	-	-	-	-	-
	Jeonnam	37	10	-	-	-	-	-	-	-
	Gyeongbuk	25	4	-	-	-	-	-	-	-
Gyeongnam	27	10	1	-	-	-	-	-	-	
Jeju	8	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		1,055	400	12	-	-	-	-	-	-
Core Industries	Biopharmaceutical	333	145	4	-	-	-	-	-	-
	Biochemical and Bioenergy	201	57	1	-	-	-	-	-	-
	Biofood	175	57	3	-	-	-	-	-	-
	Bioenvironmental	62	19	-	-	-	-	-	-	-
	Biomedical Equipment	109	45	2	-	-	-	-	-	-
	Bioinstrument and Bioequipment	55	16	1	-	-	-	-	-	-
	Bioresource	15	6	-	-	-	-	-	-	-
	Bioservice	105	55	1	-	-	-	-	-	-
Total Number of Workers	1 - 49	667	246	4	-	-	-	-	-	-
	50 - 299	278	106	4	-	-	-	-	-	-
	300 - 999	73	29	1	-	-	-	-	-	-
	1,000 or more	33	18	3	-	-	-	-	-	-
	Unknown	4	1	-	-	-	-	-	-	-
By Area	Seoul	249	94	5	-	-	-	-	-	-
	Busan	14	3	-	-	-	-	-	-	-
	Incheon	29	10	-	-	-	-	-	-	-
	Daegu	13	7	-	-	-	-	-	-	-
	Gwangju	6	3	-	-	-	-	-	-	-
	Daejeon	84	37	-	-	-	-	-	-	-
	Ulsan	9	4	-	-	-	-	-	-	-
	Sejong	4	1	-	-	-	-	-	-	-
	Gyeonggi	350	139	5	-	-	-	-	-	-
	Gangwon	44	21	-	-	-	-	-	-	-
	Chungbuk	84	32	1	-	-	-	-	-	-
	Chungnam	41	12	-	-	-	-	-	-	-
	Jeonbuk	31	8	-	-	-	-	-	-	-
	Jeonnam	37	10	-	-	-	-	-	-	-
	Gyeongbuk	25	4	-	-	-	-	-	-	-
Gyeongnam	27	10	1	-	-	-	-	-	-	
Jeju	8	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		1,055	400	12	-	-	-	-	-	-
Core Industries	Biopharmaceutical	333	145	4	-	-	-	-	-	-
	Biochemical and Bioenergy	201	57	1	-	-	-	-	-	-
	Biofood	175	57	3	-	-	-	-	-	-
	Bioenvironmental	62	19	-	-	-	-	-	-	-
	Biomedical Equipment	109	45	2	-	-	-	-	-	-
	Bioinstrument and Bioequipment	55	16	1	-	-	-	-	-	-
	Bioresource	15	6	-	-	-	-	-	-	-
	Bioservice	105	55	1	-	-	-	-	-	-
Total Number of Workers	1 - 49	667	246	4	-	-	-	-	-	-
	50 - 299	278	106	4	-	-	-	-	-	-
	300 - 999	73	29	1	-	-	-	-	-	-
	1,000 or more	33	18	3	-	-	-	-	-	-
	Unknown	4	1	-	-	-	-	-	-	-
By Area	Seoul	249	94	5	-	-	-	-	-	-
	Busan	14	3	-	-	-	-	-	-	-
	Incheon	29	10	-	-	-	-	-	-	-
	Daegu	13	7	-	-	-	-	-	-	-
	Gwangju	6	3	-	-	-	-	-	-	-
	Daejeon	84	37	-	-	-	-	-	-	-
	Ulsan	9	4	-	-	-	-	-	-	-
	Sejong	4	1	-	-	-	-	-	-	-
	Gyeonggi	350	139	5	-	-	-	-	-	-
	Gangwon	44	21	-	-	-	-	-	-	-
	Chungbuk	84	32	1	-	-	-	-	-	-
	Chungnam	41	12	-	-	-	-	-	-	-
	Jeonbuk	31	8	-	-	-	-	-	-	-
	Jeonnam	37	10	-	-	-	-	-	-	-
	Gyeongbuk	25	4	-	-	-	-	-	-	-
Gyeongnam	27	10	1	-	-	-	-	-	-	
Jeju	8	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		1,055	400	371	878	311	307	144	80	36
Core Industries	Biopharmaceutical	333	145	131	297	131	109	39	16	2
	Biochemical and Bioenergy	201	57	56	133	42	37	25	16	13
	Biofood	175	57	54	121	28	57	18	12	6
	Bioenvironmental	62	19	18	25	10	7	8	-	-
	Biomedical Equipment	109	45	39	79	29	24	10	12	4
	Bioinstrument and Bioequipment	55	16	16	44	9	13	18	4	-
	Bioresource	15	6	6	24	3	18	-	3	-
	Bioservice	105	55	51	155	59	42	26	17	11
Total Number of Workers	1 - 49	667	246	233	494	185	166	77	45	21
	50 - 299	278	106	95	231	78	85	40	23	5
	300 - 999	73	29	26	89	28	37	14	6	4
	1,000 or more	33	18	16	62	18	19	13	6	6
	Unknown	4	1	1	2	2	-	-	-	-
By Area	Seoul	249	94	85	213	75	88	27	14	9
	Busan	14	3	3	4	2	1	-	1	-
	Incheon	29	10	9	12	6	3	3	-	-
	Daegu	13	7	7	16	2	7	4	3	-
	Gwangju	6	3	3	7	2	5	-	-	-
	Daejeon	84	37	36	99	38	27	22	10	2
	Ulsan	9	4	4	5	3	2	-	-	-
	Sejong	4	1	1	1	-	-	-	-	1
	Gyeonggi	350	139	129	316	113	108	60	23	12
	Gangwon	44	21	19	33	12	9	6	5	1
	Chungbuk	84	32	29	66	21	24	8	8	5
	Chungnam	41	12	12	26	13	7	3	3	-
	Jeonbuk	31	8	6	13	1	4	1	7	-
	Jeonnam	37	10	10	34	9	14	4	4	3
	Gyeongbuk	25	4	4	10	4	4	-	-	2
	Gyeongnam	27	10	9	14	5	4	4	1	-
Jeju	8	5	5	9	5	-	2	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		1,055	400	371	24	10	2	11	-	1
Core Industries	Biopharmaceutical	333	145	131	19	8	-	10	-	1
	Biochemical and Bioenergy	201	57	56	1	-	1	-	-	-
	Biofood	175	57	54	2	2	-	-	-	-
	Bioenvironmental	62	19	18	-	-	-	-	-	-
	Biomedical Equipment	109	45	39	2	-	1	1	-	-
	Bioinstrument and Bioequipment	55	16	16	-	-	-	-	-	-
	Bioresource	15	6	6	-	-	-	-	-	-
	Bioservice	105	55	51	-	-	-	-	-	-
Total Number of Workers	1 - 49	667	246	233	2	1	-	-	-	1
	50 - 299	278	106	95	13	4	-	9	-	-
	300 - 999	73	29	26	3	-	1	2	-	-
	1,000 or more	33	18	16	6	5	1	-	-	-
	Unknown	4	1	1	-	-	-	-	-	-
By Area	Seoul	249	94	85	3	1	-	1	-	1
	Busan	14	3	3	-	-	-	-	-	-
	Incheon	29	10	9	-	-	-	-	-	-
	Daegu	13	7	7	-	-	-	-	-	-
	Gwangju	6	3	3	-	-	-	-	-	-
	Daejeon	84	37	36	3	2	1	-	-	-
	Ulsan	9	4	4	-	-	-	-	-	-
	Sejong	4	1	1	-	-	-	-	-	-
	Gyeonggi	350	139	129	5	2	-	3	-	-
	Gangwon	44	21	19	5	-	-	5	-	-
	Chungbuk	84	32	29	8	5	1	2	-	-
	Chungnam	41	12	12	-	-	-	-	-	-
	Jeonbuk	31	8	6	-	-	-	-	-	-
	Jeonnam	37	10	10	-	-	-	-	-	-
	Gyeongbuk	25	4	4	-	-	-	-	-	-
	Gyeongnam	27	10	9	-	-	-	-	-	-
Jeju	8	5	5	-	-	-	-	-	-	

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	1,055	400	371	86	38	28	12	8	-	11	2	-	9	-	-	
Core Industries	Biopharmaceutical	333	145	131	44	25	10	8	1	-	10	1	-	9	-	-
	Biochemical and Bioenergy	201	57	56	4	2	2	-	-	-	-	-	-	-	-	-
	Biofood	175	57	54	15	3	9	3	-	-	1	1	-	-	-	-
	Bioenvironmental	62	19	18	2	2	-	-	-	-	-	-	-	-	-	-
	Biomedical Equipment	109	45	39	4	1	2	-	1	-	-	-	-	-	-	-
	Bioinstrument and Bioequipment	55	16	16	4	1	2	1	-	-	-	-	-	-	-	-
	Bioresource	15	6	6	-	-	-	-	-	-	-	-	-	-	-	-
	Bioservice	105	55	51	13	4	3	-	6	-	-	-	-	-	-	-
Total Number of Workers	1 - 49	667	246	233	42	21	15	-	6	-	-	-	-	-	-	-
	50 - 299	278	106	95	36	15	9	11	1	-	10	2	-	8	-	-
	300 - 999	73	29	26	4	-	3	1	-	-	1	-	-	1	-	-
	1,000 or more	33	18	16	3	1	1	-	1	-	-	-	-	-	-	-
	Unknown	4	1	1	1	1	-	-	-	-	-	-	-	-	-	-
By Area	Seoul	249	94	85	20	6	13	-	1	-	-	-	-	-	-	-
	Busan	14	3	3	2	2	-	-	-	-	-	-	-	-	-	-
	Incheon	29	10	9	1	1	-	-	-	-	-	-	-	-	-	-
	Daegu	13	7	7	2	2	-	-	-	-	-	-	-	-	-	-
	Gwangju	6	3	3	-	-	-	-	-	-	-	-	-	-	-	-
	Daejeon	84	37	36	12	11	-	1	-	-	1	1	-	-	-	-
	Ulsan	9	4	4	-	-	-	-	-	-	-	-	-	-	-	-
	Sejong	4	1	1	-	-	-	-	-	-	-	-	-	-	-	-
	Gyeonggi	350	139	129	25	9	7	8	1	-	4	1	-	3	-	-
	Gangwon	44	21	19	10	4	3	3	-	-	5	-	-	5	-	-
	Chungbuk	84	32	29	6	1	5	-	-	-	1	-	-	1	-	-
	Chungnam	41	12	12	-	-	-	-	-	-	-	-	-	-	-	-
	Jeonbuk	31	8	6	6	-	-	-	6	-	-	-	-	-	-	-
	Jeonnam	37	10	10	-	-	-	-	-	-	-	-	-	-	-	-
Gyeongbuk	25	4	4	-	-	-	-	-	-	-	-	-	-	-	-	
Gyeongnam	27	10	9	1	1	-	-	-	-	-	-	-	-	-	-	
Jeju	8	5	5	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	1,055	400	371	34	16	7	4	5	2	1	1	-	-	-	-	
Core Industries	Biopharmaceutical	333	145	131	19	10	4	3	2	-	1	1	-	-	-	-
	Biochemical and Bioenergy	201	57	56	1	-	1	-	-	-	-	-	-	-	-	-
	Biofood	175	57	54	8	1	1	1	3	2	-	-	-	-	-	-
	Bioenvironmental	62	19	18	-	-	-	-	-	-	-	-	-	-	-	-
	Biomedical Equipment	109	45	39	2	2	-	-	-	-	-	-	-	-	-	-
	Bioinstrument and Bioequipment	55	16	16	-	-	-	-	-	-	-	-	-	-	-	-
	Bioresource	15	6	6	-	-	-	-	-	-	-	-	-	-	-	-
	Bioservice	105	55	51	4	3	1	-	-	-	-	-	-	-	-	-
Total Number of Workers	1 - 49	667	246	233	20	11	3	1	3	2	-	-	-	-	-	-
	50 - 299	278	106	95	2	1	1	-	-	-	1	1	-	-	-	-
	300 - 999	73	29	26	4	2	-	-	2	-	-	-	-	-	-	-
	1,000 or more	33	18	16	8	2	3	3	-	-	-	-	-	-	-	-
	Unknown	4	1	1	-	-	-	-	-	-	-	-	-	-	-	-
By Area	Seoul	249	94	85	8	4	3	-	1	-	-	-	-	-	-	-
	Busan	14	3	3	-	-	-	-	-	-	-	-	-	-	-	-
	Incheon	29	10	9	-	-	-	-	-	-	-	-	-	-	-	-
	Daegu	13	7	7	-	-	-	-	-	-	-	-	-	-	-	-
	Gwangju	6	3	3	-	-	-	-	-	-	-	-	-	-	-	-
	Daejeon	84	37	36	2	1	-	-	1	-	1	1	-	-	-	-
	Ulsan	9	4	4	-	-	-	-	-	-	-	-	-	-	-	-
	Sejong	4	1	1	-	-	-	-	-	-	-	-	-	-	-	-
	Gyeonggi	350	139	129	16	8	4	3	1	-	-	-	-	-	-	-
	Gangwon	44	21	19	-	-	-	-	-	-	-	-	-	-	-	-
	Chungbuk	84	32	29	8	3	-	1	2	2	-	-	-	-	-	-
	Chungnam	41	12	12	-	-	-	-	-	-	-	-	-	-	-	-
	Jeonbuk	31	8	6	-	-	-	-	-	-	-	-	-	-	-	-
	Jeonnam	37	10	10	-	-	-	-	-	-	-	-	-	-	-	-
Gyeongbuk	25	4	4	-	-	-	-	-	-	-	-	-	-	-	-	
Gyeongnam	27	10	9	-	-	-	-	-	-	-	-	-	-	-	-	
Jeju	8	5	5	-	-	-	-	-	-	-	-	-	-	-	-	

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	1,055	400	371	23	9	6	1	4	3	2	1	1	-	-	-
Core Industries	Biopharmaceutical	333	145	131	8	6	1	-	1	-	-	-	-	-	-
	Biochemical and Bioenergy	201	57	56	5	2	1	-	1	1	-	1	-	-	-
	Biofood	175	57	54	2	-	2	-	-	-	1	1	-	-	-
	Bioenvironmental	62	19	18	-	-	-	-	-	-	-	-	-	-	-
	Biomedical Equipment	109	45	39	3	-	1	-	1	1	-	-	-	-	-
	Bioinstrument and Bioequipment	55	16	16	-	-	-	-	-	-	-	-	-	-	-
	Bioresource	15	6	6	-	-	-	-	-	-	-	-	-	-	-
	Bioservice	105	55	51	5	1	1	1	1	1	-	-	-	-	-
Total Number of Workers	1 - 49	667	246	233	10	6	1	-	2	1	-	-	-	-	-
	50 - 299	278	106	95	4	-	4	-	-	1	1	-	-	-	-
	300 - 999	73	29	26	6	2	1	1	1	1	-	-	-	-	-
	1,000 or more	33	18	16	3	1	-	-	1	1	-	1	-	-	-
	Unknown	4	1	1	-	-	-	-	-	-	-	-	-	-	-
By Area	Seoul	249	94	85	10	3	2	1	2	2	-	-	-	-	-
	Busan	14	3	3	-	-	-	-	-	-	-	-	-	-	-
	Incheon	29	10	9	-	-	-	-	-	-	-	-	-	-	-
	Daegu	13	7	7	-	-	-	-	-	-	-	-	-	-	-
	Gwangju	6	3	3	-	-	-	-	-	-	-	-	-	-	-
	Daejeon	84	37	36	2	1	-	-	1	-	1	1	-	-	-
	Ulsan	9	4	4	-	-	-	-	-	-	-	-	-	-	-
	Sejong	4	1	1	-	-	-	-	-	-	-	-	-	-	-
	Gyeonggi	350	139	129	4	1	3	-	-	-	1	1	-	-	-
	Gangwon	44	21	19	3	3	-	-	-	-	-	-	-	-	-
	Chungbuk	84	32	29	-	-	-	-	-	-	-	-	-	-	-
	Chungnam	41	12	12	2	1	1	-	-	-	-	-	-	-	-
	Jeonbuk	31	8	6	-	-	-	-	-	-	-	-	-	-	-
	Jeonnam	37	10	10	2	-	-	-	1	1	-	-	-	-	-
	Gyeongbuk	25	4	4	-	-	-	-	-	-	-	-	-	-	-
	Gyeongnam	27	10	9	-	-	-	-	-	-	-	-	-	-	-
Jeju	8	5	5	-	-	-	-	-	-	-	-	-	-	-	

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	1,055	400	371	387	123	141	60	39	24	1	-	-	1	-	-
Core Industries	Biopharmaceutical	333	145	131	106	43	45	14	4	-	1	-	-	1	-
	Biochemical and Bioenergy	201	57	56	70	20	17	14	9	10	-	-	-	-	-
	Biofood	175	57	54	46	8	24	5	5	4	-	-	-	-	-
	Bioenvironmental	62	19	18	15	6	6	3	-	-	-	-	-	-	-
	Biomedical Equipment	109	45	39	41	15	12	2	9	3	-	-	-	-	-
	Bioinstrument and Bioequipment	55	16	16	22	3	6	12	1	-	-	-	-	-	-
	Bioresource	15	6	6	14	2	9	-	3	-	-	-	-	-	-
	Bioservice	105	55	51	73	26	22	10	8	7	-	-	-	-	-
Total Number of Workers	1 - 49	667	246	233	236	80	81	39	21	15	-	-	-	-	-
	50 - 299	278	106	95	104	31	43	14	14	2	1	-	-	1	-
	300 - 999	73	29	26	28	8	11	5	2	2	-	-	-	-	-
	1,000 or more	33	18	16	19	4	6	2	2	5	-	-	-	-	-
	Unknown	4	1	1	-	-	-	-	-	-	-	-	-	-	-
By Area	Seoul	249	94	85	82	30	29	10	7	6	1	-	-	1	-
	Busan	14	3	3	1	-	1	-	-	-	-	-	-	-	-
	Incheon	29	10	9	7	2	3	2	-	-	-	-	-	-	-
	Daegu	13	7	7	5	-	1	3	1	-	-	-	-	-	-
	Gwangju	6	3	3	6	1	5	-	-	-	-	-	-	-	-
	Daejeon	84	37	36	44	17	15	7	3	2	-	-	-	-	-
	Ulsan	9	4	4	5	3	2	-	-	-	-	-	-	-	-
	Sejong	4	1	1	1	-	-	-	-	1	-	-	-	-	-
	Gyeonggi	350	139	129	151	44	52	25	18	12	-	-	-	-	-
	Gangwon	44	21	19	7	1	2	1	2	1	-	-	-	-	-
	Chungbuk	84	32	29	27	10	9	2	5	1	-	-	-	-	-
	Chungnam	41	12	12	9	4	3	2	-	-	-	-	-	-	-
	Jeonbuk	31	8	6	2	-	1	-	1	-	-	-	-	-	-
	Jeonnam	37	10	10	26	7	13	3	2	1	-	-	-	-	-
	Gyeongbuk	25	4	4	4	1	3	-	-	-	-	-	-	-	-
	Gyeongnam	27	10	9	9	3	2	4	-	-	-	-	-	-	-
Jeju	8	5	5	1	-	-	-	1	-	-	-	-	-	-	

Classification	No. of Companies	With Cooperative Relationship	No. of Respondents (Joint R&D Contract)	Domestic (Private Research)						Overseas (Private Research)						
				Total	Basic Research	Experimental	Prototype	Product Development	Commercialization	Total	Basic Research	Experimental	Prototype	Product Development	Commercialization	
Total	1,055	400	371	25	13	5	5	1	1	2	1	-	-	-	1	
Core Industries	Biopharmaceutical	333	145	131	10	9	1	-	-	-	2	1	-	-	-	1
	Biochemical and Bioenergy	201	57	56	8	3	2	3	-	-	-	-	-	-	-	-
	Biofood	175	57	54	-	-	-	-	-	-	-	-	-	-	-	-
	Bioenvironmental	62	19	18	-	-	-	-	-	-	-	-	-	-	-	-
	Biomedical Equipment	109	45	39	1	-	1	-	-	-	-	-	-	-	-	-
	Bioinstrument and Bioequipment	55	16	16	-	-	-	-	-	-	-	-	-	-	-	-
	Bioresource	15	6	6	-	-	-	-	-	-	-	-	-	-	-	-
	Bioservice	105	55	51	6	1	1	2	1	1	-	-	-	-	-	-
Total Number of Workers	1 - 49	667	246	233	13	10	3	-	-	-	2	1	-	-	-	1
	50 - 299	278	106	95	3	1	1	1	-	-	-	-	-	-	-	-
	300 - 999	73	29	26	6	2	1	1	1	1	-	-	-	-	-	-
	1,000 or more	33	18	16	3	-	-	3	-	-	-	-	-	-	-	-
	Unknown	4	1	1	-	-	-	-	-	-	-	-	-	-	-	-
By Area	Seoul	249	94	85	12	6	2	2	1	1	2	1	-	-	-	1
	Busan	14	3	3	-	-	-	-	-	-	-	-	-	-	-	-
	Incheon	29	10	9	1	1	-	-	-	-	-	-	-	-	-	-
	Daegu	13	7	7	-	-	-	-	-	-	-	-	-	-	-	-
	Gwangju	6	3	3	-	-	-	-	-	-	-	-	-	-	-	-
	Daejeon	84	37	36	5	1	1	3	-	-	-	-	-	-	-	-
	Ulsan	9	4	4	-	-	-	-	-	-	-	-	-	-	-	-
	Sejong	4	1	1	-	-	-	-	-	-	-	-	-	-	-	-
	Gyeonggi	350	139	129	3	2	1	-	-	-	-	-	-	-	-	-
	Gangwon	44	21	19	-	-	-	-	-	-	-	-	-	-	-	-
	Chungbuk	84	32	29	-	-	-	-	-	-	-	-	-	-	-	-
	Chungnam	41	12	12	4	3	1	-	-	-	-	-	-	-	-	-
	Jeonbuk	31	8	6	-	-	-	-	-	-	-	-	-	-	-	-
	Jeonnam	37	10	10	-	-	-	-	-	-	-	-	-	-	-	-
	Gyeongbuk	25	4	4	-	-	-	-	-	-	-	-	-	-	-	-
	Gyeongnam	27	10	9	-	-	-	-	-	-	-	-	-	-	-	-
Jeju	8	5	5	-	-	-	-	-	-	-	-	-	-	-	-	

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	1,055	400	371	260	86	98	49	21	6	6	5	1	-	-	-	
Core Industries	Biopharmaceutical	333	145	131	81	25	34	12	8	2	5	5	-	-	-	-
	Biochemical and Bioenergy	201	57	56	44	15	13	8	6	2	-	-	-	-	-	-
	Biofood	175	57	54	50	16	21	9	4	-	-	-	-	-	-	-
	Bioenvironmental	62	19	18	8	2	1	5	-	-	-	-	-	-	-	-
	Biomedical Equipment	109	45	39	21	6	7	8	-	-	1	-	1	-	-	-
	Bioinstrument and Bioequipment	55	16	16	14	5	3	4	2	-	-	-	-	-	-	-
	Bioresource	15	6	6	10	1	9	-	-	-	-	-	-	-	-	-
	Bioservice	105	55	51	32	16	10	3	1	2	-	-	-	-	-	-
Total Number of Workers	1 - 49	667	246	233	145	44	54	32	12	3	-	-	-	-	-	-
	50 - 299	278	106	95	61	23	21	7	7	3	-	-	-	-	-	-
	300 - 999	73	29	26	29	9	15	5	-	-	1	-	1	-	-	-
	1,000 or more	33	18	16	24	9	8	5	2	-	5	5	-	-	-	-
	Unknown	4	1	1	1	1	-	-	-	-	-	-	-	-	-	-
By Area	Seoul	249	94	85	58	17	32	8	1	-	-	-	-	-	-	-
	Busan	14	3	3	1	-	-	-	1	-	-	-	-	-	-	-
	Incheon	29	10	9	3	2	-	1	-	-	-	-	-	-	-	-
	Daegu	13	7	7	6	-	4	1	1	-	-	-	-	-	-	-
	Gwangju	6	3	3	1	1	-	-	-	-	-	-	-	-	-	-
	Daejeon	84	37	36	31	7	11	8	5	-	-	-	-	-	-	-
	Ulsan	9	4	4	-	-	-	-	-	-	-	-	-	-	-	-
	Sejong	4	1	1	-	-	-	-	-	-	-	-	-	-	-	-
	Gyeonggi	350	139	129	86	33	30	20	3	-	-	-	-	-	-	-
	Gangwon	44	21	19	13	4	4	2	3	-	-	-	-	-	-	-
	Chungbuk	84	32	29	23	6	9	5	1	2	6	5	1	-	-	-
	Chungnam	41	12	12	11	5	2	1	3	-	-	-	-	-	-	-
	Jeonbuk	31	8	6	5	1	3	1	-	-	-	-	-	-	-	-
	Jeonnam	37	10	10	6	2	1	1	1	1	-	-	-	-	-	-
	Gyeongbuk	25	4	4	6	3	1	-	-	2	-	-	-	-	-	-
	Gyeongnam	27	10	9	3	1	1	-	1	-	-	-	-	-	-	-
Jeju	8	5	5	7	4	-	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		1,055	400	371	63	26	22	13	2	-	1	-	-	1	-	-
Core Industries	Biopharmaceutical	333	145	131	29	13	14	2	-	-	-	-	-	-	-	-
	Biochemical and Bioenergy	201	57	56	1	-	1	-	-	-	-	-	-	-	-	-
	Biofood	175	57	54	-	-	-	-	-	-	-	-	-	-	-	-
	Bioenvironmental	62	19	18	-	-	-	-	-	-	-	-	-	-	-	-
	Biomedical Equipment	109	45	39	7	5	1	-	1	-	1	-	1	-	-	-
	Bioinstrument and Bioequipment	55	16	16	4	-	2	1	1	-	-	-	-	-	-	-
	Bioresource	15	6	6	-	-	-	-	-	-	-	-	-	-	-	-
	Bioservice	105	55	51	22	8	4	10	-	-	-	-	-	-	-	-
	Total Number of Workers	1 - 49	667	246	233	28	13	9	5	1	-	-	-	-	-	-
50 - 299		278	106	95	21	7	6	7	1	-	-	-	-	-	-	-
300 - 999		73	29	26	12	5	6	1	-	-	1	-	1	-	-	-
1,000 or more		33	18	16	2	1	1	-	-	-	-	-	-	-	-	-
Unknown		4	1	1	-	-	-	-	-	-	-	-	-	-	-	-
By Area	Seoul	249	94	85	23	9	7	6	1	-	-	-	-	-	-	-
	Busan	14	3	3	-	-	-	-	-	-	-	-	-	-	-	-
	Incheon	29	10	9	-	-	-	-	-	-	-	-	-	-	-	-
	Daegu	13	7	7	3	-	2	-	1	-	-	-	-	-	-	-
	Gwangju	6	3	3	-	-	-	-	-	-	-	-	-	-	-	-
	Daejeon	84	37	36	3	-	-	3	-	-	-	-	-	-	-	-
	Ulsan	9	4	4	-	-	-	-	-	-	-	-	-	-	-	-
	Sejong	4	1	1	-	-	-	-	-	-	-	-	-	-	-	-
	Gyeonggi	350	139	129	31	16	11	4	-	-	-	-	-	-	-	-
	Gangwon	44	21	19	-	-	-	-	-	-	-	-	-	-	-	-
	Chungbuk	84	32	29	2	1	1	-	-	-	1	-	1	-	-	-
	Chungnam	41	12	12	-	-	-	-	-	-	-	-	-	-	-	-
	Jeonbuk	31	8	6	-	-	-	-	-	-	-	-	-	-	-	-
	Jeonnam	37	10	10	-	-	-	-	-	-	-	-	-	-	-	-
	Gyeongbuk	25	4	4	-	-	-	-	-	-	-	-	-	-	-	-
	Gyeongnam	27	10	9	1	-	1	-	-	-	-	-	-	-	-	-
Jeju	8	5	5	-	-	-	-	-	-	-	-	-	-	-	-	

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

Classification		No. of Companies	With Cooperative Relationship	No. of Respondents (Technical Tie-Up)	Domestic					
					Total	Basic Research	Experimental	Prototype	Product Development	Commercialization
Total		1,055	400	44	74	15	30	15	8	6
Core Industries	Biopharmaceutical	333	145	24	41	12	18	6	5	-
	Biochemical and Bioenergy	201	57	2	5	1	2	2	-	-
	Biofood	175	57	4	3	2	1	-	-	-
	Bioenvironmental	62	19	2	3	-	-	-	-	3
	Biomedical Equipment	109	45	7	17	-	7	7	2	1
	Bioinstrument and Bioequipment	55	16	-	-	-	-	-	-	-
	Bioresource	15	6	-	-	-	-	-	-	-
	Bioservice	105	55	5	5	-	2	-	1	2
	Total Number of Workers	1 - 49	667	246	19	29	7	13	3	2
	50 - 299	278	106	15	35	6	13	11	4	1
	300 - 999	73	29	8	8	2	4	1	-	1
	1,000 or more	33	18	2	2	-	-	-	2	-
	Unknown	4	1	-	-	-	-	-	-	-
By Area	Seoul	249	94	12	17	1	9	2	-	5
	Busan	14	3	-	-	-	-	-	-	-
	Incheon	29	10	1	4	-	2	2	-	-
	Daegu	13	7	-	-	-	-	-	-	-
	Gwangju	6	3	-	-	-	-	-	-	-
	Daejeon	84	37	2	4	4	-	-	-	-
	Ulsan	9	4	-	-	-	-	-	-	-
	Sejong	4	1	-	-	-	-	-	-	-
	Gyeonggi	350	139	14	24	6	6	7	4	1
	Gangwon	44	21	3	4	-	3	1	-	-
	Chungbuk	84	32	6	14	1	7	3	3	-
	Chungnam	41	12	1	1	1	-	-	-	-
	Jeonbuk	31	8	4	6	2	3	4	1	-
	Jeonnam	37	10	-	-	-	-	-	-	-
	Gyeongbuk	25	4	-	-	-	-	-	-	-
	Gyeongnam	27	10	1	-	-	-	-	-	-
Jeju	8	5	-	-	-	-	-	-	-	

Classification		No. of Companies	With Cooperative Relationship	No. of Respondents (Technical Tie-Up)	Overseas					
					Total	Basic Research	Experimental	Prototype	Product Development	Commercialization
Total		1,055	400	44	23	6	1	9	5	2
Core Industries	Biopharmaceutical	333	145	24	14	5	-	8	-	1
	Biochemical and Bioenergy	201	57	2	-	-	-	-	-	-
	Biofood	175	57	4	1	-	-	-	1	-
	Bioenvironmental	62	19	2	-	-	-	-	-	-
	Biomedical Equipment	109	45	7	3	1	1	1	-	-
	Bioinstrument and Bioequipment	55	16	-	-	-	-	-	-	-
	Bioresource	15	6	-	-	-	-	-	-	-
	Bioservice	105	55	5	5	-	-	-	4	1
	Total Number of Workers	1 - 49	667	246	19	-	-	-	-	-
	50 - 299	278	106	15	14	6	1	6	1	-
	300 - 999	73	29	8	7	-	-	1	4	2
	1,000 or more	33	18	2	2	-	-	2	-	-
	Unknown	4	1	-	-	-	-	-	-	-
By Area	Seoul	249	94	12	6	1	-	-	4	1
	Busan	14	3	-	-	-	-	-	-	-
	Incheon	29	10	1	-	-	-	-	-	-
	Daegu	13	7	-	-	-	-	-	-	-
	Gwangju	6	3	-	-	-	-	-	-	-
	Daejeon	84	37	2	3	3	-	-	-	-
	Ulsan	9	4	-	-	-	-	-	-	-
	Sejong	4	1	-	-	-	-	-	-	-
	Gyeonggi	350	139	14	4	1	-	2	-	1
	Gangwon	44	21	3	5	-	-	5	-	-
	Chungbuk	84	32	6	4	1	1	2	-	-
	Chungnam	41	12	1	-	-	-	-	-	-
	Jeonbuk	31	8	4	-	-	-	-	-	-
	Jeonnam	37	10	-	-	-	-	-	-	-
	Gyeongbuk	25	4	-	-	-	-	-	-	-
	Gyeongnam	27	10	1	1	-	-	-	1	-
Jeju	8	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		1,055	400	44	15	4	5	4	1	1	19	5	1	7	5	1
Core Industries	Biopharmaceutical	333	145	24	12	4	5	3	-	-	11	4	-	6	-	1
	Biochemical and Bioenergy	201	57	2	-	-	-	-	-	-	-	-	-	-	-	-
	Biofood	175	57	4	-	-	-	-	-	-	1	-	-	-	1	-
	Bioenvironmental	62	19	2	-	-	-	-	-	-	-	-	-	-	-	-
	Biomedical Equipment	109	45	7	2	-	-	1	1	-	3	1	1	1	-	-
	Bioinstrument and Bioequipment	55	16	-	-	-	-	-	-	-	-	-	-	-	-	-
	Bioresource	15	6	-	-	-	-	-	-	-	-	-	-	-	-	-
	Bioservice	105	55	5	1	-	-	-	-	1	4	-	-	-	4	-
Total Number of Workers	1 - 49	667	246	19	1	-	-	-	-	1	-	-	-	-	-	-
	50 - 299	278	106	15	11	3	4	3	1	-	13	5	1	6	1	-
	300 - 999	73	29	8	3	1	1	1	-	-	6	-	1	4	1	-
	1,000 or more	33	18	2	-	-	-	-	-	-	-	-	-	-	-	-
	Unknown	4	1	-	-	-	-	-	-	-	-	-	-	-	-	-
By Area	Seoul	249	94	12	3	-	2	-	-	1	5	1	-	-	4	-
	Busan	14	3	-	-	-	-	-	-	-	-	-	-	-	-	-
	Incheon	29	10	1	-	-	-	-	-	-	-	-	-	-	-	-
	Daegu	13	7	-	-	-	-	-	-	-	-	-	-	-	-	-
	Gwangju	6	3	-	-	-	-	-	-	-	-	-	-	-	-	-
	Daejeon	84	37	2	3	3	-	-	-	-	2	2	-	-	-	-
	Ulsan	9	4	-	-	-	-	-	-	-	-	-	-	-	-	-
	Sejong	4	1	-	-	-	-	-	-	-	-	-	-	-	-	-
	Gyeonggi	350	139	14	5	1	2	2	-	-	2	1	-	-	-	1
	Gangwon	44	21	3	2	-	1	1	-	-	5	-	-	5	-	-
	Chungbuk	84	32	6	2	-	-	1	1	-	4	1	1	2	-	-
	Chungnam	41	12	1	-	-	-	-	-	-	-	-	-	-	-	-
	Jeonbuk	31	8	4	-	-	-	-	-	-	-	-	-	-	-	-
	Jeonnam	37	10	-	-	-	-	-	-	-	-	-	-	-	-	-
Gyeongbuk	25	4	-	-	-	-	-	-	-	-	-	-	-	-	-	
Gyeongnam	27	10	1	-	-	-	-	-	-	1	-	-	-	1	-	
Jeju	8	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		1,055	400	44	4	-	1	-	2	1	1	1	-	-	-	-
Core Industries	Biopharmaceutical	333	145	24	2	-	-	-	2	-	1	1	-	-	-	-
	Biochemical and Bioenergy	201	57	2	-	-	-	-	-	-	-	-	-	-	-	-
	Biofood	175	57	4	-	-	-	-	-	-	-	-	-	-	-	-
	Bioenvironmental	62	19	2	-	-	-	-	-	-	-	-	-	-	-	-
	Biomedical Equipment	109	45	7	1	-	-	-	-	1	-	-	-	-	-	-
	Bioinstrument and Bioequipment	55	16	-	-	-	-	-	-	-	-	-	-	-	-	-
	Bioresource	15	6	-	-	-	-	-	-	-	-	-	-	-	-	-
	Bioservice	105	55	5	1	-	1	-	-	-	-	-	-	-	-	-
Total Number of Workers	1 - 49	667	246	19	-	-	-	-	-	-	-	-	-	-	-	-
	50 - 299	278	106	15	2	-	1	-	-	1	1	1	-	-	-	-
	300 - 999	73	29	8	-	-	-	-	-	-	-	-	-	-	-	-
	1,000 or more	33	18	2	2	-	-	-	2	-	-	-	-	-	-	-
	Unknown	4	1	-	-	-	-	-	-	-	-	-	-	-	-	-
By Area	Seoul	249	94	12	2	-	1	-	-	1	-	-	-	-	-	-
	Busan	14	3	-	-	-	-	-	-	-	-	-	-	-	-	-
	Incheon	29	10	1	-	-	-	-	-	-	-	-	-	-	-	-
	Daegu	13	7	-	-	-	-	-	-	-	-	-	-	-	-	-
	Gwangju	6	3	-	-	-	-	-	-	-	-	-	-	-	-	-
	Daejeon	84	37	2	-	-	-	-	-	1	1	-	-	-	-	-
	Ulsan	9	4	-	-	-	-	-	-	-	-	-	-	-	-	-
	Sejong	4	1	-	-	-	-	-	-	-	-	-	-	-	-	-
	Gyeonggi	350	139	14	-	-	-	-	-	-	-	-	-	-	-	-
	Gangwon	44	21	3	-	-	-	-	-	-	-	-	-	-	-	-
	Chungbuk	84	32	6	2	-	-	-	2	-	-	-	-	-	-	-
	Chungnam	41	12	1	-	-	-	-	-	-	-	-	-	-	-	-
	Jeonbuk	31	8	4	-	-	-	-	-	-	-	-	-	-	-	-
	Jeonnam	37	10	-	-	-	-	-	-	-	-	-	-	-	-	-
Gyeongbuk	25	4	-	-	-	-	-	-	-	-	-	-	-	-	-	
Gyeongnam	27	10	1	-	-	-	-	-	-	-	-	-	-	-	-	
Jeju	8	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		1,055	400	44	6	1	5	-	-	-	2	-	-	2	-	-
Core Industries	Biopharmaceutical	333	145	24	4	1	3	-	-	-	2	-	-	2	-	-
	Biochemical and Bioenergy	201	57	2	-	-	-	-	-	-	-	-	-	-	-	-
	Biofood	175	57	4	-	-	-	-	-	-	-	-	-	-	-	-
	Bioenvironmental	62	19	2	-	-	-	-	-	-	-	-	-	-	-	-
	Biomedical Equipment	109	45	7	2	-	2	-	-	-	-	-	-	-	-	-
	Bioinstrument and Bioequipment	55	16	-	-	-	-	-	-	-	-	-	-	-	-	-
	Bioresource	15	6	-	-	-	-	-	-	-	-	-	-	-	-	-
	Bioservice	105	55	5	-	-	-	-	-	-	-	-	-	-	-	-
Total Number of Workers	1 - 49	667	246	19	5	1	4	-	-	-	-	-	-	-	-	-
	50 - 299	278	106	15	-	-	-	-	-	-	-	-	-	-	-	-
	300 - 999	73	29	8	1	-	1	-	-	-	-	-	-	-	-	-
	1,000 or more	33	18	2	-	-	-	-	-	-	2	-	-	2	-	-
	Unknown	4	1	-	-	-	-	-	-	-	-	-	-	-	-	-
By Area	Seoul	249	94	12	-	-	-	-	-	-	-	-	-	-	-	-
	Busan	14	3	-	-	-	-	-	-	-	-	-	-	-	-	-
	Incheon	29	10	1	-	-	-	-	-	-	-	-	-	-	-	-
	Daegu	13	7	-	-	-	-	-	-	-	-	-	-	-	-	-
	Gwangju	6	3	-	-	-	-	-	-	-	-	-	-	-	-	-
	Daejeon	84	37	2	-	-	-	-	-	-	-	-	-	-	-	-
	Ulsan	9	4	-	-	-	-	-	-	-	-	-	-	-	-	-
	Sejong	4	1	-	-	-	-	-	-	-	-	-	-	-	-	-
	Gyeonggi	350	139	14	2	-	2	-	-	-	2	-	-	2	-	-
	Gangwon	44	21	3	-	-	-	-	-	-	-	-	-	-	-	-
	Chungbuk	84	32	6	1	-	1	-	-	-	-	-	-	-	-	-
	Chungnam	41	12	1	-	-	-	-	-	-	-	-	-	-	-	-
	Jeonbuk	31	8	4	3	1	2	-	-	-	-	-	-	-	-	-
	Jeonnam	37	10	-	-	-	-	-	-	-	-	-	-	-	-	-
	Gyeongbuk	25	4	-	-	-	-	-	-	-	-	-	-	-	-	-
Gyeongnam	27	10	1	-	-	-	-	-	-	-	-	-	-	-	-	
Jeju	8	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		1,055	400	44	14	2	6	3	1	2	1	-	-	-	-	1
Core Industries	Biopharmaceutical	333	145	24	4	1	3	-	-	-	-	-	-	-	-	-
	Biochemical and Bioenergy	201	57	2	2	-	1	1	-	-	-	-	-	-	-	-
	Biofood	175	57	4	2	1	1	-	-	-	-	-	-	-	-	-
	Bioenvironmental	62	19	2	2	-	-	-	-	2	-	-	-	-	-	-
	Biomedical Equipment	109	45	7	3	-	-	2	1	-	-	-	-	-	-	-
	Bioinstrument and Bioequipment	55	16	-	-	-	-	-	-	-	-	-	-	-	-	-
	Bioresource	15	6	-	-	-	-	-	-	-	-	-	-	-	-	-
	Bioservice	105	55	5	1	-	1	-	-	-	1	-	-	-	-	1
Total Number of Workers	1 - 49	667	246	19	10	1	5	1	1	2	-	-	-	-	-	-
	50 - 299	278	106	15	4	1	1	2	-	-	-	-	-	-	-	-
	300 - 999	73	29	8	-	-	-	-	-	-	1	-	-	-	-	1
	1,000 or more	33	18	2	-	-	-	-	-	-	-	-	-	-	-	-
	Unknown	4	1	-	-	-	-	-	-	-	-	-	-	-	-	-
By Area	Seoul	249	94	12	4	-	2	-	-	2	1	-	-	-	-	1
	Busan	14	3	-	-	-	-	-	-	-	-	-	-	-	-	-
	Incheon	29	10	1	2	-	1	1	-	-	-	-	-	-	-	-
	Daegu	13	7	-	-	-	-	-	-	-	-	-	-	-	-	-
	Gwangju	6	3	-	-	-	-	-	-	-	-	-	-	-	-	-
	Daejeon	84	37	2	1	1	-	-	-	-	-	-	-	-	-	-
	Ulsan	9	4	-	-	-	-	-	-	-	-	-	-	-	-	-
	Sejong	4	1	-	-	-	-	-	-	-	-	-	-	-	-	-
	Gyeonggi	350	139	14	2	-	-	1	1	-	-	-	-	-	-	-
	Gangwon	44	21	3	1	-	1	-	-	-	-	-	-	-	-	-
	Chungbuk	84	32	6	2	-	1	1	-	-	-	-	-	-	-	-
	Chungnam	41	12	1	-	-	-	-	-	-	-	-	-	-	-	-
	Jeonbuk	31	8	4	2	1	1	-	-	-	-	-	-	-	-	-
	Jeonnam	37	10	-	-	-	-	-	-	-	-	-	-	-	-	-
	Gyeongbuk	25	4	-	-	-	-	-	-	-	-	-	-	-	-	-
Gyeongnam	27	10	1	-	-	-	-	-	-	-	-	-	-	-	-	
Jeju	8	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
Total		1,055	400	44	5	3	2	-	-	-	-	-	-	-	-
Core Industries	Biopharmaceutical	333	145	24	5	3	2	-	-	-	-	-	-	-	-
	Biochemical and Bioenergy	201	57	2	-	-	-	-	-	-	-	-	-	-	-
	Biofood	175	57	4	-	-	-	-	-	-	-	-	-	-	-
	Bioenvironmental	62	19	2	-	-	-	-	-	-	-	-	-	-	-
	Biomedical Equipment	109	45	7	-	-	-	-	-	-	-	-	-	-	-
	Bioinstrument and Bioequipment	55	16	-	-	-	-	-	-	-	-	-	-	-	-
	Bioresource	15	6	-	-	-	-	-	-	-	-	-	-	-	-
	Bioservice	105	55	5	-	-	-	-	-	-	-	-	-	-	-
Total Number of Workers	1 - 49	667	246	19	4	3	1	-	-	-	-	-	-	-	-
	50 - 299	278	106	15	1	-	1	-	-	-	-	-	-	-	-
	300 - 999	73	29	8	-	-	-	-	-	-	-	-	-	-	-
	1,000 or more	33	18	2	-	-	-	-	-	-	-	-	-	-	-
	Unknown	4	1	-	-	-	-	-	-	-	-	-	-	-	-
By Area	Seoul	249	94	12	3	1	2	-	-	-	-	-	-	-	-
	Busan	14	3	-	-	-	-	-	-	-	-	-	-	-	-
	Incheon	29	10	1	-	-	-	-	-	-	-	-	-	-	-
	Daegu	13	7	-	-	-	-	-	-	-	-	-	-	-	-
	Gwangju	6	3	-	-	-	-	-	-	-	-	-	-	-	-
	Daejeon	84	37	2	-	-	-	-	-	-	-	-	-	-	-
	Ulsan	9	4	-	-	-	-	-	-	-	-	-	-	-	-
	Sejong	4	1	-	-	-	-	-	-	-	-	-	-	-	-
	Gyeonggi	350	139	14	2	2	-	-	-	-	-	-	-	-	-
	Gangwon	44	21	3	-	-	-	-	-	-	-	-	-	-	-
	Chungbuk	84	32	6	-	-	-	-	-	-	-	-	-	-	-
	Chungnam	41	12	1	-	-	-	-	-	-	-	-	-	-	-
	Jeonbuk	31	8	4	-	-	-	-	-	-	-	-	-	-	-
	Jeonnam	37	10	-	-	-	-	-	-	-	-	-	-	-	-
	Gyeongbuk	25	4	-	-	-	-	-	-	-	-	-	-	-	-
	Gyeongnam	27	10	1	-	-	-	-	-	-	-	-	-	-	-
Jeju	8	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
Total		1,055	400	44	24	5	6	7	4	2	-	-	-	-	-
Core Industries	Biopharmaceutical	333	145	24	13	3	4	3	3	-	-	-	-	-	-
	Biochemical and Bioenergy	201	57	2	3	1	1	1	-	-	-	-	-	-	-
	Biofood	175	57	4	1	1	-	-	-	-	-	-	-	-	-
	Bioenvironmental	62	19	2	1	-	-	-	-	1	-	-	-	-	-
	Biomedical Equipment	109	45	7	4	-	1	3	-	-	-	-	-	-	-
	Bioinstrument and Bioequipment	55	16	-	-	-	-	-	-	-	-	-	-	-	-
	Bioresource	15	6	-	-	-	-	-	-	-	-	-	-	-	-
	Bioservice	105	55	5	2	-	-	-	1	1	-	-	-	-	-
Total Number of Workers	1 - 49	667	246	19	9	2	3	2	1	1	-	-	-	-	-
	50 - 299	278	106	15	11	2	1	5	3	-	-	-	-	-	-
	300 - 999	73	29	8	4	1	2	-	-	1	-	-	-	-	-
	1,000 or more	33	18	2	-	-	-	-	-	-	-	-	-	-	-
	Unknown	4	1	-	-	-	-	-	-	-	-	-	-	-	-
By Area	Seoul	249	94	12	5	-	2	2	-	1	-	-	-	-	-
	Busan	14	3	-	-	-	-	-	-	-	-	-	-	-	-
	Incheon	29	10	1	2	-	1	1	-	-	-	-	-	-	-
	Daegu	13	7	-	-	-	-	-	-	-	-	-	-	-	-
	Gwangju	6	3	-	-	-	-	-	-	-	-	-	-	-	-
	Daejeon	84	37	2	-	-	-	-	-	-	-	-	-	-	-
	Ulsan	9	4	-	-	-	-	-	-	-	-	-	-	-	-
	Sejong	4	1	-	-	-	-	-	-	-	-	-	-	-	-
	Gyeonggi	350	139	14	11	3	1	3	3	1	-	-	-	-	-
	Gangwon	44	21	3	1	-	1	-	-	-	-	-	-	-	-
	Chungbuk	84	32	6	3	1	1	1	-	-	-	-	-	-	-
	Chungnam	41	12	1	1	1	-	-	-	-	-	-	-	-	-
	Jeonbuk	31	8	4	1	-	-	-	1	-	-	-	-	-	-
	Jeonnam	37	10	-	-	-	-	-	-	-	-	-	-	-	-
	Gyeongbuk	25	4	-	-	-	-	-	-	-	-	-	-	-	-
	Gyeongnam	27	10	1	-	-	-	-	-	-	-	-	-	-	-
Jeju	8	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	1,055	400	44	6	-	5	1	-	-	-	-	-	-	-	-
Core Industries	Biopharmaceutical	333	145	24	1	-	1	-	-	-	-	-	-	-	-
	Biochemical and Bioenergy	201	57	2	-	-	-	-	-	-	-	-	-	-	-
	Biofood	175	57	4	-	-	-	-	-	-	-	-	-	-	-
	Bioenvironmental	62	19	2	-	-	-	-	-	-	-	-	-	-	-
	Biomedical Equipment	109	45	7	5	-	4	1	-	-	-	-	-	-	-
	Bioinstrument and Bioequipment	55	16	-	-	-	-	-	-	-	-	-	-	-	-
	Bioresource	15	6	-	-	-	-	-	-	-	-	-	-	-	-
	Bioservice	105	55	5	-	-	-	-	-	-	-	-	-	-	-
Total Number of Workers	1 - 49	667	246	19	-	-	-	-	-	-	-	-	-	-	-
	50 - 299	278	106	15	6	-	5	1	-	-	-	-	-	-	-
	300 - 999	73	29	8	-	-	-	-	-	-	-	-	-	-	-
	1,000 or more	33	18	2	-	-	-	-	-	-	-	-	-	-	-
	Unknown	4	1	-	-	-	-	-	-	-	-	-	-	-	-
By Area	Seoul	249	94	12	-	-	-	-	-	-	-	-	-	-	-
	Busan	14	3	-	-	-	-	-	-	-	-	-	-	-	-
	Incheon	29	10	1	-	-	-	-	-	-	-	-	-	-	-
	Daegu	13	7	-	-	-	-	-	-	-	-	-	-	-	-
	Gwangju	6	3	-	-	-	-	-	-	-	-	-	-	-	-
	Daejeon	84	37	2	-	-	-	-	-	-	-	-	-	-	-
	Ulsan	9	4	-	-	-	-	-	-	-	-	-	-	-	-
	Sejong	4	1	-	-	-	-	-	-	-	-	-	-	-	-
	Gyeonggi	350	139	14	2	-	1	1	-	-	-	-	-	-	-
	Gangwon	44	21	3	-	-	-	-	-	-	-	-	-	-	-
	Chungbuk	84	32	6	4	-	4	-	-	-	-	-	-	-	-
	Chungnam	41	12	1	-	-	-	-	-	-	-	-	-	-	-
	Jeonbuk	31	8	4	-	-	-	-	-	-	-	-	-	-	-
	Jeonnam	37	10	-	-	-	-	-	-	-	-	-	-	-	-
	Gyeongbuk	25	4	-	-	-	-	-	-	-	-	-	-	-	-
	Gyeongnam	27	10	1	-	-	-	-	-	-	-	-	-	-	-
Jeju	8	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	1,055	400	8	22	4	7	5	4	2	
Core Industries	Biopharmaceutical	333	145	3	4	2	1	1	-	-
	Biochemical and Bioenergy	201	57	2	14	-	6	4	4	-
	Biofood	175	57	-	-	-	-	-	-	-
	Bioenvironmental	62	19	-	-	-	-	-	-	-
	Biomedical Equipment	109	45	2	2	-	-	-	-	2
	Bioinstrument and Bioequipment	55	16	-	-	-	-	-	-	-
	Bioresource	15	6	-	-	-	-	-	-	-
	Bioservice	105	55	1	2	2	-	-	-	-
	Total Number of Workers									
1 - 49	667	246	4	7	4	2	-	-	1	
50 - 299	278	106	1	1	-	-	1	-	-	
300 - 999	73	29	2	2	-	1	-	-	1	
1,000 or more	33	18	1	12	-	4	4	4	-	
Unknown	4	1	-	-	-	-	-	-	-	
By Area	Seoul	249	94	2	4	4	-	-	-	-
	Busan	14	3	-	-	-	-	-	-	-
	Incheon	29	10	1	1	-	-	-	-	1
	Daegu	13	7	-	-	-	-	-	-	-
	Gwangju	6	3	-	-	-	-	-	-	-
	Daejeon	84	37	2	14	-	6	4	4	-
	Ulsan	9	4	-	-	-	4	-	-	-
	Sejong	4	1	-	-	-	-	-	-	-
	Gyeonggi	350	139	2	2	-	1	1	-	-
	Gangwon	44	21	-	-	-	-	-	-	-
	Chungbuk	84	32	1	1	-	-	-	-	1
	Chungnam	41	12	-	-	-	-	-	-	-
	Jeonbuk	31	8	-	-	-	-	-	-	-
	Jeonnam	37	10	-	-	-	-	-	-	-
	Gyeongbuk	25	4	-	-	-	-	-	-	-
	Gyeongnam	27	10	-	-	-	-	-	-	-
Jeju	8	5	-	-	-	-	-	-	-	

Classification	No. of Companies	With Cooperative Relationship	No. of Respondents (Technical Manpower Exchange)	Overseas						
				Total	Basic Research	Experimental	Prototype	Product Development	Commercialization	
Total	1,055	400	8	1	-	1	-	-	-	
Core Industries	Biopharmaceutical	333	145	3	1	-	1	-	-	-
	Biochemical and Bioenergy	201	57	2	-	-	-	-	-	-
	Biofood	175	57	-	-	-	-	-	-	-
	Bioenvironmental	62	19	-	-	-	-	-	-	-
	Biomedical Equipment	109	45	2	-	-	-	-	-	-
	Bioinstrument and Bioequipment	55	16	-	-	-	-	-	-	-
	Bioresource	15	6	-	-	-	-	-	-	-
	Bioservice	105	55	1	-	-	-	-	-	-
	Total Number of Workers									
1 - 49	667	246	4	-	-	-	-	-	-	
50 - 299	278	106	1	-	-	-	-	-	-	
300 - 999	73	29	2	1	-	1	-	-	-	
1,000 or more	33	18	1	-	-	-	-	-	-	
Unknown	4	1	-	-	-	-	-	-	-	
By Area	Seoul	249	94	2	-	-	-	-	-	-
	Busan	14	3	-	-	-	-	-	-	-
	Incheon	29	10	1	-	-	-	-	-	-
	Daegu	13	7	-	-	-	-	-	-	-
	Gwangju	6	3	-	-	-	-	-	-	-
	Daejeon	84	37	2	-	-	-	-	-	-
	Ulsan	9	4	-	-	-	-	-	-	-
	Sejong	4	1	-	-	-	1	-	-	-
	Gyeonggi	350	139	2	1	-	1	-	-	-
	Gangwon	44	21	-	-	-	-	-	-	-
	Chungbuk	84	32	1	-	-	-	-	-	-
	Chungnam	41	12	-	-	-	-	-	-	-
	Jeonbuk	31	8	-	-	-	-	-	-	-
	Jeonnam	37	10	-	-	-	-	-	-	-
	Gyeongbuk	25	4	-	-	-	-	-	-	-
	Gyeongnam	27	10	-	-	-	-	-	-	-
Jeju	8	5	-	-	-	-	-	-	-	

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	1,055	400	8	-	-	-	-	-	-	-	-	-	-	-	-
Core Industries	Biopharmaceutical	333	145	3	-	-	-	-	-	-	-	-	-	-	-
	Biochemical and Bioenergy	201	57	2	-	-	-	-	-	-	-	-	-	-	-
	Biofood	175	57	-	-	-	-	-	-	-	-	-	-	-	-
	Bioenvironmental	62	19	-	-	-	-	-	-	-	-	-	-	-	-
	Biomedical Equipment	109	45	2	-	-	-	-	-	-	-	-	-	-	-
	Bioinstrument and Bioequipment	55	16	-	-	-	-	-	-	-	-	-	-	-	-
	Bioresource	15	6	-	-	-	-	-	-	-	-	-	-	-	-
	Bioservice	105	55	1	-	-	-	-	-	-	-	-	-	-	-
	Total Number of Workers	1 - 49	667	246	4	-	-	-	-	-	-	-	-	-	-
50 - 299		278	106	1	-	-	-	-	-	-	-	-	-	-	-
300 - 999		73	29	2	-	-	-	-	-	-	-	-	-	-	-
1,000 or more		33	18	1	-	-	-	-	-	-	-	-	-	-	-
Unknown		4	1	-	-	-	-	-	-	-	-	-	-	-	-
By Area	Seoul	249	94	2	-	-	-	-	-	-	-	-	-	-	-
	Busan	14	3	-	-	-	-	-	-	-	-	-	-	-	-
	Incheon	29	10	1	-	-	-	-	-	-	-	-	-	-	-
	Daegu	13	7	-	-	-	-	-	-	-	-	-	-	-	-
	Gwangju	6	3	-	-	-	-	-	-	-	-	-	-	-	-
	Daejeon	84	37	2	-	-	-	-	-	-	-	-	-	-	-
	Ulsan	9	4	-	-	-	-	-	-	-	-	-	-	-	-
	Sejong	4	1	-	-	-	-	-	-	-	-	-	-	-	-
	Gyeonggi	350	139	2	-	-	-	-	-	-	-	-	-	-	-
	Gangwon	44	21	-	-	-	-	-	-	-	-	-	-	-	-
	Chungbuk	84	32	1	-	-	-	-	-	-	-	-	-	-	-
	Chungnam	41	12	-	-	-	-	-	-	-	-	-	-	-	-
	Jeonbuk	31	8	-	-	-	-	-	-	-	-	-	-	-	-
	Jeonnam	37	10	-	-	-	-	-	-	-	-	-	-	-	-
	Gyeongbuk	25	4	-	-	-	-	-	-	-	-	-	-	-	-
Gyeongnam	27	10	-	-	-	-	-	-	-	-	-	-	-	-	
Jeju	8	5	-	-	-	-	-	-	-	-	-	-	-	-	

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	1,055	400	8	-	-	-	-	-	-	-	-	-	-	-	-
Core Industries	Biopharmaceutical	333	145	3	-	-	-	-	-	-	-	-	-	-	-
	Biochemical and Bioenergy	201	57	2	-	-	-	-	-	-	-	-	-	-	-
	Biofood	175	57	-	-	-	-	-	-	-	-	-	-	-	-
	Bioenvironmental	62	19	-	-	-	-	-	-	-	-	-	-	-	-
	Biomedical Equipment	109	45	2	-	-	-	-	-	-	-	-	-	-	-
	Bioinstrument and Bioequipment	55	16	-	-	-	-	-	-	-	-	-	-	-	-
	Bioresource	15	6	-	-	-	-	-	-	-	-	-	-	-	-
	Bioservice	105	55	1	-	-	-	-	-	-	-	-	-	-	-
	Total Number of Workers	1 - 49	667	246	4	-	-	-	-	-	-	-	-	-	-
50 - 299		278	106	1	-	-	-	-	-	-	-	-	-	-	-
300 - 999		73	29	2	-	-	-	-	-	-	-	-	-	-	-
1,000 or more		33	18	1	-	-	-	-	-	-	-	-	-	-	-
Unknown		4	1	-	-	-	-	-	-	-	-	-	-	-	-
By Area	Seoul	249	94	2	-	-	-	-	-	-	-	-	-	-	-
	Busan	14	3	-	-	-	-	-	-	-	-	-	-	-	-
	Incheon	29	10	1	-	-	-	-	-	-	-	-	-	-	-
	Daegu	13	7	-	-	-	-	-	-	-	-	-	-	-	-
	Gwangju	6	3	-	-	-	-	-	-	-	-	-	-	-	-
	Daejeon	84	37	2	-	-	-	-	-	-	-	-	-	-	-
	Ulsan	9	4	-	-	-	-	-	-	-	-	-	-	-	-
	Sejong	4	1	-	-	-	-	-	-	-	-	-	-	-	-
	Gyeonggi	350	139	2	-	-	-	-	-	-	-	-	-	-	-
	Gangwon	44	21	-	-	-	-	-	-	-	-	-	-	-	-
	Chungbuk	84	32	1	-	-	-	-	-	-	-	-	-	-	-
	Chungnam	41	12	-	-	-	-	-	-	-	-	-	-	-	-
	Jeonbuk	31	8	-	-	-	-	-	-	-	-	-	-	-	-
	Jeonnam	37	10	-	-	-	-	-	-	-	-	-	-	-	-
	Gyeongbuk	25	4	-	-	-	-	-	-	-	-	-	-	-	-
Gyeongnam	27	10	-	-	-	-	-	-	-	-	-	-	-	-	
Jeju	8	5	-	-	-	-	-	-	-	-	-	-	-	-	

Classification	No. of Companies	With Cooperative Relationship	No. of Respondents (Technical Manpower Exchange)	Domestic (Large Enterprises)						Overseas (Large Enterprises)						
				Total	Basic Research	Experimental	Prototype	Product Development	Commercialization	Total	Basic Research	Experimental	Prototype	Product Development	Commercialization	
Total	1,055	400	8	-	-	-	-	-	-	-	-	-	-	-	-	-
Core Industries	Biopharmaceutical	333	145	3	-	-	-	-	-	-	-	-	-	-	-	-
	Biochemical and Bioenergy	201	57	2	-	-	-	-	-	-	-	-	-	-	-	-
	Biofood	175	57	-	-	-	-	-	-	-	-	-	-	-	-	-
	Bioenvironmental	62	19	-	-	-	-	-	-	-	-	-	-	-	-	-
	Biomedical Equipment	109	45	2	-	-	-	-	-	-	-	-	-	-	-	-
	Bioinstrument and Bioequipment	55	16	-	-	-	-	-	-	-	-	-	-	-	-	-
	Bioresource	15	6	-	-	-	-	-	-	-	-	-	-	-	-	-
	Bioservice	105	55	1	-	-	-	-	-	-	-	-	-	-	-	-
	Total Number of Workers	1 - 49	667	246	4	-	-	-	-	-	-	-	-	-	-	-
50 - 299		278	106	1	-	-	-	-	-	-	-	-	-	-	-	-
300 - 999		73	29	2	-	-	-	-	-	-	-	-	-	-	-	-
1,000 or more		33	18	1	-	-	-	-	-	-	-	-	-	-	-	-
Unknown		4	1	-	-	-	-	-	-	-	-	-	-	-	-	-
By Area	Seoul	249	94	2	-	-	-	-	-	-	-	-	-	-	-	-
	Busan	14	3	-	-	-	-	-	-	-	-	-	-	-	-	-
	Incheon	29	10	1	-	-	-	-	-	-	-	-	-	-	-	-
	Daegu	13	7	-	-	-	-	-	-	-	-	-	-	-	-	-
	Gwangju	6	3	-	-	-	-	-	-	-	-	-	-	-	-	-
	Daejeon	84	37	2	-	-	-	-	-	-	-	-	-	-	-	-
	Ulsan	9	4	-	-	-	-	-	-	-	-	-	-	-	-	-
	Sejong	4	1	-	-	-	-	-	-	-	-	-	-	-	-	-
	Gyeonggi	350	139	2	-	-	-	-	-	-	-	-	-	-	-	-
	Gangwon	44	21	-	-	-	-	-	-	-	-	-	-	-	-	-
	Chungbuk	84	32	1	-	-	-	-	-	-	-	-	-	-	-	-
	Chungnam	41	12	-	-	-	-	-	-	-	-	-	-	-	-	-
	Jeonbuk	31	8	-	-	-	-	-	-	-	-	-	-	-	-	-
	Jeonnam	37	10	-	-	-	-	-	-	-	-	-	-	-	-	-
	Gyeongbuk	25	4	-	-	-	-	-	-	-	-	-	-	-	-	-
	Gyeongnam	27	10	-	-	-	-	-	-	-	-	-	-	-	-	-
	Jeju	8	5	-	-	-	-	-	-	-	-	-	-	-	-	-

Classification	No. of Companies	With Cooperative Relationship	No. of Respondents (Technical Manpower Exchange)	Domestic (Government-funded)						Overseas (Government-funded)						
				Total	Basic Research	Experimental	Prototype	Product Development	Commercialization	Total	Basic Research	Experimental	Prototype	Product Development	Commercialization	
Total	1,055	400	8	11	2	4	2	2	1	-	-	-	-	-	-	-
Core Industries	Biopharmaceutical	333	145	3	-	-	-	-	-	-	-	-	-	-	-	-
	Biochemical and Bioenergy	201	57	2	8	-	4	2	2	-	-	-	-	-	-	-
	Biofood	175	57	-	-	-	-	-	-	-	-	-	-	-	-	-
	Bioenvironmental	62	19	-	-	-	-	-	-	-	-	-	-	-	-	-
	Biomedical Equipment	109	45	2	1	-	-	-	-	1	-	-	-	-	-	-
	Bioinstrument and Bioequipment	55	16	-	-	-	-	-	-	-	-	-	-	-	-	-
	Bioresource	15	6	-	-	-	-	-	-	-	-	-	-	-	-	-
	Bioservice	105	55	1	2	2	-	-	-	-	-	-	-	-	-	-
	Total Number of Workers	1 - 49	667	246	4	4	2	2	-	-	-	-	-	-	-	-
50 - 299		278	106	1	-	-	-	-	-	-	-	-	-	-	-	-
300 - 999		73	29	2	1	-	-	-	-	1	-	-	-	-	-	-
1,000 or more		33	18	1	6	-	2	2	2	-	-	-	-	-	-	-
Unknown		4	1	-	-	-	-	-	-	-	-	-	-	-	-	-
By Area	Seoul	249	94	2	2	2	-	-	-	-	-	-	-	-	-	-
	Busan	14	3	-	-	-	-	-	-	-	-	-	-	-	-	-
	Incheon	29	10	1	-	-	-	-	-	-	-	-	-	-	-	-
	Daegu	13	7	-	-	-	-	-	-	-	-	-	-	-	-	-
	Gwangju	6	3	-	-	-	-	-	-	-	-	-	-	-	-	-
	Daejeon	84	37	2	8	-	4	2	2	-	-	-	-	-	-	-
	Ulsan	9	4	-	-	-	-	-	-	-	-	-	-	-	-	-
	Sejong	4	1	-	-	-	-	-	-	-	-	-	-	-	-	-
	Gyeonggi	350	139	2	-	-	-	-	-	-	-	-	-	-	-	-
	Gangwon	44	21	-	-	-	-	-	-	-	-	-	-	-	-	-
	Chungbuk	84	32	1	1	-	-	-	-	1	-	-	-	-	-	-
	Chungnam	41	12	-	-	-	-	-	-	-	-	-	-	-	-	-
	Jeonbuk	31	8	-	-	-	-	-	-	-	-	-	-	-	-	-
	Jeonnam	37	10	-	-	-	-	-	-	-	-	-	-	-	-	-
	Gyeongbuk	25	4	-	-	-	-	-	-	-	-	-	-	-	-	-
	Gyeongnam	27	10	-	-	-	-	-	-	-	-	-	-	-	-	-
	Jeju	8	5	-	-	-	-	-	-	-	-	-	-	-	-	-

Classification	No. of Companies	With Cooperative Relationship	No. of Respondents (Technical Manpower Exchange)	Domestic (Private Research)						Overseas (Private Research)					
				Total	Basic Research	Experimental	Prototype	Product Development	Commercialization	Total	Basic Research	Experimental	Prototype	Product Development	Commercialization
Total	1,055	400	8	6	-	2	2	2	-	-	-	-	-	-	-
Core Industries	Biopharmaceutical	333	145	3	-	-	-	-	-	-	-	-	-	-	-
	Biochemical and Bioenergy	201	57	2	6	-	2	2	2	-	-	-	-	-	-
	Biofood	175	57	-	-	-	-	-	-	-	-	-	-	-	-
	Bioenvironmental	62	19	-	-	-	-	-	-	-	-	-	-	-	-
	Biomedical Equipment	109	45	2	-	-	-	-	-	-	-	-	-	-	-
	Bioinstrument and Bioequipment	55	16	-	-	-	-	-	-	-	-	-	-	-	-
	Bioresource	15	6	-	-	-	-	-	-	-	-	-	-	-	-
	Bioservice	105	55	1	-	-	-	-	-	-	-	-	-	-	-
	Total Number of Workers	1 - 49	667	246	4	-	-	-	-	-	-	-	-	-	-
50 - 299		278	106	1	-	-	-	-	-	-	-	-	-	-	-
300 - 999		73	29	2	-	-	-	-	-	-	-	-	-	-	-
1,000 or more		33	18	1	6	-	2	2	2	-	-	-	-	-	-
Unknown		4	1	-	-	-	-	-	-	-	-	-	-	-	-
By Area	Seoul	249	94	2	-	-	-	-	-	-	-	-	-	-	-
	Busan	14	3	-	-	-	-	-	-	-	-	-	-	-	-
	Incheon	29	10	1	-	-	-	-	-	-	-	-	-	-	-
	Daegu	13	7	-	-	-	-	-	-	-	-	-	-	-	-
	Gwangju	6	3	-	-	-	-	-	-	-	-	-	-	-	-
	Daejeon	84	37	2	6	-	2	2	2	-	-	-	-	-	-
	Ulsan	9	4	-	-	-	-	-	-	-	-	-	-	-	-
	Sejong	4	1	-	-	-	-	-	-	-	-	-	-	-	-
	Gyeonggi	350	139	2	-	-	-	-	-	-	-	-	-	-	-
	Gangwon	44	21	-	-	-	-	-	-	-	-	-	-	-	-
	Chungbuk	84	32	1	-	-	-	-	-	-	-	-	-	-	-
	Chungnam	41	12	-	-	-	-	-	-	-	-	-	-	-	-
	Jeonbuk	31	8	-	-	-	-	-	-	-	-	-	-	-	-
	Jeonnam	37	10	-	-	-	-	-	-	-	-	-	-	-	-
	Gyeongbuk	25	4	-	-	-	-	-	-	-	-	-	-	-	-
	Gyeongnam	27	10	-	-	-	-	-	-	-	-	-	-	-	-
Jeju	8	5	-	-	-	-	-	-	-	-	-	-	-	-	

Classification	No. of Companies	With Cooperative Relationship	No. of Respondents (Technical Manpower Exchange)	Domestic (Universities)						Overseas (Universities)					
				Total	Basic Research	Experimental	Prototype	Product Development	Commercialization	Total	Basic Research	Experimental	Prototype	Product Development	Commercialization
Total	1,055	400	8	3	-	1	1	-	1	1	-	1	-	-	-
Core Industries	Biopharmaceutical	333	145	3	2	-	1	1	-	-	1	-	1	-	-
	Biochemical and Bioenergy	201	57	2	-	-	-	-	-	-	-	-	-	-	-
	Biofood	175	57	-	-	-	-	-	-	-	-	-	-	-	-
	Bioenvironmental	62	19	-	-	-	-	-	-	-	-	-	-	-	-
	Biomedical Equipment	109	45	2	1	-	-	-	-	1	-	-	-	-	-
	Bioinstrument and Bioequipment	55	16	-	-	-	-	-	-	-	-	-	-	-	-
	Bioresource	15	6	-	-	-	-	-	-	-	-	-	-	-	-
	Bioservice	105	55	1	-	-	-	-	-	-	-	-	-	-	-
	Total Number of Workers	1 - 49	667	246	4	1	-	-	-	1	-	-	-	-	-
50 - 299		278	106	1	1	-	1	-	-	-	-	-	-	-	-
300 - 999		73	29	2	1	-	1	-	-	1	-	1	-	-	-
1,000 or more		33	18	1	-	-	-	-	-	-	-	-	-	-	-
Unknown		4	1	-	-	-	-	-	-	-	-	-	-	-	-
By Area	Seoul	249	94	2	-	-	-	-	-	-	-	-	-	-	-
	Busan	14	3	-	-	-	-	-	-	-	-	-	-	-	-
	Incheon	29	10	1	1	-	-	-	-	1	-	-	-	-	-
	Daegu	13	7	-	-	-	-	-	-	-	-	-	-	-	-
	Gwangju	6	3	-	-	-	-	-	-	-	-	-	-	-	-
	Daejeon	84	37	2	-	-	-	-	-	-	-	-	-	-	-
	Ulsan	9	4	-	-	-	-	-	-	-	-	-	-	-	-
	Sejong	4	1	-	-	-	-	-	-	-	-	-	-	-	-
	Gyeonggi	350	139	2	2	-	1	1	-	1	-	1	-	-	-
	Gangwon	44	21	-	-	-	-	-	-	-	-	-	-	-	-
	Chungbuk	84	32	1	-	-	-	-	-	-	-	-	-	-	-
	Chungnam	41	12	-	-	-	-	-	-	-	-	-	-	-	-
	Jeonbuk	31	8	-	-	-	-	-	-	-	-	-	-	-	-
	Jeonnam	37	10	-	-	-	-	-	-	-	-	-	-	-	-
	Gyeongbuk	25	4	-	-	-	-	-	-	-	-	-	-	-	-
	Gyeongnam	27	10	-	-	-	-	-	-	-	-	-	-	-	-
Jeju	8	5	-	-	-	-	-	-	-	-	-	-	-	-	

Classification		No. of Companies	With Cooperative Relationship	No. of Respondents (Technical Manpower Exchange)	Domestic (Medical Institutions)					Overseas (Medical Institutions)					
					Total	Basic Research	Experimental	Prototype	Product Development	Commercialization	Total	Basic Research	Experimental	Prototype	Product Development
Total		1,055	400	8	2	2	-	-	-	-	-	-	-	-	-
Core Industries	Biopharmaceutical	333	145	3	2	2	-	-	-	-	-	-	-	-	-
	Biochemical and Bioenergy	201	57	2	-	-	-	-	-	-	-	-	-	-	-
	Biofood	175	57	-	-	-	-	-	-	-	-	-	-	-	-
	Bioenvironmental	62	19	-	-	-	-	-	-	-	-	-	-	-	-
	Biomedical Equipment	109	45	2	-	-	-	-	-	-	-	-	-	-	-
	Bioinstrument and Bioequipment	55	16	-	-	-	-	-	-	-	-	-	-	-	-
	Bioresource	15	6	-	-	-	-	-	-	-	-	-	-	-	-
	Bioservice	105	55	1	-	-	-	-	-	-	-	-	-	-	-
Total Number of Workers	1 - 49	667	246	4	2	2	-	-	-	-	-	-	-	-	-
	50 - 299	278	106	1	-	-	-	-	-	-	-	-	-	-	-
	300 - 999	73	29	2	-	-	-	-	-	-	-	-	-	-	-
	1,000 or more	33	18	1	-	-	-	-	-	-	-	-	-	-	-
	Unknown	4	1	-	-	-	-	-	-	-	-	-	-	-	-
By Area	Seoul	249	94	2	2	2	-	-	-	-	-	-	-	-	-
	Busan	14	3	-	-	-	-	-	-	-	-	-	-	-	-
	Incheon	29	10	1	-	-	-	-	-	-	-	-	-	-	-
	Daegu	13	7	-	-	-	-	-	-	-	-	-	-	-	-
	Gwangju	6	3	-	-	-	-	-	-	-	-	-	-	-	-
	Daejeon	84	37	2	-	-	-	-	-	-	-	-	-	-	-
	Ulsan	9	4	-	-	-	-	-	-	-	-	-	-	-	-
	Sejong	4	1	-	-	-	-	-	-	-	-	-	-	-	-
	Gyeonggi	350	139	2	-	-	-	-	-	-	-	-	-	-	-
	Gangwon	44	21	-	-	-	-	-	-	-	-	-	-	-	-
	Chungbuk	84	32	1	-	-	-	-	-	-	-	-	-	-	-
	Chungnam	41	12	-	-	-	-	-	-	-	-	-	-	-	-
	Jeonbuk	31	8	-	-	-	-	-	-	-	-	-	-	-	-
	Jeonnam	37	10	-	-	-	-	-	-	-	-	-	-	-	-
	Gyeongbuk	25	4	-	-	-	-	-	-	-	-	-	-	-	-
Gyeongnam	27	10	-	-	-	-	-	-	-	-	-	-	-	-	
Jeju	8	5	-	-	-	-	-	-	-	-	-	-	-	-	

<Table 5> Size of Sales and Import in Bioindustry

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

Industry / Category		No. of Respondents (Multiple Responses)	Domestic Sales	Export Amount	Total
			Total	Total	Total
Total		1,233	9,138,461	11,859,846	20,998,307
Industry with Sales Generated	Bio pharmaceutical	186	2,331,985	3,506,493	5,838,478
	Biochemical and Bioenergy	276	2,390,566	360,302	2,750,868
	Biofood	278	1,840,776	2,352,874	4,193,650
	Bioenvironmental	60	69,026	66	69,092
	Biomedical Equipment	163	1,058,324	4,220,932	5,279,256
	Bioinstrument and Bioequipment	75	140,327	50,631	190,958
	Bioresource	18	80,913	11,324	92,237
	Bioservice	177	1,226,544	1,357,224	2,583,768
Biopharmaceutical	1010) Bio-antibiotics	9	30,192	84,352	114,544
	1020) Biologically manufactured low-molecular medicines	1	24,511	14,549	39,060
	1030) Vaccines	23	710,210	451,601	1,161,811
	1040) Hormones	15	145,746	87,628	233,374
	1050) Therapeutic antibodies and cytokines	32	80,100	2,386,092	2,466,192
	1060) Hemotherapeutics	4	402,088	144,393	546,481
	1070) Cell-based therapeutics	17	41,706	298	42,004
	1080) Gene therapeutics	5	350,992	0	350,992
	1090) Biological diagnostic products	1	1,242	2,835	4,077
	1100) Enzymes and live bacteria medicines	3	14,090	70	14,160
	1110) Biomaterial-based medicines	9	35,585	14,810	50,395
	1120) Veterinary biopharmaceuticals	30	85,708	22,730	108,438
	1000) Other biopharmaceuticals	37	409,815	297,136	706,951
	Total	186	2,331,985	3,506,493	5,838,478
Biochemical and Bioenergy	2010) Biopolymers	14	31,432	38,463	69,895
	2020) Industrial enzymes and reagents	6	32,033	309	32,342
	2030) Enzymes and reagents for research	36	112,477	20,514	132,991
	2040) Biocosmetics and home & personal care chemicals	86	429,766	103,008	532,774
	2050) Biological agrochemicals and fertilizers	109	113,739	5,324	119,063
	2060) Biofuels	15	1,661,059	192,204	1,853,263
	2000) Other biochemical and bioenergy products	10	10,060	481	10,541
	Total	276	2,390,566	360,302	2,750,868
Biofood	3010) Functional health foods	132	564,455	55,100	619,555
	3020) Food-grade microorganisms & enzymes	3	1,127	11	1,138
	3030) Food additives	27	182,802	515,312	698,114
	3040) Fermented foods	7	76,622	0	76,622
	3050) Feed additives	89	999,585	1,780,588	2,780,173
	3000) Other biofoods	20	16,185	1,862	18,047
	Total	278	1,840,776	2,352,874	4,193,650
Bioenvironmental	4010) Biological treatment agents and systems	29	19,480	29	19,509
	4020) Materials and equipments for bio-immobilization	13	26,454	0	26,454
	4030) Bioenvironmental agents and systems for treatment and recycling	10	16,467	38	16,505
	4040) Measuring apparatus and service for environmental pollution and assessment	1	1,160	0	1,160
	4000) Other bioenvironmental products and services	7	5,465	0	5,465
	Total	60	69,026	66	69,092

Industry / Category		No. of Respondents (Multiple Responses)	Domestic Sales	Export Amount	Total
			Total	Total	Total
Total		1,233	9,138,461	11,859,846	20,998,307
Biomedical Equipment	5010) Biosensors	4	196	0	196
	5020) In-vitro diagnostics	105	894,431	3,994,246	4,888,677
	5030) Medical devices using biosensors and/or biomarkers	1	314	15,038	15,352
	5000) Other biomedical equipments	53	163,383	211,649	375,032
	Total	163	1,058,324	4,220,932	5,279,256
Bioinstrument and Bioequipment	6010) Gene/protein/peptide analysis, synthesis, and manufacturing instruments	9	11,717	4,520	16,237
	6020) Cell analysis and cultivation equipments	24	32,111	29,638	61,749
	6030) Multi-functional and other bioanalysis instruments	14	15,411	1,839	17,250
	6040) R&D and manufacturing equipments	6	22,199	5,254	27,453
	6050) Bioprocess equipment parts	2	215	0	215
	6000) Other bioinstruments and bioequipments	20	58,674	9,380	68,054
	Total	75	140,327	50,631	190,958
Bioresource	7010) Seeds and seedlings	4	54,688	8,961	63,649
	7020) Genetically Modified Organisms for use as food, feed or processing	2	3,945	10	3,955
	7030) Experimental animals	5	21,485	2,289	23,774
	7000) Other bioresources	7	795	64	859
	Total	18	80,913	11,324	92,237
Bioservice	8010) Bio-consignment production and procurement services	17	663,142	1,251,025	1,914,167
	8020) Bio-diagnostic and analytical services	58	142,321	65,610	207,931
	8030) Clinical/non-clinical R&D services	37	219,444	16,488	235,932
	8040) Other R&D services	50	95,910	24,076	119,986
	8050) Processing, treatment, and warehousing services	12	52,247	25	52,272
	8000) Other bioservices	3	53,480	0	53,480
	Total	177	1,226,544	1,357,224	2,583,768

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

Industry / Category		No. of Respondents (Multiple Responses)	Import Amount
			Total
Total		333	4,769,249
Industry Performing Imports	Biopharmaceutical	200	4,065,908
	Biochemical and Bioenergy	44	289,582
	Biofood	35	105,495
	Bioenvironmental	3	149
	Biomedical Equipment	23	58,034
	Bioinstrument and Bioequipment	21	228,178
	Bioresource	4	19,306
	Bioservice	3	2,598
Biopharmaceutical	1010) Bio-antibiotics	4	2,312
	1030) Vaccines	32	325,570
	1040) Hormones	40	320,819
	1050) Therapeutic antibodies and cytokines	66	927,436
	1060) Hemotherapeutics	19	175,339
	1070) Cell-based therapeutics	1	3,761
	1080) Gene therapeutics	3	2,158,959
	1090) Biological diagnostic products	1	4,486
	1100) Enzymes and live bacteria medicines	1	9,384
	1110) Biomaterial-based medicines	1	9,155
	1120) Veterinary biopharmaceuticals	4	1,702
	1000) Other biopharmaceuticals	28	126,986
	Total	200	4,065,908
Biochemical and Bioenergy	2010) Biopolymers	2	300
	2020) Industrial enzymes and reagents	6	1,427
	2030) Enzymes and reagents for research	11	49,918
	2040) Biocosmetics and home & personal care chemicals	1	401
	2050) Biological agrochemicals and fertilizers	11	15,272
	2060) Biofuels	6	196,823
	2000) Other biochemical and bioenergy products	7	25,440
	Total	44	289,582
Biofood	3010) Functional health foods	16	86,960
	3020) Food-grade microorganisms & enzymes	3	3,264
	3030) Food additives	6	6,439
	3050) Feed additives	5	4,952
	3000) Other biofoods	5	3,881
	Total	35	105,495
Bioenvironmental	4010) Biological treatment agents and systems	1	11
	4000) Other bioenvironmental products and services	2	137
	Total	3	149
Biomedical Equipment	5010) Biosensors	1	34
	5020) In-vitro diagnostics	16	33,329
	5000) Other biomedical equipments	6	24,670
	Total	23	58,034
Bioinstrument and Bioequipment	6010) Gene/protein/peptide analysis, synthesis, and manufacturing instruments	3	30,904
	6020) Cell analysis and cultivation equipments	2	1,110
	6030) Multi-functional and other bioanalysis instruments	4	51,975
	6050) Bioprocess equipment parts	1	223
	6000) Other bioinstruments and bioequipments	11	143,966
	Total	21	228,178
Bioresource	7010) Seeds and seedlings	2	18,723
	7030) Experimental animals	1	458
	7000) Other bioresources	1	126
	Total	4	19,306
Bioservice	8010) Bio-consignment production and procurement services	1	2,461
	8020) Bio-diagnostic and analytical services	1	6
	8030) Clinical/non-clinical R&D services	1	132
	Total	3	2,598

<Table 6> Status of Bioindustry by Area

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

Classification		No. of Companies	No. of Respondents	Bioindustry Workers									
				Doctor's		Master's		Bachelor's		Others		Total	
				Total	Average	Total	Average	Total	Average	Total	Average	Total	Average
Total		1,055	1,037	3,234	3	10,339	10	27,030	26	15,015	14	55,618	54
Core Industries	Biopharmaceutical	333	315	1,585	5	4,955	16	10,751	34	4,553	14	21,844	69
	Biochemical and Bioenergy	201	201	378	2	1,259	6	3,236	16	2,083	10	6,956	35
	Biofood	175	175	322	2	1,006	6	3,330	19	2,627	15	7,285	42
	Bioenvironmental	62	62	33	1	127	2	594	10	175	3	929	15
	Biomedical Equipment	109	109	380	3	1,188	11	3,573	33	3,205	29	8,346	77
	Bioinstrument and Bioequipment	55	55	56	1	181	3	1,058	19	581	11	1,876	34
	Bioresource	15	15	48	3	156	10	493	33	353	24	1,050	70
	Bioservice	105	105	432	4	1,467	14	3,995	38	1,438	14	7,332	70
	Total Number of Workers	1 - 49	667	667	862	1	1,936	3	5,352	8	1,524	2	9,674
50 - 299		278	271	972	4	3,309	12	11,243	41	5,490	20	21,014	78
300 - 999		73	65	713	11	2,109	32	4,350	67	3,404	52	10,576	163
1,000 or more		33	33	683	21	2,974	90	6,069	184	4,596	139	14,322	434
Unknown		4	1	4	4	11	11	16	16	1	1	32	32
By Area	Seoul	249	233	663	3	1,995	9	5,027	22	1,167	5	8,852	38
	Busan	14	14	15	1	32	2	156	11	41	3	244	17
	Incheon	29	29	331	11	1,168	40	3,002	104	1,430	49	5,931	205
	Daegu	13	13	16	1	48	4	711	55	641	49	1,416	109
	Gwangju	6	6	7	1	20	3	37	6	4	1	68	11
	Daejeon	84	84	248	3	611	7	1,397	17	384	5	2,640	31
	Ulsan	9	9	48	5	195	22	711	79	340	38	1,294	144
	Sejong	4	4	8	2	73	18	160	40	87	22	328	82
	Gyeonggi	350	350	1,145	3	3,613	10	7,981	23	5,257	15	17,996	51
	Gangwon	44	44	164	4	481	11	1,290	29	1,151	26	3,086	70
	Chungbuk	84	84	389	5	1,438	17	4,111	49	2,665	32	8,603	102
	Chungnam	41	41	87	2	300	7	797	19	785	19	1,969	48
	Jeonbuk	31	31	34	1	115	4	501	16	459	15	1,109	36
	Jeonnam	37	37	25	1	91	2	477	13	191	5	784	21
	Gyeongbuk	25	23	18	1	37	2	229	10	179	8	463	20
	Gyeongnam	27	27	27	1	100	4	338	13	148	5	613	23
Jeju	8	8	9	1	22	3	105	13	86	11	222	28	

Classification		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		1,055	1,037	2,854	3	7,793	8	6,886	7	375	-	17,908	17
Core Industries	Biopharmaceutical	333	315	1,398	4	3,813	12	2,522	8	146	-	7,879	25
	Biochemical and Bioenergy	201	201	350	2	1,086	5	793	4	60	-	2,289	11
	Biofood	175	175	297	2	791	5	629	4	31	-	1,748	10
	Bioenvironmental	62	62	32	1	105	2	218	4	1	-	356	6
	Biomedical Equipment	109	109	307	3	786	7	777	7	28	-	1,898	17
	Bioinstrument and Bioequipment	55	55	51	1	137	2	241	4	14	-	443	8
	Bioresource	15	15	43	3	102	7	120	8	0	0	265	18
	Bioservice	105	105	376	4	973	9	1,586	15	95	1	3,030	29
Total Number of Workers	1 - 49	667	667	814	1	1,709	3	1,792	3	15	-	4,330	6
	50 - 299	278	271	892	3	2,509	9	2,874	11	69	-	6,344	23
	300 - 999	73	65	568	9	1,378	21	1,217	19	105	2	3,268	50
	1,000 or more	33	33	577	17	2,189	66	1,003	30	186	6	3,955	120
	Unknown	4	1	3	3	8	8	0	0	0	0	11	11
By Area	Seoul	249	233	584	3	1,512	6	1,670	7	56	-	3,822	16
	Busan	14	14	14	1	24	2	25	2	2	-	65	5
	Incheon	29	29	257	9	730	25	491	17	50	2	1,528	53
	Daegu	13	13	13	1	29	2	143	11	30	2	215	17
	Gwangju	6	6	7	1	20	3	17	3	0	0	44	7
	Daejeon	84	84	225	3	519	6	501	6	16	-	1,261	15
	Ulsan	9	9	44	5	142	16	77	9	20	2	283	31
	Sejong	4	4	8	2	73	18	36	9	10	3	127	32
	Gyeonggi	350	350	1,078	3	2,941	8	2,517	7	101	-	6,637	19
	Gangwon	44	44	125	3	323	7	248	6	0	0	696	16
	Chungbuk	84	84	329	4	977	12	650	8	62	1	2,018	24
	Chungnam	41	41	70	2	224	5	125	3	1	-	420	10
	Jeonbuk	31	31	30	1	86	3	100	3	21	1	237	8
	Jeonnam	37	37	18	-	69	2	148	4	3	-	238	6
	Gyeongbuk	25	23	18	1	33	1	55	2	3	-	109	5
	Gyeongnam	27	27	26	1	74	3	59	2	0	0	159	6
Jeju	8	8	8	1	17	2	24	3	0	0	49	6	

Classification		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		1,055	1,037	46	-	793	1	6,190	6	10,838	10	17,867	17
Core Industries	Biopharmaceutical	333	315	22	-	382	1	2,677	8	3,314	11	6,395	20
	Biochemical and Bioenergy	201	201	5	-	44	-	647	3	1,727	9	2,423	12
	Biofood	175	175	3	-	40	-	1,012	6	2,177	12	3,232	18
	Bioenvironmental	62	62	0	0	5	-	173	3	151	2	329	5
	Biomedical Equipment	109	109	2	-	73	1	683	6	1,715	16	2,473	23
	Bioinstrument and Bioequipment	55	55	1	-	17	-	137	2	412	7	567	10
	Bioresource	15	15	3	-	20	1	65	4	204	14	292	19
	Bioservice	105	105	10	-	212	2	796	8	1,138	11	2,156	21
Total Number of Workers	1 - 49	667	667	4	-	28	-	646	1	1,209	2	1,887	3
	50 - 299	278	271	6	-	166	1	1,947	7	4,146	15	6,265	23
	300 - 999	73	65	13	-	221	3	1,122	17	2,823	43	4,179	64
	1,000 or more	33	33	23	1	376	11	2,464	75	2,660	81	5,523	167
	Unknown	4	1	0	0	2	2	11	11	0	0	13	13
By Area	Seoul	249	233	1	-	48	-	309	1	633	3	991	4
	Busan	14	14	0	0	0	0	18	1	20	1	38	3
	Incheon	29	29	9	-	216	7	1,587	55	1,276	44	3,088	106
	Daegu	13	13	0	0	3	-	165	13	326	25	494	38
	Gwangju	6	6	0	0	0	0	0	0	2	-	2	-
	Daejeon	84	84	3	-	35	-	246	3	312	4	596	7
	Ulsan	9	9	2	-	19	2	166	18	264	29	451	50
	Sejong	4	4	0	0	0	0	89	22	75	19	164	41
	Gyeonggi	350	350	11	-	207	1	1,417	4	3,207	9	4,842	14
	Gangwon	44	44	0	0	35	1	368	8	1,041	24	1,444	33
	Chungbuk	84	84	17	-	213	3	1,160	14	2,075	25	3,465	41
	Chungnam	41	41	0	0	4	-	164	4	704	17	872	21
	Jeonbuk	31	31	2	-	5	-	177	6	382	12	566	18
	Jeonnam	37	37	1	-	0	0	108	3	155	4	264	7
	Gyeongbuk	25	23	0	0	0	0	63	3	158	7	221	10
	Gyeongnam	27	27	0	0	7	-	136	5	136	5	279	10
Jeju	8	8	0	0	1	-	17	2	72	9	90	11	

Classification		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		1,055	1,037	334	-	1,753	2	13,954	13	3,802	4	19,843	19
Core Industries	Biopharmaceutical	333	315	165	1	760	2	5,552	18	1,093	3	7,570	24
	Biochemical and Bioenergy	201	201	23	-	129	1	1,796	9	296	1	2,244	11
	Biofood	175	175	22	-	175	1	1,689	10	419	2	2,305	13
	Bioenvironmental	62	62	1	-	17	-	203	3	23	-	244	4
	Biomedical Equipment	109	109	71	1	329	3	2,113	19	1,462	13	3,975	36
	Bioinstrument and Bioequipment	55	55	4	-	27	-	680	12	155	3	866	16
	Bioresource	15	15	2	-	34	2	308	21	149	10	493	33
	Bioservice	105	105	46	-	282	3	1,613	15	205	2	2,146	20
	Total Number of Workers	1 - 49	667	667	44	-	199	-	2,914	4	300		3,457
50 - 299		278	271	74	-	634	2	6,422	24	1,275	5	8,405	31
300 - 999		73	65	132	2	510	8	2,011	31	476	7	3,129	48
1,000 or more		33	33	83	3	409	12	2,602	79	1,750	53	4,844	147
Unknown		4	1	1	1	1	1	5	5	1	1	8	8
By Area	Seoul	249	233	78	-	435	2	3,048	13	478	2	4,039	17
	Busan	14	14	1	-	8	1	113	8	19	1	141	10
	Incheon	29	29	65	2	222	8	924	32	104	4	1,315	45
	Daegu	13	13	3	-	16	1	403	31	285	22	707	54
	Gwangju	6	6	0	0	0	0	20	3	2	-	22	4
	Daejeon	84	84	20	-	57	1	650	8	56	1	783	9
	Ulsan	9	9	2	-	34	4	468	52	56	6	560	62
	Sejong	4	4	0	0	0	0	35	9	2	1	37	9
	Gyeonggi	350	350	56	-	465	1	4,047	12	1,949	6	6,517	19
	Gangwon	44	44	39	1	123	3	674	15	110	3	946	22
	Chungbuk	84	84	43	1	248	3	2,301	27	528	6	3,120	37
	Chungnam	41	41	17	-	72	2	508	12	80	2	677	17
	Jeonbuk	31	31	2	-	24	1	224	7	56	2	306	10
	Jeonnam	37	37	6	-	22	1	221	6	33	1	282	8
	Gyeongbuk	25	23	0	0	4	-	111	5	18	1	133	6
Gyeongnam	27	27	1	-	19	1	143	5	12	-	175	6	
Jeju	8	8	1	-	4	1	64	8	14	2	83	10	

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

		No. of Companies	No. of Respondents	2020											
				R&D Investment		Facility Investment		Total Investment		Bio R&D Investment		Bio Facility Investment		Bio Total Investment	
				Total	Average	Total	Average	Total	Average	Total	Average	Total	Average	Total	Average
Total		1,055	1,023	5,835	5,653	1,177	1,151	6,961	6,805	2,270	2,219	797	779	3,067	2,999
Core Industries	Biopharmaceutical	333	310	2,233	9,109	393,525	1,269	321,728	10,378	1,533,702	4,947	288,901	932	1,822,603	5,879
	Biochemical and Bioenergy	201	200	213,264	10,656	136,314	682	226,758	11,338	171,532	858	42,725	214	214,257	1,071
	Biofood	175	173	193,172	1,117	59,012	341	252,184	1,458	121,053	700	31,315	181	152,368	881
	Bioenvironmental	62	60	25,505	425	7,657	128	33,162	553	14,103	235	5,637	94	19,740	329
	Biomedical Equipment	109	106	288,690	2,723	268,007	2,528	556,697	5,252	187,851	1,772	116,216	1,096	304,067	2,869
	Bioinstrument and Bioequipment	55	54	29,507	546	9,160	170	38,667	716	22,672	420	9,160	170	31,832	589
	Bioresource	15	15	40,132	2,675	1,348	90	41,480	2,765	12,509	834	1,348	90	13,857	924
	Bioservice	105	105	251,472	2,395	302,600	2,882	554,072	5,277	207,044	1,972	302,100	2,877	509,144	4,849
	Total Number of Workers	1 - 49	667	657	52,873	842	43,264	66	596,137	907	467,295	711	40,558	62	507,853
50 - 299		278	268	108,182	3,847	193,062	720	1,223,924	4,567	683,114	2,549	157,693	588	840,807	3,137
300 - 999		73	66	74,778	11,345	132,508	2,008	881,286	13,353	377,261	5,716	119,482	1,810	496,743	7,526
1,000 or more		33	31	340,180	110,982	808,489	26,080	4,248,939	137,063	732,324	23,623	479,369	15,464	1,211,693	39,087
Unknown		4	1	10,472	10,472	300	300	10,772	10,772	10,472	10,472	300	300	10,772	10,772
By Area	Seoul	249	229	674,672	2,946	36,257	158	710,929	3,104	349,958	1,528	30,831	135	380,789	1,663
	Busan	14	12	3,038	253	420	35	3,458	288	3,038	253	270	23	3,308	276
	Incheon	29	29	270,462	9,326	342,199	11,800	612,661	21,126	266,488	9,189	342,149	11,798	608,637	20,987
	Daegu	13	12	88,315	7,360	5,320	443	93,635	7,803	7,208	601	4,320	360	11,528	961
	Gwangju	6	6	3,747	625	745	124	4,492	749	1,117	186	725	121	1,842	307
	Daejeon	84	84	515,909	6,142	133,149	1,585	649,058	7,727	164,780	1,962	44,175	526	208,955	2,488
	Ulsan	9	9	48,763	5,418	800	89	49,563	5,507	26,862	2,985	720	80	27,582	3,065
	Sejong	4	3	9,627	3,209	8,000	2,667	17,627	5,876	4,310	1,437	3,000	1,000	7,310	2,437
	Gyeonggi	350	346	339,048	9,622	496,113	1,434	3,825,161	11,055	876,356	2,533	243,619	704	1,119,975	3,237
	Gangwon	44	43	115,416	2,684	14,039	326	129,455	3,011	100,522	2,338	14,039	326	114,561	2,664
	Chungbuk	84	82	46,293	5,723	69,140	843	538,433	6,566	317,991	3,878	66,587	812	384,578	4,690
	Chungnam	41	41	111,609	2,722	8,320	203	119,929	2,925	40,410	986	5,720	140	46,130	1,125
	Jeonbuk	31	31	50,257	1,621	11,218	362	61,475	1,983	29,205	942	8,800	284	38,005	1,226
	Jeonnam	37	37	11,535	312	10,320	279	21,855	591	9,103	246	9,320	252	18,423	498
	Gyeongbuk	25	24	56,213	2,342	11,613	484	67,826	2,826	56,050	2,335	10,962	457	67,012	2,792
	Gyeongnam	27	27	18,647	691	24,720	916	43,367	1,606	13,784	511	6,915	256	20,699	767
	Jeju	8	8	6,884	861	5,250	656	12,134	1,517	3,284	411	5,250	656	8,534	1,067

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

		No. of Respondents (Multiple Responses)	Domestic Sales	Export Amount	Total
			Total	Total	Total
Total		1,233	9,138,461	11,859,846	20,998,307
By Area	Seoul	197	1,301,243	676,733	1,977,976
	Busan	15	5,979	1,889	7,868
	Incheon	24	409,933	3,562,488	3,972,421
	Daegu	18	48,288	41,447	89,735
	Gwangju	5	1,859	0	1,859
	Daejeon	97	443,708	88,941	532,649
	Ulsan	9	1,076,005	6,522	1,082,527
	Sejong	2	1,822	0	1,822
	Gyeonggi	419	2,620,312	6,034,092	8,654,404
	Gangwon	72	220,726	356,251	576,977
	Chungbuk	132	1,382,728	680,121	2,062,849
	Chungnam	62	158,954	61,065	220,019
	Jeonbuk	46	289,350	58,096	347,446
	Jeonnam	48	292,503	22,314	314,817
	Gyeongbuk	31	845,389	241,333	1,086,722
	Gyeongnam	43	30,537	24,026	54,563
	Jeju	13	9,125	4,527	13,652
Industry with Sales Generated	Biopharmaceutical	186	2,331,985	3,506,493	5,838,478
	Biochemical and Bioenergy	276	2,390,566	360,302	2,750,868
	Biofood	278	1,840,776	2,352,874	4,193,650
	Bioenvironmental	60	69,026	66	69,092
	Biomedical Equipment	163	1,058,324	4,220,932	5,279,256
	Bioinstrument and Bioequipment	75	140,327	50,631	190,958
	Bioresource	18	80,913	11,324	92,237
	Bioservice	177	1,226,544	1,357,224	2,583,768
Seoul	Biopharmaceutical	24	385,453	29,908	415,361
	Biochemical and Bioenergy	32	51,723	1,469	53,192
	Biofood	19	51,060	2,630	53,690
	Bioenvironmental	4	8,560	0	8,560
	Biomedical Equipment	29	482,997	541,544	1,024,541
	Bioinstrument and Bioequipment	7	25,029	1,086	26,115
	Bioresource	7	4,415	74	4,489
	Bioservice	75	292,006	100,021	392,027
Busan	Biopharmaceutical	2	350	13	363
	Biochemical and Bioenergy	2	3,018	0	3,018
	Biofood	3	1,350	0	1,350
	Bioenvironmental	3	185	0	185
	Biomedical Equipment	1	20	17	37
	Bioinstrument and Bioequipment	2	475	1,860	2,335
	Bioservice	2	581	0	581
Incheon	Biopharmaceutical	9	1,414	2,338,350	2,339,764
	Biochemical and Bioenergy	7	14,575	492	15,067
	Biomedical Equipment	2	69	0	69
	Bioinstrument and Bioequipment	1	200	0	200
	Bioservice	5	393,675	1,223,646	1,617,321
Daegu	Biopharmaceutical	5	31,313	34,341	65,654
	Biochemical and Bioenergy	2	766	0	766
	Biofood	1	1,090	355	1,445
	Bioenvironmental	3	4,680	0	4,680
	Biomedical Equipment	3	10,100	6,752	16,852
	Bioinstrument and Bioequipment	1	150	0	150
	Bioservice	3	189	0	189
Gwangju	Biochemical and Bioenergy	1	150	0	150
	Biofood	1	739	0	739
	Bioenvironmental	1	180	0	180
	Bioservice	2	790	0	790
Daejeon	Biopharmaceutical	10	28,358	35,202	63,560
	Biochemical and Bioenergy	35	137,390	21,694	159,084
	Biofood	14	211,734	467	212,201
	Bioenvironmental	2	4,987	0	4,987
	Biomedical Equipment	12	33,949	25,930	59,879
	Bioinstrument and Bioequipment	12	20,827	5,648	26,475
	Bioresource	2	1,210	0	1,210
	Bioservice	10	5,253	0	5,253
Ulsan	Biochemical and Bioenergy	6	1,066,933	6,522	1,073,455
	Bioenvironmental	3	9,072	0	9,072

		No. of Respondents (Multiple Responses)	Domestic Sales	Export Amount	Total
			Total	Total	Total
Total		1,233	9,138,461	11,859,846	20,998,307
Sejong	Biofood	1	1,608	0	1,608
	Bioinstrument and Bioequipment	1	214	0	214
Gyeonggi	Biopharmaceutical	69	255,086	270,957	526,043
	Biochemical and Bioenergy	72	631,586	263,083	894,669
	Biofood	77	1,017,940	2,283,189	3,301,129
	Bioenvironmental	21	28,060	0	28,060
	Biomedical Equipment	70	317,015	3,159,023	3,476,038
	Bioinstrument and Bioequipment	44	82,922	41,421	124,343
	Bioresource	5	63,675	6,729	70,404
Gangwon	Bioservice	61	224,028	9,690	233,718
	Biopharmaceutical	15	75,751	92,783	168,534
	Biochemical and Bioenergy	12	13,650	2,802	16,452
	Biofood	20	37,560	7,745	45,305
	Bioenvironmental	5	2,161	0	2,161
	Biomedical Equipment	15	86,777	230,939	317,716
	Bioinstrument and Bioequipment	2	278	216	494
Chungbuk	Bioservice	3	4,549	21,766	26,315
	Biopharmaceutical	34	1,008,802	467,912	1,476,714
	Biochemical and Bioenergy	20	55,534	19,488	75,022
	Biofood	49	220,581	7,826	228,407
	Bioenvironmental	1	460	0	460
	Biomedical Equipment	17	48,521	183,137	231,658
	Bioinstrument and Bioequipment	1	7,470	309	7,779
Chungnam	Bioresource	1	3,675	0	3,675
	Bioservice	9	37,685	1,449	39,134
	Biopharmaceutical	11	34,856	1,013	35,869
	Biochemical and Bioenergy	12	25,646	492	26,138
	Biofood	28	56,776	3,129	59,905
	Bioenvironmental	3	3,328	0	3,328
	Biomedical Equipment	6	36,020	56,431	92,451
Jeonbuk	Bioinstrument and Bioequipment	2	2,328	0	2,328
	Biopharmaceutical	1	17	0	17
	Biochemical and Bioenergy	14	96,943	31,037	127,980
	Biofood	21	153,378	17,655	171,033
	Bioenvironmental	2	323	0	323
	Biomedical Equipment	3	37,188	8,032	45,220
	Bioresource	1	0	1,373	1,373
Jeonnam	Bioservice	4	1,501	0	1,501
	Biopharmaceutical	1	771	367	1,138
	Biochemical and Bioenergy	23	264,699	7,344	272,043
	Biofood	11	8,849	10,775	19,624
	Bioenvironmental	8	6,430	29	6,459
	Biomedical Equipment	1	1,550	0	1,550
	Bioresource	2	7,938	3,147	11,085
Gyeongbuk	Bioservice	2	2,266	652	2,918
	Biopharmaceutical	3	508,358	233,566	741,924
	Biochemical and Bioenergy	15	17,151	2,016	19,167
	Biofood	9	52,957	5,722	58,679
	Bioenvironmental	1	100	0	100
	Biomedical Equipment	2	2,802	29	2,831
	Bioservice	1	264,021	0	264,021
Gyeongnam	Biopharmaceutical	2	1,456	2,081	3,537
	Biochemical and Bioenergy	20	5,897	179	6,076
	Biofood	16	21,368	12,631	33,999
	Bioenvironmental	3	500	38	538
	Biomedical Equipment	2	1,316	9,098	10,414
Jeju	Biochemical and Bioenergy	3	4,905	3,685	8,590
	Biofood	8	3,786	751	4,537
	Bioinstrument and Bioequipment	2	434	92	526

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

		No. of Respondents (Multiple Responses)	Import Amount
			Total
Total		333	4,769,249
By Area	Seoul	180	4,049,817
	Busan	1	2,432
	Incheon	4	12,131
	Daegu	1	6
	Gwangju	1	132
	Daejeon	20	26,354
	Ulsan	3	184,574
	Sejong	0	
	Gyeonggi	65	321,988
	Gangwon	9	33,612
	Chungbuk	25	70,196
	Chungnam	7	16,022
	Jeonbuk	5	2,287
	Jeonnam	3	11,707
	Gyeongbuk	4	19,879
	Gyeongnam	4	17,998
Jeju	1	114	
Industry Performing Imports	Biopharmaceutical	200	4,065,908
	Biochemical and Bioenergy	44	289,582
	Biofood	35	105,495
	Bioenvironmental	3	149
	Biomedical Equipment	23	58,034
	Bioinstrument and Bioequipment	21	228,178
	Bioresource	4	19,306
	Bioservice	3	2,598
Seoul	Biopharmaceutical	162	3,894,216
	Biochemical and Bioenergy	4	48,916
	Biofood	3	16,969
	Biomedical Equipment	6	4,400
	Bioinstrument and Bioequipment	5	85,315
Busan	Biochemical and Bioenergy	1	2,432
Incheon	Biopharmaceutical	1	9,155
	Biochemical and Bioenergy	1	286
	Bioinstrument and Bioequipment	1	229
	Bioservice	1	2,461
Daegu	Biopharmaceutical	1	6
Gwangju	Bioservice	1	132
Daejeon	Biopharmaceutical	3	610
	Biochemical and Bioenergy	8	5,055
	Biofood	2	288
	Biomedical Equipment	1	18,997
	Bioinstrument and Bioequipment	6	1,403
Ulsan	Biochemical and Bioenergy	2	184,563
	Bioenvironmental	1	11
Gyeonggi	Biopharmaceutical	13	78,433
	Biochemical and Bioenergy	13	30,332
	Biofood	13	58,289
	Bioenvironmental	2	137
	Biomedical Equipment	13	13,104
	Bioinstrument and Bioequipment	9	141,231
	Bioresource	1	458
	Bioservice	1	6
Gangwon	Biopharmaceutical	2	2,632
	Biochemical and Bioenergy	2	1,053
	Biofood	3	8,755
	Biomedical Equipment	2	21,172
Chungbuk	Biopharmaceutical	10	37,981
	Biochemical and Bioenergy	4	4,086
	Biofood	9	20,491
	Biomedical Equipment	1	360
	Bioresource	1	7,279
Chungnam	Biopharmaceutical	3	10,053
	Biochemical and Bioenergy	1	5,436
	Biofood	3	533

		No. of Respondents (Multiple Responses)	Import Amount
			Total
Total		333	4,769,249
Jeonbuk	Biochemical and Bioenergy	3	2,106
	Biofood	1	55
	Bioresource	1	126
Jeonnam	Biochemical and Bioenergy	2	263
	Bioresource	1	11,444
Gyeongbuk	Biopharmaceutical	3	18,849
	Biochemical and Bioenergy	1	1,030
Gyeongnam	Biopharmaceutical	2	13,973
	Biochemical and Bioenergy	2	4,025
Jeju	Biofood	1	114

Appendix 1. Explanation on Classification Scheme



[KS J 1009] Bioindustry Classification Code

1. Biopharmaceutical Industry

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

1010 Bio-antibiotics

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

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

1020 Biologically manufactured low-molecular medicines

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

1030 Vaccines

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

Exception DNA vaccines and veterinary vaccines

1040 Hormones

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

Includes Growth factors

1050 Therapeutic antibodies and cytokines

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

1060 Hemotherapeutics

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

1070 Cell-based therapeutics

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

Includes Cell therapeutic products and artificial organs

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

1080 Gene therapeutics

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

Includes DNA vaccines

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

1090 Biological diagnostic products

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

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

1100 Enzymes and live bacteria medicines

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

1110 Biomaterial-based medicines

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

Includes Placenta medicines and hyaluronic acid products

1120 Veterinary biopharmaceuticals

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

Includes Veterinary vaccines and veterinary live bacteria medicines

Exception Feed additives

1000 Other biopharmaceuticals

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

2. Biochemical and Bioenergy Industry

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

2010 Biopolymers

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

Exception Cell therapeutic products and gene therapeutics

2020 Industrial enzymes and reagents

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

2030 Enzymes and reagents for research

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

2040 Biocosmetics and home & personal care chemicals

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

2050 Biological agrochemicals and fertilizers

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

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

2060 Biofuels

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

2000 Other biochemical and bioenergy products

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

Note Development services are classified under the bioservice industry.

3. Biofood Industry

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

3010 Functional health foods

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

3020 Food-grade microorganisms & enzymes

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

Exception Functional health foods

3030 Food additives

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

Exception Functional health foods

3040 Fermented foods

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

Exception Functional health foods

3050 Feed additives

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

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

3000 Other biofoods

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

4. Bioenvironmental Industry

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

4010 Biological treatment agents and systems

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

4020 Materials and equipments for bio-immobilization

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

4030 Bioenvironmental agents and systems for treatments and recycle

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. Bioinstrument and Bioequipment Industry

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

5010 Biosensors

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

5020 In-vitro diagnostics

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

5030 Medical devices using biosensors and/or biomarkers

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

Includes Medical instruments that utilize biomarkers and biosensors.

5000 Other biomedical equipment

Other biomedical components and materials that are not classified above.

6. Bioprocess and Equipment 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, and 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 freezing dryer

6050 Bioprocess equipment parts

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

Includes Disposable bioreactor bag and mixing bag

6000 Other bioinstruments and bioequipments

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

7. Bioresource Industry

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

7010 Seeds and seedlings

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

Includes Genetically modified seeds and seedlings

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

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

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

7030 Experimental animals

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

7000 Other bioresources

Other bioresources that are not classified above.

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

8. Bioservice Industry

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

8010 Bio-consignment production and procurement 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 procurement services (drug discovery, mechanism R&D, safety and efficacy evaluation, approval/certification services, etc.)

8040 Other R&D services

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

8050 Processing, treatment, and warehousing services

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

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

8000 Other bioservices

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

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

[Appendix] Biotechnology Classification Code

A. Genetic Engineering

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

A1. Gene manipulation

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

Corresponding List

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

A2. Gene expression and regulation

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

Corresponding List

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

A209. RNA interference

A3. Gene application

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

Corresponding List

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

A4. Gene therapy

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

Corresponding List

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

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

B. Protein Engineering

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

B1. Protein structure analysis

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

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

B2. Protein function analysis

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

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

B3. Complex protein engineering

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

- Corresponding List**
- B301. Antibody engineering
 - B302. Protein modification
 - B303. Receptor engineering
 - B304. Protein design
 - B305. Complex protein formation

B4. Peptide engineering

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

**Corresponding
List**

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

B5. Protein application

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

**Corresponding
List**

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

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

C. Other Macromolecule Engineering

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

C1. Lipid engineering

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

**Corresponding
List**

- C101. Functional lipid development

C2. Carbohydrate engineering

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

Corresponding List	C201. Polysaccharide chemistry C202. Neoglycan technology C203. Functional carbohydrate development
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C0. Other macromolecule engineering, N.E.S.

D. Therapeutic Cell and Tissue Engineering

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

D1. Therapeutic cell utilization

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

Corresponding List	D101. Pluripotent stem cell utilization D102. Multipotent stem cell utilization D103. Progenitor cell utilization D104. Therapeutic cell differentiation induction D105. Cell/Immune cell based implants utilization D106. Extracellular vesicle utilization
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D2. Bioenvironment regulation

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

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

D3. Functional biomaterial development

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

- Corresponding List**
- D301. New biomaterial development
 - D302. Biocompatibility enhancing technology
 - D303. Functional supporter development
 - D304. Biocompatibility materials development

D4. Cell engineering

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

- Corresponding List**
- D401. Cell assays
 - D402. Cell manipulation
 - D403. Cell carrier

D5. Tissue engineering

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

- Corresponding List**
- D501. Tissue assays

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

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

E. Systems Biology and Bioinformatics

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

E1. Gene sequence analysis

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

Corresponding List

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

E2. Functional genomics

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

Corresponding List

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

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

E3. Proteomics

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

Corresponding List

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

E4. Bioinformatics

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

Corresponding List

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

- E0. Other systems biology and bioinformatics, N.E.S.
System biology and bioinformatics, n.e.s.

F. Metabolic Engineering

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

F1. Metabolite production

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

Corresponding List

- F101. Primary metabolite production (amino acid, organic acid, alcohol, etc.)
- F102. Secondary metabolite production (antibiotics, etc.)
- F103. Production of other bioproducts (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 economics analysis G508. Process analysis technology
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G0. Other bioprocesses, N.E.S.

Corresponding List	G001. Bioleaching G002. Cyopreservation
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H. Bioresource Production and Utilization

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

H1. Plant resource utilization technology

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

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

H2. Animal resource utilization technology

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

Corresponding List

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

H3. Microbial resource utilization technology

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

Corresponding List

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

H4. Insect resource utilization technology

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

Corresponding List

- H401. Functional insect and its material utilization
- H402. Utilization of insect organ and insect cell line

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

H5. Marine/freshwater organism technology

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

- Corresponding List**
- H501. Aquatic animal breeding and development
 - H502. Aquatic farming
 - H503. Excellent individual preservation
 - H504. Aquatic microorganism utilization
 - H505. Aquatic plant breeding and utilization
 - H506. Aquatic organism resources screening
 - H507. Aquatic environment preservation

H6. Food engineering

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

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

H7. Biomaterializing technology

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

- Corresponding List**
- H701. Metabolism-enhancing biomaterial screening

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

H8. Biodiversity conservation

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

Corresponding List

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

H0. 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.

II. Clean technology

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

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

I2. Environmental pollution control and management technology

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

- Corresponding List**
- I201. Air pollution control and treatment
 - I202. Water pollution control and treatment
 - I203. Soil pollution control and treatment
 - I204. Waste treatment
 - I205. Environmental pollutants measurement and analysis
 - I206. Environmental assessment and control
 - I207. Ecosystem restoration

I3. Bioenergy technology

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

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

I0. 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 chip production and application
- J104. Nano-bioelectronic device fabrication
- J105. Nano-biosensor system
- J106. Nano-bioactuator fabrication
- J107. Nano-biosignal analysis

J2. Nano-biomaterial technology

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

Corresponding List

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

J3. Nano drug delivery system

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

**Corresponding
List**

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

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

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

**Corresponding
List**

- J401. Nano-fluidic
- J402. Nano-processing
- J403. Nano-lithography
- J404. Surface and interface control
- J405. Nanoscale particle manipulation
- J406. Nanoflow visualization & diagnosis

J0. Other nanobiotechnology, N.E.S.**K. Bioelectronics Engineering**

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

K1. Biosensor fabrication

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

**Corresponding
List**

- K101. Biomaterial immobilization
- K102. Sensor array fabrication

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

K2. Bioelectronic device fabrication

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

Corresponding List

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

K3. Biochip fabrication

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

Corresponding List

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

K4. Microfluidics

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

Corresponding List

- K401. Plastic microfabrication
- K402. Microfluidic transport

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

K0. Other bioelectronics, N.E.S.

L. Biosafety and Efficacy Evaluation

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

L1. Safety evaluation

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

Corresponding List

- L101. Medicine and cosmetics safety evaluation
- L102. Food and food additives safety evaluation
- L103. Chemical material 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. Combinatorial biology

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

**Corresponding
List**

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

M2. Drug delivery

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

**Corresponding
List**

- M201. Controlled release formulation

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

M3. Immunotherapy

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

Corresponding List

- M301. Immunomodulator
- M302. Immunotherapeutics
- M303. Targeted immunotherapy

M0. Other biotechnology, N.E.S.

Appendix 2. Survey Questionnaire





Report on Survey on Domestic Bioindustry 2021

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, 2021 to December 31, 2021.

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.

Tel.: +82-2-3215-2380

Fax.: +82-2-3215-2565

E-mail: cha@kedkorea, ked2022@naver.com



I . General Information

1. Company Name		2. Name of Representative (CEO)		Sex	<input type="checkbox"/> ① Male <input type="checkbox"/> ② Female
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 2021?

(Unit: KRW)

* Capital paid by the incorporated company (headquarters) as of December 31, 2021.

Trillion	100 billion	10 billion	Billion	100 million	10 million	Million

KRW

10. How much is your total and equity capital as of the end of 2021? (Unit: KRW)

Total capital

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

KRW

Equity capital

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

KRW

* 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 2021?

Number of employees (Regular workers + non-regular workers)	Total: _____ (Male: _____ / Female: _____)	<input type="checkbox"/> ① 1 - 49 <input type="checkbox"/> ② 50 - 299 <input type="checkbox"/> ③ 300 - 999 <input type="checkbox"/> ④ 1,000 or more
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* Number of employees include regular and non-regular workers. Non-regular workers: industrial technical personnel, service workers, part-time workers, dispatched workers, substitute workers, contract workers, house/home workers, and day workers.

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

<p>12-1. Do you have any business units that belong to the headquarters?</p> <p><input type="checkbox"/> ① Single-unit enterprise (Businesses that do not own plants, R&D centers, or branches)</p> <p><input type="checkbox"/> ② Businesses that own plants, branches, R&D centers, sales offices, or branches</p>	<p>12-2. Certification (multiple responses allowed) * as of end of 2021</p> <p><input type="checkbox"/> ① Venture company</p> <p><input type="checkbox"/> ② INNO-BIZ</p> <p><input type="checkbox"/> ③ MAIN-BIZ</p> <p><input type="checkbox"/> ④ N/A</p> <hr/> <p>12-3. Listing * as of the end of 2021</p> <p><input type="checkbox"/> ① KONEX-listed company</p> <p><input type="checkbox"/> ② KOSDAQ-listed company</p> <p><input type="checkbox"/> ③ Listed company</p> <p><input type="checkbox"/> ④ N/A</p>																												
<p>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.</p> <table border="1" style="width: 100%; border-collapse: collapse;"> <thead> <tr> <th style="width: 10%;">Priority</th> <th style="width: 35%;">Classification</th> <th style="width: 25%;">Business Name</th> <th style="width: 30%;">Address</th> </tr> </thead> <tbody> <tr> <td style="text-align: center;">1</td> <td><input type="checkbox"/> ① Plant <input type="checkbox"/> ② R&D Center</td> <td></td> <td></td> </tr> <tr> <td style="text-align: center;">2</td> <td><input type="checkbox"/> ① Plant <input type="checkbox"/> ② R&D Center</td> <td></td> <td></td> </tr> <tr> <td style="text-align: center;">3</td> <td><input type="checkbox"/> ① Plant <input type="checkbox"/> ② R&D Center</td> <td></td> <td></td> </tr> <tr> <td style="text-align: center;">4</td> <td><input type="checkbox"/> ① Plant <input type="checkbox"/> ② R&D Center</td> <td></td> <td></td> </tr> <tr> <td style="text-align: center;">5</td> <td><input type="checkbox"/> ① Plant <input type="checkbox"/> ② R&D Center</td> <td></td> <td></td> </tr> <tr> <td style="text-align: center;">6</td> <td><input type="checkbox"/> ① Plant <input type="checkbox"/> ② R&D Center</td> <td></td> <td></td> </tr> </tbody> </table>		Priority	Classification	Business Name	Address	1	<input type="checkbox"/> ① Plant <input type="checkbox"/> ② R&D Center			2	<input type="checkbox"/> ① Plant <input type="checkbox"/> ② R&D Center			3	<input type="checkbox"/> ① Plant <input type="checkbox"/> ② R&D Center			4	<input type="checkbox"/> ① Plant <input type="checkbox"/> ② R&D Center			5	<input type="checkbox"/> ① Plant <input type="checkbox"/> ② R&D Center			6	<input type="checkbox"/> ① Plant <input type="checkbox"/> ② R&D Center		
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1	<input type="checkbox"/> ① Plant <input type="checkbox"/> ② R&D Center																												
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4	<input type="checkbox"/> ① Plant <input type="checkbox"/> ② R&D Center																												
5	<input type="checkbox"/> ① Plant <input type="checkbox"/> ② R&D Center																												
6	<input type="checkbox"/> ① Plant <input type="checkbox"/> ② R&D Center																												

13. How much is your company's net income or net loss as of year 2021 (Jan 1 - Dec 31, 2021)?

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.

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

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

15. Please indicate the manpower status of bioindustry as of the end of 2021 in your company. Please make sure to include regular and non-regular workers. (Unit: persons)

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

* Researchers: R&D personnel in the bioindustry.

* Production workers: include production workers and facility/quality management workers working in the bioindustry other than R&D centers

* Other positions including sales/administrative: All manpower in the bioindustry other than researchers and production workers.

* Non-regular workers refer to industrial technical personnel, service workers, part-time workers, dispatched workers, substitute workers, contract workers, telecommuters, day workers, etc.

16. Please fill in your company's R&D and facility investment costs for the entire period of 2021. (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 2021. 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 2021 (Jan. 1 - Dec. 31, 2021)	Total Investment (Bioindustry + other)	10 billion	Billion	100 million	10 million	Million	KRW	10 billion	Billion	100 million	10 million	Million	KRW
	Investment in the Bioindustry	10 billion	Billion	100 million	10 million	Million	KRW	10 billion	Billion	100 million	10 million	Million	KRW

* R&D investment: R&D cost within your company (labor cost, materials cost, and other expenses), consignment R&D cost, technology introduction cost, etc.

* Facility investment (acquisition cost of property, plant, and equipment): costs for acquiring mechanical equipment, land, or building.

* Total investment = investment in the bioindustry + investment in other industries

17. Have your company ever had a **cooperative relationship with other organizations (companies, research institutes, universities, or medical institutions)** in the bioindustry in between the year (Jan 1 – Dec 31, 2021)?

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

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

① Yes (go to No. 17-1)

② No (go to No. 18)

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

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

<input type="checkbox"/> 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)
<input type="checkbox"/> 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)
<input type="checkbox"/> 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)
<input type="checkbox"/> 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, ③ prototype, ④ product development, and ⑤ commercialization (refer to page 6 for more details for each cooperation stage.)

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

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

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

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

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

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

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

(3) Technical Tie-up (Licensing)							
Classification	Companies			Research Institutes		Universities	Medical Institutions
	SMEs and Venture Companies (1-299 workers)	Middle-standing Companies (300-999 workers)	Large Enterprises (1,000 workers or more)	Government-funded	Private		
Cooperative Relationship	<input type="checkbox"/> ①	<input type="checkbox"/> ②	<input type="checkbox"/> ③	<input type="checkbox"/> ④	<input type="checkbox"/> ⑤	<input type="checkbox"/> ⑥	<input type="checkbox"/> 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: _	① Basic research: _	① Basic research: _	① Basic research: _	① Basic research: _	① Basic research: _	① Basic research: _
	② Experimental: _	② Experimental: _	② Experimental: _	② Experimental: _	② Experimental: _	② Experimental: _	② Experimental: _
	③ Prototype: _	③ Prototype: _	③ Prototype: _	③ Prototype: _	③ Prototype: _	③ Prototype: _	③ Prototype: _
	④ Product development: _	④ Product development: _	④ Product development: _	④ Product development: _	④ Product development: _	④ Product development: _	④ Product development: _
	⑤ Commercialization: _	⑤ Commercialization: _	⑤ Commercialization: _	⑤ Commercialization: _	⑤ Commercialization: _	⑤ Commercialization: _	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: _	① Basic research: _	① Basic research: _	① Basic research: _	① Basic research: _	① Basic research: _	① Basic research: _
	② Experimental: _	② Experimental: _	② Experimental: _	② Experimental: _	② Experimental: _	② Experimental: _	② Experimental: _
	③ Prototype: _	③ Prototype: _	③ Prototype: _	③ Prototype: _	③ Prototype: _	③ Prototype: _	③ Prototype: _
	④ Product development: _	④ Product development: _	④ Product development: _	④ Product development: _	④ Product development: _	④ Product development: _	④ Product development: _
	⑤ Commercialization: _	⑤ Commercialization: _	⑤ Commercialization: _	⑤ Commercialization: _	⑤ Commercialization: _	⑤ Commercialization: _	⑤ Commercialization: _

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

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

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

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

(4) Domestic/International Technical Manpower Exchange							
Classification	Companies			Research Institutes		Universities	Medical Institutions
	SMEs and Venture Companies (1-299 workers)	Middle-standing Companies (300-999 workers)	Large Enterprises (1,000 workers or more)	Government-funded	Private		
Cooperative Relationship	<input type="checkbox"/> ①	<input type="checkbox"/> ②	<input type="checkbox"/> ③	<input type="checkbox"/> ④	<input type="checkbox"/> ⑤	<input type="checkbox"/> ⑥	<input type="checkbox"/> 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: _	① Basic research: _	① Basic research: _	① Basic research: _	① Basic research: _	① Basic research: _	① Basic research: _
	② Experimental: _	② Experimental: _	② Experimental: _	② Experimental: _	② Experimental: _	② Experimental: _	② Experimental: _
	③ Prototype: _	③ Prototype: _	③ Prototype: _	③ Prototype: _	③ Prototype: _	③ Prototype: _	③ Prototype: _
	④ Product development: _	④ Product development: _	④ Product development: _	④ Product development: _	④ Product development: _	④ Product development: _	④ Product development: _
	⑤ Commercialization: _	⑤ Commercialization: _	⑤ Commercialization: _	⑤ Commercialization: _	⑤ Commercialization: _	⑤ Commercialization: _	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: _	① Basic research: _	① Basic research: _	① Basic research: _	① Basic research: _	① Basic research: _	① Basic research: _
	② Experimental: _	② Experimental: _	② Experimental: _	② Experimental: _	② Experimental: _	② Experimental: _	② Experimental: _
	③ Prototype: _	③ Prototype: _	③ Prototype: _	③ Prototype: _	③ Prototype: _	③ Prototype: _	③ Prototype: _
	④ Product development: _	④ Product development: _	④ Product development: _	④ Product development: _	④ Product development: _	④ Product development: _	④ Product development: _
	⑤ Commercialization: _	⑤ Commercialization: _	⑤ Commercialization: _	⑤ Commercialization: _	⑤ Commercialization: _	⑤ Commercialization: _	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 2021 in the table below.

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

* Intermediate products among the corresponding items include raw materials, intermediates, bulk, etc.

* For classification codes, refer to <Example> Bioindustry Classification Code [KS J 1009] on page 12.

* Exports should be indicated in the corresponding currency and unit.

* For the name of the country exported to, if the number of exporting countries is fewer than 5, indicate all, and if there are more than 5 countries, indicate each of the top 1 to 4 countries with the highest proportion.

* The proportion (%) of exports by country refers to the proportion of the country out of the total exports.

20. Please fill in the table below for products, services, or trading technologies in the overseas **bioindustry** that were imported in 2021.

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

* Intermediate products among the corresponding items include raw materials, intermediates, bulk, etc.

* For classification codes, refer to <Example> Bioindustry Classification Code [KS J 1009] on page 12.

* Imports should be indicated in the corresponding currency and unit.

* For the name of the country imported from, if the number of importing countries is fewer than 5, indicate all, and if there are more than 5 countries, indicate each of the top 1 to 4 countries with the highest proportion.

* The proportion (%) of imports by country refers to the proportion of the country out of the total imports.

* If there are more than 10 items, please indicate them on a separate sheet.

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

<Example> Bioindustry Classification Code (KS J 1009)

Area	Code	Area	Code	Area	Code
Biopharmaceutical	1010) Bio-antibiotics 1020) Biologically manufactured low-molecular medicines 1030) Vaccines 1040) Hormones 1050) Therapeutic antibodies and cytokines 1060) Hemotherapeutics 1070) Cell-based therapeutics 1080) Gene therapeutics 1090) Biological diagnostic products 1100) Enzymes and live bacteria medicines 1110) Biomaterial-based medicines 1120) Veterinary biopharmaceuticals 1000) Other biopharmaceuticals	Biochemical and Bioenergy	2010) Biopolymers 2020) Industrial enzymes and reagents 2030) Enzymes and reagents for research 2040) Biocosmetics and home & personal care chemicals 2050) Biological agrochemicals and fertilizers 2060) Biofuels 2000) Other biochemical and bioenergy products	Biofood	3010) Functional health foods 3020) Food-grade microorganisms & enzymes 3030) Food additives 3040) Fermented foods 3050) Feed additives 3000) Other biofoods
Bioenvironmental	4010) Biological treatment agents and systems 4020) Materials and equipments for bio-immobilization 4030) Bioenvironmental agents and systems for treatment and recycling 4040) Measuring apparatus and service for environmental pollution and assessment 4000) Other bioenvironmental products and services	Biomedical Equipment	5010) Biosensors 5020) In-vitro diagnostics 5030) Medical devices using biosensors and/or biomarkers 5000) Other biomedical equipments	Bioinstrument and Bioequipment	6010) Gene/protein/peptide analysis, synthesis, and manufacturing instruments 6020) Cell analysis and cultivation equipments 6030) Multi-functional and other bioanalysis instruments 6040) R&D and manufacturing equipments 6050) Bioprocess equipment parts 6000) Other bioinstruments and bioequipments
Bioresource	7010) Seeds and seedlings 7020) Genetically Modified Organisms for use as food, feed or processing 7030) Experimental animals 7000) Other bioresources	Bioservice	8010) Bio-consignment production and procurement services 8020) Bio-diagnostic and analytical services 8030) Clinical/non-clinical R&D services 8040) Other R&D services ₂₎ 8050) Processing, treatment, and warehousing services 8000) Other bioservices		

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