

Mid and Long-Term Plans for Fostering Scientific Technologies Concerning Agricultural Food Products (Proposal) (Part 1)

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I BACKGROUND

□ The need for the “integration of scientific technologies and agriculture” was greatly increased in order to achieve the administrative philosophy of creative economy and increase the happiness of its citizens.

○ There is a need to create new strategies to strengthen the integration of administrative philosophy, the goals for agricultural policy and R&D policies.

□ Changes in Domestic and International Trade Environment and New Opportunities

○ A new engine for growth in agricultural area is required under the expansion of market opening by FTAs and slow growth of agricultural and forest product industry.

* Current situation of FTA (2013): In effect with 45 countries (8 FTA), negotiation on going with 25 countries (12 FTA), 5 FTAs under preparation

* The change in added value for agricultural and forest product industry: In 2007, Korean Won (“**KRW**”) 24.6조 → In 2009, KRW 27.0조 → In 2011, KRW 25.3 조 (2005 as the criteria year)

○ Cooperation with various sectors is needed in order to solve the agricultural problems.

- Improved problem solving skills by a collective response from various ministries upon agricultural problems such as climate change, environmental pollution, energy and food security.

○ There are new opportunities ahead in the agricultural area due to the development of ICT and BT.

- New uses for the technological developments such as automated cultivation system by using ICT and life science industry by using BT are arising.

⇒ Achieving Creative Agriculture by Strengthening R&D Competitiveness in Agricultural Food Products

II CURRENT SITUATION OF R&D ON AGRICULTURAL AND FORESTRY FOOD PRODUCTS

1. Trends of domestic and international R&D policy on agricultural and forestry products

□ (Domestic) A full-scale support on scientific technology promotion policy for improving competitiveness in agricultural areas in order to respond to the unlimited competition in the global market

○ Foundation works are being carried out such as enactment of statutes for comprehensive management of R&D and the establishment of institutions.

- Enactment of Act on the Promotion of Science and Technology for Food, Agriculture, Forestry and Fisheries, Establishment of the Committee on the Promotion of Science and Technology for Food, Agriculture, Forestry and Fisheries (2009)

○ Five-year comprehensive plans for the promotion of science and technology for food, agriculture, forestry and fisheries is established in order to prepare a blueprint for R&D on agriculture, forestry and fisheries products.

○ The boundaries of R&D on agriculture and forestry food products are to be expanded, among other ways, by expanding and rearranging the Agricultural and Forestry Technology Development Plan in 1994.

* Expansion of R&D areas: (Original) Agriculture and forestry technology development → (New) Golden seed project, Biogreen 21, Development on food industry technologies, high technology production development, export strategy development, development on the technology concerning livestock diseases

□ (International) Developed countries setting scientific technology innovation policy as the major administrative agenda and essential investment areas for R&D and rightsizing the promotion structure thereof

○ (The United States) A department of the vice-minister class called REEO was newly established (2008 farm bill) to manage and plan the policies and concentrated the investment on food safety, health and bio-energy.

- Vitalization of private R&D such as joint research by corporations and universities, supporting on innovation research by small and medium-sized enterprises

○ (The Netherlands) Five major areas for research is being selected. Basic research is funded by the government and applied research is funded by utilizing private resources such as corporations.

- Wageningen University (WUR) is established in 1998

○ (Japan) An institution called Committee for Agriculture, Forestry and Fishery Technologies (日本 農林水産技術會議) within Ministry of Agriculture, Forestry and Fisheries manages the related policies and reformed the national research institution to separate administrative legal entities (2009).

- Concentrated investment on sustainability, safe food and future technologies and revitalization of private R&D

2. Current situation on major R&D

□ (Corresponding FTA) Plans for improving the industrial competitiveness on items expected to be damaged due to the FTA with large economies (The United States, EU and others) and for expanding exports are promoted.

○ Nineteen items that urgently need to improve competitiveness are under ‘Corresponding FTA by improving competitiveness and technology development program’ since 2008.

* Food (bean, wheat), horticulture (vegetable seed, pepper, garlic, tomato, paprika, apple, pear, sweet persimmon, grapes, peach, citrus fruit, lily), special use (ginseng), livestock production (Korean cow, pig, chicken, dairy cattle)

* Investment status: KRW 18.3 billion (2011) → KRW 19 billion (2012)

□ (Conversion of agriculture) Through the conversion of agriculture and food industry, agriculture and ICT/BT, improvement on agricultural productivity and high added-value on related products will be achieved.

○ In order to globalize food industry, ‘High Added-value Technology Development Program’ is promoted.

* By 2017, 82% of the technology level will be achieved compared to the developed countries.

* Investment status: KRW 18.3 billion (2010) → KRW 24.8 billion (2011) → KRW 29.0 billion (2012)

○ Conversion of IT and robotics, construction of production system based on sensors and networks, development of agricultural technologies by using energy-saving and newly developed renewable energy techniques.

* Investment status: KRW 17.4 billion (2009) → KRW 18.7 billion (2010) → KRW 17.8 billion (2011) → KRW 31.9 billion (2012)

□ Agricultural and life science industries will be promoted as new engine for growth by establishing 「Life industry 2020+ Development Plan (2010)」.

○ Original technologies related to agricultural and life science industries will be secured and ‘Life Science Industry Technology Development/ New Generation Bio-Green 21 Project’ will be promoted in order to prepare a national strategy on corresponding development of technologies.

* Investment status: KRW 73.0 billion (2010) → KRW 83.2 billion (2011) → KRW 122.3 billion (2012)

○ Using natural resources from agriculture and forestry industry, eco-friendly bio-energy and development of technology related to agricultural and life science advanced materials for the promotion of nation’s health.

* Investment status: KRW 66.0 billion (2010) → KRW 82.2 billion (2011) → KRW 103.2 billion (2012)

□ (Stable Food Supply) Anticipatory response to future crisis on production and supply of agricultural products due to sharp rise on international cereal price, climate change and

mutated livestock diseases

○ In order to protect food sovereignty and to establish stable production basis, National Institute of Crop Science in Rural Development Administration (“RDA”) is promoting ‘Development of Species and Stable Production Technology’.

* Investment status: KRW 13.25 billion (2009) → KRW 17.22 billion (2010) → KRW 19.1 billion (2011) → KRW 15.09 billion (2012)

○ Preliminary feasibility plan for ‘Adaptation Structure Build Plan for Agricultural Forestry Fishery Food on Climate Change’ is being promoted in order to establish agricultural environment that adapts to climate change.

* Investment status: KRW 38.0 billion (2012) → KRW 42.1 billion (2013)

○ ‘Technology Development Plan for Responding to Livestock Diseases’ is promoted to effectively respond to national disasters such as Food-and-mouth disease, AI and others.

* Investment status: KRW 6 billion (2012) → KRW 6 billion (2013)

□ (Enhancing Citizen’s Happiness) In order to preserve traditions and culture in agricultural villages and to provide a comfortable environment, ‘Comprehensive Plan for Agricultural Fishery Village Life Style Improvement’ is being promoted.

○ Projects such as preserving the sceneries of agricultural villages, area plan, utilization of traditional knowledge in agriculture, improvement and diversification of agricultural village tour and development of technologies for returning farmers are promoted.

* Investment status: KRW 4.11 billion (2009) → KRW 5.28 billion (2010) → KRW 4.90 billion (2011) → KRW 4.18 billion (2012)

○ Enhancement of forest value to improve citizen’s health, commercialization of effective forestry service and development of high technology for forestry resource information utilization are promoted.

* Investment status: KRW 12.96 billion (2010) → KRW 20.11 billion (2011) → KRW 14.21 billion (2012)

3. Accomplishments and introspection

A. R&D Investment on Agricultural and Forestry Food Products

□ (Accomplishments) For the last five years (2008~2012), the entire budget for agricultural forestry food product (including RDA and Korea Forest Service, “KFS”) marked 3.4% annual increase, whereas R&D budget marked 8.7% annual increase.

○ Although the percentage of R&D budget compared to the total MAFRA budget has increased from 4.0% in 2008 to 4.9% in 2012, the rate of increase is lower than that of other departments.

* Percentage of R&D budget compare to the total budget (2012): MAFRA 4.9%, Ministry of Knowledge Economy¹ 29.7%, Ministry of Education 10.1%

¹ As of February 2015, Ministry of Trade, Industry and Energy.

Table 1. Percentage of R&D budget compare to the total budget (2012)

(Amount unit: 100 million KRW)

Division	2008	2009	2010	2011	2012	Annual Increase Rate
MAFRA, RDA, KFS R&D Budget (A) (including fishery area)	5,709 (6,554)	6,257 (7,192)	6,699 (7,752)	7,463 (8,625)	7,983 (9,089)	8.7 (8.5)
Government Research and Development Fund (B)	110,784	123,437	137,014	148,902	160,244	9.7
Total Expenditure in MAFRA, RDA, KFS (C) (including fishery area)	142,756 (158,247)	151,434 (167,898)	155,040 (172,074)	159,584 (176,303)	163,454 (180,758)	3.4 (3.4)
A/B (%) (including fishery area)	5.1 (5.9)	5.1 (5.8)	4.9 (5.7)	5.0 (5.8)	5.0 (5.7)	-
A/C (%) (including fishery area)	4.0 (4.1)	4.1 (4.3)	4.3 (4.5)	4.7 (4.9)	4.9 (5.0)	-

□ (Introspection) Despite the quantitative expansion of government investments, the direction of investment and private R&D investment are insufficient.

○ Investment according to seven major industries is being made without the establishment of connection between the essential research area and agricultural policy goals. Hence, there is a limit to achieve a successful research outcome based on selection and concentration.

- R&D business is being supported in a wide, non-specific style without any consideration on connecting to related technologies- resulting in a limit to synergy creation.

○ Private R&D Investment percentage among the nationwide R&D investment records 74%, whereas the percentage of private R&D investment in agricultural and food industry is stalled at 26%.

* Private R&D Investment in agricultural, fishery food industry: Food and beverage industry (2010: KRW 266.1 billion), agricultural, forestry and fishery industry (KRW 18.0 billion)

B. R&D system efficiency and improvement

□ (Accomplishments) A basis for R&D efficiency has been established by enhancing policy modification function in agricultural food product R&D constructing information system and others.

○ R&D policy modification between departments and agencies has been strengthened, along with the establishment of special institutions for research management and commercialization of product.

* Establishment of Agricultural, Forestry, Fishery Product Science and Technology Committee (April 2009), Korea Institute of Planning & Evaluation for Technology in Food, Agriculture, Forestry & Fisheries (October 2010), Foundation of Agricultural Technology Commercialization & Transfer (September 2010)

○ By forming and operating joint planning group between ministry and institutes, R&D efficiency was increased and various problems at the site of agriculture were being solved (2011).

○ A comprehensive agricultural, forestry, fishery product R&D information service called FRIS was established (2012). By the above service, R&D information on agricultural food product is comprehensively managed which will review overlapping or similar information.

* FRIS: Food, Agriculture, Forestry and Fisheries R&D Information Service

□ (Introspection) Despite efforts to converge R&D policies on agricultural, forestry food product, the convergence research between ministries and departments, ministries and institutions are yet unsatisfactory. Furthermore, the level of commercialization and industrialization of technology remains low.

○ The connection between 19 research development agenda set by RDA and 7 major investment area set by MAFRA is weak.

○ Convergence researches between departments for enhancing agricultural competitiveness by combining agriculture, ICT and BT are inadequate.

* The percentage of IBNT investment in agricultural food product R&D: 3.3%

○ Level of contribution on creating substantial added value is insufficient due to low level of commercialization and industrialization of agricultural and forestry product R&D development technology.

* Rate of commercialization: MAFRA 23.8%, RDA 20.0%, Small and Medium Business Administration 39.3%, Ministry of Knowledge Economy 30.7% (kistep, 2010).

C. The level of scientific technology related to agricultural and forestry food product and agricultural competitiveness

□ (Accomplishments) Through continuous R&D, the level of scientific technology related to agricultural has risen constantly.

○ In 2009, the rate of level of technology compared to that of the country with the best technology remained at 67.4%. In 2012, the above rate increased to 75.4%.

○ Industry sectors with high level of technology are: 'traditional food (88.1%)', 'animal products (81.4%)', 'seed industry(78.6%)', 'lumber industry(78.0%)'.

□ (Introspection) The level of advanced agricultural scientific technology is low and despite the enhancement of the level of technology, the competitiveness of Korean agriculture

declined.

○ Advanced production system, technologies related to biological and IBT convergence industry are below average. There is an urgent need to secure technology competitiveness in newly developed areas.

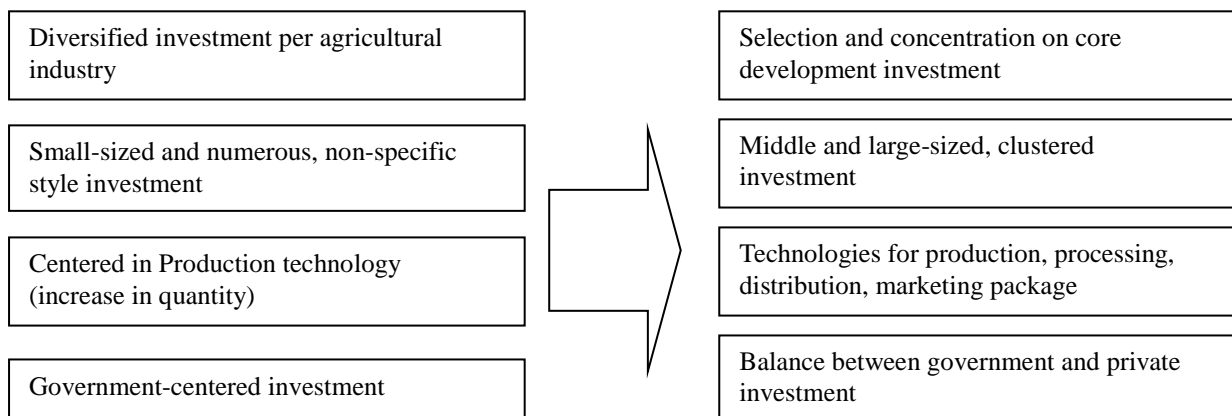
○ Despite the continuous improvement in the level of scientific technologies related to agricultural, forestry food products, the competitiveness of agricultural industry is declining. There is a need to expand the spread of developed technology at the fields.

* The rank of Korean agricultural competitiveness: 23 (2008) → 17 (2009) → 18 (2010) → 26 (2011).

4. Implications

□ There is a need to set up a strategic investment direction in order to improve R&D accomplishments in agricultural and forestry food products.

○ Considering agricultural policy goals and level of technology development, core investment areas and the size of investment should be determined. Further, private R&D should be expanded in order to strengthen the competence of private technology development.



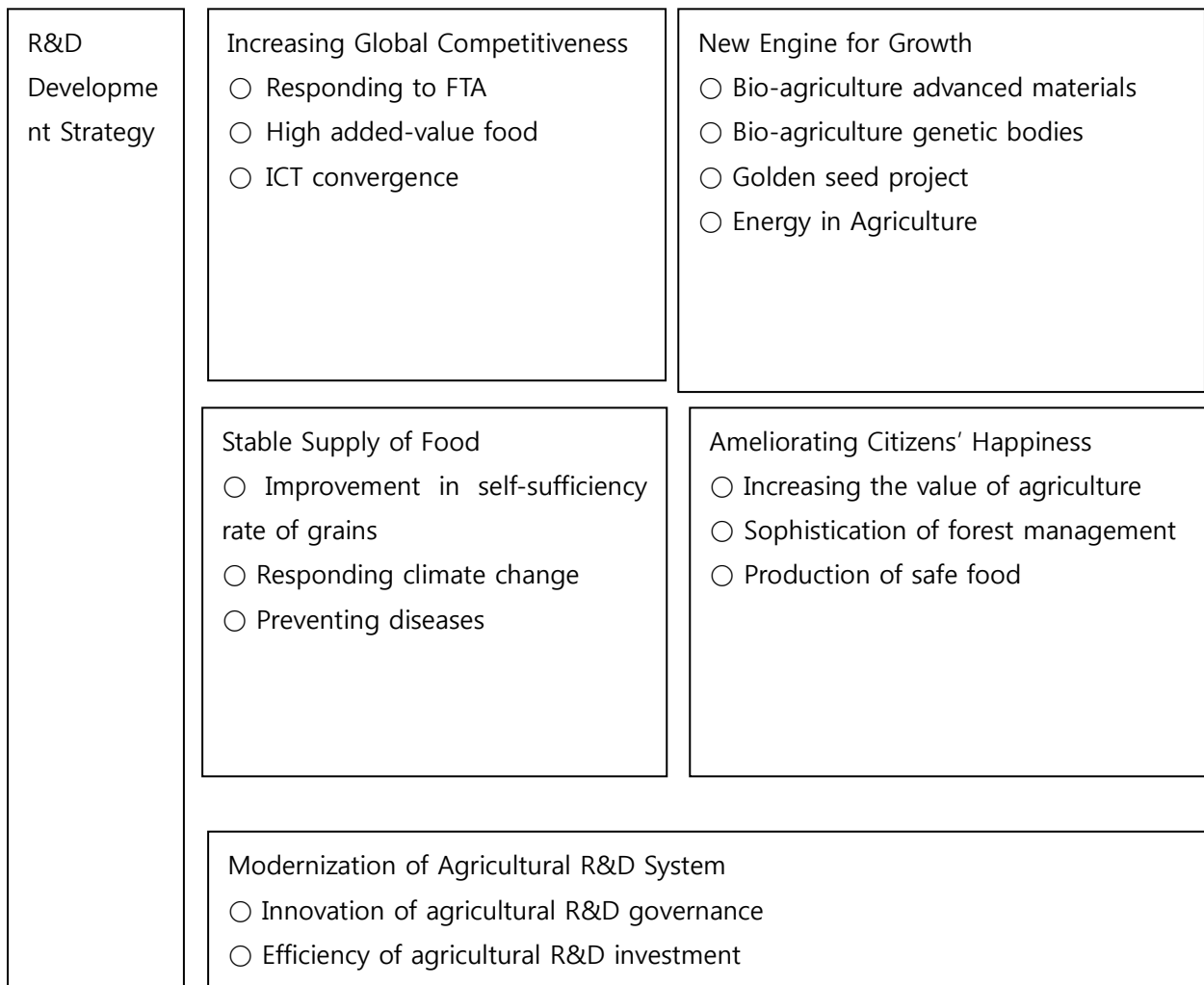
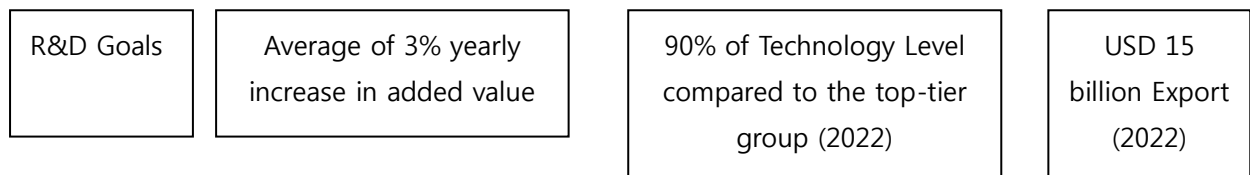
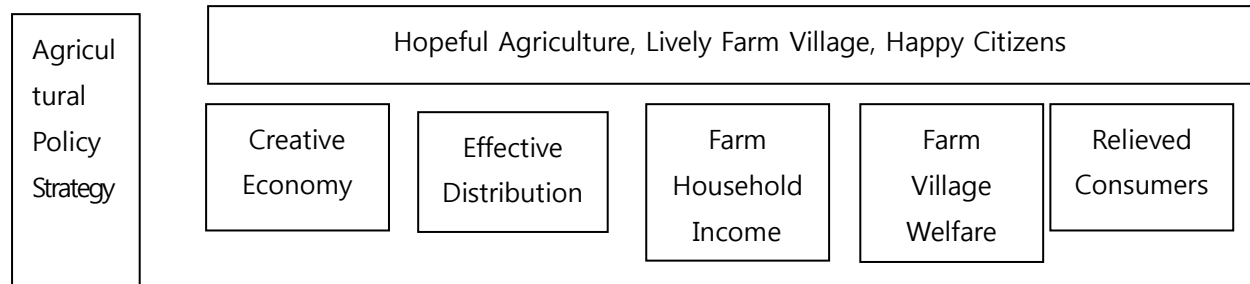
□ R&D System needs renovation in order to enhance investment effectiveness.

○ Open, convergence R&D system should be strengthened by collaborating with the Ministry of Science, ICT and Future Planning, Ministry of Trade, Industry and Energy and Ministry of Education in order to improve problem-solving abilities.

○ Collaboration system should be expanded between national research institutes, College of Agriculture, private research center.

III BASIC DIRECTIONS

1. Vision and policy directions



2. Accessible R&D system

◆ To create an optimal result, a systematic R&D structure should be formulated by connecting the government’s agricultural policy and R&D strategy

- Major R&D field should be selected by applying administrative and agricultural philosophy
 - Four major research areas should be selected by reflecting R&D environment such as global open market and climate change and administrative and agricultural philosophy such as creative economy and citizen happiness.
- A system that R&D substantially contributes to the achievement of policy goals should be established
 - Policy goals → R&D goals → Necessary technology should be connected and strategic decision-making structure should be firmly established such as reviewing validity of investment per research project and setting technology development goals.
- Technology road map (TRM)’s strategic decision-making system on order of priority should be established
 - Problem-solving R&D system should be established by choice and concentration through selecting 50 core technologies for industry development that can be felt by farmers and citizens.
 - Considering the period of investment, marketability and public character for 50 core technologies, the subject and method of promotion shall be decided.
 - 50 core technologies should be promoted by the method of mid and large-sized project (total project expenses up to KRW 10 billion).
 - Open-type research should be promoted by cooperation between departments and should be adjusted according to assessment on outcome and change in environment.

Table 2. Investment of core strategic technology

Category	Core Strategic Technology	Amount of investment for core strategic technology	Average project period	Other
1. Strengthening global competitiveness	15	21.6 billion Korean won	3~5 years (long term project 7~10 years)	Yearly average 17.3 billion Korean won
2. Creating a new engine for development	15	22.5 billion Korean won		
3. Stable Food Supply	10	13.7 billion Korean won		
4. Improving citizens’ happiness	10	12.9 billion Korean won		
Total	50	70.7 billion Korean won		

- Agricultural Food R&D Governance for Optimal Outcome
 - “Cooperation and Coexistence System” will be established by adjusting, integrating, making joint projects and distributing functions between central departments, central and

local R&D institutions.

- Creative Economy Environment with R&D's Substantial Contribution to Economic Development
- Private R&D's capacity will be improved in Government-driven R&D and support will be enhanced at technology transfer and commercialization for technology industrialization.

3. Investment Expansion and Portfolio Innovation

A. Investment Size on Agricultural R&D

Goals

- ◆ Realizing R&D Investment that Leads 3% Yearly Growth on Added-value of Agricultural Food Industry
- ◆ Improving Investment Effectiveness by Productive Government R&D and Expanding Private R&D

□ Realizing R&D Investment that Leads to 3% Yearly Growth on Added-value of Agricultural Food Industry

○ Problem-solving R&D investment should be expanded to respond to factors that hinder agricultural food industry such as decrease in farm household, climate change and livestock diseases.

* Added-value of agricultural food industry (based on prices in 2005): ('07) KRW 55.7 trillion → ('09) KRW 58.0 trillion → ('11) KRW 56.8 trillion

- For the last five years (2007 ~ 2011), added-value of agricultural food industry has increased by 0.5% every year.

□ Improving Investment Effectiveness in Agricultural Food Industry

○ By administering and adjusting function of Science and Technology Commission of Food, Agriculture and Forestry, system will be improved by eliminating redundant projects and expanding public projects for core research areas.

- Evaluation process such as determining redundant projects will be strengthened by establishing priorities for investment according to R&D policy.

- Quality of projects will be improved by utilizing private professionals through public project expansions.

* Percentage of private R&D investment: ('11) 26% → ('17) 33 → ('22) 40

* Percentage of industrialization of technology: ('11) 21% → ('17) 30 → ('22) 35

◆ Continuous Increase in Agricultural R&D Budget to Achieve 10% of the Total Budget of MAFTA Until 2022

B. Investment Portfolio for Four Core Research Areas

Goals

- ◆ Budget Increase in Four Core Research Areas, Budget Size Remained for Other Areas
- ◆ Select and Concentration of Investment for 50 Problem-Solving Core Technologies

□ Strategic R&D Investment Distribution System to Strengthen the Competitiveness of Agricultural Food Industry and to Prepare for the Future

○ Directional R&D will be sought by establishing ‘comprehensive portfolio’ for four core research areas.

- Investment percentage for four core research areas will be expanded from current 48.6% to 70% in 2022.

- Investment percentage for other areas is currently at 50.4 % and will be decreased to 30% in phases until 2022 in order to achieve effectiveness in investment.

○ A road map for technology development in four core research area will be established in order to utilize it for future technology development plans and investment guidelines.

- Investment for ‘global competitiveness improvement’ area and ‘creation of new engine for development’ area will be greatly increased. Investment effectiveness will be improved for ‘stable food supply’ and ‘improvement of citizen’s happiness’.

Table 3. Comprehensive portfolio for four core research areas

Category	Percentage in budget in 2012	Percentage in budget in 2022	Difference (%p)	Ratio of increase in percentage
1. Global competitiveness improvement	16.2	23.7	7.5 ↑	46.3
2. Creation of new engine for growth	16.6	24.2	7.6 ↑	45.8
3. Stable food supply	10.0	13.8	3.8 ↑	38.0
4. Improvement of citizen’s happiness	6.8	8.3	1.5 ↑	22.1
Others*	50.4	30.0	▼ 19.6	▼ 40.5
Total	100.0	100.0	-	-

* ‘Others’ indicates investment on research, facilities, labor cost in areas other than four core investment.

□ Selection and Investment on 50 core strategic technology for pending issues and agricultural policies to satisfy demands

○ Investment direction will be changed from non-specific, small-sized method to large-sized projects.

- Currently, the investment size for each project remains at KRW 1 billion. It will be expanded to the size of KRW 100 billion in research group and project groups.

○ Convergence research will be expedited by cooperation between divisions and international joint research. Open-style research system will be enhanced.

○ Core strategic technology will be processed by 3~5 year-long project and readjusted based on performance evaluation and environmental change.

Table 4. Investment Plans for 50 core Strategic Technology

Category	Core strategic technology	Average project duration	Others
1. Global competitiveness improvement	15	3~5 years (Long-term project will take 7~10 years)	Yearly investment of KRW 173 billion is to be promoted
2. Creation of new engine for growth	15		
3. Stable food supply	10		
4. Improvement of citizen's happiness	10		
Total	50		

□ Strengthening challenging and creative research support to acquire future core technologies and to change to developed countries R&D and rightsizing public institution-based research projects

○ Rightsizing will be promoted by enhancing the percentage of basic research to 45% by 2022 (42.5% in 2012).

- For public institution-based research projects, the role of institution will be redefined to fulfill its function and roles.

○ Budget for Strategic Research connected to R&D industrialization will be increased to improve commercialization and industrialization.

(to be continued)

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