The 31st STAG Board Meeting

Theme II: From S&T Research to Industrial Applications

2.5 Commercialization of Agricultural S&T Research

Dr. Ying Yeh
Director, Department of Science and Technology, COA

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Overview

I. Strategies for implementation of agricultural S&T policy and commercialization of R&D results

II. Current status of commercialization of agricultural technology R&D results

III. Cases of commercializing agricultural technology R&D results

IV. Themes for discussion

I. Strategies for Implementation of Agricultural S&T Policy and Commercialization of R&D Results

Guiding principles

"Healthful, excellent, LOHAS and sustainable"

Key Strategic Goals

1. Promote healthful agriculture, and safeguard the sanitation & safety of agr. products
2. Create excellent agriculture, and facilitate the industrialization of agr. S&T
3. Develop LOHAS agriculture and step up operational efficiency of local agri-business
4. Ensure sustainable agriculture, and protect natural ecosystems

Research Focus (ratio of budget)

(1) Establish safe agr. systems in line with intl. standards (20.07%)

(2) Strengthen competitiveness and research capability (59.50%)

(3) Vitalize rural villages and strengthen support (0.74%)

(4) Uphold biodiversity and sustainable use of resources (19.69%)

Strategies for Policy Implementation

1. Strengthen R&D & application of technologies for safe agriculture and pest control and quarantine.
2. Perfect the supply and management systems for safe agricultural products

1. Improve & add value to varieties, products, technologies, materials & management.
2. Promote innovative R&D, and strengthen management & counseling support for agri-business
3. Develop human resources and expand international marketing

1. Perfect the planning and support systems for the rebirth of rural villages

1. Strengthen studies on ecosystem protection and restoration as well as biodiversity
2. Investigate the impacts of climate change and perfect the sustainable use and management of resources

I. Strategies for Implementation on Agricultural S&T Policy and Commercialization of R&D Results

Promotion Strategies

- Plan overall business structure
- \+
- Mobilize interdisciplinary teams
- \+
- Perform innovative rolling management
- \+
- Motivate the involvement of COA-affiliated institutions

Important Measures

- Perfect the rules & regulations on protection, management and utilization of R&D results
- Strengthen interdisciplinary integration and academic-industry R&D cooperation
- Promote innovative value adding for R&D results and a mechanism for diversifying commercialized products
- Establish a matching mechanism to streamline marketing channels
- Promote incubation of agri-industry and provide business management counseling
- Strengthen manpower training on interdisciplinary agricultural business management

II. Current Status of Commercialization of Agricultural Technology R&D Results

1. Perfect Rules & Regulations on Protection, Management and Utilization of R&D Results

- Add or revise regulations on ownership and utilization of agricultural R&D results
- Operate the Agricultural IPR Review Panel
- Conduct assessment of the R&D results management system
- Help to register famous trademarks in Taiwan and establish brand names
- Promote plant variety rights to protect breeders' rights
- Sign a cross-strait agreement on IPR protection and cooperation

（See Appendix 2 for details)

Office for Agricultural Technology Industry（AgriTI™）

1 Formulation of innovative modes of technology transfer

1. Differential pricing
2. Industrialization design
3. Strategic alliance

2 Risk management and protection of rights

1. Analysis of patents
2. Analysis of infringement of rights
3. Contract design

3 Formulation of strategies on price negotiation

1. Analysis of markets and potential clients
2. Scenario planning
3. Price negotiation

4 Facilitation of cooperation on interdisciplinary value adding

1. Interdisciplinary R&D
2. Inter-institutional promotion

5 Diversified marketing measures for R&D results

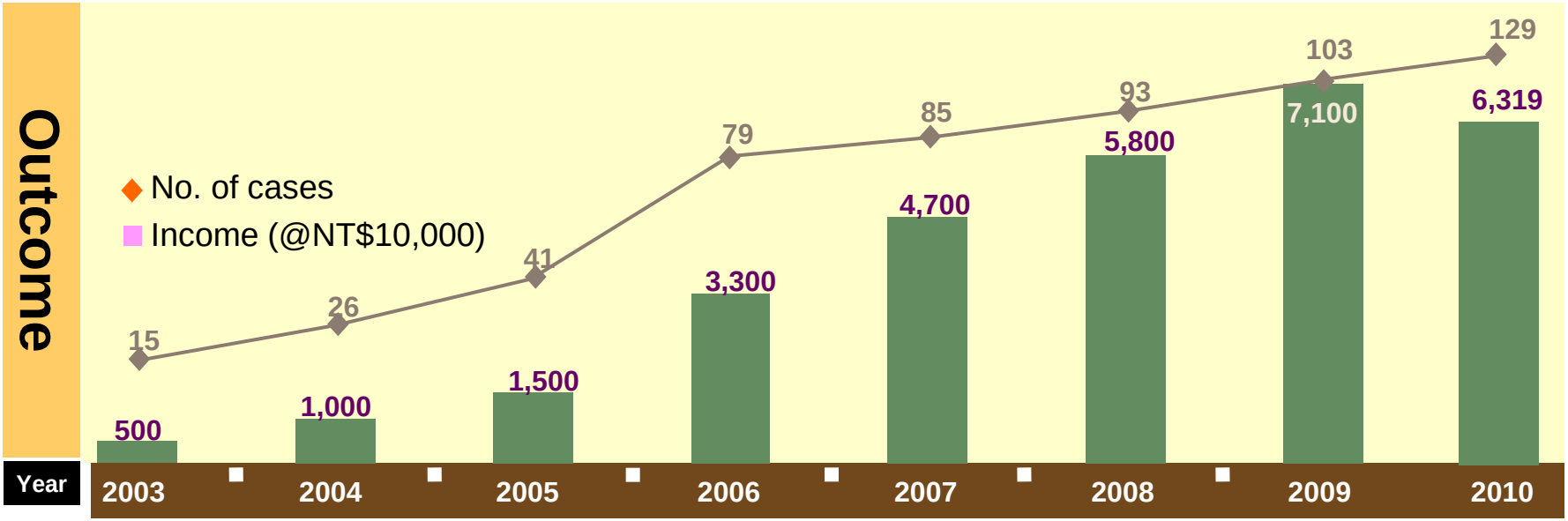
- TATM (Taiwan Agriculture TechnoMart)
- Local & intl. trade shows
- Local & intl. technology services
- Meetings to present R&D results and investment opportunities

6 Resources for industrial services

1. Reference of R&D projects
2. Facilitation of industry applications

AgriTI:Office for Agricultural Technology Industry

2. Implement Academic-Industry Cooperation projects and Agricultural S&T Programs



Accomplishments of academic-industry cooperation projects

- In 2005-2006, 17 technology transfer cases resulted in commercialization, involving a total budget input of NT$19.77 million and matching funds of NT$2.74 million. Related budget input was NT$15.35 million. In total, 43 products were developed yielding revenues of NT$51.09 million. The internal rate of return was 3.82.

Accomplishments of agricultural S&T programs

- Special scientific projects for agricultural institutions and related outcome appraisals were conducted starting in 2006. From 2007, special scientific projects for agro-industry began to be conducted.
- In 2010, special projects for academic, public corporations, and industries were commissioned, out of which 15 cases were completed. The ensuing investment from industry reached NT$139 million.

3. Promote Incubation of Agro-industry and Provide Business Management Counseling

◆ Provide an environment for the incubation of innovative agro-industry

Three incubation centers have been set up for agriculture, fisheries, and livestock, respectively. There are seven tenants in the Agricultural Res. Inst., five in the Fisheries Res. Inst., and 11 in the Livestock Res. Inst. Among them, since the establishment of its incubator in 1995, the Livestock Res. Inst. has successfully graduated four tenants, facilitated 10 academic-industry projects with a total value of NT$8 million, completed seven cases of technology transfer, facilitated investments valued about NT$9.5 million, increased tenants' incomes by NT$50 million, and contributed to the establishment of one new company.

Incubated companies:

(1) Taiwan Farm Industry Co., Ltd. – development of "TLRI Black No.1" pig products (livestock processing)

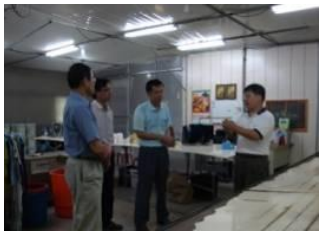
(2) Taiwan Poultry Biotechnology Co. – breeding of Taiwan red-feathered native chicken (livestock breeding)

(3) Kai Shing Trading Co. Ltd. – breeding of colored chicken and establishment of feeding pattern (livestock breeding)

(4) DR.Chip Biotechnology Inc. – nucleic acid kit for quality control of livestock products (biotechnology)

◆ Provide counseling on agribusiness operation and management

Counseling on agribusiness operation and management was provided from 2009 to 2010. Achievements include completion of 515 on-site visits and further diagnosis for agribusiness, and 99 cases of counseling. In addition, four cases of counseling for the Center-satellite system in the agricultural industrial chain were completed.



①

- Submission of application by business owners
- On-site visits and diagnosis by consultants
- Recommendations for improvement

Visit & diagnosis

- Systematic
- Integrated
- Focused

②

- Application for counseling
- Screening of applications
- Input of counseling resources

Individual counseling

③

- Publication of success stories
- Presentation of counseling achievements
- Media reports

Presentation of achievements

S&T agro-industry

Attract investment for agriculture via market-oriented thinking

- **The application procedures for academic-industry cooperation projects have been revised. From 2012, such projects will be proposed by universities/research institutes together with industry so that industry can be involved early in the project planning stage to have their needs adequately addressed and thus the R&D outcomes can be maximized.**
- **Make presentations on assessment projects during investment fairs or visits to medium- and large-sized enterprises interested in investing in agricultural S&T and increase the understanding of investment companies in the investment targets so that technology transfer and investment have a greater chance of success upon assessing the risks.**

4. Strengthen Training of Interdisciplinary Agricultural Business Management

- **Since 2005, the master's degree credit program on interdisciplinary agricultural S&T has been conducted six times in cooperation with National Chengchi University. Three hundred agricultural workers and COA staff received training on agricultural S&T commercialization, IPR protection, and R&D result utilization.**
- **In 2010 the master's degree credit program on S&T agribusiness management was conducted in cooperation with National Taiwan University. Forty-three agribusiness managers received training on professional agribusiness management and the systematic operation of agribusiness.**

5. Promote the Establishment of an Agricultural S&T Research Institute

According to Article 14 of the draft "Agriculture Basic Act", the central government should facilitate the establishment of an agricultural S&T research institute and an agricultural policy research institute with the functions of industrializing agricultural S&T and providing policy support.

COA-affiliated res. & exp. institutes

Continue R&D on mass production technology development and cross-industry cooperation

Agricultural S&T Research Institute

(including Agricultural Supra Incubation Center (ASIC) to integrate innovative agricultural S&T for incubation of new business)

Early 2013

Starting 2011

Industrial Technology Research Institute

(1) Development of commercialized R&D products, establishment of mass production technology

(2) Strengthening of technology protection, matching and value-added utilization

Animal Technology Institute Taiwan

Expand the capability needed by ASIC for promoting new business, think tank for industry research and S&T policy, industry development counseling, etc.

Other Counseling Systems

(1) Development plans for commercialization of agrobiotechnology

(2) Scientific special projects

6. Clustering Effect of Industries in the Pingtung Agriculture Biotechnology Park (PABP)

- PABP covers an area of 233 ha. Completed construction works include comprehensive infrastructure, the 1st and 2nd stages of building construction, the 3rd stage building for animal vaccines, living areas, and dormitories. In addition, the R&D and exportation center for ornamental fish covers R&D, farming, quarantine, packing, exporting, etc., and is scheduled to open in spring 2012.
- For the 12 buildings for the ornamental fish industry, seven farming/biotech companies have submitted incubator tenant applications. After its completion in Feb. 2012, Taiwan will endeavor to become the center of the world's ornamental fish industry.
- Established in Dec. 2006, PAPB already has 67 agrobiotech companies operating on its premises, resulting in investments that amount to NT$4.2 billion. The clustering effect is gradually being exhibited.
- In 2010 production of firms in the PAPB was valued about NT$1.5 billion, and a wide range of items were exported to over 30 countries in small amounts.
- It is estimated that by 2018 there will be more than 120 companies in PAPB, generating an annul production value of NT$18 billion and over 6,000 jobs.

Current status of PABP industry clustering

Natural beauty products industries
(Plant seeds and seedlings, functional food, cosmetics biotech, etc.)
38 industries

Fish farming biotech industries
(Ornamental fish, fish breeding, and peripheral products for ornamental fish)
12 industries

Biotech. agr. materials industries
(Bio-fertilizers, bio- pesticides, plant nutrients, etc)
7 industries

Livestock and poultry biotech industries
(Animal vaccines, feed additives, probiotics, etc.)
6 industries

Biotech. diagnostics and OEM industries
(Virus detecting, food safety testing, biotech OEM, etc.)
4 industries

III. Cases of Commercializing Agricultural Technology R&D Results

Outcomes of Agricultural Biotechnology (Case I)

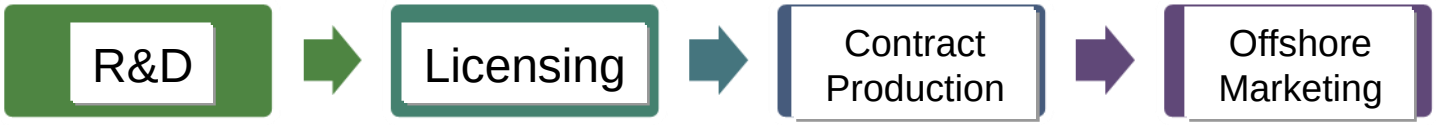
DR.Chip Biotechnology Inc.	
Project focus	Phalaenopsis
Project name	Promotion plan for commercializing a series of reagents to detect orchid viruses
Technology transfer	Source: Phase three of the National Agricultural Biotechnology Project (Graduate Institute of Biotechnology, Chaoyang University of Technology) Technologies: Detecting system that can detect 3 kinds of orchid viruses at the same time
Outcomes	1. The commercialized product, “DR.Orchid(C8)Kit”, **has created revenues of NT$4.2 million for DR.Chip Biotechnology Inc.** in 2009 and 2010. 2. The product has been adopted and utilized by companies such as **Taiwan Sugar Company**, **Tai Ling Biotech Inc.**, **Yiching Fang Biotech Inc.**, and **Prolong Biotech Inc.**

Outcomes of Agricultural Biotechnology (Case II)

Advanced Green Biotechnology Inc.	
Project focus	Biopesticide
Project name	Mass production of iron- and phosphate-solubilizing microbial fertilizers, product quality standardization, etc.
Technology transfer	Sources: National Chung Hsing University and Agricultural Chemicals and Toxic Substances Research Institute Technologies: Culture techniques of microbial fertilizers and entomogenous fungi
Outcomes	➢ Export to China, Malaysia, Thailand, Italy and Netherlands. Market volume stood at NT$50 million in 2010 and is expected to increase to NT$100 million in 2011. ➢ Safe, no toxic side effects, environmentally friendly ➢ Clustering effect at the Pingtung Agricultural Biotechnology Park

Outcomes of Technology Industrialization (Case I)

Variety development, IP protection deployment, contract production and offshore marketing of vegetable soybean



Participating inst.	Kaohsiung DARES	Food Processors	Contacted Farmers	Food Processor & Traders
Functions	Release of Kaohsiung No. 6, 7, 8, 9 and 10	Receiving new varieties from Kaohsiung DARES	Contract production	Export of vegetable soybeans with or without shell
Economic outcomes for 2001-2010	Licensing fee of NT$17.91 million (NT$59.44 million in R&D for 2001-2010)	80% of production areas with new varieties	Production value of NT$7.3 billion	Export value of NT$14.1 billion
Industrial outcomes	Varieties with good flavor, high yield and easy to harvest using machines; variety rights in Japan; marketing deployment	Renewal of varieties to enhance competitiveness	Mobilizing of specialized farmers for production; good contract relations; supply of quality products	40% market share in Japan; improving export competitiveness

Outcomes of Technology Industrialization (Case II)

Licensing and marketing deployment of animal vaccines

- Vaccine: Swine atrophic rhinitis recombinant subunit PMT vaccine
- Companies: Gao Sheng, Da Feng (production), Bayer (global marketing)
- PIs: Cheng-I Liu and Maw-Sheng Chien of NCHU
- Time of marketing: Permission in March 2004, marketing in June 2004, export to Korea and 14% market share in February and June 2008

Economic outcomes	Licensing fee of NT$600,000; profits over NT$10 million; capital investment in academic-industry cooperation NT$10 million; job opportunities for veterinary medicine graduates
Industrial outcomes	Establishment of marketing model for animal vaccines; nurturing of local companies for international marketing

IV. Themes for Discussion

- How can agricultural R&D be effectively planned and commercialization carried out?
- How to attract capital to invest in agribusinesses so as to expand the scale of operation, increase both domestic and international markets, and accelerate industrialization of agricultural S&T?

Thank You for Your Attention!

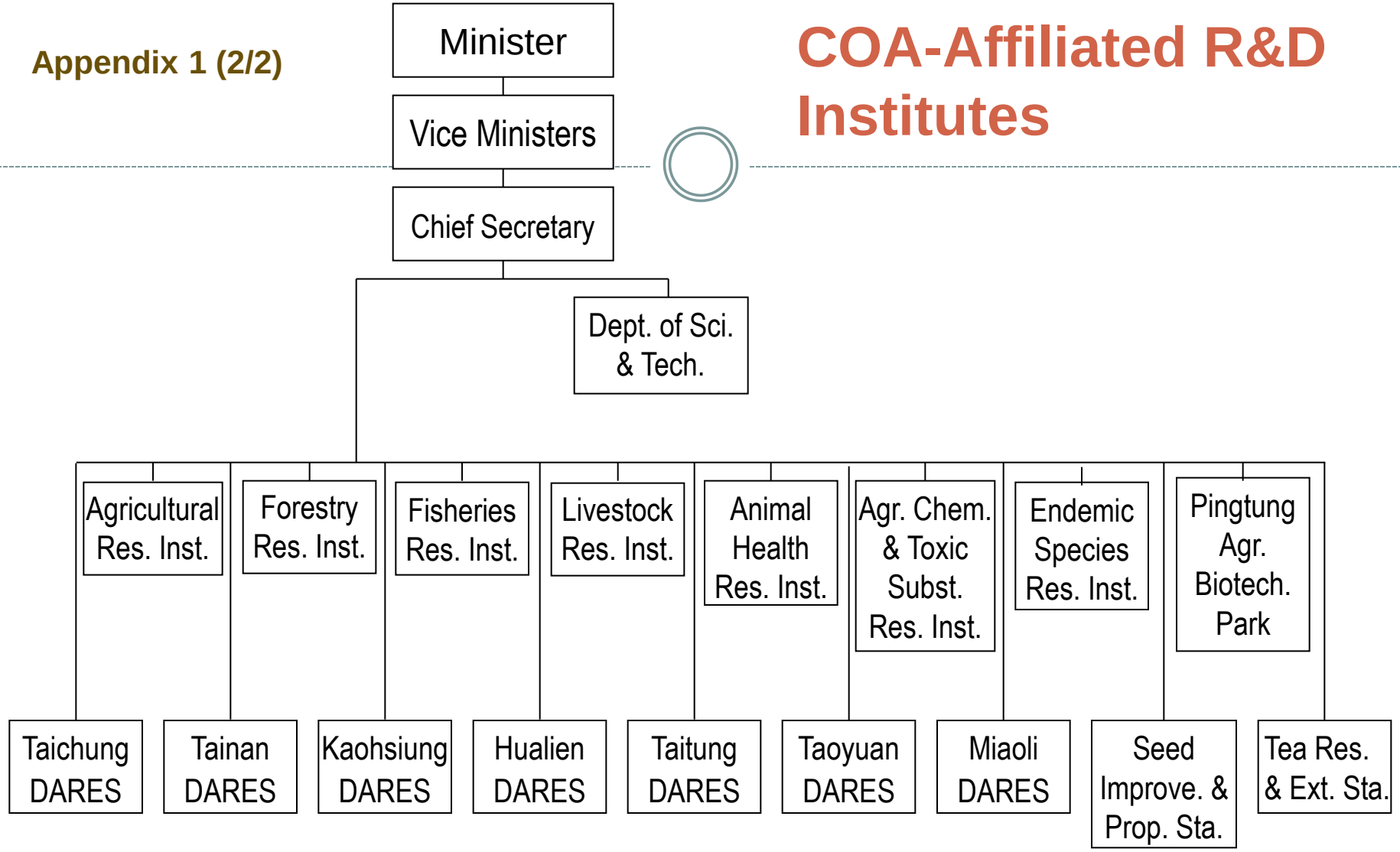
Appendices

The COA's Science and Technology R&D System

- The COA is in charge of overall planning and management of agricultural S&T. Agricultural R&D programs and projects are formulated in accordance with various national S&T development plans so as to meet the needs of agricultural development policies. Programs and projects are implemented by the COA's R&D institutes, universities, Academia Sinica, and public enterprises.
- The COA's R&D institutes perform applied research, universities conduct both training and research, and Academia Sinica runs basic research. Private businesses and public enterprises implement specialized areas of research.

Appendix 1 (2/2)

COA-Affiliated R&D Institutes



IPR Protection and Management Systems

- **Revising regulations on the ownership of agricultural R&D results:** Provision of IP analysis, technology valuation, and legal consultation; establishment of six platforms for the management of R&D results and contracts
- **Staging of agricultural IPR review meetings:** Eighty two meetings have been conducted, and 1,006 cases of technology transfers, patent applications or offshore licensing have been approved
- **Assessing the R&D results management system:** Sixteen institutions have passed assessment (nine public enterprises and seven universities) and are thus qualified for COA research support

Appendix 2 (2/3)

- **Trademark registration and branding for value:** Labeling of local specialties such as Wen-shan paochong tea, Ma-dou pomelos, and Sun Moon Lake black tea; registration of CAS premium/organic agricultural products in China
- **Protection of animal and plant variety rights to ensure breeders' rights:** In compliance with the Plant Seed and Seedling Act, accept variety registrations; bilateral negotiations with the US, Australia, Japan and EU for mutual acceptance of variety rights applications
- **Signing of the Cross-Strait Agreement on Intellectual Property Rights Protection and Cooperation:** The agreement is protecting Taiwan's patents, trademarks and variety rights in China and has facilitated the cancellation of eight illegitimate trademark registrations, such as "A-li-shan" tea and "Chih-shang" rice in China

Appendix 2 (3/3)

Taiwan Agriculture TechnoMart (TATM)

—A platform for licensing innovative agricultural technologies