



Overview of CAAS's Research

Tianzhi Ren

Director General, Dept. of S&T, CAAS

June 2018



Contents

1

General Introduction

2

Progress in Scientific Innovation

3

New Situation and Main Tasks



1. General Introduction





CAAS

Establishment

Founded in 1957.

Nature

CAAS is a National comprehensive agricultural research institution, which affiliated to the Ministry of Agriculture and Rural Affairs.

Goal & Task

Responsible for the basic research, applied basic research, applied research of national agriculture science and technology; Solve the major fundamental, directional, strategic, and critical scientific issues in the development of national agriculture and rural economic development.

Structure

**10 administrative departments,
34 affiliated institutes (14 in Beijing and the rest distributing in 15 provinces),
2 affiliated units (graduate school, and publishing house).**

1.1 Discipline System

9 Disciplines

Crop Science
Horticulture Science
Animal Sciences
Veterinary Sciences
Plant Protection Sciences
Agricultural Resources and Environmental Science
Agricultural Mechanization and Engineering Science
Agro-product Quality, Safety and Processing Science
Agricultural Information and Economics Science

57 Areas

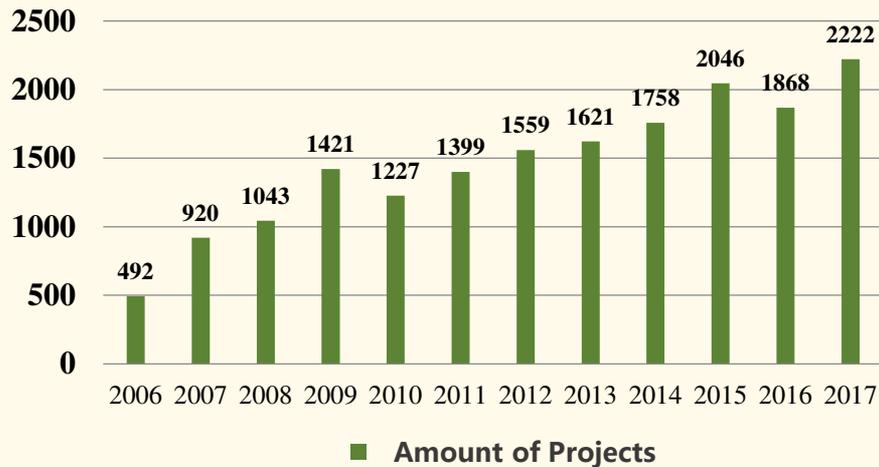
Crop molecular biology
Physiology and cultivation of horticultural plants
Animal biotechnology and reproduction
Animal epidemic disease
Crop diseases
Agriculture agronomy
Agricultural environmental engineering
Agricultural mechanization engineering
Agricultural product quality safety and controlling
Agricultural product processing
.....

> 300 Directions

Crop synthetic biology technology
Vegetable genetic breeding
Technology of Animal Genomics
Avian virus disease
Epidemic monitoring and control of horticultural crop diseases
Agricultural meteorological disaster prevention and control
Agricultural non-point source pollution
Facility plant environmental engineering
Agricultural remote sensing technology
Toxicology and evaluation of agricultural products pollutant
Rural development and governance
.....

1.2 Research Projects

- From 2012 to 2016, CAAS host 8,832 new projects at different levels, with a total contracted funding of RMB 9.53 billion. Compared with the period from 2007 to 2011, **the amount of projects increased by 47 %, with an increase of 117% for the contract funding.**
- In 2017, CAAS hosted 2,222 new projects at all levels, with the total contracted fund RMB 2.06 billion.



✓ National Key Research and Development Program

Year	Project Amount	Funding (RMB 100 million)	Ratio to Agricultural Projects	Ratio to Agri-projects Funding
2016	32	16.4	25%	31%
2017	30	8.9	22%	24%

✓ National Natural Science Foundation

From 2016 to 2017, there were **628** funded projects with the total funding of **RMB 290 million**.

✓ Public-interest Scientific Institution Basal Research Fund

Annual fund of **RMB 228 million**, covering 34 affiliated research institutions

1.3 Platforms

CAAS has the “three-level” and “three-class ” science and technology platform system, namely “national-level, province or ministry-level, academy-level” , and “scientific research, technology, and supporting” . The total number reaches **533**, including **42** state level, **322** ministry level, and **169** academy level.

	Scientific research	Technological innovation	Basic supporting
National level	9	12	21
Province and Ministry level	111	123	88
Academy level	77	32	60
Total	197	167	169

✓ Major and Key Platforms

National-level platform

	Amount of CAAS	Amount of State	Ratio
State key lab.	6	25 (Agriculture)	24%
National key scientific facilities	2	2 (Agriculture)	100%
National S&T Foundation platforms	4	28	14%

Ministry-level platform

	Amount of CAAS	Amount of State	Ratio
Comprehensive key lab of the Ministry of Agriculture	22	42	52%
Risk assessment lab of the Ministry of Agriculture	30	105	29%
Chief Scientists in Modern agricultural technology system	18	50	36%

1.4. Agricultural Science and Technology Innovation Program

✓ Background

- **Agricultural Science and Technology Innovation Program(ASTIP) was established only for CAAS by the Ministry of Finance and the Ministry of Agriculture in 2013.**
- **The main task of ASTIP for CAAS is to optimize subject arrangement, develop talent and teams, improve research conditions, steadily support the continuous research of research teams, solve the scientific and technical issues that restrict agriculture development, and play the leading role: the vanguard to reform, the national team to innovate, and the think-tanks to make decision-making by the innovation of system and mechanism.**

✓ Innovation of System and Mechanism



Explore new research mechanism — stabilizing research direction
Design three-level subject system and decide the long-term research tasks.



Explore new research-organizing mode — innovation team
Change the research groups to scientific innovation teams.

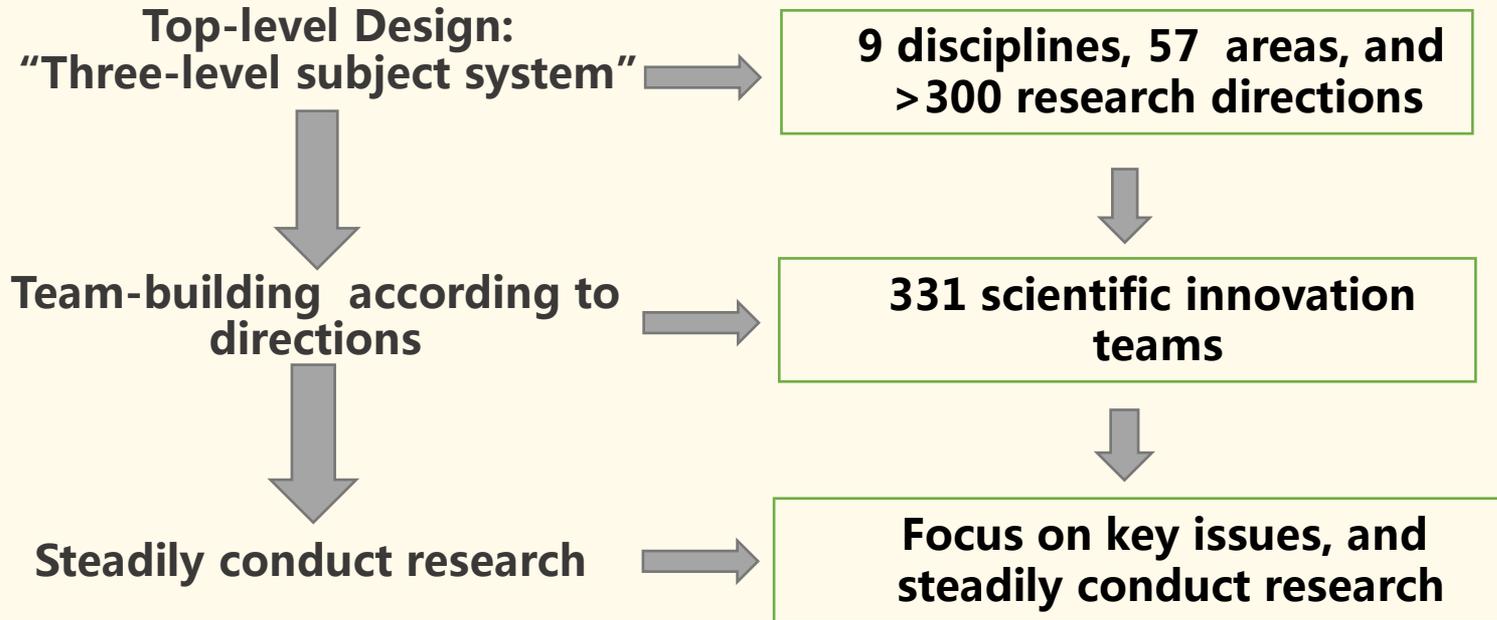


Explore new research supporting mode — steady support
Change the competition-oriented research support to steadily support in accordance with tasks.



Explore new management mode — performance management
Change the project report assessment to performance management, and focus on goal-oriented results.

✓ Set Up Research Team



4,094 people are selected into the Agricultural Science and Technology Innovation Program. The ratio of chiefs, backbones, and assistants is 1:5.6:5.8

- 
- ✓ **Steadily support innovation team to conduct long-term research**
 - **All the 331 scientific research teams get funded.**
 - **In 2017, the average funding from ASTIP was about 2.27 million(RMB)**

- 
- ✓ **Steadily support cross-institution and cross-subject teams to conduct coordinative research in major selected topic or global strategic tasks.**
 - **Solve the major issues or produce high-impact results by facing regional key issues, technological bottleneck of agricultural development, as well as major scientific issues**
 - **20 coordinative innovation tasks have been launched, and the annual investment has exceeded RMB 100 million.**

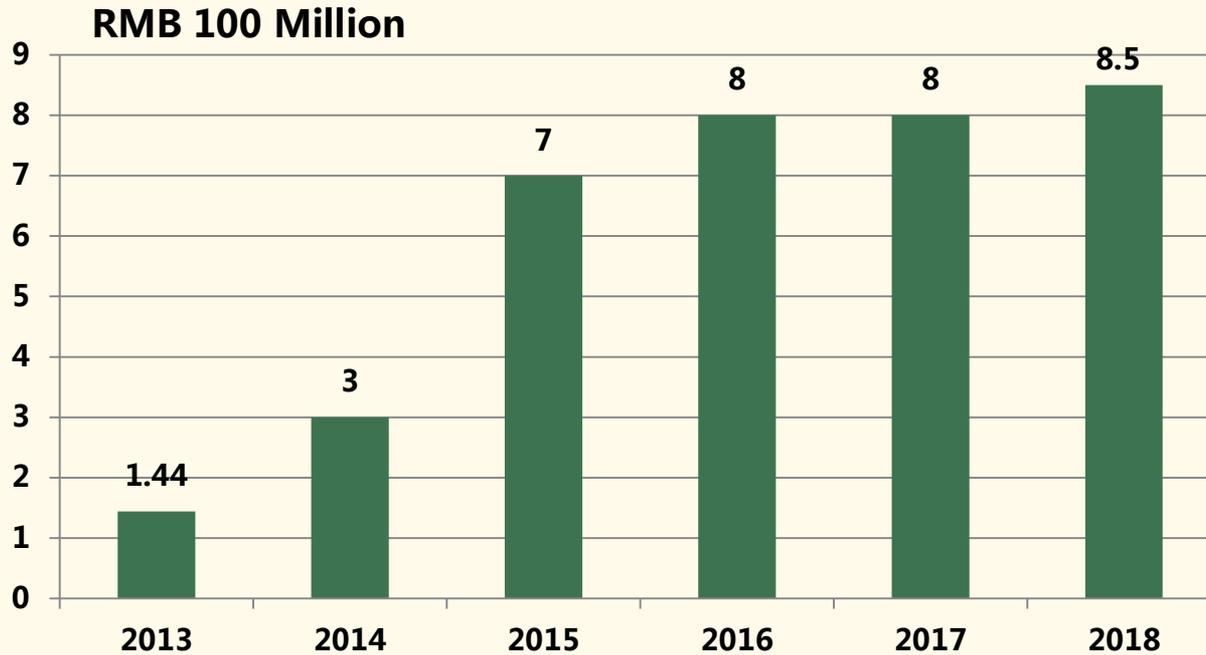
✓ List of Coordinative researches(20)

No.	Name of Coordinative Innovation Task	Leading Institution	Chief Technician	Teams Included
1	Planting industry integration innovation of green technology for increasing production and increasing efficiency	Corp Institution	Changling Huang	48
2	Animal husbandry integration innovation of green farming technology	Animal husbandry Medical Institution	Junmin Zhang	39
3	Soil fertility improvement in the Northeast China and Sustainable technology	Capital Planning Institution	Chang' ai Lu	8
4	Comprehensive prevention and control of heavy metal pollution for rice in south China	Environmental Protection Institution	Zhongqi Liu	14
5	Intensive agricultural efficient water use and underground water protection technology in north China	Environment and Development Institution	Qingsuo Wang	9
6	Biological basis and core-material innovative manufacturing of high photo-effect breeding of crops	Biology Institution	Tiegang Lu	7
7	Mechanism of nutrient metabolism in crops and key techniques for nutrition enhancement	Biology Institution	Chunyi Zhang	15
8	Comprehensive controlling of citrus Huanglongbing	Plant Protection Biology Institution	Xueping Zhou	9
9	Cultivation and industrialization of domestic fine breeds of main livestock and poultry	Animal husbandry Medical Institution	Junya Li	9
10	Chinese-style food engineering technology	Processing Institution	Xiaofeng Dai, Hong Zhang	13



No.	Name of Coordinative Innovation Task	Leading Institution	Chief Technician	Amount of Participation Group
11	Green key prevention and controlling technology of destructive soil borne diseases and pests	Plant Protection Institution	Aocheng Cao	17
12	Domestication breeding research of important horticultural crop variety	Vegetable Institution	Rifei Sun	21
13	High-efficient intelligent equipment and technology integration research of crops	Agricultural Machinery Institution	Chengqian Jin	21
14	Plantation technology integration and demonstration of salt and alkaline land crops in the western arid regions	Cotton Institution	Fuguang Li	22
15	Green high-efficient agricultural technology integration and demonstration in water conservation area of Danjiangkou	Environmental Protection Institution	Dianlin Yang	13
16	Quality target appreciation and breed quality innovation of crops	Corp Institution	Lihui Li	25
17	Key equipment technology and new product innovative manufacturing of agricultural nanometer materials	Environment and Development Institution	Haixin Cui	8
18	Association discovery and computing digging of multi-source heterogeneous agriculture	Information Institution	Tan Sun	22
19	Analysis and utilization of crop gene big data	Gene Institution	Sanwen Huang	31
20	Coordinative innovation integration demonstration of agricultural science and technology going globally	Investment Institution	Ke Jin	35

✓ ASTIP Funding from Chinese Government



2013-2018 : RMB 3.594 billion in total

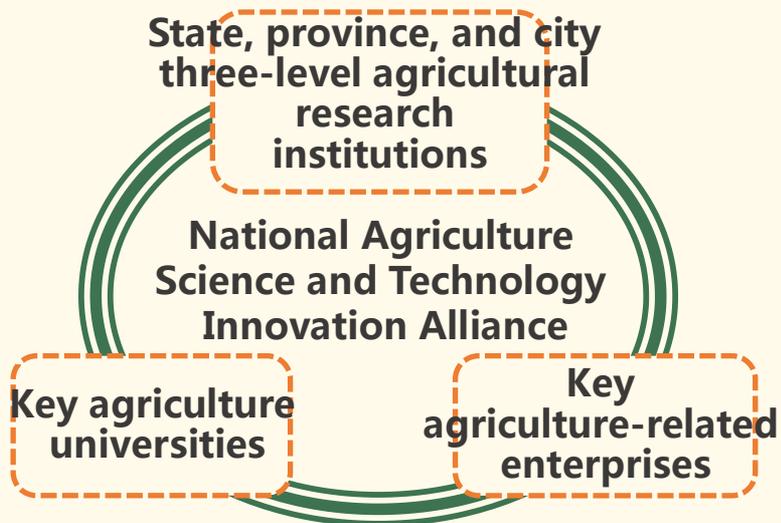
1.5 National Agriculture Science and Technology Innovation Alliance

Establishment: Dec. 22, 2014

CAAS is the Secretariat of the alliance.

Members: about 700 units including “Four academies” affiliated to the Ministry of Agriculture and Rural Affairs, provincial-level agricultural academies, municipal-level agricultural academies, agriculture universities, large agriculture-related enterprises, and etc.

At present, there are 70 alliances including professional, industrial and regional alliances.





✓ The Objective of Alliance

- **Collaborative Research as on a “single chessboard”** . Set up a model of coordination and collaboration in agricultural research, and make it become the core platform of national agricultural joint research.
- **“A Chain” of innovation.** Set up an organizing mode for agricultural research innovation which cover from the up, the middle, to the down stream of agricultural industry, and make it become the core network of national agricultural innovation.
- **An Integration Service.** Set up a way for integrated agricultural service which can provide comprehensive service, and make it become the core strength of supporting the development of modern agriculture.

✓ Main Tasks

1

Regional Key Issues

Coordinative innovation in major areas

- Northeast black soil protection
- Water conservation in North China
- Comprehensive treatment of heavy metal pollution in southern rice fields

2

Industrial major Issues

Coordinative innovation of industrial major issues

- Comprehensive prevention and control of gibberellic disease in the main areas of wheat production
- Corn straw utilization of northeastern China
- Comprehensive controlling of citrus Huanglong disease, etc.

3

Green and high-efficient agricultural Product production

Demonstration of main agricultural products including corn, rice, bean, dairy cow, mutton sheep, and pork.



2. Progress in Scientific Innovation



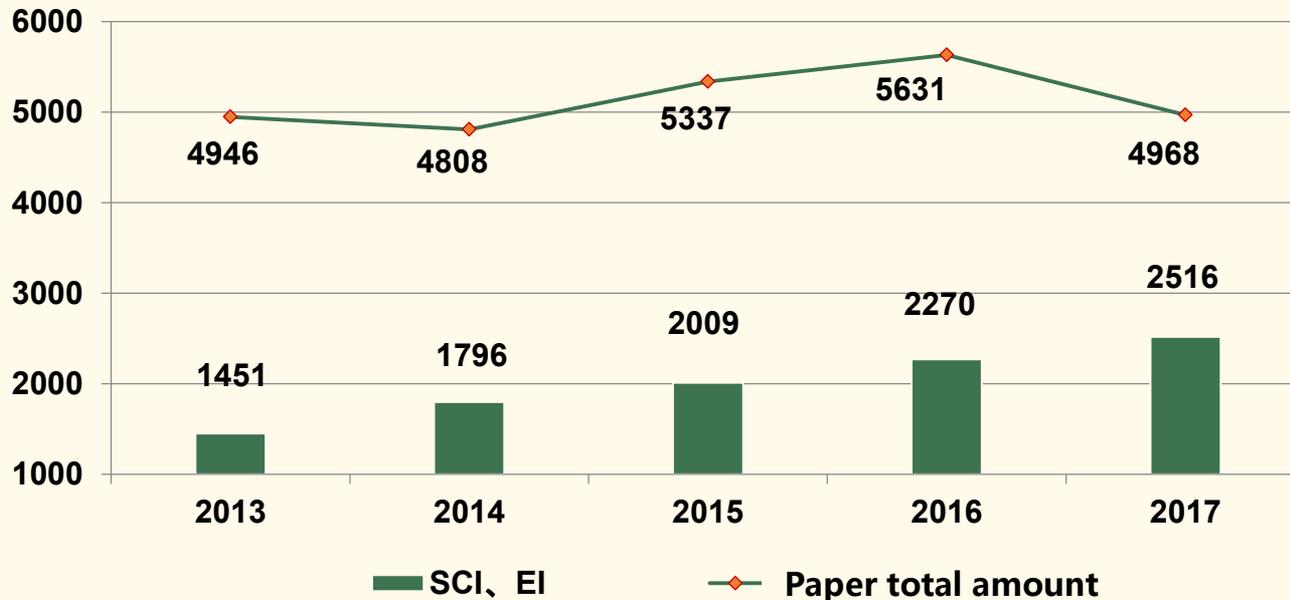
2.1 National Awards

Over the past five years, CAAS has obtained **34** national awards, including **1** Nature Science Award, **6** Invention Award, and **27** Progress Awards.

Year	Amount of Award	Agriculture-related Award	Ratio of Agri-awards (%)
2013	6	32	18.8
2014	7	27	25.9
2015	6	33	18.2
2016	7	29	24.1
2017	7	30	23.3

2.2 High-level Papers

- Over the past five years, more than 25,000 academic papers have been published, including nearly 10,000 in SCI/EI journals
- 88 papers published in top international academic journals such as Science, Nature, PNAS, and CellResearch.



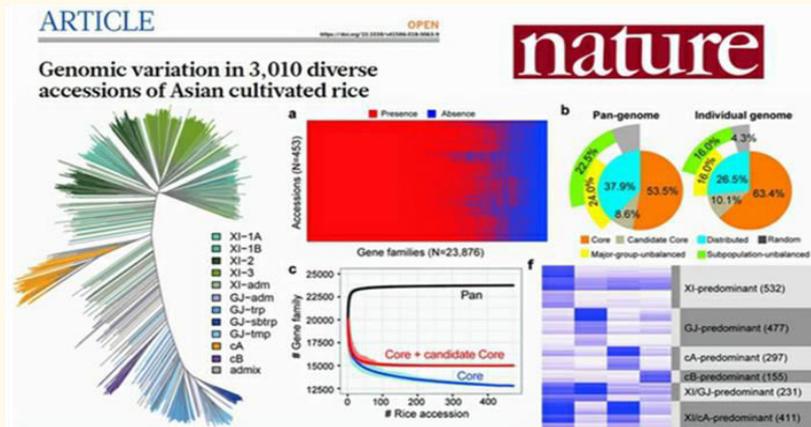


In 2017, 9 experts were included into Most Cited Chinese Researchers by Elsevier

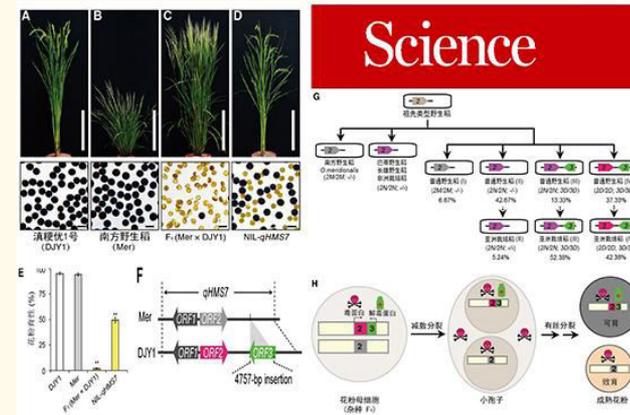
Most Cited Chinese Researchers	Field
Zhonghu He, Jizeng Jia, Zhikang Li, Jianmin Wan, and Kongming Wu	Agriculture and biology
Hualan Chen, Zejun Li, and Guangzhi Tong	Immunology and microbiology
Xingquan Zhu	Veterinary

2.3 Some Key Research Achievements

- ✓ **Corp basic research maintaining the leading level in the world**
 - Set up the second largest crop germplasm resource base in the world, with more than 480,000 accessions in long-term storage
 - Firstly set up the core collection and mini core collection of main crops including rice, wheat, and bean
 - Conduct genomic sequencing of wheat, cotton, oilseed rape, and cucumber and continuously strengthen the original innovation and prospective study



Lead and complete the largest plant gene sequencing in the world, including more than 31 million genome variations



Systematically analyze the infertility problems and genetic characteristics of japonica rice and indica rice

- ✓ Major breakthrough made in the basic research of vegetables

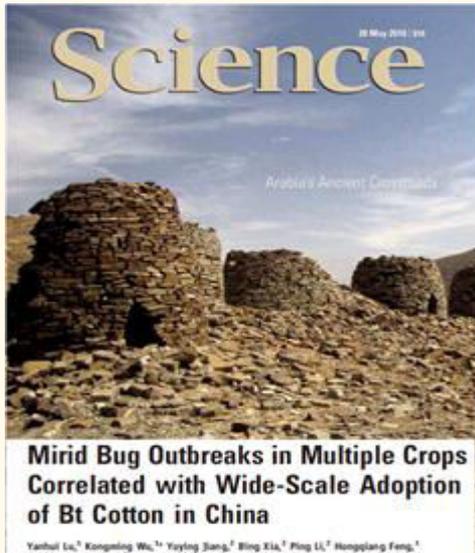


Paper about cucumber bitter flavor biosynthesis, regulation and controlling, and domestication published at the cover of *Science* with long range



Illustrate the hereditary basis of tomato flavor and discover its controlling mechanism for the first time to lay important theoretical foundation to the improvement of tomato flavor, which was published at the cover of *Science*

✓ Rapid development of plant protection research

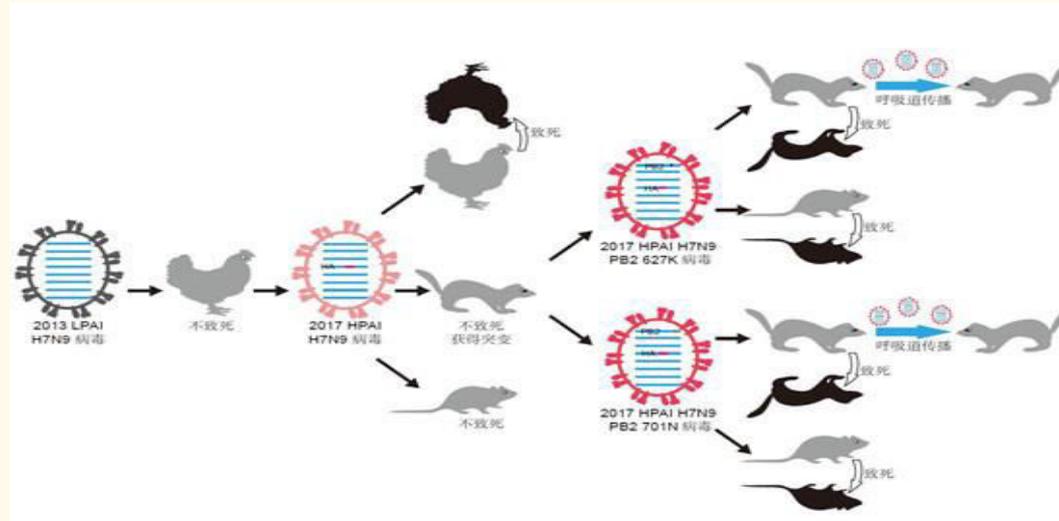


Systematically analyze the influence of genetically modified crops on insect structure for the first time



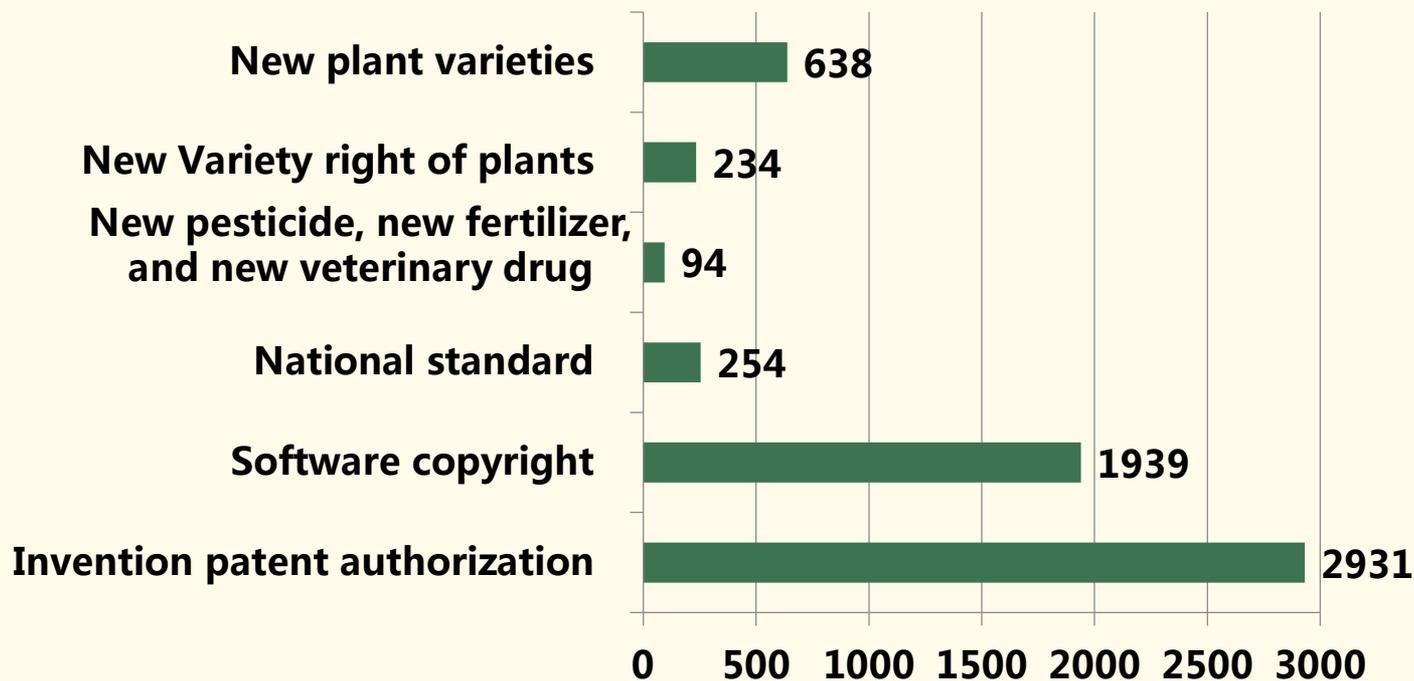
Conduct systematic research on the ecological service function and mechanism of Bt corps from the measure of landscape ecology for the first time and illustrate the ecological controlling function of Bt corps to natural enemy insects

✓ National Bird Flu Reference Lab makes new contributions to the prevention and control of H7N9



Disclose the evolution and variation of H7N9, firstly discover the high pathogenicity virus H7N9, and timely provide important scientific basis for the formulation of H7N9 prevention and controlling policy for poultry and human beings. Relevant research was published at *Cell Research* on October 24.

2.4 Key Technology and Major Product Development



Part achievements produced from 2013 to 2017

✓ Leading the world in biological technology and invention patents in terms of pharmaceuticals

Field	Company/ Institution	Rank in related field	Invention patent amount
Biology	Institute of Crop Sciences, Chinese CAAS	1	694
	Jiangnan University	4	333
	Zhejiang University	6	252
	BGI	7	204

Field	Company/ Institution	Rank in related field	Invention patent amount
Pharmaceuticals	Lanzhou Institute of Husbandry and Pharmaceutical Sciences of CAAS	1	466
	Zhejiang University	4	313
	Jiangnan University	5	283
	China Medical University	6	254
	Ji' nan Xingye Medical Treatment Science & Technology	7	254
	Fudan University	10	233

Source: *Global Innovation Report 2017* published by Clarivate Analytics (former Thomson Reuters IP and Science Business Department)



3. New Situation and Main Tasks



New Situation & New Requirement

19th CPC National Congress

New era

Innovation-driven development strategy

Rural revitalization strategy

Green development strategy

New mission

Build a powerful nation of science and technology

New requirement

President Xi Jinping proposed in the letter for CAAS' s 60th anniversary:

CAAS should follow the latest trends of international agricultural science, meet the country' s strategic demands and cater to the development of modern agriculture in China, to speed up building world-leading disciplines and scientific institutes and push forward overall leapfrog development in China' s agricultural science.

In Short: Three orientations

Two first-class

Overall leap development

Development Goal

- About 1/5 subjects become the world first-class;
- Around 1/5 research institutes become the world first-class ones.

All the subjects and institutes reach the world first-class level;

Comprehensive research strength and international influence takes the leading position in the world;

2018-2020

2021-2035

2036-2050

Two
first-class

Above 2/3 of subjects is to reach the world first-class level;
2/3 of institutes is to be built as the world first-class ones.

Major Tasks

1. Strengthen the construction of first-class disciplines
2. Design major science and technology projects
3. Cultivate major scientific achievements
4. Promote the construction of major platforms
5. Deepen the construction of innovation alliance
6. Conduct the scientific supporting action of rural revitalization
7. Advance the ASTIP to develop in-depth

1. Strengthen the construction of first-class disciplines

- ❑ Add some research areas and directions to support rural revitalization, “three orientations”, and green agriculture development
- ❑ Enhance the leading role of discipline system on the scientific innovation direction for CAAS as well as the guidance to the aim and task of innovation teams
- ❑ Select first-class subject benchmarking institutions for reference
- ❑ Promote the construction regional comprehensive institutions, such as Southwest and West institutions.

2. Design major science and technology projects

- According to the national demand and agricultural development, enforce the design of major projects, and conduct strategic research with prospective, overall and key science and technology issues
- Closely follow the development trend of international science and technology, and actively guide the innovative goals of CAAS to focus on advanced science and technology and hot issues
- Pay more attention to project application and process management, such as national major R&D plan, and key NSF project.

3. Cultivate major scientific achievements

- ❑ Organize and conduct some research subjects focusing on breakthrough output, and give them enough support.**
- ❑ Improve the Rewarding system about paper, patent, and achievement award.**
- ❑ Pay more attention to the early result of research, cultivate major achievements by using the funds of ASTIP.**



List of subjects selected on major output

No.	Selected Subject	Leading Unit	Leader
1	Cultivation and demonstration of quality water-saving wheat and new corn variety	Plant Institute	Zhonghu He
2	Cultivation and demonstration of quality green super new rice variety	Rice Institute	Shihua Cheng
3	New-type mark vaccine creation of major animal disease	Harbin Veterinary Research Institute	Zhigao Bu
4	Cultivation of qualified high-efficient beef and new fine-wool sheep variety	Institute of Animal Sciences Lanzhou Institute of Husbandry and Pharmaceutical Sciences	Junya Li Bohui Yang
5	Creation and industrialization of green prevention and controlling core product of crop diseases and pests	Plant Protection Institute	Dewen Qiu
6	Qualified, multiple prevention, and high-efficient gene digging of main crops	Plant Institute	Youzhi Ma
7	Creation and industrialization of feed antibiotic substitute key products	Fodder Institute	Jianhua Wang Guanghai Qi
8	Cultivation of potato diploid seed	Genome Institute	Sanwen Huang

4. Promote the construction of major platforms

- ❑ **Actively apply the construction of new national key science and technology platform, such as National Key Lab.**
- ❑ **Construct the opening and sharing labs, and improve the utilization efficiency of large-scale facilities.**
- ❑ **Set up a series of CAAS new platforms such as key labs.**

5. Deepen the construction of innovation alliance

- ❑ **By Sticking to revitalizing agriculture via quality and green, focus on agricultural and regional key tasks**
- ❑ **Explore new mechanism of agriculture coordinative research and application by strengthening the demonstration of technological innovation.**
- ❑ **Construct a group of new modes in national agricultural coordinative research which can be easily promoted or duplicated.**

6. Conduct the scientific supporting action of rural revitalization

- ❑ **Take the rural revitalization lead the scientific work of CAAS;**
- ❑ **Enhance the scientific innovation, achievement transformation, model demonstration, and capability construction by relying on ASTIP and National Innovation Alliance;**
- ❑ **Accelerate the formation of a group of macro-strategy, key technologies, and model mode that lead and support the rural revitalization.**

7. Advance the ASTIP to develop in-depth

Strengthen the management of innovation team

Strengthen the evaluation of chief experts, and strictly implement the team members drop-out mechanism, and team dynamic adjustment mechanism.

Strengthen the management of team task

By adopting the peer evaluation to evaluate the progress of research teams, make teams further focus on their research goal.

Strengthen the management of coordinative tasks

Strictly implement the responsibilities of leading units and leading persons, enhance the organizing of coordinative research of cross-subject or cross-field, striving for the breakthrough results.



Thanks for your attention

