



Phytosanitary Education System in China

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Among the Chinese Initiative “One Road” Countries
25-28 September 2018, Nanning Guangxi, China**

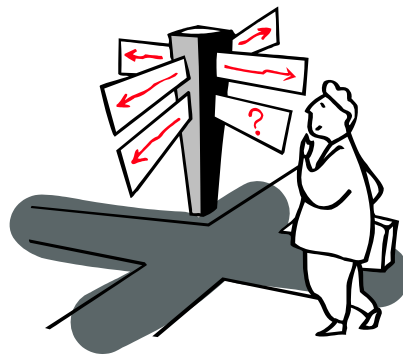
Outline

- The general situation of phytosanitary education system in China
- The practice of phytosanitary education in China: CAU as an example
- The challenges, opportunities and prospects of phytosanitary education in China



中國農業大學
China Agricultural University

I. The general situation of phytosanitary education system in China



Plant Quarantine

- **Official Control**
- **Public Participation**
- **Phytosanitary Education and Research**

Governments
Universities & Institutes
Other organizations

The origin of phytosanitary education system

- **The professional education of plant protection in China:** has a history dated back **1905**, courses of **Plant Pathology** and **Entomology** were opened in the College of Agriculture at Imperial University of Peking.



Group photo of teachers and students in the College of Agriculture (**1913**)



Group photo of the first graduate in the College of Agriculture (**1916**)



Establishment of the Department of Pest and Disease(**1923**)

(Photos cited from internet)



Dr. Bingwen ZOU

- **The earliest suggestion of plant quarantine in China:** in **1916** by Dr. Bingwen ZOU. He emphasized the importance of plant quarantine.



Dr. Fengmei ZHU

- **The first paper named as plant quarantine in China:** was published in **1927** by Dr. Fengmei ZHU. These papers emphasized the significance and basic methods of plant quarantine, including the **import quarantine and export quarantine**.

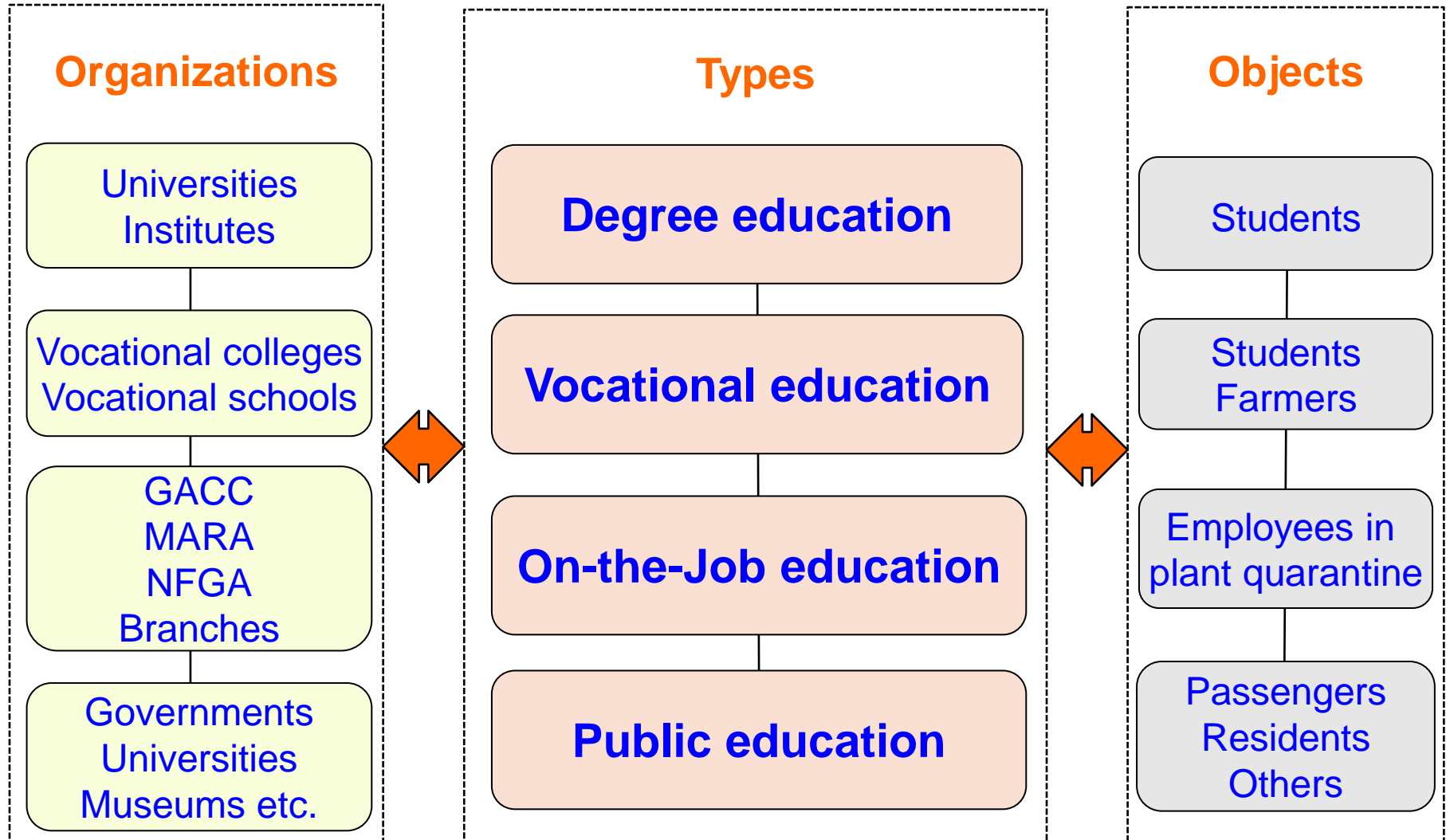
(Photos cited from internet)

- **From 2001**, as one member of WTO, China has faced more challenges from the **global market** and the international regulations.
- In the trends of economic globalization and integration, **pests are spread more quickly and widely in the world**, which are causing significant economic and biological losing of plants and plant products.
- China pays high attention to **the phytosanitary education** through **Four-in-One system**.



(Photos provided by quarantine officers in China)

The Four-in-One Education System



Public education: governments and universities mainly

- Passengers, regular program.
- Residents and other publics, periodical program.



The public phytosanitary education in China: phytosanitary regulations, phytosanitary procedures and quarantine pests

(Photos in 2017-2018, provided by plant quarantine workers in China)

On-the-job education: GACC, MARA, NFGA mainly

- Civil servants of plant quarantine, periodical program.
- Technicians of plant quarantine, periodical program.



**The on-the-job phytosanitary education in China:
national and regional technical training of plant quarantine**

(Photos cited from the related news of plant quarantine on internet)

Vocational education: colleges and schools mainly

- Junior college students, 3-year program.
- Farmers, periodical program.



The screenshot shows the CABTS (China Agricultural Broadcasting and Television School) website. The header features the CABTS logo and the word 'Home'. A left sidebar lists navigation options: Education & Training, Academic Forum, Cooperation, Instructional Resource, and Publication. The main content area is a grid of images and text boxes. It includes a 'Central Agricultural Broadcasting and Television School' section with images of a satellite dish, a white van labeled 'farmers', and a building labeled 'rural areas'. Below this is a 'NEWS' section with three bullet points: 'National Working Conference for Presidents of CABTS Schools', 'Building Open Sharing Instructor Depository Management Platform for Promoting Further Implementation of New Type of Career Farmers', and 'Video Program of CABTS Awarded at the 19th China Sector Television Program Show'. At the bottom left, there are logos for '中国农业信息网' (China Agriculture Information Network), 'Rural Laborer Transfer Training' (www.nmpx.gov.cn), 'University of Saskatchewan Extension Division', and 'Agrifoodasia.com' (亚洲食品贸易开发中心).

Education and Training

Diploma Education



Using modern distance education and traditional training approaches, we provide secondary diploma education, post-secondary diploma education and cooperative higher education programs for rural people to study off-campus. The programs cover most areas of agriculture under the categories of crop cultivation, livestock, economics and management, agricultural engineering, forestry, agri-ecology, rural home economics etc

Enter

Training Programs



We also offer a number of types of training program including applicable agricultural technology training, Green Certificate training, youth farmers' training and etc We teach farmers both through distance media and face-to-face.

Enter

Rural Laborer Transfer Training



In 2004, six ministries as the Ministry of Agriculture, Ministry of Finance, Ministry of Labor and Social Security, Ministry of Education, Ministry of Science and Technology, Ministry of Construction cooperatively launched the 'Sunshine Program -

The farmer education in China: plant quarantine and IPM techniques

<http://www.crdenet.net.cn/>

Degree education: 50+ universities and institutes

- Undergraduates, 4-year program, Bachelor D.
- Postgraduates, 2-year program and 3-year program, Master D.
- Postgraduates, 3-year program, 4-year program, 5-year program, PhD.



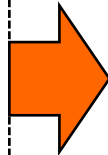
The degree education of plant protection in China: script, thesis, and dissertation.

Majors of undergraduates

Plant Protection

Pesticide Science

**Animal and Plant
Quarantine**



Majors of postgraduates

Plant Pathology

Agricultural entomology and Insect Pests
Management

Pesticide Science

**Plant Quarantine and
Agricultural Ecosystem Health**

Invasion Biology

Biosecurity

The two-level major structure of plant protection in China

China Agricultural University

- US News & World Report (2018): Agricultural Sciences, the 4th university
- MOE China (2017): First-class university and 9 Top disciplines (including Plant Protection)

College of Agriculture at
Imperial University of Peking
(predecessor of Peking University)

1905

China Agricultural University

Merged by

- Beijing Agricultural Engineering University
- Beijing Agricultural University

1995

1949

Beijing Agricultural University

Merged by

- College of Agriculture of Peking University
- College of Agriculture of Tsinghua University
- College of Agriculture of North China University



中國農業大學



II. The practice of phytosanitary education in China: CAU as an example



- **Faculties:** 100 faculties, including 37 professors, 33 associate professors.
- **Students:** 1038 students, including 422 undergraduates, 616 postgraduates (329 for Master Degree, 287 for PhD).
- **Directions:** 15 directions, for research and the education of postgraduates, including **Plant Quarantine and Invasion Biology (PQIB)**.



植物保护学院
College of Plant Protection

请输入关键词



首页

学院介绍

机构设置

师资力量

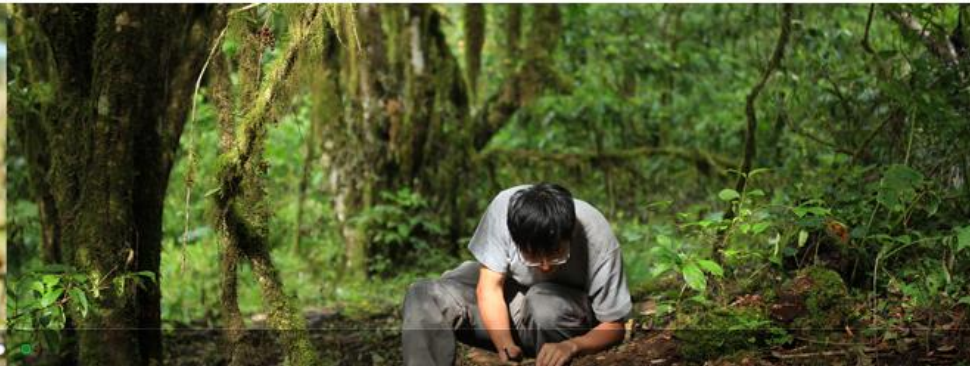
人才培养

科学研究

合作交流

党建工作

学生事务



(<http://cpp.cau.edu.cn/>)

The Development of PQIB



- **From 1990 to 1995:** Specialization of plant quarantine, leading by Prof. Ruihua Jin and Dr. Hong Chen.
- **From 2001 to now:** Laboratory of plant quarantine and invasion biology (CAUPQL), leading by Dr. Zhihong Li.
- **From 2004 to now:** Direction of plant quarantine and invasion biology (PQIB), leading by Dr. Zhihong Li, especially the education of postgraduates, including 5 laboratories.

The Missions of PQIB

- **Education:** training the undergraduates and postgraduates with advanced theory, method and technology of plant quarantine and invasion biology.
- **Research:** studying the techniques, measures and mechanism of prevention and control of quarantine pests and invasive alien species.
- **Service:** providing the technical guidance, decision supports and outstanding professionals of plant quarantine and invasive alien species management to government and other organizations.



The Team of PQIB (Sep. 2018)

■ 22 supervisors:

- 10 faculties: 5 Prof. + 4 Associate Prof. + 1 Lecturer
- 12 collaborative Profs: from phytosanitary institutes and centers, collaboration program from 2004

■ 66 students:

- 15 PhD students (4-year program and 5-year program, 1 student from Bangladesh of English education)
- 36 Master degree students (2-year program and 3-year program, 1 student from Bangladesh of English education)
- 15 undergraduates (1-year program, URP and script)

The Education and Research of PQIB



The phytosanitary education and research in CAU:
more practices in classroom, laboratory, field/port, and international platform.

The main courses

- **Plant Quarantine:** 32 hours, for undergraduates, required course of plant protection major, from 1980s.
- **Outline of Animal and Plant Quarantine:** 32 hours, for undergraduates, elective course, from 2001.
- **Treatment Technology of Plant Quarantine:** 32 hours, for undergraduates, elective course, from 2006.
- **Principles and Techniques of Plant Quarantine:** 48 hours, for postgraduates, elective course, from 2003.
- **Invasion Biology:** 32 hours, in English, for postgraduates, elective course, from 2011.
- **Professional English and Scientific Writing of Plant Quarantine and Agricultural Ecosystem Health:** 16 hours, for postgraduates, required course, from 2013.



More case studies of plant quarantine during courses:
The students from China, Pakistan, Bangladesh, Thailand, Malaysia, South Africa, Trinidad and Tobago, and Jamaica etc. .

The sub-directions of thesis and dissertation

- **Pest Risk Analysis:** quantitative assessment especially, techniques such as SOM, @Risk, CLIMEX/MaxEnt, ArcGIS etc.
- **Pests Identification:** molecular identification especially, techniques such as DNA Barcoding, PCR, Real-time PCR, Chip etc.
- **Pests Treatment:** environmentally friendly treatment especially, techniques such as fumigation, irradiation, heat and cold treatment etc.
- **Pests Invasion Mechanism:** invasive fruit flies and viruses especially, techniques such as genome, transcriptome, RNAi, informatics etc.



More training of advanced phytosanitary techniques:

Quantitative assessment training by Dr. Kriticos and Dr. Paini

(CSIRO, Australia) , **DNA barcoding training** by Dr. Norman Bar (USDA-APHIS-CPHIST, USA)

RESEARCH ARTICLE

Global Establishment Risk of Economically Important Fruit Fly Species (Tephritidae)

Yujia Qin¹, Dean R. Pain^{2*}, Cong Wang¹, Yan Fang¹, Zhihong Li^{1*}

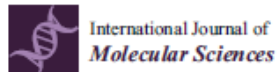
MOLECULAR ECOLOGY RESOURCES

Molecular Ecology Resources (2016)

doi: 10.1111/1755-0998.12542

A high-throughput detection method for invasive fruit fly (Diptera: Tephritidae) species based on microfluidic dynamic array

FAN JIANG,*† WEI FU,† ANTHONY R. CLARKE,‡ MARK KURT SCHUTZE,‡ AGUS SUSANTO,§ SHUIFANG ZHU† and ZHIHONG LI*



Article

Comparative Transcriptome Analyses Uncover Key Candidate Genes Mediating Flight Capacity in *Bactrocera dorsalis* (Hendel) and *Bactrocera correcta* (Bezzi) (Diptera: Tephritidae)

Shaokun Guo¹, Zihua Zhao, Lijun Liu, Zhihong Li^{*} and Jie Shen^{*}

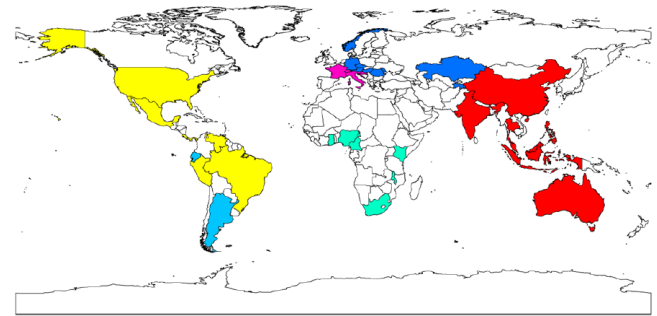
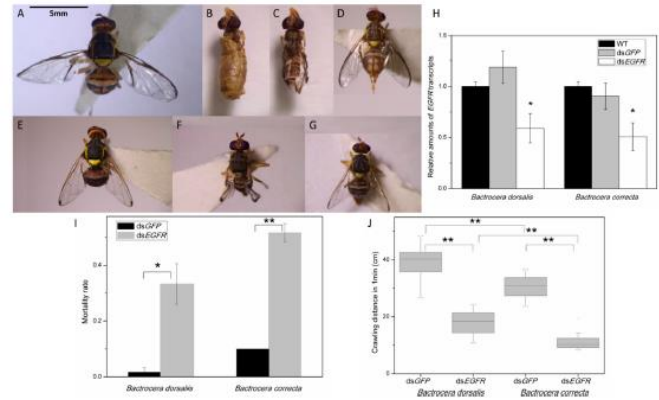
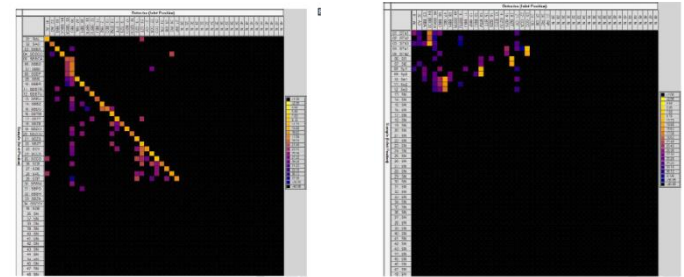


Figure 1. Countries clustering based on fruit fly species assemblages. Map of world showing those countries that were allocated to the same neuron in a SOM analysis (same colour) and hence those countries that have the most similar fruit fly species assemblages.

doi:10.1371/journal.pone.0116424.g001



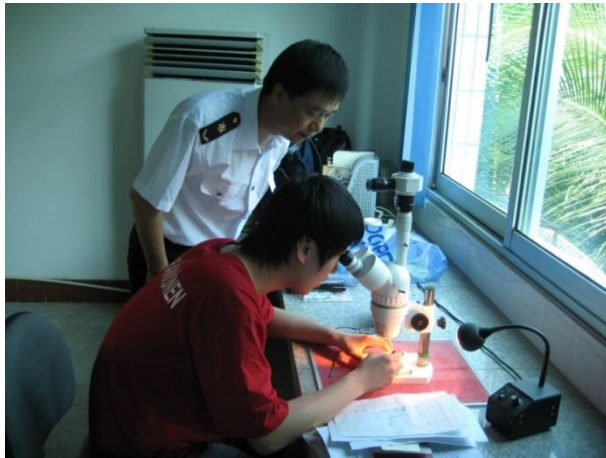
More training of scientific writing:

Script, thesis, dissertation, report, paper, and research proposal, in Chinese and English.



**More opportunities of international and national communication on
plant quarantine and invasion biology:
Academic meetings, joint-education abroad, and visiting scholars etc..**

The practices and services



More phytosanitary practices in field and ports

Guided by the quarantine officers and experts of MOA-NATESC and GACC etc.

- **Technical support in China:** PRA of import fruits and seeds, species identification of fruit flies, stored insect pests and virus etc..
- **Decision support in China:** plant quarantine measures and standards for GACC, MARA, etc..
- **International services:** ISPMs of IPPC, Member of International and regional steering committee of pests (e.g. TAAOSC), DNA Barcodes database of EIFF for Papua New Guinea 2018, Editors of international journals etc.



More international and national services of plant quarantine:
PRA, training, review, evaluation and workshop etc.

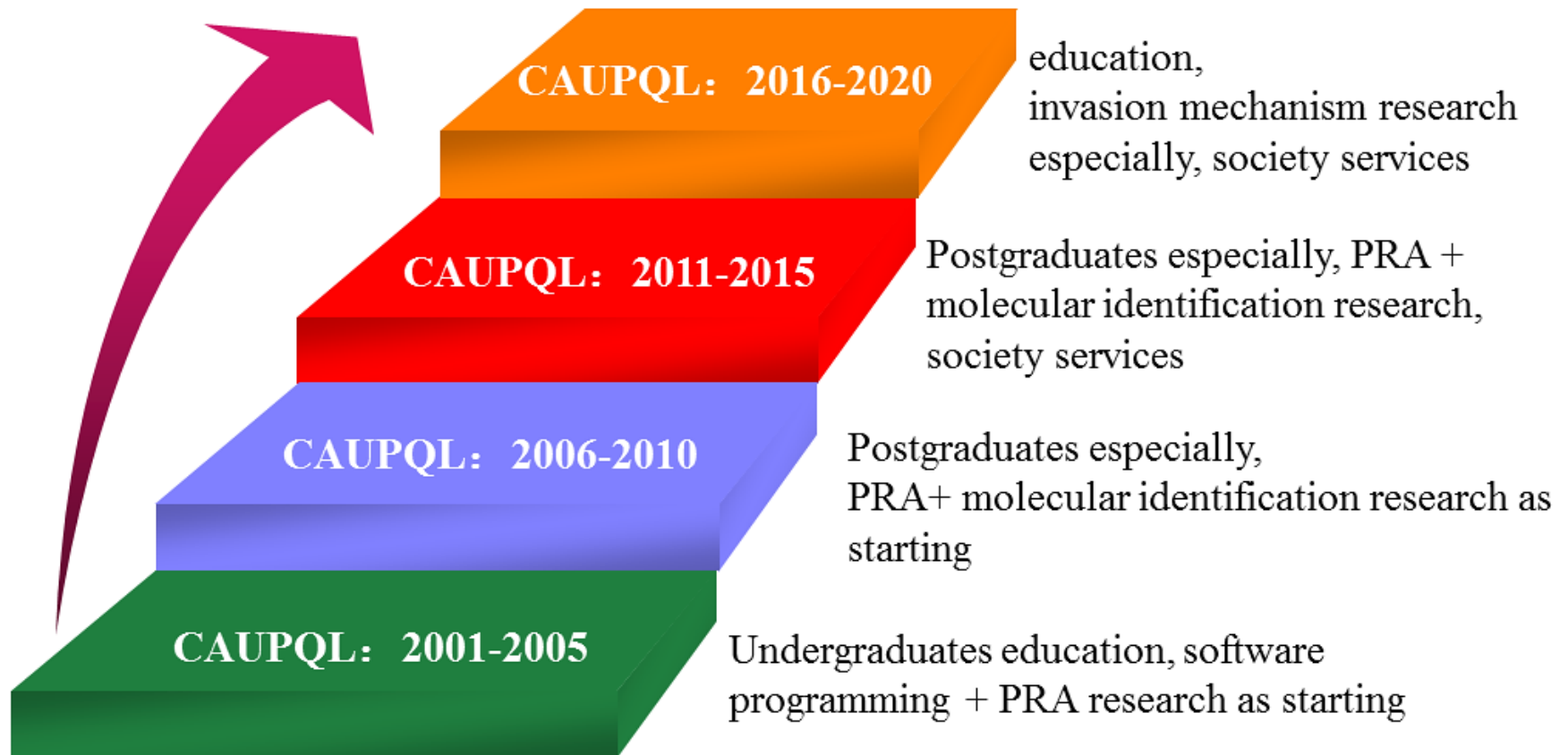
The Achievements of CAUPQL

- From 2001-2018: 78 Bachelors
- From 2005-2018: 67 Masters (including 5 international graduates)
- From 2007-2018: 23 PhDs (including 1 international graduate)



Most of the 168 graduates
are working in the fields of plant protection, especially for plant
quarantine and Invasion Biology.

Education and Research plan of 2016-2020



Main Development Steps of CAUPQL

To promote the international education program with more collaborations

■ Chinese-teaching program:

- Language: learning Chinese, 1 year
- Courses: 1 year
- Thesis/dissertation: 1-2 year/3 years
- Funds: CSC/Beijing and other scholarship + research program

■ English-teaching program

- Courses: 1 year
- Thesis/dissertation: 1-2 year/3 years
- Funds: CSC/Beijing and other scholarship + research program



International students from Thailand, South Africa and etc., guided by Chinese experts .

To promote the research programs with international collaborations

- **Pest Risk Analysis:** e.g., fruits + seeds, especially potential economic loss, ALOP and sampling basing on quantitative assessment models etc..
- **Phytosanitary Diagnosis & Treatment:** e.g., fruit flies + stored insect pests, especially the species complex and cryptic species basing on mitochondrial genome, and the alternative technologies of methyl bromide etc..
- **Pest Invasion Tracing and Invasion Mechanism:** e.g., *Bactrocera* sp., especially the invasion origin and pathway, the mechanism related with flight ability, temperature adaptation and symbiotic bacteria basing on stable isotope, simplified genome/re-sequence, transcriptome, RNAi, CRISPR/Cas9 etc..



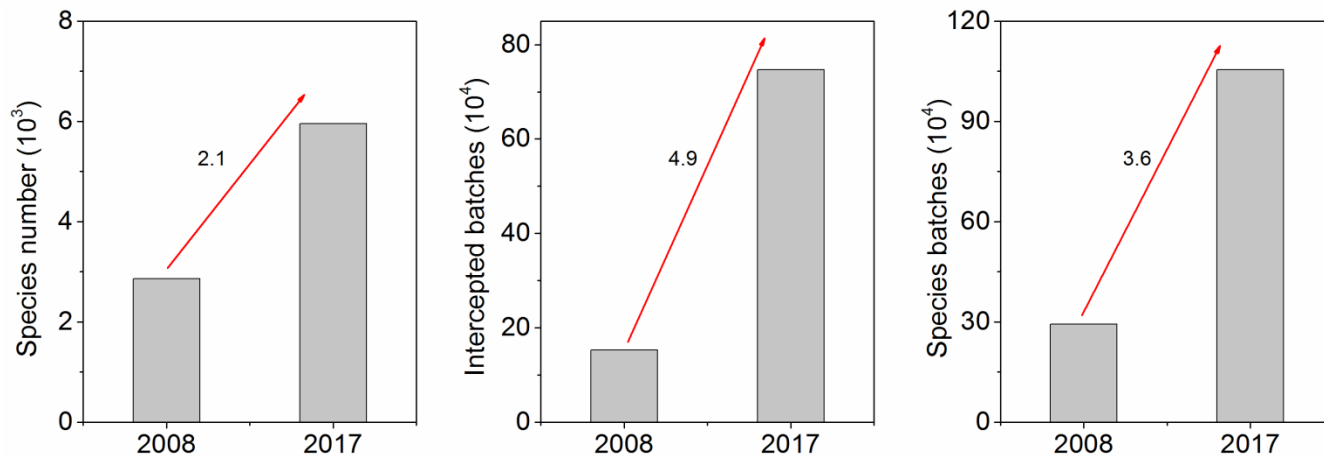
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III. The challenges, opportunities and prospects of phytosanitary education in China



The Challenges of Phytosanitary Education

- **Movement increasing:** especially the development of trade, tour and e-commerce. **For pests: So free trip!**
- **Global changing:** especially the development of climate change and nitrogen deposition. **For pests: So suitable environment!**
- **Pests evolving:** especially the development of invasive mechanism of pests. **For pests: So happy life!**



The increasing of pest intercepted data from import plants and products to China

The Opportunities of Phytosanitary Education

- **More attentions:** Public Education Day of National Safety from 2015, including plant quarantine and IAS management.
- **More supports:** National First-Class University and Top Discipline Programs from 2017, and National Key R&D Programs from 2016.
- **More platforms:** One Belt and One Road Initiative, e.g., Collaborative laboratory and center. FAO-China SSC program and IPPC 2020-2030, e.g., 4 packages, ISPMs, Third party entities etc..



The Public Education Day, Beijing, Apr. 2018



The FAO-China Workshop Roma, Nov. 2016

The Prospects of Phytosanitary Education

- **To strengthen the Four-in-One education system:** especially the **public education** and the **postgraduates education** as the basis of prevention and control of pests.
- **To establish the international platform of education and research:** especially the **international/regional collaborative center** of phytosanitary education and research.
- **To develop and share the education resources:** especially the **international remote education system/database** of plant quarantine.



species complex/cryptic species + molecular identification + invasion mechanism + ISPMs



International education system of plant quarantine

Outline

- The general situation of phytosanitary education system in China
- The practice of phytosanitary education in China: CAU as an example
- The challenges, opportunities and prospects of phytosanitary education in China

BEST WISHES FROM CAU!
LOOKING FORWARD TO MORE COLLABORATIONS
AND PROGRESS ON PHYTOSANITARY EDUCATION
AND RESEARCH!

