



China-CIMMYT Partnership: The Past, and the Future

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**China: providing sufficient food
for 1.3 billion people is always a big task ...**

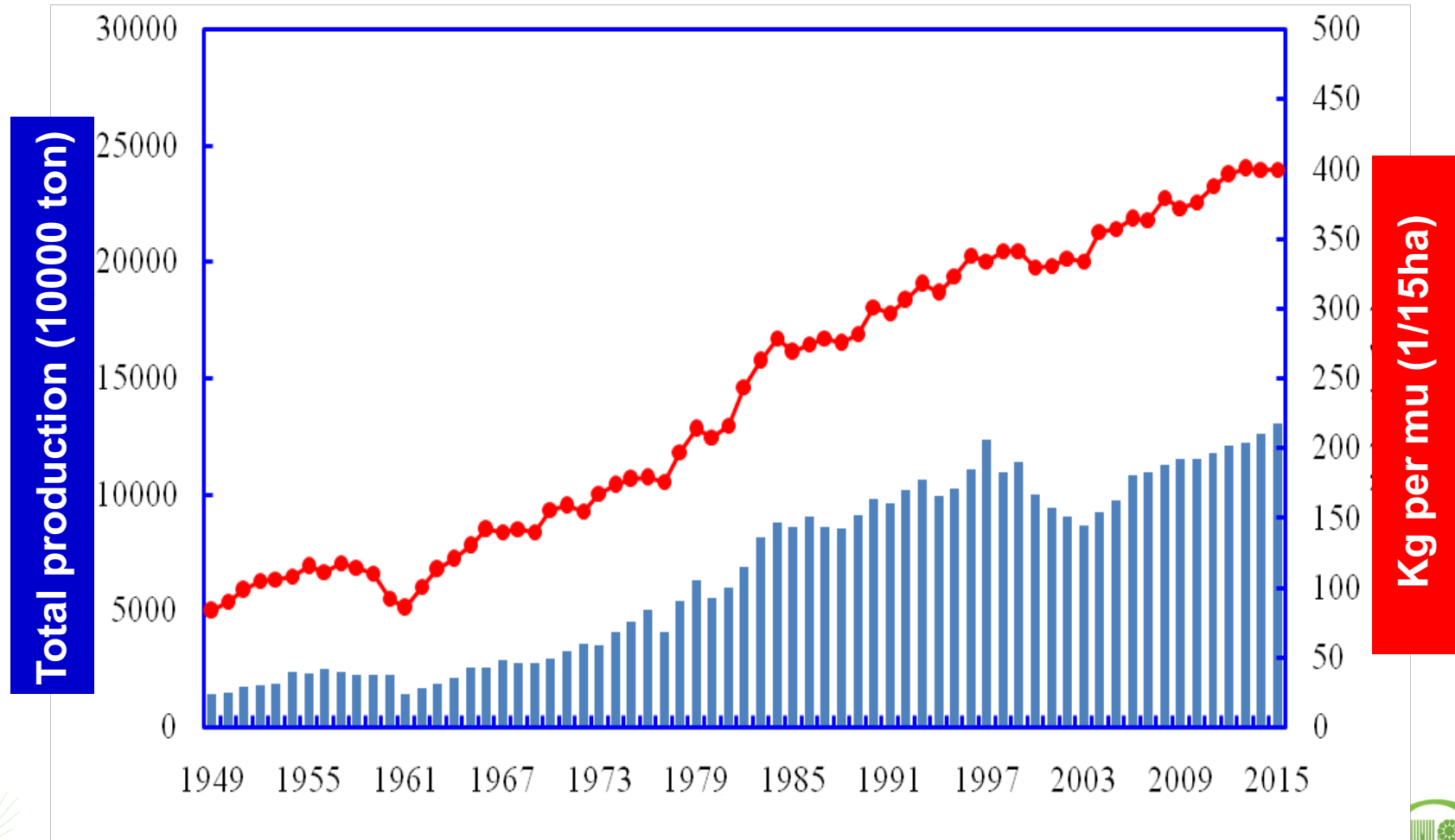


Major staple food crops in China

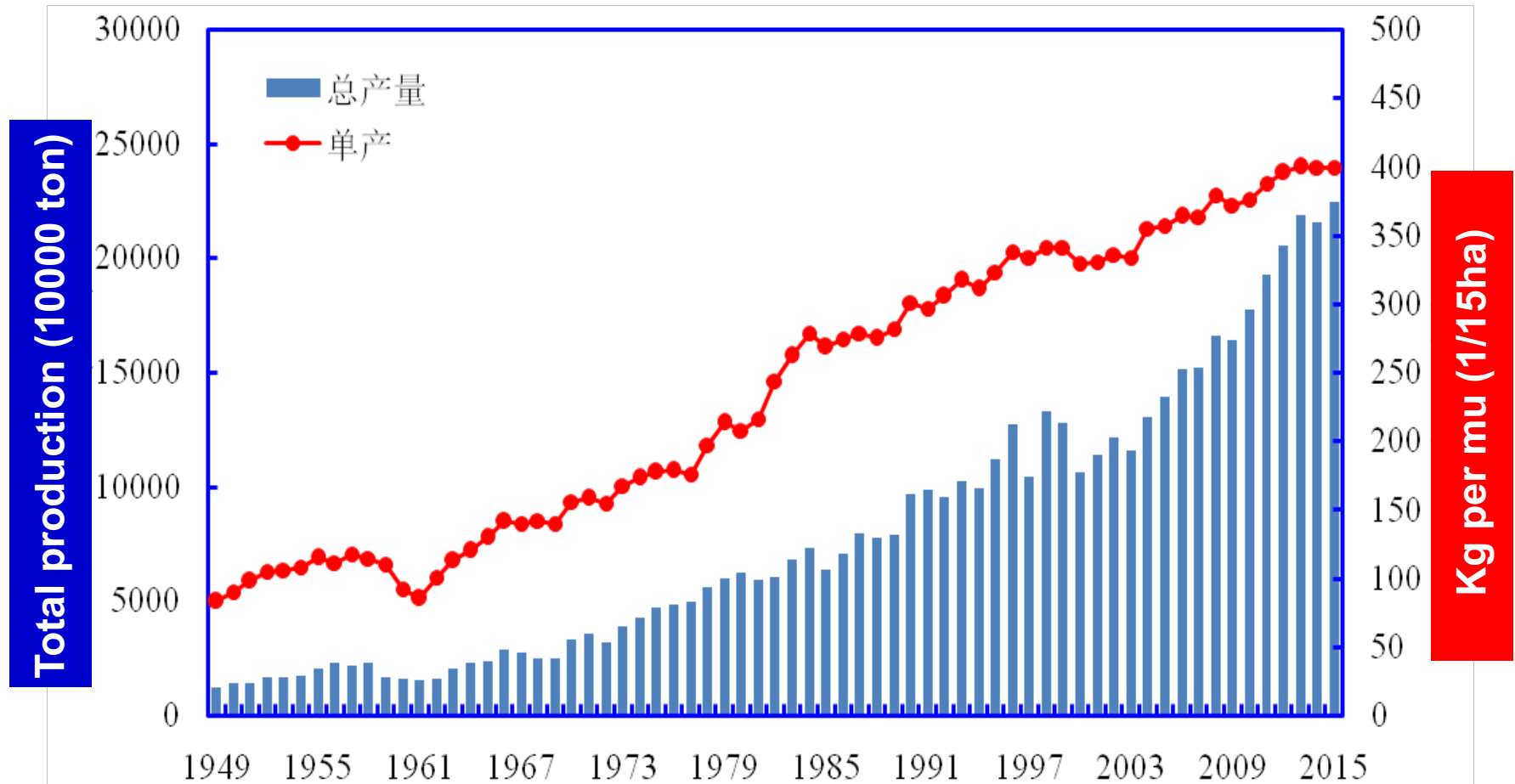
Crops	Area (Mha)	Yield (kg/ha)	Production (Mt)	% World
Maize	38	5891	224	23
Rice	30	6892	208	27
Wheat	24	5392	130	17

Data: 2015

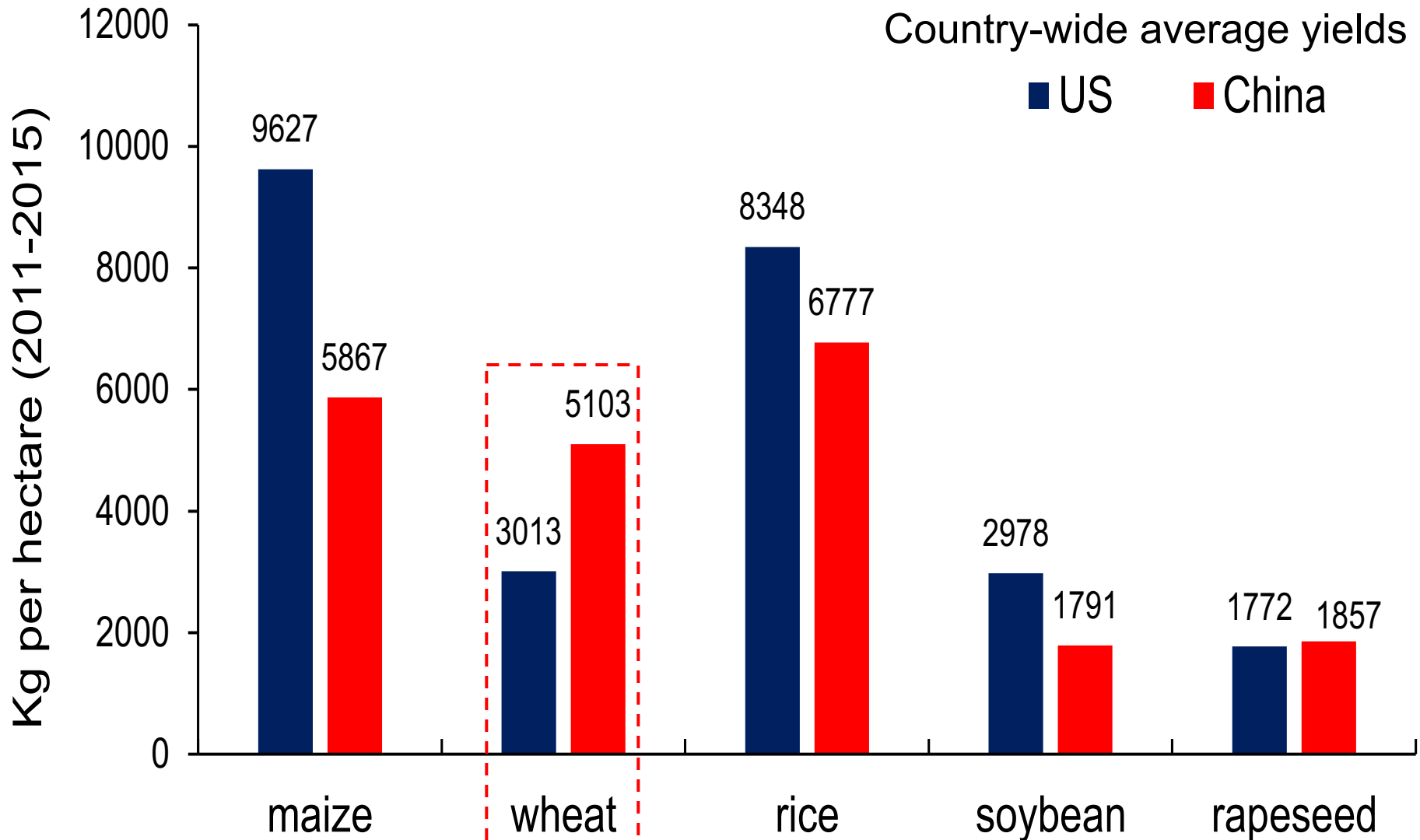
Wheat production in China in the last 65 years



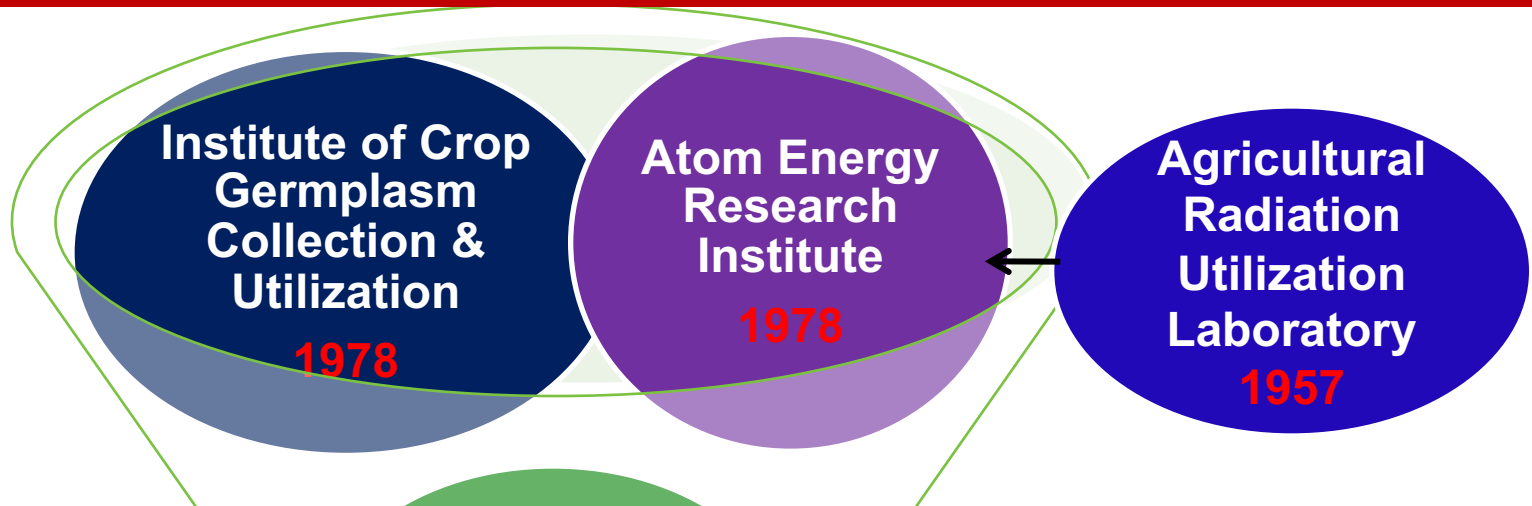
Maize production in China in the last 65 years



Comparison of crop yields between USA and China (2011-2015 average)



The history of Institute of Crop Sciences, CAAS (ICS-CAAS)



ICS-CAAS
2003



Core research areas in ICS-CAAS

Crop germplasm and utilization

Genomics and crop design

Crop genetics and breeding

Crop management



wheat



corn



soya



rice

700 researchers + 400 graduate students

National Crop Gene Bank hosted by ICS-CAAS



- 470,000 accessions in 350 crop species including staples, vegetables, fibers, and flowers
- 80% are from China
- 18,000 maize and wheat lines from CIMMYT
- 1000 lines donated to CIMMYT



High-profile articles published by ICS-CAAS in the last 5 years

Journal types	Journals	Papers
General (20)	Nature	2
	Nature Biotechnology	3
	Nature Genetics	3
	Nature Communications	3
	PLoS Genetics	1
	Developmental Cell	1
	PNAS	4
	Genes Development	1
	Nucleic Acids Research	2
	Plant & crop sciences (39)	Plant Cell
Plant Physiology		9
New Phytologists		9
Plant Journal		10
Genome Biology		1
Current Opinion Plant Biology		1

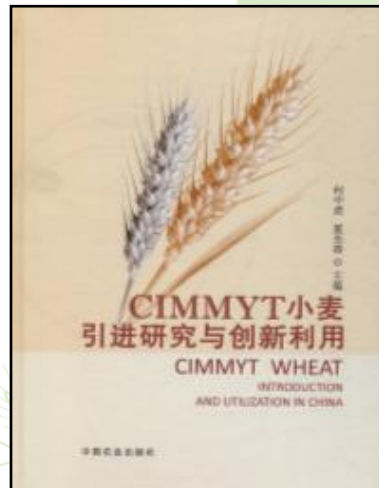
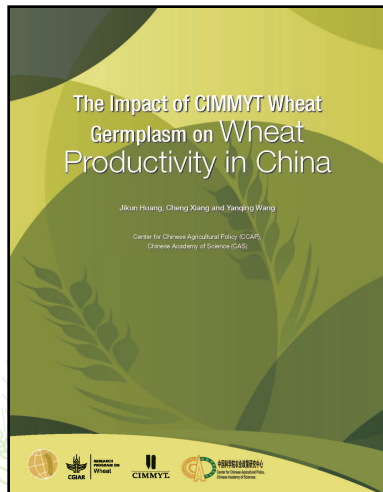
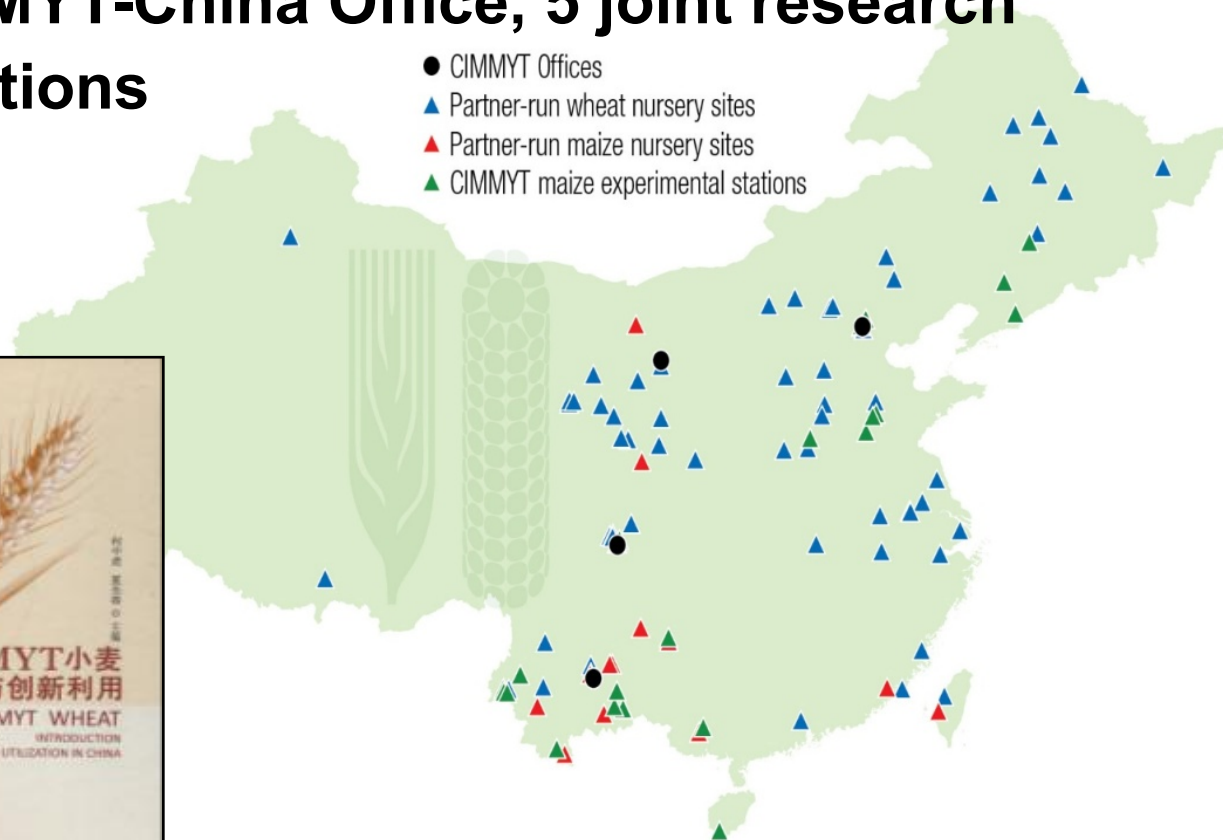
China-CIMMYT collaborations

1970-1985: purchase of commercial seeds from Mexico, and introduce new varieties

1986-1996: wheat/maize shuttle breeding and training

1997-present: CIMMYT-China Office, 5 joint research programs in 3 locations

- CIMMYT Offices
- ▲ Partner-run wheat nursery sites
- ▲ Partner-run maize nursery sites
- ▲ CIMMYT maize experimental stations



China-CIMMYT: **Maize**

- 5,000 accessions introduced to south China including Yunnan, Sichuan, Guizhou, and Guangxi
- 13 commercial subtropical hybrid varieties released have CIMMYT parents
- More than 1 million ha CIMMYT varieties grown in China

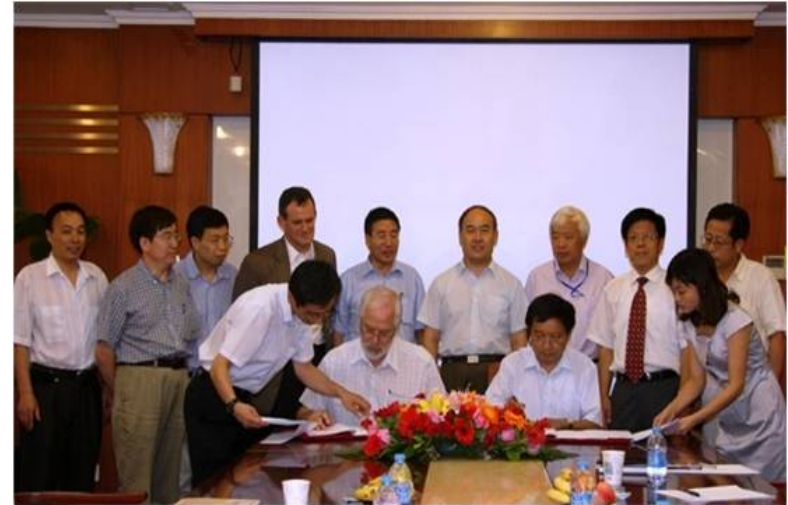


**Dan Jeffers and Fan Xinming
(Yunnan Academy of
Agricultural Sciences)**



CAAS-CIMMYT Joint Research Center for Applied Genomics and Molecular Breeding

- Procedures for marker-assisted breeding for abiotic stress tolerance in maize
- Application of breeding methods using high-density markers
- Gene discovery of candidate genes and genotyping



Yunbi Xu of ICS-CAAS
as a maize molecular
breeder, signed on Aug 6,
2010



Marker-assisted breeding for maize cultivar with high-oil content



Yunrui-8

High oil content and resistance to several major diseases



China-CIMMYT: **Wheat**

- **CAAS-CIMMYT wheat quality checking laboratory**
- **Quality testing for noodle and steamed bread**
- **60 trait-specific markers developed, used in 14 countries**



Trait-specific markers used in wheat breeding

Traits	# of loci	# of markers	# of alleles
Quality	18	58	72
Agronomic	11	25	21
Disease resistance	2	14	9
Total	31	97	102
CAAS-CIMMYT	18	40	48

Han6172: containing KAUZ from CIMMYT

a leading variety in yellow river and Huai Valley,
with a total area of 8 million ha



Two wheat varieties released from molecular marker program



ZM998

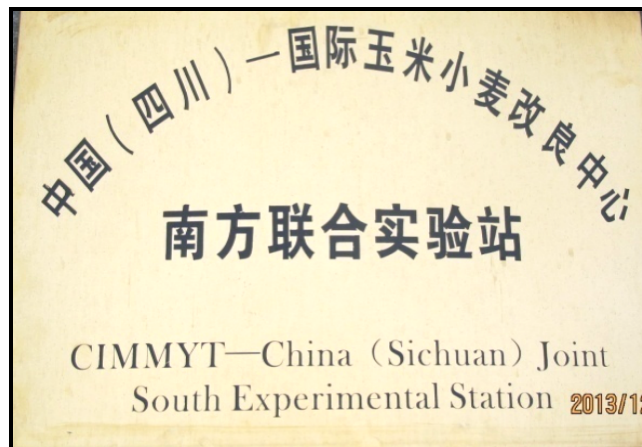


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Sichuan AAS-CIMMYT Joint South Experimental Station

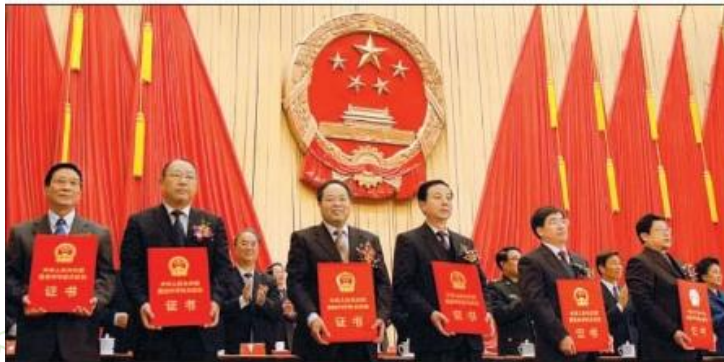
- Dr. Garry Rosewarne in Sichuan province (2011-2015)
- New wheat varieties Chuanmai 42 and its 25 progenies derived from synthetic hexaploid wheat



Contributions of CIMMYT to China are highly recognized by Chinese farmers and government



Friendship awards to CIMMYT scientists: Thomas Lumpkin, Sanjaya Rajaram, Hans Braun, Ravi Singh, S. K. Vasal, Carlos de León, José Luis Araus, Javier Peña



First-class award given by
State Council of China in
2008

China still needs CIMMYT

- Big challenges in producing more with less land and less input under climate change environment, China can not deal it alone
- China-CIMMYT partnership is a national strategy
- New germplasm, improved production technology, training, international network, and joint efforts in Africa
- China needs to increase its contributions to CIMMYT



Joint training next generation scientists

- CIMMYT training has played a crucial role in wheat and maize research in China, over 300 scientists in the past
- Future priority: breeding, crop management and physiology, and application of new technology
- Types: Joint PhD students and visiting scientists, conference
- Opportunities: 10 positions per year from China Scholarship Council
- Henan Agricultural University-CIMMYT joint maize and wheat innovation center

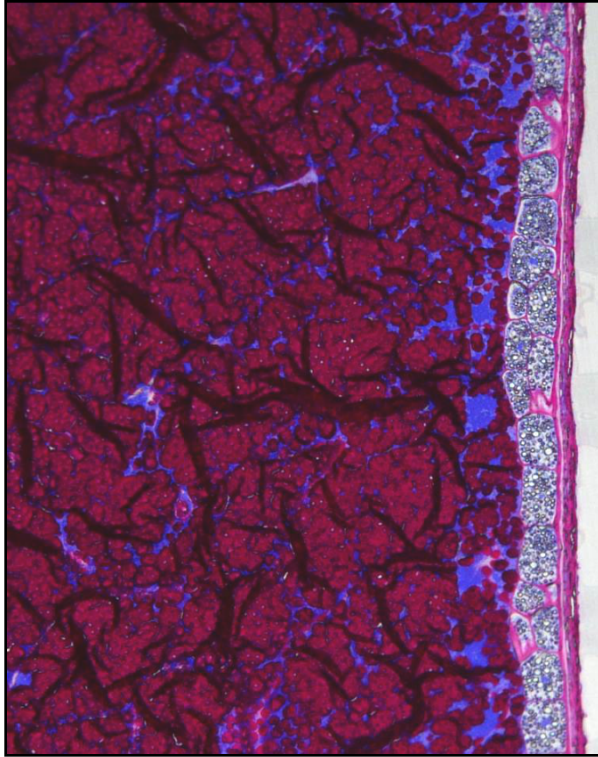


Priorities in coming 10 years

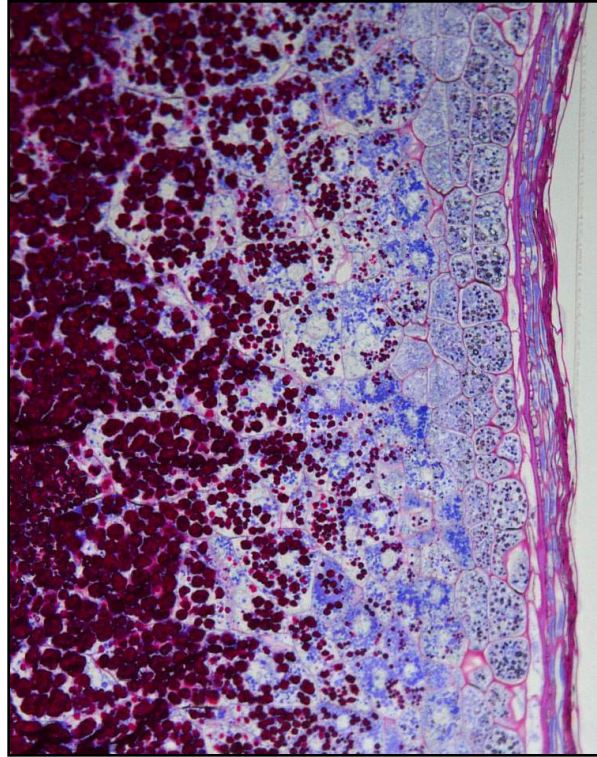
- HTP genotyping and field-based phenotyping facilities to support precision breeding
- Genes for high water- and nutrition-use **efficiency**, and **tolerance** to biotic and abiotic stresses
- Breeding target **from yield to quality traits** (nutrition, function and high-market value products)
- **Genome-editing** to support traditional breeding
- New-generation breeders well-trained in phenotyping, genomics, and large-scale data analyses
- Creation of **new traits** through mutagenesis



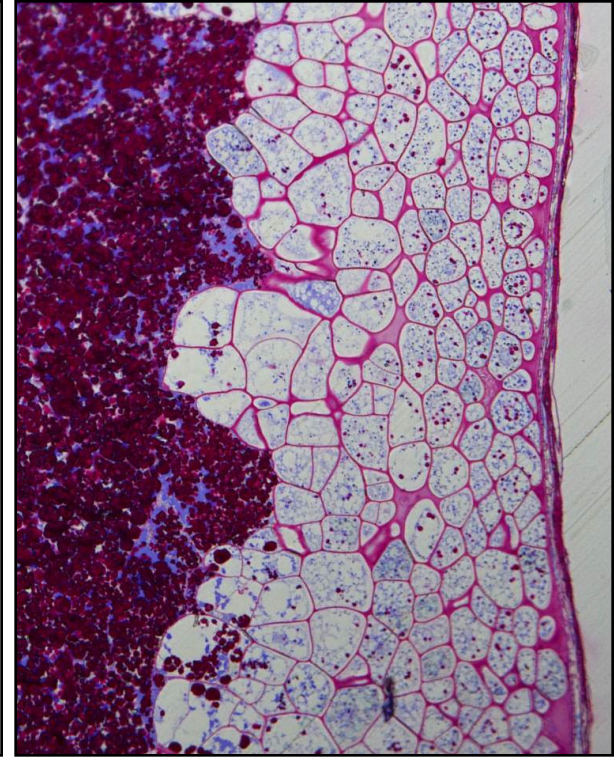
Thick aleurone lines identified from EMS mutagenesis



ZH11



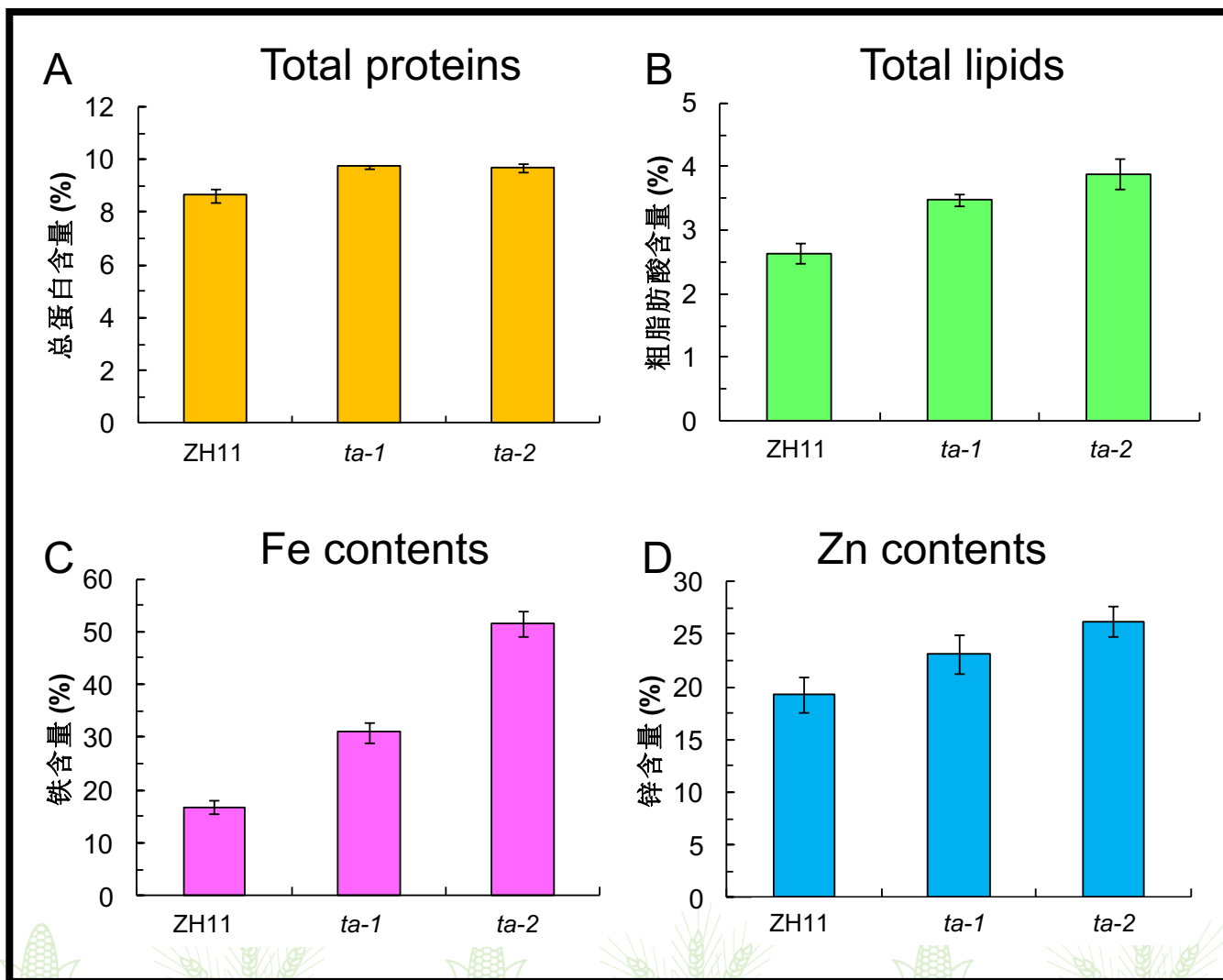
ta1



ta2



ta1 and *ta2* showed increased nutrition



Nutritional analyses of *ta2*, compared to normal whole meal rice

60% increase
in Vitamin B6
& B9



80% increase
antioxidants

20% increase in
Vitamin B3

30% increase in
fibre

Data from CSIRO



谢谢！
Gracias!

**Thank you
for your
interest!**

 **CIMMYT**^{MR}
International Maize and Wheat Improvement Center


1966-2016
CIMMYT