Center for Resources, Environment and Food Security (CREFS)  
China Agricultural University
1. Background

Chinese agriculture underwent astonishing development over the past three decades at high resource and environmental costs. Resource inefficiency, ecological and environmental pressure, and relatively low production capacity have restrained continuous agricultural development, and threatened food security and environmental sustainability in China. It is imperative to transform the current agricultural developmental model, maintain a steady increase in food production, meanwhile substantially improve resource use efficiency and protect ecological environment.

Scientists at China Agricultural University (CAU) have performed systematic research and pilot demonstration regarding agricultural resource utilization, ecological environment protection, and high crop yield. Many projects not only impose significant impact on international community, but also extensively promote agricultural development in China. To date, multi-disciplinary collaboration has become an increasingly important strategy worldwide for ensuring food security and protecting environment. Lancaster University in UK founded the largest Environment Center in Europe covering earth science, life sciences, resource utilization, ecological and environmental sciences, and so forth. In 2011, Lancaster University, CAU, and more than 10 other domestic and overseas partners initiated the International Food Security Alliance. University of Nebraska also established a special sector to promote sustainable agriculture development. To better lead national research in agricultural resource utilization, food security, and ecological environment protection, strengthen interdisciplinary innovation, and promote global strategic collaboration, the Center for Resources, Environment and Food Security (CREFS), CAU, was established in 2011.

2. Objectives

CREFS is devoted to agricultural science and technology innovation and development of domestic and international strategic collaboration. Its long term goal is to implement top-level research programs, explore novel solutions to agricultural problems and challenges, and pave the way for intensive sustainable agriculture in China. The center also aims to nurture smallholder-based modern agricultural developmental model, establish global food security research alliance, and provide strategic support for global food and environment security.

3. Organization and personnel

- Director: Prof. Fusuo Zhang
- Deputy Director: Prof. Rongfeng Jiang, Prof. Xinping Chen, Prof. Jianbo Shen

4. Scientific and technological innovation and demonstration

CREFS integrates research, innovation, and demonstration: 1) tackles challenging agricultural problems using worldwide cutting-edge theories and techniques, and finds out problem-solving
strategies or technical solutions; 2) builds up a nationwide demonstration network to facilitate technology extension, and substantially advances high yield and high efficiency agriculture in China.

➢ Four scientific and technological innovation and demonstration bases
The research center is based on four major scientific and technological innovation and demonstration bases from North China to South China: 1) the Quzhou base in Hebei province represents a smallholder farming system; 2) the Lishu base in Jilin is a medium-scale maize production system; 3) the Jiansanjing base in Heilongjiang is a large-scale rice farming system; 4) the Xuwen base in Guangdong is featured by tropical high value cash crops. These bases well represent different developmental stages and scales of agricultural production in China (Fig. 1).

![Fig.1 Four major bases for scientific and technological innovation and demonstration](image)

➢ The national collaboration network
CREFS established a nationwide nutrient management network with financial support from the Ministry of Agriculture (Fig. 2) and is dedicated to promote R&D, efficient nutrient management, and large-scale soil testing and fertilizer recommendation via close collaboration with major fertilizer corporations (Fig. 3).
5. International cooperation networks

- International organization or alliance
  - Asia-Pacific Integrated Nutrient Management (APINM), FAO
  - Global Partnership for Nutrient Management (GPNM), UNEP
International Food Security Alliance (IFSA)

6. National and international projects

- Mechanisms of high-yielding cultivation and efficient resource utilization in major crop production systems (973 Project, National Basic Research Program of China)
- Rhizospheric process of efficient phosphorus utilization in crop production and its regulatory mechanisms (the Key Project of Natural Science Foundation of China)
- Integration and application of best nutrient management technologies (Special Fund for Agro-scientific Research in the Public Interest, Ministry of Agriculture)
- Rhizospheric regulation of efficient nutrient utilization in crop production (the Innovative Group Grant of the National Natural Science Foundation of China)
- Comprehensive demonstrations of advanced agricultural machinery and technologies for efficient nutrient utilization in major crop production systems (948 Project, Ministry of Agriculture)
- Sustainable resource use in the North China Plain (DFG-MOE IRTG, Sino-German project)
- Innovative nitrogen management technologies to improve agricultural production and environmental protection in intensive Chinese agriculture (BMBF-MOST, Sino-German project)
- Recycling of organic residues from agricultural and municipal origin in China (BMBF-MOST, Sino-German project)
- Low Carbon agriculture (Sino-UK project)
- Agricultural sustainability and extension innovation: farmer field school (Sino-US project)
- National soil testing and fertilizer recommendation project (covering all 2,498 of agricultural
counties, Ministry of Agriculture)