CAU & COE
IN BRIEF

Lujia Han, PhD
Dean and Prof. of the College of Engineering
China Agricultural University (CAU)
OUTLINE

- About CAU & COE
- Research Priority
- Cooperation Opportunities
1. About CAU & COE

- History can be dated back to 1905, when the College of Agriculture was founded by the Qing Dynasty
- One of the top ranked key state universities in China
- A leading agricultural education and research institution in China
- Directly subordinated to the Ministry of Education
### West campus
- Agronomy
- Horticulture
- Plant Protection
- Animal Science and Technology
- Veterinary Medicine
- Biological Science
- Natural Resources and Environmental Sciences
- School of Continuing Education

### East campus
- Economics and Management
- Food Science and Nutrition Engineering
- Engineering
- Informatics and Electrical Engineering
- Water Conservancy and Civil Engineering
- Humanities and Development
- Natural Science
- International College of Beijing
Top ranked national key disciplines

- Agricultural Engineering
- Crop Science
- Plant Protection
- Agricultural Resources & Environment
- Animal Husbandry
- Veterinary Medicine
Top 1% of disciplines in the world by Essential Science Indicators (ESI)

- Agricultural Science
- Plant and Animal Science
- Biology and Biochemistry
- Environmental Science
- Chemistry
- Microbiology
- Engineering
## National Ranking: Agricultural Engineering

### 2010-2012

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<tr>
<th>Rank</th>
<th>University</th>
<th>Score</th>
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### National Ranking: Agricultural Engineering

#### 2007-2009

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http://www.chinadegrees.cn/xwyjysjyx/zlpj/xksppm/
Collaborative Education Program

- **2+2 Undergraduate Transfer Program**
  - Agricultural Engineering at CAU, China
  - ABE at Purdue University, USA
  - Dual BSc. Degree
Collaborative Education Program

CSC innovative talent international cooperation development project

- China-US 100 Environment & Energy PhD Program
  - COE, China Agricultural University
  - University of Tennessee/Oak Ridge National Lab

- Dual Masters Degree Program in Applied Mechatronic Engineering
  - COE, China Agricultural University
  - Harper Adams University, UK
Key Research Institution in COE

◆ Key Laboratory for *Soil-Machine-Plant Systematic Technology*, the Ministry of Agriculture;

◆ Key Laboratory of *Clean Production and Utilization of Renewable Energy*, the Ministry of Agriculture;

◆ *Conservation Tillage* Research Center, the Ministry of Agriculture;

◆ Scientific Observing and Experimental Station for *Arable Land Conservation* (North Hebei), the Ministry of Agriculture;

◆ National R&D Branch Center for *Agro-processing Equipment*, the Ministry of Agriculture;
Key Research Institution in COE

◆ Engineering Research Center for *Agricultural Equipment and Facilities*, the Ministry of Education;

◆ Key Laboratory for *Modern Agricultural Equipment Design*, the Beijing Municipality;

◆ *Agricultural Engineering Academy*, CAU;

◆ *Biomass Engineering* Center, CAU;

◆ Strategy Research Center for China *Agricultural Mechanization Development*, CAU
Practical Teaching Center in COE

- National Experimental Teaching Demonstrating Center for Mechanical and Agricultural Engineering, MoE
- National Virtual Experimental Teaching Center for Mechanical and Agricultural Engineering, MoE
- Beijing Practical Innovation Base for Engineering Majors, Beijing Municipality
- Mechanical Engineering Practical Training Center, CAU
- Innovation Center for Undergraduate Students, COE
Lab of Agro-material analysis
Lab of Soil-Machine-Plant System
Lab of Agricultural Machinery
Labs of Vehicle Engineering
Lab of Flexible Manufacturing System
Mechanical Engineering Training Center
2. Research Priority

Machine System & Agricultural Mechanization
- Soil-Machine-Plant System
- Development Strategy for Agricultural Mechanization
- Conservation Tillage
- Precision Farming

Agricultural Machinery
- Farm Machine
- Off-Road Vehicle
- Agricultural Robots and Intelligent Equipment
- Measurement and Control Technology for Agricultural Equipment
2. Research Priority

Digital Design & Virtual Reality
- Virtual Reality & Simulation
- Ergonomics Design
- Industrial Design

Agro Product Processing
- Drying Technology and Machinery
- Feed & Forage Processing
- Fruit and Vegetable Processing
- Nondestructive Detection and Machine Vision

Agricultural Biomass Engineering
- Biomass Material Properties Characterization
- Bio-processing for Value Added Products
- Biogas & Bio-based Energy
Conservation Tillage

--- Lead by Dr HW Li
Mechanized Maize Production -- Lead by Dr DX Zhang

Technical mode for Corn Harvesting

Key components design for a precision planter
Research contents:

- Design of visual navigation controller for Agricultural Machine
- Study on navigation line detection arithmetic: histogram fusion algorithm
- Obstacle recognition and interference sources identification

VISION AIDS TO NAVIGATION OF AGRICULTURAL MACHINE

Sensors and actuators of the navigation platform

Field navigation line detection results using rotation and projection arithmetic

-- Lead by Dr SM Wang
This monitoring software develops a geographic information system based on Lab Windows/DVI software platform. This software achieves the real-time location display of the engineering machinery on the electronic map. It can also inquire the information of engineering machinery.

Research contents:

- Remote Agricultural Machinery Data Logger
- Wireless sensors network
- Codeless Data Acquisition and Analysis Software

Lead by Dr SM Wang
Fruit Juice Processing – Lead by Prof. SY Zhang
Agricultural Robot – Lead by Prof. TZ Zhang & W Li
UMV in agriculture – Lead by Dr. YJ Zhen
Digital Design & Virtual Reality – Lead by Prof. ER Mao & ZH Song
Industry Design
—Lead by Dr S Liu
- Pulsed Combustion drying Technology

- Pulsed Vacuum Drying and Osmosis Technology

- Air Impingement Drying Technology

**Drying Technology**

-- Lead by Dr XD Liu, Dr ZJ Gao et al

- Drying model of agro-product based on pore network simulation
Straw processing for ruminant feed
Characterization of Biomass Feedstock

Representative straw samples
Representative manure samples

Research on agro-biomass properties

Research on analysis methods of agro-biomass properties

Chemical composition
Physical properties
Mechanical properties
Thermal properties
Proximate and ultimate analysis

Correlation analysis among agro-biomass properties

Research and development of agro-biomass properties database

Database of chemical composition
Database of physical properties
Database of mechanical properties
Database of thermal properties
Database of proximate and ultimate analysis

Construction of web-based database

Research on rapid analysis techniques for agro-biomass properties

- WJ Niu, LJ Han*, X Liu, GQ Huang, LJ Chen. Energy, 2016;
- XL Shen, GQ Huang, ZL Yang, LJ Han*. Applied Energy, 2015;
- C Cao, ZL Yang*, LJ Han. Cellulose, 2015;
Bio-behavior Modeling of Lignocelluloses

- Longjian Chen, Haiyan Zhang, Junbao Li, Minsheng Lu, Xiaomiao Guo, Lujia Han*. Bioresource Technology, 2015;
- Longjian Chen, Aiwei Li, Xueqing He, Lujia Han*. Carbohydrate Polymers, 2015;
- Longjian Chen, Lujia Han*, Ouarda Saib, Guoping Lian. Pharmaceutical research, 2015;
Composting of Agro-residues
Bio-refining for Value Added Products

**Biomass**

- Cellulose
- Lignin
- p-Coumaryl alcohol
- Coniferyl alcohol
- Sinapyl alcohol
- Hemicellulose

**Alcoholysis**

- Carbohydrate
  - Glucose
  - Ethyl glucoside
  - Ethyl fructoside
- Alcoholysis
- H^+ + MeOH

**Aromatic compound**

- Ethyl levulinate
- Ethyl formate
- 5-ethoxymethylfurfural

**Fuel & chemical**

- Levulinate
- Alkyl glucoside
- γ-Valerolactone
- Furfural
- p-Hydroxybenzoate

- Weihua Xiao, Ximing Zhang, Xue Wang, Wenjuan Niu, Lujia Han*. Bioresources, 2015;
- Weihua Xiao, Lujia Han*, Yanyan Zhao. Industrial Crops and Products, 2011.
NIR/IR/NIRM Detection and Assessment

- Xunpeng Jiang, Zengling Yang, Lujia Han*. *Analytical and Bioanalytical Chemistry*, 2014;
※H2020: Sustainable techno-economic solutions for the agricultural value chain, AgroCycle (WASTE-2015-two-stage, 690142)

※European Commission 7th Framework Project: Quality and Safety of Feeds and Food for Europe, QSAFFE (FP7-KBBE-2010-4, 265702)
International Collaboration Project

※Unilever R&D in Colwoth UK
Measurement and modelling study for transdermal delivery (2005-)

※ Walloon Agricultural Research Centre (Belgium)
International S & T Cooperation Program
— Optical and Spectroscopy Methods for Detecting and Quantifying the Different Animal Protein Materials in Feeding stuffs (2010DFA34540)
— Detection of Contaminants and Additives in Animal Feed Using Multi-information Fusion and Multi-detection NIRM plus Imaging techniques (2015DFG32170)
International Collaboration Project

※ International Proficiency Test - Microscopy Method for MBM Detection
IAG/RIKILT-Institute of Food Safety Wageningen UR (2011-2015)

※ International Proficiency Test - NIRM Method for MBM Detection
EURL-FA/Institute for Reference Materials and Measurements (IRMM), Joint Research Centre (JRC) (2009)
3. Cooperation Opportunities

- Government scholarship students
- Campus study tours
- Hosting workshops
- Hosting training courses
- Personnel exchanges
- ……
COE Academic Program

Post-Doctoral Program
- Agricultural Engineering
- Mechanical Engineering

Ph. D. and MSc. Degree Program
- Agricultural Engineering
- Agricultural Mechanization Engineering
- Agricultural Biological System Engineering
- Processing and Storage of Agricultural Products
- Vehicle Engineering
- Mechatronic Engineering
- Mechanical Manufacture and Automation
- Mechanical Design and Theory

Master of Engineering Program
- Agricultural Engineering
- Mechanical Engineering
- Vehicle Engineering
- Project Management Engineering
- Industrial Design Engineering

Master of Agriculture Program
- Agricultural Mechanization

BSc. Program
- Agricultural Engineering
- Agricultural Mechanization and Automation
- Vehicle Engineering
- Mechatronic Engineering
- Machine Manufacturing & Automation
- Industrial Design
Thank you very much for your attention!