

3.3 Cooperation project University of Bonn and CAU

Duration of project:

The cooperation between Institut für Landtechnik der Universität Bonn and China Agricultural University (CAU) at Beijing started in 2001 on basis of a DAAD scholarship granted to Prof. Yurui Sun, CAU/College of Information and Electrical Engineering and keeps on to 2014

- Budget:**
- DAAD Exchange scholarships ca 60 000 €, 2003-2012
 - BML/BLE Exchange travel support 30 000 €, 2008-2012
 - DFG Project ca 60 000 €, 2009-2012

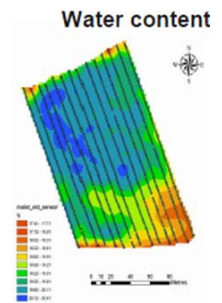
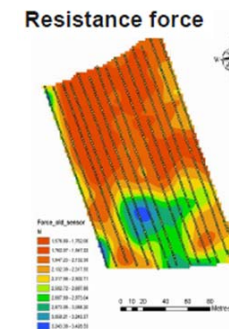
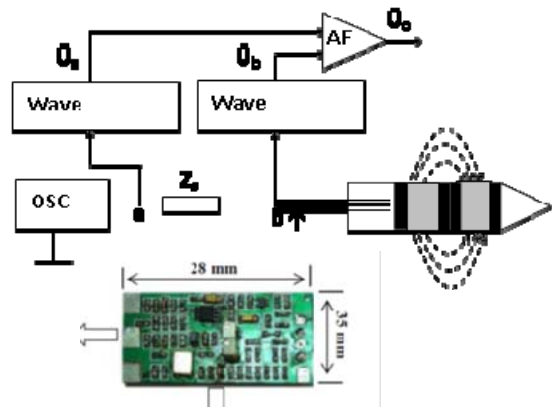


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Research Topic: Sensing of soil conditions with impedance probe for in situ measurement of soil water content combined with a penetrometer for sensing soil resistance

Objectives: Sensor development for precision farming for mapping of soil water content in field scale

Impedance sensor embedded in a penetrometer tip: circuit diagram and board, application of the sensor in the field and mapping of soil water content and soil mechanical resistance



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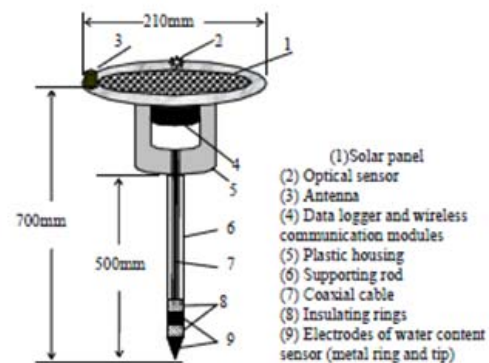
Research Topic: Sensing of soil conditions with impedance probe in a wireless sensor net for soil water content and extension of the sensor principle to detect water content of living plants

Objectives: Long term monitoring of soil water content in field scale and sensor development for monitoring of water stress for herbaceous crop plants

Prof. Yurui Sun with one of his PHD students working in a glasshouse of INRES on sensing of waterstress of herbaceous plants, 2013



Probe for monitoring of soil water content in a sugarbeet field using wireless a sensor net for data transmission

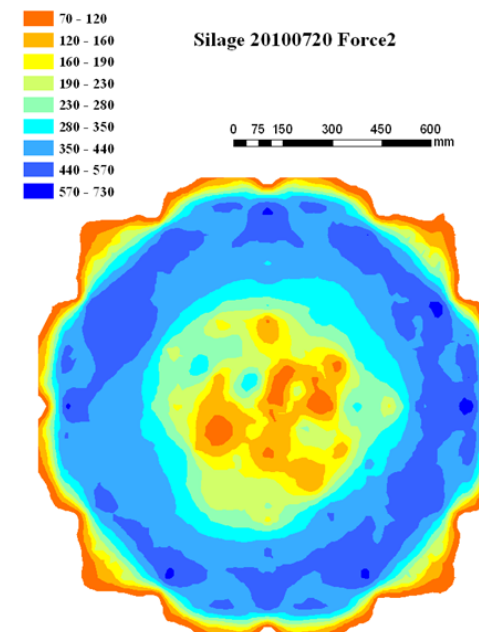


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Research Topic: Sensing of ruminant feedstock quality, silage bales from grass and maize

Objectives: Detection of bale density and 3D visualization

Using a penetrometer as experimental device for detection of density distribution in forage bales as quality indicator of fermentation

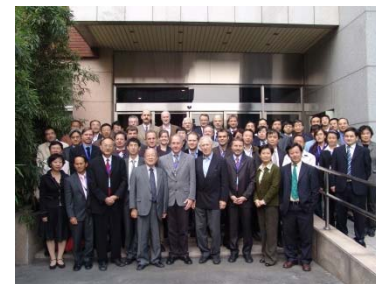


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Participating students: Chinese students of CAU who graduated as a PhD degree within the cooperation:

- Dr. Ma Daokun: Combined methods for on-the-go measurement of soil water content, strength and electrical conductivity, June 2006
- Dr. Lin Jianhau: Coupling model of soil compaction and water content based on combined measurement method, June 2007
- Dr. Zeng Qingmeng: On-the-go combined measurement method improvement and interpretation for soil moisture content, electrical conductivity and mechanical resistance, June 2009
- Dr. Wang Congying: Study on the theory and method of time domain reflectometry for soil dielectric characteristics measurement, June 2011
- Dr. Meng Fenjia: Study on precision measuring and devices for bale silage density, June 2012
- Dr. Cai Xiang: Study for plant wilting identification at leaf-scale based on 3D machine vision, June 2013
- Dr. Cheng Wenxi: Innovation of fringe field dielectric sensing for soil-plant water dynamics observation, June 2013

Prof. Sun with three of his PhD students 2013 in Beijing, PhD defense of Cai Xiang at CAU 2013, and participants of DFG-NFSC symposium in Beijing, 2009



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Strengths of project/programme:

- The cooperation has been mutual supported by
 - DFG and National Science Foundation of China (NFSC)
 - DAAD and China Scholarship Council (CSC)
 - Ministry of Agriculture German and Chinese side
- Cooperation with industry: Claas company since 2010
- 50 publications are outcome of the cooperation together with other departments of the university of Bonn (Institut für Nutzpflanzen und Ressourcenschutz, INRES) und der CAU Kiel Institut für Landwirtschaftliche Verfahrenstechnik
- Both research groups have complementary competences and successfully cooperated in electronic based sensing in precision agriculture in the last decade



Application of impedance sensor in
a lysimeter in China, field
experiments on experimental farm
Frankenforst