**中荷AGD-CSC项目招生课题目录**

**Proposal List for AGD-CSC Students Call**

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| No. | Topic | Objective of project |
| 1 | Diversifying forage production systems: increasing productivity and resource use efficiency | Grasslands in China cover more than 40% of the total land area and play an important role in livestock farming (mainly focused on meat production) and environmental conservation. 90% of China’s grasslands are degraded because of overgrazing. At the same time, increases in income allow people to consume more meat. Thus, there is a huge gap between limited forage production capacity and increasing human demands of animal products. Closing this gap requires research on production of forage crops, management of grasslands and on efficient use of fodders.  This project will develop sustainable forage systems in agricultural land and grassland with the aim of simultaneously improving forage productivity and increasing the efficiency with which resources are used. This project will consist of two sub-projects: 1) increasing forage productivity and resource use efficiency by introducing functional species and enhancing species complementarity; 2) restoring grassland productivity by re-introducing legumes. The first project wil be carried out by a 1+3 PhD candidate.    \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_  Objectives and work plan for the 1+3 PhD candidate  The 1+3 PhD candidate will work on cultural practices improving the productivity of (arable) forage crops and methods to enhance the efficiency of the forage use. Forage species have unique characteristics to perform ecosystem services that have been largely overlooked in the current agricultural systems: feeds for animal nutritional requirements, soil nutrient cycling, carbon sequestration, etc. We will study the production of high quality forage in intercropping systems of alfalfa and forage maize. Alfalfa is a high-quality perennial C3 forage species which can improve N provision and rooting depth of the swards. Intercropping alfalfa with the annual forage C4 species maize will improve the water use efficiency, especially during the summer.  Work plan of the PhD student is scheduled as below：   1st year in China: (1) write and submit the PhD proposal; (2) design and conduct 1st experiment in agricultural land to identify the productivity and radiation use efficiency (RUE) of different mixtures of alfalfa and maize to obtain significant benefits. This experiment will be performed under two different irrigation levels (200 and 400 mm) and three N fertilization levels (0, 50, 100 kg N ha-1). Aboveground biomass for each growth period, rooting depth during the period of maximum growth, forage quality, biological nitrogen fixation, and sap pressure (plant water potential) will be measured.   2nd year in the Netherlands with several visits to China. (1) summarize results and write up papers. (2) design and conduct 2nd experiment by diversifying forage system in a relatively long-term (3 years) in Quzhou county including sowing either alfalfa, maize alone, alfalfa/maize intercropping, and alfalfa/maize rotation and compare them with typical wheat-maize rotation system. Aboveground biomass for each growth period, rooting depth during the period of maximum growth, forage quality, and biological nitrogen fixation will be measured.   3nd year in Netherlands with several visits to China. Model analysis of field data.  4th year in Netherlands. Model analysis of field data. Write and defend PhD thesis at WUR. |
|  | **Supervisors:**  Prof. Paul Struik; Prof. Yingjun Zhang; Dr. Jingying Jing | **Preferred background**: An MSc in Agronomy or Grassland science  **Essential skills and competencies**: experimental design and data analysis; botanical analysis; yield assessments; laboratory skills, including chemical analyses; writing; good oral and written communication in English |
| 2 | The pig toilet as solution for animal welfare and environmental-friendly pig production | The overall aim of this project is to achieve fundamental knowledge and  practically applicable breakthroughs that can substantially contribute to more  sustainable pig husbandry and pork production in China and the Netherlands.  Here, ‘sustainable’ means: 1) recycling minerals (N, P, K) in the manure–crop–  feed / food residues cycle ; 2) low emissions of ammonia, odorous compounds,  greenhouse gases, and dust; 3) a healthy housing environment for pigs and  farmer, with low concentrations of aerial pollutants, including pathogens; 4)  welfare friendly, with enough space, bedding and rooting material for the pigs,  and an outside yard (possibly covered); and 5) economically viable production. |
|  | **Supervisors**: Prof. Dr. Peter Groot Koerkamp; Dr. Andre Aarnink; Prof. Baoming Li; Dr. Chaoyuan Wang | **Preferred background:**  **-** A master degree in engineering of biosystems engineering;  - Affinity with pig or animal production systems;  - Understanding of environmental impacts of livestock farming;  **The ideal candidate has the following skills and compentencies :**  Some basic knowledge of animals, animal behaviour and animal physiology;  Some understanding experience with measurement of aerial climate and gases;  Experience with design of farming systems;  Team player and good communicator, both orally and written; |
| 3 | Upscaling China's Science and Technology Backyards (STB) through modified technologies and policies | This project will investigate ways to strengthen and expand China's "Science and Technology Backyards" (STB) through policies (including economic incentive systems) and modified technologies (based on local conditions). Currently applied at the village level, the STB model has demonstrated considerable success in increasing crop yield with higher nutrient use efficiency, while also empowering smallholder farmers. After 10 years of experimentation and now with more than 100 STB villages across China, it is time to consider how to apply the lessons learned from the STB model beyond the village level. Working together with the 3+1 and 2+2 PhD candidates, we will develop ways to translate the lessons learned from STBs so far at the village level into policy and economic incentive systems operating at the county, provincial, and national levels. Depending on the PhD candidate’s interests, the project could focus on STBs within a specific area in China, a broad-based comparison across China, or an international analysis examining the potential to implement an STB model in other countries (e.g., Belt and Road African countries). |
|  | **Supervisors**: Dr. Annah Zhu; Dr. Xueqin Zhu; Prof. Peter Oosterveer; Dr. Xiaoqiang Jiao | **Preferred background**: The candidate will have a background in the social sciences (sociology, geography, economics, policy, political science, or anthropology) and general knowledge of rural development and agriculture in China. Ideally, the candidate will also have experience doing research with small-holder farmers (interviewing/surveying) in rural areas across China. Prior familiarity and experience with STBs is also a plus. Candidates with international experience who are interested in analyzing the potential for the STB model to be transferred to other countries are also encouraged to apply.  **Essential skills and competencies**: Familiarity and experience with qualitative methods (including interviews, surveys, or ethnography), or mixed qualitative and quantitative methods. Knowledge of econometric analysis is a plus. |
| 4 | Intelligent monitoring and universal robotic harvester for Autonomous intercropping system | Scope: A selective harvesting robot in an intercropping field needs to be versatile in order to deal with the vast variety of appearance, geometrical and mechanical properties of plants and their produce. Moreover, the robot should not damage the crops and their delicate produce, thus should be safe in interaction with the environment. To this end, novel soft robotic gripping and harvesting solutions will be developed in this project. The soft nature allows the robots to adapt to their surroundings and to perform different tasks safely.  Methodology:  The research involves mathematical modelling, Finite Element Analysis, CAD design and fabrication techniques to design and build the soft actuators. Furthermore, Soft sensors will be embedded and novel control paradigms will be developed to control the soft tools. The robot will be experimentally validated in field experiments. |
|  | **Supervisors:** Prof.dr.ir. EJ van Henten; Dr. GW Kootstra; Dr.ir. DF van Apeldoorn; Dr.ir. A Leylavi Shoushtari; Dr.ir. HA Khan; Dr.ir. L Kooistra | **Required background of the PhD candidate**: PhD students with expertise in Control and Mechatronics and with interest in soft robotics are encouraged to apply. Preference will be given to students with strong background in mechanic/mechatronic engineering, robotic system design and experimentation, control systems, CAD design.  **Essential skills and competencies**  In addition, good communication skills (written and oral) are essential. |
| 5 | Developing sustainable breeding strategies for dairy cattle in China with emphasis on improved resilience | The main objective of this PhD-student who will spend 3 years at WU and 1 year at CAU is to develop  sustainable breeding strategies increasing efficiency and reducing environmental impact of dairy  production. The main objective is split into three sub objectives:  1. To develop a bio-economic model for Chinese Holstein cattle to determine the economic  breeding goal  2. To develop a model for Chinese Holstein cattle to determine the environmental impact and  determine an environmentally sustainable breeding goal  3. To develop sustainable genomic breeding strategies balancing selection on efficiency and  resilience minimizing environmental impact and maximizing farm profit |
|  | **Supervisors**: Dr Han Mulder; Prof. Imke, J.M. de Boer; Prof. Yachun Wang, Prof. Ying Yu | tbd |
| 6 | Improving nutrient cycling and social welfare in the crop and livestock systems | **Description**: The general objectives are to explore alternative management strategies from the life cycle perspectives, with the emphasis on the increased nutrient utilization and social welfare in the crop and livestock systems of China. The specific objectives are  1) to develop a life cycle assessment model used for the systematic analysis of feed production, livestock production, manure management and eco-environmental impacts at different scales;  2) to increase the understanding of economic performance and social welfare of the livestock systems;  3) to explore strategies to achieve multiple sustainable targets through optimizing analysis. |
|  | Supervisors: Prof Oene Oenema, dr Xueqin Zhu & dr Fan Li; Dr. Yong Hou | **Preferred background:** The candidate will have a background in environmental sciences with strong interests in economics or in economics with strong interests in environmental problems and circular economy, and general knowledge of rural development and agriculture in China.  **Essential skills and competencies:** (Mathematical) modelling, quantitative skills, knowledge of GAMS is a plus. |