

## **Project 2: PhD study in climate change mitigation through sustainable agriculture**

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### **Background**

Climate change is increasingly recognized as a critical challenge to ecosystems health, human well-being and the future development as underscored by the award of the Nobel Peace Prize 2007 to IPCC. Climate change often adds to existing stresses and increases the vulnerability of communities and agroecosystems in rural areas of developing countries (Leary et al. 2008). The effects of climate change are multiple and often subtle as they work through multiple mechanisms. It can thus be difficult to separate the mechanisms from the mechanisms that people have evolved over decades to cope with a variable and changeable climate. Thus the most important question is who is vulnerable to these changes.

Low-External-Input Sustainable Agriculture (LEISA) or Organic Farming (OF) may stabilise or enhance crop yields. As a consequence of the agronomic techniques behind LEISA and OF, soil fertility improves, which implies a carbon sequestration (Pretty et al. 2006). However, data are fragmented, based on meta-studies and to some degree anecdotal.

### **Partnership**

We consequently propose a PhD project that will be linked to an existing collaboration between two private Danish companies (NORDECO and Øllingegaard) and a Cambodian NGO (CEDAC) who supports 800 households in Eastern Cambodia to promote sustainable agriculture. CEDAC has an extensive evaluation and monitoring unit. NORDECO is a private, Danish consultancy company; Øllingegaard is a private Dairy Company. Associated with CEDAC is a national farmers' organisation (Farmer and Nature Network). The current PhD project will further bring into play Aarhus University with expertises in animal husbandry, University of Copenhagen with expertise in organic agriculture and soil fertility, as well as the Royal University of Phnom Penh with expertise in Cambodian agriculture. The consortium builds on existing partnerships in research as well as education.

### **Methods**

This inter-institutional, international, and cross-disciplinary consortium will build the PhD project on a number of up-to-date research methods that are relevant for the study and this particular context. These include (i) qualitative and quantitative assessments of the flows of nutrients and matter within a number of selected farms typical for the agroecological settings/farming system, (ii) novel use of tracers to study soil fertility and nutrient and carbon fluxes, and (iii) use of state-of-the-art dynamic soil-plant-atmosphere models (APSIM) which LIFE has a particular expertise in applying in tropical sustainability studies.

These methods are appropriate to investigate the main changes in carbon storage, productivity, and environmental impact induced by the promotion of agroforestry, intensive use of organic fertilisers, sustainable rice intensification systems, and improved integration of crops and animal husbandry.

### **Aims and deliverables**

Outcomes of the study will be a unique documentation of the potential of tropical sustainable agriculture to sequester carbon while reducing vulnerability to a changing climate for the farmers. A particular aim is to develop a carbon audit tool that can be used in similar settings.

### **On behalf of the consortium / Andreas de Neergaard**

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### **References**

Leary *et al.* (2008) *Climate Change and Vulnerability*. Earthscan, London.  
Pretty *et al.* (2006) *Environmental Science & Technology* 40: 1114-1119.