

## **PhD-project – “Increasing agrobiodiversity in Sudano-Sahelian cropping systems - Effect on ecosystem services and farm sustainability”**

This “sandwich” PhD project is part of the 3F2 (Feeding the soil and feeding the cow to feed the people) project funded by the McKnight foundation and is co-funded by the Initiative OneCG - Transformational Agroecology Across Food, Land and Water Systems. The PhD study will be implemented in Burkina Faso as a collaboration between CIRAD (Centre de Coopération Internationale en Recherche Agronomique pour le Développement), INERA (Institut de l’Environnement et de Recherches Agricoles), the farmer organization AMSP, and Wageningen University (WUR).

The PhD position will be hosted by the Plant Production Systems group at the WUR, with Prof. Dr. Katrien Descheemaeker as promotor, and Dr. Juliette Lairez (CIRAD - Ouagadougou), Dr. Eveline Compaoré (INERA - Ouagadougou), Dr. David Berre (CIRAD - Montpellier), and Dr. Danaë Rozendaal (WUR) as co-promotors.

### **Context**

Sudano-Sahelian West Africa is one of the poorest regions in the world and is characterized by semi-arid climatic conditions. The economy of this region is based on rainfed agriculture, with agro-sylvo-pastoral systems as the main source of farmers’ livelihood and food security. However, average yields of the main staple food crops, sorghum and pearl millet, have remained low ( $< 1 \text{ t ha}^{-1}$ ). In this environment, the traditional management of agroforestry parklands through tree, crop and livestock integration allowed sustainable agricultural production. This old equilibrium is now challenged by growing demographic pressure. The degradation of parklands and the reduction of fallow periods impact soil quality negatively (Bayala et al., 2015). An increase in feed demand due to the increased livestock population contributes to this degradation (Rahimi, 2021). The difficult equation to be solved is to ensure long-term soil fertility improvement, with emphasis on soil organic matter content (Bationo, 2007), concomitantly with a short-term production increase that farmers need, considering their labor constraints, risk aversion and low investment capacity. Enhancing biodiversity in cropping systems is a very promising approach toward agroecological intensification (AEI). Agrobiodiversity promotes higher, and more stable, crop yields (Dainese et al., 2019; Beillouin et al., 2021) and provision of a large range of ecosystem services (pest control, nutrient cycling, water regulation, carbon storage). It allows the diversification of products and income opportunities and contributes to improved food security and farming systems resilience (Thrupp, 2000). The agrobiodiversity can be increased through crop rotation, agroforestry, cover crops, cultivar or crop mixtures and intercropping. Most of these innovations were tested at plot scale in the 3F project in on-station and on-farm trials, along with an exploration of collective dynamics on biomass use. The new phase of this project will focus on the impact of agrobiodiversity on farmers’ income and their resilience to shocks, and on ecosystem services. The overall objective is to boost biomass production and quality so as to mitigate the tradeoffs between feeding the soil, feeding the cows and feeding the people and to contribute to an agroecological intensification of agro-sylvo-pastoral systems in Burkina Faso.

## **PhD project**

The main objective of the PhD will be to better understand multidimensional effects of increased agrobiodiversity, with a focus on criteria relevant to farm households and on key ecosystem services. The PhD will assess under which conditions and for which farm types, different systems with increased agrobiodiversity could (i) lead to win-win effects for several sustainability criteria (e.g., food security, income, resource conservation, gender equity, etc.), or (ii) generate trade-offs between sustainability criteria, especially between subsistence issues and long-term impacts.

A set of criteria and ecosystem services relevant for farmers will be identified, and the perceptions of different types of farmers on ecosystem services will be analyzed (including differences in perceptions between male and female farmers). A multi-criteria framework will be co-designed with local actors and effects of agrobiodiversity on the criteria and ecosystem services at farm and landscape level will be assessed. Evidence-based information will be produced on opportunities and constraints of increasing agrobiodiversity for a diversity of farmers. Innovative cropping systems that balance best the agro-ecosystem services with farmers constraints and goals will be co-created in a co-learning process between farmers, scientists and advisors.

## **We ask**

For this interdisciplinary project we look for an enthusiastic person with an appropriate MSc degree in agronomy, agroforestry, livestock science or agricultural economics with strong analytical skills and interest in participatory research with farmers and other stakeholders. Experience with experimental work and/or modelling is an advantage, and affinity with quantitative work will be indispensable.

The candidate should be able to combine broad system aspects with more detailed aspects of agricultural production systems.

Good communication skills and proficiency in English and French (both oral and written) are a prerequisite. Candidates from West African countries and women are highly encouraged to apply.

PhD candidates from non-Anglophone countries are required to submit an internationally recognised Certificate of Proficiency in the English Language (e.g., TOEFL, IELTS) with their CV. Note that this is an absolute requirement as candidates cannot be admitted to the PhD program at Wageningen University otherwise. This certificate is not a requirement for PhD candidates who have completed their higher education with English as the language of instruction.

Requirements are one of the following:

- TOEFL internet-based 90, with minimum sub-score 20 for speaking,
- IELTS 6.5, with minimum sub-score 6.0 for speaking,
- Cambridge Certificate of Advanced English (CAE) minimum grade B,
- Cambridge Certificate of Proficiency in English (CPE) any grade.

## **We offer**

A sandwich PhD study of four years, including an allowance (1300 €/month) for 18 months in Wageningen and a stipend (750 €/month) for 30 months in the country of field work. Health insurance will be covered for the whole four year period. Bench and University fees will also

be covered. As part of the sandwich PhD, you have to broaden your knowledge as specified in a Training and Supervision Plan (see [www.pe-rc.nl](http://www.pe-rc.nl) for further information), including refresher courses, advanced PhD courses, presentation of posters and talks at conferences.

### **Further information**

Information about the project can be found at the website: <https://www.ccrp.org/grants/3f/>

Information about the Plant Production Systems Group can be found at the website: <http://www.wageningenur.nl/en/Expertise-Services/Chair-groups/Plant-Sciences/Plant-Production-Systems-Group.htm>

### **How to apply**

You can apply until the 30th of August 2022. Please submit your application via email to **3f2phd\_position.pp@wur.nl**

The application should include the following:

1. A one-page motivation letter
2. Your curriculum vitae highlighting your academic training, work experience and list of publications
3. Scanned copies of academic diplomas (bachelor and master) and associated lists of marks/qualifications for courses followed
4. Your English proficiency certificate
5. Contact information for three references