Building Opportunity on Lesser-known Diversity in Edible Resources (BOLDER) of the Crop Trust

Opportunity Crops Scholarship

Call for applications for four PhD positions

Genetics Biotechnology and Seed Science Unit, Faculty of Agricultural Sciences, University of Abomey-Calavi & The Norwegian University of Life Sciences

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1- Background

One of the 17 Sustainable Development Goals is to attain zero hunger by 2030, but whether most of African countries are on track towards this ideal is questionable[1] . While the continent is projected to be the most populous one by 2099s a critical mass of its population is already food-insecure[2] , a situation that is being exacerbated by climate change and environmental degradations. Coping with these complex issues requires adopting an integrated approach of disrupting the overreliance on major commodity such as rice, maize, and wheat over opportunity crops (also called neglected and underutilized species). These species are nutrient-dense, hold the ability to help diversify both the agricultural and the food system and constitute a security net that filters pest and diseases-caused damages[3] . They can easily thrive in harsh conditions. However, the current organizational architecture of these species suggest they cannot compete with the so-called major crops because of several limitations including: the paucity of established data (e.g., production statistics, nutritional data), the poorly organized value chains (when they exist), and the low flow of knowledge, technology and products among the value chains actors, among others.

Building Opportunities for Lesser-known Diversity in Edible Resources' (BOLDER) project, an extended work package of the larger Biodiversity for Opportunity, Livelihoods and Development (BOLD) initiative is designed to promote opportunity crops in West African countries (Benin and Ghana) and East African countries (Uganda and Tanzania). BOLDER is a three-phases project dedicated to improving nutrition security in West and East Africa through the increased use and value of nutritious but currently underused, climate

1 Atukunda, P., Eide, W. B., Kardel, K. R., Iversen, P. O., & Westerberg, A. C. (2021). Unlocking the potential for achievement of the UN Sustainable Development Goal 2–'Zero Hunger'–in Africa: targets, strategies, synergies and challenges. Food & nutrition research, 65.

2 FAO, IFAD, UNICEF, WFP and WHO (2022) The State of Food Security and Nutrition in the World 2022. Repurposing food and agricultural policies to make healthy diets more affordable. Rome, FAO.

3 Imathiu, S. (2021). Neglected and underutilized cultivated crops with respect to indigenous African leafy vegetables for food and nutrition security. Journal of Food Security, 9(3), 115-125.

resilient and environment-friendly crops. It will work towards exhibiting the potential of four opportunity crops in each of the four target countries and operated through threes pillars namely: i) increasing the availability of the target opportunity crops diversity; ii) improving the production, marketing, and/or consumption of these opportunity crops, and iii) enhancing the capacity of researchers, practitioners, and food system actors to improve use and value of opportunity crops. Under this third pillar, a total of eight PhDs students (four in East Africa and four in West Africa) will be trained in Plant Science, Food Systems and Value Chain R4D. This activity is placed under the umbrella of the Genetics, Biotechnology and Seed Science Unit (GBioS) of the Faculty of Agricultural Sciences of the University of Abomey-Calavi (FSA-UAC) and the Norwegian University of Life Sciences (NMBU).

2- Objectives of this call

This call for applications is open to citizens of Benin and Ghana to fill four PhD positions: two in Plant Sciences and two in Food Systems.

All four PhD candidates will register at the University of Abomey-Calavi and will be supervised by a panel of scientists from the University of Abomey-Calavi, the University of Parakou, the Norwegian University of Life Sciences (NMBU), the Alliance of Bioversity International and CIAT, the West African Centre for Crop Improvement (WACCI), Department of Crop Science, University of Ghana, and World Vegetable Center. For each PhD student their supervisory committee will be set by the research team.

3- Expectations from the recruited PhD candidates

The Plant Science PhD candidates through their research will contribute to the BOLDER project **Output 1** on characterization of opportunity crops diversity and participatory evaluations using the TRICOT approach while the other two will contribute to the project **Output 2** activities in deepening our understanding of opportunity crops food systems and value chains. The four PhD candidates to be recruited are expected to work on the following indicative topics in Plant Science (two PhD candidates), and in Food Systems (two PhD candidates).

Plant Science Applicants

Two PhD research projects will focus on the genetic and low-cost phenotypic characterization of genebank and breeding materials for opportunity crops (stakeholders selected crops for Benin: *Corchorus olitorius, Vigna suubterranea, Synsepalum dulcificum, Digitaria exilis*; and for Ghana: *Solanum torvum, Adansonia digitata, Sesamum indicium, Amaranthus cruentus*. The aim is to identify information on the adaptive traits of opportunity crops, their nutritional value, and their suitability for different uses, such as food, feed, and fiber. The research will also focus on identifying unique genotypes and suitable breeding strategies for improving desirable traits. Another aspect of the PhD research will

involve conducting a performance evaluation of opportunity crops traits using the citizen science approach known as triadic comparisons of technology options (tricot). This approach applies an incomplete block design to assign randomized incomplete blocks of three technologies (out of larger number) to a large number of farmers from different gender and socioeconomic groups for on-farm assessment in diverse agro-ecologies. Combining this approach with digital tools makes it possible to obtain insights for both local adaptation and a scale of reach compared to earlier participatory plant breeding/ variety selection approaches. This approach has shown promising results recently and it is at scale in West Africa. The planned PhD research and training will be critical in building local capacity for demand-led breeding and evaluation of opportunity crops using data science at a low cost in West Africa. The goal is to improve the identification and selection of opportunity crops varieties with desirable traits, ultimately leading to the mainstreaming of NUS in sustainable food systems in Africa. Students may focus on: **1)** modelling the genetic bases of micro-nutrients contents in jute mallow for superior cultivars development through GWAS-GS. This study will combine genomics research and on-farm tricot, and provide evidence on how this approach can lead a demand-driven breeding of different NUS, accelerate trait discovery for climate adaptation, strengthen seed systems, increase adoption of NUS, and create links to value chain or **2)** modelling the genetic bases of yield and nutrient content in Amaranthus for elite cultivar development through GWAS-GS. The suitable candidate is expected to combine genomics research and on-farm tricot, and provide evidence on how this approach can lead to a demand-driven breeding of different opportunity crops, accelerate trait discovery for climate adaptation, strengthen seed systems, increase adoption of opportunity crops, and create links to value chains.

Food Systems Applicants

The two PhD research projects in Food Systems will focus on two main areas and the selected species for the two countries. The first area will be the opportunity crops value chain and marketing. Specifically, the study will explore bottlenecks, inefficiencies, and opportunities in opportunity crops production, processing, distribution, and consumption. The research will also analyze the demand for opportunity crops products, the preferences and behaviors of consumers, and the most effective marketing strategies for promoting opportunity crops in food systems.

The second area of focus in Food Systems will be the nexus between traditional knowledge on the cultivation and consumption of opportunity crops (local food culture) and the broader political and economic factors affecting the development and promotion of opportunity crops in inclusive and equitable food systems. This project will examine the interconnection between the cultural practices of local communities regarding the cultivation and consumption of opportunity crops and the larger economic and political systems that shape the food systems in which these communities operate. On the one hand, local food cultures have evolved over generations and reflect the specific

ecological, social, and cultural contexts in which they are situated. This traditional knowledge often includes the cultivation practices, processing methods, and culinary traditions associated with opportunity crops. Such traditional knowledge is important for understanding opportunity crops nutritional, cultural, and economic significance and how they can be integrated into sustainable food systems. On the other hand, the broader political and economic factors affecting the development and promotion of opportunity crops in inclusive and equitable food systems include government policies, global trade agreements, corporate influence, and consumer preferences. These factors can create barriers to the promotion and development of opportunity crops, which can impact the livelihoods of smallholder farmers and the availability of diverse and nutritious foods for local communities. By understanding these factors, the research will aim to identify opportunities to promote the development and promotion of opportunity crops in inclusive and equitable food systems in Africa.

4- Scholarship: financial support and duration

The scholarship includes subsistence allowances, contribution to research costs, insurance cost, contribution to conference attendance cost and cost related to the participation in BOLDER-organized training relevant to the various PhD topics. The PhD candidate will also benefit from a three-months mobility (only once) to conduct parts of his/her research at NBMU. The return ticket for this series of mobility will be entirely covered by the project.

a) The PhD duration is 36 months.
b) PhD students will receive a monthly stipend of 750 Euros (when in Benin) and 1,500 Euros when in Norway. This amount includes the settling allowance.
c) Additional benefits are available on a case by case basis.

5- Eligibility

Applicants should have an academic background in fields such as agronomy, plant breeding, agricultural economics, nutrition and food ethnography, food technology, or other relevant disciplines. Additionally, candidates must be proficient in English and meet the following criteria at the time of their scholarship application:

a) **be a citizen of Benin or Ghana;**
b) **hold a MSc degree in plant sciences, plant breeding, food system, value chain or related-disciplines;**
c) not currently enrolled in another PhD program;
d) being bilingual in English and French is a comparative advantage;
e) students in Plant Science will be assessed on their knowledge of crops or prior experience with the TRICOT methodology or genomics research.

6- Submission

The **Scholarship application file** is to be submitted as **a unique PDF attachment** by the deadline to the emails indicated in section 7, and should include the following:

a) cover letter;
b) student research proposal that clearly indicate the topic to which the candidate applies;
c) national ID or Copy of Passport Bio Data page;
d) certificate of previous degree(s) /or a Proof that the degree(s) has been completed;
e) all transcripts/academic records;
f) a support letter from home Higher Education Institution (from the MSc supervisor);
g) two recommendation letters;
h) curriculum Vitae;
i) certificate of English or French language skills if any; and
j) any other supporting documents (e.g., first page of publications).

7- Deadline

Applications should be submitted To: dedeoutchokponhoue@gbios-uac.org and copy to e.adako@gbios-uac.org no later than **November 30, 2024**. All applications received will be acknowledged, however only shortlisted candidates will be contacted and invited for interview.