

UNIVERSITY OF DAR ES SALAAM
COLLEGE OF AGRICULTURE FOOD SCIENCE AND TECHNOLOGY
SCHOLARSHIP OPPORTUNITY FOR PHD STUDIES IN FOOD SECURITY
PROGRAMME
(Readvertised)

The Sustainable Agricultural Production and Value Addition for Enhancing Food Security in Tanzania (Food Security) a Sida-funded sub-programme, has 5 scholarship positions for PhD studies commencing in March 2025. Some of selected applicants will be co-supervised by Swedish supervisors and will spend up to six months (three months twice) in Sweden.

Common Eligibility:

- The scholarships are strictly intended for UDSM staff only;
- Applicants must have a GPA of at least 3.8 for a Bachelor degree and a good Master degree with a GPA of 4 or above for dissertation or a pass for thesis;
- Master degree must be less than 5 years old;
- Qualified females are encouraged to apply.

Three key areas of study are:

1. Agricultural Productivity (Crops and Livestock) and Safety (2 positions)

1.1. Mapping of inherent soil micro and macronutrients in selected Tanzania Agro-ecological zones, and improvement of productivity.

Soil fertility is one of the most important edaphic factors for crop establishment, development and production. Crops require both macro and micro nutrients at the right amount, right time, right source and right place to grow properly and yield well. In order for soil to be fertile, it should retain moderate to high level of the nutrients needed for proper plant growth and bumper harvest, provided that other factors are held constant. If any of the plant nutrients is below the optimal level, fertiliser application becomes essential for consideration in order to uplift the soil fertility level for a successful cropping. However, application of the fertiliser is judiciously guided and applied only after observing and understanding the present fertility level of the soil. This is important because application of the fertiliser to the field prior understanding of the existing fertility level usually lead to over or under application of the nutrients, which in-turns compromise growth and final crop yield.

It is natural for soil fertility to vary in time and space, but the magnitude for spatial variability is great within and across agro-ecological zones due to existence of different influencing factors. Some applied amount and type of nutrients could be available in one place yet unavailable in another locality. Notwithstanding, an application of required fertiliser type at a recommended amount and time, aiming at improving soil fertility and crop productivity need a prior understanding of the inherent fertility level. Nevertheless, there is limited research on the available micro and macro-nutrients levels in some of agro-ecological zones, particularly the one covering lake zone. It is against the above background this call is looking for a suitable candidate to undertake studies for the same in Kagera region as a representative of lake zone, particularly in understanding differences in traditional banana performance as influences by edaphic factors and generate soil map that would guide fertiliser recommendation.

Objective: The overall objective of this study is to enhance land productivity and improve crop production through generating prior information for understanding and addressing edaphic constraints.

Supervision: The main supervisor and Co-supervisors will be from the University of Dar es Salaam.

Applicant should have a strong background in the area of soil science/ agronomy, crop production, geographical information system, and remote

1.2 Digitization of Livestock Services: Develop Applications for disease and treatment options and breeding services.

The world has seen a tremendous increase in using Information and Communication Technologies (ICT) solutions to facilitate the capturing, management, and exchange of information. Amidst technological advancement and high rate of population growth, Tanzania has not adequately managed to utilise ICT solutions to enhance livestock productivity. Despite the significant adoption rate of ICT solutions in health, transport, and financial sectors in Tanzania, there are no existing locally designed ICT platforms that offer reliable information on livestock diseases, breeding and livestock services. It is anticipated that the proposed research will produce, as one of its outputs, a digital solution for livestock information that will easily be accessible to the intended audience, particularly, on the web and as a mobile application. It is anticipated that the digital solution will provide different ways to record/capture, present, share, and utilise livestock information to lay down the foundation for evidence-based selective breeding decisions of livestock for sustainable livestock.

- **Objectives:** Overall objective is to develop a digital mobile application for animal diseases, treatment options, breeding and feeds that will be at farmers' fingertip.

- **Supervision:** The main supervisor will be from University of Dar es Salaam, with co-supervision from Sokoine University of Agriculture.

Additional eligibility: Applicant should have a strong background in ICT-related studies, particularly, Computer Science, Information systems, Information Technologies, and Data Science. Demonstrated understanding of livestock management will be an added advantage.

2. Food processing, innovation and value addition (2 position).

2.1. Banana Juice extraction and Design of Banana juice extraction unit for local communities

Value addition is one of the key area for postharvest processing. Many of the agricultural produces in African countries are exported in raw form with little value addition. Postharvest processing is one of the processes for adding value to agricultural produces. Banana is one of the crop that has been consumed for many years with little processing. Technological breakthrough based on non-enzymatic, mechanical malaxation followed by pressing was recently achieved. It is still a challenge to understand end point marked by coagulation of pulp before pressing, hence a more reliable method is required.

Objective: The overall objective is to investigate the mechanism for the release of clear banana juice during mechanical extraction process, and design a mechanical malaxation equipment with microprocessor to identify end point of tannin-protein interaction.

Supervision: The main supervisor will be from University of Dar es Salaam, with co-supervision from Chalmers University of Technology.

Additional eligibility: Applicant should have a strong background in Mechanical, Agricultural or Electromechanical Engineering.

2.2. Processing of different legumes for human and animal feed and promotion of the technology

In Tanzania, postharvest losses of legumes are estimated to range between 30% and 50%, primarily due to insufficient human capacity and inadequate processing and storage technologies. Legumes, such as black-turtle beans, peas, and lentils, are nutrient-rich and vital for balanced diets. However, many legumes contain anti-nutritional factors, such as phytates, tannins and protease inhibitors, which can reduce protein digestibility and mineral bioavailability. These compounds, along with the underutilisation of legumes as a plant-based protein source, hinder their potential contribution to addressing the country's nutritional needs. Additionally, protein production in Tanzania remains insufficient to meet the demands for both food and animal feed, necessitating imports of animal feed.

To address these challenges, the adoption of novel processing methods is crucial. Advanced techniques can mitigate the impact of anti-nutritional factors, enabling the optimal utilisation of legumes for human consumption and animal feed. Furthermore, the broad diversity of legume crops offers opportunities for selecting climate-resilient varieties, which are essential for sustaining agricultural productivity in the face of climate change. Legumes also contribute to environmental sustainability through their nitrogen-fixing ability, which enhances soil fertility while maintaining a low carbon footprint.

Objective: This study aims to develop innovative processing technologies for legumes to enhance their nutritional value, reduce postharvest losses, and improve their utilisation for human consumption and animal feed in Tanzania.

Supervision: Supervisors will be from the University of Dar es Salaam, with co-supervision from Chalmers University of Technology, Sweden.

Additional eligibility: Applicant should have a Master's degree in Food Science, Food Technology, Food Engineering, Chemical Processing, Biochemistry, or a related field. Strong academic performance and research background in food processing or nutrition. Experience in laboratory analysis and/or food processing technologies is an advantage. Excellent communication and writing skills in English.

3. Innovation in Agro waste management and Environmental Health (1 position).

3.1. Value Addition to agroWastes: Production of cricket from agricultural waste

The increasing demand for animal protein to cater to the ever growing human population has prompted the quest for alternative protein sources from insects. Crickets are among insect species of major interest, its rearing is attracting attention as a novel way to produce food and feed because they are more eco-friendly due to their low emission of greenhouse gases, low water and feed intake, and the small land requirement for their production. However, rearing of crickets at large scale depends on the commercial chicken feed, which is expensive to the ordinary people and therefore cannot be sustained.

Rearing crickets using substrate waste presents a sustainable and innovative approach to food production. Substrate waste, such as agricultural byproducts (e.g., fruit and vegetable scraps, grain husks) and food waste, can be repurposed as feed for crickets. Utilising waste materials as feed can significantly lower the costs associated with cricket farming. Conversion of waste into high-quality protein will help to meet the growing global demand for alternative food sources. This method contributes to a circular economy, it minimises landfill waste and reduces greenhouse gas emissions associated with waste decomposition.

Objective: This study aims to optimise the rearing conditions and substrate composition for crickets to enhance growth rates, survival, and nutritional quality, while minimising environmental impact and production costs.

Supervision: Supervisors will be from the University of Dar es Salaam.

Additional eligibility: Applicant should have a background in Entomology, Food Science, Agriculture, Chemical and Process Engineering, Food Science, Biochemical Engineering or a related field. Experience with insect rearing is an added advantage.

ADDITIONAL INFORMATION:

Application must be accompanied with transcripts, certificates, CV and a concept note of not more than two pages addressing a topic of interest of the above PhD position. The application must reach the Project Principal Investigator by 17th February 2025. Submit your application in electronic form to: kibazohi@yahoo.com and copied to aluda3549@gmail.com

Short listed applicants will be interviewed before end of February 2025. Selected applicants will commence studies in March 2025.