Arbeitsgemeinschaft Tropische und Subtropische Agrarforschung (ATSAF) e.V.
Council for Tropical and Subtropical Agricultural Research

ATSAF Academy
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Junior Scientists Tandems

Final Report

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Supervisor at German Research Institution (IARC): Professor Andreas Gattinger
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Supervisor at National University: Associate Professor A.C.L Safalaoh
International Agricultural Research Center (Country): International Livestock Research Institute (ILRI), Kenya
Supervisor at IARC: Dr. Sonja Leitner
Start and end date of stay at IARC/ GRI: 31st March to 28th September 2025
Title: Greenhouse Gas Emission Dynamics from Chicken Manure With and Without Black Soldier Fly Larvae

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During my ATSAF Junior Scientist Tandem (JST) scholarship, I had the privilege of conducting my research stay at Justus-Liebig University (JLU) in Gießen, Germany, under the Professorship of Organic Farming and Sustainable Land Use led by Prof. Dr. Andreas Gattinger, who was my co-supervisor with Dr. Sonja Leitner, senior scientist at International Livestock Research Institute (ILRI) in Kenya.

Throughout my stay, I was primarily involved in greenhouse gas (GHG) measurements within the multidisciplinary GreenChicken Project at the Ober-Hardthof research station. The project seeks to understand sustainable approaches for dual-purpose organic chicken meat and egg production to maintain productivity and efficiency while keeping the environmental footprints in check.

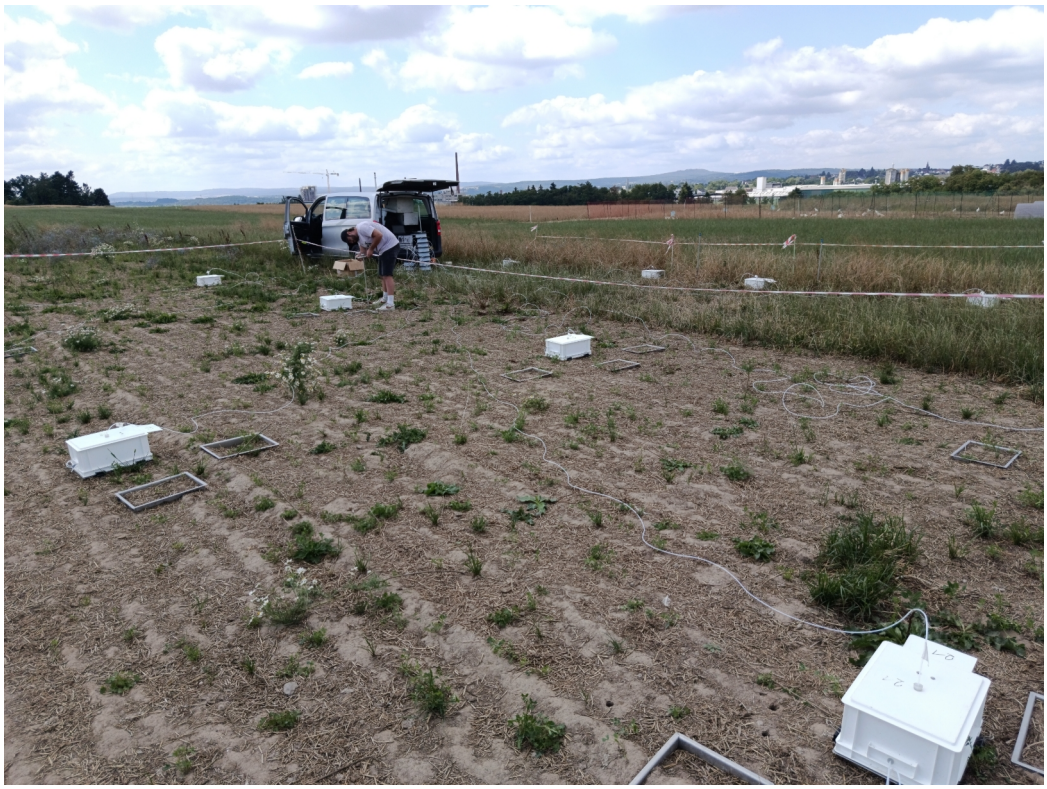

Figure 1: Greenhouse gas measurements using static chamber approach, from land previously occupied by a chicken mobile barn at Oberer-Hardthof

In organic farming, the use of synthetic amino acids is prohibited. This makes organic poultry diets expensive and heavily dependent on imported soybean meal from South America, which contributes significantly to the environmental footprint of organic poultry production. The GreenChicken project explores Black Soldier Fly Larvae (BSFL) as an alternative organic protein source with a balanced amino acid profile. BSFL can be grown on organic waste, making them a potentially circular and climate-friendly feed

ingredient. Three dual-purpose chicken breeds—Coffee OTZ, Sandy, and Lohmann White—were raised in mobile barns that were moved monthly and provided access to outdoor runs. They were fed two types of organic diets: one containing BSFL meal and another without.

Figure 2: Connecting tubes to static chambers at Oberer-Hardthof

My specific work focused on measuring greenhouse gas emissions (ammonia, carbon dioxide, and methane) from BSFL growing on chicken manure collected from these diets. Although rearing BSFL on chicken manure is currently not permitted under EU regulations, this experimental setup aimed to evaluate the environmental implications and potential GHG savings of such a circular system. The core question was whether using chicken manure as a substrate for BSFL production would affect the GHG emissions potential of chicken manure. The concept is significant because, in the EU, larvae are currently grown on chicken feed-grade substrate and later fed to chickens—a process that makes little sense from a life-cycle perspective. Instead, growing larvae on waste from the same production system could close the nutrient loop, reduce environmental impact, and enhance resource efficiency. This study is among the few that have examined this innovative concept, and the results are being prepared for a scientific manuscript publication.

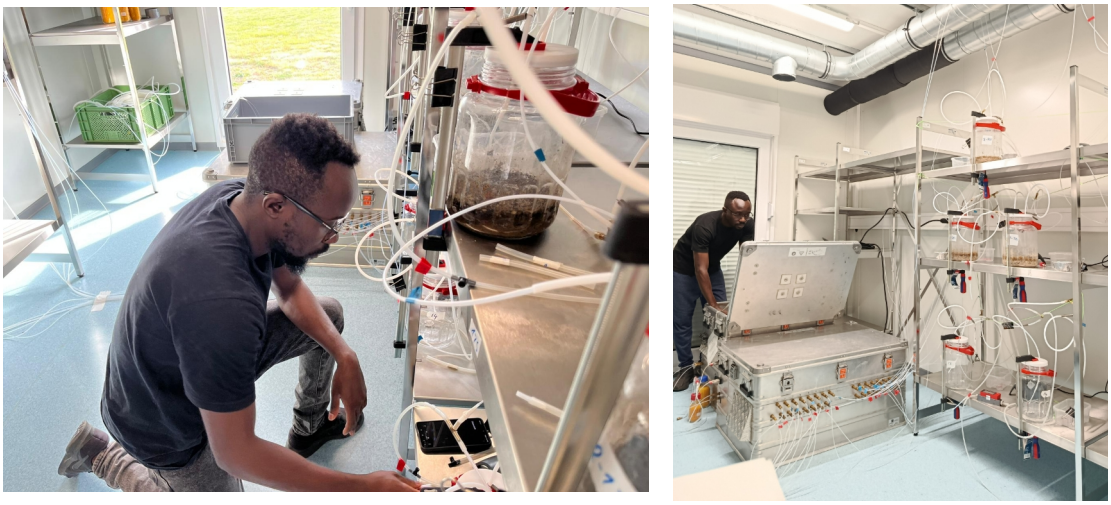

Figure 3: Setting up my experiment in a climate chamber at Franhoufer Institute

During my stay, I was introduced to advanced greenhouse gas measurement techniques, including both dynamic and closed chamber methods using Picarro and Innova analyzers. I also gained practical experience with isotopic techniques (N15) for tracing nutrient dynamics in biological systems, the principles of ring-down cavity spectroscopy for gas detection, and quantification of ammonia using acid traps. I participated in the setup of experimental systems, including calibration of airflows, gas collection in climate chambers, and overall experiment management.

Collaboration and networking were integral parts of this experience. I worked with scientists from other institutions, including Dr. Patrick Klüber from the Fraunhofer Institute for Molecular Biology and Applied Ecology (IME) and Dr. Connor Simpson from the Karlsruhe Institute of Technology (KIT) in Garmisch. These interactions enriched my understanding of interdisciplinary research approaches and provided valuable exposure to high-level international collaboration.

Figure 4: From left, Prof. Gattinger, Jan Heller (my JST counterpart at ILRI), Gabriela-Maria, Bryan and Michael demonstrating how the static chamber approach works

Beyond research, my experience at JLU was personally and culturally rewarding. I was warmly welcomed by the team, especially Gabriela, who helped organize my accommodation and travel, as well as Bryan Dix, Michael Hauschild, Wiebke, and other staff members who made my stay feel like home. I also had the opportunity to attend the Tropentag 2025 Conference at the University of Bonn as a student reporter, which was a highlight of my stay. The event allowed me to engage with fellow students and scientists from around the world and to connect with professors from CGIAR centers.

Overall, my JST stay was a transformative academic and professional experience. This experience has inspired me to consider pursuing a PhD at Justus-Liebig University in consortium with ILRI. I am deeply grateful to ATSAF for supporting this opportunity, which has significantly strengthened my research capacity, international exposure, and motivation to contribute to sustainable agricultural development in Malawi and beyond.