Expedition: Resilience of Small-Scale Farmers Toward Climate Change in Upper East Ghana

Field Study: Conservation

Summary: *In the Sudan-Savanna ecoregion of Ghana, climate change leads to less frequent yet heavier rainfall events and longer and more intense droughts. This can cause crop failure and decrease the food security and income of the local population, which mainly lives off rainfed subsistence agriculture. Irrigation provides the opportunity for an additional growing period during the dry season and can both increase food production and mitigate climate change risks. With the goal of better understanding feedbacks between climate and society, including whether dry season farming as a mitigation tool is resilient to these risks, Tropical Ecologist Silvia Schrötter interviewed farmers and key informants to investigate land use strategies, crop choice, and the ecosystem services provided by the integrated farming practices of different irrigation schemes.*

THE EXPEDITION

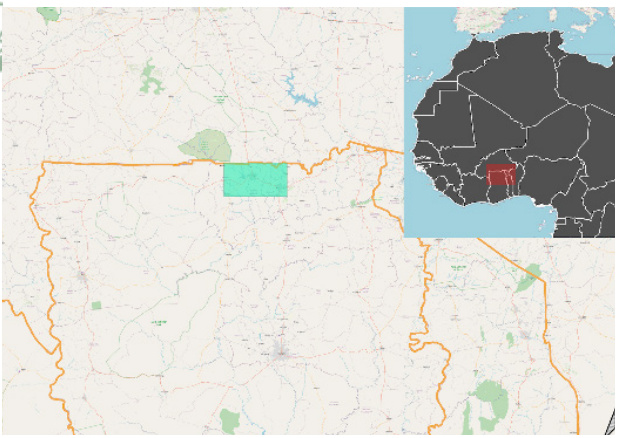
In the Upper East Region of Ghana, farmers suffer from the environmental consequences of climate change, which threaten their livelihoods. Since food production is limited to the rainy season and most people are sustained by agriculture, any climatic shocks such as heavy rainfalls, drought and heatwaves can be a risk to their survival.

Silvia Schrötter with local farmers and village chief

Irrigation during the dry season - a new practice in this area compared to other regions of the world - is becoming more popular as a tool to increase resilience to climate change and improve the overall livelihood of farmers and their families.

To understand the resilience of farmers who use irrigation and rainfed farming to combat the consequences of climate change, Silvia and her team investigated crop diversity and ecosystem services as describing factors. Growing several crops can increase overall production, suppress pests and diseases, and buffer and mitigate climate change risks. Integrated land use systems provide a wide variety of ecosystem services, which can also improve resilience against climate change risks.

For a general overview of the area, they interviewed key informants of the West African Science Service Center on Climate Change and Adapted Land Use (WASCAL), the



WHO
Silvia Schrötter

WHAT
Analyzing the resilience of small farmers toward climate change

WHEN
June - September 2021

WHERE
Upper East Region, Ghana

WHY
To understand how current and future farming techniques can help mitiagte the impact of climate change on farmers in Upper East Ghana

Ministry of Food and Agriculture, and the Ghana Irrigation Authority, and held group discussions in each selected village. The study area included villages around the city Bolgatanga, where Silvia was stationed throughout the expedition. The sites were selected together with scientists from WASCAL, covering different ethnic groups, soil types and irrigation schemes.

In this region, farmers use water from large-scale dam reservoirs, small village reservoirs, rivers and groundwater wells to water their crops. Different methods and technologies to transport the water from the source to the field were used, including mechanized water pumps, canals and watering cans. For additional data collection, they interviewed over 150 farmers in seven different villages. To observe the crop diversity, they recorded the different types of crops grown under irrigation or rainfall by each farmer, and additionally noted why the farmer chose these specific crops. Through these methods, they were able to understand the decision-making process behind a farmer's crop choices and which factors led to a higher or lower crop diversity.

To understand the ecosystem services that were provided in these farming schemes, they recorded whether agroforestry systems existed, whether natural fertilizers, pesticides and herbicides were used, if several crops were combined on

Silvia Schrötter

one patch of land, if water-saving techniques were applied, and so on. The ecosystem services provided by these practices can already be found in existing literature, so they used these integrated land use practices to represent the ecosystem services.

The collected data provided an overview of land-climate interactions and the resilience of farmers using different irrigation schemes.

EXPEDITION GOALS

The key goals of the expedition:

IDENTIFY:

- Different irrigation schemes and their managment
- Crop types grown, rainfed, and under irrigation
- Reasons why farmers chose these specific crop types
- Existing integrated farming practices, such as agroforestry, combining several crops on a patch of land, natural fertilizer, pesticides, herbicides, water saving techniques

Female farmer and son pound guinea corn after the harvest

ANALYZE:

- Resilience of farmers based on their farming practices in the face of climate change
- Factors that limit and drive climate change resilience
- Ecosystem services provided through integrated farming practices

EXPEDITION RESULTS

Once the expedition to Ghana was completed, the project was aborted by the University before the final publication of scientific papers. As a result, only preliminary results were obtained. Silvia and her team observed that under irrigation, over 50% of the farmers grew less than six different crop types; they also recorded farmers who grew up to 18 different types. The main crops under irrigation were rice, leafy vegetables, okru, onions, peppers and tomatoes. Combining several crops within one field was mainly recorded in rainfed farming, and hardly observed under irrigation. The decision of farmers regarding which crops to plant was based on different social, environmental, economic and governance factors. Through their research, Silvia and her team then analyzed which of these factors drive and limit the diversification of crops.

The main driving factors of the farmers were environmental resilience and market demand. Silvia and her team found that consideration of the soil, knowledge and tradition, and personal nutritional needs and preferences had inconclusive impacts

tion, and personal nutritional needs and preferences, had inconclusive impacts on the number of crops grown under irrigation. However, the workforce and amount of water a crop type needed and the income a crop makes were limiting the crop diversity.

Overall, they concluded that the following actions could increase the crop diversity under irrigation, thereby increasing the resilience of these farming systems to climate change:

- Sharing knowledge on growing different local crops
- Improving storage possibilities, as well as water access and availability
- Supporting technology to reduce the work force
- Supplying fertilizer beyond cash crops
- Regulating market prices and access

CHALLENGES AND LESSONS LEARNED

One of the first challenges was launching the expedition. The Covid-19 pandemic restricted travel and made unreasonable a field campaign based on close interaction with local people in various villages, so the mission was postponed several times. Once research began, everything on site went smoothly despite minor struggles, as they had "an amazing local partner with WASCAL," which supported the scientific aspects and logistical planning.

Heavy rainfalls sometimes made it impossible to go into the field, since streets were often completely flooded and regions unreachable, even with an off-road motorbike. Silvia also suffered from unexpected medical issues, including malaria on several occasions despite taking prophylaxis. Fortunately, she successfully collected the required data and returned fully recovered.

Silvia Schrötter with elephant, Upper East Ghana

Back home in Germany, Silvia reports experiencing a "lack of professional supervision in my field of research, followed by restrictions in outreach for suitable support, common hierarchical power-play in academia, etc. After struggling mentally and, indirectly, physically with these conditions, I decided to leave this work environment, despite my

Due to the circumstances that led to Silvia's resignation (and the resignations of five co-researchers due to similar circumstances), the project was not completed. "The lesson I learned is that even while wanting to do something good for the world, it is essential to prioritize your own health and leave toxic environments. The saying 'when one door closes, another door opens' can, in my opinion, be adapted to 'you can close and open doors yourself,' and that academic titles don't define your worth!"

EXPEDITION FUNDING : DAAD (German Academic Exchange Society), Germany.

ABOUT THE FLAG CARRIER

Silvia Schrötter - Team meeting in a village

Silvia is an ecologist passionate about incorporating the human dimension into n ture conservation and climate change adaptation. In tropical regions, where natural ecosystems and humans are particularly vulnerable, Silvia aims to help those areas withstand upcoming challenges in order to secure the future stability and adaptability of ecosystems and societies.

Silvia conducted this expedition as a research fellow with the Franco-German Fellowship Programme on Climate, Energy, and Earth System Research, created to support the implementation of the 2015 Paris Climate Agreement under the French initiative, "Make Our Planet Great Again." Her research was part of the MONSOON project at Germany's University of Augsburg in collaboration with the West Africa Science Service Centre on Climate Change & Adapted Land Use (WASCAL).

EXPEDITION TEAM:

Team Lead:
Silvia Schrötter, MSc Tropical Ecology and Natural Resource Management
Loal Supervisior: Samuel Guug, MSc Enviornmental Sciences
Field Assistant:
Michael Tindan