# Effect of climate change on mixed crop-livestock systems in the Sudan savannah of West Africa

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## Introduction

- Climate change is projected to have significant impacts in the Sudan savannah zone of West Africa where mixed crop livestock systems (MCLS) dominate.
- However, the estimation of climate impact on mixed systems using combinations of detailed crop and livestock models remains under-developed in this region.
- Here, we conducted a survey and applied a modelling approach to estimate the impacts of climate change on crop yields and livestock numbers.

## Study site

- Sudan savannah zone of WA.
- Annual rainfall: 600 – 800 mm.
- Mean temperature: 28.5 °C.
- **Burkina Faso:** Three communes (Loumbila, Ziniaré, Zitenga) in the Oubritenga province.
- **Ghana -** Three districts (Kassena Nankana, Builsa North, Bongo) in the Upper east region.

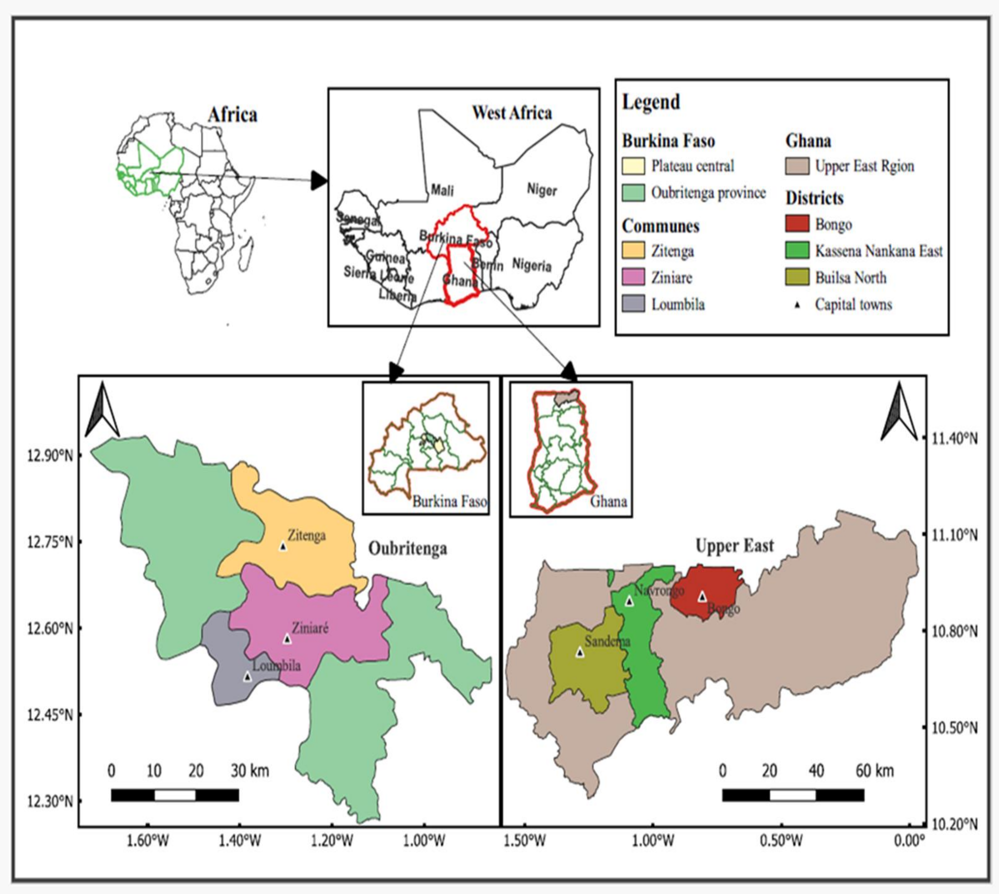


**Fig. 1 A map showing survey sites in Burkina Faso (left) and Ghana (right), respectively**.

## Methods

### Data

### Modelling

### Validation

### Climate analysis

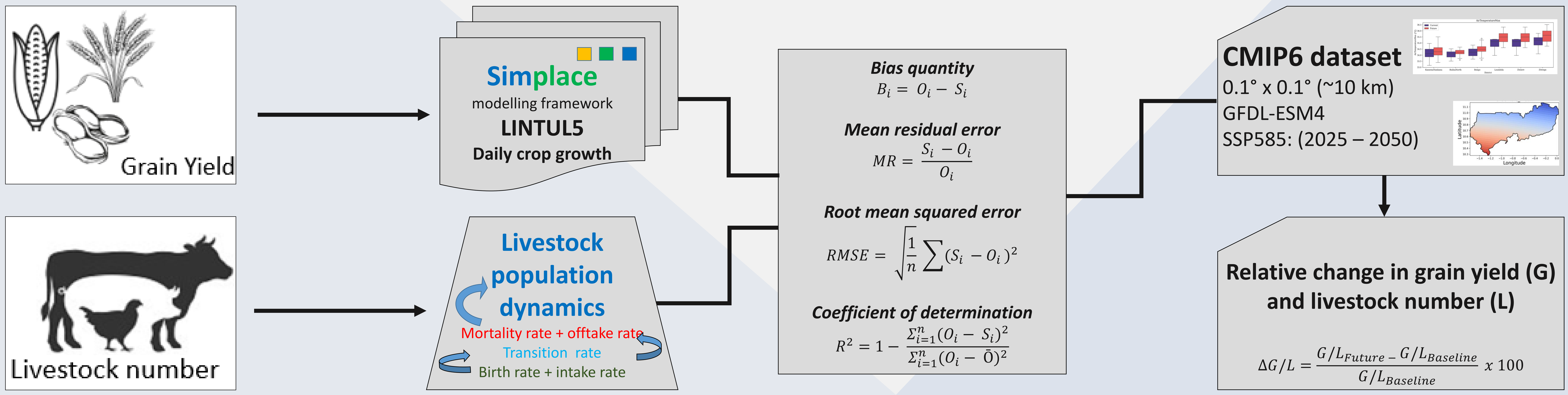



**Fig. 2 Integrated model description and climate scenario analysis to simulate crop livestock systems under current and future scenarios**

## Results

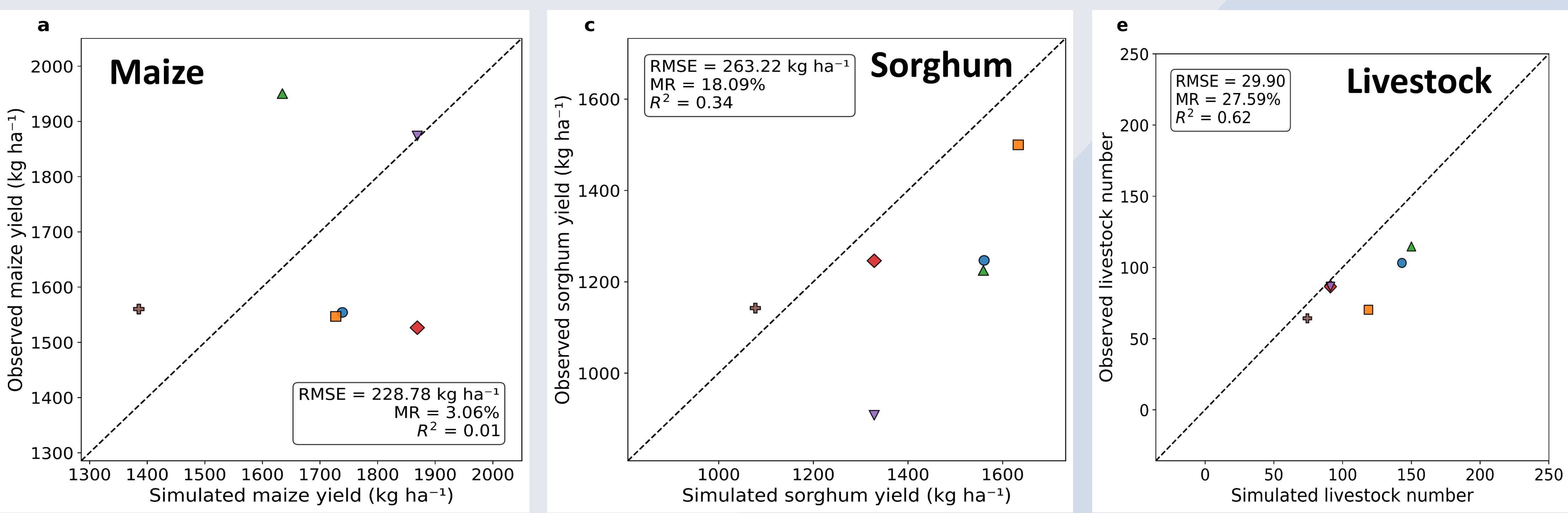
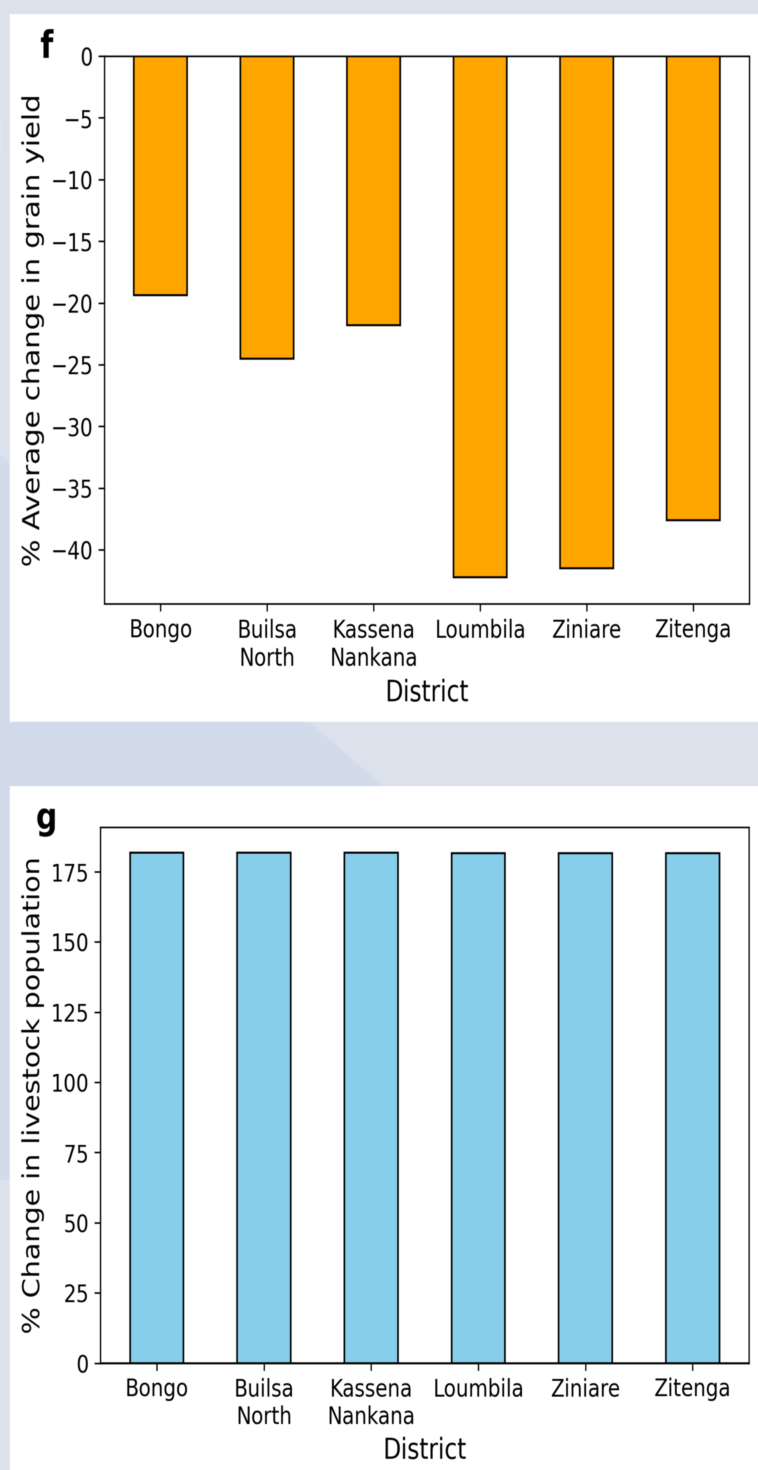
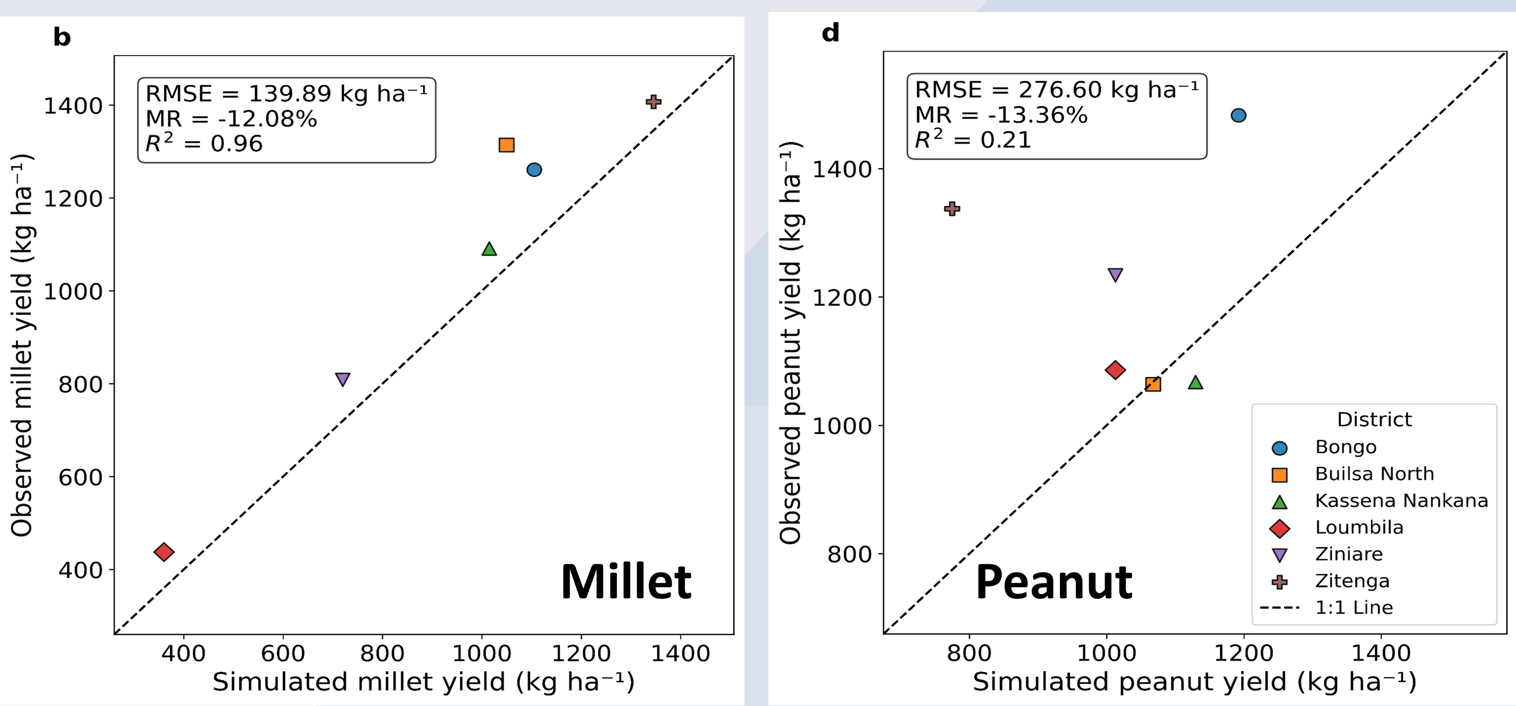



**Fig. 3 Comparison of simulated and observed grain yields (a-d), livestock number (e), average percentage change in grain yield (f) and livestock number (g).**




- For model validation, at the crop level, the best model performance was recorded for millet grain yield (Fig. 3b).
- At the district level, the best model performance was observed for peanut grain yield at Builsa North (Fig. 3d).
- The model prediction looks reliable for capturing livestock numbers collectively (Fig. 3e).
- In the future, the study locations will likely experience a significant decline in grain yield (up to -42%), and livestock numbers (up to 181%).

## Conclusion

We conclude that, given the interplay of resource use in MCLS, it is important to also consider climate impacts beyond yield and livestock numbers to be able to implement adaptation strategies for sustainable crop and livestock production.