



# KB 35: Nature-based adaptation pathways for climate-resilient and safe food systems

[project/motif numbers]

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## Objectives and methods

This project aims to generate knowledge on Nature-based Solutions (NBS) that contribute to enhancing food systems for strengthening food security, climate resilience and circularity. Cases from Europe (the Netherlands), Africa (Ghana) and Asia (India) are used to explore the impacts of combinations of NBS at different spatial scales, landscapes and food production systems. The Ghana case covers Bono East Region, which is Ghana's main provider of food, and therefore popularly referred to as *Ghana's food basket*. But for how long will this be the case? Climate change is turning agriculture into an unreliable and unprofitable business. Which are the NBS that could be of help, and make Ghana's food basket climate resilient and circular?

## Results, future scenarios and nature-based solutions in context

Our Theory of Change is that combining the two popular NBS of rainwater harvesting and forest landscape restoration contributes to climate resilient and circular food systems, if carefully planned within their socio-spatial context through stakeholder consultation and participatory scenario modelling. If carefully done, it optimises water use and water retention capacities of soils, while sequestering carbon, enhancing biodiversity and augmenting the socio-economic position of Bono East inhabitants.



In order to test our Theory of Change, we analysed the Bono East food system and identified those biophysical and socioeconomic factors that define a landscape's suitability for rainwater harvesting and forest landscape restoration (figure 1). We combined and superposed the maps in Bayesian belief networks and artificial neural networks revealing the landscape areas which are suitable for rainwater harvesting for irrigation (Figure 2 and 3) and forest landscape restoration (Figure 3). Both exercises were implemented through stakeholder consultation and literature review, within the restrictive circumstances of COVID-19.

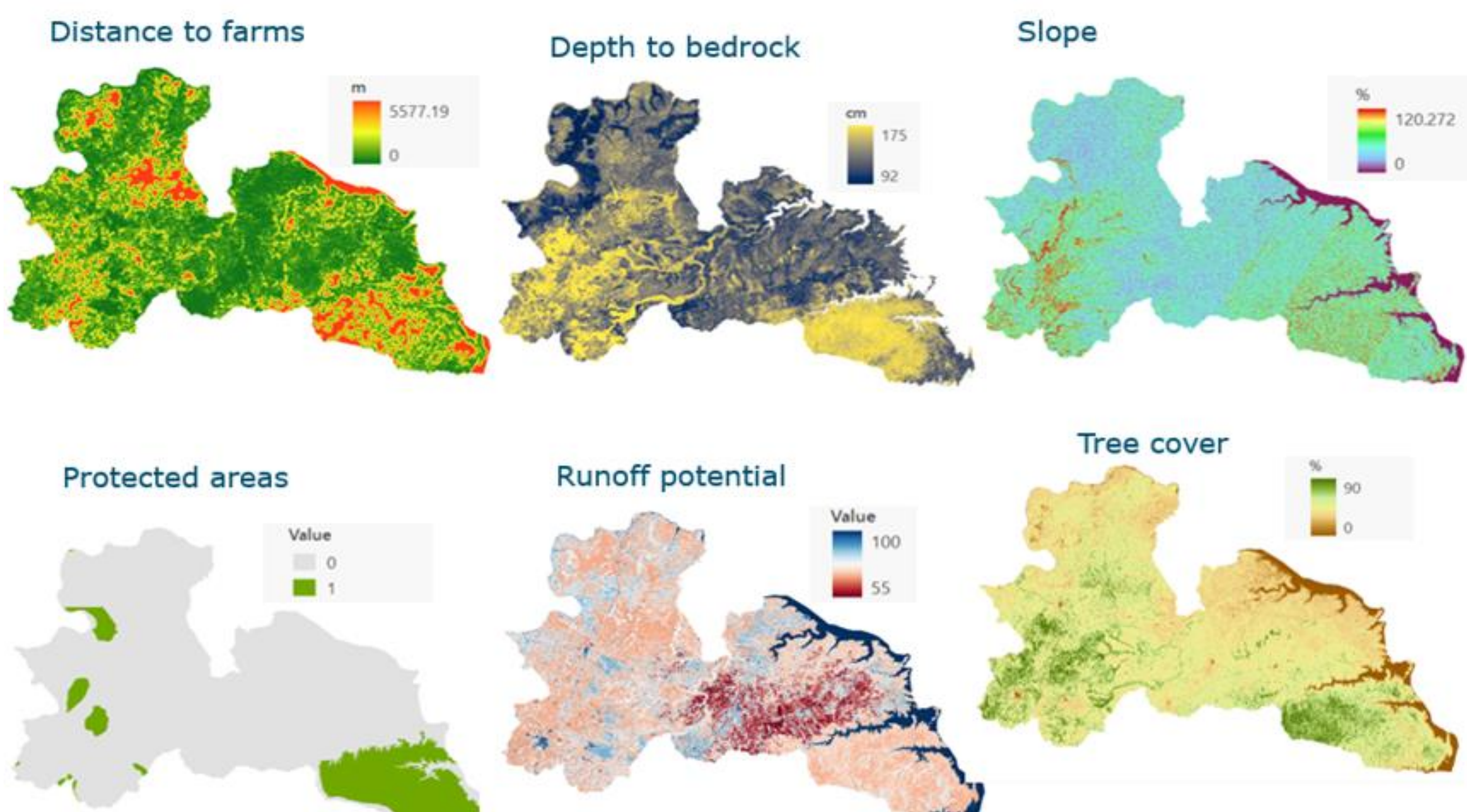


Figure 1: Maps of input indicators of rain water harvesting for irrigation like distance to farms, depth of bedrock, slope, protected areas, runoff potential and tree cover.

But what will happen in future, when the impacts of climate change will be more pronounced? Comparing suitability under climate change and otherwise socioeconomic scenarios (e.g. land productivity, production value and agricultural land use change) gives us an impression (Figure 3 and 4).

The MAGNET model allows us to compare the suitability maps for rainwater harvesting and forest landscape restoration on private and customary owned farmland, for now and in future.

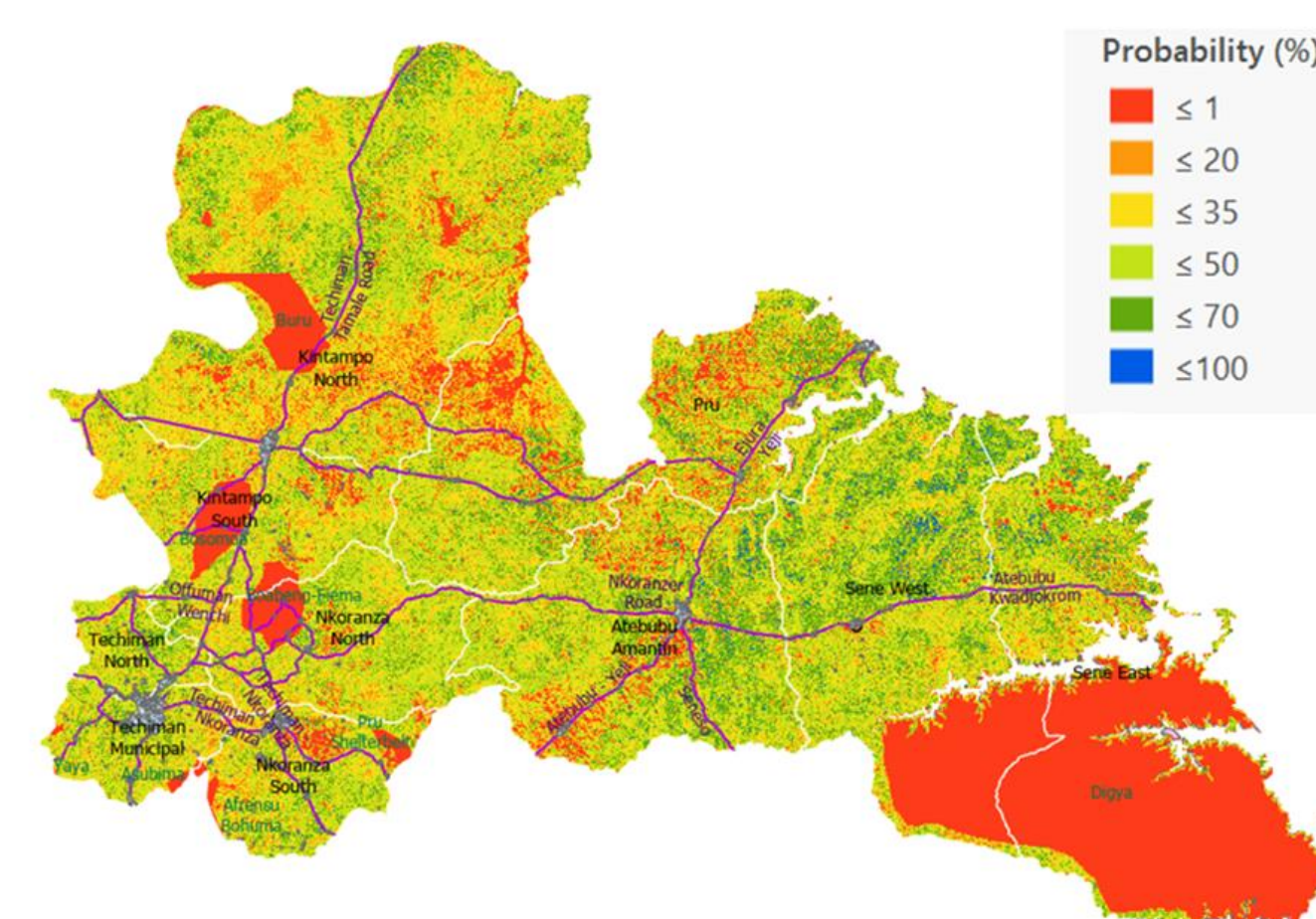


Figure 2: Suitability maps of rain water harvesting for irrigation under current conditions

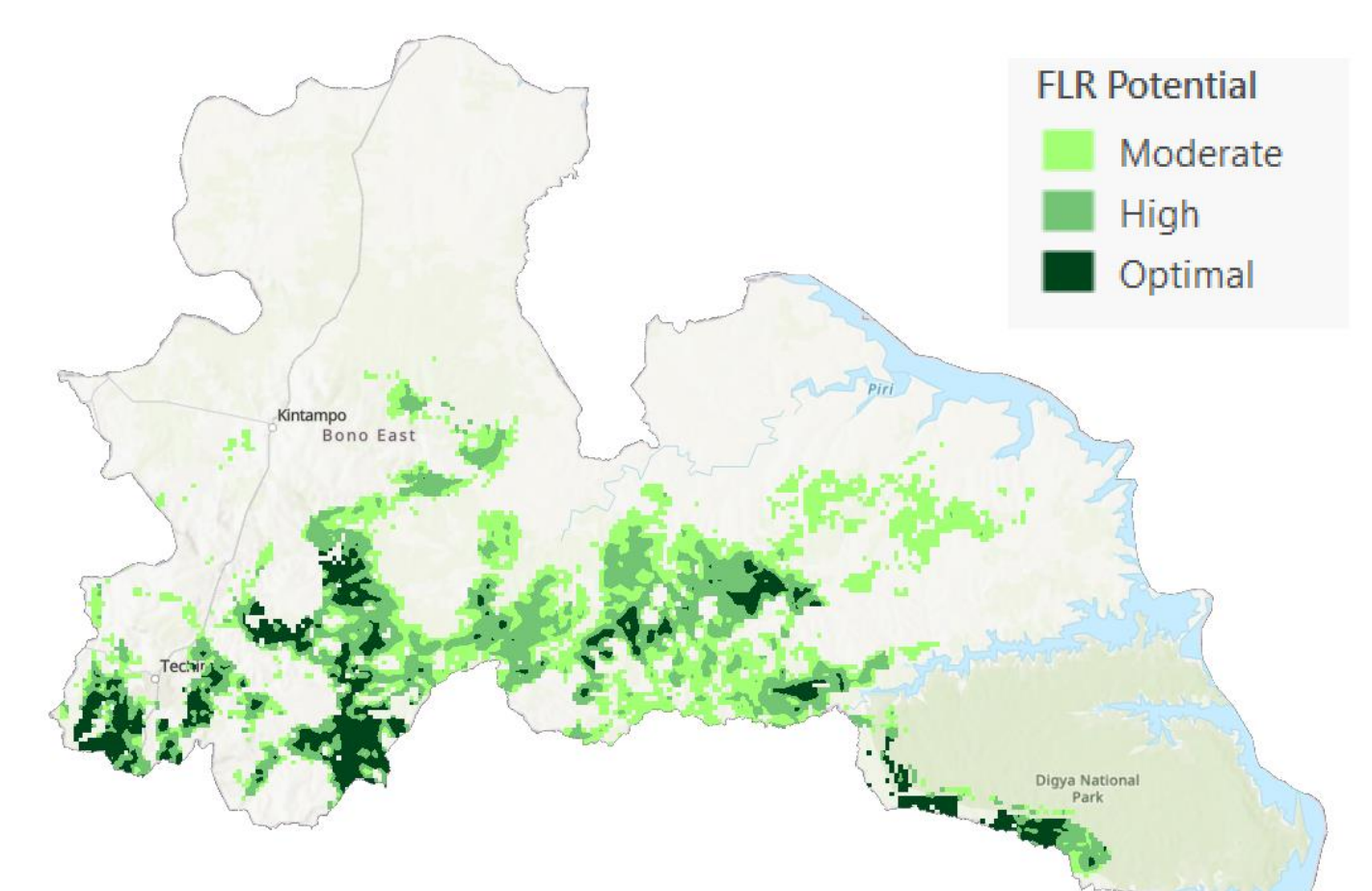


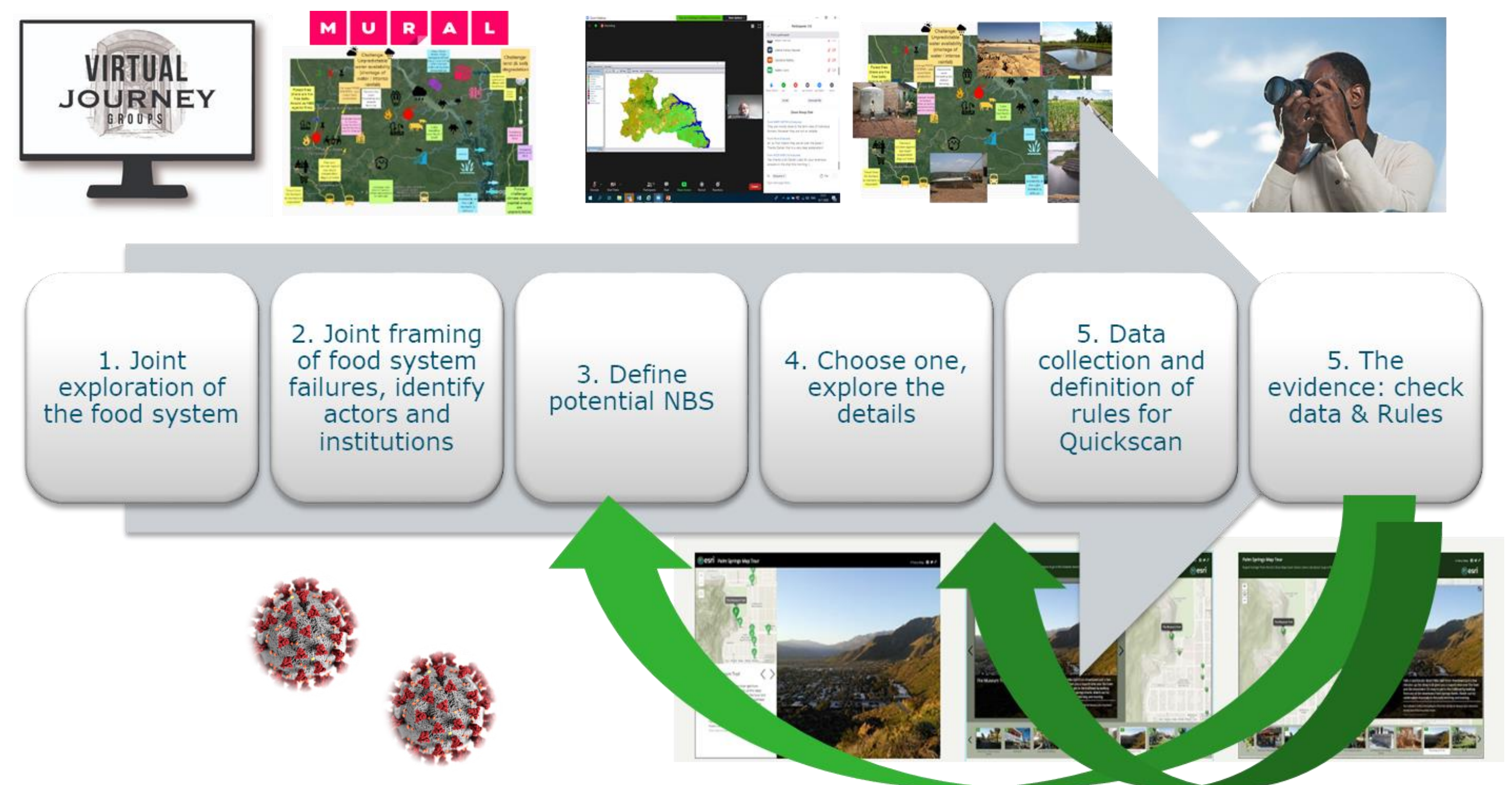
Figure 3: Suitability map for FLR (outside existing forests and protected areas) under current climate conditions



Figure 4: Development of food product production indicators for the SSP2 projections of Ghana in 2050 (sourced from SSP2 (middle-road) scenarios projected by MAGNET model). The grey bars indicate a marginal increase on the total land availability for agriculture in 2050, which indicates that food system innovation is needed, ideally through NBS initiatives as rainwater harvesting and forest landscape restoration.

## What's new?

Scenario modelling is nothing new. But participatory scenario modelling under COVID-19 conditions is new. In order to involve local stakeholders in the exercise, we developed a new methodology based on participatory online tools. With this, we were successful in involving stakeholders, and developing a new version of our well known Quicksan scenario modelling tool called Quicksan 2.0. The following figure sketches the process as how it was carried out, with local stakeholders, online.



## What's next?

Having suitability maps and scenarios is great, but only values if embedded in spatial planning systems and concrete investment planning on the ground. That is why 2022 is planned to organise multiple workshops with stakeholders, in Bono East, to verify the results, and work with public and private stakeholders on turning the projections into concrete actions.

