The effects of climate change on traditional orchard meadows and their distribution in Baden-Württemberg

Melina Radecke

The effects of climate change on traditional orchard meadows and their distribution in Baden-Württemberg

Climate change is one of the greatest challenges facing humanity and biodiversity this century. The effects are already and will be even more severe, including increased extreme weather events, rising sea levels and water shortages for many regions of the world. This will then pose risks to human health, the food supply and biodiversity (IPCC 2022).

Traditional orchards have been recognised to host a high number of species due to their structural heterogeneity and are sometimes even called rainforests of temperate regions. Although orchard meadows are of great importance for humans and nature, they are threatened and are even classified as endangered in the Red List of biotope types in Baden-Württemberg, where there is the largest area of orchard meadows in Germany. With the threat of climate change, the situation of orchard meadows in Germany could worsen. That is why the goal of this thesis is to find out how climate change affects traditional orchard meadows and their potential distribution.

First, a small literature review on the effects of climate change on orchard trees in Central Europe and the concrete relevant climatic factors is conducted. From these results, individual factors which are important for the existence of orchard trees are derived in order to estimate their climatic niche. This research provides the basis for addressing the following research questions.

What is the climatic niche of orchard trees in Central Europe and which factors of climate change are particularly problematic for them?

How do climate conditions in Baden-Württemberg change under different climate scenarios SSP1 2.6 and SSP5 8.5?

How does climate change alter the site quality of traditional orchards in Baden- Württemberg ?

Using a species distribution model (SDM), the effects of climate change on the future distribution of orchards in Germany will be explored. A Generalized Linear model (GLM) is used where the dependent variable is a dataset of all orchard trees in Baden-Württemberg from the Landesanstalt für Umwelt Baden-Württemberg from 2012-2015.(Borngräber et al. 2020). For the independent variables of the GLM, climatic data of the CHELSA Bioclim dataset as well as soil data and topographic data will be used. The model will be trained with the orchard tree dataset

and current climate and environmental variables, and then projected into the future (period 2041-2070) using the SSP1 2.6 and SSP5 8.5 climate scenarios.