

The BioValue project aims at:

- increasing biodiversity along the agri-food value chain through the optimal introduction of underutilised genetically diverse crops by
- developing a dynamic and adaptable tool for analysing the links between biodiversity, the agri-food value chain, the environment and consumer preferences and health.

Impacts of climate change on value chains of underutilized crops: a case study on perceived changes and responses of farms in Germany

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1. Introduction

- Climate change has severe impacts on food value chains.
- Farmers are the value chain agents most vulnerable to climate change risks [1].
- **Aim of the Study:**
 - Understanding the impacts of climate change and the coping strategies that farmers invent and use.
- **Focus of the Study:**
 - German Farmers who grow underutilized crops (lentils, eggplant, buckwheat, Lathyrus).

2. Methodology

- **December 2022 – January 2023: Qualitative, semi-structured interviews:**
- Target: German farmers growing underutilized crops (Table 1) – all organic farms
- Focus 1: perceived climate change impacts – changes in climate ranked according to the strength of their effect on agricultural activity:
 - “Which changes in climatic conditions have the highest impact on your agricultural activity?”
- Focus 2: adaptation strategies and their cost:
 - “What are your strategies for coping with the following changes in climate?”
- **Comparison to climate projections – RCP8.5 mid-century scenario**

Table 1: Description of the sample: Number of interviewed farmers (n =13), number of grown crops and varieties, arable land.

Crops	Lentils	Eggplant	Buckwheat	Lathyrus
Farmers (n = 13)	5	5	2	1

	Number of crops	Number of varieties	Total arable area (ha)
Mean	5	9	61.73
Min	1	4	2
Max	8	19	200

3. Results

Table 2: Impacts of perceived climate change, comparison to mid-century RCP8.5 projections and farmer’ coping strategies *

* Reference period 1971-2000 ; (S) Summer, (W) Winter

Climate Change impact	Increase of perceived climate change impact									
	Increased temperature		Decreased water availability	Increase in extreme heat days		Increased precipitation		Extreme weather events		
Projected change [2]	15 th percentile	85 th percentile	Less water in summer, More water in winter	15 th percentile	85 th percentile	15 th percentile	85 th percentile			
	+1.4°C (S)	+2.3°C (S)		+4.6 d	+10.3 d	-10% (S)	+9% (S)			
	+1.3°C (W)	+2.5°C (W)				+2% (W)	+19% (W)			
Most expensive coping strategies	Grow new varieties and crops more tolerant to high temperatures		Creation of bigger water reservoirs	Adapting more efficient irrigation techniques		Installation of shading in greenhouses	Building larger reservoirs and drains		Protection of plants through plastic film tunnels	
	Own equipment purchase (independency with timing of the harvest)			Sow as early as possible in summer to use spring humidity						
Other coping strategies	Creation of good soil structure / composition (increased crop resilience)		Cultivation of winter crops for winter moisture use	Growing intercrops for a longer period		Creation of grass paths in greenhouses (makes the climate cooler and more humid)				
Example affected crops	Lathyrus / Lentils		Eggplant / Lentils		Eggplant		Eggplant		Eggplant	

4. Conclusion

- German farmers' perceptions of the impact of climate change are in line with climate change projections.
- Among the most important coping strategies are:
 - Adjustment of the crop portfolio: growing new varieties and crops that are more tolerant to high temperatures and dry conditions.
 - Improvement of the soil quality – increased crop resilience
 - Adjustment of farming activities timing: e.g. earlier sowing, harvesting
 - Implementing more efficient irrigation techniques
 - Installation of greenhouse shading
- **Future actions and policies should consider the currently used coping strategies and support further climate change adaptation of farmers.**

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References: 1. Hoffman, E. and Schöpflin, P. (2022). Climate Change Risk Assessment and Adaptation Measures in the Food Supply Chain—Perceptions and Responses of Buying Firms. In: Filho, W. L., Djekic, I., Smetana, S., & Kovaleva, M. (Eds.). Handbook of climate change across the food supply chain. Springer, pp. 285 - 304.
2. German Environment Agency (2021). Climate Impact and Risk Assessment 2021 for Germany - Summary. Climate Change 27/2021.

