Title: Exploring private sector financing initiatives in biodiversity conservation: the case of wildflower strips in Germany

Background of the topic

The thesis deals with the topic of wildflower strip (WFS) as an example of agri-environmental schemes in Germany. These strips provide herbaceous vegetation within a field. Sowing wildflower seed mixtures, they are either cultivated on an annual or perennial basis (Uyttenbroeck et al. 2016). It is widely acknowledged that WFS is one of the most effective and applied measures to improve ecosystem services to crops and enhancement of biodiversity (Albrecht et al. 2020; Schmidt et al. 2022). Biodiversity in arable land increases significantly with the establishment of WFSs compared to control fields without WFS (Stroot et al. 2021). This is key to agricultural production as biodiversity builds the basis for ecosystem services like pollination, pest control and nutrient cycles (Mei et al. 2021). Hence, the aim of WFS "is to enhance farmland biodiversity by providing food and shelter for insects, […] other animal, and […] wild plants" (Uyttenbroeck et al. 2016, p. 226) that attract functional arthropods that benefit ecosystem services (Haaland et al. 2011).

During the last decades intensive agriculture (fertilisation, seed cleaning technologies, use of herbicides) led to a decrease in biodiversity within agricultural landscapes (Stroot et al. 2021). As a result flower plants are rare in the remaining plant communities which are generally "species poor and dominated by highly competitive grasses and nitrophilous ruderals" (Schmidt et al. 2022, p. 2). Consequently, declines in ecosystem services e.g., pollination services are observed (Schmidt et al. 2020).

Given the strong loss in biodiversity and the positive effects of WFS on the former, the establishment of WFS is incentivized by subsidies (Piqueray et al. 2021). Concretely subsidies shall compensate farmers for their foregone income due to yield loss (Schmidt et al. 2020). Next to agri-environmental schemes offered by State governments, support for cultivating WFS is provided from the private sector, for example, foundations, climate- and environment organisations and other actors such as the Bavarian Farmers' Association in cooperation with the Zeidler foundation (Bayerischer Bauernverband 2020) and flower sponsorship platforms like Combayn (BayWa 2022).

According to the German Nature and Biodiversity Conservation Union not all WFSs lead to positive effects on biodiversity as impact varies strongly based on choice of field, seed mixture and sowing, duration and vegetation structure (Henningson 2021). They point out that public financing has to be done carefully to avoid setting incentives for critical measures (Henningson 2021). Mei et al. (2021) emphasise that currently provided schemes rarely take into account quality differences between WFSs while including respective criteria would increase biodiversity and therefore, ecosystem services that underpin agricultural production.

Literature provides insights on the effects of WFS on various parameters like pollinators, pest control, crop yield and studies investigating the quality of seed mixtures etc. However, there is a research gap regarding the overview of different schemes and private sector financing, involved stakeholders and linked to it variances in quality of WFS and finally their impact on biodiversity

and ecosystem services. Furthermore, knowledge about the different types of stakeholders and their interests is limited.

Research objective

The research objective is to map and analyse the different actors and forms of WFS financing in Germany. The core is to understand the financing system, including public as well as private sector intervention, potential quality differences of different financing schemes and their respective impact on biodiversity. Assuming a boost in private sector financing, the main question is which core success criteria need to be fulfilled by schemes in order to call private sector financing effective in terms of biodiversity conversation. Or put differently, are private sector financing schemes worth it or would the money better be spent in form of public subsidies? Hence, the overarching research question can be formulated as follows:
What types of private financing schemes for WFS exist in Germany, what are core success criteria of this measure for biodiversity conservation and does private sector financing fulfil them?

To answer the research question, theoretical conditions as well as core structures of implementation need to be understood, namely who the relevant stakeholders are, which quality differences exist in WFSs, what the public and private sector financing structures look like and what core success criteria, ecological, economic and social need to be fulfilled by private WFS financing. Based on the general research objective, three sub-objectives and respective questions can be formulated as follows:

- Who are the stakeholders involved in WFS financing?
    - Public: stakeholders and their interest and motivation
    - Private sector: (interest)groups, actors and their interest and motivation
    - Recipients (focus on farmers)
- How heterogenous are WFS financing schemes?
    - Which kind of financing schemes are provided? (public and private)
    - What are requirements of different financing schemes? (public and private)
    - Are there quality differences in WFS and are they considered in financing? (public and private) => categorisation of WFS with respect to quality
- What are core success criteria for private sector WFS financing schemes as measure for biodiversity conservation? And does private sector WFS financing fulfil these criteria?
    - What are core success criteria for a WFS financing scheme to be considered an effective measure for biodiversity conservation? (different perspectives of stakeholders)
    - Evaluation of private WFS financing (public funding schemes as benchmark)

Methodological approach

The methodological approach for the thesis will mainly be based on qualitative research, consisting of a mixture of different methods, as outlined below:

- **Literature research** (scientific and grey literature) to explore the scope of existing financing schemes and involved stakeholders (supply/consumption), incl. conditions in selected federal states. Based on the size of the agricultural area (Statista 2021) and other factors, the states Bavaria, Lower Saxony and Baden-Württemberg are subject of

the analysis[1]. Furthermore, details about the ecological evidence, criteria like quality differences of WFSs, costs etc., interests and incentives of stakeholders of WFS financing shall be reviewed based on provided literature. Criteria for study selection will be determined to minimize publication bias, depending on the subject e.g., date, country/federal state of research, focus etc. In addition to standard databases like Scopus, AgEcon Search, Thünen institute etc. further sources such as AgraEurope, TopAgrar, Genios, regional farmers' newspaper, official webpages of stakeholders and other sources will be used for grey literature research.

- Linked to the literature research, a **stakeholder analysis** will be done to define the key stakeholders in Germany's WFS funding, focusing on Bavaria, Lower Saxony and Baden-Württemberg. Core groups and their interest and motivation shall be mapped.
- Based on the results of the literature research and the stakeholder analysis **expert interviews** (guided interview) will be deducted. The objective of the interviews is to receive insights on quality differences of WFSs and respective schemes, interests and motivation of actors, core success criteria in their point of view and economic figures. Additionally, a general "expert-check" of results gathered so far is aspired. Experts shall ideally cover the various stakeholder groups (approach e.g., with respect to concrete funding program).
- Finally, based on the results core success criteria for effective WFS financing shall be defined and applied for assessing private financing schemes in terms of biodiversity conservation.
- Ideally the final steps include formulation of policy recommendations for future private sector WFS financing schemes (optional).

The following table shall provide an overview of how each sub-objective shall be reached:

sub-objective	method	additional task
stakeholder mapping of WFS funding actors	literature research stakeholder analysis expert interviews	
Heterogeneity of WFS funding schemes	literature research expert interviews	expert interview (guided interview) - preparation - execution - evaluation
Core success criteria and assessment of private WFS financing	literature research expert interviews definition of core success criteria benchmarking with public subsidy schemes	

Expected results

It is assumed that results show that WFS and WFS financing schemes in Germany are quite heterogenous including quality differences that lead to different levels of effectiveness. It is

[1] A deviation of this selection is possible for stakeholders that offer nationwide schemes.

expected that based on results a stakeholder map and a “categorisation” of schemes according to quality and financing can be developed. Finally, results allow to define core success criteria that determine effective implementation of WFS financing. Based on the defined criteria private financing schemes can be compared with public funding.
Ideally, recommendations for future schemes design, incl. requirements and quality controls can be formulated based on the findings.

Timeline of work planning

Task	March	April	May	June	July	August
Literature research						
Writing: study context and framework incl. hypothesis						
Stakeholder analysis						
Writing: Methods, Procedures						
Preparation expert interview						
Interview: executing and evaluation						
Overall evaluation of (interview) results						
Gross-margin calculation						
Writing: results						
Tables, Graphs etc.						
Writing: Discussion and Conclusion						
Proof reading						
Submission						

First outline of completed thesis

1 Introduction
2 Study context and framework
    2.1 Definitions
    2.2 Wildflower strips
    2.3 Legal requirements for funding and financing schemes
    2.4 Framework and Hypothesis
3 Materials, Methods and Procedures
    3.1 Literature research
    3.2 Stakeholder analysis
    3.3 Expert interview
    3.4 (cost-benefit analysis)
4 Results
    4.1 Stakeholder mapping
    4.2 Categories of wildflower strip financing schemes
    4.3 Core success criteria
    4.4 Evaluation of private sector wildflower strip financing
5 Discussion
6 Conclusion

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S_4 (7/15/2022): stakeholder interview farmer.

S_5 (7/25/2022): stakeholder interview company.

S_6 (8/2/2022): stakeholder interview farmer.

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