

## Masters thesis

### Title: Diversity and Concentration: Unraveling the Dynamics of Strategic Decision-Making in Seed Supply - An Agent-Based Modeling Approach

Summary: This proposed master's thesis aims to explore the intricate dynamics of the seed producing industry through with agent-based modeling. The seed multiplication sector serves as a critical nexus within the agricultural system, influencing the availability and diversity of crop varieties essential for global food security. By constructing a toy simulation, this master's thesis aims to unravel the strategic decision-making processes of various stakeholders within the industry and assess the resultant diversity in seed varieties supplied under different what-if scenarios.

Description: The proposed thesis seeks to fill a critical gap in our understanding of the complex interactions and strategic behaviors prevalent in the seed multiplication industry. Through the development of an agent-based model, we aim to simulate and analyze how decisions made by seed producers leads to different outcomes in the distribution of seed varieties. By exploring diverse what-if scenarios in terms of strategies to go for different kinds of seed varieties kinds (drought tolerant or pest resistant varieties) ranging from shifts in in plant breeding efforts and estimated famer preferences this thesis will provide insights into the resilience and adaptability of the industry in the face of uncertainty.

Methodology: The methodology will involve the development and calibration of an agent-based model that reflects the structure and dynamics of the seed multiplication industry. Based on past publications and already conducted qualitative interviews the student will condense strategies of seed producers and transfer them into an agent-based toy model, which focuses on elucidating the dynamics stemming from industrial concentration like mergers & acquisitions. The model will then look at different outcomes in terms of varietal diversity and industrial concentration amongst players. The model will then be validated through comparison with real-world observations.

Programing skills is NOT a prerequisite, but we expect a certain willingness to engage with multitude of materials to learn the same in a supported self-guided process. Potential programs used are either Netlogo or the Repast Symphony from Java, depending on previous programing experience.

Check out examples of agent-based models here: [NetLogo Webpage](#) (toy models) and [ComSES](#) (and here is what they looks like for research)

**If you are interested - please contact:  
Dr. Maria Gerullis**

Department für Agrarökonomie und Rurale Entwicklung  
- Management der Agrar- und Ernährungswirtschaft -  
Platz der Göttinger Sieben 5  
37073 Göttingen  
T: +49 (0)551 39-23281  
Raum: MZG 11.150

#### Sources:

Gerullis, M., Heckelei, T., & Rasch, S. (2021). Toward understanding the governance of varietal and genetic diversity. *Ecology and Society*, 26(2).

Books on Agent-based Modelling: "Introduction to Agent-Based Modeling" - <https://intro2abm.com/>