Project Description

"Digital management support systems for small and medium-sized enterprises in value chains of ornamental plants, perennials, and cut flowers" (PlantGrid - Subproject 2A)

For many value chains in horticulture, the problem lies in the heavy reliance of consumer demand for horticultural products, especially ornamental plants, perennials, and cut flowers, on external factors such as weather, public holidays, vacations, regional events, or other often unknown influencing factors. Since assessing the impact of these factors is challenging for companies or information is often lacking, it results in significant uncertainties in planning and ordering goods that have a limited shelf life. In daily business operations, this leads to situations of either out-of-stock (during high demand) or high excess stocks, which can even lead to the disposal of perishable plants. Apart from the cost and management burden, this negatively affects customer and employee satisfaction, as well as the economic performance of individual companies. It also has implications for resource utilization, sector competitiveness, and sustainability-oriented actions.

Despite the utilization of operational planning and decision support systems (e.g., ERP, merchandise management, and ordering software) in many companies in the horticultural retail trade, the problem has not been satisfactorily resolved in recent years, particularly for ornamental plants, cut flowers, or perennials. Additionally, the explicit investigation of big data usage in small and medium-sized enterprises (SMEs) for horticulture applications has been lacking in scientific literature. Existing approaches primarily focus on implementing IT applications in strictly organized supply chains, whereas companies are often integrated into supply networks where the flow of goods between companies is organized on short notice and without specific coordination.

In view of the problem situation described, the present project examines the possibilities of using and processing internal and external data for SMEs in horticulture for the value chains of ornamental plants, cut flowers and perennials. This includes incorporating data related to customers, sales, as well as information concerning the procurement, logistics, and production of plants. In a successful outcome, a multi-tiered digital management support system will be developed and tested for various actors in the investigated value chains. As project results, analysis and forecasting systems for the sales of selected ornamental plants, cut flowers, or perennials for companies in horticultural retail are conceivable. These insights can also be utilized for improved disposition and ordering of goods, leading to efficiency gains in the upstream production and trade stages, as well as in logistics.

Overall, the project addresses the following research questions:

- How should information systems be designed to adequately represent the heterogeneous structures in supply chains for ornamental plants, perennials, and cut flowers?
- How can internal and external supply chain data be utilized to improve sales forecasts for ornamental plants, perennials, and cut flowers for individual companies?
- To what extent can sales forecasts be linked with advanced analysis and forecasting approaches aimed at better planning and optimization of processes in the supply chains?
- What approaches can be derived for optimizing logistics?
- What are the effects of current and future developments in automation and digitization on job quality and employee satisfaction?

The Chair of Marketing and Management of Renewable Resources (Prof. Dr. Klaus Menrad) and the Chair of Bioinformatics (Prof. Dr. Dominik Grimm) are working on innovative approaches to digitalisation to increase efficiency in value chains for ornamental plants, perennials and cut flowers in the course of sub-project 2. Machine learning methods are utilized to develop models for sales forecasting. For this purpose, both internal data such as historical sales data and external factors like weather or holidays are used as data sources. In a further step, this model, initially focused on the sales stage, will be extended to the trade and production stages, which potentially offer additional relevant factors such as product availability that can be used for predictions. In addition to the modelling, the participating companies will be asked how their customers view the use of big data or other IT applications, what benefits they expect or what fears they have in this context.

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