

## Extended Abstract

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<b>Paper/Poster Title</b>	<b>The FSEC-SSPs: Shared Socio-economic Pathways for global agricultural production and their implications for on-farm management decisions</b>
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<b>Abstract</b>	<b>200 words max</b>
<p>The Shared Socio-economic Pathways (SSPs) are qualitative descriptions of five equally plausible, potential future scenarios related to climate change mitigation and adaptation. The FSEC-SSPs extend the SSPs framework and contribute to this literature by focusing on the global agricultural production level as its scope. We examine the drivers determining future on-farm management decisions and their outcomes regarding output and productivity, profitability, and environmental impacts. We apply a qualitative approach using semi-structured interviews and expert workshops, with its results to be implemented as a baseline in Integrated Assessment Modelling exercises. The storyline elements and the associated storylines are defined by an international group of experts in agricultural economics from both FSEC (Food System Economics Commission) and various other research institutions. Besides, bio-physical and locational factors of the farm, especially the structure of the agricultural system of the particular country and the political environment, are predicted to be significant drivers of future development. However, demand for various product groups, the availability and use of specific technologies, and the market structure are additional forces to impact production decisions. The description of typical farms for each SSP in different world regions will support the qualitative storylines.</p>	
<b>Keywords</b>	Shared socio-economic pathway, agricultural production, scenarios, storyline development, SSPs
<b>JEL Code</b>	Q10, Q13, Q18, Q01, Q16
<b>Introduction</b>	<b>100 – 250 words</b>
<p>In the context of the IPCC's 5<sup>th</sup> Assessment Report (Dellink et al. 2017, O'Neill et al. 2017), the international research community, together with governments and NGOs, developed the Shared Socio-economic Pathways (SSPs). These pathways describe five equally plausible, potential future scenarios linked to climate change mitigation and adaptation, focusing on socio-economic developments, such as demographics, human development, economy and lifestyle, policies and institutions, technology, and environment and natural resources. Following this initiative, various studies have been published describing individual SSPs (e.g., SSP1 by van Vuuren et al. 2017, SSP5 by Kriegler et al. 2017) or implementing SSPs on the global level (O'Neill et al. 2017, regional level (SSP narratives for agriculture in Finland by Lehtonen et al. 2021), or sector-specific level (land use in SSPs by Popp et al. 2017, Eur-Agri-SSPs by Mitter et al. 2020). We extend the basic SSPs and contribute to this literature by focusing on the agricultural production level as its scope. In the FSEC-SSPs (Food System Economics</p>	

Commission), we examine the drivers determining future on-farm management decisions and the outcomes regarding output and productivity, profitability, and environmental impacts.

### **Methodology**

**100 – 250 words**

Our study applies the qualitative approach of scenario development described by Mitter et al. (2019). In a first step, we use semi-structured interviews combined with expert workshops and an extensive literature review to gather information on drivers of change for agricultural production. We invited FSEC-internal experts together with external experts in agricultural economics from various international research institutions to discuss future developments. The drivers are translated to storyline elements, revised by a FSEC-internal supporting group. Along with these elements, dynamics and directions for all five SSP storylines (SSP1: Sustainability – taking the green road, SSP2: Middle of the road, SSP3: Regional rivalry – a rocky road, SSP4: Inequality – a road divided, SSP5: Fossil-fueled development – taking the highway) are described, displaying different possible futures for the agricultural sector on a global scale until 2050. Several iterations of review and revision in the expert group as well as in the internal supporting group are established to ensure consistency and plausibility of the FSEC-SSPs. In an attempt to capture and display the diversity of global agricultural production and highlight differences between the single storylines, we provide a limited number of typical farming examples per SSP in distinctive settings and with exemplary farm types.

### **Results**

**100 – 250 words**

Our study shows that besides farm and farmer's characteristics, such as biophysical factors, availability of farm assets, or education, external factors play a significant role in influencing an individual's decisions on-farm management. We distinguish between various aspects of demand patterns (e.g., demand for food, change in dietary habits), markets and value chains (e.g., value chain structure, price development), policies and institutions (targets of policies, role of institutions), the structure of the agricultural sector (e.g., rural services, social safety net), and technology (e.g., digital technologies, pace of diffusion and adoption). Additionally, the FSEC-SSPs are embedded in overarching population and societal developments, such as demography, GDP development, urbanization, or governance quality. While all elements individually influence the future of agricultural production, interlinkages and uncertainties are considered just as well. As general population development estimated for each SSPs impacts demand for food, dietary habits are influenced by policies, substitutes for traditional foods, or prices, among other factors.

### **Discussion and Conclusion**

**100 – 250 words**

Based on the SSP framework, we derive five different futures of the global agricultural sector, with a diverse set of outcomes. Despite the focus on on-farm management decisions, external factors, such as policies, acceptance, and regulation of technologies, or overarching societal factors, like governance quality, shape the agricultural sector's future. The use of examples allows us to emphasize differences and capture the diversity of global farming in each storyline. The FSEC-SSPs serve as baseline assumptions for other modelling exercises using Integrated Assessment Models on a global or national scale. Additionally, exploring storylines of future agricultural production can help to evaluate policies designed to follow a particular pathway in transforming today's food system towards a nature-positive, healthy, inclusive, and resilient food system