

Smallholders and the Impact of the Agri-food Supply Chain

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Abstract

As the main drivers of primary food production, smallholders play a central and indispensable role in the agri-food supply chain (AFSC). Their responsibilities extend far beyond cultivation to include the prudent use of resources, the implementation of sustainable agricultural practices, and adaptation to changing environmental and market conditions. As smallholders, they are responsible for the journey of food from field to fork, shaping the quality, sustainability and resilience of the entire AFSC. As well as producing a wide range of crops, their work includes soil health, water management and biodiversity conservation, which are critical to the long-term sustainability of agricultural systems. In addition, the decisions that smallholders make about seed varieties, farming practices and the management of climate challenges have a direct impact on food security by determining the availability, accessibility and nutritional value of the food they produce. However, smallholders are increasingly confronted with a variety of challenges that affect their work and the sustainability of agricultural production, and these challenges have a significant impact on the entire AFSC. This study will examine the key challenges facing smallholders in today's agricultural economy and the potential impact of smallholders on actors within the AFSC, and will explore possible ways to overcome these challenges from an expert perspective. In order to gain an overview of these critical issues, the study uses a qualitative approach to consider 17 expert perspectives from various actors in the agricultural sector gathered in January-March 2023. This included consulting

firms, agricultural cooperatives and actors in the AFSC, from seed producers to retailers. This should ensure an integrative understanding of the challenges and enable the formulation of possible strategies to overcome them. The results reveal that smallholders are confronted with an immense amount of documentation due to the various regulatory requirements. This tends to overwhelm their knowledge and ability to deal with it, and ultimately confronts them with uncertainty about their efforts to provide the documentation. The question of how to implement digitalisation on the farm and how to deal with price pressures from the market are also major challenges for smallholders. At the same time, AFSC companies have recognised that smallholders can make a significant contribution to achieving company goals, and have taken strategic steps such as integrating smallholders into their own digital systems. In conclusion, in the immediate future, actors in the AFSC sector will seek to collaborate closely and support smallholders through knowledge sharing, digital integration and market-driven strategies to increase the sustainability and efficiency of food production.

1. Theoretical Background

Smallholders¹ play an essential and often underestimated role in the global AFSC [1], [2], [3]. Their decisions, practices and challenges have a far-reaching impact on the availability, sustainability and quality of food production [4], [5], [6]. The involvement of smallholders in the AFSC is not only a question of agricultural productivity, but also touches on aspects of social justice, environmental sustainability and economic

¹ Smallholders are a diverse group of farmers, typically characterised by small farms, often with limited resources and less than 10 ha of land [68].

resilience [7], [8]. The role of smallholders in ensuring food security and building a resilient AFSC is vital in a world where population growth, climate change and resource scarcity are putting increasing pressure on AFSC systems [9], [10]. Their agricultural methods, which are often based on traditional knowledge and sustainable practices, are crucial for the preservation of biodiversity and soil health [11]. By cultivating small plots of land and diversifying their crops, smallholders make an important contribution to resilience in the face of climatic and economic changes [12], [13], [14]. However, smallholders also face considerable challenges [15]. Access to markets, financial resources and modern technologies is often restricted, which limits their productivity and income [16], [17]. In addition, political decisions and global trade dynamics that favour large-scale industrial farming models can weaken the position of smallholders in the AFSC [18], [19]. These inequalities mean that their potential role in food security and the sustainable development of agriculture is not fully realised [20], [21], [22]. The choices that smallholders make - such as the crops they grow, the techniques they use and how they manage natural resources - have a direct impact on the AFSC [23], [24]. By choosing to cultivate traditional varieties they contribute to the preservation of genetic diversity, while the use of sustainable agricultural practices can ensure long-term soil fertility as well as the satisfying the requirements of AFSC actors and consumers [25], [26], [27]. These decisions affect the resilience of the AFSC as a whole to environmental change and socio-economic disruption, as well as the quantity and quality of food production [28], [29]. The ability of smallholders to respond to rapidly changing market conditions and consumer preferences is often limited by the abovementioned challenges and the lack of linkages to distribution channels that would allow smallholders direct access to consumers [30]. These constraints make it difficult for smallholders to capitalise on high-value markets or niche products that could offer higher added value [31], [32]. In addition, consumer habits are changing, and demand for diverse, high-quality and sustainably produced food is increasing [33]. While this can create opportunities for smallholders who use traditional or agroecological farming methods, it also puts them at risk of being displaced by industrial agriculture, which can produce on a larger scale and at lower cost [34], [35]. The resilience of AFSCs depends largely on their ability to adapt to change and withstand disruption. Smallholders play a key role in this, as their practices and knowledge of agrobiodiversity conservation are an essential pillar of the adaptive capacity of the AFSC system. As smallholders

collectively represent significant market power that is often underestimated despite their important contribution to the food economy, it is crucial to analyse their challenges in detail from a practical perspective [36]. This includes considering expert opinions and involving companies whose activities significantly shape and influence food production. The need for such an approach arises from the fact that through their direct link to food production, smallholders play a key role in food security and the sustainability of food supply chains, and have a significant impact on the AFSC. The development of targeted, evidence-based strategies that consider the specific conditions and needs of smallholder is therefore essential in order to strengthen their resilience, increase their productivity and promote their sustainable integration into global food supply chains.

In light of this background, this study addresses the following research question:

"What are the main barriers and impacts of smallholders within AFSC systems, and what can be done to overcome them, from the experts' point of view?"

In order to answer the research question, a qualitative research method of expert interviews was chosen in order to gain deeper and more practical insights into the issues facing smallholders. This method allows the complex dynamics and challenges faced by smallholders to be captured and understood at first hand. Expert interviews provide the opportunity to gather detailed information and perspectives that go beyond quantitative data and shed light on the nuances of farming practices, decision-making processes and the impact of policy frameworks on smallholders. By engaging directly with experts working in various areas of agribusiness, policy-making and sustainable development, valuable insights can be gained that can help formulate targeted recommendations for strengthening the role of smallholders in the AFSC. To enable a structured investigation, the study was divided into the following sections. Section 2 is dedicated to the methodology of the study in detail by presenting the expert groups and describing the analysis tool used to evaluate the interviews. Section 3 presents the key results of the study, summarising the most important aspects and findings from the expert interviews. Finally, section 4 discusses the results and draws conclusions that not only reflect the findings but also formulate recommendations for future research and policy measures.

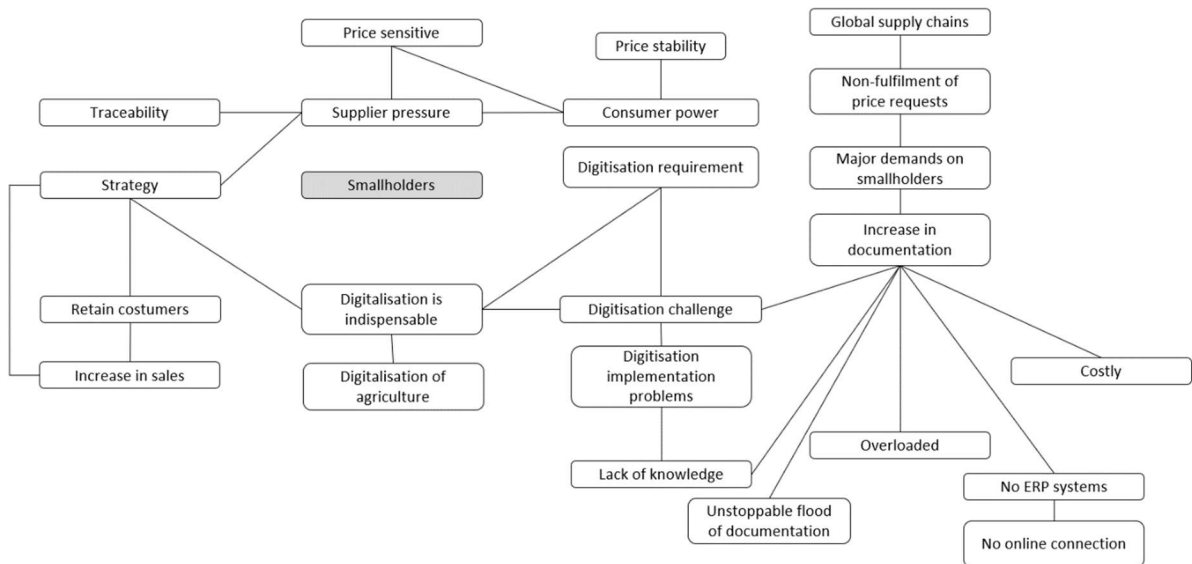


Figure 1: Associations with current challenges

2. Research Methodology

In order to understand the impact of smallholders and the impact of the AFSC, the study involved interviewing experts from three main groups of companies that influence the AFSC: (a) extension agencies, (b) AFSC actors ranging from seed producers to retailers, (c) agricultural cooperatives. The interviews were conducted between January and March 2023, involving 17 experts with between 4 and 35 years of experience and using methods such as web applications, phone calls and face-to-face meetings. Open-ended questions guided the interviews to delve into the challenges involved in digitizing the AFSC to improve efficiency. The data was analyzed using the qualitative GABEK method and WinRelan® software, focusing on understanding individual and organizational perspectives on the topic [37, 38, 39]. The analysis involved preparing the data, breaking down the interviews into meaningful units, manually coding these units with key terms, and visualizing the connections between terms in order to map collective thoughts and knowledge about the challenges of the digitizing process [40]. This approach provided in-depth insights into the research topic.

3. Results and Discussion

The ever-increasing focus on sustainability, particularly within the food industry in the EU, means that all of the actors involved must increasingly fulfill higher standards in order to operate their businesses and ultimately market their products [41, 42, 43]. This shift is evident in various initiatives. Throughout the years, the EU Commission has issued numerous directives that affect smallholders, such as the Integrated Pest Management (IPM) directive, the Sustainable Use

of Pesticides Directive (SUD) or genetically modified organisms (GMOs) [44]. In addition, there is a growing emphasis on promoting sustainable practices among smallholders, as highlighted by the need to precisely define and adjust legislative efforts to acknowledge and support the seed systems used by smallholders [45]. This aligns with the overarching objective of improving food security while conserving resources, as evidenced by the adoption of agroecologically efficient agricultural systems that contribute to food sovereignty [46]. However, from the smallholders' point of view, these standards lead to a documentation requirement that they cannot adequately cope with (see Figure 1). An expert reported:

"(...) But you just can't absorb this flood of documents to fulfil them all perfectly, no matter what." (Ek6)

Rather, smallholders are confronted with a great deal of uncertainty regarding the standards. One expert report on this:

"(...) half [of them] (...) I didn't understand at all, but not because I hadn't heard it, but because I have no idea about it." (Bp1)

Another expert reported the following effect of documentation requirements:

"(...) we would basically have to be almost (...) civil servants to see through it, because you don't even know, am I going to declare it like this? What does that mean for me? What costs will I incur? Another example: I have an old machine shed in my backyard where I keep a few of my machines. This is categorized as agricultural land. But I can't enter

a building unless I click on "Garden shed larger than 30 square metres" and that's definitely not correct either. And that's how you find your way through, and that's the case with many things." (Ek7)

In the course of smallholders meeting documentation requirements, the digitalization of farms is becoming unavoidable, which in turn represents a major challenge for smallholders when it comes to implementation. Challenges such as insufficient investment, technological complexity, limited internet access, adjustment to new workflows, and staffing shortages have been recognized as major obstacles [47], [48], [49]. In addition, the integration of digital tools in agriculture faces additional challenges due to inadequate infrastructure, poor connectivity, skills shortages and a lack of appropriate decision support tools [50]. Moreover, the shift towards digitalization requires a strategic approach and a clear understanding of the implications. Studies have shown that responses to digitalization in agriculture are often ad hoc, indicating the lack of a structured approach as well as uncertainty about the digital transition in the sector [51]. Furthermore, the uneven transformation of farming practices through automation and digitalization is closely tied to the political and sustainability dynamics within specific agricultural settings, highlighting the complexity of integrating digital technologies into traditional farming practices [52]. One expert stated that

"If you are a smallholder, you are no different from any consumer. Imagine you would like to have a digital solution that helps you in many ways. Trying to connect all these services that you need is a challenge." (Fg4)

Another expert reported briefly and concisely on the aspect of digitalization:

"(...) we are too small for that." (Bn6)

In conclusion, another expert summarised the situation regarding the lack of digitalisation as follows:

"(...) no online connection and therefore this is a manual process, which means that employees are behind it, employees would then have to search for information on request and then forward it manually or by scan or whatever (...)." (Ec6)

Both the increasing documentation effort and the need for digitalization represent an internal operational challenge that smallholders are increasingly forced to deal with. Another important discussion area for smallholders and

market actors is the price situation and the resulting price pressure. The price pressure that smallholders experience from customers can be attributed to various factors within the agricultural supply chain [53]. Customers, including retailers and consumers, exert price pressure on smallholders for several reasons, impacting the profitability and sustainability of farming operations. One key reason for this pressure is the increasing consumer demand for lower-priced agricultural products, driven by factors such as competition among retailers, the price sensitivity of consumers, and economic conditions [54]. This is confirmed by one expert as follows:

"Yes, absolutely. Of course, it's deliberately stronger now due to inflation. During corona, nobody paid that much attention to money. You could clearly feel that, sales have shot up everywhere." (Cw6)

As a result, smallholders often face downward pressure on prices to meet the expectations of cost-conscious customers. Moreover, the consolidation of retail power in the AFSC has contributed to price pressure on smallholders [55]. Large retailers and supermarkets hold significant bargaining power, allowing them to negotiate lower prices with suppliers, including smallholders, in order to maintain their profit margins and competitive pricing strategies [56], [57]. An expert reported the following:

"Sometimes it's the case that someone can't produce below a certain price and the customer then says we can't pay it either. That's just the way it is sometimes, then they look around for a new one. I think that there are also shifts (...)." (Ce5)

This power dynamic leads to a situation where smallholders are compelled to accept lower prices for their produce in order to secure contracts with major retailers. One expert reported:

"Yes, I think the biggest challenge is that we have it when you think about price negotiation." (Fd2)

In addition, globalization and international trade play a role in exerting price pressure on smallholders. The interconnected nature of the global economy means that smallholders are not only competing with local producers, but also with international suppliers [58]. This competition can drive prices down as smallholders strive to remain competitive in the global market, facing challenges such as price volatility and fluctuating demand [59]. In addition, one expert summarised this by stating:

"Most of the challenges really show up when something in the global supply chain doesn't meet the quality you need, doesn't meet the price you said it would, doesn't meet the requirements." (Fd6)

Furthermore, changing consumer preferences and market trends influence the price pressure that smallholders experience. Shifts towards organic, sustainable, or ethically sourced products can require smallholders to make investments in new practices or certifications in order to meet evolving customer demands, potentially increasing production costs and affecting pricing strategies [60]. While the demands on smallholders are increasing, both within the farm and in relation to market players, smallholders have an immense impact on the entire AFSC. Smallholders make an indispensable contribution to the functioning and maintenance of the AFSC and therefore play a central role in the agricultural and food system [61]. This role is characterized by their fundamental function in the production of food and raw materials, which form an essential basis for feeding the population [62], [63]. Through their decisions regarding cultivation methods, plant breeding and resource management, smallholders have a decisive influence on the efficiency and sustainability of food production and thus on the availability and quality of food [28], [29]. However, the role of smallholders goes far beyond pure food production. They are equally important players in overcoming challenges such as climate change, the preservation of biodiversity and the sustainable use of natural resources [64], [65]. By using innovative and sustainable agricultural practices, smallholders can help to reduce greenhouse gas emissions, improve soil quality and protect water resources [66]. In addition, the adaptation and integration of modern technologies into farms plays a crucial role in increasing productivity and efficiency while minimizing environmental impacts [67]. The importance and influence of smallholders on the food industry has been recognised by food sector stakeholders, whose responses to the main challenges faced by smallholders included the following:

"The actors have all realized at the end of the day that it is the smallholders who bring the money into the company and when I have understood that, then I look for ways to serve my customer, my smallholders, in the best possible way and in the future it will be the case that the breeders will be more and more committed to the smallholders, more to the smallholders than to the trade and that also means that the most diverse companies (...) will have a rethink and there will be a new way of thinking, which yesterday was fully related to

wholesale and retail, tomorrow will be related to the smallholders." (Ef6)

With regard to providing smallholders with support in overcoming these challenges, one expert reported the following experience:

"Business processes are being developed, online solutions, (...) which are aimed at the smallholders, which are then aimed at the real end customer in order to do business with him and, above all, to do business sustainably, which also means we are talking about retaining customers." (Ef7)

The expert added:

"(...) we will then work more than ever on the smallholders and in the future, there will be digital solutions such as partial patch-specific sowing or variety recommendation programs, which we have collected under the guise of "crop wise." (Ef8)

4. Conclusion

This study emphasises the complex and central role of smallholders in the food value chain and the many challenges they face in today's agricultural economy. As the linchpin of primary food production, the smallholder is not only responsible for growing a wide range of food crops, but also for maintaining sustainable farming practices, efficient resource management and the preservation of diversity. These tasks are crucial for the long-term sustainability of agricultural systems and thus for global food security. The research highlights several critical challenges facing smallholders, including overwhelming documentation requirements, the daunting task of farm digitalisation and significant market-driven price pressures. These challenges, exacerbated by stringent regulations and rapid technological change, place smallholders at a turning point that requires adaptability and resilience. The study also emphasises the indispensable contribution of smallholders to the AFSC. Involving and supporting smallholders through knowledge sharing, digital inclusion and market-orientated strategies is seen as crucial to improving the sustainability and efficiency of food production. The study therefore emphasises the need for close cooperation and support of smallholders by all AFSC stakeholders in order to overcome the challenges and strengthen the role of smallholders in the AFSC. Although this study has provided some insight into the barriers and opportunities for smallholders to influence the AFSC, there are two main limitations. The study focused mainly on smallholder fruit and vegetable farmers and less on cereal, dairy or livestock farmers. The latter are likely to have different constraints and impacts on the food chain than fruit and vegetable farmers. Furthermore, the

analysis is mainly focused on the German food market and the results are only partly transferable to other countries. In conclusion, future research should focus more on the strategic orientation of smallholders, and the extent to which they are better able to assert their market power and are less exposed to the influence of wholesalers and retailers, and ultimately consumers.

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