Extended Abstract
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Paper/Poster Title	Big Data Platforms in the Agricultural Sector – An Oligopolistic Platformization?

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Abstract	*200 words max*

Big Tech companies, including Amazon, Google, and Microsoft, are increasingly providing their cloud computing and artificial intelligence to the digital platforms operated by the world's largest agribusinesses like Bayer, BASF, and John Deere. These platforms combine and, in real-time, analyze space, climate, and agronomic data gathered by satellites, drones, sensors, and robots to make site-specific on-farm decisions. The paper studies the platformization of the agricultural sector and analyzes how agribusinesses and Big Tech companies use Big Data platforms to reinforce and establish their market dominance in the agricultural sector. We use an analytical framework[1] focused on three platform mechanisms – datafication, selection, and commodification – enriched by concepts of economic theory. The findings show that the platformization of the agricultural sector is an exceptional case study because it leads to the cooperation between two industries characterized by high market concentration: Big Tech companies and the established input and farm machinery companies. We argue that this "oligopolistic platformization" is mutually beneficial for both industries, even if the leading agribusinesses have not yet found a way to commodify their services. Unlike in other sectors, it is highly unlikely that the platformization of the agricultural sector will be disruptive to the already dominating agricultural companies.

Keywords	Digital Agriculture, Big Data, Smart Farming, Platformization
JEL Code	Technological change and the knowledge-based economy (O3)

Introduction	*100 – 250 words*

Big data platforms are a critical technology in the digital transformation of the agricultural sector. They combine and, in real-time, analyze space, climate, and agronomic datasets gathered by satellites, drones, sensors, and robots. By using artificial intelligence and machine learning, these platforms have the potential to support on-farm decisions, e.g., advise farmers regarding irrigation and site-specific application of seeds and agrochemicals, predict harvesting time, and forecast weather. The knowledge generated from these ag platforms will be increasingly important to aid the adaption to and mitigation of the interlinked challenges of climate change, food insecurity, and environmental degradation. Climate-smart agriculture can reduce these threats by increasing farmers' adaptive capacity and resilience and resource use efficiency in agricultural production systems.[2]

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[1] José van Dijck, Thomas Poell, and Martijn de Waal, *The Platform Society* (New York: Oxford University Press, 2018).

[2] Leslie Lipper et al., "Climate-Smart Agriculture for Food Security," *Nature Climate Change* 4, no. 12 (December 2014): 1068–72, https://doi.org/10.1038/nclimate2437.

Scholars have studied the emergence of Big Data platforms in other sectors and have coined the term platfomization, which describes the societal trend that companies, even outside the technology and internet sectors, are starting to provide digital platforms and attendant business models.[3] The development of Big Data platforms in the agricultural sector is currently driven by established agricultural input and farm machinery companies, the world's largest Big Tech firms, and venture capital funded start-ups.[4] Hence, the platformization of the agricultural sector is an exceptional case study because – unlike sectors such as health, public transportation, and education – it leads to the cooperation between two industries characterized by high market concentration. By drawing on Dijck et al.'s analytical framework, the paper elucidates how the platformization of the agricultural sector works in details and how it impacts these companies' market domination.

Methodology | *100 – 250 words*

We draw on expert interviews, field observation and secondary research to analyze the platformization of the agricultural sector. Interviewees represented agricultural machinery companies, seed and agrochemical businesses, Big Tech companies, and policymakers. Interview questions focused on key concepts of Dijck et al.'s analytical framework such as datafication, selection, and commodification. First, datafication comprises the capturing and circulation of data and includes the ability of networked platforms to render into data many aspects of the world which have never been quantified before. Second, commodification as a platform mechanism refers to the transformation of online and offline objects, activities, emotions, and ideas into tradable commodities and involves the development of multisided markets and new business models. Finally, the mechanism of selection concerns the curation of most relevant topics, terms, actors, objects, offers, services, etc., and takes shape through personalization, trends and reputations, and moderation practices. Furthermore, market competition versus cooperation were elements considered. The interviews were semi-structured, securing the discussion of pre-defined aspects, while allowing the interviewee to raise or expand upon aspects they deem particularly relevant.[5] To assess these interviews, a qualitative content analysis has been conducted following the guidelines of Hermann.[6] The applied code system is based on Dijck, Poell, and Waal's theoretical framework.

Results | *100 – 250 words*

The analysis reveals that agribusinesses and Big Tech companies use the platform mechanism datafication to open new markets. By quantifying aspects of agriculture that have not been quantified before, these data become enrolled in value circles. Moreover, agribusinesses use datafication to create network effects as the availability of complementary services drives the value of their sectoral platforms. Agribusinesses use the platform mechanism selection to create information asymmetry and vendor lock-ins aiming at maintaining their companies' core business. However, they struggle to successfully commodify their platform services and currently follow three different attempts of commodification: the commodification of farmers' expert knowledge, a combined farming package, and the commodification of decarbonization in farming. Big Tech companies, on the contrary, succeeded in

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[3] Dijck, Poell, and Waal, *The Platform Society*.

[4] Regina Birner, Thomas Daum, and Carl Pray, "Who Drives the Digital Revolution in Agriculture? A Review of Supply-side Trends, Players and Challenges," *Applied Economic Perspectives and Policy* 43, no. 4 (December 2021): 1260–85, https://doi.org/10.1002/aepp.13145.

[5] Nicholas Clifford, Shaun French, and Gill Valentine, *Key Methods in Geography*, 2nd edn. (Los Angeles, California: SAGE Publications, 2012).

[6] Margaret G. Hermann, "Content Analysis," in *Qualitative Methods in International Relations*, ed. Audie Klotz and Deepa Prakash (London: Palgrave Macmillan UK, 2008), 151–67, https://doi.org/10.1057/9780230584129_10.

commodifying agronomic data and have gained an oligopolistic status in providing their digital infrastructure to agronomic platforms. By turning Big Data into an invaluable resource for agronomic decision-making, these companies are positioning themselves as gatekeepers of knowledge essential for global food security and climate smart agriculture.

The findings of this paper contribute to two significant areas of study. First, they present new insights into the platformization of societal sectors as this phenomenon has gained momentum over the last decade in many areas, including media, education, health, and travel. Second, they offer new knowledge about Smart Farming from a social sciences perspective and study the intersection of the most giant agribusinesses and Big Tech companies.

Discussion and Conclusion	*100 – 250 words*

The results indicate that the platformization of the agricultural sector is neither an entirely platform-driven nor a user-driven process but rather one that results from the already existing market structures of the agricultural sector. These structures strongly determine the dominant players driving the platform economy as market concentration is high, with only a few agribusinesses in agricultural machinery, agricultural chemical, seed and biotechnology, controlling large market shares. Players new to the agricultural sector encounter barriers to entry, as customer access – access to farmers – is prohibitively expensive for new companies. In contrast to start-ups, incumbent firms have established close business relationships with farmers as they have provided their products to farmers for years. Hence, we argue that the agricultural sector is undergoing an "oligopolistic platformization" which is for both industries – Big Tech companies and the established agribusinesses – mutually beneficial, even if the leading agribusinesses have not yet found a way to commodify their services. Unlike in other sectors, it is unlikely that the platformization of the agricultural sector will be disruptive to the already dominating agricultural companies, but it might further accelerate the concentration process.

The platformization of the agricultural sector is linked and facilitates major technological change in the agriculture sector with a number of potential benefits, such as mitigating climate change and environmental degradation. Along with these possible positive developments will come additional social, economic, and political implications for the agricultural sector. A forward-thinking platform governance approach for the agricultural sector must anticipate the monopolistic tendencies induced by the platformization of the agricultural sector and will be crucial in mitigating the negative consequences of this new technology.

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