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Aspects regarding digitalization of Romanian agriculture

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Abstract: The adoption and integration of advanced technologies into agricultural practices commonly referred to as "Agriculture 4.0"—represents a transformative shift toward smarter, more efficient, and sustainable farming systems. This new era of agriculture is characterized by the widespread implementation of digital innovations such as Internet of Things (IoT) sensors, drones, artificial intelligence (AI), big data analytics, GPS-guided machinery, and cloud-based farm management platforms. These tools have the potential to revolutionize the agricultural value chain, enabling real-time decision-making, optimizing input use, increasing yields, and reducing environmental impact.

In the Romanian context, Agriculture 4.0 holds significant promise due to the country's rich agricultural heritage, extensive arable land, and ongoing integration within the European Union's digital and sustainability frameworks. However, the uptake of smart farming technologies remains uneven and limited. Key barriers include low levels of investment capacity among small and medium-sized farms, underdeveloped rural digital infrastructure, limited access to training and digital education for farmers, and fragmented policy implementation. These challenges have created a digital divide that risks excluding a large share of rural producers from the benefits of technological progress.

This paper explores the current state of digital agriculture in Romania, analyzing both the structural challenges and emerging opportunities associated with its modernization. Special emphasis is placed on assessing the role of EU funding mechanisms, national digital strategies, and private sector innovation in driving this transformation. The paper argues that a coordinated, inclusive, and well-financed approach is necessary to accelerate Romania's transition to smart farming. Bridging the technological gap in rural areas is essential not only for increasing productivity and resilience in the agricultural sector, but also for aligning with

broader EU ao	als related to	sustainability. cl	limate adar	otation. and	rural development
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