Special Committee on Artificial Intelligence in a Digital Age

European Parliament

AIDA Working Paper on

'AI, Agriculture and Food Security'

following the AIDA/AGRI Public Hearing on 14 June 2021

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Introduction

The Special Committee on Artificial Intelligence in a Digital Age (AIDA), in co-operation with the Committee on Agriculture and Rural Development (AGRI), organised on 14 June 2021 a public hearing on **"Artificial intelligence in agriculture and food security"**. The hearing explored the implications of AI in the agricultural sector by holding two panel discussions bringing together AI experts from across government, industry, academia and civil society. The key takeaways from both panels are summarised below, followed by contributions on the outcome of the hearing made by the European Parliament political groups. A video recording of the event is available via the AIDA Committee website[1].

The first panel of the hearing was guided by the question of how **AI can promote the transition towards a smarter and more sustainable future agriculture,** while the second panel focused on **how AI can be used in agricultural development and in achieving food security.**

In the context of the European Commission's plans on the future of agriculture in the European Union, which include the Common Agricultural Policy (CAP)[2], the EU Green Deal[3], the Farm to Fork Strategy[4] and the Biodiversity Strategy for 2030[5], looking at the potential role of emerging technologies can be important. In addition, the Coordinated Plan on Artificial Intelligence[6], published by the European Commission in April 2021, covers actions to support the development of AI systems for sustainable agriculture.

In relation to the hearing, AIDA Chair Dragoș Tudorache highlighted the following points: "Artificial intelligence has no purpose in and of itself. Its role, as a sophisti-

cated technology that uses increasingly complex data to make increasingly accurate predictions, projections, and in some cases decisions, is to improve the way our economies and societies function. Using AI in agriculture is ultimately, just like using it in any other domain, a way to improve the well-being of our citizens".

"AI in agriculture will help us make more efficient use of the land, optimize our resource use, shorten supply chains, and increase the quality of the agricultural products we consume. But this is not just about a linear increase in efficiency; by researching and deploying AI technology in agriculture and interdependent domains we are also increasing our strategic resilience and reducing our impact on the environment, making good on Europe's ambition to become a global player and model for the world" he added.

1 AIDA website, https://www.europarl.europa.eu/committees/en/aida

2 The future of food and farming - Communication on the Common Agricultural Policy post-2020

3 Communication and roadmap on the European Green Deal, COM(2019) 640

4 Communication - A Farm to Fork strategy for a fair, healthy and environmentally-friendly food system, COM(2020) 381

5 Communication - EU Biodiversity Strategy for 2030 Bringing nature back into our lives, COM(2020) 380

6 Communication - Coordinated Plan on Artificial Intelligence (COM(2018) 795

Key takeaways:

Panel 1:

The first panel focused on the question of **"how can AI promote the transition towards a smarter and more sustainable future agriculture?"**, with the participation of four expert panellists:

- **Dr Sjaak Wolfert**, independent researcher associated with Wageningen University & Research, The Netherlands
- **Dr Francesca Hennig-Possenti**, Chair of the artificial intelligence group at CEMA, Senior in-house lawyer at John Deere GmbH & Co. KG Germany
- **Dr Steven Davy**, Head of Division, Programmable & Autonomous Systems (PAS) at Walton Institute for Information and Communication Systems Science (WIT), Coordinator of H2020 CYBELE
- **Pieluigi Londero**, Head of Unit, Implementation Support and Integrated Administration Control System, European Commission

Applying AI to the domain of agriculture and food security requires a paradigm shift, including the adoption of new techniques, technologies, holistic working methods and multidisciplinary views. Sjaak Wolfert stated in his presentation, that **a responsible innovation approach must include technical robustness, human-centric design, explainable screening and auditing, as well as socio-economic feasibility, social acceptance, and ethical desirability.** Mr Wolfert mentioned three groups of disciplines that should support the use of new digital solutions: **data science, AI, and the ICT sector,** which are meant to develop smart algorithms and organise sound infrastructures for data exchange, followed by **business modelling, governance, and ethics** to develop solutions that are economically and legally feasible, socially acceptable and ethically desirable. Lastly, **ecosystem development** was also mentioned as being necessary to bringing the right stakeholders together and supporting awareness-raising and communication efforts geared towards a wider community. If all these disciplines are harmoniously integrated, then AI solutions for agriculture can be developed, according to Mr Wolfert.

Considering that in the year 2050, we will have to provide food for a very large number of people - **up to 9 billion** - the agricultural sector will be facing major challenges, stressed Francesca Hennig-Possenti. In order to adjust to the new reality, we need to grow the capabilities of agriculture and engage with AI **not only in the field of robotics but also within the field of data analysis.** Ms Hennig-Possenti stated that employing AI in the field of agriculture represents a necessity for achieving food security. She recognized

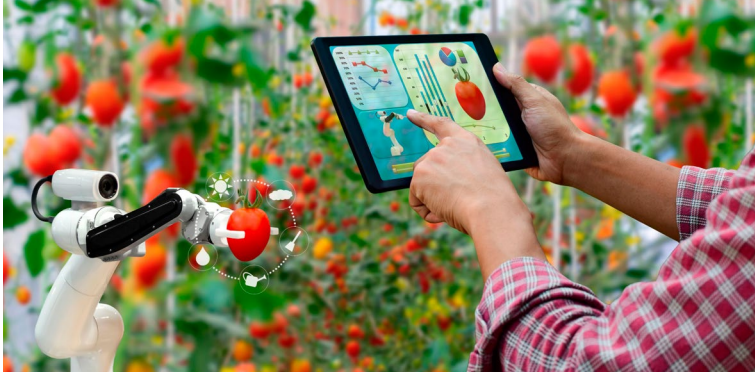
that AI technologies are still under development and that they can pose ethical challenges, however, she encourages further development of AI applications in agriculture.

AI can bring a more sustainable future for agriculture, but first, the major obstacles need to be tackled in order to unlock its full potential, according to Steven Davy. Some of the main challenges of employing AI applications in agriculture are: lack of concrete investment, reluctance to embrace new technologies (mainly due to cost of adoption) and gaps in skills and knowledge related to AI and the agri-food sector. Mr Davy stated that one approach to tackling these problems is to heavily invest in training within the agri-food sector, especially with the aim of raising awareness about how AI can lead to sustainable and transformative changes in the sector. **Mr Davy also underlined that the uptake of AI-powered technologies should be incentivised by the EU for agribusinesses, but not without ensuring responsible, ethical and trustworthy AI.** He added that some of the prerequisites to achieving this goal include: the need for AI to be explainable to farmers, more energy efficient, and suitable for the agriculture field.

One of the European Commission's political priorities is "Europe fit for the Digital Age"[7], which aims at strengthening Europe`s digital sovereignty and setting standards in fields such as AI, cybersecurity, data strategy, and digital skills, according to Pieluigi Londero. Mr Londero highlighted that **AI technology in agriculture must be supported by data.** The European Commission Proposal for a Data Governance Act[8] is geared towards creating a harmonised framework for data exchanges, making public sector data available for reuse, and ensuring sharing of data among businesses in Europe. This initiative alongside the AI legal framework and the Coordinated Plan on AI can help farmers meet economic profitability and environmental goals, according to Mr Londero.

7 Political guidelines of the Commission 2019-2024

8 Proposal for a Regulation on European data governance (Data Governance Act), COM(2020) 767



Panel 2:

The second panel focused on the question of **"how can AI be used in agricultural development and in achieving food security"**, with the participation of four expert panellists:

- **Juan Francisco Delgado**, Executive Vice-President, European Foundation on Innovation (INTEC), Senator for the European Parliament Union of the World Business Angels Forum (affiliated to the G-20 for issues of social inclusion) and Vice President of Startup Europe Smart Agrifood Summit
- **Mute Schimpf**, Food Campaigner
- **Rian Wanstreet**, PhD Candidate at the University of Washington and researcher at the UW Tech Policy Lab, Fellow at Harvard's Berkman Klein Center and Central European University's Center for Media and Data Studies
- **Matija Zulj**, CEO & Founder, AGRIVI

Keeping in mind that Europe competes in a global race to enhance agricultural capabilities, the new AI paradigm requires determination while being able to protect the environment and battle global hunger, stated Juan Francisco Delgado. Employment is a key aspect in the field of agriculture, and introducing a system of incentives for quality employment should be a priority alongside mass training for farmers in AI use, Mr Delgado said. Data, a driving force for AI, should be secure, transparent, and traceable and, according to Mr Delgado, block chain can help in this endeavour. Considering that **globally, 420,000 people die every year due to food contamination, with children under the age of five being particularly at risk (according to WHO), consumers must be placed at the heart of the food supply chain.** In addition, Mr Delgado encouraged farmers to use AI for exchanging information in real time, identifying the amount of fertilizers needed and reducing the use of pesticides.

Farmers must be included in the debate regarding the development of digital farming and they must be aware of new technologies, highlighted Mute Schimpf at the beginning of her presentation. Ms Schimpf stated that it is challenging to manage mixed data sets and data from different sources - from farmers, the public, and data recorded by machinery, and underlined **the necessity of knowing who is allowed to access, collect, and aggregate data, including third party transfers.** In this context, data transparency is crucial, and a clear process of how farmers can give and withdraw consent should be ensured, Ms Schimpf added. **Using AI is not the only way of developing best practices in agriculture and techniques such as better crop rotation or more diverse mix of plant seeds can also help, for example, in reducing pesticide use.** Ms Schimpf said that a bottom-up approach, which provides data sovereignty and a democratic procedure for farmers, is needed. Innovation should start with farmers as they are the party most aware of the dangers of AI, such as its high energy consumption. Considering that farmers are usually in a weak bargaining position and that specific groups of farmers could be further marginalised, it is better to avoid the assumption that AI will inherently contribute to the Farm to Fork strategy or the European Green Deal, Ms Schimpf stated.

AI is not the appropriate technology to rely upon for agricultural development or food security, stressed Rian Wanstreet. Due to climate change, which has increased resource competition, the field of agriculture is experiencing attacks on food supplies by malicious actors. **By continuing to rely on technology in the agriculture sector, we are at risk of undergoing ransomware attacks, hacktivism, alteration of data with the aim of by-passing regulations or manipulating market prices,** according to Mr Wanstreet. Taking into account the uncertainty of whether AI will ever be able to mitigate the carbon footprint of agriculture, Mr Wanstreet added that the high level of energy required by AI technologies to gather, store, and share data is detrimental to the field. Moreover, since real-world conditions make it impossible to train AI on consistent and clean datasets, a complete redesign of agriculture to become AI friendly would be needed to efficiently employ applications. Mr Wanstreet expressed doubts on whether AI in agriculture will be able to empower farmers, increase food production, decrease input use or cut emissions, and underlined the contradiction of the European Commission supporting the Green Deal while moving forward with adopting AI technologies for agricultural uses.

In moving towards sustainable agriculture development and ensuring food security, AGRIVI's Matija Zulj presented his views on the three main drivers of digitalisation in agriculture. Firstly, the **business environment** of traditional open-field agriculture has the responsibility of making decisions in real time with no room for error. Secondly, customers are driving digitalisation by expressing their preferences for sustainability, requiring farms to apply agricultural practices that are both sustainable and which respect agricultural quality standards. Lastly, **labour shortages** paired with the Covid-19 pandemic have drastically affected seasonal workforce migration, meaning that farms are at risk of not being able to carry out their activities. Mr Zulj stated that **AI can support farmers by, for example, providing thorough analysis, bridging aggregated data or disseminating information to farms quickly. He emphasized that all AI-based practices should be sustainable and matched with regulatory and market-driven standards.**

Contributions by Political Groups

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Group of the European People's Party (Christian Democrats)

The agricultural sector will be facing significant challenges in the upcoming years, especially considering that by 2050 we will need to provide food to up to 9 billion people, a significantly larger number of people compared to today. On these challenges, artificial intelligence technology could play a major role, enabling farmers to increase food production, decrease unnecessary costs, optimise resources and/or cut emissions.

In order to achieve the best technological advancements in the agricultural field, farmers should be aware of the new opportunities that technologies provide. Farmers must be included in the debate regarding the development of digital farming.

Collecting and gaining the insights of data will play a key role in this technological progress. We acknowledge that collecting and processing mixed data sets and data from different sources can be challenging, especially for smaller farmers. That is why we should ensure a clear scheme, clarifying who is allowed to access, collect, and aggregate data, including third party transfers.

Group of the Progressive Alliance of Socialists and Democrats in the European Parliament

AI can contribute to more sustainable farming practices by providing innovative solutions and control methods, and by making it possible to work more effectively and sustainably. Equal access to new technologies is a key precondition to a fairer, more sustainable and more transparent agriculture, as the use of AI on capital-intensive big farms could exacerbate further structural changes in rural areas. Thanks to AI, more skilled workers could be interested in entering into agriculture, however, low skilled workers should be able to receive necessary AI skills and digital literacy, in order to succeed in the jobs transformation, leaving nobody behind. As farmers increasingly use AI, the companies which have developed and operate these technologies might get access to data about the farmers' land, quality of soil, water resources, type of crops and animals on their holdings or on yields (for example from grassland, harvest volumes, or from animals in terms of animal weight, reproduction or volumes of milk). The farmers' interests in terms of data ownership and data protection must be safeguarded. When it comes to food security, AI can be used by authorities to better target inspections based on risk criteria, thus leading to a more efficient use of public resources and to a stronger enforcement of food security standards in the EU.

The Renew Europe Group

Artificial intelligence will play a crucial role in agriculture to support the green transition and reach our climate objectives. While dramatically improving work conditions, yields and profitability for farmers, AI based monitoring, measurement and processing of agricultural data will help, for example, to rationalize practices and reduce reliance on material inputs, such as fertilizers or pesticides, or fossil fuels, by fostering the use of lighter and smaller autonomous machines. AI based applications are already numerous and many promising precise agriculture technologies will emerge in the coming years. However, to bring digital transition into the fields, we need to guarantee a fair access to these new technologies and promote them. As 40% of rural areas in the EU have no access to high-speed internet, there is a dire need to support a faster deployment of broadband infrastructures. We also need to provide farmers with the necessary support and incentives for the uptake of these game changing technologies, for instance by ensuring genuine rewarding of collection and sharing of data.

Group of the Greens/European Free Alliance

Before applying AI to the agricultural sector, we need to assert the kind of agriculture we want. The current model is not sustainable for the environment nor farmers. Giant monocultures rely on non-reproductive seeds, pesticide and fertilizers and deplete the quality of the soil, biodiversity and food resilience. Farmers depend on crop giants upstream to get new seeds, chemicals and indebt themselves for costly equipment and on multinational retailers downstream who control the price of crops. Adding AI to such a system will only worsen the degradation of biodiversity, the situation of dependency of farmers by handing data power to third parties and add the high-energy consumption and rare metal depletion to the list of adverse environmental impacts. Instead, AI could model agricultural resilience, crop diversity and increase food quality and supply in permaculture. With 1/3 of food wasted every year, improving the management of the food chain would also improve food security. Instead of planning AI-piloted drones to pollinize flowers and crops in the future, we can put AI to better use than expanding the current practices responsible for the death of bees.

The Identity and Democracy Group

Artificial intelligence in agriculture could participate in the challenge of feeding a growing population, by improving the ratio between agricultural output (usual food) and agricultural input (land, energy, water, fertilisers, pesticides, etc.). Through precision agriculture, the data collection on soil, weather and crops, and their sharing with all the actors in the supply chain, we can optimise the input/output ratio, reducing food and resource waste. Any use of AI in agriculture should be aimed at food security, safety, and the environmental and economic sustainability of farming. AI can also be a solution for agriculture in the developing world, especially in Africa. Basic hydroponic farming and AI could allow developing countries to reach economic sustainability and food self-sufficiency in an environmentally friendly way. The European Union should also be an important actor in the process, by supporting the introduction of AI and precision agriculture in less developed countries.

The Left group in the European Parliament - GUE/NGL

The current intensive agricultural model is unsustainable for our planet. AI applications in the sector are mirroring this dangerous path, exacerbating monocultures, especially the ones linked to high water demand.

In a system where brokers collect agricultural data to influence the markets, the sovereignty over this data is key. Small farmers and short-circuits risks being marginalised by this digitalisation. Automation of agriculture risks destroying numerous jobs.

AI applications in agriculture are often praised for their potential reduction of pesticides or their efficient water management. Although it will not be sufficient to reach ecological sustainability. AI in agriculture has yet to prove its beneficial social and environmental impact. AI is no magical solution. Our planet and food sovereignty requires a massive U-turn in our agricultural model, with agroecology policies, in defense of small, medium and familial agriculture models, supported by massive employment policies and targeted supportive AI applications.

ABOUT THE EDITOR:
Special Committee on Artificial Intelligence in a Digital Age
European Parliament
Directorate General for Internal Policies of the Union

BRU - KOHL Building
aida-secretariat@ep.europa.eu

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