

## RETOS Y OPORTUNIDADES DE LA DIGITALIZACIÓN EN LA AGRICULTURA, LA SILVICULTURA Y LAS ÁREAS RURALES

**M.M. Delgado-Serrano<sup>\*a</sup>, S. Sánchez<sup>a</sup>**

<sup>a</sup> *WEARE-Water, Environmental, and Agricultural Resources Economics Research Group, Departamento de Economía Agraria, Finanzas y Contabilidad. Universidad de Córdoba (Córdoba, [mmdelgado@uco.es](mailto:mmdelgado@uco.es); Córdoba, [es2salos@uco.es](mailto:es2salos@uco.es))*

### Resumen

*DESIRA- Digitalisation: Social and Economic Impacts in Rural Areas* es un proyecto Horizonte 2020, que tiene por objetivo analizar los impactos socioeconómicos de la digitalización en áreas rurales y mejorar la capacidad de respuesta de la sociedad y las entidades políticas ante los retos que la digitalización generará en la agricultura, la silvicultura y las áreas rurales. El proyecto de investigación cuenta con 22 ‘Living Labs’ distribuidos por toda Europa que estudian el proceso de digitalización en diferentes escenarios (certificación maderera, agricultura de precisión, incendios forestales, etc.). En cada uno de ellos se identifican y analizan las circunstancias, medidas y/o normativas que puedan perjudicar o facilitar la adopción de tecnologías digitales en la agricultura, la silvicultura y las áreas rurales. Esta información es crucial para facilitar la transición digital y minimizar los potenciales impactos negativos en la sociedad que la adopción de estas nuevas tecnologías pueda generar en los próximos 10 años. Los resultados de este proyecto proporcionarán información útil para afrontar los retos y explotar al máximo las oportunidades relacionadas con la digitalización en la agricultura y las áreas rurales y para diseñar la próxima generación de políticas para las áreas rurales.

**Palabras clave:** digitalización, impacto socioeconómico, áreas rurales

### 1. Introduction and objectives

Digitalisation has deep repercussions on people’s lives, and generates losers (who are marginalized by the changes), and opponents (who resist and elaborate alternative rules of the game) as well as winners (who benefit from the change). Indeed, new digital technologies are game changers, as they reconfigure routines, rules, actors and artifacts that constitute business models, consumption and shopping styles, service provision, as well as learning processes and innovation.

According to Eurostat people living in rural areas usually recorded the lowest share of individuals accessing the internet on a daily basis. Less than two-thirds (62 %) of the EU-28 population living rural areas accessed the internet on a daily basis in 2016, while this share is 72 % for people living in towns and suburbs, and 75 % among city-dwellers.

To reap the benefits of digitalisation while minimizing its costs, access and governance need to be governed. The key to success in this endeavour is to understand the mutual influences between technological systems and social organization.

Through a multi-actor approach and a multidisciplinary community DESIRA is identifying the state, the trends and dynamics of digitalisation in agriculture and rural areas. The project will foresee through digitalisation scenarios potential winners, losers and opponents, and assess the net impacts of future challenges. The final outcome is to develop a Policy Roadmap that analyses the policy implications of digitalisation in rural areas and the issues needing policies and actions.

DESIRA objectives are:

- to fill the socio-economic knowledge gaps on digitalisation in agriculture, rural areas and forestry;
- to assess the past and current socio-economic impact of digitalisation in relation to Sustainable Development Goals;

- to improve the capacity of rural communities to reflect on future risks and opportunities related to digitalisation;
- to improve the capacity of rural communities to reap the opportunities offered by digitalisation and to improve resilience to related associated risks;
- to promote online interaction and learning – complementary to face-to-face interaction – among a wide range of stakeholders;
- to increase the uptake of societal concerns in ICT-related policy and innovation, and to align digitalisation scenarios with societal needs and expectations.

## 2. Methodology

The project will be developed following the next step:

1. Defining the conceptual and analytical framework of digitalisation in rural areas and mapping the digital game changers.
2. Assessing the past and present impact of digitalisation through a network of Living Labs, each of them addressing a specific question.
3. Developing scenarios of future evolution of digitalisation.
4. Assessing the existing policy frameworks and instruments at national and EU levels influencing the digitalisation, in order to identify the building blocks and the policy pathways to design future-proof policies that boost sustainable and inclusive digitalisation of rural areas.
5. Elaborating an Ethical Code on Digitalisation.
6. Dissemination, Communication and Outreach of the project results.

DESIRA will pursue its objectives by mobilizing a network of rural businesses and services, public authorities, citizen groups, digital technology operators, farmers, media and academics, organized into 20 Living Labs and one EU-level Rural Digitalisation Forum.

## 3. Results and Discussion

DESIRA initiated in June 2019 and will last till May 2023. This section presents the main results obtained till now and the next steps that will follow:

1. DESIRA has developed a Conceptual and Analytical Framework ([https://desira2020.eu/wp-content/uploads/2020/07/D1.1\\_CAF-report\\_1.pdf](https://desira2020.eu/wp-content/uploads/2020/07/D1.1_CAF-report_1.pdf)) and an Inventory of Digital Game Changers (<http://desira2020.eu/wp-content/uploads/2020/11/D1.3-Taxonomyinventory-Digital-Game-Changers.pdf>) based upon the concept of Socio-Cyber-Physical System. The first version of the Conceptual and Analytical Framework has identified a knowledge gap in the understanding of digital systems, as the current conceptualizations do not consider the social implications of digitization. The concept of *Socio-Cyber-Physical System* - an integrative concept that links digital technologies to its social context - has been proposed and developed. The term allows system designers and adopters to better understand how ICTs can change, and can be changed by, social structures and dynamics. Coherently, a Taxonomy and Inventory of Digital Game Changers has been developed. This report has proposed a link between technologies, application scenarios and impact.

The main message that emerges from these two reports is that digitalisation is a trend that can - and should - be managed. Digitalisation strategies should start from a deep understanding of the problems to which digital technologies apply and from awareness of the specific characteristics of the social context in which they are introduced.

2. Guidelines for the impact assessment of digitalisation in rural areas have been developed. DESIRA is developing a participatory indicator-based method for impact assessment of past, current and future digitalisation trends, according to the principles of Responsible Research and Innovation (RRI) and aligned with the SDGs. The pan-European

assessment of digitalisation in rural areas is in an advanced state of finalization. The results show evidence of a continuous digital divide as broadband technologies evolve. One of the main messages is that if Europe wants to be on the right track towards its 2025 broadband commitments, it will need to define a structural solution for the continuous lagged digital state of rural areas.

3. DESIRA partners have set up the 20 Living Labs that will carry out the assessment of digitalisation of different topics linked to agriculture, forestry and rural areas and have started to gather information. With the contribution of the Living Labs, a list of indicators linked to the SDGs has been defined.
4. Guidelines for the scenario assessment and for the related workshops have been developed and Living Labs are initiating this task. DESIRA will develop 80 digitalisation scenarios and communicate them through digital storytelling. Digital storytelling is a method that encourages everyday people to share their visions and their concerns through multimedia stories. DESIRA will develop 5 Use Cases and Showcase technologies, including a Virtual Farm Platform employing virtual reality technology. In software and systems engineering, use cases make it clear what can be achieved, and how, by using a system. Showcase technologies are proof of concepts demonstrating the characteristics of RRI-based technology development.
5. DESIRA will develop a Policy Analysis, a Roadmap and an Ethical Code. An Ethical Code is a set of principles that, when adopted by an organization, guides its members in taking the right decisions. It would help enterprises and researchers to identify technological solutions coherent with their social responsibility profile.
6. An intense dissemination, communication and outreach activity has been carried out, including the establishment of the Rural Digitalisation Forum and of its Working Groups.
7. DESIRA uses a Virtual Research Environment (VRE) to boost the potential of participatory research. A VRE is “a web-based working environment tailored to serve the needs of a community of practice, providing the whole array of tools needed to accomplish the community’s goal(s)”. The VRE is based on D4science (d4science.org) and integrated with OpenAIRE (OpenAire.eu).

The main beneficiaries of the project will be researchers, rural businesses and services, public authorities, citizen groups and local communities, digital technology operators, farmers, foresters, and the media.

#### 4. Conclusions

DESIRA aims to achieve high impact through four pathways: conceptual development, by providing tools for better understanding of digitalisation and its impact; capacity development, by improving the capacity to carry out innovation through a RRI approach, and to design appropriate policies; technology development, by providing the basis for developing digitalisation applications based on the RRI concept; policy influence, which will make policy makers more aware of the ethical issues related to digitization.

DESIRA has gathered its main conclusions till now in a *set of principles* to guide and support the future development and implementation of digitalisation processes in agriculture, forestry and rural areas.

- *Create the basic conditions for digitalisation – infrastructure, skills and exploitation capacity:* There are three basic conditions for a successful digitalisation strategy in rural areas: technological infrastructure, human capital, and economic gains.
- *Anchor digitalisation to sustainable development:* Digitalisation can be a driver of sustainable development, provided that digitalisation processes and strategies are aligned with Sustainable Development Goals. Digitalisation can improve the territorial capital of

rural areas and their sectors, and digital solutions can address the needs and expectations of rural communities and businesses while addressing European societal challenges.

- *Adapt digitalisation to different contexts by engaging with local stakeholders:* Many of the issues addressed in the discussion about digitalisation are multi-factorial, and need to be considered from a multi-level and multi-actor perspective. For example, in some contexts robotisation can save farming from declining in areas where farmers' average age is growing and there is a shortage of labour, while in others it may lead to farm concentration and unemployment. Communities with different problems and different endowments of human capital and of digital skills may respond differently to incentives to digitalisation.
- *Favour digital inclusion of all citizens to avoid marginalisation and polarisation:* Even in a level playing field, digitalisation can generate uneven development, as early adoption may lead some to accumulate competitive advantage with respect to late adopters. To prevent this from leading to marginalisation and polarisation, and to ensure equal access to the possibilities created by digitalisation, active policies should be put in place to avoid digital exclusion and to ensure that no one is left behind. All the rural social and economic groups, particularly more vulnerable and disadvantageous ones, need to be heard and involved.
- *Develop local digital ecosystems supported by brokers that link local needs with digital knowledge:* The contribution of digitalisation to development depends on the integration of actors, infrastructures, digital application systems, data and services. Gaps in one of these aspects may hamper the success of digitalisation strategies. The development of conducive digitalisation ecosystems is related to 'connectors', individuals and agencies that support digital coordination of local actors, selecting the best technologies, and promoting data sharing and interoperability.
- *Develop adaptive governance models that engage science and innovation with policy makers and civil society:* there is a clear need to change current governance models and develop ones that address local issues such as infrastructure, skills, data, innovation, and digital inclusion in a coherent and consistent way. To achieve this, governance models will need to shift from reactive to proactive models. New multi-actor governance models should be considered, which integrate and engage science and innovation with policymakers, civil society and citizens, in the co-creation process for digitalisation, in a way that balances power. In-depth local knowledge about stakeholders and their role in the local society, business chances/threats, ways of communication, etc., is needed to fully understand the truth behind the stories. This knowledge will enable the design and implementation of sustainable digital development pathways that are adapted to the local reality.
- *Design policy tools for sustainable digitalisation, that support local communities in developing and implementing digitalisation actions plans:* sustainable digitalisation is an ambitious programme of social transformation, as it looks at how digital technologies can trigger the reconfiguration of social and economic relations. For this reason, the whole set of policies that affect rural areas, agriculture and forestry should be revised and designed in the light of the opportunities and of the threats that digitalisation poses to them.

The previously mentioned guiding principles for the digitalisation of agriculture, forestry and rural areas can be put into practice with the implementation of actions in four key rural development domains, namely: i) Human capital; ii) Innovation; iii) Investments; and iv) Governance.

More information about DESIRA: <https://desira2020.eu>