DIGITAL LITERACY IN RURAL AREAS: AN INDISPENSABLE CONDITION TO BRIDGE THE DIVIDE IN LATIN AMERICA AND THE CARIBBEAN

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Foreword

Reiterating the need for inclusion

Manuel Otero
Director General of the Inter-American Institute for Cooperation on Agriculture (IICA)

The publication of this new document, entitled "Digital Literacy in Rural Areas: An Indispensable Condition to Bridge the Divide in Latin America and the Caribbean", is in keeping with the mission with which the Inter-American Institute for Cooperation on Agriculture (IICA) was entrusted almost eight decades ago: to support the efforts of its 34 Member States to achieve agricultural and rural development.

It also responds to the need to update the institutional agenda with respect to the new challenges and obstacles to sustainable development in rural areas of the Americas, an issue that the General Directorate of IICA committed to addressing in greater depth in early 2018, by placing technology and innovation at the center of technical cooperation activities.

Consequently, this study forms part of resolute, continuous efforts to effectively foster the development of efficient public policies aimed at empowering rural populations.

This is the second publication to be launched over the past few months within the framework of a partnership between IICA, the Inter-American Development Bank (IDB) and Microsoft.

Like the document "Rural Connectivity in Latin America and the Caribbean: A Bridge to Sustainable Development During a Pandemic", published in October 2020, this new publication seeks to achieve further progress in fostering connectivity and the dissemination of new technologies.

While the former document focused on providing a comprehensive overview of the status of rural connectivity in the region, this new document shines the spotlight on digital skills development.

Let us recall that at least 77 million rural dwellers in Latin American and the Caribbean do not have connectivity at the necessary minimum standards of quality. While 71% of the urban population in Latin America and the Caribbean has access to connectivity services, in rural populations the percentage drops to less than 37%, a gap of 34 percentage points that undermines the region's tremendous social, economic and productive potential.

After having identified and analyzed the scope of the issue of connectivity in the region, we agreed, together with the IDB and Microsoft, on the importance of addressing another relevant issue: technology use and training needs among rural dwellers, with a view to fostering their full, substantial inclusion.

The Covid-19 pandemic and the social distancing measures implemented to curb the spread of the disease, which resulted in millions of people modifying their daily habits, as well as an urgent need to digitalize work, education and trade, has rendered this inclusion all the more necessary and urgent.

IICA, the IDB and Microsoft have provided a broad overview of the status of rural connectivity in the most unequal region in the world, where half the population lacks access to a bank account or debit card, a significant number of people do not have access to the Internet or face issues related to Internet quality and cost, and there are insufficient Internet-enabled devices. This has encouraged governments to mobilize themselves in support of a connectivity agenda, as demonstrated by the active participation of officials from dozens of countries in the recent forums organized by IICA to discuss this issue and foster more and better changes.

Once again, in collaboration with the IDB and Microsoft, we are seeking to take a new and bold step, to tackle a topic which is often overlooked in public discussion: the adoption of digital skills among the rural population of Latin America and the Caribbean.

If we mobilize ourselves as governments, the private sector, civil society and international funding and technical cooperation agencies, to highlight the problem of rural connectivity and to establish a vast pro-connectivity coalition, we will be able to generate a broad-based movement to tackle the problem of the use of technological and digital resources that connectivity facilitates.

As the author of the study has clearly established, both issues involve crucial concerns that must be addressed simultaneously, since the problem of limited digital skills is of no less importance than the problem of inadequate connectivity. Physical connectivity is irrelevant if inhabitants of rural areas are not versatile in the use of these new resources that can transform ways of producing and life as a whole in our societies.

Undoubtedly, the time is ripe to take this approach, given that the availability of new technological resources and their incorporation into agriculture and the food value chain is creating difficulties and opportunities that rural areas must tackle to capitalize on their enormous potential.

The pandemic has enhanced the strategic role of family farming and prompted greater political and social awareness about its importance.

The sixteen million family farmers who live and work in rural areas of Latin America and the Caribbean are the backbone of agriculture, an activity that guarantees the food and nutritional security of the region.

Therefore, it is our collective responsibility to demolish the new barriers that are obstructing these farmers' access to knowledge – a decisive factor in improving crop and animal production, and in turn, income, thereby guaranteeing education and work for their families and future generations, as well as rural retention.
The problem is already at the heart of our agenda, first of all, due to the potential that digital transformation offers for rural development.

It is also important, due to the timely convening of the 2021 UN Food Systems Summit, which is seeking to generate conditions to improve global food systems and meet the Sustainable Development Goals (SDGs), in a framework in which the contribution of digital technologies and their incorporation into agriculture will be key to improving production practices and food consumption.

Therein lies the fundamental importance of encouraging digital skills training: we need to develop capacities, which we know will facilitate a qualitative leap in the standard of living of rural dwellers.

IICA is mobilizing efforts to achieve these goals, continuously adopting a results-based approach, by establishing partnerships to create a positive impact that contributes to bridging the multiple gaps that are hindering agricultural transformation in the Americas, which is critical, given the strategic nature of this sector.

The renewed institutional commitment is to redouble our efforts in this direction, in an area that is directly linked to expanding the horizons and opportunities of people, and thus to achieving sustainable development.

About the author[1]

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(1) **Acknowledgements** The author is grateful to Jorge Werthein, Federico Villarreal, Guido Nejamkis, Federico Bert and Karen Montiel for the critical reading of this document and for their contributions. To Eugenia Salazar for researching information to enrich the data in the document. Also for the contributions from consultations with Hernán Galperin, Pablo Palacio, Octavio Sotomayor and Lilian Chamorro.

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AFP / Carlos Mamani

Executive summary

The adoption of digital skills among the rural population of Latin America and the Caribbean is a subject that has been left out of public debate, as the obstacles to access to rural connectivity have frequently monopolized attention, deferring the issue of how these resources are used. However, both access and use are equally crucial, and need to be addressed simultaneously.

The availability of new technological resources and their incorporation into agriculture and the food value chain raises major challenges in emerging countries and in rural areas in particular. Infrastructure obstacles, the high cost of accessing technology, and digital literacy limitations among the population all contribute to slowing down the process of digital growth. In addition, the current crisis caused by COVID-19 has catalyzed the need to generate advances in this area, in order to boost development and inclusion in rural territories and agriculture, thereby incorporating the benefits of digitalization. It is therefore strategic to place rural areas, which today lag behind in terms of access to connectivity and use of technologies, at the forefront of public discussions on the potentialities of digital transformation in developing rural life in the region.

In the development of food systems, the contribution of digital technologies and their incorporation into agriculture are a key element in transforming production practices and food consumption[2]. The role of technology is central, whether

(2) The United Nations Food Systems Summit 2021 focuses its agenda on the need to generate conditions to improve food systems throughout the world in order to meet the Sustainable Development Goals (SDGs) and fulfil the Paris Agreement.

in promoting equitable livelihoods within food systems or seeking alternatives to overcome poverty and food insecurity. Digital technologies play a major role as they can provide alternatives to current problems and challenges in rural communities in terms of production, commercialization and development.

Although the technology available makes it possible to foresee the benefits of digitalization on the food and agriculture sector, extensive transformations are required in agricultural systems and in community practices to incorporate the potentialities of these technologies. It is not the technology per se that can provide changes through its adoption, but rather, as experts on the subject point out, it is human talent and the organizations themselves who allow such transformations to occur (Toyama, 2015). In this regard, universalizing access to technologies does not guarantee a full, conscious and reflective use of the same technologies (Tedesco, 2017) and it is necessary to encourage education in digital skills to develop capacities that represent a qualitative leap for technology users.

According to the OECD (2020), there is a positive link between the dissemination of digital technologies at sectoral level and productivity growth. **A study for the European Union (2020) indicates that the associations of ICT skills with productivity are strong: a 1% increase in simple ICT skills is associated with a 2.5% increase in labor productivity, and a 1% increase in complex ICT skills with a 3.7% increase in labor productivity.** The same report suggests that both cognitive and non-cognitive capacities have a positive correlation with labor productivity.

The development of digital skills is associated with advances in the population's education. Using digital devices requires knowledge and literacy in reading and writing, and also basic mathematical knowledge. Formal education provides the basic prerequisite of knowledge to later acquire these skills, and the lack of educational opportunities limits the harnessing of these technologies. In this regard, it is necessary to consider historical conditioning factors in the access to school education in rural areas in Latin America and the Caribbean, which means young people and adults have restricted educational opportunities, and thus low technological literacy. Among the adult population of the region residing in rural territories, a little over 2 out of 10 inhabitants have finished secondary school, and in several countries the proportion is even lower (SITEAL-IIPE UNESCO, 2018).

Studies show that there are broad disparities in the adoption of digital technologies in rural areas in Latin America and the Caribbean, and that there are patterns and inequalities that exist in the "offline" world, which persist in "online" environments (Barrantes and Vargas, 2019; Barrantes and Cozzubo, 2019).

Key findings on digital adoption in rural areas in Latin America and the Caribbean include the following:

- Internet use is more frequent among those who have greater schooling, come from favorable economic backgrounds, do more highly-qualified work and have technological tools at their disposal.

- There is differential use and access by gender. Girls come into contact with technology later than boys and have fewer stimuli for using technological devices.

- Children and young people in rural homes are key in encouraging the adoption of technologies in their environment, and are the most frequent users. The presence of young people encourages internet and mobile phone adoption.

- Schools (especially at secondary level) are an incentive for internet use.

- The most frequent internet uses and the initial incorporation of these technologies at all ages is for leisure purposes, and their use for more systematic learning (whether formal or informal) is less common. This latter use (for learning purposes) is a more frequent habit among people with higher education levels (Van Deursen and Van Dijk, 2014).

- Digital illiteracy is a major limitation among those who state they do not use these technologies (as well as reasons of infrastructure and costs). Another major factor is the lack of awareness in rural areas that these resources exist and the existence of diverse technologies with no clear purpose.

- The COVID-19 pandemic has accelerated the use of technologies for the purpose of e-commerce in rural areas.

Digital skills training in rural areas in the region has been carried out, to date, through seven identified strategies:

- Community strengthening to promote technological skills and digitalization.
- Agricultural e-commerce.
- Digital skills training for the 4.0 industry and employability.
- Smart farming.
- Specialized digital consultancy.
- Search for solutions to encourage rural digitalization (Hackathon)
- Competitive funds

The analysis of cases surveyed in this document reveals major projects that involve efforts made by important institutions and organizations at national, regional and international level. These experiences must be broadened and multiplied in other contexts to include more options, in order to bridge the digital skills education gap in rural areas.

Bridging the digital gaps in the use of technology that exist among people and between rural and urban territories must be a priority for policymakers, if the benefits of such technologies are recognized and clear to see. An intensive and flexible use of technology has great potential to make productive processes and public and private services more efficient, improve productivity and the quality of products and services, transform employment opportunities, foster the training of human resources in rural areas, and broaden the possibilities of knowledge and of participation in culture, among other key factors for achieving sustainable development within food systems.

1 Introduction

The year 2020 was a prolific one for the production of documents and recommendations about connectivity in Latin America and the Caribbean. The region's technological lag added to the crisis caused by the COVID-19 pandemic and its consequences dictated an agenda based around development needs in the digital ecosystem.

A large number of the documents generated have produced quantitative data with the purpose of gauging the problem of access to connectivity as one of the critical issues to be resolved in the near future (IICA, IDB, Microsoft, Oxford University, IFAD, CAF, ECLAC, GSMA, to mention just some of the main contributors). Progress includes the measurement of the gaps between the various countries and within them; the generation of strategic information to assess the scope of the crisis in production and the limits of working from home due to the lack of connectivity; the identification of existing barriers in terms of infrastructure and the expansion of coverage; studies on the problem of regulatory practices, limitations in affordability, disadvantages in women's access to digital technology, coverage and access to ICTs in rural education, and other aspects. These documents have also generated recommendations for the States with the purpose of enacting policies to bridge existing gaps.

The issues addressed mainly concerned the so-called access gap; however, today it is recognized that there is a new digital divide due to the different ways the internet is used and the multiple digital technologies, which has led to a reconsideration that the divide is not only restricted to availability and access, but rather that there is also a demand gap, also known as the second-level digital divide (Bucy, 2000; Peter and Valkenburg, 2006; Van Deursen and Van Dijk, 2014; among others).

The subject of digital skills for the adoption and effective use of information and communication technology resources, and the question of relevant content to encourage the use of these resources, frequently takes second place and is relegated in the public debate on the benefits of connectivity and problems associated with their absence. In this regard, there are critical problems and obstacles in the use of technology in rural areas that this document will show. This study argues that we are not facing a problem of access to technology (which indeed exists) but also that it is vital to guarantee the conditions and skills necessary for the use of such technologies. Furthermore, both obstacles require different strategies and policies, and although they are connected, it is not a case of resolving one of the problems to then tackle the other, but rather a case where both challenges must be addressed simultaneously.

There are numerous reasons why it is important to focus on digital skills. First, it is narrow-minded to understand connectivity as simply a question of material facilities. Of course, access is a necessary and basic condition, but it is in no way sufficient to resolve the barriers to effective and smart use of the technology available at present. Secondly, any program to increase connectivity has to consider how it is incorporated effectively and fully into users' practices and everyday lives, and this is a priority in rural areas. Likewise, the United Nations Food Systems Summit 2021 focuses its agenda on the need to generate conditions to improve food systems throughout the world in order to meet the Sustainable Development Goals (SDGs) and the Paris Agreement. **The contribution of digital technologies and their incorporation into agriculture are key aspects for transforming production practices and food consumption.**

In this context, it is strategic to place rural areas, which today are lagging behind in terms of connectivity reach and technology use, at the forefront of the debate about the potentialities of digital transformation for everyday life in these areas. In short, the intention is to prioritize the sector that is most behind in terms of access and expansion of the benefits of digitalization, and which urgently requires digital development to reach its full potential.

The assumption that the problem of digital technology is restricted to access is nothing new. The so-called technological solutionism (Morozov, 2015) has often been accepted as common sense to understand modern inventions. It happened with the radio (Edison), cinema (Darrow), television (Clark), and now we have also succumbed to this illusion with the arrival of digital devices (Negroponte) (Buckingham and Martínez Rodríguez, 2013). The compulsion to acquire the latest technological resources is based on the belief that technology is key in resolving development lags (Tobeña, 2019). From the perspective of technological availability, it is not just a question of "connecting" rural areas, but also about adequately managing the means so that the use of resources is effective. This is not intended as a criticism of digital technology; on the contrary, it is of transcendental importance as digital tools are vital for the development of productive, social and cultural life. Indeed, as the current COVID-19 crisis has shown, the limited and insufficient use of digital technologies forms a barrier between those who are included and those who are on the margins of such exchanges in contem-

porary society. Limitations to access entail new conditions of exclusion and contribute to deepening pre-existent inequalities.

One of the premises that inspired this document was taken from a public conversation held between Natasha Santos (Vice President of Bayer) and the Director General of IICA, Manuel Otero, where she pointed out that digital technology is of utmost importance because of what it allows people to do. It is precisely a question of understanding technology as a matter that concerns humanity more than a merely instrumental or technical issue. For productive activity and life as a whole in rural areas, it is evident that technology provides possibilities that are not available if the technology is absent. In particular, it is known that the potentialities offered by digital agriculture and the incorporation of commercialization chain technologies open opportunities for production that are in no way replaceable in the absence of such technologies. For this reason, **the potential of digitalization in rural areas is enormous and the present barriers to its development (in terms of content, education and necessary skills for its full use) require urgent attention.**

The 2021 Food Systems Summit argues for the need for transformation, from production through to consumption, as a necessary condition for attaining sustainable development. The Summit will focus on the importance of reforms geared towards promoting good nutrition and health for the planet's population as a whole, conserving and regenerating ecosystems and promoting wellbeing and equity. Along the action lines proposed for this world summit, the role of technologies is crucial as they imply, among other questions, promoting equitable livelihoods in food systems, as well as searching for alternatives to overcome poverty and food insecurity; in this respect, digital technologies play an important role as they can contribute to overcoming these barriers. The Summit also proposes that technical innovations should go further to optimize yields and productivity. With this in mind, Agnes Kalibata, Special Envoy of the 2021 Food Systems Summit, states that the role of technology in the future of agriculture will depend on the possibilities of these being embraced to provide real life solutions[3]. These solutions will not be possible if there are disparities between the

(3) "What the future of farming will look like: UN Agnes Kalibata." TIME, 2021 https://time.com/5933750/agnes-kalibata-future-of-farming/

technologies and the chances their beneficiaries have of using them. Hence, the problem of the development of digital technologies for agriculture, and above all, of ensuring that technologies reach rural communities and are able to train rural populations in digital skills to use these technologies, is vital and should be a major focus in the coming years at global level.

The centrality of this issue is also reflected in views expressed recently by different ministers and secretaries of agriculture of Latin America and the Caribbean. At the virtual conference organized by the NGO Chaguanas.com in 2020, Trinidad and Tobago's representative[4] stressed that digital transformation is vital for optimizing productive processes and ensuring food security, and that these technologies are a key resource for improving food quality and generating products of nutritional value. In other discussion forums, Colombia's representative stressed the crucial role of digital platforms and their growing presence during the Coronavirus pandemic, stating that rural e-commerce has been developed on the electronic platforms present in Colombia ("Agricultura por Contrato")[5]. The Mexican government stated at the 2019 Meeting of the Ministers of Agriculture of the Americas that information and communication technologies (ICTs) are necessary tools to reduce poverty in the rural sector, while emphasizing the need to encourage the States to promote the use of and access to ICTs at all levels and for all inhabitants[6]. Argentina put forward a common perspective in stating that "technological developments must be accessible to all sectors," while also stressing that "agricultural production is no longer just working the land; it also involves work in laboratories, in the field and in agroindustry, with technological developments that make us competitive, and above all, a form of agricultural production in balance with the environment, with social equity, and which brings quality of life for those who are part of this system"[7]. At the 2021 Davos Economic Forum, Brazil[8] argued that the agribusiness sector should be included in the context of fast-paced digital transformations. The coming decade will be marked by digital and biological convergence; innovation is essential to adapt agriculture to the global reality and is a vector that can conciliate food security and the conservation of the environment. On the subject of digital skills, at the virtual forum in

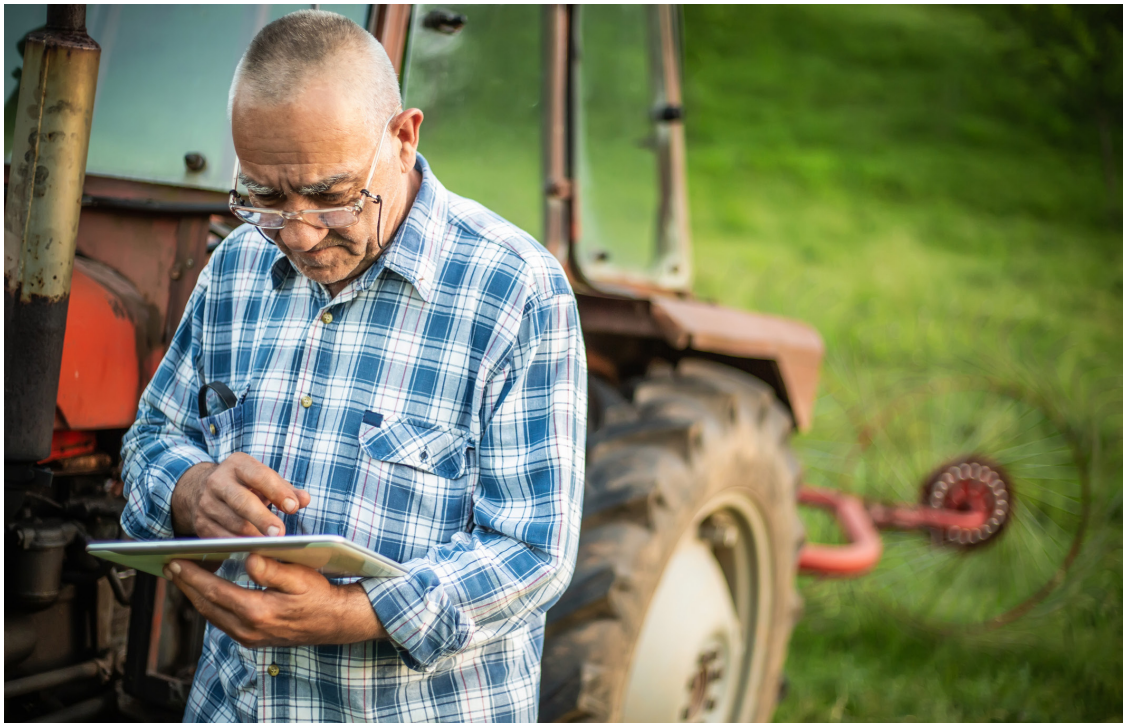
(4) Clarence Rambhrat, Trinidad and Tobago Minister of Agriculture, Land and Fisheries. https://newsday.co.tt/2021/01/26/rambharat-promises-help-for-small-farmers/

(5) Rodolfo Zea, Colombian Minister of Agriculture and Rural Development. https://www.google.com/url?q=https://id.presidencia.gov.co/Paginas/prensa/2020/Debemos-perder-miedo-a-virtual-lograr-que-agricultores-comercialicen-sus-productos-por-medios-digitales-Ministro-Agr-200504.aspx&source=gmail&ust=1614095716085000&usg=AFQjCNEfZO7xw1T8BSUx9LkMAziyyU-wcw

(6) Victor Villalobos, Mexican Secretary of Agriculture and Rural Development. https://www.iica.int/es/prensa/noticias/mexico-convoco-al-agro-del-mundo-que-exalto-el-uso-de-tecnologias-digitales-para

(7) Luis Basterra, Argentine Minister of Agriculture, Livestock and Fishing. https://emfao.cancilleria.gob.ar/es/el-impacto-cient%C3%ADfico-tecnol%C3%B3gico-en-el-desarrollo-del-sector-agropecuario

(8) Tereza Cristina Corrêa da Costa Dias, Brazilian Minister of Agriculture, Livestock and Food Supply. https://agenciaBrazil.ebc.com.br/economia/noticia/2021-01/tereza-cristina-transformacao-digital-deve-inserir-agronegocio



the series "Bridging the Digital Divide in Rural Areas of Latin America and the Caribbean: Towards a Digital Agricultural Revolution", organized by IICA, Costa Rica stressed the need to strengthen digital literacy in rural areas in order to make the most productive use possible of available technologies[9].

In short, the different perspectives summarized here reflect the fact that the adoption and use of digital technologies require greater attention, both due to the gaps identified, the urgent need to address this problem from the perspective of public policies, and because of the high untapped potential of these technologies for rural development.

The present document covers the challenges arising from the growth of digitalization and the skills needed to incorporate them into rural areas. Firstly, an overview is presented of the opportunities that digitalization and technological development bring, by stressing the importance of addressing the lag in usage of such technologies in rural areas. Furthermore, the document stresses how the problem caused by the lack of digital skills has been neglected as a result of the COVID-19 crisis. Secondly, the document addresses the conditions and uses of ICTs in the rural milieu, as a starting point to expanding digital skills. It also presents the results of recent research into technology use in rural areas in a number of Latin American countries. The fourth chapter looks at a survey of cases in the region, including recent experiences of digital skills training in rural areas, and initiatives to encourage the incorporation of technologies into agriculture. Lastly, a number of recommendations and conclusions are offered.

(9) Paola Vega, Costa Rican Minister of Science, Technology and Telecommunications. https://www.iica.int/es/prensa/noticias/reduccion-de-brecha-digital-en-america-latina-y-el-caribe-exige-politicas-publicas

2 Rural technological development in a time of digitalization: aligning rural life with the modern day

The so-called "Fourth Industrial Revolution" (Industry 4.0) is bringing drastic changes in various sectors of the economy, as digital transformations are used in productive processes[10]. In rural areas, there is a notable "informatization of agriculture" (ILO, IDB, INTAL, 2019) carried out through a network of ICT-based services that improve yields, optimize production costs, conserve the environment and strengthen food security.

Considerable digital agricultural transformations are expected for the coming decade, which may contribute (along with other variables) to improving the issue of limited food access and quality for a growing world population. Thus, digitalization will be a key element in modifying components that form part of the agrifood chain as a result of automation (FAO, 2019). Real-time, interconnected, data-based operations will make it possible to create systems with high capacity for adaptation to change, thus increasing profitability, sustainability, inclusiveness and food security.

Aside from these advances and the availability of new technological resources, the incorporation of such resources to agriculture and to the food value chain raises a number of challenges for their growth, especially considering the pre-existent divide in emerging countries and rural areas in particular. In these contexts, obstacles in terms of infrastructure, high costs for accessing technology, limitations in digital literacy and restrictions on educational opportunities slow down the process of digital expansion.

(10) The concept of the Fourth Industrial Revolution was coined by Klaus Schwab, founder of the World Economic Forum, at the 2016 edition of the forum. This "Industry 4.0" corresponds to the current trend of automation and data exchange. It mainly includes cyber-physical systems, the Internet of Things and cloud computing. The term "Industry 4.0" came about from a high-tech strategy project of the Federal Government of Germany to foster the computerization of manufacture.

Although the technology available allows us to anticipate the benefits of digitalization in the agrifood sector, profound transformations are required in agricultural systems and in community practices to effectively incorporate the potential of technologies. It is not the technology per se that can provide changes through its adoption, but rather, as experts in this subject point out, it is human talent and organizations that permit such social transformations (Toyama, 2015). Former director of research at Microsoft India[11], Kentaro Toyama, believes that technology can only broaden existing human capacity and intentions, but it cannot replace them. Hence, the number of technologies available or the access to them cannot make up for the lack of teachers, professionals or agricultural workers who are educated and motivated. In short, **technology can only magnify existing human capacity and intention; therefore, for development to occur, it is crucial to build skills to ensure an intelligent, flexible use of such technologies, and stimulate the development of these skills.**

This hypothesis calls for a close review of the disparities in the installation of digital technologies in the current scenario, to avoid adopting a naïve technological "solutionism" appoach, and in order to propose suitable alternatives and strategies to address obstacles to the use of digital technologies in rurality.

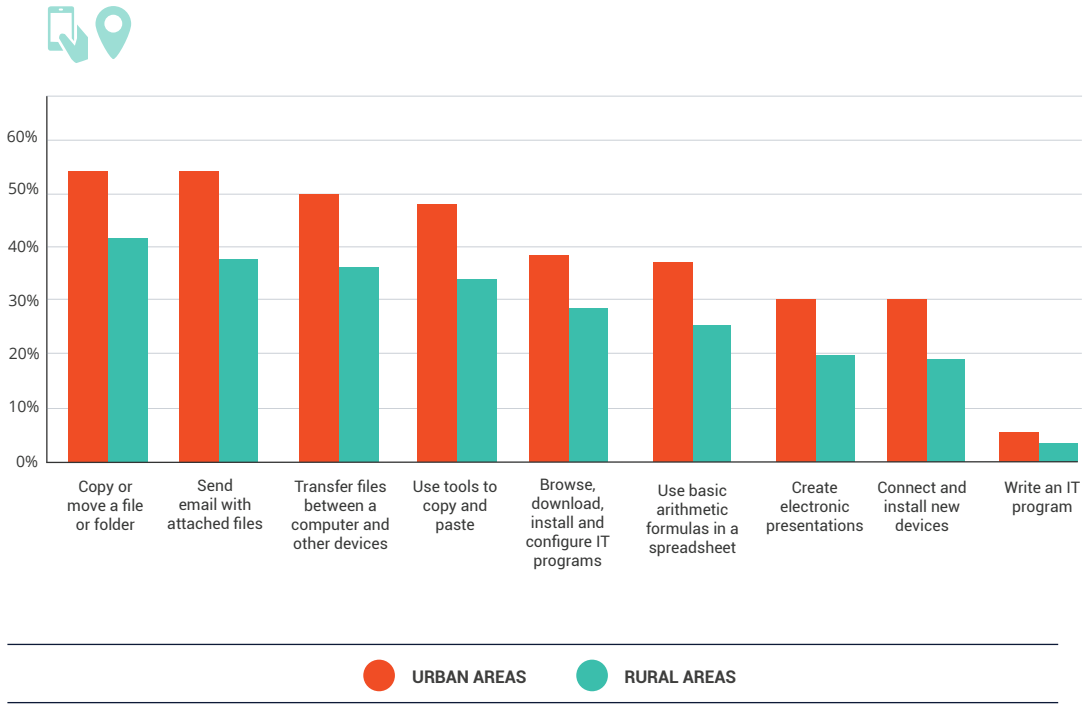
Firstly, there are obstacles associated with infrastructure conditions and access to technologies in rural areas. This subject was addressed comprehensively in the document "Rural Connectivity in Latin America and the Caribbean—A bridge to sustainable development during a pandemic" (IICA, IDB and Microsoft, 2020) which estimates that in 24 countries of the region, 77 million people who live in rural areas lack connectivity to a minimum standard. Furthermore, there is a 34% gap between rural and urban areas: 71% of the urban population of Latin America and the Caribbean have connectivity options available, whereas only 37% do in rural areas.

The document "Digital Rural Gender Divide in Latin America and the Caribbean" (University of Oxford, IICA, IDB, IFAD) found that in 17 of the 23 countries in the region analyzed, fewer women than men report that they own a mobile phone; less educated women who live in rural areas are the least "connected". While fewer women than men state that they own a mobile phone, there is also a variation in the rural/urban division, as gender and place of residence interact, thus producing various disadvantages for women who inhabit rural territories.

In second place, rural communities are affected by the changing nature of labor as a result of growing automation. These communities are often unequipped to handle the technical aspects of jobs that require technological skills, and they are at a disadvantage compared to urban workers who have greater opportunities for immersion in technologies, and therefore are more likely to adapt to changes. In other words, there is a difference in the digital skills available in rural areas compared to urban ones, which marks a starting point characterized by disparities in access, learning and use opportunities, and fails to create a level playing field.

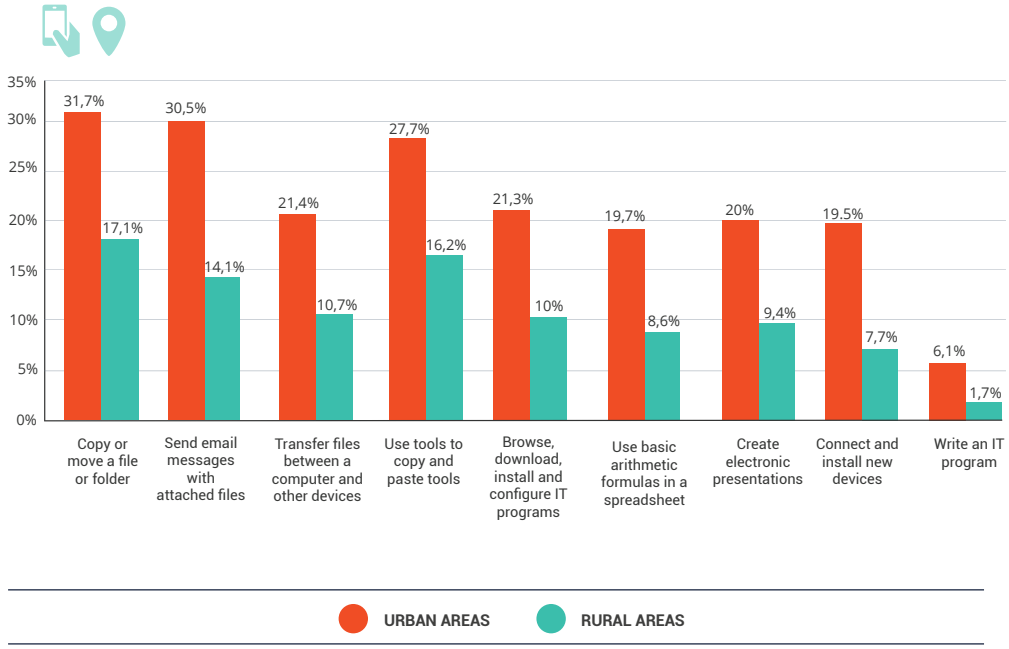
(11) This is the conclusion of research based on fifty cases of technology incorporation in India, carried out by Microsoft.

GRAPH 1. AVERAGE PROPORTION OF POPULATION IN RURAL AND URBAN AREAS WITH A SPECIFIC DIGITAL SKILL, 2017



Source: ITU, 2019

GRAPH 2. AVERAGE PROPORTION OF POPULATION IN LATIN AMERICA AND THE CARIBBEAN IN RURAL AND URBAN AREAS WITH A SPECIFIC DIGITAL SKILL, 2017



IICA based on ITU data, 2020 based on data from Brazil, Colombia, Ecuador, Jamaica, Dominican Republic, Mexico and Peru

Thirdly, there are major disparities in the adoption of digital agriculture practices between countries (according to their development indicators), and between family or local companies and international companies operating on a larger scale. Access to financial and education resources influences opportunities for incorporating the most advanced technologies. Small producers in rural areas are those most affected by restrictions in infrastructure and access to technology. This is also due to the fact that adoption of digital agricultural technology is more cost effective when applied in large-scale economies, thus affecting small producers more than large enterprises. However, many digital technologies with high impact potential are very low cost or even free (e.g. monitoring and marketing apps, even WhatsApp). In contrast, as mentioned here, others have a high cost (e.g. selective spraying).

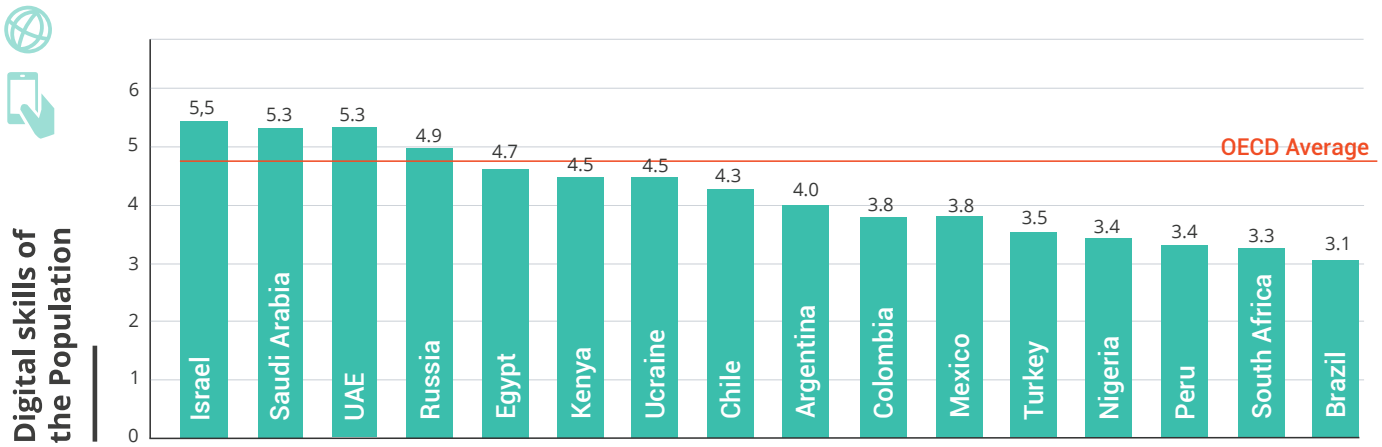
2.1 Digitalization and increased productivity in rural areas: steps to favor a virtuous circle

The OECD (2020) recognizes that digitalization has the potential to increase productivity and bring about sustainable development, but that its net impact will depend on the policies that are adopted, the institutional frameworks, and the characteristics of the digital ecosystem. As mentioned here, digitalization changes the models of consumption and production, thus generating increases in productivity that can be combined with environmental sustainability goals to benefit society as a whole. However, if the deployment of digitalization is not oriented at the principles of equity that affect different contexts and actors, it can intensify social exclusion, exploitation and unsustainable production (ECLAC, 2020).

Digitalization in rural areas opens new opportunities and at the same time requires careful intervention based on the differential conditions between countries, and above all, existing differences within the countries in terms of the diversity of actors responsible for agriculture. Although increased productivity is the main driver of economic growth (Solow, 1988), the dynamics of innovation and technology are associated with productive structures, labor relations and income distribution. Consequently, the effects of digital technologies on productivity are the result of access to such technologies, how dynamically the actors can incorporate them, the participation of companies and SMEs in digital transformation, the presence of suitable skills, and a competitive environment that favors the digital economy (OECD, 2019a).

Likewise, the development of digital skills influences the possibilities for insertion in the global digital economy. Graph 3 shows the untapped potential of emerging markets caused by undeveloped digital skills.

GRAPH 3. EMERGING MARKETS THAT LAG BEHIND AS A RESULT OF INSUFFICIENT DIGITAL SKILLS



Source: Google, 2019

According to a document produced by Google (2019), entitled The Digital Sprinters: Driving Growth in Emerging Markets: "Emerging countries cannot participate in the global digital economy unless their workforce has sufficient digital literacy. Skill development contributes to emerging markets in two critical ways. It empowers individuals to find jobs and empowers consumers to use digital products - thereby increasing their demand for digital products and services. For these two reasons, developing skill proficiency is akin to doubling-down -- it not only increases access to a digital workforce, but also boosts adoption and promotes the diffusion of the digital economy".

A number of studies also show that the adoption of digital technologies varies greatly between different countries and also within those countries (Hagsten et al., 2012), based on the skills and incentives of private companies (Andrews, Nicoletti and Timiliotis, 2018). Indeed, the capacity and sophistication of each sector are important in accelerating the benefits that can be obtained through new technologies.

According to the OECD (2020) there is a positive connection between the diffusion at sectoral level of digital technologies and the growth of productivity. Results are sturdier in the case of high productivity companies. A study for the European Union (2020) shows that the associations of ICT skills with other indicators are strong: a 1% increase in simple ICT skills is associated with a 2.5% increase in labor productivity, and a 1% increase in complex ICT skills with a 3.7% increase in labor productivity. The analysis of this document suggests that both cognitive and non-cognitive capacities show a strong and solid positive correlation with added labor productivity.

According to a study by the US Chamber Technology Engagement Center, unleashing the digital potential of rural companies in the USA would add over $140 billion to the US economy in the next three years, while generating 360,000 new jobs in rural communities. This report, based on a survey of 5300 companies in rural areas in the USA, provides a number of recommendations for public and private sectors to help unlock the economic potential of rural areas in the USA, including: increasing rural companies' access to digital education and digital tools so that they can scale up their business; increasing training in digital skills (38% of small rural companies say that they cannot find staff with the required digital skills); and increasing digital connectivity in rural areas.

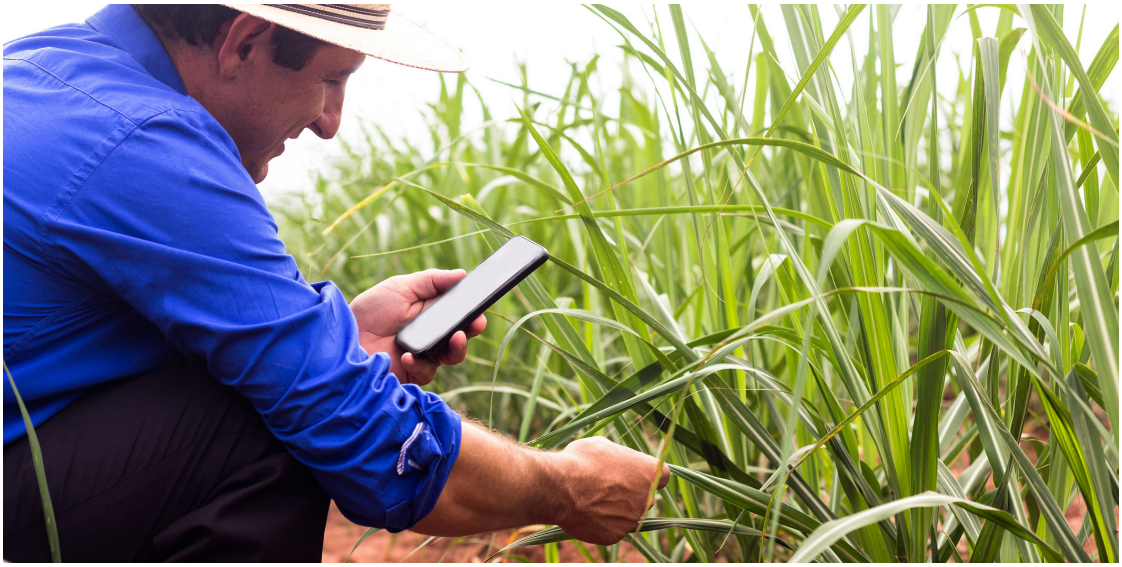
One example of the increase in agricultural productivity can be found in the study conducted by ILO, IDB and INTAL (2019) for medium-sized agroindustrial companies that intensified their technological-productive strategies and achieved high yields, as a result of the informatization of production. This analysis, focusing on agroindustrial production in Argentina, provides indications of the different capacities that come into play with technological availability, which are associated with investment possibilities, innovation culture, risk management and users' digital skills. This study describes the strategies within the elite of producers and presents a typology that differentiates between the profile of the so-called superproducers, sophisticated medium-sized producers and the startup sector of knowledge-intensive business services (KIBS). Each of these shows different styles for adopting information technologies in agriculture (which in turn are distinguished from traditional producers who have not incorporated such technologies). This example helps to visualize how those rural areas where technology must be incorporated are truly dissimilar, and therefore multiple modalities can be implemented to incorporate these technologies and obtain the wide range of benefits offered by them.

2.2 Growth of digital skills in a context of economic and employment restrictions: an indispensable condition in rural areas

According to 2016 World Economic Forum estimates, the fourth industrial revolution will incorporate $14.2 trillion to the world economy in the next fifteen years. This growth in productivity will be the combined result of the application of artificial intelligence, automation through cyber-physical systems and the use of the cloud in production and service processes based on value chains (ILO, IDB, INTAL, 2019)

.

However, these global estimates will probably fall short due to the economic crisis resulting from the COVID-19 pandemic, which is unprecedented in the region and particularly affects the most vulnerable groups. The decrease in economic activity in Latin America and the Caribbean will have negative repercussions for the labor market, with a 5.4% increase in unemployment (ECLAC, 2020a), and will also affect the quality of jobs, in a region with almost 58% informality (OECD, 2020c). It is possible that poor workers will be disproportionately affected and inequalities will increase, given that the poverty rate has increased 7.1% in 2020, with 37.3% of the population affected (ECLAC, 2020a). Likewise, lockdown measures and the closure of businesses have had adverse effects on the poorest and most vulnerable workers, who tend to be informal, have low-quality jobs, little social protection and unstable incomes (OECD et al., 2019). The region of Latin America and the Caribbean is facing the possible loss of 17 million jobs in the formal sector and an increase in the informal economy of up to 62% (Altamirano Montoya, Azuara Herrera and González, 2020). Inequalities stemming from the pandemic in terms of employment are mainly reflected in the possibility of working from home (Birdsall and Lustig, 2020), which has particularly affected work in rural areas.This is one of the sectors with the lowest rates of teleworking



because of the nature of work involved, among other reasons. Logically, agricultural work offered a meager 1% of teleworking opportunities during the lockdown imposed in the region (ECLAC, 2020); however, it is one of the sectors that continued to work without interruptions during this same period.

The situation described poses a major challenge for rural areas, a territorial space affected by these conditions of vulnerability, but which at the same time presents great productive potential that requires innovation and technology to add value to the production of these regional economies and address the food issue.

Agriculture is a central activity in the region, one of the few that has remained active and stable during the outbreak of COVID-19, and it is expected that in the coming years it will incorporate the advantages of digitalization to a greater extent. There are still no estimates for this process, the speed with which it will be incorporated and whether this will affect the food system. Some of the activities are expected to begin incorporating such innovations, and even indirect jobs generated by agriculture such as transport and the operation of machinery by contractors will be affected by technological changes in labor markets. In this regard, although there is still some debate about the speed with which these changes will occur, and how the process of "destruction" of work and the rate of creation of employment resulting from new activities will turn out, it is clear that the foundation must be set for this transformation to occur.

AFP / Marvin Recinos

3 Education conditions and digital skills in rural areas: barriers to overcome

The knowledge society and the development of information and communication technologies entail the pressing need to incorporate digital skills in order to attain full inclusion in contemporary society. Following this path over the last three decades, policies have been adopted globally to align the challenges stemming from ICTs with education systems and ongoing training of adults, as the use of these instruments provides benefits for productive growth, social inclusion and local development.

In recent years, the deployment of digitalization has also transformed societies and the world of work profoundly, leading to a greater need to incorporate new competencies and skills so that individuals are equipped to participate actively in these environments (IDB, 2018). Indeed, the crisis caused by the outbreak of COVID-19 has exposed the distance between those who have access to IT resources, digital and communication skills and competencies, and those who are left out. This situation has triggered a debate about the need to align national digital agendas with ICT education policies and an increase in digital infrastructure.

3.1 Education conditions in rural areas as a starting point for boosting digital skills

Digital literacy, understood as the possibility to incorporate and make frequent and flexible use of technological resources, is also conditioned by education opportunities available to rural populations. In this regard, historical conditioning factors in access to school education in rural areas of Latin America and the Caribbean resulted in young people and adults having restricted educational opportunities. These people, along with those who are still in compulsory education, have low digital literacy; this unresolved issue must be urgently addressed.

Tedesco (2017) draws an analogy between traditional literacy campaigns, intended to universalize reading and writing ability, and the need to be digitally literate in order to access information and exercise citizenship. According to this author, there is a widespread consensus today that the main gap is not exclusively access but the type of access and the ability to effectively use technological devices (Doueuhi, 2010, cited by Tedesco, 2017). Tedesco argues that the various studies into information technology, albeit using different denominations, agree that the main division exists between *users and manipulators*, that is, between those whom new technologies will turn into passive recipients, and those who will raise their voices and play a leading role, both in the orientation of technological evolution, and in social and political evolution. The passage from one state to the other entails a great cognitive leap.

"If we analyze the campaigns for traditional literacy and the current programs to make access to technologies universal under the same lens, then giving each student a computer is arguably a fundamental step in the process of democratizing education; however, this requires that those actions be accompanied by strategies belonging to a higher phase, one that is more complex but equally urgent and necessary, geared towards teaching students to use these computers in a reflective manner. Just as distributing books *en masse* is a necessary yet insufficient condition for promoting reading, making access to technologies universal does not guarantee their full, conscious and thoughtful use" (Tedesco, 2017: 215).

The development of digital skills is associated with advances in the education of the population. The use of digital devices requires knowledge and literacy in reading and writing, and also basic mathematical knowledge. There is a knowledge prerequisite that formal education provides, and as a result, the lack of educational opportunities limits the harnessing of such technologies.

At present, many students leave school early in Latin America and the Caribbean, a situation that has worsened dramatically in 2020, with soaring dropout rates caused by the pandemic. In 2017, 43 million young people aged 15 to 29 (31% of the youth population) had not completed secondary education (compulsory in many countries) and were not registered at a school (OECD, 2017).

This trend is even more pronounced when reviewing information by geographical area. According to data from SITEAL (IIPE-UNESCO) for the year 2018, the average of years of schooling in rural areas oscillated between six years for countries such as Bolivia, Brazil and Colombia, and rose to eight years in Uruguay.

TABLE 1. AVERAGE YEARS OF SCHOOLING FOR THE POPULATION IN ARGENTINA, BOLIVIA, BRAZIL, COLOMBIA, COSTA RICA, ECUADOR, PANAMA, PARAGUAY, PERU AND URUGUAY IN 2018 BY GEOGRAPHICAL AREA

	ARG	BOL	BRA	COL	COS	ECU	PAN	PAR	PER	URU
Urb	11,1	11	9,8	9,9	9,2	10,6	11,5	10,8	10,3	10,2
Rur	-	5,8	5,8	5,8	7,1	6,9	7,5	7,7	5,5	8,1

Source: SITEAL (IIPE- UNESCO)

Similarly, the completion of secondary education is far from universal in the countries of the region, and presents even fewer favorable indicators in rural areas. This fact is relevant because, as will be presented below, secondary education plays an important role in the development of digital skills.

TABLE 2. RATE OF COMPLETION OF SECONDARY SCHOOL FOR ARGENTINA, BOLIVIA, BRAZIL, COLOMBIA, COSTA RICA, ECUADOR, PANAMA, PARAGUAY, PERU AND URUGUAY IN 2018 BY GEOGRAPHICAL AREA.

	ARG	BOL	BRA	COL	COS	ECU	PAN	PAR	PER	URU
Urb	69,7	82	70	80,8	58,4	79,1	74	73,1	89,7	42,7
Rur	-	56,1	47,5	49	50,5	57,3	51,8	47,9	70,7	28,3

Source: IIPE-UNESCO

In 2016 OECD countries had an average of 84% of people aged 25-34 with at least secondary education completed. In eight of the countries for which data is available, it is expected that at least 85% of the population will graduate from secondary education before they reach age 25, but in Brazil, Costa Rica and Mexico

it is expected that fewer than 60% of young people will do so (OECD, 2017b). The secondary education completion rate in under-25s is over 80% in more than half of the OECD countries for which data is available, with numbers ranging from 60% in Mexico to over 90% in Spain, Greece, South Korea and Slovenia.

With respect to the education level reached among the adult population in Latin America and the Caribbean, there is a widespread unfavorable situation that is even worse in rural areas. Among those who reside in rural areas, a little more than 2 in 10 inhabitants have finished secondary school and in various countries, the proportion is even lower.

TABLE 3. PERCENTAGE OF POPULATION AGED 20 AND OVER WITH AN EDUCATION LEVEL OF COMPLETE SECONDARY SCHOOL OR LESS, FOR ARGENTINA, BOLIVIA, BRAZIL, COLOMBIA, COSTA RICA, ECUADOR, PANAMA, PARAGUAY, PERU AND URUGUAY IN 2018 BY GEOGRAPHICAL AREA

	ARG	BOL	BRA	COL	COS	ECU	PAN	PAR	PER	URU
Urb	60	62,1	54,3	60,5	43,1	55,9	61,7	58,7	65,5	35,5
Rur	-	20	22,3	23,9	24,2	23,3	26,2	28,1	20,9	16,4

Source: SITEAL- IIPE UNESCO

Furthermore, among those who graduate, the results obtained are below the average of OECD countries. The results of the Programme for International Student Assessment (PISA)[12]shows that the countries of LAC that participate in this assessment have an average performance equivalent to three years less of secondary education than the average performance of the OECD. Likewise, satisfaction with the education system decreased from 63% to 56% between 2006 and 2017, below the levels of OECD countries, which was 65% in 2017 (OECD/CAF/UN ECLAC, 2018).

(12) PISA (Programme for International Student Assessment) is a systematic global OECD study consisting of a system of examinations taken by students aged 15, measuring academic performance in mathematics, exact/natural sciences and reading (the test also features other instruments to survey additional information). The purpose of PISA is to evaluate educational systems and provide comparable data between countries that orient the formulation of education policies. The evaluation operation takes place every three years. In 2018 (the last year the test was carried out), ten countries from Latin America and the Caribbean participated: Argentina, Brazil, Chile, Colombia, Costa Rica, Mexico, Panama, Peru, Dominican Republic and Uruguay. Incorporation to PISA tests is decided by the countries themselves.

The socioeconomic conditions of the families of students and their schools have a high influence on the learning results obtained by the students in the region. The calculated average of years in the education system for students from lower-middle income backgrounds and from vulnerable sectors is approximately seven to eight years, in comparison with an average of almost ten years of education for those students in the fourth quartile of income in the same countries. Hence, education opportunities correlate with social origin, and school education does not succeed in counteracting the disadvantages in the homes.

The results of the education system and education conditions for young people are vital to establish a basis of knowledge that will enable the acquisition of digital skills for the upcoming changes in digitalization processes. Estimates from 2019 suggested that in OECD countries, around 14% of jobs could change dramatically to the point of disappearing entirely, and a further 32% could be transformed significantly (OECD, Manpower Group/ANDI, 2019). Although there is no consensus regarding the process of transformation that will occur in the region, nor the rate at which it will grow, there is widespread agreement on the need to increase the proportion of workers with cognitive and interpersonal skills in Latin America and the Caribbean, as these are among the hardest skills to acquire. In this regard, it is known that the school model on which the formal education system is based has been forged in conjunction with the process of industrialization over the course of the twentieth century, and has educated students with the necessary preparation to form part of this model of work and production. Technological changes, the need to train people more suitably to allow them to adapt to a changing context, and the importance of not just knowledge but also know-how and soft skills, pose new challenges and demand more from the formal education system. Although cognitive skills continue to be highly relevant, there are signs indicating that the importance of non-cognitive skills is also increasing rapidly. In a world in which jobs have become more changing and less routine, characteristics such as adaptability, communication and collaboration skills, problem solving, critical thinking, creativity and willingness to learn have gained importance. The literature reflects how these skills provide workers with better job and income opportunities, and help counteract poverty and social exclusion (OECD, 2019).

The case of Arbusta[13], a software testing company with a social orientation operating in Colombia, Argentina and Uruguay, offers a model which is worth reviewing closely, as it employs people who have completed secondary school from disadvantaged socioeconomic backgrounds, and who are trained by the company. Under the premise of boosting "frequently neglected talent" the company's directors state that to train their staff (young people, mostly women, who would not usually get jobs in the formal labor market), they need the literacy levels provided by schools, familiarity with a mobile phone and a number of aptitudes and soft (interpersonal) skills for the job (March, Vulcano, 2020). In this sense, the basis of a

(13) See https://arbusta.net/

school education is fundamental for the subsequent acquisition of a number of digital skills whose complexity may increase. Likewise, the authors reveal a matter that may at first seem counter-intuitive: digital training can take place on-site, in the work place, and does not require lengthy, formal theoretical preparation. "Learning on the job" is the premise with which technological knowledge is accessed starting from a basic minimum level, to then reach more complex stages. Technological development admits various types of expertise and the world of production requires skills with different levels of complexity and sophistication to make use of the benefits of the digitalization processes. However, the absence of school literacy in terms of reading and writing, mathematics and basic technological knowledge is almost an excluding condition for access to the digital universe.

The above poses the challenges that the rural education agenda faces in preparing the next generations for the pressing needs of a future that has already arrived.

3.2 School-educated youth and access to digital skills in rural areas

Although education systems have adopted a broad variety of policies in terms of ICT incorporation and training, the digital divide still represents an obstacle when considering the incorporation of new technologies into education in Latin America and the Caribbean (Lugo, Delgado, 2020). Data available for some countries in the region show differences that lead to opportunities for that digital transformation. According to Van Deursen et al (2019), digital exclusion magnifies existing inequalities in offline life. Consequently, digitalization could deepen existing differences if children and young people in rural areas, and those from disadvantaged socioeconomic backgrounds, have restricted contact with digital education content, or if they only access the benefits of connectivity for use in activities with low cognitive demand. These challenges may restrict their possibilities for exploring the broad potentialities of these tools.

There are a number of data that show existing limitations in the effective incorporation of the benefits of digitalization and the use of ICTs[14].

According to the OECD study (2020) and based on regional data, the variables of gender, socioeconomic origin, situation in the labor force, geography and skills determine inequalities in use. Although internet access in Latin America has grown and expanded, the central use of these technologies is focused on leisure activities among the population with a low level of education, and their use for

(14) An analysis of the existing gaps in access to connectivity in rural homes and schools in Latin America and the Caribbean can be consulted in section 4.6 of the document "Rural Connectivity in Latin America and the Caribbean—A bridge to sustainable development during a pandemic"; (IICA, IDB and Microsoft, 2020).

learning purposes (whether formal or informal) occupies a less important place in comparison with the habits of people with higher education levels (Van Deursen and Van Dijk, 2014; OECD, 2019).

For the region, if internet use is differentiated between students from urban and rural backgrounds, the former participate in social media almost 30% more and use messaging apps 20% more than the latter. This shows the different opportunities for exposure to and use of these resources. In relation to the educational purposes, schools contribute to bridging the digital divide in the region in terms of the possibilities they offer for internet use, given that the differences in internet use among students of different socioeconomic origins are less pronounced within schools than outside them, although disparities remain significant. The suspension of in-person learning in 2020 due to the spread of COVID-19 aggravated this situation, as a sizeable number of children and young people in the region can only use technology devices and the internet at school.

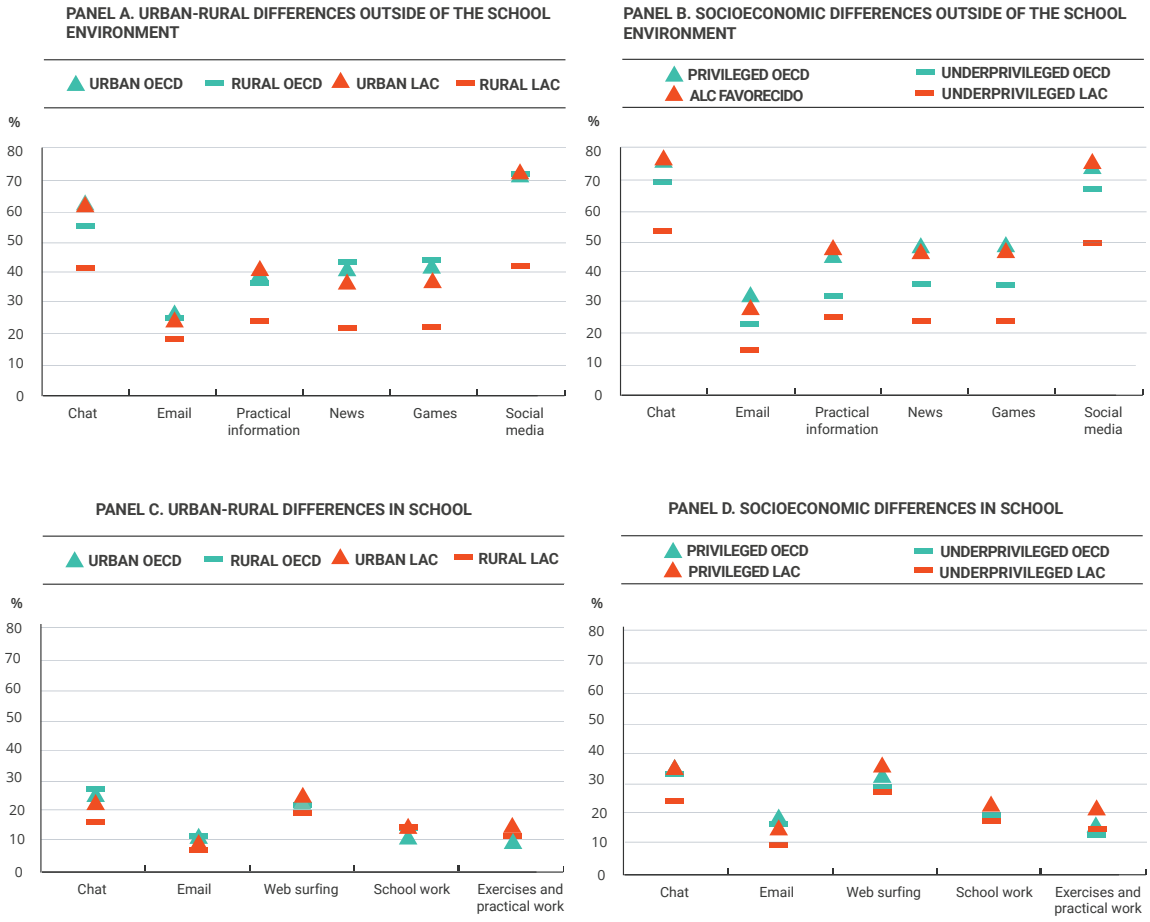
Students from a favorable socioeconomic background are 5-10% more likely to use messaging software and browse the internet at school for academic work than those from a disadvantaged economic background[15]. Likewise, this trend is probably boosted by access to mobile phones among students from favorable backgrounds, which are also used in schools for educational purposes (Graph 4, Panel B). These groups are also more likely to use ICTs to do school work. The data from the 2018 PISA exams revealed the gender gap that exists in Latin America and the Caribbean, as boys are more likely than girls to use the internet at school to access email and do school work.

Socioeconomic inequalities can intensify as a result of territorial and gender inequalities in the use of digital devices, whether in the home or at school. Students from rural areas who come from disadvantaged homes are less likely to use ICTs than those from favorable urban backgrounds.

(15) This calculation is based on the material conditions of families, regardless of whether their residence is urban or rural.

GRAPH 4. USE OF ICTS INSIDE AND OUTSIDE SCHOOL BY SOCIODEMOGRAPHIC CATEGORY, AVERAGES FOR LATIN AMERICA AND THE CARIBBEAN AND OECD, 2018

Average use of ICT technologies inside and outside of school, bysociodemographic category in Latin America, the Caribbean and OECD countries, 2018



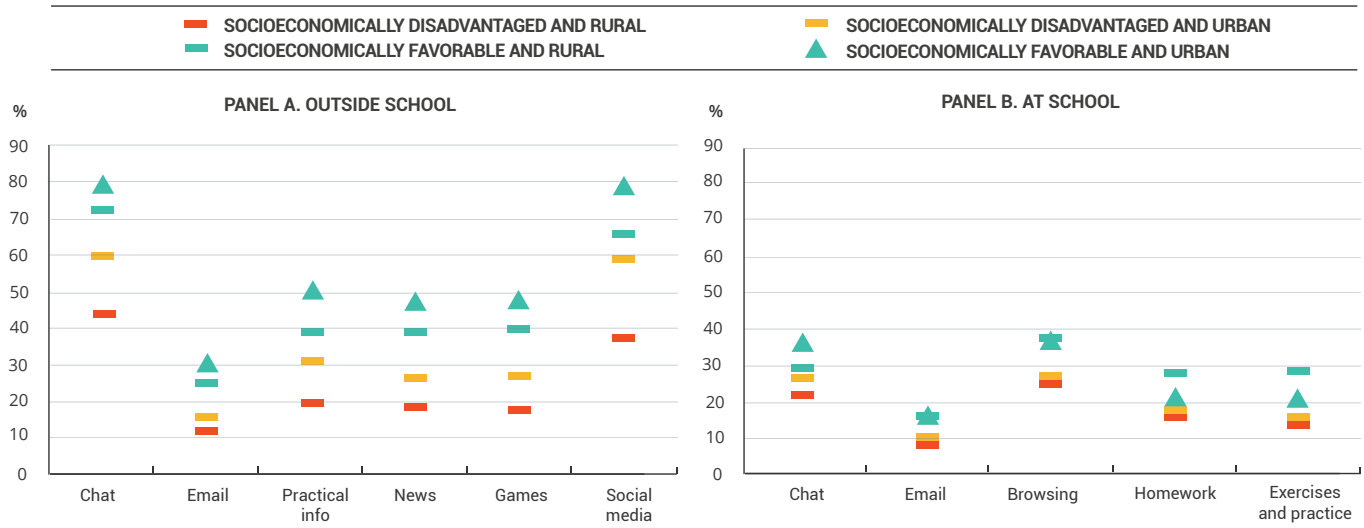
Notes: The proportion was calculated as an average of countries from the OECD and from Latin America and the Caribbean who participated in the PISA questionnaire on familiarity with ICTs. Students are considered to belong to disadvantaged socioeconomic backgrounds if their values on the PISA socioeconomic and cultural index are in the lowest 25% of their country or economy. Rural students are those whose school is located in "a village, rural community or settlement of fewer than 3,000 inhabitants"; urban students are those whose school is located in a town of over 100,000 inhabitants. "Browsing" is understood as "browsing the internet to do school work" and "downloading, uploading content or browsing the school's website (e.g. the intranet)". "Exercises and practice" refers to "practicing and doing exercises, such as those for learning languages or mathematics". "Homework" refers to "doing homework on a computer at an education centre" and "using computers at the center for group work and to communicate with other students".

Source: Source: OECD, 2020

According to the same source (OECD, 2020), in the case of ICT use, the socioeconomic and geographical gaps broaden even more when combined. Outside of schools, greater disparities are observed among rural students from disadvantaged backgrounds and urban students from favorable backgrounds. In contrast, students from favorable backgrounds, whether urban or rural, are more likely to use ICTs at school in comparison with their peers from disadvantaged backgrounds.

GRAPH 5. USE OF ICTS INSIDE AND OUTSIDE CENTRE OF EDUCATION BY SOCIOECONOMIC LEVEL AND LOCATION, AVERAGES FOR LATIN AMERICA AND THE CARIBBEAN AND OECD, 2018.

Proportion of students who use ICTs inside and outside school for an activity at least three times a week



Notes: The proportion was calculated as an average of countries from the OECD and from Latin America and the Caribbean who participated in the PISA questionnaire on familiarity with ICTs. Students are considered to belong to disadvantaged socioeconomic backgrounds if their values on the PISA socioeconomic and cultural index are in the lowest 25% of their country or economy. Rural students are those whose school is located in "a village, rural community or settlement of fewer than 3,000 inhabitants"; urban students are those whose school is located in a town of over 100,000 inhabitants. "Browsing" is understood as "browsing the internet to do school work" and "downloading, uploading content or browsing the school's website (e.g. the intranet)". "Exercises and practice" refers to "practicing and doing exercises, such as those for learning languages or mathematics". "Homework" refers to "doing homework on a computer at an education center" and "using computers at the center for group work and to communicate with other students."

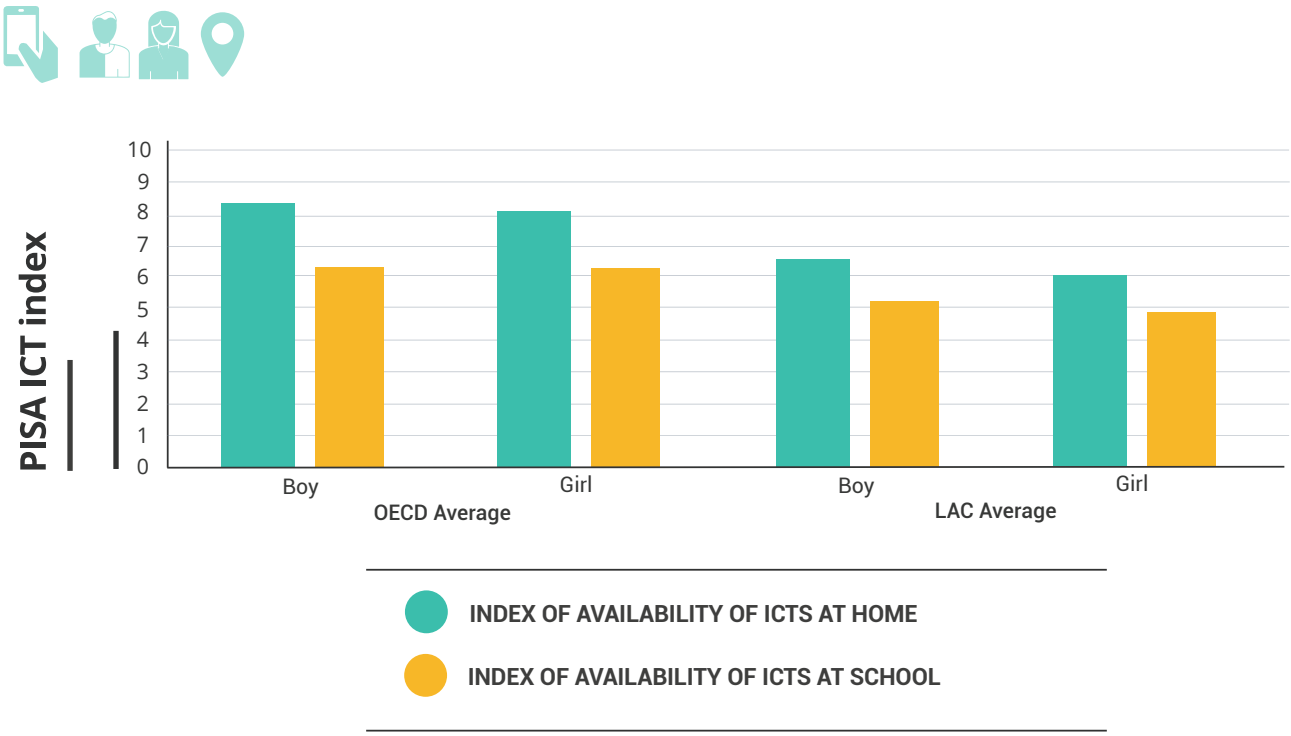
Source: OECD, 2020

Regarding gender differences, although there are no specific data by geographic space (urban or rural), access to digital technologies is unfavorable for girls in comparison to boys (OECD, 2020).

In the countries of Latin America and the Caribbean, as in those of the OECD, boys are 4% more likely than girls to use digital devices before the age of 4, and 5% more likely to use them for the first time between the ages of 4 and 6. Girls are approximately 5% more likely than boys to use a digital device for the first time between the ages of 10 and 12. It is important to bear in mind that early exposure to devices has a positive correlation with better results in PISA tests. Therefore, girls are at a disadvantage.

Boys also have more access to ICTs than girls. The gender divide in access is greater for students of Latin America and the Caribbean than for those of the countries of the OECD. The difference between boys and girls in the OECD and in LAC is significant for the indexes measuring access to ICTs inside and outside schools. Girls aged 15 continue to be comparatively less exposed to ICTs and therefore their chance to develop digital skills is restricted.

GRAPH 6. STUDENT ACCESS TO ICTS BY GENDER, AVERAGES FOR OECD AND LATIN AMERICA AND THE CARIBBEAN, 2018



Notes: The difference between boys and girls is significant, 10% in the OECD and Latin America and the Caribbean for both indexes. The difference between the OECD and Latin America and the Caribbean is significant for both indexes as regards boys or girls.
Source: Developed by the author based on OECD (2018d), 2018 PISA database (database) www.oecd.org/pisa/data/2018database/.

Source: OECD, 2020

It would prove very useful to break down this data according to geographical area, as it is highly likely that in rural areas the initial use of devices is delayed due to affordability issues (a trend that is also present among adults), and to differences in access that favor boys over girls as a result of the patterns observed in rural adults (Oxford, IICA, IFAD, 2020).

3.3 Digital skills in the rural population of the region: from access to the use of ICTs.

The issue of access and use of ICTs is at the center of numerous studies in both developed and developing countries. In Latin America and the Caribbean in particular, digital gaps have been identified according to age, gender, socioeconomic status, mother tongue, and geographic location (Barrantes et al, 2019; Marsical, et al. 2019; Galperin, 2017). Likewise, a group of studies outside the region delve into the problems of access and limitations in rural areas in developing countries and warn about the persistent gaps and obstacles to the inclusion of technologies (Dohose, Cheng; 2018; Park, et al. 2019; Salemenik, et al, 2017).

These studies show that the number of Internet subscribers rises according to income, educational level and the presence of children in rural households. However, despite the fact that there are certain key factors that impact the usage of the Internet such as age, income and educational level (which influence its adoption), they fail to predict the type of online activities carried out by the different users (Penard, et al, 2015; Kilen thong, 2014; Prieger, et. al, 2013). On the contrary, the purpose of Internet use (communication, entertainment, social media and e-commerce) is mostly associated with digital skills (Garín Muñoz, 2019). This constitutes fertile ground to further promote the development of these skills.

There are fewer specific studies for Latin American and Caribbean countries.[16] Gutiérrez and Gamboa (2010) found that educational restrictions constitute a significant limitation for internet use in low-income populations in Colombia, Mexico, and Peru. For their part, Grazzi and Vergara (2012) analyzed the effects of language on internet use in Paraguay and concluded that if the users' mother tongue (Guaraní) is not available in the online content of their digital world, this

(16) A systematization of these studies can be found in Martínez Domínguez and Mora Rivera (2020), Internet adoption and usage patterns in rural Mexico, Technology in Society, Volume 60, 2020, 101226, ISSN 0160-791X, https://doi.org/10.1016/j.techsoc.2019.101226. http://www.sciencedirect.com/science/article/pii/S0160791X19302684


AFP / Panta Astiazaran

will constitute a cultural barrier that will hinder the adoption of ICTs. In the case of Brazil, a study based on information from 2005 to 2013 (Nishijima et al., 2017) suggests that the factors that promote Internet use are linked to a higher level of education, income, employment and number of household members. Correa et al (2017) point out, based on a study conducted in 22 communities in Chile, that factors such as age, income, social capital and the presence of children in the home are tied to the level of internet use.

In addition to analyzing the key factors that determine the adoption of the internet, the research studies conducted by Martínez Domínguez and Mora Rivera (2020) on the rural population in Mexico, as well as the works by Barrantes et al (2020) for Ecuador, Guatemala, Peru and Paraguay, all address the issue of internet use and purposes (communication, entertainment, social media, e-commerce and electronic government). These contributions are highly valuable, as they delve into a generally unexplored topic within the local context, that is, the patterns of use of technologies in rural areas.

The studies in question show a positive correlation between educational level, income, and the development of digital literacy. In this sense, those with higher qualifications are less likely to claim a lack of digital skills compared with those with fewer years of schooling. This problem needs to be addressed, particularly in rural areas, since the most vulnerable groups, such as older women and other people who possess a low level of education, make up the majority of the rural population (Barrantes and Vargas, 2019; Barrantes and Cozzubo, 2019). This situation, combined with problems of telecommunications infrastructure, affordability and lack of digital skills, fuels a vicious circle that distances the most vulnerable population from the possibilities of further adopting technology.

The most relevant findings also show that the presence of children under 12 years of age in households reduces the likelihood of adults reporting a lack of digital skills as the main reason for not subscribing to an internet service (Grassi, Vergara, 2012; Martínez Domínguez, Mora Rivera, 2020). In these cases, the main obstacle lies in the cost of access to connectivity and mobile technology. Thus, these results indicate that children could potentially contribute to the transmission of digital skills to adults within the home, and play a role in investment decisions in this area. This trend reveals an unmet need, and calls for more affordable connectivity for families with school-age children, an issue that must be addressed by public policies.

The data for Mexico indicate that the probability of using the internet in rural areas is higher in women, youth and people with higher levels of education. There is a difference in terms of age: the older a person is, the less likely he or she is to use the internet due to lack of digital skills. Thus, young people are more committed to technology, whereas older adults are less inclined and more resistant to its use. Data on internet use shows that business owners are more likely to use the internet, and at the opposite extreme the lowest adherence is found among day laborers and manual workers who are the least likely to engage in online activities.

Women begin to use the Internet in order to stay connected with their family and friends, thus replicating their traditional role as caregivers and providers of support in the digital space. Internet use is mostly associated with leisure activities (entertainment and social media) compared with older age groups. The association between the use of the internet and the search for information is more widespread among students who attend secondary school, which shows that there is a specific use for educational purposes (this trend has been identified both in the works of Martínez Domínguez and Mora Rivera (2020) and in Grazzi and Vergara (2014)). Finally, the likelihood of a person using the Internet increases when he or she has sufficient skills to download programs and applications[17]. This digital skill is key to fully tapping into the potential of the Internet.

In summary, based on the aforementioned studies, it is possible to infer that rural internet users are young people with more years of education, and who come from households with better economic conditions. Internet usage patterns (search for information, communication, entertainment, social media, e-commerce, and e-government) differ significantly based on gender, age, educational level, occupation, and geographic location, which further demarcates the digital divide between those who utilize the Internet and those who do not (Martínez Domínguez; Mora Rivera, 2020).

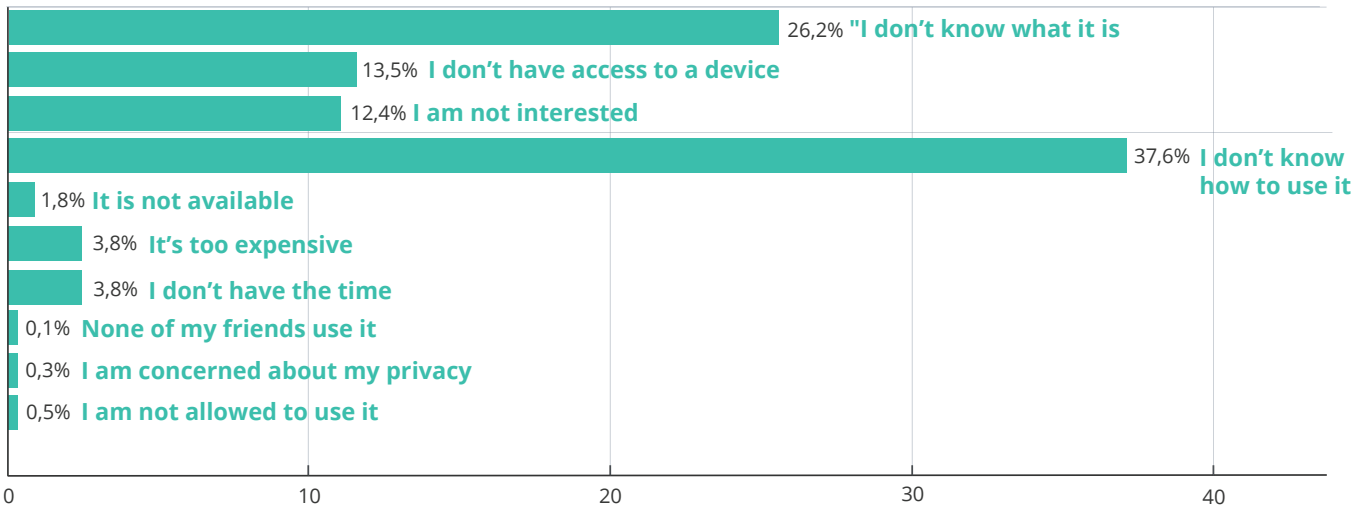
The research conducted by the After Acces[18] initiative among the rural population of Ecuador, Guatemala, Peru and Paraguay (by way of a widespread survey), showed

(17) These results are consistent with the study conducted by Grazzi and Vergara (2014) for seven countries in Latin America and Mexico

(18) https://afteraccess.net/about-afteraccess

the limitations in the ability to successfully make use of digital technologies (Barrantes et al, 2020). Among the main reasons for not using this service, respondents claimed "not knowing how to use it" (38%), and "not knowing what it is" (26%); only four out of ten people stated that they use these resources in rural areas.

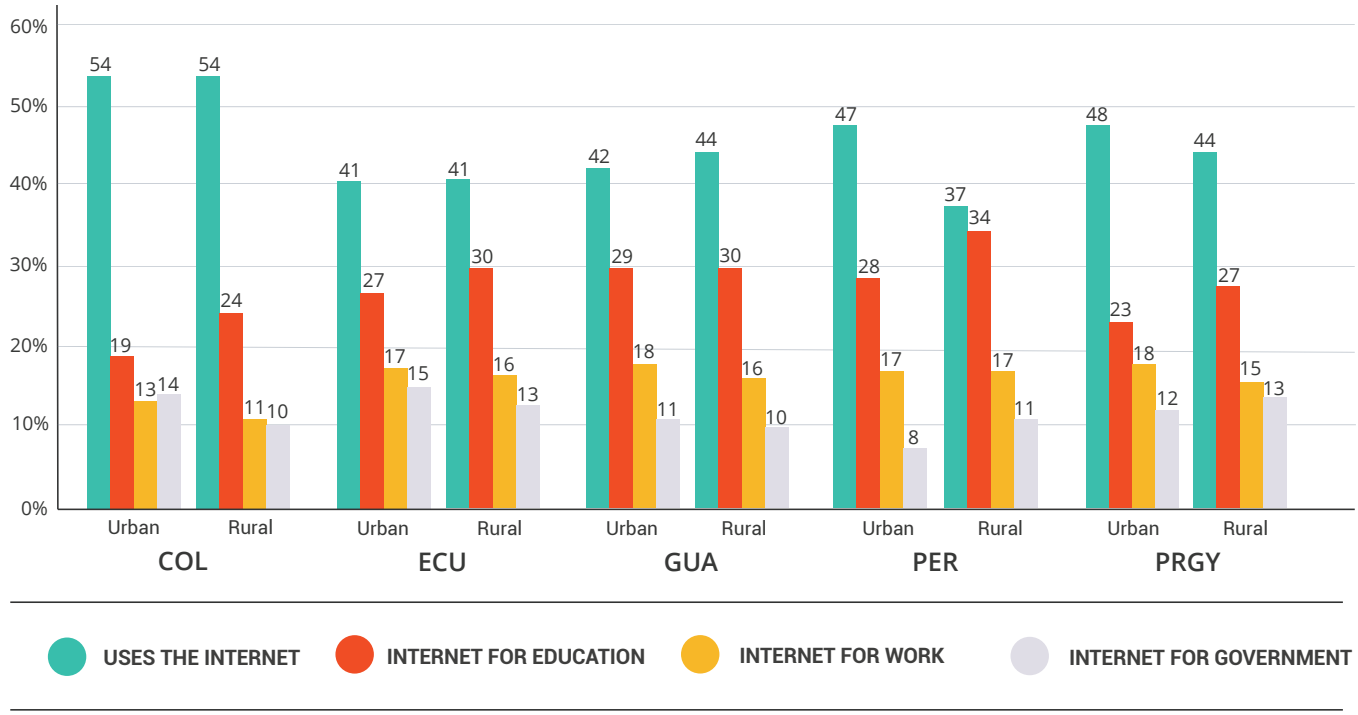
GRAPH 7. MAIN REASONS FOR NOT USING THE INTERNET IN RURAL AREAS (%)



Source: Barrantes et. al, 2020 based on After Access- LATAM

Furthermore, significant differences were observed in the reasons for using the internet in urban and rural areas. In cities, a large number of activities were identified: recreational, education- and/or work-related, as well as online administrative procedures and government services. An interesting fact that emerges from Graph 8 is that the only indicator that appears to be higher in rural areas than in cities in all countries is the use of the internet for educational purposes. This leads to the conclusion that education constitutes a major driver in the adoption of technology in rural areas.

GRAPH 8. INTERNET USERS BY TYPE OF USE (%)



(Source: Barrantes et. al, 2020 based on After Access- LATAM)

In the rural areas of all the mentioned countries (although with a greater difference in Peru and Paraguay), the use of the internet is relatively recent. Rural usage and adoption dates back to less than five years (after 2015), whereas in urban areas the average is ten years. This trend reveals an important fact, which is that the incorporation and especially the expansion of internet use is gradual. Barrantes and Vargas (2019) highlighted that during a first stage, the Internet is used to access information, to communicate, and for other basic activities. A more intensive usage follows, featuring an expanded universe of activities: leisure, education, work and management of other services (banking, government, health, etc).

In the case of Brazil[19], a study carried out in 2020 through a partnership between Embrapa, the Brazilian Micro and Small Business Support Service (Sebrae) and the National Institute for Space Research (INPE) revealed that within a sample of 750 respondents, 84% of farmers stated that they use at least one digital technology as a support tool in agricultural production.

(19) https://www.embrapa.br/busca-de-noticias/-/noticia/54770717/pesquisa-mostra-o-retrato-da-agricultura-digital-Brazileira

More than 70% of rural producers who participated in the survey affirmed that they use the Internet. 57.5% of them said they use social media, such as Facebook, and messaging services, such as WhatsApp, in order to obtain or disseminate information related to their property, to buy inputs or to sell their production.

Acccording to Édson Bolfe, coordinator of the study and researcher at Embrapa Informática Agropecuaria (SP), these tools are used for general activities to help with the planning and management of the property, but a significant number of rural producers are now starting to explore other applications as well. He also pointed out that 95% of respondents stated they would like to have more information on digital agriculture. Almost 41% of the farmers said that one of the main difficulties they face is the lack of knowledge about the most appropriate technologies. This means that there are many tools that farmers do not know about, or whose purpose is unclear to them. Finally, according to the survey, the COVID-19 crisis and the social distancing measures that were imposed accelerated the use of tools to commercialize production.

In sum, the studies conducted reveal the wide disparities that exist in the adoption of digital technologies in rural areas. Internet use is linked to patterns and inequalities that can already be observed in the "offline" world. Its use is more frequent among those with a higher education level, who come from a more favorable economic environment, carry out more qualified work or are involved in activities that require technological tools. There is a differential use according to gender, and the presence of children and youth in the households is a relevant factor in promoting the adoption of these tools. Young people are the most likely to use these technologies, and schools (especially at the secondary level) represent an incentive to use the internet. Once internet access is obtained, users gradually begin to explore new uses and purposes.

Finally, the lack of digital skills is a major limitation among those who stated that they do not use these technologies (in addition to infrastructure- and cost-related reasons), along with insufficient knowledge about the existence of these resources in rural areas and the broad range of technologies whose purpose is unclear. Nonetheless, certain studies have shown a growing interest in these tools and the evidence reveals an increasingly rapid adoption of new technologies, especially within trade chains, as a result of the crisis caused by COVID-19.

The described studies constitute a step forward in the gathering of evidence on the drivers of digital inequality. However, for Latin America and the Caribbean, there are currently very few assessments available, and an ongoing, in-depth analysis is required in order to fully understand the status of and the dynamics associated with digital inequality in rural areas. The high costs of conducting surveys among a population that resides in remote areas, the discussions surrounding how to measure digital skills, and the excessively scattered statistical data, are also considered limitations that may explain the lack of studies on the subject.

AFP Marvin Recinos

4 Examples of education in digital skills in Latin America and the Caribbean

To better understand the possibilities that are available to boost the development of digital skills in the rural population of Latin America and the Caribbean, an overview is presented here of current initiatives in the region, classified into seven strategies. The cases discussed correspond to a survey of experiences currently under way that was carried out in early 2021 by IICA Delegations in 34 countries. These examples, taken from a broader universe of data that was collected, facilitate a detailed analysis of a number of experiences focused on the development of skills for the use of new technologies. Much can be learned from these ongoing projects, which could be replicated in other countries. The selection responds to variability criteria in relation to the type of interventions involved and criteria has also been followed that take into account territorial diversity, scale, scope and institutional alliances that supported these experiences.

The cases have been classified according to seven identified strategies[20]. This order is based on the focal points and the strategies identified in the survey[21]:

- Strengthening the community to promote technological skills and digitalization
- Agricultural e-commerce

(20) Trends referring to agricultural e-commerce, smart agriculture and specialized digital consultation have been taken from the document GSMA-IDB LAB (2020) "Landscaping the Agritech Ecosystem for Smallholder Farmers in Latin America and the Caribbean". The others were developed from the survey of cases in the present report.

(21) Although some of the cases could be included with others because they incorporate various components, they have been classed based on the central priority involved.

- Digital skills training for industry 4.0 and employability
- Smart farming
- Specialized digital consultancy
- Search for solutions to promote rural digitalization (Hackathon)
- Competitive funds

Strategy 1
Strengthening the community to promote technological skills and digitalization

These initiatives are part of training programs that encourage the adoption of digital solutions in scattered rural communities where the reach of connectivity and its adoption are still incipient. These are programs that are also aimed at women, young people and the indigenous population as agents of community change. These proposals seem to overcome gaps in access and use of technologies.

Name of the project: NANUM Mujeres conectadas

Countries: Argentina, Paraguay and Bolivia

Years: 2020- 2023

Partnerships: vina Foundation, IDB Lab, Gran Chaco Foundation, Nativa Foundation (Bolivia). Sunú Group and Tree Shadow (Paraguay)

Financiamiento: $2,768,200

The objective of the NANUM Mujeres Conectadas (Connected Women) project is to promote the role of women as agents of change in the access to and adoption of rural connectivity and innovation applied to the development of productive organizations.

In its three years of implementation, this trinational initiative has sought to facilitate interconnection for 40 isolated communities by providing home connectivity for 5,000 homes. It works directly with 5,000 women belonging to different indigenous peoples of the Gran Chaco region of Argentina, Bolivia and Paraguay (Wichi, Qom,

Pilagá, etc.) and rural women, between the ages of 18 and 55 and their families, to reach out to 25,000 people. The project promotes the creation of 40 women-run companies that will provide internet service to their communities. Furthermore, 1,000 loans will be granted for the use of innovative payment solutions.

The project foresees the creation of an Open Innovation Fund that will promote access to and adoption of solutions that will help reduce the vulnerability of the Chaco communities in the face of climate change and post-pandemic effects (COVID-19). Financial support will be provided to innovative initiatives based on digital technologies that will bridge the digital divide, promote learning and the exchange of knowledge, as well as support local production processes to achieve economies adapted to climate change and post-pandemic challenges.

Prior projects:

NANUM is the continuation of two prior experiences in which Fundación Avina, together with Samsung (Gran Chaco NAMUM Village) and the IDB Lab (Proadapt), worked to support the territorial development of the Gran Chaco through connectivity and adaptation to climate change.

Results:

20 remote economy centers (NANUM centers) equipped with connectivity were built, and activities were developed with the communities around these centers to promote digital literacy and assist them in the adoption of digital tools (more than 3,300 hours of training was provided and 900 people were trained in these centers). Likewise, digital tools were developed, which facilitated the adaptation of practices of local producers in the face of climate change, although with limited scale given the lack of connectivity (for this reason, the current initiative aims to scale-up connectivity, taking it from the centers to the homes).

Information: https://acdi.org.ar/proyectos/nanum/

Name of the project: "Techio Comunitario" Community Program for Promoters in Telecommunications and Broadcasting.

Countries: Regional

Years: 3 editions developed in 2016 - 2018 and 2020 (in progress)

Partnerships: Techio Comunitario- Redes por la Diversidad, Equidad y Sustentabilidad AC-UIT (Networks for Diversity, Equity and Sustainability).

The training course is the result of a process that began in 2012 with the identification of the technical training needs of indigenous communities, required to develop projects involving broadcasting, telecommunications and community networks. Between 2016 and 2017, the first edition was held in Mexico, coordinated by Redes AC and Palabra Radio, along with 17 other organizations. A second initiative was

developed between 2018 and 2019 and the third, called the Training Program for Technical Promoters in Indigenous Communities for the Generation, Development and Maintenance of Communication and Broadcasting Network Technologies, was carried out together with the UIT between 2019 and 2020.

Since 2004, Redes AC has been working to promote communication in indigenous communities, through political and regulatory advocacy programs aimed at creating a legal framework without discrimination, training opportunities for indigenous communicators, community networks for the development of indigenous telecommunications and applied research. Together with Indigenous Community Technologies (TIC AC) and Rhizomática, they were able to develop their own community cell phone networks (Baladron, 2020).

The content of the program responds to the needs for technical training raised by indigenous communities and the organizations with which they work.

The course features a core, common curriculum to teach the basics of community communication and technologies, electricity, electronics and free software. This information is needed to advance towards the different specializations, which include radio broadcasting, community cellular telephony and wireless internet networks. Finally, an integration module combines technical knowledge with community communication processes.

The most recent edition of the course is based on the methodology and training needs of indigenous peoples in Latin America. The conformation of each of the courses and the curricular structure have been designed based on previous editions, which have sought to set the foundations for the implementation of training processes capable of building the technical capacities of indigenous peoples, with a view to fostering entrepreneurship and sustainable communication and telecommunications projects in their communities.

The modules included in the program are the following:

1. Community communication and technologies
2. Basic electricity and electronics
3. Radio frequency and computer networks
4. Regulatory framework for telecommunications and broadcasting
5. Sustainability in telecommunications and broadcasting projects

The goal of the course is to provide training to indigenous technicians on maintenance and development of their telecommunications and ICT networks, thereby promoting entrepreneurship among its participants and ensuring the sustainability of the networks in these communities.

Furthermore, it features workshops and laboratories, taking into account the needs of the communities and their worldview. An important issue to ensure that this training adequately contributes to the adoption of technology is the methodology

applied, which consists of participatory actions and research carried out by applying principles of popular education and popular pedagogy. Finally, the guides and documents included in the workshop are published on its website for public consultation.

https://www.redesac.org.mx/publicaciones

Information:

https://techiocomunitario.org/historia-del-proceso-3/
https://www.redesac.org.mx/
https://www.itu.int/en/ITU-D/Digital-Inclusion/Indigenous-Peoples/Pages/Promotores-Tecnicos.aspx

Video of the last edition of the "Program for the Training of Indigenous Peoples of Latin America on Telecommunications and Boradcasting"

https://www.youtube.com/watch?v=iPgLFQQAdhU&feature=youtu.be

Strategy 2
Agricultural e-commerce

Digital advances have driven the development of agricultural e-commerce. Its performance depends on such factors as mobile network coverage, adoption of digital payment systems, knowledge of e-commerce platforms, and development of logistics networks. The crisis caused by COVID-19 and changes in food consumption have led to a trade model of services that more directly connects producers with each other and with consumers through the use of platforms and other e-commerce digital resources.

Name of the project: Dom Távora
Country: Brazil
Year: 2020
Partnerships: United Nations Development Program (UNDP). International Fund for Agricultural Development (IFAD). Municipal governments of the State of Sergipe.
Financiamiento: $28,600,000.

This project is one of the responses to the crisis caused by COVID-19, and its goal is to boost the use of social media and digital resources (in this case WhatsApp for e-commerce) in the State of Sergipe.

The entities mentioned above have been supporting the fifteen municipal governments of the State of Sergipe with the lowest Human Development Index (HDI) through the Dom Távora program. With this initiative, families of rural producers have the opportunity to receive financial and technical support to develop businesses in areas such as livestock, artisanal production and rural tourism. The Dom Távora project seeks to benefit about 10,000 families of farmers living in Sergipe, thus reaching about 40,000 people.

Although internet connection is unstable in the municipalities, family farmers have been able to use smart phones and, especially, WhatsApp, to commercialize their products through weekly meetings with their buyers.

This form of communication has allowed them to strengthen the networks between producers, by creating a system of product evaluation to guarantee high quality; it also allows them to redirect products that were not sold in one area to another market, thus optimizing sales and reducing waste. It has also offered an opportunity to receive technical assistance through phone calls, photos and audio messages. Another factor to highlight is the integration of the youngest members of the community and of women as central actors in the project. Young people find it easier to integrate technological tools into pre-existing commercialization chains, while women have come up with new ideas to guarantee a stable income, especially for artisans. The project also provides support for women, by addressing questions of gender and violence. The initiative includes 22 associations of rural producers, and takes into account the conditions of greatest vulnerability during the pandemic.

Information: https://www.seagri.se.gov.br/projeto/2/projeto-dom-tavora

Strategy 3
Digital skills training for industry 4.0 and employability

New forms of production require skills training in the labor market to ensure employability based on the new rules of labor organization. Different large-scale initiatives are presented below, which seek to massively incorporate transferable digital skills to different areas and branches of industry 4.0. Although they do not focus exclusively on rural areas, they are aimed at the population as a whole and driven by organizations responsible for formal education and job training, and therefore also include the rural population.

Name of the project: Microsoft Global Skills Initiative
Start Year: 2020

Microsoft has developed an initiative for 25 million people all over the world to acquire, by the end of 2020, the new digital skills necessary for driving the economy after the crisis caused by COVID-19.

In 2020, the world faced various challenges, including the COVID-19 pandemic, which led to job losses (affecting 250 million people globally) and has also sped up the move towards greater digitalization. Technological change prior to the pandemic showed a growing process of transformation, along with a decrease in the resources invested by employers in staff training in the last twenty years. Likewise, it is estimated that by 2025 there will be 149 million jobs that will require digital skills.

Microsoft president Brad Smith stated that "the biggest brunt of the current downturn is being borne by those who can afford it the least". Unemployment rates are spiking for people of color and women, as well as younger workers, people with disabilities and individuals with less formal education. Our goal is to combine the best in technology with stronger partnerships with governments and nonprofits to help people develop the skills needed to secure a new job".

The Global Skills Initiative targets the people who, within the current digital economy, need to develop new skills to go back to work, get a new job or keep the job they already have. Microsoft believes that for inclusive recovery it is vital to provide digital skills for those most affected by unemployment, including people with low income, women and minorities.

"COVID-19 has created both a public health and an economic crisis, and as the world recovers, we need to ensure no one is left behind," said Microsoft CEO, Satya Nadella. "Today, we're bringing together resources from Microsoft including LinkedIn and GitHub, to reimagine how people can learn and apply new skills—and help 25 million people facing unemployment due to COVID-19 prepare for the jobs of the future".

The initiative is based on three areas of activity:

1. Using data available on a large scale to identify skills and job posts currently in demand in the job market at global level.
2. Offer free access to training courses and resources necessary for the most in-demand jobs.
3. Connect skills acquired in the courses with certifications and free job search tools to help people find work.

The tools, training and certification are available in English, French, German and Spanish.

Microsoft's commitment consists of supporting this effort with funding of $20 million in cash subsidies to:

- Collaborate with nonprofits and with vulnerable populations to get them into the job market and offer good practices for job searches.
- Place the data and analysis resulting from this project at the disposal of governments so that they have evidence to evaluate local economic needs.
- Advocate public policies that promote training opportunities necessary in the new digital economy.
- For employers, Microsoft introduced a new app at the end of 2020 based on Microsoft Teams that aims to help improve employees' skills as job posts increase in the economy.

More information:

https://news.microsoft.com/2020/06/30/microsoft-to-help-25-million-people-worldwide-acquire-new-digital-skills-needed-for-the-covid-19-economy/news.microsoft.com/skills.

https://www.youtube.com/watch?v=JBgL-asr4c8

Name of the project: INNOVACCIÓN

Country: Mexico

Year: 2020

Partnerships: Microsoft Latin America. Department of Public Education.

The program is completely free of charge at national level. In partnership with universities, it seeks to bridge the gap between professional skills in industry 4.0 and market needs.

The program includes the following action lines:

a) Virtual innovation

Narrative: This is a journey to explore the areas of intervention of industry 4.0 and cloud-based digital tools that help to create opportunities to make a better society.

Teaching approach: Two training cycles were designed that include two trips. One individual, and another in the community, so that travelers can construct, expand and develop new skills.

Digital sherpas: People who, because of their track record, are capable of sharing their knowledge with the communities included in each subject area. They are not broadcasting teachers, but drivers of community learning.

Actions and results

Around 80,000 students participated in the two editions of the general cycle, each one with five key areas and modules related to: AI, IoT, Cloud, Bots, Big Data and Security.

Five certifications: endorsed by the Department of Public Education, CONOCER and Microsoft. Around 4000 students decided to get the certification.

Over 88 learning experiences held in the first edition, such as: master classes with specialists, students' lectures, public discussions with people from the industry, weekly challenges and a Hackathon.

In January 2021 a specialized course was developed with three thematic areas concerning global market needs, aimed at young university students from public institutions in Mexico who would receive a certificate in Microsoft Azure Fundamentals AZ-900.

b) Innovation Lab

This project includes the installation of three laboratories to generate industry 4.0 projects. Located in Chihuahua (AI Center), Veracruz (UV) and Chiapas (ITTG), these laboratories are user-focused spaces. They function as a meeting point for disruptive learning experiences. They follow an agenda tied to digital culture and industry 4.0. These are environments that promote innovation, allowing connections with digital industry. Activities are supported by a University Teaching Hacker.

Actions/Results:

Construction of three laboratories in two universities and an Artificial Intelligence Center.

Joint work by the Department of Public Education, higher education institutions and Microsoft in an education model for the laboratories.

There will be a differentiated agenda with activities like in-person and online meetings, presentation of research results, workshops, boot camps, and hackathons focusing on industry 4.0.

The digital education includes national and international certification in virtual innovation.

These spaces facilitate collaboration networks between laboratories, other universities and national and international industries

More information:

https://computerworldmexico.com.mx/educacion-y-salud-avances-del-plan-innovar-por-mexico/

Project name: Alianza Microsoft y Servicio Nacional de Aprendizaje (Microsoft and SENA Partnership).
Country: Colombia
Year: 2020

This partnership between the two organizations seeks to contribute to improving employability among Colombians through the joint execution of training programs and projects in soft and technical skills required by the labor market and industry 4.0.

This partnership includes the following action lines:

- Up-to-date curricular content in line with labor requirements
- Apprentice training
- Knowledge transfer (teacher training)
- Standardized certificates
- Incubator for labor insertion

From these five action lines of the partnership, the following results can be highlighted:

a) Training through LinkedIn:

- In 2020 an agreement was signed between SENA and LinkedIn, the world's largest professional network, which belongs to Microsoft, to train 500,000 Colombians, including apprentices, instructors, entrepreneurs and SENA collaborators from all the regions of the country, through training courses on the LinkedIn Learning platform.
- By February 2021, 390,000 people had been trained in both technical and soft skills through more than 330,000 courses completed and 10 million training videos on LinkedIn Learning.
- The graduation rate for these courses taken on LinkedIn was 24% (considerably higher than that of Harvard/MIT MOOCs: 3.13%)
- The most popular skills in which SENA users trained were: Excel, personal development, data analysis, communication, leadership, life skills, Office 365, time management and administration.
- An analysis was delivered to SENA of the skills and roles most required by Colombian companies through the search engine of the LinkedIn Economic Graph.

b) Training Tech Day–SENA Apprentices

- Training of 1000 apprentices in the basics of Azure, Data, Power Platform and M365 Fundamentals through Microsoft specialists and Microsoft Learn.
- 1000 apprentices participated in the Microsoft Skills Challenge

c) Training SENA teachers

- Training and certification of 500 teachers in basic skills for AZURE AZ-900.

d) Joint certification and curriculum

- Two joint SENA and Microsoft certifications in Data Science (Data cleansing and data display).
- Support for curricular construction of first virtual technical course in software development.

e) Microsoft SENA Incubator

- Design of an incubator model for apprentices seeking to improve models of employability and encourage hiring of apprentices by companies in partnership with Microsoft and SENA that require people with specific technology skills such as Cibersecurity, Data, Cloud and others associated with Microsoft technologies.

More information:

https://news.microsoft.com/es-xl/acuerdo-linkedin-sena-beneficiara-a-500-mil-aprendices-y-colaboradores-de-la-entidad-en-su-proceso-de-formacion/

https://www.sena.edu.co/es-co/Noticias/Paginas/noticia.aspx?IdNoticia=4551

Strategy 4
Smart Farming

Smart farming concerns the use of drones, satellites, and sensors that produce and transmit data about crops, animals, natural resources (water, soil, biodiversity, forests) and different practices of agricultural activity. Its use is growing and the solutions proposed depend on connectivity between devices which, when connected with the Internet of Things (IoT), maximize production processes, thus reducing costs and saving resources.

According to an Agritech report (GSMA, 2020), the expansion of smart farming apps in rural areas depends on the availability of a low-power wide-area network (LPWAN). These networks support devices that require low power consumption, have a wide reach and are low cost, which are crucial factors for success in the agriculture sector. To date, most Internet of Things LPWANs have been deployed using an unlicensed spectrum.

Training requirements for using smart farming are a major challenge in the region and progress has been made in this direction. For example, Gardi et al (2014) state that "digital soil mapping is not common in LAC. It is used mainly in the field of precision agriculture in countries like Brazil, Chile and Argentina. Furthermore, some research centers have started to use digital soil mapping as part of research and development policies in countries such as Argentina (National Institute of Agriculture Technology, INTA) Bolivia (Universidad Mayor de San Simón), Brazil (Embrapa-Solos), Chile (private companies), and Venezuela (Universidad Central de Venezuela). Its main use in the region has been to quantitatively map soil properties (clay, sand and silt content, organic carbon content and other properties related to soil fertility)".

Name of the Project: Central American Program for Integrated Coffee Rust Management (PROCAGICA)

Countries: Guatemala, Honduras, El Salvador, Nicaragua, Costa Rica, Panama and Dominican Republic

Year: 2016-2021

Institution responsible: Inter-American Institute for Cooperation on Agriculture (IICA)

Partnerships: European Union

Regional partners: Tropical Agricultural Research and Higher Education Center (CATIE); Central American Agricultural Council (CAC); French Agricultural Research Centre for International Development (CIRAD); Regional Cooperative Program for the Technological Development and Modernization of Coffee Production (PROMECAFE).

National partners: National Coffee Association of Guatemala (ANACAFE); Salvadoran Coffee Council (CSC); Honduran Coffee Institute (IHCAFE); Nicaraguan Institute for Agricultural Technology (INTA); Ministry of Family, Community, Cooperative and Associative Economy (MEFCCA); Institute of Agricultural Protection and Health (IPSA); Costa Rican Coffee Institute (ICAFE); Ministry of Agricultural Development (MIDA); Dominican Coffee Institute (INDOCAFE).

Local partners: 199 coffee-producing cooperatives/organizations/groups.

Direct beneficiaries: 7059 small coffee growers (35% women; 8% young people).

Financiamiento: International initiative funded by the European Union €16,045,000.00.

PROCAGICA supports regional and national efforts to control coffee leaf rust, by reinforcing the capacity for response and adaptation among small and medium coffee producers to address climate and natural risks. At local level, actions are implemented with an integrated approach—modernization, technical extension and education, ties with the financial sector and the strengthening of producer organizations—in the focal areas that are being assisted locally in Guatemala, Honduras, El Salvador and Nicaragua.

The program includes the use of digital tools that make it possible through the development of local networks to provide suitable information for decision-making on adapting to variability and climate change, and on possible threats to coffee production and to other livelihood systems.

Within this process, tools have been developed for "coffee risk management". These tools have been consolidated on the Pergamino IT platform, the first integrated information system, open access, accessible for use in the countries, with tools for collecting data and creating advanced data analysis spaces (https://www.redpergamino.net).

Pergamino includes a mobile app designed for producers; this tool was created to involve coffee-producing families of the region to collect field data related to coffee risk management in real time. Thus, the forecasts and recommendations issued will have a great level of reliability.

Furthermore, the tool functions online/offline and makes it possible to issue personalized recommendations immediately to producers who enter information from their productive units, and allows the user to see the alert level in their country.

As part of PROCAGICA, a mobile app has been developed to assess the vulnerability and adaptation capacity of coffee plantations and territories to climate change (Vulnerability Tool). This mobile app (for online/offline use) allows coffee producers and technical staff to quickly and continuously evaluate the state of vulnerability to climate change of their productive units.

Furthermore, during the COVID-19 health crisis, the physical presence of professionals providing technical support to coffee-growing families in rural territories was limited. In this period, recommendations were shared over broadcast lists using WhatsApp, a tool that a high percentage of families working directly with PROCAGICA have access to. The strategy made it possible to enable constant interaction between technicians and producers belonging to the 191 organizations, with whom they exchanged audio and text messages and images to orient them on specific subjects.

Más información: http://procagicard.com/antecendentes/

Strategy 5
Specialized digital consultancy

The last decade has seen an advance in consultancy tools in Latin America and the Caribbean that allow small producers to acquire knowledge to boost productivity. The available tools provide information on market prices, climate and agricultural practices through voice messages, SMS, WhatsApp and other apps. Alternatives have also been generated to solve problems such as pest and disease control, and for agrometeorological consultancy.

Because of the widespread presence of mobile phones and difficulties in connectivity, many of these services are channeled through basic mobile phones, although increasingly more new tools require the use of smart phones and internet access.

Project name: Precision Agriculture for Development (PAD)
Country: Brazil
Year: 2020
Partnerships: IICA- Precision Agriculture for Development (PAD)-Brazilian Ministry of Agriculture, Livestock and Provision (MAPA)

This initiative includes the use of 2G technology and higher, big data, machine learning and the operational bases of the behavior economy, and enables small agricultural producers to send personalized messages over mobile phones to mitigate the impact of COVID-19 which prevents in-person services in rural areas and thus continue improving productivity and yield (e.g., with technical orientation on pests, crops, good practices and animal health, among many others). In Latin America, in partnership with PAD (organization co-founded by 2019 Economics Nobel Prize winner Michael Kremer) allows family producers from these countries who implement it to incorporate digital agricultural services, technical assistance and rural extension services.

In providing actionable information to the right people, in the right form and at the right time, PAD trains small producers with personalized assistance over mobile phones, resulting in improved productivity, increased profitability and advances in environmental sustainability.

Up to 2022 MAPA, PAD and IICA will provide around 200,000 small producers in north-east Brazil with technical assistance and rural extension services via messages over landline and mobile phones. Digital technology offers the opportunity to provide personalized attention remotely at an infinitely lower cost than the system that has been in place for decades, something that is increasingly necessary at

times when the destructive effects of COVID-19 have constrained the traditional extension model.

The Director General of IICA stated that "PAD provides a reliable service that sends technical information directly to the homes of farmers, advising them about soil preparation, overseeing their production, climate conditions, as well as pest and disease control and management, to mention just a few examples. The PAD methodology allows governments and institutions to send a weekly technical message at a cost as low as USD 1.5 per family per year, which is 200 to 300 times less than traditional technical assistance services".

More information:

https://iica.int/es/prensa/noticias/pad-agricultura-de-precision-para-el-desarrollo-y-el-iica-unen-fuerzas-para

https://iica.int/es/prensa/noticias/brasil-sera-el-primer-pais-de-america-latina-en-recibir-soluciones-digitales-para

Name of the project: AgriExtApp
Countries: Caribbean Region. Pilot in Antigua and Barbuda, The Bahamas and Saint Vincent and the Grenadines. Requests have been made to adapt the app for Honduras and Haiti.
Year: 2020
Partnerships: IICA, Ministries o Agriculture of Antigua and Barbuda, The Bahamas, and St. Vincent and the Grenadines. Support from CARDI and CARICOM.

Development of an app designed for Caribbean producers who access remote agricultural extension services. The project was developed after a request made by agriculture ministries of the Caribbean to the Director General of IICA, due to the historic challenge in providing extension services in the region, worsened by the Coronavirus pandemic. The project aims to help extension services to increase coverage and information quality.

The project was designed internally by technical teams of IICA, with a collective structure and production of content by ministries, extension service officers, producers and assistance from IICA staff. At present, it is available as a web application for Android and Apple mobile phones.

The app provides information on crop management, good practices, sanitary and phytosanitary problems, online assistance and a network for exchanging information, and it is intended to benefit agricultural producers, key actors of agriculture

ministries and extension services, including agents of official services in English-speaking Caribbean countries and CARICOM members in general, with eventually similar projects in the countries that are added.

The project started with two groups of key products: roots and tubers, and livestock (mainly small ruminants). The group of products selected in the first stage corresponds to the strategy to replace a large proportion of foods that the region imports, thus strengthening food security in the Caribbean.

The experience of the pilot countries is preliminary and encouraging, such as the case of Antigua and Barbuda, which has already expanded the list of products and produced technical details, receiving both official support and support from producers chosen initially.

The next steps will be to consolidate progress in pilot countries, beginning gradually to meet the demands of other Caribbean countries and extra-regional demands as well. The use of the app will be monitored and evaluated among beneficiaries, in order to continue strengthening the tool.

More information:

https://antiguanewsroom.com/antigua-launches-mobile-app-for-farmers/#:~:text=The%20ICT%20App%20is%20an,to%20remotely%20access%20agricultural%20information.&text=The%20app%20is%20a%20pilot,Grenadines%20and%20Antigua%20and%20Barbuda.

Project name: Edgar App
Country: Perú
Year:
Partnerships: Luteran Word Relief- Cacao Movil

Virtual agricultural extension that connects cocoa producers with technical experts.

Development of a mobile app for Android to improve cocoa production through tutorials, notifications and specialized attention. Edgar sends the producer timely notifications according to the management schedule of their ecosystem and provides personalized advice from an extension specialist.

The app includes tutorials to guide the producer during the entire year (from September to September) in high-yield technical management in cocoa plantations.

https://proyectoedgar.com/

Strategy 6
Search for solutions to promote rural digitalization (Hackathon)

A number of the experiences surveyed invite different figures to search for solutions for undertaking agricultural activity through intensive use of the new technologies available.

Hackathons encourage the ecosystem of technology specialists to participate in resolving problems related to agricultural practices in specific contexts. These instances also include training and mentoring actions to increase participants' knowledge and technological capacity.

Name of the project: Hackaton IICA
Country: Latin America and the Caribbean
Year: 2018 (ongoing)
Institution responsible: Inter-American Institute for Cooperation on Agriculture
Socios: Microsoft, Universidad CENFOTEC, World Animal Protection (WAP), SENASA (Costa Rica), Ecuadorian Ministry of Agriculture and Livestock (MAG), SAP, Syngenta, Club Agtech, Bayer, Alliance for Entrepreneurship and Innovation (AEI), Latin American Organization of Young Agricultural Entrepreneurs (OLAJ), Universidad Zamorano and 4-H Clubs.

IICA has organized a number of innovation activities in the Hackathon modality, which aim to develop prototypes of digital technologies according to the real needs of countries, and provide training for members of participating teams. In the context of these activities, lectures are given and exercises carried out to strengthen digital skills in areas related to the development of tools. Mentoring is also organized with incubators or accelerators to help teams undertake ventures geared towards providing technology solutions for the needs of rural areas in the countries.

The 2019 edition of the hackathon was an in-person event where fifty young technology professionals from Costa Rica participated in an intense competition over two days to develop a tool that would allow producers and State services to minimize and mitigate the impact of natural disasters in the agricultural sector. All participants had technical support from IICA, Microsoft, SENASA, World Animal Protection (WAP) and the Universidad CENFOTEC, especially for supporting the process of conceptualization and codification. The winning team, made up of four young people from Turrialba, a rural area of Costa Rica, developed a mobile phone

app to facilitate interaction between the National Animal Health Service (SENASA) of Costa Rica and agricultural producers. For SENASA the contribution of these young people was highly valuable to respond to the challenges posed by agriculture and to provide a better service and attention to the agricultural sector.

The online hackathon held in mid-2020 invited young people from all the countries in the hemisphere to resolve the pressing need to connect small Ecuadorian agricultural producers with consumers during the COVID-19 crisis, through the development of technological solutions to maintain the supply of foods under strict health regulations and encourage short commercialization circuits. This edition was organized by the Ministry of Agriculture and Livestock (MAG) of Ecuador, the Inter-American Institute for Cooperation on Agriculture (IICA), the Universidad Cenfotec, SAP, Syngenta and Club Agtech. Experts from these organizations were responsible for mentoring and training the 240 enrolled participants from fourteen countries in the hemisphere. The winning team in this edition was made up of five students from the Escuela Superior Politécnica Agropecuaria de Manabí, who developed a technological solution to boost the continuous functioning of the agrifood chain and open up new permanent, inclusive and responsible markets for family-based agricultural producers in Ecuador.

Also in 2020, IICA organized a Challenge for Rural Youth, in an attempt to provide an opportunity for the exchange of knowledge and at the same time help establish community of young rural workers of the Americas. The initiative had the support of Bayer, Universidad Cenfotec, the Alliance for Entrepreneurship and Innovation (AEI), the Latin American Organization of Young Agricultural Entrepreneurs (OLAJ), Universidad Zamorano and 4-H Clubs. The challenge had two parts; a conceptual challenge, and a technological challenge. Fifty young people participated in the process, divided into twelve groups. In addition to multiple mentoring sessions for each group's conceptual proposals, the participants received training in related areas with interactions in networks and communities.

Aside from developing specific technological solutions for each problem, hackathons strengthen participants' digital skills, empower rural youths in innovation processes, and position the role of IICA and its partners in the development of suitable digital solutions.

More information:

http://hackathon.iica.int/

https://iica.int/es/prensa/noticias/este-fin-de-semana-hackaton-impulsara-jovenes-desarrollar-tecnologia-de-respuesta

https://iica.int/es/prensa/noticias/convocan-hackaton-para-disenar-software-que-conecte-productores-agropecuarios-y

https://iica.int/es/prensa/noticias/jovenes-rurales-ganaron-hackaton-iica-2019-tras-desarrollar-aplicacion-para-la

https://iica.int/es/prensa/noticias/iica-lanzo-desafio-para-construir-la-comunidad-de-jovenes-rurales-de-las-americas

http://desafio-innovacion.iica.int/

Project name: Agro-Fintech/ Agro- Connect
Country: Mexico
Year: 2016 (ongoing)
Partnerships: Sparkassen Foundation. Universidad Iberoamericana Puebla and German Federal Republic Cooperation
Funding: S/D

Since 2016 the Sparkassen Foundation has implemented the Agro-Fintech project in Mexico to strengthen the agricultural sector and promote rural development through the supply of financial services. In this context, collaboration began with the Universidad Iberoamericana Puebla to plan and hold its first hackathon, the "Hackafest - Finanzas Digitales Rurales", with the backing of the Sparkassen financial group. With the hashtag #noblabla, participants were invited to develop functional, innovative prototypes for the Mexican agricultural sector.

Over three days of intensive innovation and collaborative development, a total of thirteen teams made up of programmers, entrepreneurs, university students and figures from the world of finance developed digital solutions focused on the rural financial cooperatives and savings sector and small agricultural producers.

After the Hackafest, the agro.connect program is the second stage of the Sparkassen Foundation's digital transformation and innovation strategy. The partnership with Brixton Ventures Laboratory for the program was confirmed for the development of the program. Their experience in the area of incubation and acceleration of startups has made it possible to design a unique program to benefit rural areas in Mexico.

More information:
https://hackafest.mx/

Strategy 7
Competitive funds

Competitive funds are present in a number of initiatives available to small producers and companies in order to encourage investment and promote the development of the rural sector.

Due to the need to generate new capacities and skills among beneficiaries, these funds include specific lines for training to adopt digital technologies. The survey identified funds with a focus on the development of the rural sector, and others for modernizing the activity of small- and medium-sized producers which include incentive lines in the agrifood sector.

Name of the project: Red de Asistencia Digital Fortalece Pyme
Country: Chile
Year: 2020 (open call)
Partnerships: Corporation for the Promotion of Production (CORFO)
Funding: $4.5 million (annual) in public funds for the creation of the Centers.

CORFO's Digital Assistance Network *Fortalece Pyme* was developed for SMEs which access their services to increase the use and adoption of digital technologies in their business processes, thus contributing to increasing income by boosting sales and reducing costs. The *Fortalece Pyme* centers carry out technological extension activities to share knowledge, skills, and practices and provide specialized services for the adoption and use of digital technologies in companies.

Through the *Fortalece Pyme* Digital Assistance Network, CORFO aims to set up a center (project) in every region of the country by 2021, which requires public cofunding of $4.5 million per year. This network of projects estimates that at least 40% of the SMEs assisted will be from the agrifood industry.

Information: https://www.corfo.cl/sites/cpp/inn-fortalece-pyme

Project name: Rural Economic Development Initiative (REDI)
Country: Jamaica
Year: 2019 (second stage underway)
Partnerships: Government of Jamaica. World Bank.
Funding: USD15 million

This wide-reaching initiative aims to develop agriculture and tourism and increase activity for rural producers. Producers who apply for support funds receive technical assistance for developing their business plans, and if necessary, co-funding or support from counterpart subsidies as part of the REDI II project of "Investments in climate resilient agriculture and community tourism for rural enterprises".

The aim is to promote the development of agricultural/tourism community enterprises (integrated into productive associations or "partnerships") to help them overcome their limitations and achieve greater competitiveness in selected value chains, with more reliable ties with buyers and markets, and adopt a greater capacity for managing climate risk.

The program offers technical assistance and development of skills, including training for technology in agricultural activity.

In the first stage (up to 2017) the program aimed to improve the livelihood of the population in rural areas by developing opportunities for over 19,000 micro and small rural agricultural producers and tourism service providers. According to World Bank data, the promotion of modern agricultural technologies and practices boosted agricultural productivity by 50-100% and increased agricultural income between five and ten times. Some 22% of the 19,000 beneficiaries were under 30 and 51% were women.

The REDI project allowed rural agricultural producers and tourism service providers to create micro and small rural enterprises with legal recognition and connect them to the markets (i) through financial and technical support for small agricultural and rural tourism companies; (ii) by helping to develop critical infrastructures oriented at the market, at commercialization and small-scale management; (iii) by increasing access to technical innovation and support services for companies; (iv) by improving the financial management of rural enterprises; and (v) by providing the development of technical, environmental and technology skills and training in disaster mitigation and recovery.

More information: https://www.worldbank.org/en/results/2020/10/23/boosting-agricultural-and-rural-livelihoods-in-jamaica

5 Conclusions

The present report set out to address the problem of the adoption of digital skills among the rural population of Latin America and the Caribbean. As indicated, this is an issue that has been postponed in public debate, as obstacles to access for the rural community tend to monopolize attention, and the use of these resources is relegated to the background. However, both problems (access and use) are equally crucial and need to be addressed simultaneously. In particular, limitations on the deployment of digital skills must be addressed due to the need to increase frequent and flexible use of these technologies. Furthermore, the current crisis caused by COVID-19 is a catalyst for the question in terms of the need to generate progress in this subject to boost development in rural territories and agriculture by incorporating the benefits of digital technologies.

In this study we have shown the advantages of including technologies in rural areas, and also sketched the necessary starting points in terms of education and basic training for their full adoption, as well as the current conditions of the rural population in relation to the uses of digital resources. In this sense, it has been possible to identify the way in which different profiles are connected with technologies, from a series of available studies and through the reconstruction of regional statistical data. Thus, there is major evidence in relation to the problems entailed in the adoption of technologies in contexts of limited school education, different incorporation patterns based on the type of economic activity of the active population in rural areas, women's possibilities to develop digital skills, the role of rural schools in the early access to ICTs, and the incentive generated by children and young people in rural homes for the incorporation of new technologies.

Much remains to be explored to provide a more in-depth analysis of the issues presented in this document. In this instance, a preliminary systemization was made of cases that might cast some light on trends in the region, which made

it possible to identify seven strategies to boost digital skills. Although this is not an exhaustive systemization of all the existing development experiences, the presentation of these cases shows that there is a significant number of initiatives in execution that address the problem, and illustrates trends and forms of intervention when promoting the development of digital skills. This survey also reveals that there is a large number of proposals, which reflect the joint work of major institutions and organizations, whether at national, regional or international levels, and that these experiences must be broadened and multiplied in other contexts, in addition to offering more options to bridge the training gap in digital skills that exists in rural areas.

Bridging the digital gaps in the use of technology that exist among people and between rural and urban territories must be a priority for policymakers, if the benefits of such technologies are recognized and clear to see. An intensive and flexible use of technology has great potential to make productive processes and public and private services more efficient, improve productivity and the quality of products and services, transform employment opportunities, foster the training of human resources in rural areas, and broaden the possibilities of knowledge and of participation in culture, among other key factors for achieving sustainable development within food systems.

6 Recommendations

1 **The deployment of digitalization in rural areas and the development of digital skills must address situations of inequity in the region and the rural population.** The different situations, the broad regional diversity and differences between beneficiaries of programs must constitute the starting point for all policies that seek to counteract inequalities and promote the development of digital skills. The subregional disparities, the socioeconomic conditions of the population, the beneficiaries (young people, women, indigenous population, etc). call for alternatives that must not follow a one-size-fits-all approach. Policies to encourage digital skills have to be governed by principles of equity, in accordance with the various contexts and actors, to avoid intensifying social exclusion.

2 **Tackle the problem of digital skills by segmenting the beneficiaries of the initiatives.** Training strategies must consider different options based on their target population. Hence the need to promote a pool of segmented actions based on their different beneficiaries. Uses, flexibility and approach to technologies are not the same among people with greater levels of formal education, among people of different ages, in the case of rural women, and for those who are more likely to be exposed to digital technologies. Creating genuine opportunities for immersion in technologies and designing tailor-made experiences with local users can generate better conditions for the adoption of the necessary digital

skills. Young people deserve particular attention in these strategies, as they show eagerness and flexibility in incorporating technologies and, as a sector, encourage the adoption of such technologies. In turn, these technologies can drive opportunities for work and wellbeing in rural areas, while fostering a sense of belonging and the subsequent generational replacement of agricultural workers. Women and the indigenous population also require specific actions for the inclusion of technologies. In both cases it is necessary to overcome the problem of exclusion; for indigenous communities in particular, the cultural and linguistic diversity must be taken into full account in order to preserve ancestral legacies.

3 **Incentivize the production of technological digital resources for small rural producers and training programs for their adoption.** There is still an unfulfilled demand in the deployment of digital tools for agricultural activity and overall rural development (e.g., the tourist industry). Alternatives for smart farming, agricultural e-commerce platforms, specialized digital consultancy, platforms for administration, logistics and transport, and the full management and incorporation of these tools has great potential that remains untapped. Promoting competitive funds for the development of these tools and their adoption in rural areas is imperative.

4 **Promote the creation of local content.** This requires the production of material that encourages the use and demand of digital resources. In this sense, such content must promote the preservation of languages, local cultural productions and practices that protect the cultural heritage of the rural population. The governments, in partnership with the private sector, must drive the creation of hyper-media content, develop resources for open access digital training, and encourage the development of platforms that favor learning and respect the cultural diversity of the region. Creating friendly content that addresses cultural affinities, identity and regional products is a key point in preserving cultural heritage and gaining the acceptance of its beneficiaries.

5 **Encourage access to digital technology through formal education.** The presence of children and young people in homes and the influence of schools drive the incorporation of technologies in rural areas. States must be encouraged to sustain ICT policies as a motor for development in rural areas, and to train the young population so they can become qualified resources, thus motivating them to settle in rural areas and encouraging adults to adopt these technologies. Young people in rural areas must receive digital training to encourage efficient internet use (which is today focused to a great extent on entertainment and social media) and ICTs must be included in education programs from primary school to higher education. Guaranteeing universal internet access at rural schools is a necessary condition for driving the full development of digitalization today and in the future.

6 **Contribute to closing the affordability gap in rural areas.** The costs of accessing digital technologies (internet services and devices) are a severe limitation that slows down the adoption of technologies and the development of digital skills. The public authorities and private companies in the sector must agree on specific policies and regulations to diligently bridge the first gap in digital access.

7 **Conduct impact assessments of the ongoing training initiatives in digital skills and construct stable partnerships.** The cases analyzed reveal the valuable contributions made by international organizations, international cooperation, States, enterprises, civil society organizations, etc., in the development of projects. However, it is necessary to assess outcomes and impacts to determine the most efficient methods, and therefore move efforts in this direction in the coming years. Such assessments also serve as input for scaling-up and replicating these initiatives in different contexts. The experiences that were analyzed have not, for the most part, become widespread. It is also necessary to share good practices that lead to favorable responses in the adoption of digital technologies in rural areas.

8 **Support research studies on digital skills in the region.** The lack of scientific research on the subject and the evidence that can be extracted from such studies is a key factor in the design of policies and initiatives that promote the development of digital skills in the region. The absence of such studies, and the scarce lines of funding for the production of research at a regional level, urgently call for an agenda that includes this line of research and development. Funding provided by public science and technology entities and other relevant organizations (foundations, companies, etc). is crucial. The lack of priority given to the second digital gap, and the high cost of carrying out studies in scattered spaces and with populations with limited access to ICTs, all account for the void that exists in the region with respect to relevant studies and research on this subject.

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