

Does women's techno-education impact the agri-food sustainability?

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Abstract

Women contribute decisively to the economy and have an important participation in agricultural exploitation in the world, providing their labor. But if they had better access to technology and training in a more equitable way, they could contribute much more. In effect, the rapid technological changes that have occurred in the sector pose an even greater challenge to achieve equalizing the role of women to that of men in the agri-food sector. The limitation of the female gender to training and empowerment prevents them from taking advantage of the technology that are contributing to the achievement of a world free of hunger and malnutrition, which is one of the sustainable development goals (SDG). Therefore, this work analyzes the world situation in terms of training and gender gaps to see if these elements affect the achievement of four of the sustainable development goals (SDG 2, 4, 5 10) in 87 countries. The results of the multiple linear regression show the existence of a positive relationship between these elements is demonstrated. Then, as a real example, Spain is chosen as a country reference and analyzed in terms of training by gender, digital gender gap and labor gap. Finally, some advice and recommendations that allow the achievement of the inclusion of women in the improvement of the countries are suggested.

Keywords: Sustainable development goals, Digital divide, Training gap, Gender equality, Food security.

1. Introduction

According to the FAO (2020), currently 690 million people in the world suffer from hunger, which represents 8.9% of the world population. This source indicates that, in 2019, about 750 million people, or almost one in 10 people in the world, were exposed to serious levels of food insecurity. These figures could be reduced considerably, by investing in the necessary material and human resources, and it is the reason why three elements are considered essential for this: a) access and proper use of technology, b)

adequate training and the guarantee of equality and c) the participation of women in this area (Women inclusion).

Likewise, the International Labor Organization (ILO, 2017) indicates that fighting against the gender gap would have an added benefit of 5.8 trillion dollars to the global economy. And it specifies that the increase in the participation of the female gender as a labor force, including the ICT sector, would provide capital, in the form of taxes for the countries. This same study explains that, in the case of Spain, GDP could grow by

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34 billion dollars if the employment gender gap is closed by 25% (ILO, 2017). Another study by the European Union (2018) confirms that the incorporation of women in the digital innovations sector could bring up a benefit of 16 billion euros per year to the GDP of the European Union.

Research shows that if women farmers had the same access to productive resources as men, they could increase yields by 20% to 30% and total agricultural production by 2.5% to 4%, taking out from hunger to between 100 and 150 million people (FAO, 2011). These statistics indicate that the contribution of women to agricultural production is fundamental and that they represent up a large rate of the workforce employed in cultivation and production of basic food products for domestic consumption and for sale, since they grow vegetables that are important for family nutrition.

These figures show us the attention that should be accorded to women to achieve various sustainable development goals (SDGs), including those who can contribute to the promotion of agriculture and the guarantee of food security, that represent a priority for all governments concerned with the achievement of food self-sufficiency, the fight against hunger and the improvement of nutrition in their countries.

Also, everyone's involvement is a necessity since the equitable participation of both genders can increase the benefits of world economies by 34% (IMF, 2018). This implication is closely linked with the degree of education, training, and employability, so that women bring added value to this sector.

In this sense, the UN (2015) indicates that women and men are actors and beneficiaries of development. Women's participation in it is not only a matter of justice and human rights, but also a matter of economic calculation, because ignoring half of humanity would not allow achieving the desired sustainable development.

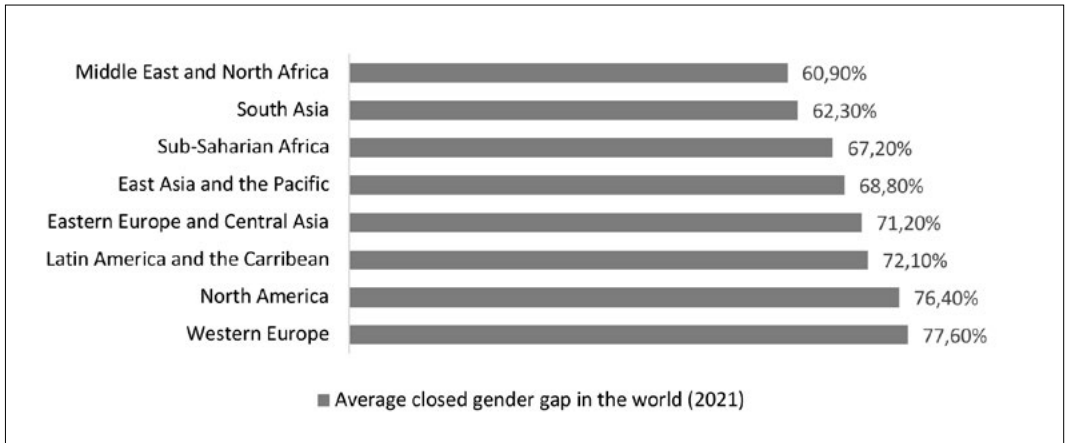
For this purpose, the objective of our study consists in analyzing the world situation of women in terms of education, the digital divide and technological education, with the aim of confirming or denying whether these variables: Inclusive Internet Index, Gini Index, Gender Digital Index and Gender Gap Index

affect the achievement of sustainable development goals, which are SDG 2 main objective of this study, SDG 4 related to education, SDG 5 related to equality and SDG 10 related to infrastructure and technology. This study is applicated to 87 countries selected according to the availability of the same information of the same year in the database used. and then further a specific analysis of Spain is proposed as an example. The choice of these sustainable development goals is since they are closely related to the empowerment of women and their role in the agricultural sector, which almost never positions them as protagonists, and limits them to a role of assistant or subordinate, due to ignorance of the performance capabilities in this development (Mason *et al.*, 2016). This is the reason why there is a need to pay a particular attention to equity at work, on family farms, in the household and in the apportionment of resources between cash crops and subsistence, since the benefit of women is not yet being recognized in the rural environment (Kizilaslan and Yamanoglu, 2010). Which prompts us to ask ourselves the following question: if education on the one hand and technology on the other hand contribute to the achievement of the SDGs, how would this achievement be if the two are achieved together equally between men and women?

2. State of the art

Women play a decisive and fundamental role in the agri-food sector, which today has become a strategic sector for the economy and constitutes one of the most important assets in the economic recovery (Hidalgo García, 2013). In fact, Women and especially rural women play a key role in supporting their households and communities to achieve food and nutrition security, generate income, and improve rural livelihoods and general well-being. As such, they are active players in achieving the SDGs. We must also recognize that through local knowledge and experience, women often understand their environment and the needs of their community better than anyone. They transmit traditional knowledge in medicinal plants and contribute significantly to the mainte-

Figure 1 - Average closed gender gap in the world (2021).



Source: Own elaboration from Statista (2021).

nance of agriculture, food security,¹ nutrition, and health (UNEP WCMC, 2020).

Unfortunately, nowadays, rural women and girls face persistent structural constraints that prevent them from fully enjoying their human rights and hamper their efforts to improve their lives and those of those around them. Evidence indicates that if these women had the same access to productive resources as men, they could increase yields on their farms by between 20 and 30 percent, increasing total agricultural production in these countries by between 2.5 and one 4 percent. This would reduce the number of hungry people in the world by between 12 and 17 percent (UN WOMEN, 2021). It is important to highlight that the right to food was recognized as a human right in 1948 in the Universal Declaration of Human Rights. In this year, the world started to give greater importance to ensuring the access to food. Some years later, this right led to other new notions, such as the concept of food security in the 1970s (Mechlem, 2004).

Although women are gaining ground a little more every day, gender gaps continue to exist throughout the world and especially in developing or underdeveloped countries (Benabdallah *et al.*, 2020), which today prevents the respect

of the general commitment expressed by all the countries of the world, and that it consists of the achievement of the 17 sustainable development objectives (Agarwal, 2018). These gaps could be observed in Figure 1.

In fact, although women are considered as an important target group for the achievement of SDGs, their participation in agriculture is generally unpaid and they are considered as auxiliary family workers (Rahman *et al.*, 2020). It should be noted that, today, more than three-quarters of the world's extreme poor live in rural areas, and 70% of the world's poor are women. What it emphasizes the importance of developing policies and programs that address the needs, interests and limitations of women and men in the agricultural sector. This includes renewing and strengthening extension systems to be more responsive and inclusive to women, addressing structural barriers to women's access to productive resources such as the access to education or the access to ICTs (Information and Communication Technologies), and improving financial systems to respond to the needs of rural women producers and entrepreneurs (Adinolfi *et al.*, 2020), even to get out of the least productive segments of the rural economy.

¹ The term of "food security" was defined by Andersen (2009) as the availability of enough food at a global, national, community, or household level.

Indeed, ICTs contribute to improving food security and promoting agricultural sustainability by offering opportunities that benefit farmers, connecting them to remote areas and helping them to improve their cultivation methods and productivity (better production, information on prices of market, environmental conditions control, food supplies monitoring, delivery efficiency) (Awuor *et al.*, 2013).

Technology stands out as an important element since it allows organizations to provide targeted information to reduce food waste and contributes towards the realization of this sustainability development goal. In this regard, FAO (2017) specifies that apart from contributing to the agrarian field closely related to food security, the technology not only allows its users to plan and manage the purchase and use of food, but also receive alerts on the expiration dates of the purchase and propose solutions to avoid food waste. However, it is not enough to have the technological tools and infrastructures for desired result to be obtained in this sector and in several others, but it is necessary to multiply its use and allow it to be widely used. This is done through training and empowerment, managing to take advantage of its benefits in the best possible way (Kumar *et al.*, 2015).

In recent years, there has been a wide recognition of the vital roles played by women in the agrarian sector because of the need for women to have access, through formal and non-formal training, to get knowledge and necessary skills to improve agricultural production, processing, and marketing. Wiig (2013), comments in this purpose that, among all legal rights, the right to land is the most fundamental and describes it as a permanent source of income for stable financial security, food security and well-being, but not all women have access to the training and economic capacities to access this right. Whereby it is important to highlight that the future of the rural environment involves creating more opportunities, improving the employment situation of women, and supporting their educational capabilities and access to new technologies, services, and infrastructures (Lahiri-Dutt and Adhikari, 2015). All these elements show us the need to focus more efforts to achieve the 17 sustainable development

goals, which, have not been achieved as originally planned for 2020, a date that has been set after to 2030. This This achievement has not been achieved by the most involved countries such as Spain that although it is well positioned in terms of achieving the sustainable development goals, since it occupies rank 21 among 162 countries, with a score of 77.8. However, there are still sustainable development goals that can be improved, including SDG 2 where its score is still far away (56.2), SDG 4 and 5 even if it has a good score (95.4 and 82.7 respectively) and SDG 10 where there are still many efforts to contribute (69.2) (Bertelsmann Stiftung, 2019).

3. Materials and methods

3.1. Analysis of the world situation

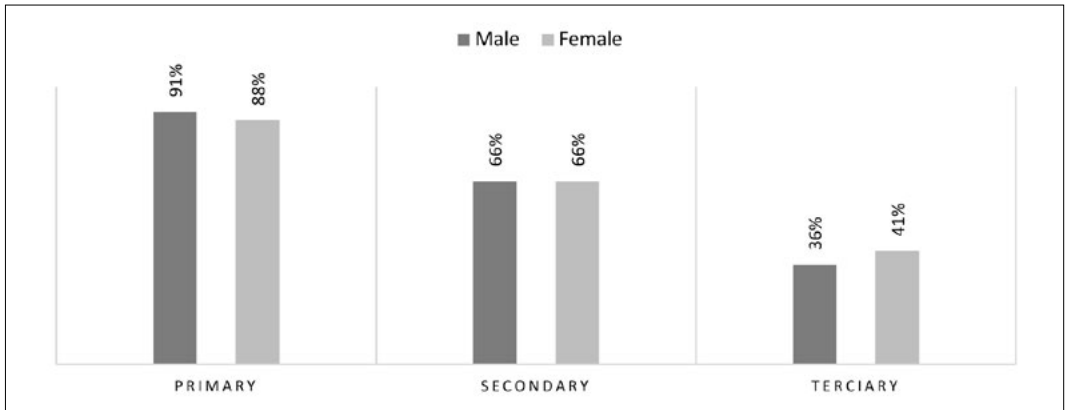
In the 21st century, education is a basic human right, but persistent inequalities in education paralyze the lives of millions of women and girls around the world. Indeed, according to world statistics, women make up more than two-thirds of the world's 796 million illiterates, and only 39 percent of rural girls attend secondary school. This is much less than rural boys (45 percent), urban girls (59 percent), and urban boys (60 percent) (UN WOMEN, 2021).

This difference in education can be observed in Figure 2, where it is clearly seen that at the time of integrating primary education, it is children who predominate 91% compared to 88%, however perfect equality is achieved in the secondary studies, until reaching a predominance of women in tertiary studies (university) at 41% compared to 36%.

UN WOMEN (2021) indicates in this way that if women had the same access to agricultural assets, education, and markets as men, it could lead to an increase in agricultural production and a reduction in the number of hungry people by 150 million. This is because women reinvest up to 90% of their income in their homes, an investment in nutrition, food, health care, school, and income-generating activities for their family, helping to break the cycle of intergenerational poverty (UNEP WCMC, 2020).

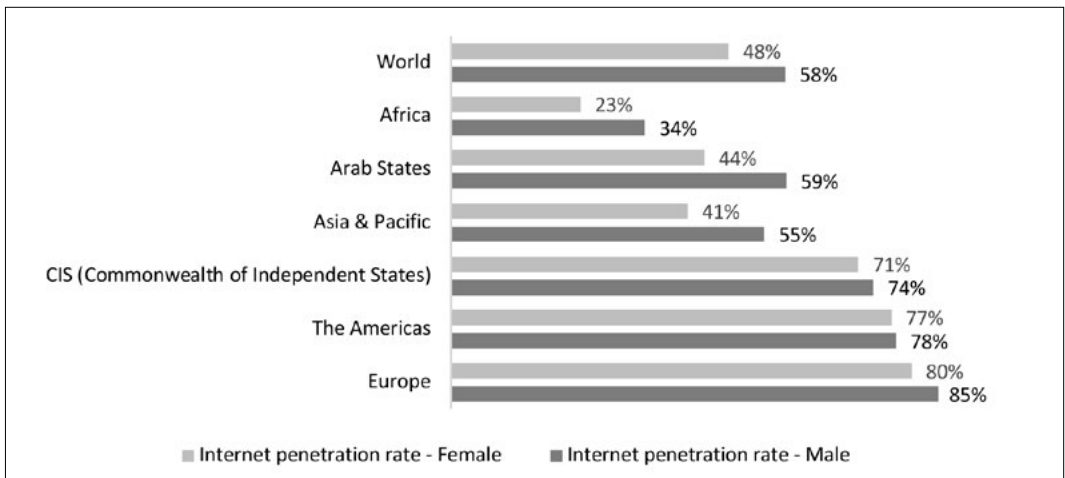
The Technoserve report (2016) reveals that tech-

Figure 2 - Educational achievements by gender around the world (2020).



Source: Own elaboration from Statista (2021).

Figure 3 - Digital gender gap in terms of internet penetration (2019).



Source: Own elaboration from ITU (2019a).

nology is also enabling significant progress: since connecting farmers to multinational agribusinesses, and facilitating payments, to increasing the productivity, incomes, and resilience of farmers.

Investing in the training of rural women is, today, an indisputable necessity, and promoting their technological skills even more so. If one wishes to fight against the digital gender gap² in this sector.

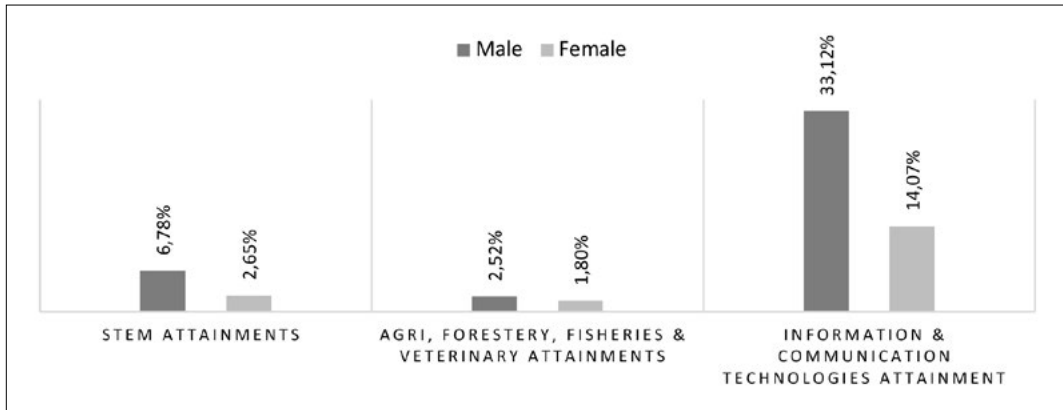
Indeed, inequalities in access to and use of tech-

nology constitute a huge disadvantage for those who are left out or behind and do not get to take advantage of it. These inequalities are observed in various aspects of daily life and range from the use of the internet (see Figure 3) to egalitarian training in ICTs or professional insertion in the technology sector itself or in other sectors that use technology such as it is the agriculture sector.

In fact, technology has been mentioned by the

² The gap between individuals, households, businesses and geographic areas at different socio-economic levels with regard both to their opportunities to access information and communication technologies (ICTs) and to their use of the Internet for a wide variety of activities. The digital divide reflects various differences among and within countries (OECD, 2001).

Figure 4 - Educational specialties by gender (2019).



Source: Own elaboration from World Economic Forum (2020).

World Summit (UN, 2006) as one of the elements that affected the empowerment of women in rural areas. It was indicated that guaranteeing equality in access to ICTs contributes to breaking the glass ceiling that prevented, and in some cases still prevents, women from reaching certain positions in the field of technology.

On the other hand, Stock (2017) has shown in her studies that women are often excluded from training programs in new technologies and sustainable agricultural practices, which makes it difficult for them to contribute on an equal footing with men in this sector. This gap in technological and agricultural education is also reflected in the workplace, creating another gender gap and demonstrates the existence of a glass ceiling that prevents the development of women's professional careers in the same way as men.

This technology training imbalance can be seen in Figure 4, which compares the level and training preferences of men and women in terms of STEM attainment, Agri, Forestry, Fisheries & Veterinary attainment and Information & Communication Technologies attainment.

UNDESA (2012) commented about that, that Women make up at least half of the world's farmers and tend to have different needs and approaches that most policy is not sensitive to and is therefore likely to be less effective in reaching its objectives. Some Women, for example, often do not have access to land tenure or credit and financial services. They lack access to education and extension services as well, making it hard

for them to implement new technologies, this is due to the affordability and lack of digital skills. In this way ITU (2019b) indicates that less than half population has basic computer skills, such as copying a file or sending an email with an attachment, and that an estimated 3.6 billion people remain disconnected, and that the number of households with a home computer is only 49.7%.

Finally, it could be said that there are a lot of factors that affects the achievement of the sustainable development goals, and especially those studied in this research investigation, and it is the reason why a multiple regression is proposed in the following part to check the existence of a correlation between our variables and this SDG's attainment.

3.2. Methodology

In this work, we want to analyze the influence of the digital gender gap in achieving the sustainable development goals related to food security and determined by the following SDGs: 2, 4, 5 and 10.

To do it we use information from some international databases, such as the Global Gender Gap Report (World Economic Forum, 2020), the Inclusive Internet Index report (The Economist Intelligence Unit, 2020) and Bertelsmann Stiftung (2019), which provides detail information regarding the variables used. We obtained the available information from 87 countries. To address the aim of this work, a linear regression model is proposed (Equation 1) in which the dependent variable is

Table 1 - Independent variables statistics.

Variable	Description	Mean/ Percent.	Sd.	Min.	Max.	Expected Effect
Inclusive Internet Index	(0 =Total exclusive. 100 = Total inclusive)	66.96	15.14	26.70	86.00	+
Gini Index	(0 = Total equality. 100 = Total inequality)	38.64	7.42	26.50	63.00	-
Gender Digital Divide Index	(0 =Total equality. 100 = Total inequality)	9.77	12.33	0.00	69.40	-
Gender Gap Index	(0 = Total equality. 100 = Total inequality)	29.55	5.54	17.80	45.00	-

Source: Produced by the author.

a measure of SDG achievement. As regressors, variables which measure the distance between the levels of access and use of ICTs for women and men are considered. The definitions of these variables would be as follows and summary statistics are presented in Table 1:

- *Inclusive Internet Index*: This index is made up of four elements that define the degree of inclusion (Availability, affordability, relevance, and availability) of all Internet-related services in a country. The measure expresses a percentage between 0 and 100, where 0 corresponds to total exclusivity and 100 to total inclusivity.
- *Gini Index*: This index measures inequality in terms of wealth within a country. The measure expresses a percentage between 0 and 100, where 0 corresponds to total equality (everyone has the same wealth) and the value 100 corresponds to total inequality (inequality in the distribution of wealth). The objective of this variable is to see if the availability of financial resources influences the achievement of these SDGs or not.
- *Gender Digital Divide Index*: It is a percentage that represents the distance between the levels of access to ICTs by gender, and expresses values between 0 and 100, where 0 corresponds to total equality in the use of ICTs and 100 corresponds to the total inequality or the empowerment of men in the use of ICT.
- *Gender Gap Index*: This is the distance between women and men, made up of four categories of information, which indicate the degree of integration of women in par-

ticipation and economic opportunity, educational level, health and survival and empowerment political. It should be noted that this variable does not consider the technological aspect. The measure expresses a percentage between 0 and 100, where 0 corresponds to total equality and 100 corresponds to total inequality between men and women.

The desired linear regression is as follows:

$$SDG_{ji} = \beta_0 + \beta_1 GDD_i + \beta_2 IINT_i + \beta_3 GINI_i + \beta_4 GD_i + \epsilon_i \quad (1)$$

Where:

IINT = Inclusive Internet Index

GINI = Gini index

GDD= Gender Digital Divide Index

GG = Gender Gap Index.

ϵ = Error term

j = Sustainable development goal in which we focused on (j=1...4).

4. Results

In this section you can see the result for each of the four sustainable development objectives considered (Table 2).

It can be observed that at the *Model a* is estimated without considering the Gender Gap variable, and later it is included, to make a more sensitive analysis of the gender element. The objective of this is to find out if the estimated parameters of “The digital gender gap” change or not with its inclusion.

In Table 2, it can be observed that the variables

Table 2 - Results of the ordinary least squares regression analysis for the effects of the set of indices in each ODS considered.

Variables	Model a				Model b			
	SDG 2	SDG4	SDG 5	SDG 10	SDG 2	SDG4	SDG 4	SDG 5
IINTI	0.226*** (3.43)	0.873*** (7.54)	0.065 (0.54)	-0.282* (-1.98)	0.228*** (3.45)	0.877*** (7.61)	0.084 (1.20)	0.281** (-2.00)
GINI	-0.307*** (-2.90)	0.054 (0.29)	0.136 (0.70)	-2.79*** (-12.29)	-0.314*** (-2.96)	0.038 (0.21)	0.050 (0.45)	-2.82*** (-12.53)
GDD	-0.209*** (-2.74)	-0.312** (-2.33)	-0.546*** (-3.92)	-0.334** (-2.07)	-0.185** (-2.33)	-0.254* (-1.84)	-0.235*** (-2.81)	-0.236 (-1.38)
GG					-0.142 (-1.03)	-0.346 (-1.44)	-1.885*** (-13.04)	-0.539* (-1.67)
F-Valor	26.34	53.35	10.77	55.20	20.04	41.05	67.06	43.08
(prob.)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)
R ²	0.48	0.66	0.28	0.69	0.49	0.67	0.76	0.70
Adj. R ²	0.47	0.65	0.25	0.67	0.47	0.65	0.75	0.68

Source: Own elaboration.

that have been included have the expected effect. In other words, as the “Digital Gender Gap” increases, the proportion of the SDG that the country has reached decreases. On the other hand, an increase in the “Inclusive Internet” index has a positive effect on most of the SDGs analyzed.

Regarding the variable of “Gender Gap” it is observed that it has a negative effect on the analyzed SDGs, also, the impact of its inclusion in the *Model b* on the variable “Digital Gender Divide” stands out this effect when the variable “Gender gap” (DG) is included in the models. In view of these results, we can say that, although the “Digital Gender Gap” has a negative effect on the achievement of the SDGs, there are other dimensions of the gender gap, in addition to the technological dimension, that further compromise achievement of these objectives for the different countries.

Regarding SDG 2 (Essential objective of our study), we can see that an increase of one percentage point in the “Inclusive Internet Index” increases by 0.226 perceptual point (p.p.) the proportion of SDG 2 that this country can achieve. On the other hand, an increase of one unit in the “GINI” index (one p.p.) reduces by 0.307 p.p. the percentage reached of said SDG. In the same way, we observe that an increase of

one percentage point (pp) of the “Gender Digital Divide Index” reduces the percentage reached of SDG2 by 0.209 p.p., this effect being statistically significant.

In the same way, we can observe that an increase of one p.p. in the first variable (IINTI) increases by 0.873 p.p. the proportion of SDG4 achieved. Regarding the variable GINI, one p.p. increases by 0.054 p.p. the percentage of this SDG. Similarly, the precedent SDG, we can see that an increase of one percentage point of the Gender Digital Divide reduces the percentage achieved of SDG 4 by 0.312 p.p.

In the case of SDG 5, the statistics are also significant, since the positive variation of IINTI by 0.065 p.p. increase the proportion of this goal but not at the same level as SDG 2 and 4. As for the GINI Index, we can see that one p.p. increases the percentage of this SDG too. Also, we observe that the increase of one percentage point pf the Gender Digital Divide reduces the percentage of SDG5 by 0.546 p.p.

Finally, we notice that an increase of one p.p. in IINTI reduces by 0.282 p.p. the proportion of this goal 10, and one p.p. in the GINI reduces by 2.79 p.p. the percentage of SDG 10, and that the variable Gender Digital Divide reduces the percentage reached of SDG 10 by 0.334 p.p.

5. Discussion

5.1. Discussion of the results

The significance of the result observed in this study confirms the impact that technology has on the need for food security, as well as the need to incorporate and, above all, prepare women in this field and offer them the resources necessary to carry out their tasks and contribute of added value. Therefore, investing in male and female smallholder farmers is an important way to increase food security and nutrition for the poorest, as well as food production for local and global markets. Also, it is recommended to promote the development of new technologies as an essential tool to improve the personal and employment situation of rural women, as a dynamic measure of the rural economy, and articulate measures that promote conciliation and co-responsibility, to be able to help rural women access to the labor market and information (Hidalgo García, 2013).

The results demonstrate the complementarity that exists between the four SDGs and equality what Ukeje (2004) says that females have the capability of increasing agricultural production given the roles they play in the production process, but they require to be empowered through training and the provision of the appropriate ICTs to reach it.

5.2. Discussion about the situation of Spain

To project these results on a specific case, the situation in Spain can be analyzed, since in this country the agri-food sector represents one of the most important assets in the economic recovery and what makes Spain a power world order food. In fact, the Spanish agri-food sector represents 10% of GDP, generates more than 2.5 million jobs and exports worth more than 50,000 million euros, with an increase of 50% over the figures of 2011. This achievement has been possible thanks to the role played by women, who contribute to the solidity of agricultural and fishing activity, the quality of products from the countryside and the sea (FEAGAS, 2018).

The Spanish rural environment is made up of a total of 6,678 municipalities, in which 7.6

million people are registered, 16.1% of the population. 50.8% of its inhabitants are men and 49.2% women (Ministry of Agriculture, Fisheries and Food, 2019). According to Alonso and Trillo (2014), rural gender issues in Spain focuses on three social problems: rural exodus and, consequently, depopulation (especially among better-educated women), masculinization and ageing. Adding to these problems, a decisive element which influences this segregation. That element is the difficulty of conciliation between family and professional responsibilities, which cause income gaps and occupational segregation. In fact, the choice of occupation is expected as an important determinant of women's earnings and a key factor which underline the gender wage gap. Gammage *et al.* (2020) also stipulate that the pregnancy and childbearing affect women's ability to pursue different types of economic opportunities and even the choice of sectors in which they seek to work.

There are also various other factors that can be mentioned, such as society being convinced that a certain profession is "a man's job". This could be because of the stereotypes instilled in minds from childhood, or the lack of self-confidence due to not having training or not having the necessary technological capabilities to assume more responsibilities (UPA, 2019). Effectively, in the case of Spain, some differences could be observed between academic capacities, university orientations and technological aptitudes between men and women, which demonstrate the existence of a digital gender gap. These differences are due to several socio-economic factors that can be summarized as follows in Table 3.

In this table, the presence of women and men is not the same at all levels of study, nor in all specialties. In fact, we see that the literacy and enrolment rate in the first two cycles is almost the same for both genders, but enrolment in high school shows a clear difference between the two with a prevalence of women almost double. These statistics may be women are more educated and can reach higher educational levels if given the opportunity.

However, the effect of the social factors of the stereotypes of selection of the formations, previously indicated in the different specialties, is ob-

Table 3 - Comparison of training level and specialities by gender in Spain.

<i>Indicators (2020)</i>		<i>Spain</i>	
<i>Training levels and specialities</i>		<i>Male (%)</i>	<i>Female (%)</i>
<i>Educational attainment</i>	Literacy rate	99.00	98.00
	Enrolment in primary education	98.50	97.60
	Enrolment in secondary education	94.00	97.80
	Enrolment in tertiary education	58.70	97.00
<i>Graduates by degree type</i>	<i>Agri, forestry, fisheries and veterinary, attainment</i>	<i>1.91</i>	<i>0.99</i>
	Arts and humanities, attainment	6.56	9.60
	Business, admin and law, attainment	31.11	18.94
	Education, attainment	2.12	22.35
	Health and welfare, attainment	9.14	21.30
	Engineering, manufacturing and construction, attainment	25.08	6.78
	<i>Information and comm technologies, attainment</i>	<i>5.77</i>	<i>0.92</i>
	Natural Sci, mathematics and statistics, attainment	8.87	4.73
	STEMS, attainment (Science, Technology, Engineering and Mathematics)	39.72	12.44
	Services, attainment	3.52	6.10
	Social sci, journalism and information, attainment	5.89	8.11

Source: *The global gender gap report (World Economic Forum, 2020)*.

served, since women are more present in sectors such as education, health, journalism, the arts and humanities and services, while men predominate in the scientific, technological and agricultural sectors, which clearly demonstrates the reason for the masculinization of these sectors and justifies this need for investment in the fields of training, education and provision solid infrastructure. In fact, the orographic and geographical conditions in regions make it difficult to install and access quality infrastructure. These connectivity problems affect all people, but are especially relevant among women, especially among older women and those with fewer socioeconomic resources. They are the ones that find the greatest problems when it comes to accessing the use of the Internet with mobile or digital devices of quality. In any case, it should be noted the existence of network drops or gaps in connectivity also in current cities with certain frequency (Vico-Bosch and Rebollo-Catalán, 2018).

Another factor that influences the digital divide is the labor inequality between men and women. The delay in the incorporation of wom-

en into the workplace also creates a difference in the understanding and use of new technologies between genders (Herrero Pulgar, 2012). Additionally, women are already disproportionately responsible for housework and care, so they have less time on their farms, compared to men. With the expectation of caring for out-of-school children or sick relatives, women farmers are more likely to carry the burden of additional household responsibilities. This situation shows a difference between in the case of rural areas and urban areas where the adoption of the technology is not the same (see Figure 5).

This gap in technological and agricultural education is reflected in the workplace, creating another gender gap and demonstrates the existence of a glass ceiling that prevents the development of women's professional careers in the same way as men. In this sense, Eurostat data (2019) shows that the presence of Spanish women in the Food and beverage industry represents 45.5% in front of 54.5% of men, the same gap is showed in the food industry where women represent 28.7% in front of 71.3% of men, and in the agriculture and

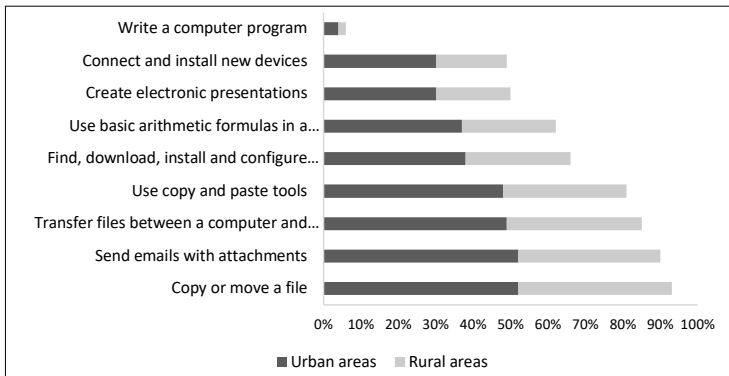


Figure 5 - Average proportion of the population in rural and urban areas with a specific digital aptitude in Spain (2017).

Source: FAO (2019).

fishing industry where women represent 23.8% in front of 76.2%, which indicate a male predominance of the labor market of this sector.

Furthermore, women farmers generally have less access to savings and credit than their male counterparts. In the case of Spain, Law 35/2011 on Shared Ownership in Agricultural Holdings recognizes that gender equality in rural areas evolves slowly and that farms whose owners are women tend to be of smaller economic dimensions and low profitability (Hidalgo García, 2013). In addition to this law, the Spanish Government has approved on September 28, 2021, a royal decree to encourage equality for women in jointly owned agricultural holdings (Ministry of Agriculture, Fisheries and Food, 2021). It must be said that this royal decree comes to regularize and equalize the alarming statistics showed in Table 4. For this reason, awareness about joint land titling is encouraged through socialization campaigns that focus on women to inform them of their rights and duties regarding land ownership.

The digital divide in rural areas is also caused by age. It is evident that younger people who

have been born in the era of new technologies are more used to using them and considering them as part of their daily lives. However, older people have much more difficulty handling gadgets or equipment that have not been around for much of their lives. There are even many cases in which the older population directly avoids these technologies of their own free will. This aging of the population increases the situations of coexistence with people in a position of dependency in rural areas, which affects the workload of caregivers, generally women, reducing their possibilities of labor, political or social participation (Ministry of Agriculture, Fisheries and Food, 2020a)

6. Conclusion

“Every man, woman, and child have the inalienable right not to suffer from hunger or malnutrition to fully develop and maintain their physical condition and mental faculties”, said Gifra Durall and Beltrán García (2013: 26). Therefore, it is necessary to raise awareness among the population about the world food

Table 4 - Presence of Spanish women in the rural world.

Comparative element	Men (%)	Women (%)
Employment rate in Agriculture, livestock, forestry and fishing (2017)	75.13	24.87
People who have received aid in rural development (2019)	67.00	33.00
Farm owners (2016)	67.58	32.42
People with high positions - Heads of farms (2016)	74.21	25.78
Entrepreneurship in rural areas (2019)	46.00	54.00

Source: Own elaboration based on data from the information system of public employment services (SISPE, 2018), Ministry of Equality (2019), INE (2016).

problem and strengthen solidarity in the fight against hunger, malnutrition, and poverty.

Today, the contribution of women in the fight against this malnutrition is more than essential since they are among the actors in the agricultural and agri-food sector. However, it is only recently that their key role as food producers and suppliers and their decisive contribution to household food security began to be recognized, for which they have a long way to go before reaching fair equality in this environment.

However, today, development and globalization have allowed the achievement of this objective through technological innovation and the inclusion of women as labor, which has been complementary and not primary for a long time.

The results of this study demonstrate the complementarity that exists between these two elements and the effect they have on the achievement of sustainable development, especially those referred to in this research namely the eradication of hunger through education, equality, and accessibility to the necessary infrastructure. As a matter of fact, the reproductive roles that women play could be considered as an added factor to pay more attention to topics gender. And this is not only for the need to achieve equity between men and women, but also the need to achieve structural changes oriented to reduce poverty and food insecurity.

The inclusion of women has been confirmed to be a decisive element in many of the SDGs, because it allows duplicating efforts and contributions in all sectors and countries and having them on the top management team, specifically in the rural world represents a windfall.

Also, it should be noted that the differences in the female and male mental faculties make it necessary to resort to this complementarity. In this sense, Slyke *et al.* (2010) indicate that technology is not used in the same way by the two genders, but the association of both creates a certain synergy that leads to a better productivity.

Therefore, it is recommended, to sensitize both genders, all agencies, and senior decision-makers on the absolute need to guarantee equal opportunities, whether in training, employment or in the acquisition of strategic tools, to achieve financial independence and autonomy. This will

allow to conciliate between the professional and the personal life and get women involved in many areas and activities.

In this way, the General Director of Rural Development, Innovation and Agrifood Training, Isabel Bombal, has also highlighted the importance of a fair, balanced, sustainable, and inclusive development of the rural environment. She has pointed out the importance of designing an action plan for rural women, to guarantee their real and effective equality, and to make visible the fundamental role they play (Ministry of Agriculture, Fisheries and Food, 2020b).

Several measures can also be applied for the integration of women in careers related to food security, whether in agricultural specialties or in other more technological ones that are considered complementary in this sector.

The inclusion of women in general meetings, which are decisive in this area, can also be useful to guarantee equal opportunities, in addition to the application of laws that promote their integration, such as inheritance, land ownership or granting aid.

Moreover, the promotion of intelligent work (telework, remote management, web training, tele-administration, etc.) represents a good option to face the obstacles that prevent women from participating in the agrarian world, not only due to the issue of conciliation, but also to the issue of rurality in some cases. The difficulty for women to move to urban areas to seize some opportunities, oblige them very often to take flights (rural exodus), which weakens their social fabric and productivity and encourages the creation of an unpopulated and empty Spain.

Women must be sensitized to the different technical careers they may be eligible to and to the importance of being in harmony with their decisions, regardless of the influences they may have. ICTs can improve rural livelihoods and empower smallholder farmers in developing countries by expanding access to agricultural and market information and can also contribute to the development of social justice and equity by empowering less protected groups in rural communities.

Empowering women, providing them fair access to land, financing, seeds, agricultural training, food within the home, access to markets and

decision-making processes is therefore a condition essential to eradicate hunger in the world. Without pro-active policies in favor of gender equality, it is impossible to guarantee the sustainable future of our agri-food systems and end that infamous scourge of malnutrition. Equality between men and women is, first and foremost, a matter of fundamental justice but it is also a basic prerequisite for achieving food security for all.

Lastly, it must be specified that this work has had limitations in terms of the sample, since the initial idea was to consider all the countries of the world, but the availability of the same data for all variables and in the same years has not been possible, for which has been limited to the 87 countries. It would also have been interesting to apply this same regression on the autonomous communities of Spain that has been selected as the reference country in the discussion part. These limitations could be considered for further future research in which a specific survey could be elaborated to determine the achievement of this sustainability between rural and urban areas.

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