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RESEARCH ARTICLE

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Assessing knowledge and engagement on sustainable development goals: exploratory research in the agri-food departments of Ibero-American universities

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Abstract

Aim of study: To offer an overview of current knowledge and civic engagement in the implementation of sustainable development goals (SDGs) applied to agriculture sector.

Area of study: Members of university communities from agri-food field departments at universities from three Ibero-American countries (Spain, Colombia and Brazil).

Material and methods: 631 on line surveys from different Ibero-American faculties of the area. Descriptive, quantitative and qualitative analysis was performed. The level of knowledge and engagement of SDGs related to agriculture sector as Goal 2 (Zero Hunger) and 12 (Responsible Consumption and Production) were investigated.

Main results: The level of knowledge about the SDG Agenda, the priority rating for the implementation of each goal and the level of engagement varied significantly between countries. While Spain obtained the highest values in most of the variables relating to knowledge of the SDGs, followed by Brazil, Colombia showed the highest levels of engagement and willingness to apply specific actions in the agri-food sector to promote the implementation of the SDGs.

Research highlights: The knowledge and engagement must be improved if we are to achieve the SDGs, and education and research play a vital role in bridging the SDG implementation gap in agri-food field. In the area the best-known SDG strategies are those related to sustainable farming systems and the least-known are the concept of 'degrowth' as a possible efficient strategy, 'permaculture' and 'local production and consumption'. Big differences exist between countries in terms of public knowledge and engagement with SDGs.

Additional key words: SDGs; 2030 Agenda; higher education; agri-food policies; sustainability education; participation.

Abbreviations used: MDGs (millennium development goals); SD (sustainable development); SDGs (sustainable development goals); UN (the United Nations).

Authors' contributions: Conception and design of experiments; analysis and interpretation of data; drafting of manuscript, revision & editing: AG & JDGQ. Performance of experiments, statistical analysis: AG. Supervision, project administration and funding acquisition: JDGQ.

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Introduction

In recent decades there has been a general increase worldwide in concern and awareness of the importance of Sustainable Development (SD). At the end of the 20th century social mobilization played a vital role in putting the environment on the global agenda, a process that culminated in a number of international summits. The concept of sustainable development first appeared in a report entitled "Our Common Future" (also known as the Brundtland Report) issued by the World Commission on Environment and Development in 1987 (WCED, 1987). In the United Nations (UN) Conference on Environment and Development (UNCED), also known as the Rio de Janeiro Earth Summit, 150 states came together to sign the Framework Convention on Climate Change in 1992.

Increasing international awareness of these issues led to the signing of the Kyoto Protocol in Japan on December

1997, in order to reduce the impact of global warming, and in the year 2000 the Millennium Development Goals were established. Goal 7 was to Ensure Environmental Sustainability. A UN conference specifically devoted to SD (the UN Conference on Sustainable Development) was held in Rio in 2012 (Gupta & Vegelin, 2016). This event was also widely referred to as Rio+20 or the Rio Earth Summit 2012 (UN, 2012).

In September 2015, within the framework of the 2030 Agenda, the UN and Heads of Governments agreed on 17 sustainable development goals (SDGs) with 169 related targets. The SDGs replaced the millennium development goals (MDGs), in force from 2001 to 2015. The aim of the SDGs was to set out a path towards sustainable global development with economic, social and environment dimensions, in order to meet "the necessities of the present generation without harming the future generation´s capacity to meet their own". The SDGs also included new areas that had not been a primary focus of the MDGs such as climate change, economic inequality, innovation, sustainable consumption, global peace and justice (Aitsi-Selmi *et al.*, 2016; Jayasooria, 2016; Dlouha & Pospísilova, 2018).

In order to accomplish these 17 ambitious goals and achieve the overall aim of sustainable development, a multi-stakeholder approach is required that brings together the public and private sectors, national, regional and local governments, private companies, civil society and international organizations. Universities are also an essential partner in the achievement and implementation of the SDGs (Caiado *et al.*, 2018; Leal Filho *et al.*, 2018, 2019; Salvia *et al.*, 2019).

Successful achievement of the SDG for 2030 requires enhancing public knowledge and involvement (Gough, 2018). To this end, basic information is crucial. Sustainable strategies that encourage the implementation of SDGs cannot be applied if there is insufficient knowledge and information about this issue, including a basic description of the different goals and their ultimate purpose. Several studies of democratic participation have highlighted the fact that information and knowledge of citizen rights lie at the heart of civic engagement (Rojas & Puig, 2009; Östman, 2012; Monk, 2013).

Linking sustainable development goals and higher education is important for two core reasons: the social responsibility of higher education institutions and the need for greater training, research and awareness raising. Since the World Declaration on Higher Education for the 21st Century adopted by the World Conference on Higher Education (UNESCO, 1998) and the communication from the UNESCO (2009), social responsibility has become a more intrinsic aspect of the higher education system, particularly in universities (Vasilescu *et al.*, 2010). The social responsibility of universities has also been analyzed from the perspective of the application of international environmental quality standards, harmonization, unification of problems and objectives, and a greater coordination and cooperation with other stakeholders (Dlouha & Pospísilova, 2018; Madzík *et al.*, 2018).

The study by Wright & Wilton (2012) went further by defining and linking sustainable development with the sustainable university. The results showed that most felt that universities had a key role to play in creating a sustainable future. When asked how to make universities more sustainable, the most popular solution was to improve the use of resources and reduce waste. They were also asked about the largest barriers that had to be overcome on campus, which they regarded as financial and resource-based issues and resistance to change.

The second reason for emphasizing the link between universities and SDGs is the role played by universities in the field of training, research and awareness raising (Argibay *et al.*, 1997; Yubero & Larrañaga, 2002; SDSN Australia/Pacific, 2017). Goal 12.8 says: *by 2030 ensure that people everywhere have the relevant information and awareness for sustainable development and lifestyles in harmony with nature.* It seems logical that, due to the nature of their profession, those who work in education must make a more active contribution than the average person to the successful implementation of this and other goals.

Public policy researchers often refer to gaps in the implementation of these policies (Blahna & Yonts-Shepard, 1989; Ongaro & Valotti, 2008). There are various types of gaps and in this article we will be focusing particularly on the gap between what citizens know and what they practice (Thamlikitkul, 2006). The first stage is therefore to assess how much people know about sustainable development.

The SDGs offer an excellent opportunity to extend education for sustainable development (ESD) (Leal Filho *et al.*, 2019). Universities are expected to lead social changes towards SD (Lazzarini *et al.*, 2018) and must play an essential role in transforming societies (Dlouha & Pospísilova, 2018; Leal Filho *et al.*, 2019). However, integrating the principles of Education for Sustainability (UNESCO, 2014) across all levels and aspects of education is far from easy. To this end, higher education institutions are starting to integrate SD practices and initiatives into their activities and curricula (Darnton, 2009). Introducing specific SD skills within the curriculum and presenting practical examples of how specific topics can be linked to the SDGs (Akinsemolu, 2018).

Studies such as those by Leal Filho *et al.* (2019) found that the most common reasons cited by university staff for not integrating SDGs into the syllabus were a lack of personal training and the difficulty of incorporating SDGs into their courses. Studies such as Lazzarini *et al.* (2018) propose an inter- and transdisciplinary approach that integrates the social dimension into technical fields of study

such as engineering. Any changes aimed at integrating an SD approach into current thinking will facilitate a cultural shift and a more holistic transformation towards the sustainable education of future generations (Ong, 2007).

According to Salvia *et al.* (2019), although the UN inevitably takes a global approach to SDGs, the specific actions must be taken at local level. It is equally inevitable that there will be different priorities and necessities in the different geographical regions or even between countries in the same region, depending on their particular situation. Very few studies have focused on how the different SDGs can be achieved in different geographical regions.

Within the context described above, this paper therefore aims to provide new data regarding the level of knowledge of SDGs and of engagement in their implementation, focusing in particular on members of the university communities from agriculture- and food-related departments at universities in Spain, Colombia and Brazil. With this information, we can reflect on the involvement of the academic community and the technical support it provides in the implementation and achievement of SDGs. Our research evaluated the level of knowledge and engagement with SDGs amongst the university community, focusing specifically on SDGs 2 (Zero Hunger) and 12 (Responsible consumption and production) due to the direct impact that universities can have in this field and their important role in the implementation of these goals.

The objective of this paper was to assess the levels of public knowledge and engagement with SDGs in university communities in Spain, Brazil and Colombia.

Material and methods

Questionnaire design and data collection

Online surveys were carried out to compile data. Survey design was based on previous research studies and procedures used in Education for Sustainable Development, and the aim was to assess the degree of information, education, knowledge, engagement and awareness of sustainable development issues amongst the participating population (Miguel González *et al.*, 2012; Carracedo *et al.*, 2016; Gómez-Quintero *et al.*, 2019).

The survey was self-administered and had a semi-structured format with 27 questions divided into three blocks. The first block of questions sought to gather sociodemographic information about the participants and was composed of closed questions. The second block sought to assess the participants' knowledge of the SDGs and of some of the current strategies (general and specifically related to their field of study) for implementing SDGs 2 and 12. The third block evaluated the respondents' level of personal engagement with SDGs and the degree to which they are implementing or expect to implement these strategies in their current and future professional careers. These blocks consisted of 10 and 6 closed questions respectively, most of which used a Likert scale. Other questions involved multiple choice or ranking answers. The main questions from the survey which answers are analyzed in the current article are compiled on the Appendix [suppl].

The techniques applied in the questionnaire to evaluate the level of knowledge and engagement of the university community came from a review of the specific targets proposed by the UN (https://www.un.org/sustainabledevelopment/) for implementing SDGs 2 and 12. We also conducted a wide review of websites, guides, and reports about agri-food strategies published by international agencies such as FAO (http://www.fao.org/sustainable-development-goals/en/) and UNESCO (2017). In addition, various experts and researchers in the field were consulted.

Before launching the questionnaire, it was pre-tested to ensure the consistency and validity of the questions. Some questions had already been validated in other similar studies in Spain (Miguel González *et al.*, 2012; Carracedo *et al.*, 2016; Gómez-Quintero *et al.*, 2019).

In order to avoid language problems, each question was translated from Spanish (official language in Spain and Colombia) into Portuguese (official language in Brazil) and from Portuguese into Spanish so as to ensure identical meaning (Dufour *et al.*, 2010). The questions were the same for all three countries except for the logical adaptation of some questions to the local economic situation (such as those relating to minimum household income levels). The online survey was distributed using Google Forms and was carried out exclusively during May 2018.

Participants were selected using convenience sampling. This is a non-probability method, in which participants are selected on the basis of being easy to reach or contact. This method was designed for exploratory research and was combined with snowball sampling (Grande & Abascal, 2014), in which additional participants are recommended or located by another person, who is allowed to select and contact other possible participants who meet the initial sampling requirements. In this case participants had to be members of the university community in one of the selected countries and regions and had to work or study in the field of agri-food sciences.

Main groups who collaborate in the current questionnaire were students, which were classified in three groups according to the academic level (degree students, Master's or Ph.D. students). Also academic staff, group that include all members that give different kind of lessons in the university as lectures, assistant professors, associate professors, full professors, although they can also develop another activities as research. However, people who belong to university community involved in the research field but they do not teach practical or theoretical classes were separately and classified under a specific category named researcher.

The questionnaire was sent out via email by the "Campus Iberus" Excellence Consortium of Universities in Spain and some international partners in Brazil and Colombia. It was sent to rectors and office managers of universities from the three countries, who were asked to forward the link with the questionnaire to a range of members of their communities, specifically students, academic staff (teachers) and researchers working in the agri-food area. Links to the questionnaire were also circulated on social media, research networks and via a Brazilian technical journal (Pubvet).

A total of 670 surveys were received. 146 of them were from Spain, 122 were from Colombia and 402 from Brazil.

The geographical location of the sample centers in the three countries is displayed in Fig. 1. As seen in Table 1, most of the participating universities in Spain (80.6%) came from the Campus Iberus Excellence Consortium (which includes the universities of Zaragoza, Lleida, La Rioja and Navarra). Most of the Colombian participants came from universities in the western central and eastern parts of the country. Due to Brazil's huge geographic extension, the participating universities were classified into the 5 regions into which the country is usually divided, rather than detailing each specific university. The greatest response was from universities in the southern regions of the country.

Statistical analyses

All questionnaires and answers were individually reviewed. The field data was entered on an Excel spreadsheet. After checking for missing data and outliers the sample was reduced to a final group of 631 surveys (139 from Spanish, 112 from Colombian and 380 from Brazilian universities).

The SPSS for Windows Statistical package v.22.0 (IBM SPSS Statistics, SPSS Inc., Chicago, IL, USA) was used for the analyses. The variable "Country" was considered as a fixed factor in the statistical model.

The first stage was to run a descriptive analysis of the variables so as to obtain frequencies, means and deviations. This was followed by a statistical comparison using Crosstabs procedures (for qualitative variables)

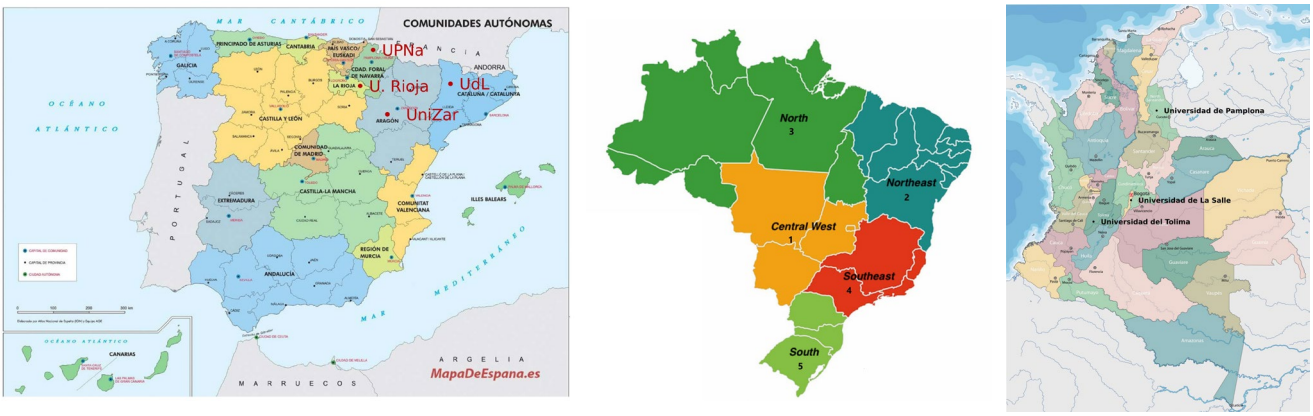

Figure 1. Location of the universities that took part in the study: a) Spain, b) Brazil, c) Colombia. *Source*: Created by the authors from a) proyectomapamundi.com, b) wikipedia images, c) mapamundi.online.

Table 1. Territorial distribution of the universities that participated in this study. Values expressed as a percentage of the answers from each country.

Spain (n =139)		Colombia (n=112)		Brazil (regions) (n=380)	
Zaragoza (Unizar)	64.7	Tolima	67.9	South[3]	47.1
Lleida (UdL)	9.4	Pamplona	14.3	Southeast[4]	27.6
Rioja (UR)	5.0	La Salle (Bogotá)	8.0	Central-West[5]	11.1
Pública de Navarra (UPNa)	1.4	Others[2]	9.8	Northeast[6]	11.8
Others[1]	19.4			North[7]	2.4

[1] Madrid, Las Palmas, Soria, Valladolid, León, Barcelona, Castilla la Mancha. [2] Cooperativa, Antioquia, Nacional de Colombia, Santander. [3] Includes universities from the States of Paraná, Río Grande del Sur and Santa Catarina. [4] Includes universities from the States of Espírito Santo, Minas Gerais, Rio de Janeiro and São Paulo. [5] Includes universities from the States of Goiás, Mato Grosso and Mato Grosso del Sur, as well as the Federal District. [6] Includes universities from the States of Alagoas, Bahia, Ceará, Maranhão, Paraíba, Pernambuco, Piauí, Río Grande del Norte and Sergipe. [7] Includes universities from the States of Acre, Amapá, Amazonas, Pará, Rondônia, Roraima, Tocantins.

and an analysis of variance using a General Linear Model (GLM) procedure (for quantitative variables). The mean and standard error of the mean (SEM) of each variable were also calculated. Differences between means were evaluated using Duncan's multiple range test ($p \leq 0.05$).

Results and discussion

Description of the sample (socioeconomic profile of respondents)

As set out in Table 2, there were no statistical differences between countries regarding the responses in both genders ($p>0.05$). However, the roles played by the participants within their respective academic communities varied between countries ($p<0.001$), as did their ages ($p<0.001$). While in Spain most answers came from undergraduates and academic staff, in Colombia the proportion of academic staff was much smaller than in the other two countries. In Brazil the percentage of undergraduates was low compared to the other two countries, while it had the highest percentage of PhD students. There was also a high percentage of answers from academic staff. The different proportions of participants within the university community in each country also affected the results for the income variables. Table 2 shows that Colombia had the highest percentage of respondents with low incomes (household income equivalent to one official minimum wage), while Brazil had the highest proportion of people earning more than 10 times the official minimum wage ($p<0.001$). Spain showed the lowest percentages at both ends of the income scale. These statistics confirmed the findings of the Sustainable Development Report (Sachs *et al.*, 2019), which in relation to SDG 10 (reducing inequality) cited mayor challenges in Colombia and Brazil (ranked 67th and 57th out of 162 countries). Although Spain had a better position in the ranking (21st), significant changes were still required.

Agri-food is a broad field within academia covering a wide range of different faculties. This also varies from one country to the next depending on their national curricula and college system. Most participants belonged to veterinary or zootechnical faculties, or to others that combined the two (animal science). The agri-food sector also covers agricultural engineering, the second most important source of participants, except in Colombia. Schools and faculties specializing in food sciences (from a technological or an engineering perspective) were also considered in this research.

It was important to recruit participants from the widest possible range of faculties so as to provide complementary visions as to how to achieve the SDGs in the agri-food field.

Level of general and specific knowledge of SDGs

As shown in Fig. 2, there were statistical differences ($p<0.001$ and $p<0.050$) between countries in terms of the level of knowledge of the millennium development goals (MDGs) and the sustainable development goals (SDGs), respectively.

In general, the MDGs appeared to be better known than the SDGs (except in Colombia), probably due to the duration of each one. While the MDGs had remained in force for 15 years (2000-2015), the SDGs were still relatively new (three years old at the time the survey was conducted).

The high level of knowledge about the MDGs in Brazil would require a specific, detailed study. It may be related with the period of government of Luiz Inácio Lula Da Silva, of the Workers Party, between Jan. 1, 2003 and Jan. 1, 2011. Social policy was a priority for this government and this may have helped raise public awareness of the MDGs. In general, the MDGs were better known than the SDGs in Spain and Brazil while in Colombia, the opposite was true. If we compare the general level of knowledge of the SDGs in the three countries, they were much better known in Spain and Brazil than in Colombia.

Important differences can be observed when comparing the percentage of positive replies regarding knowledge of the MDGs in our survey of members of university communities and a survey by the Spanish Center for Sociological Research (CIS, 2015), which interviewed members of the general Spanish population. Knowledge of the MDGs was much more generalized in our survey than in that conducted by the CIS (70.5% *vs*. 24.6%). Gómez- Quintero *et al.* (2017) reported that 52.85% of their sample group (young people and adults from rural areas) knew nothing about the MDGs while 30.03% knew "just a little".

The same occurs with SDGs, where the percentage of the Spanish population who knew about the SDGs rose from 10.8% in 2016 to 36% in 2019 (CIS, 2016, 2019), values that were considerably lower than the 64.7% found in our university sample group. Miguel González *et al.* (2012) found that people with a high educational level were more likely to know about MDGs and other development terminology. This was particularly noticeable when comparing graduates with people with other levels of education, a finding that matches the results obtained in this survey.

As shown in Fig. 3, the top priority SDGs also varied depending on the country or continent consulted (more detailed results in Table S1 [suppl]). In a survey about the 17 SDGs, Salvia *et al.* (2019) found that the challenges to be overcome on the path towards achieving the SDGs varied from continent to continent, and even from region to region. For their part,Leal Filho

Table 2. Sociodemographic characteristics of participants involved in the study. Definition of participant´s profile according to age, gender, university information and economic variables. (*n*= 631).

	Spain (n=139)	Colombia (n=112)	Brazil (n=380)	*p* value
GENDER (%)				
Men	42.4	52.7	42.6	0.150
Women	57.6	47.3	57.4	
AGE, years (%)				
18-25	41.7 B	68.8 A	25.8 C	
26.-30	8.6 B	12.5 B	21.3 A	
31-35	2.9 B	5.4 B	14.5 A	
36-40	2.2 B	3.6 AB	8.4 A	
41-45	4.3	3.6	8.7	<0.001
46-50	7.9	3.6	6.1	
51-55	14.4 B	1.8 C	8.2 A	
56-60	8.6 A	0.9 B	3.2 B	
61-65	7.2 A	-	2.9 B	
>65	2.2	-	1.1	
ROLE WITHIN THE UNIVERSITY COMMUNITY (%)				
Degree student	41.7 B	71.4 A	25.3 C	
Master's student	2.2 B	8.0 A	14.7 A	
PhD student	9.4 B	5.4 B	17.9 A	<0.001
Researcher	5.8	8.0	9.7	
Academic staff	41.0A	7.1 B	32.4A	
FACULTY, CENTERS (%)				
Veterinary	51.8 A	50.0 A	30.3 B	
Zootechnic	0.7 C	21.4 B	36.1 A	
Animal science (Vet. & Zoot.)	1.4 B	26.8 A	0.0 C	<0.010
Food sciences (Eng. & Technol.)	12.2 A	0.9 B	4.7 B	
Agric. Eng.	32.4 A	0.0 C	20.5 B	
Other sciences	1.4 B	0.9 B	8.4 A	
UNIVERSITY FUNDING (%)				
Public	100 A	86.6 B	86.1 B	<0.001
Private	0.0 B	13.4 A	13.9A	
NET MONTHLY HOUSEHOLD INCOME (%)[1]				
n	132	110	618	
1 min. wage	5.3 B	37.3 A	2.9 B	
1-3 min. wage	31.8 A	24.5 AB	20.2 B	
3-6 min. wage	43.9 A	22.7 B	20.7 B	<0.001
6-10 min. wage	15.2 AB	10.0 B	19.4 A	
>10 min. wage	3.8 B	5.5 B	36.7 A	

[1] min. wage= minimum wage; Values 1 min. wage (2018) = 736 €/month (Spain); 781,242 COP, Colombian Peso/month (Colombia); 954 BR, Brazilian Real/month (Brazil). 1€= 3,418 Colombian peso; 1 €= 4.56 Brazilian real (exchange rates as 02.Jul.2018). A,B: indicate statistical differences ($p \leq 0.05$) between countries in the same variable of each row considered.

et al. (2019) showed that the introduction of SDG-related content in school curriculums also varied by continent.

It is quite logical and predictable that the university community would consider a quality education (SDG 4) a priority goal. Indeed, the first four objectives (SDGs 1-4)

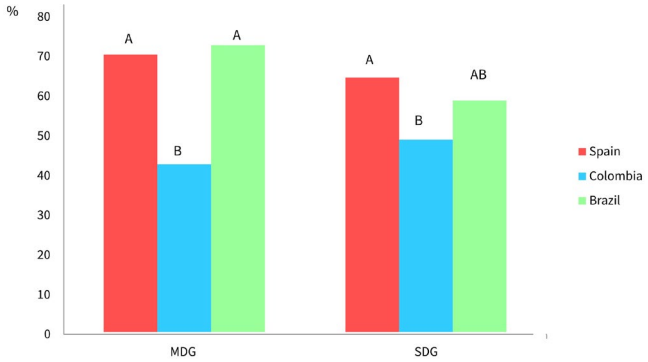

Figure 2. Percentage of participants in each country that know or have heard about the millennium development goals (MDGs) and sustainable development goals (SDGs), *n*= 139, 112 and 380 for Spain, Colombia and Brazil, respectively. A, B: indicate statistical differences ($p \leq 0.05$) between countries in the same variable (MDGs or SDGs respectively).

identify the most basic human needs, which is perhaps why Brazil and Colombia, countries with a human development index lower than Spain (UNDP, 2019) give greater priority to these objectives.

Spain considered gender equality (SDG 5) an important goal, while for Brazil it was the third least important objective. Spanish participants also emphasized clean energy, reduction of inequalities, responsible production and consumption and action for the climate, peace and justice. In Colombia, education (SDG 4), life on land (SDG 15) and partnerships for achieving the goals (SDG 17) were all considered important.

According to reports from the European Union (2017) and the World Bank (2017 a,b), while in Europe significant efforts have been made to improve environmental impacts, reduce consumption, waste production and CO_2 emission, and promote renewable energy sources, in other regions such as Latin America the main emphasis is on improving education, nutrition, health systems and security. Inequality in income distribution is another important priority on the path towards a promising future in both regions (Nicolai *et al.*, 2016; Salvia *et al.*, 2019).

In this paper we will be focusing above all on two SDGs, zero hunger (SDG2) a priority issue in Brazil and Colombia (SDG 2) and responsible consumption and production another (SDG 12), an important goal in Spain and Colombia. Historically, when a country is developing, the priority in terms of agriculture, livestock and food is to increase production. The general aim is for the country to increase food production sufficiently to supply the increasing demand and respond to the changes in consumption habits. Once access to food for the whole population is guaranteed (food security), the demand for high quality products and concerns about more sustainable forms of production start to increase, as consumers become more aware of the consequences of certain models of consumption. Consequently, consumers start to demand products that are more respectful of the natural environment and animal welfare, and offer higher standards and quality (Sañudo *et al.*, 2017).

In these variables our results are consistent with the research by Leal Filho *et al.* (2019), who found that most of their respondents had some knowledge of SDGs. Most of them also agreed about the need to integrate SDGs into higher education institutions inside and outside class, but were unsure about how to put this into practical effect within the teaching syllabus.

Specific knowledge about the strategies for implementing SDGs 2 and 12

Table 3 sets out the answers to questions about the degree of knowledge about the different possible strategies

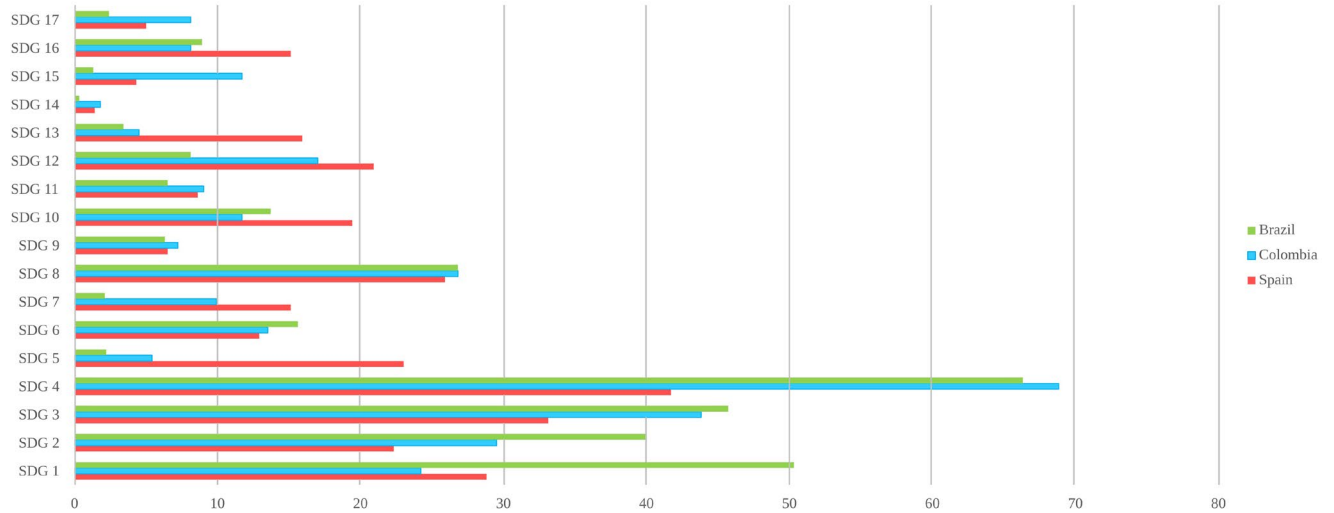

Figure 3. Sustainable development goals (SDGs) that should be given priority (n=631 answers; values expressed as percentage of answers for each goal)

Table 3. Average scores[1] about the degree of knowledge of the possible strategies for implementing SDGs in the agriculture and food sectors.

	Spain (n=139)	Colombia (n=112)	Brazil (n=380)	SEM[2]	*p* value
Degrowth	2.68	2.46	2.42	0.049	0.095
Carbon footprint	3.84 A	3.21 B	3.59 A	0.049	<0.001
Short supply chain – Km 0 products	3.60 A	2.14 C	2.77 B	0.056	<0.001
Deforestation	3.94 B	3.38 C	4.18 A	0.044	<0.001
Agroecology	3.60 B	3.62 B	4.03 A	0.046	<0.001
Food sovereignty	3.38	3.25	3.15	0.052	0.199
Resilience	2.66 B	2.75 B	3.33 A	0.055	<0.001
Genetic biodiversity: plants, animals, seeds	3.75 A	3.38 B	3.87 A	0.048	0.001
Sustainable farming systems	3.66 B	3.69 B	4.00 A	0.047	0.003
Permaculture	2.14 B	2.33 B	2.76 A	0.055	<0.001
Organic agriculture	3.76 B	3.53 B	4.11 A	0.044	<0.001
Organic livestock	4.05 A	3.54 B	4.06 A	0.043	<0.001
Alternatives to synthetic additives	3.19 A	2.87 B	3.38 A	0.052	0.001
Animal welfare	4.34 A	4.04 B	4.34 A	0.040	0.016
Use of by-products from agribusiness	3.71 A	3.38 B	3.83 A	0.049	0.003
Overconsumption of food / hunger	3.63 A	3.13 B	3.43 A	0.048	0.004
Food wastage	3.81 A	3.13 B	3.98 A	0.043	<0.001
Labeling systems; certification of production and responsible consumption	3.87 A	3.14 C	3.58 B	0.048	<0.001
Differentiated quality brands	3.90 A	2.97 C	3.44 B	0.049	<0.001

[1] Scale (1-5): 1, totally unknown; 2, partially unknown; 3, indifferent; 4, partially known; 5, totally known. [2] SEM: standard error of mean. A,B: indicate statistical differences ($p \leq 0.05$) between countries in the same variable of each row considered.

for implementing SDGs 2 and 12. Statistical differences can be observed between the countries for most of the strategies. However, the responses were much more similar for general strategies such as those related to the concept of degrowth as a possible efficient strategy (the least-known of all the strategies presented in the questionnaire) and food sovereignty, which is quite well-known.

In all three countries there was a high level of knowledge about issues such as organic production (livestock and agriculture), deforestation and animal welfare. Awareness of these issues was higher in Brazil than in Spain and Colombia, probably because of the impact on the Amazon rainforest. Brazil also stood out for its high level of knowledge of genetic biodiversity and sustainable farming systems. In South American countries, distribution and consumption strategies such as the promotion of locally made products, labeling systems, differentiated quality brands and resilience were less well-known. Colombia was the country with the lowest levels of knowledge about most development strategies.

The most favored type of action to develop in each country will depend on the different level of priority that each country gives to them (Salvia *et al.*, 2019). As well as the basic conditions, strengths, capacities and peculiarities of the country, which can differ between those belonging to the same subregion (Nhemachena *et al.*, 2018). For instance, in Latin-America the strategies used to reduce ambiental impact and favor a sustainable developed differed depending on the country studied. Strategies used to reduce greenhouse gas emissions from livestock production, which at the same time let be efficient in productive terms varied as shows FAO-AGROSAVIA (2018). Kanter *et al.* (2016, 2018) compiled practical examples that detailed how applicate SDGs into action in beef field and other diverse agricultural trade-offs in Uruguay. The application in other countries of the proposed models developed is a great challenge, and each strategy must be adapted to the particular conditions. Guerrero *et al.* (2020) summarized some successful initiatives applied in different Ibero-American countries as Spain, and the complex relationship that the most of strategies proposed on Table 3, which are actions not only necessary to achieve SDG 2 and 12, but also collaborate with others SDGs.

Civic engagement in the implementation of SDGs

As Table 4 shows, various statistical differences were observed between countries in the degree of applicability

Table 4. Average scores regarding the degree of engagement and applicability of the following strategies in respondents' future careers[1] .

	Spain (n=139)	Colombia (n=112)	Brazil (n=380)	SEM[2]	*p* value
Degrowth	4.26	4.32	4.17	0.099	0.821
Carbon footprint	6.48 A	6.07 AB	5.62 B	0.109	0.004
Short supply chain–Km 0 products	6.39 A	5.27 B	5.69 B	0.105	0.002
Decrease of deforestation	6.06 B	6.95 A	6.69 A	0.109	0.023
Implementation of food sovereignty	5.86 B	6.88 A	5.73 B	0.103	<0.001
Use of resilient species	5.50 B	6.32 A	6.20 A	0.104	0.013
Increase genetic biodiversity: plants, animals, seeds	6.36	6.96	6.78	0.101	0.139
Sustainable farming systems	6.49 B	7.74 A	7.26 A	0.098	<0.001
Implementation of permaculture	4.77 B	5.85 A	5.38 A	0.108	0.006
Organic agriculture	6.25 B	7.14 A	6.45 B	0.105	0.018
Organic livestock-	6.56 B	7.68 A	6.67 B	0.102	<0.001
Use of alternative synthetic additives	6.23	6.79	6.55	0.103	0.224
Increase animal welfare	7.08 B	8.04 A	7.60 AB	0.098	0.007
Use of by-products from agribusiness	6.71 B	7.59 A	7.28 A	0.099	0.014
Decrease food wastage	7.01 B	7.47 AB	7.74 A	0.098	0.011
Application of labeling systems, certification of production and responsible consumption	6.96	6.89	6.92	0.103	0.980
Application of differentiated quality brand	6.78	6.51	6.83	0.106	0.531

[1] Scale (1-10): 1- not applicable; 10- totally applicable. [2] SEM: standard error of mean. A,B: indicate statistical differences ($p \leq 0.05$) between countries in the same variable of each row considered.

of all the strategies except degrowth, which was the least known and therefore the least applicable. In accordance with the approach of ecological economics (Martínez-Alier *et al.*, 2010; Beling *et al.*, 2018) degrowth is not necessarily generalized negative growth throughout the economy. It exposes the physical and social limits of conventional growth and maximizes efficiency in the use of resources. This ecological rationale is in line with targets 12.2, 12.4 and 12.5 of the SDGs.

There was some consensus between the three countries regarding specific strategies such as those relating to labeling, various ways of certifying responsible production or consumption and quality brands that guarantee product quality, which were all considered very applicable. It is worth noting that over the last decade in Latin American countries there has been growing interest in strategies of this kind for food products (Teixeira & Sañudo, 2019), which could explain the answers. The general public perception regarding traceability is also changing although improvements need to be made in the way it is implemented in food companies (Lopes *et al.*, 2020; Pelegrino *et al.*, 2020).

When asked about their level of engagement and the applicability of the different strategies in their future professional careers, most participants seemed relatively optimistic, except for permaculture in Spain which had average scores of less than 5 out of 10. Generally, the scores for level of engagement and applicability of the strategies were higher in Colombia and Brazil than in Spain, especially those relating to deforestation, the use of resilient species, the combination of sustainable farming systems, or the use of surplus food and by-products from the food industry.

Fig. 4 presents the distribution of the answers provided by participants from the three countries to questions about their knowledge of the different strategies and their applicability. Participants were also asked the following direct question: Do you believe that your actions can contribute to achieving the SDGs? Although many of the participants in all three countries responded positively (42-49% of sample), there were statistical differences ($p<0.050$), between Spain (34.5%) and Latin America (44.5-51.8%, Colombia-Brazil), where a higher percentage felt that they could make a positive contribution, although it was interesting to note that many stated that they were unsure how to do so. It worth describes the cluster profile involving people who are willing to make changes but still don't know how to do it. Because they could be considered as one of the first target groups to involve in the process of implementation SDGs strategies and start significative changes.

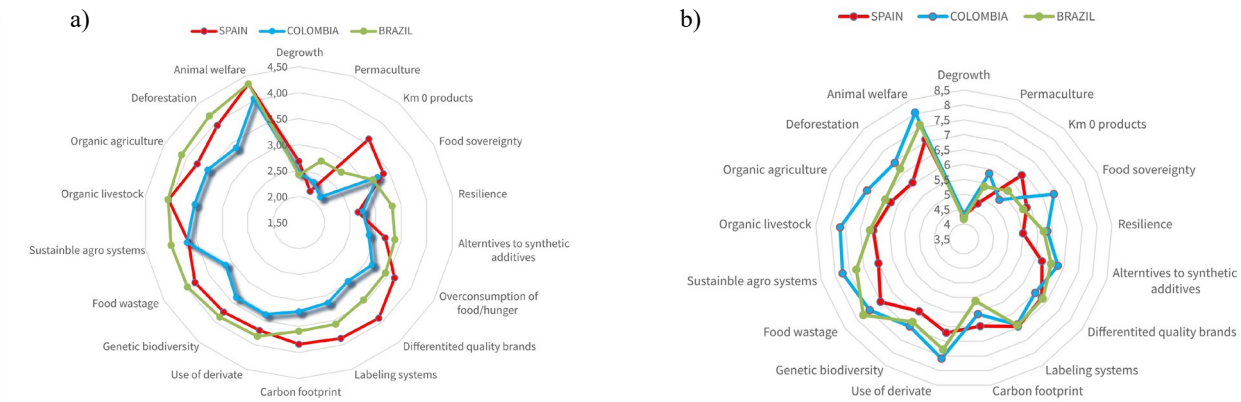

Figure 4. Comparison between knowledge and application of strategies between countries: a) degree of knowledge of general concepts relating to sustainable development [Scale (1-5): 1, totally unknown – 5, totally known]; b) strategies for implementing SDGs in the agri-food area (engagement) [Scale (1-10): 1, not applicable; 10, totally applicable].

Most of persons from this cluster were women (75% on the Spanish subsample and 68% in the Brazilian). Related to their role in the university, in Spain most of people were degree students (56.3%), being academic staff the second group more represented in this target (25%). In Colombia also degree students were the higher group (77.6%), but academic staff represented the lowest percentage (5%). In Brazil profile of participants were varied, cluster was composed again by students, mainly from degree (32%), but also Ms.C and Ph.D (16.6% and 18.9% respectively). Academic staff, as it was found in the Spanish group, involve the 26% of this Brazilian cluster. Also, it is remarkable than the cluster involve an important percentage of persons who had not heard about SDGs (39.6%, 62.1% and 50.9% in Spain, Colombia and Brazil respectively). Fact that partially would explain the difficulty to implementation of strategies.

The Spanish participants were the most skeptical about making a positive contribution to achieving SDGs (p<0.050), arguing that their actions could not bring about change or that changes of this kind were the responsibility of politicians. This attitude, which was much less widespread in Latin America, is consistent with the results of CIS surveys carried out amongst the general Spanish population in 2019, in which it was reported that the main obstacle to achieving SDGs was a lack of political will (40.5%), followed by political and institutional corruption (23.2%) and a lack of social awareness amongst people, companies and institutions (11.4%).

Pohlmann *et al.* (2020) reported that many changes are still required in agri-food models, as is greater collaboration between all the stakeholders in the production chain. This requires not only enhanced public engagement, but also the frameworks for implementing SDGs, education about these goals and more widespread public participation.

Conclusions

Universities can make fundamental contributions to achieving the SDGs in their role as social actors that specialize in providing education, training and research. SDG 2 and 12 need professionals in food, animal sciences, agriculture and livestock farming to produce healthy, sustainable food, while keeping their animals in conditions that guarantee their welfare. These specialists are trained in universities. These institutions need to adapt their content to the sustainable paradigm, replacing their traditional approach. The bibliography consulted suggests that many universities are already on this path and are adapting their syllabuses towards SDGs.

The results of our research show that Latin America there is less information and knowledge but a greater willingness to collaborate in SDGs. This apparent contradiction is explained from the meso and macro levels. Within countries (meso level), more informed people participated more. But, the comparison between countries (the macro level) reveals the differences in the role of the state (welfare or liberal) the expectations of citizens and the geographical context. The needs and priorities regarding implementation of the SDGs must also be adjusted to level and context.

There are a number of basic steps that universities can take to help achieve the SDGs. These include providing knowledge, innovative approaches and possible solutions to the associated problems as well as educating their students to become current and future implementers of SDGs. Surveys such as this one enable us to identify whether the academic community in a agriculture and food, field are aware of the different strategies being applied to achieve the SDGs and if they are collaborating in this process.

While this study aspires to make a useful contribution to the emerging literature on SDGs and their relationship with universities and the degree of knowledge and willingness amongst the members of university

communities to engage and participate in the implementation of these goals, it also has various limitations that must be taken into account when generalizing its findings. Firstly, the fact that knowledge and attitudes towards SDGs are continuously changing within these communities, due to the various awareness-raising campaigns that universities have been carrying out since the surveys in this study were conducted. This means that the methodology used in this study could be useful for measuring the effectiveness of the different strategies for raising awareness of SDGs that are currently being applied in various universities around the world.

Despite its limitations, this study makes an important contribution in terms of the relevance of the data gathered. The methodology developed in this research could also be applied in similar future studies focusing on other academic fields, so complementing this study about agri-food.

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