Article

The Knowledge and Perception of Sustainability in Livestock Systems: Evidence from Future Professionals in Italy and Argentina

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Abstract: The preference of consumers for more sustainable consumption patterns has a great impact on what and how food is produced. Consumers' interest in sustainable agricultural products can drive this type of production, and the primary sector should take advantage of this opportunity to propose new paradigms in the supply of livestock products. Although sustainable alternatives can be imposed through rules or regulations, it is important that market forces act through consumer choices so that the development of the sector may have long-lasting effects. Professionals involved in the primary sector and, in particular, in livestock production must be trained to face the new challenges of the sector and meet market demands. Improving production with a view to sustainability is one of the challenges that need to be addressed at a global level. The present study investigated the perception and knowledge of sustainability of some future professionals in the sector to understand whether the academic training delivered to them is suitable. The results show that respondents have partial knowledge of sustainability, especially of its environmental dimension. Their idea of sustainability is particularly linked to the extensification of production rather than sustainable intensification, and only marginally do they consider the social and economic dimensions of sustainability. Less knowledge of the social and economic components is particularly relevant if sustainability is pursued through an extensive approach that leads to an inevitable reduction in production. The academy must act to improve the knowledge of sustainability in its three main components in an essential balance.

Keywords: sustainable development; environmental sustainability; economic sustainability; social sustainability; students' perspective; future practitioners; education; sustainable livestock

1. Introduction

The livestock sector is under the magnifying glass of all environmental observers, who are increasingly demanding that it move towards more sustainable models. In addition, consumers have begun to change their consumption habits, increasingly demanding products that demonstrate a commitment to a more sustainable model, that is, they call for "development that meets the needs of the present without compromising the ability of future generations to meet their own needs" [1]. All this suggests the need to understand whether the technicians and future professionals involved in the livestock sector have sufficient knowledge of the subject to be able to provide support to livestock farming facing this challenge.

To mitigate the damage caused by climate change, shifts in traditional production systems, still based on linear economic models, have been proposed internationally, orienting them towards more sustainable and circular development. Already in 2015, the United

Nations [2] called for economic sectors to contribute to achieving global sustainable development goals, while in 2020, the European Farm to Fork strategy announced an ambitious environmental legislative proposal to make the agri-food system more sustainable.

Many authors mention that livestock production and, in particular, meat production massively contribute to global warming and environmental degradation [3,4], since the livestock system is recognised as an important source of emissions of anthropogenic greenhouse gases and makes intensive use of chemical inputs, antibiotics and raw materials for feed [5,6]. These hypotheses are difficult to demonstrate because, as stated in the scientific literature, the environmental impact of animal protein production varies according to the species raised and the production system used, even within similar production methods [6–8]. Poore and Nemecek indicate that such variability is due to the heterogeneous characteristics of the agricultural sectors, including differences between producers from the same geographic regions and between countries with developed and emerging economies, also attributed to the different traceability systems and regulations concerning the livestock system in the various countries [9].

There is no consensus in the scientific community on what the most sustainable production system is, and it is necessary to unify the methodology to study the subject matter, including all the factors that determine it [9]; however, consumers are concerned about the production system and require greater attention from the productive sector [10,11], increasingly demanding that social, ethical and environmental issues be addressed [12,13].

The preference of some consumers for more sustainable consumption patterns [14] has a great impact on what and how food is produced [15]. The consumption of foods of animal origin entails a complex, dynamic process [16] that is highly controversial for ethical and environmental reasons [10,17], and frequently, the patterns of behaviour are not unambiguously consistent with attitudes [13]; however, consumers' interest in sustainable agricultural products can drive this type of production, and the primary sector should take advantage of this opportunity to propose new paradigms in the supply of livestock products. Although sustainable alternatives can be imposed through rules or regulations, it is important that market forces act through consumer choices [15] so that the development of the sector may have long-lasting effects.

Studies in the international literature often focus on the point of view of companies (drivers and barriers), consumers or civil society, but little attention is given to what employees (current technicians, i.e., not managers) and future professionals think. In order to gain a broader understanding of how to meet the demands of consumers, civil society, policymakers, and all those who actively work and will work in the livestock sector, it is now necessary to also investigate the perspectives of those who have received less attention in studies on the sustainability of animal production.

This research is part of a broader study on sustainability that investigates how much the technicians involved in the three fundamental dimensions of sustainability (environmental, social and economic) know about the subject matter [18]. The results of the first study indicated that there were no differences in the knowledge of sustainability between students majoring in different fields (economics, social sciences and agricultural sciences). Students exhibited greater knowledge of the environmental dimension of sustainability than of its social and economic components.

This second study is oriented towards the animal protein sector, as it is held to be the main culprit of environmental impact. The aim of this study was to analyse the perception and knowledge that young future professionals engaged in the primary sector have about both the three dimensions of sustainability and the perceived level of sustainability of livestock production, in order to understand if, through academic training, future professionals have a broad and multidisciplinary and holistic understanding of the concept of sustainability and possess the tools to support the primary sector in pursuing sustainable development. Students of technical-scientific subjects related to animal production (e.g., agronomy, animal husbandry, veterinary medicine and technicians or graduates in animal production sciences) must receive proper training to be able to develop more sustainable

solutions [19]. University education plays an essential role in training responsible professionals by teaching the knowledge, skills and values that contribute to the sustainable improvement of the world [20]. Therefore, this research focuses on university students training in the field of animal production at the National University of Lomas de Zamora (Buenos Aires, Argentina) and the University of Teramo (Italy), namely future workers and decision makers who will contribute to shaping the political, social, environmental and economic spheres [21] in two key countries for livestock production.

Argentina is one of the main international exporters of beef, milk, chicken meat and pork. In addition, the total domestic consumption of animal proteins is higher in this country than the average consumption in Mercosur countries [22]. On the other hand, Italy is one of the main producers of organic food in Europe [23], aiming at increasing production in line with the objectives of the Green Deal [24].

An analysis of the knowledge and perception of sustainability of future professionals will make it possible to fill a gap in this area and understand whether their training is adequately preparing them to face the challenges. In addition, comparing the students in these two countries may help understand whether developing countries with high productivity of raw materials differ from developed countries already oriented towards sustainable production and seeking to increase and improve it.

2. Materials and Methods

Between April and June 2021, a survey was carried out using CAWI (computer assisted web interviewing) methodology among students in university courses related to animal production (agronomy, animal husbandry, veterinary medicine and graduates in animal production sciences, etc.) at the National University of Lomas de Zamora (Buenos Aires, Argentina) and the University of Teramo (Italy).

The questionnaire was one used in a previous investigation [18] with some modifications incorporating questions about animal production. A pilot test of the questionnaire was carried out with a small group of people (*n* = 20 in each country) belonging to the target population, as indicated in the literature [25]. Staff from the faculties involved sent the link to the questionnaire to all students enrolled in the mentioned courses. The entire target population was contacted by email (1312 Argentine students and 851 Italian students). Participation in the survey was voluntary, and participants signed their informed consent.

A probabilistic sampling was carried out among both populations. In order to reach the confidence level of 95%, the margin of error of 5%, and heterogeneity of 50%, the expected completed surveys were 298 for Argentina and 265 for Italy. The database was managed with Microsoft Excel, and analyses were performed with Infostat software version 2020 [26].

The survey consisted of three thematic sections and a total of 43 questions, as follows:

Section 1. Demographic and personal characterisation: The demographic characteristics of the respondents were first obtained.

Section 2. Perception and knowledge of sustainability and its dimensions: This section included questions about the degree of respondents' concern about the sustainability of the planet. Subsequently, to analyse their spontaneous idea of sustainability, the respondents were asked to write the first word that came to mind in response to a cue word, "sustainability". Then, to analyse their views about different aspects of the subject matter, they were asked to rank the perceived importance of 12 proposed statements related to the three dimensions of sustainability and, successively, to identify the three dimensions that make it up, within a proposed list. The respondents were next asked about how easy to understand the concept of sustainability was and to what extent they agreed with the statement "The concern for sustainability has the potential to cause changes in the production system". They were also asked to mention where they obtained information about the subject and to self-assess their own knowledge of the topic.

Section 3. Perception of the level of sustainability of animal source foods: The perception of the level of sustainability applied to livestock production was specifically investigated. The perception of sustainability of production at the national level was analysed for the following nations: Argentina, Italy, the United States, Brazil, China and the European Union. Subsequently, the animal husbandry production chains (beef and dairy cows, chickens and pigs) were investigated, differentiated by production system (field/extensive or confined/intensive). The questions then inquired into the respondents' perception of the need to improve these production systems. They were asked to mark which of the following changes were necessary: "improving the quality of the food given to the animals", "eliminating the excessive use of medication/antibiotics", "improving the breeding environment", "improving the treatment of animals throughout the life cycle" and "improving the slaughter practices".

First, the data were analysed through descriptive analysis in order to find similarities and differences between future professionals in the livestock sector of the two countries (Argentina and Italy). Bivariate analyses were then carried out to find relationships between pairs of variables and determine the statistical significance of the possible differences observed [27]). Different chi^2 analyses were performed, for the crossing of two categorical variables, one of them always being the country of the students surveyed.

The results are presented following the structure of the survey in its thematic sections: 1. demographic and personal characterisation; 2. perception and knowledge of sustainability and its dimensions; 3. perception of the sustainability of animal source foods.

The evaluation scale used in most of the questions was 11 points (from 0 to 10), where 0 was the lowest score (e.g., not at all important/not at all concerned) and 10 was the highest (definitely important/extremely concerned). For a better understanding of the data, the results are expressed with scores grouped into three levels of importance, as follows: from 0 to 3 little or not important at all; from 4 to 6 moderately important; and from 7 to 10 very or totally important. Categorical scales were used for the remaining questions.

3. Results

3.1. Demographic and Personal Characterisation

The comprehensive response rate was 27.3% (24.5% in Argentina and 31.6% in Italy). The sample consisted of 590 university students (321 Argentine and 269 Italian) attending courses related to animal production. In the Argentine sample, 60.1% were female, while in the Italian sample, almost 82.5% were female. In addition, both populations were characterised according to age into three groups and according to whether they were working or not (see Table 1).

Table 1. Sample characteristics.

Students	Argentine *n* = 321	Italian *n* = 269
Gender (%)		
Female	60.1	82.5
Male	39.9	17.5
Age (%)		
18–27 years old	55.1	82.5
28–40 years old	31.5	15.6
41+ years old	14.3 ([1])	1.9
Workers (%)		
Yes	75.1	25.3
No	24.9	74.7

Note ([1]) The high % of people aged 41 years or more is related to the frequency with which the student population also works and takes a longer time to obtain a degree.

3.2. *Perception and Knowledge of Sustainability and Its Dimensions*

3.2.1. Perception of Sustainability and Its Dimensions

Respondents from both countries were asked to rate their concern for the sustainability of the planet (Figure 1): in both countries, almost all of the students expressed high concern (Argentine students 93.5% and Italian students 95.1%).
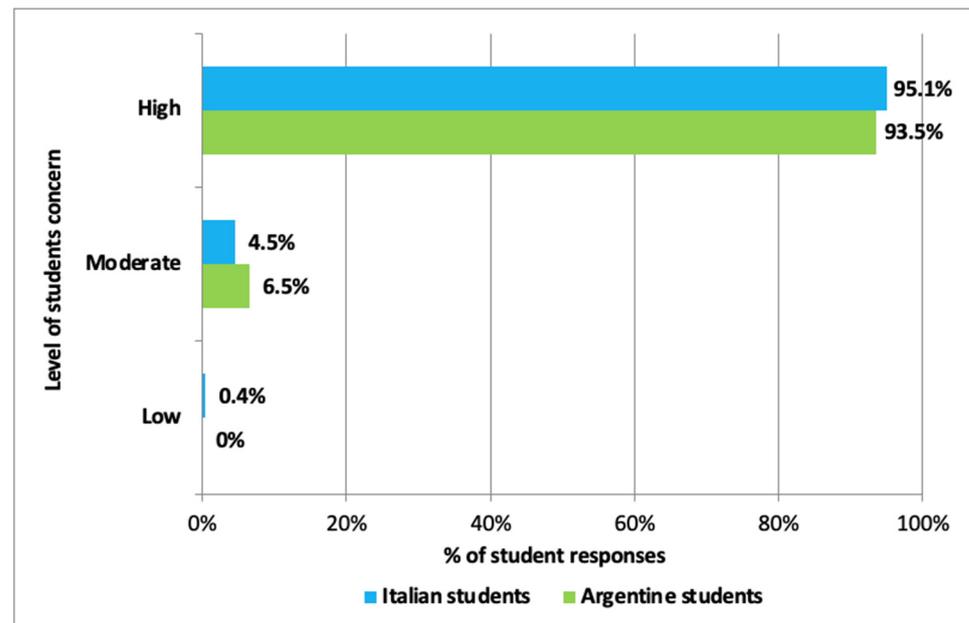

Figure 1. Level of concern for the sustainability of the planet.

No significant difference was found in the level of concern for the sustainability of the planet between the two groups of respondents ($p = 0.3055$); that is, concern did not vary with the country.

Subsequently, respondents were asked to write the first word that came to mind when they thought about sustainability. It turned out that the dimension most widely evoked by the students of both countries was the environment (67% Argentinians and 53% Italians), followed by a wide distance by the social and economic dimensions. The above-mentioned order was the same in both groups of respondents; however, significant differences were observed between Argentine and Italian students ($p = 0.0195$) (Figure 2).
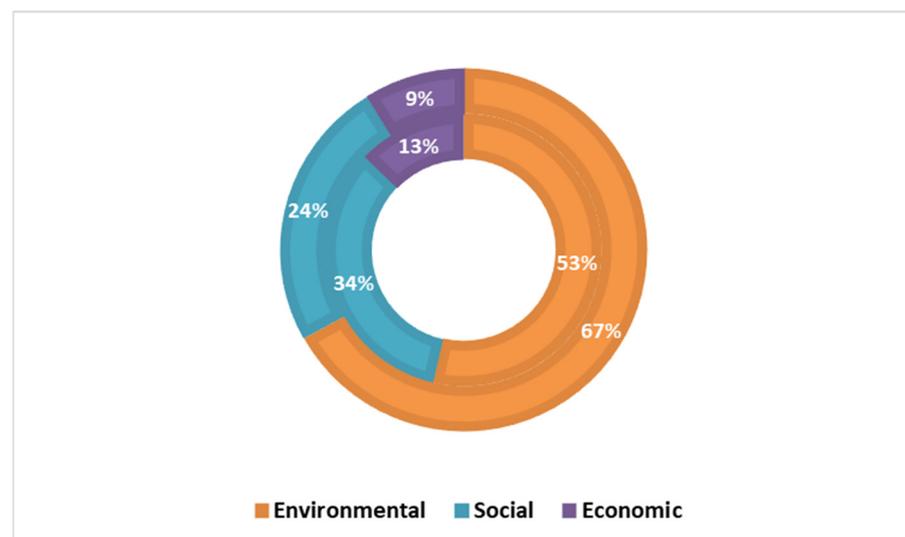

Figure 2. Percentage of words used by Argentine and Italian students, by dimensions.

Respondents were asked to assess the level of importance that they attributed to each of the 12 proposed statements (Table 2) related to sustainability, four for each dimension (environment, economic and social).

Table 2. Assessment of the degree of importance attributed to each statement related to sustainability.

Theme		Statements	Students	Mean	Score Value Attributed by Students (%)			*p*-Value
					Little or Not at All Important	Intermediate Importance	Very or Definitely Important	
Social Dimension	1.	Allows social development and roots in the local territory	Argentine	8.23	3.1	15.0	81.9	*p* = 0.3249
			Italian	8.08	3.3	10.8	85.9	
	2.	Respects the human rights of producers and workers	Argentine	7.76	6.5	20.6	72.9	*p* = 0.0525
			Italian	8.00	7.4	13.0	79.6	
	3.	Protects the public health of people	Argentine	8.56	2.2	12.1	85.7	*p* = 0.0041
			Italian	8.90	0.7	5.2	94.1	
	4.	Requires more training and work to reduce the human impact on the environment	Argentine	9.07	3.1	3.1	93.8	*p* = 0.0757
			Italian	9.27	0.7	4.8	94.4	
Environmental Dimension	5.	Balances the development of humanity and care for the environment	Argentine	9.32	0.31	4.36	95.3	*p* = 0.2433
			Italian	9.40	0.0	0.7	99.3	
	6.	Maintains natural resources over time, for present and future generations	Argentine	9.35	1.2	4.4	94.4	*p* = 0.0171
			Italian	9.48	0.0	0.8	99.2	
	7.	Adopts low-polluting production processes (e.g., less use of chemicals)	Argentine	8.93	1.6	4.7	93.8	*p* = 0.0046
			Italian	8.90	3.0	6.3	90.7	
	8.	Favours biodiversity and reduces environmental risks (e.g., erosion, floods, fires, etc.)	Argentine	9.23	0.6	3.7	95.6	*p* = 0.3307
			Italian	8.96	0.4	7.8	91.8	
Economic Dimension	9.	Is easier to implement on small production scales (e.g., family farming)	Argentine	8.02	4.3	18.1	77.6	*p* = 0.0935
			Italian	7.86	4.5	18.6	77.0	
	10.	Requires more labour than traditional agriculture	Argentine	7.21	10.3	22.4	67.3	*p* = 0.2807
			Italian	7.59	5.2	21.2	73.6	
	11.	Is a profitable activity that creates jobs	Argentine	8.64	0.9	8.7	90.3	*p* = 0.9841
			Italian	8.26	0.7	14.5	84.8	
	12.	Strives to reduce losses to make more efficient use of resources	Argentine	8.37	2.8	11.5	85.7	*p* = 0.0588
			Italian	8.96	0.0	5.6	94.4	

The participants from both countries attributed a high level of importance to all statements, with means greater than 7.21.

There were statistically significant differences in the assessment of social statement 3 (*p* = 0.041) and in two statements (6 and 7) concerning the environmental dimension (*p* = 0.0171 and *p* = 0.0046, respectively). In the survey conducted in Italy, more than 90% of respondents ranked the importance of the following assertions: statements 5, 6, 7 and 8 (all related to the environment), statements 3 and 4 (all related to social dimension), and only one statement (relating to economic dimension) (statement 12). More than 90% of the Argentine respondents also agreed that six statements were very significant. They agreed with the Italian students in four environmental statement evaluations (statements 5, 6, 7, and 8) and one social dimension. An analysis of the perception of the four statements of each dimension as a whole made it evident that the respondents from the two countries coincided in the order of importance they attributed to the three dimensions.

The assessment of the environmental dimension was the highest (average of 9.20 among Argentinians and 9.18 among Italians), followed by the social (average 8.41 among Argentinians and 8.56 among Italians) and the economic (with the lowest average, 8.06 among Argentinians and 8.17 among Italians) dimensions (Table 3).

No statistically significant difference (*p* > 0.05) was found between students from the two countries in the assessment of each dimension.

Table 3. Level of importance by dimension.

Dimension	Average of Each Dimension (from the Sum of the 4 Statements)		*p*-Value
	Argentine Students	**Italian Students**	
Environmental	9.20	9.18	*p* = 0.2807
Social	8.41	8.56	*p* = 0.2433
Economic	8.06	8.17	*p* = 0.2871

3.2.2. Knowledge of Sustainability and Its Dimensions

From the set of dimensions listed, the environmental dimension turned out to be the most widely identified (96.9% among Argentine respondents and 99.3% among Italian respondents), followed by the economic one (80.4% among Argentine respondents and 78.5% among Italian respondents) and the social one (78.8% among Argentine respondents and 72.9% among Italian respondents). A statistically significant difference was found in the identification of the environmental dimension, with the Italian students recognising this dimension to a greater extent than the Argentinians (p = 0.0421). In contrast, no statistically significant differences were observed between the two countries in the recognition of the social (p = 0.0912) and economic (p = 0.6384) dimensions (Table 4).

Table 4. Percentage of students who identified the different dimensions of sustainability.

Dimension	Students (%)		*p*-Value
	Argentine	**Italian**	
Environmental Dimension	96.9	99.3	*p* = 0.0421
Economic Dimension	80.4	78.5	*p* = 0.6384
Social Dimension	78.8	72.9	*p* = 0.0912
Three dimensions	9.4	13.4	*p* = 0.1213

The set of three dimensions was simultaneously identified by 9.4% of the Argentine respondents and by 13.4% of the Italian respondents (Table 4), with no statistically significant differences (p = 0.1213) in the knowledge of the three dimensions evaluated simultaneously by the future professionals surveyed.

Most students in both groups expressed only moderate agreement with the statement that sustainability is an easy concept to understand. On the other hand, the two groups of future professionals indicated that they fully agreed that the concern for sustainability has the potential to cause changes in the production system. There were no statistically significant differences between the two countries in either of these statements (Table 5).

Table 5. Level of agreement with the statements about sustainability.

Statements	Students	Mean	Score Values Attributed by Students (%)			*p*-Value
			Totally Disagree or Agree Little	**Moderately Agree**	**Strongly or Totally Agree**	
The concept of sustainability is easy to understand	Argentine	5.52	19.9	44.3	35.8	*p* = 0.1461
	Italian	5.21	22.7	49.0	28.3	
The concern for sustainability has the potential to cause changes in the production system	Argentine	6.52	14.3	29.3	56.4	*p* = 0.1692
	Italian	6.41	11.9	36.4	51.7	

The surveyed students reported using different sources of information (Figure 3). The main source for both groups was found to be Internet search engines, with a slight difference between Italian (80.7%) and Argentine (70.7%) students. Italian students also mentioned that their second source of information was social networks (55.4%), while Argentine students reported using specific books/papers (52.6%).
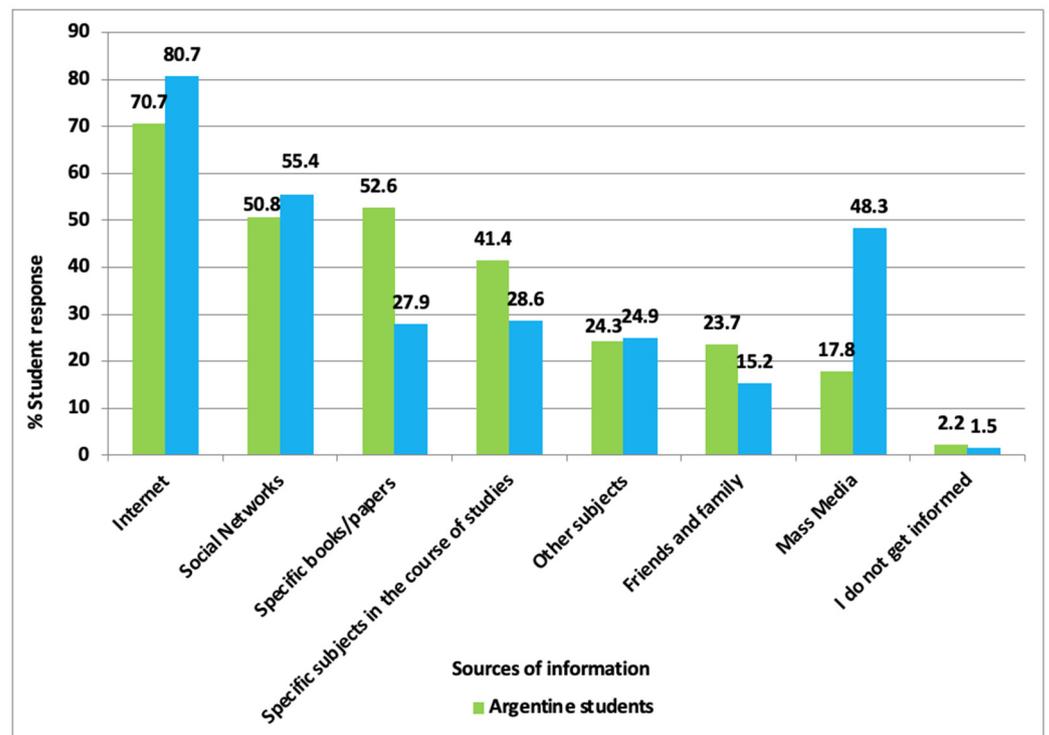
Figure 3. Sources of information used by Argentine and Italian students.

It was found that 51.7% of Argentine students evaluated their knowledge as good, followed closely by 43.6% those who considered their knowledge to be moderate and 4.7% poor. Among Italian students, 40.5% evaluated their knowledge as good, 48.3% as moderate and 11.2% as poor (Figure 4).
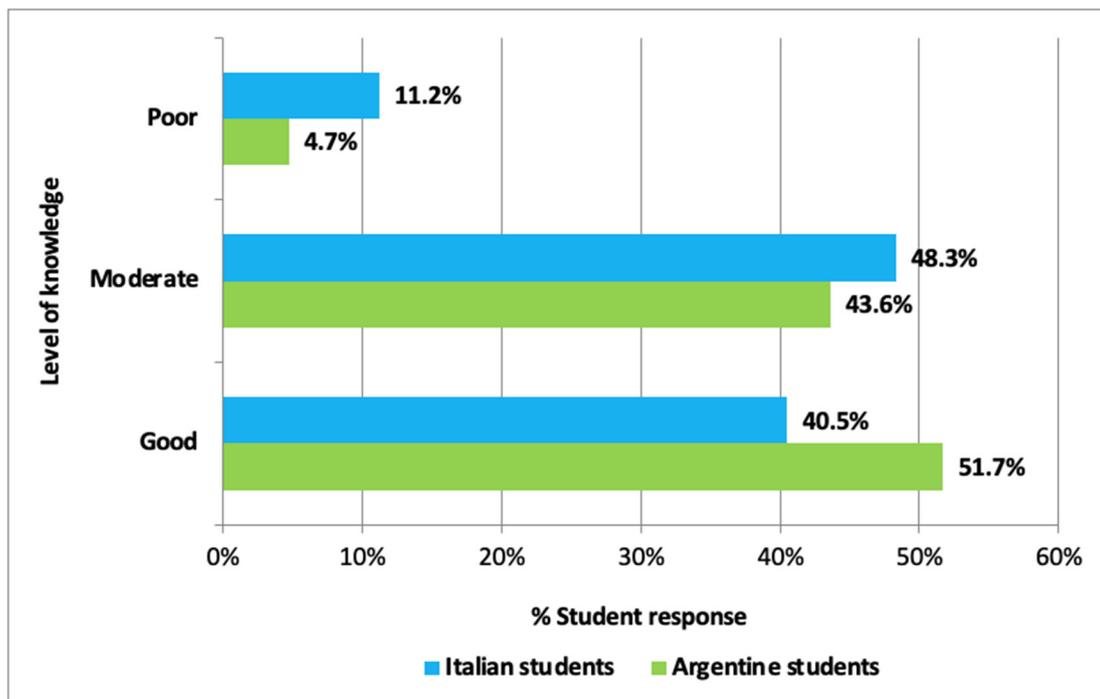

Figure 4. Assessment of the students' level of knowledge about sustainability.

3.3. Perception of the Level of Sustainability of Animal Source Foods

3.3.1. Perception of the Level of Sustainability of Food Production in Different Countries

Respondents were asked to rate their perceptions of the sustainability of food production in different countries. The countries assessed were those of the respondents (Argentina and Italy) and three major world producers of food raw materials, namely Brazil, the United States and China (Table 6). It was assumed that the interviewees had knowledge only of the production systems of their own countries. For this reason, we asked for Argentina and Italy, despite the fact that the latter is part of the European Union, while the assessments of the countries excluding their own were only their perceptions.

Table 6. The perceived sustainability of food production in different countries (%).

Country	Students	Perceived Sustainability		
		Low	Intermediate	High
Argentina	Argentine	29.7	54.4	15.9
	Italian	52.4	36.4	11.2
Brazil	Argentine	39.0	49.7	11.3
	Italian	57.2	31.6	11.2
China	Argentine	54.1	28.2	17.7
	Italian	64.3	24.9	10.8
United States	Argentine	39.7	40.5	19.8
	Italian	41.3	49.4	9.3
European Union	Argentine	8.8	28.1	63.1
	Italian	7.1	42	50.9
Italy	Argentine	8.7	28.5	62.8
	Italian	9.3	49.8	40.9

The perceived level of sustainability for food production was relatively positive for the EU, with the highest assessment by the two groups of students (very or totally sustainable: 63.1% among Argentine respondents and 50.9% among Italian respondents), with significant differences ($p = 0.0018$). China turned out to be the country with the lowest or most negative assessment, with 54.1% of Argentine and 64.3% of Italian respondents considering Chinese food production to have a low level of sustainability, with a statistically significant difference between the groups ($p = 0.0243$). Argentine students attributed a moderate level of sustainability to their home country, while Italian respondents perceived low or no sustainability in Argentina, with statistically significant differences ($p < 0.0001$). Finally, Italian production was perceived as being moderately sustainable (49.8%) by the Italian students, but as having a lower level of sustainability than the set of European countries. Argentine students evaluated the level of sustainability of Italian production as high, perfectly in line with European production.

3.3.2. Perception of the Level of Sustainability of Livestock Production

To analyse the perception of the sustainability of foods of animal origin, respondents were asked to rate the production of beef cows, dairy cows, chickens and pigs. For all categories, the options of confined rearing (intensive management systems, cages or sheds) and free-range rearing were presented, except for dairy cows because in Argentina only the field production system can be evaluated due to its great preponderance. The results obtained are presented below (Table 7).

Table 7. Assessment of sustainability in livestock production chains.

Production System	Students	Perceived Sustainability		
		Low	Intermediate	High
Cows raised in pasture-based management systems	Argentine	21.5	35.5	43.0
	Italian	19	34.5	46.5
Cows in intensive management systems	Argentine	54.8	31.2	14.0
	Italian	48	35.7	16.3
Dairy cows	Argentine	25.9	39.9	34.3
	Italian	16.0	30.1	53.9
Free-range chicken	Argentine	15.6	31.8	52.6
	Italian	15.2	28.3	56.5
Chicken raised in barn	Argentine	50.2	34.0	15.9
	Italian	56.9	29.7	13.4
Pigs raised in pasture-based management systems	Argentine	16.2	38.3	45.5
	Italian	20.1	46.1	33.8
Pigs raised in barn	Argentine	55.8	33.0	11.2
	Italian	56.5	31.2	12.3

Production characterised by animal confinement or intensive methods in cow, chicken and pig rearing were perceived as having low sustainability by students of both countries (more than 48% of those surveyed on the production of the three farm animals); no statistically significant differences were found ($p > 0.05$) between the assessments of the students surveyed (confined meat cows $p = 0.2498$; confined chicken $p = 0.2622$; and confined pig $p = 0.8601$).

On the contrary, high sustainability assessment was observed in the field production systems of chickens and beef cows. In both countries, the level of sustainability of chicken production was rated as high by 52.5% and 56.5% of the students surveyed from Argentina and Italy, respectively, and that of beef cow production was rated as high by 43% and 46.5%, with no significant difference in either of the two productions (in chickens $p = 0.6026$ and in beef cows $p = 0.6368$). On the other hand, differences were observed in the evaluation of the production of pigs raised in pasture-based management systems, where the Argentine respondents valued it as highly sustainable, as with the other field production systems, while the Italian students valued it as moderately sustainable, with significant differences between the two ($p = 0.0159$).

In the case of dairy cows, only field production in Argentina was evaluated, because it is the main production system in this country, while free stabling was evaluated for Italy. The Argentine respondents (39.9%) rated the production of dairy cows in Argentina as moderately sustainable, whereas Italian students (53.9%) rated their country's system as highly sustainable, with significant differences between Argentine and Italian students ($p < 0.0001$).

3.3.3. The Production of Animal Source Foods and Potential for Improvement

Respondents were asked to indicate what productive aspects could be modified in the future to improve sustainability or its perception in the different production systems proposed (Table 8).

The aspect to be improved that most students selected was eliminating the excessive use of medication/antibiotics in both countries (Argentine students 20.9% and Italian students 21.9%). For the Argentine students, other productive factors to be improved were the quality of the food given to the animals (20.5%) and the breeding environment of the animals (20.2%). For the Italian students, the quality of the food given to the animals did not seem to be a priority point of improvement since it obtained a relatively low percentage

of responses (12.0%). Italians perceived the breeding environment of animals (21.8%) and the treatment of animals throughout the life cycle (21.6%) as aspects to be improved.

Table 8. Contingency table of livestock production systems and their potential improvement points (%).

Production	Student	Quality of the Food Given to the Animals	Eliminating the Excessive Use of Medica-tion/Antibiotics	Breeding Environment of the Animals	Treatment of Animals Throughout the Life Cycle	Improving the Slaughter Practices	Did Not Answer
Cows raised in pasture-based management systems	Argentine	44.2	42.7	41.1	45.2	45.2	9.0
	Italian	24.5	52.8	31.6	43.1	50.9	8.9
Cows in intensive management systems	Argentine	55.1	57.0	65.1	52.0	43.0	8.7
	Italian	41.3	61.7	78.8	66.2	55.0	2.2
Dairy cows ([1])	Argentine	48.0	54.5	46.7	46.4	26.8	10.9
	Italian	23.8	53.2	29.4	45.4	35.3	8.9
Free-range chicken	Argentine	42.7	40.8	34.9	34.0	36.1	15.9
	Italian	19.7	32.7	34.6	39.4	40.1	18.2
Chicken raised in barn	Argentine	56.1	64.5	59.8	49.2	37.4	8.7
	Italian	33.5	63.9	77.3	63.6	51.3	3.0
Pigs raised in pasture-based management systems	Argentine	47.4	40.2	38.9	34.3	39.9	13.4
	Italian	26.8	48.7	40.5	43.1	43.5	13.0
Pigs raised in barn	Argentine	59.8	62.0	62.0	53.9	45.2	10.0
	Italian	34.2	60.2	78.4	67.7	52.0	3.0
Total (%)	Argentine	20.5	20.9	20.2	18.2	15.8	4.4
	Italian	12	21.9	21.8	21.6	19.3	3.4
Ranking potential improvement	Argentine	2	1	3	4	5	6
	Italian	5	1	2	3	4	6

Note ([1]) In the case of dairy cows, only field production in Argentina was evaluated, because it is the main production system in this country, while free stabling was evaluated for Italy.

Concerning the need for productivity improvements of the species raised, by type of production, the students from both countries considered the confined or intensive systems as those requiring the greatest improvement, though in different orders. Among Argentine students, the first production to be improved was that of pigs (16.9%), followed by beef cows (16.3%) and chickens (15.9%). On the other hand, among Italian students, the first production to be improved was that of beef cows (17.9%), followed by pigs (17.4%) and chickens (17.2%). In both countries, necessary improvements were also considered for extensive production, but at lower percentages (Table 8).

Concerning the production by species, there were significant differences in the evaluation of beef cows in pasture-based management systems. The demand for improvements perceived by Argentine students was greater than that perceived by Italian students in feed quality ($p < 0.0001$) and breeding environment ($p = 0.169$). On the other hand, a greater need for improvement was perceived by Italian students in the excessive use of medication/antibiotics with a significant difference ($p = 0.0143$). In the remaining possible improvements analysed, there were differences in the evaluations, but they were not statistically significant.

In stabled beef cows, statistically significant differences were revealed in different parameters. The assessment assigned to feed quality showed a greater need for improvement in Argentina ($p = 0.0008$), and there was a greater need for improvement in Italy for the breeding environment ($p = 0.0002$), the treatment of animals throughout the life cycle ($p = 0.0005$) and improving the slaughter practices ($p = 0.0036$).

In confined chickens, the greatest point of improvement in Argentina was the excessive use of medication/antibiotics, followed by the breeding environment, while in Italy the opposite order was observed. No statistically significant difference was found for the evaluations on the use of medication/antibiotics ($p = 0.8905$), but a statistically significant difference was found in the evaluation of breeding environment ($p < 0.0001$). In free-range chickens, statistically significant differences were found in the evaluations of feed quality

(p = 0.0001) with a need for improvement mostly perceived in Argentina, followed by excessive use of medication/antibiotics (p = 0.0001), with a greater need for improvement perceived by Italian respondents.

In pigs in confined systems, there were significant differences in the need for improvement in feed quality (p < 0.0001), with a higher need reported by Argentine students in the breeding environment (p < 0.0001) and in the treatment of animals throughout the life cycle (p = 0.0007), with demands for greater improvement by Italian students. In the field production system, a greater need for improvement in feed quality was assigned by Argentine students, with a significant difference with respect to the improvement indicated by the Italians (p < 0.0001).

For free-range dairy cows, the aspect perceived as most in need of improvement in both countries was the excessive use of medication/antibiotics, without statistically significant differences (p = 0.7419). The second aspect for the Argentine students was the feed quality, with statistically significant differences from the evaluation given by the Italian students (p < 0.0001), while the second aspect rated by the Italian students was the treatment of animals throughout the life cycle, with a statistically significant difference from the evaluation of the Argentine students (p < 0.0001).

Finally, the questionnaire inquired about the importance of sustainability for their professional future in the livestock sector. Respondents from both countries valued this topic as highly or totally important (94.5% Argentine and 88.1% Italian students) (Figure 5), with a statistically significant difference (p = 0.0361).
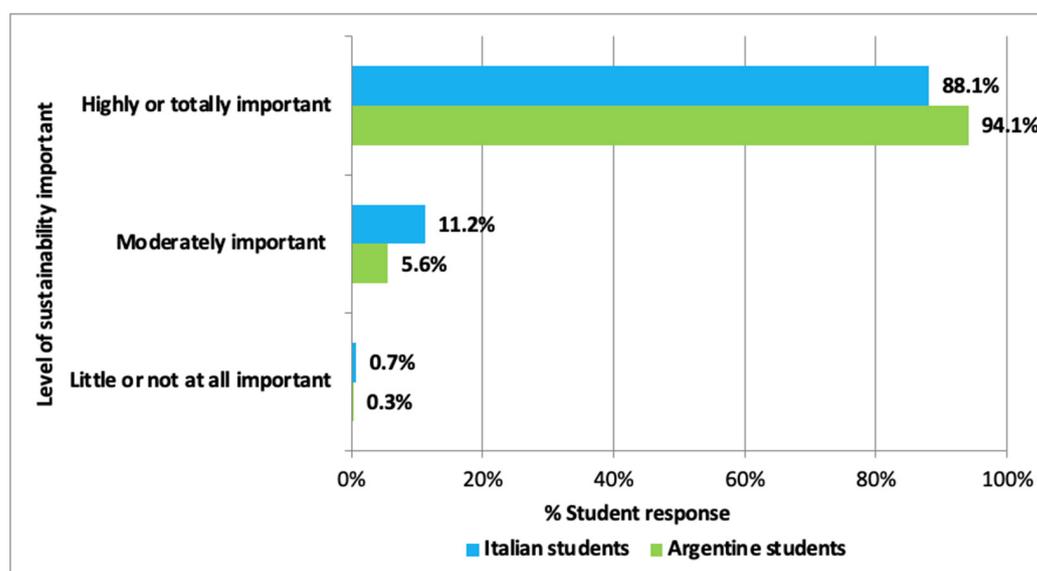

Figure 5. Importance of sustainability for the students' future work (%).

4. Discussion

The results of this work confirm that there is a high level of concern in relation to the sustainability of the planet. The concern is not only at the level of society, as demonstrated by the movements against climate change (Fridays for Future [28]; Rise for Climate [29]; Y20 [30]), but also at the level of the scientific community and, in this case, represented by future professionals in the primary sector, without distinction between the two countries studied and the different academic training of the students surveyed.

The concept of sustainability is highly linked to the environmental dimension. The participants thought of sustainability mainly in terms of environmental sustainability and only at lower percentages in terms of economic and social sustainability, in both countries. These findings are consistent with the literature, which indicates that people and students attending different courses mainly evoke the environmental dimension [31–35]. Although the environmental component arose spontaneously more frequently, the respon-

dents attributed high importance to all the proposed statements related to sustainability. It should be noted that environmental statements yielded higher scores in both groups of respondents, again positioning the environmental dimension first, followed by the social and economic dimensions. Future Italian professionals recognise sustainability's ability to protect the public health of citizens; however, it was the future Argentine professionals who indicated a stronger relationship between sustainable production and the lower use of chemical pollutants. This result is unique and deserves to be investigated to understand why the health of citizens and sustainability involving a lower use of chemical pollutants are not perceived as related.

Only 9.4% of the Argentine and 13.4% of the Italian respondents simultaneously identified the three dimensions of sustainability; nevertheless, they attributed a high level of importance to all the statements related to the three dimensions. It is possible that the level of importance attributed derives from an analytical and critical ability to identify the relationship between the concepts contained in the statements and sustainability, but without real theoretical knowledge of it, as evidenced by other authors [31,32,36,37]).

This analysis would also justify the declared difficulty in understanding the concept of sustainability, which should draw attention to the sources used for information. Although important and valid information can be found on the web, it can be difficult to navigate and select that with scientific value [38–41]. It would be desirable for future professionals such as those surveyed in this study to be trained mainly in specific courses and texts, and only subsequently use the web.

The training of future professionals involved in food production is a key aspect that will help the sector to face the challenges involved in food production. As with their future colleagues from other countries [31,42], both groups of students understood the importance of sustainability in their future work since almost all the respondents declared that this topic will be highly important to their future employment. Most of the respondents also indicated that the concern for sustainability has the potential to cause changes in the production system and perceived the production systems in their countries as moderately sustainable.

Concerning the level of sustainability perceived by type of livestock production, it can be noted that extensive production was considered to be mostly sustainable, a result in accordance with the principle of organic production (Regulation EU 2018/848 [43]) but in disagreement with the literature that analyses the impact on the environment using the life cycle assessment (LCA) methodology, which indicates how more efficient productions are less impactful per unit of product [8,44].

According to the perception of future professionals, intensive production must improve in the use of antibiotics, perceived as high both among Argentine and Italian students. In addition, they perceived some points related to the ethical components of production systems as requiring improvement. In Argentina, the productive environment and the quality of animal feed, particularly for pigs, are critical elements. This result is in line with the findings in the literature [45–47], which indicate that in the perception of the Argentine population, pigs are fed poor-quality products. For Italians, on the other hand, the factors to be improved are the productive environment and the treatment of the animals throughout the life cycle, particularly for beef cows.

5. Conclusions

The issue of sustainability is broad and complex and can be approached from different points of view, including the perspective of an extensive approach, in line with the indications of the European Green Deal and policies in favour of a diet change, or from a sustainable intensification approach, as a principle at the base of the LCA studies. All strategies may be appropriate to meet different demands according to their characteristics, or they can give rise to new strategies through the synergy of production methodologies. However, they must all maintain the same objective, to meet the needs of the three components of sustainability. For this reason, it is necessary for academic training to be broad, articulated, deep and up to date, so that future professionals can autonomously

identify the most suitable instruments to respond to the various demands that arise in the productive reality. The results of this study indicate that the knowledge of the sustainability of the students, of all the careers evaluated and in the two countries under analysis, is partial. Either spontaneously or induced and regardless of the chosen career, the majority of students associate sustainability with the environmental dimension, relegating the social and economic dimensions to collateral dimensions. It is necessary to reflect on the level and quality of academic training, including careers oriented towards productions of animal origin, and think about educational proposals that include the three dimensions in a more inclusive way, or with a systemic character of interrelationships and multidisciplinary way, for the benefit of a more complete training and oriented to the future productive challenges. Therefore, universities surveyed must continue acting to improve the knowledge of their apprentices, whether by providing specific courses, expanding the subject contents or helping students to use the web correctly to enjoy all its advantages, since sustainability is increasingly important for the future employment of professionals who graduate from technical-scientists subjects. Students currently seem to be predominantly focused on the environmental component of sustainability and on the extensive approach, which may not always be the best response in all situations, especially in a world where the population is estimated to continue to increase. Since this work represents a case study, in which the respondents are Italian and Argentinean students, the results cannot be generalised to global consumption dynamics. In the future, it will be increasingly important to analyse the perspectives of the various actors involved in the productive sector, to encourage joint strategies and identify the points at which it is necessary to intervene with knowledge and information systems. Future research may focus on the reasons why the social and economic dimensions are not reflected in the minds of future professionals. Training will play an essential role in rebalancing the importance attributed to the three fundamental components of sustainability.

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