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A case study of agri-food systems in rural Spain: Impacts, responses and institutional lessons

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Abstract: Galicia is one of Spain's leading regions regarding agricultural and livestock production. In the light of the COVID-19 crisis, the permeability to the economic shocks of these sectors led to an unprecedented recession, given the heterogeneity of their characteristics, resulting in widespread losses. The main objective of this article is to analyze the impact of COVID-19 in the agricultural and livestock sectors in Galicia and, at the same time, identify the degree of affectation in each of these sectors, determine the impact of the pandemic in each province and study the institutional responses to the COVID-19 crisis. For this purpose, financial analysis of these sectors will be carried out through a sample of 998 companies. The results show a variation in operating income of –16.41% in the agricultural sector and –9.15% in the livestock sector in Galicia, although they are mixed across the different provinces of the region. Despite the articulation of a network of public aids and the adoption of new commercialization strategies, there are sub-sectors with high losses, such as the ornamental plant industry and the subsector dedicated to the production of beef.

Keywords: agriculture and livestock; COVID-19; economic performance; ecosystem management; food supply chains; food system resilience

The crisis resulting from the COVID-19 pandemic has implied an unprecedented economic challenge. Spain, along with Italy, was one of the first European countries to reach a high number of reported COVID-19 infections. On March 14, 2020, three days after the World Health Organisation (WHO) had declared COVID-19 a pandemic, a state of emergency was established in Spain. This period entailed the partial closure of national borders, as well as the lockdown of the population and the paralysis of activity in most sectors (Paez et al. 2021). Only the sectors considered essential to the economy were able to continue their activities, among them

livestock and agriculture. In the case of Galicia, due to the reduction of the infection rate, the phase of state restrictions due to the pandemic ended on June 15, 2020. For the rest of the Spanish regions, the state restrictions were in force until June 19–21, 2020.

The strategic primary sector of the economy also continued to guarantee food supply during the second state of emergency period (November 7–December 3, 2020) (Fernández-González et al. 2021b). Thus, in Spain, the agricultural and livestock sector is performing better than most of the country's industries, except for one of its regions: Galicia. This region, located

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in the northwest of the Iberian Peninsula, has granted strategic status to the primary sector as it accounts for 3.1% of GDP and 4.5% of employment in the region and devotes 378 627 ha to cropland and 450 255 ha to livestock grazing. However, the Galician agriculture and livestock sector has, in aggregate, limited capital and liquidity, whose financial fragility is medium-high.

Agriculture and livestock farming in Galicia is a sector that, in general terms, is not very technified (Fandiño et al. 2006). Additionally, 90% of its business structure is made up of micro-enterprises, while 29% are self-employed. Therefore, external market shocks can have a high impact on the evolution of the sector (López-Iglesias et al. 2013). The main objective of this paper is to measure the potential effects of the COVID-19 pandemic on the agricultural and livestock sectors in Galicia. Thus, the consequences are studied in a disaggregated manner at the sectoral level (distinguishing between the agricultural and livestock sectors in a disaggregated manner) and at the territorial level (analyzing the effect of the pandemic in each Galician province). In addition, institutional actions to mitigate the effects of the pandemic in these sectors are determined. To this end, the evolution of the rates of change of the main economic and financial variables of the firms will be studied and the biophysical, commercial, institutional, or legal causes that describe the dynamics of the sector will be analysed.

Although there are previous studies in academia on the effects of the pandemic on the primary sector in Spain (Batlle-Bayer et al. 2020; Vidaurreta et al. 2020) and in Galicia (Pena-Boquete and Dios-Murcia 2021), their analysis is not focused on the performance of the business sector disaggregated by provinces, nor in the realization of a holistic study of the external factors affecting this industry. Therefore, this study is not only of interest to academics but also to stakeholders and policymakers in the sector.

Agriculture and livestock farming in Galicia. The social and economic importance of agriculture and livestock farming in Galicia is very high. In addition to the long historical tradition of this sector in the region, 25% of the working population of Galicia is employed in agriculture, livestock, forestry, or fishing. As a result, Galicia is the most agricultural region in Spain (Salaverri et al. 2019).

Since the 1980s, there is a significant increase in technological progress in the sector (Cámara-Salim et al. 2021). While Galicia experienced a decrease in agricultural land of –16% (145 000 ha) between 1985 and 2005, there was a progressive increase in turnover

in the agricultural sector. The specialization process of production has resulted in sized, automated systems with scarce connection to the environment, in which, in general terms, price competitiveness is the objective. Another recent phenomenon is the relocation of production areas. The existence of infrastructures has determined the location of production farms since, given the complex Galician orography, transport costs could be very high. This phenomenon has occurred, among others, in the milk sector, where production plants have proliferated in areas with suitable soil, climate and slope, while production in mountain zones has disappeared (Swagemakers et al. 2017).

During the 21st century, the agricultural and livestock sector experienced three clear phases associated with economic cycles in Spain. The explanation for this dynamic lies in the low elasticity of demand for essential goods. In the first period, from 2000 to 2007, the relative weight of the primary sector in the economy declined. However, during the economic crisis (2008–2014), the contribution of this sector to gross value added increased, while from 2015 onwards it fell again, but less sharply (Roibás et al. 2018). The slowdown in this decline results from the growing adoption of a new paradigm in agriculture, based on competition in quality and not in prices. The approval of protected designations of origin, the expansion of organic production, the achievement of international quality certifications, and the expansion of the range of products have reinforced the strategy of differentiation and excellence in part of the sector (Conde-Cid et al. 2018). Thus, comparing foreign trade data from 2005 to 2016, it is observed that exports increased from 18.7% to 21.3%. This trend, combined with the decrease in imports, which fell from 32.5% to 29.3% in a decade, reflected the degree of self-sufficiency of the sector. As a result, the structural deficit was reduced by more than half between 2005 and 2016 (Ministry of Agriculture, Fisheries and Food 2020).

Considering the trends described above, there are important benchmarks in the medium-term evolution, from 1990 to 2019, of the Galician agricultural sector. Agricultural production in Galicia increased by 45.8% in 29 years, while employment in the sector decreased by –82.1%. Thus, the average production per worker multiplied by 8.5. However, the increase in income per farmer has not reached such a high increase (it is only 5 times higher) because of the reduction in prices and the strong increase in intermediate consumption of the activity and the amortization of fixed capital in the face of technological improvements in the sector. As a consequence of this dynamic, agricultural production in Galicia

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moved from representing 6% of the Spanish total in 1990 to 7% in 2019, but the importance of Galicia in national agricultural employment decreased, falling to 6.8% of the population employed in agriculture in 2019 when in 1990 this same variable reached 21%.

Although the situation of the Galician agricultural sector has changed over the last three decades, its structure has remained almost unchanged. The most important subsector continues to be the livestock sector, with nearly 60% of agricultural production. The economic weight of the subsector is focused on four activities: the production of milk, beef, poultry, and pork. Agriculture, on the other hand, is a much less specialized subsector in which vegetable, potato, grain cereal and fruit crops stand out. The fruit sector includes the wine grape sector, which is the one with the highest turnover (Table 1).

One of the determining factors for the modernization of agriculture in Galicia has been the transfer of public

funds from the European Union (EU). The Common Agricultural Policy (CAP), through its LEADER and European Regional Development Fund (ERDF) programs, has boosted the increase in rural incomes and the fixation of the population in these towns. Since 1986, when Spain joined the EU, until 2006, Galicia was one of the southern European countries that benefited most from this aid. However, with the great enlargement of the EU in 2004, Western Europe was ousted as the priority region in the distribution of agricultural funds. In any case, Galicia has continued to benefit from the following plans of the CAP 2007–2013 and 2014–2020 and following its strategic lines aimed at organic production, sustainability, or productive diversification.

Although the new CAP reform was to be approved in 2020 to be applied during the period 2021–2027, the inability to reach an agreement by the EU Council of Agriculture Ministers has resulted in a two-year ex-

Table 1. Livestock and agricultural production: Annual summary by province

Production	Product	Unit	A Coruña	Lugo	Ourense	Pontevedra	Galicia		
			2020				2020	2019	2019/2020 (%)
Livestock									
	total live weight	t	56 858	76 197	151 953	133 832	418 840	426 776	−1.85
	calves < 1 year	t	29 475	27 847	12 778	25 503	95 603	103 397	−7.54
	pigs	t	14 447	3 689	1 775	71 691	91 602	88 127	3.94
Total	farm chicken	t	12 936	44 661	134 850	31 078	223 525	224 085	−0.25
live weight	rabbits	t	0	0	2 550	5 560	8 110	11 166	−27.37
	milk	1 000 L	1 269 906	1 308 073	18 505	291 739	2 888 223	2 713 265	6.45
	chicken eggs (size L)	1 000 dozens	13 387	18 566	1 504	14 103	47561	40 132	18.51
Agriculture									
	wheat	t	5 691	6 475	23 449	460	36 075	34 509	4.54
Grain cereals and legumes	rye	t	323	2 424	11 744	139	14 630	18 512	−20.97
	grain corn	t	44 740	13 595	11 446	26 293	96 074	89 760	7.03
	dried bean	t	−	−	−	−	3 896	3 331	16.96
Tubers	potato	t	−	−	−	−	283 667	371 983	−23.74
Forage crops	forage corn	t	−	−	−	−	1 978 181	1 847 052	7.10
	polyphyte meadow	t	−	−	−	−	3 743 915	3 672 990	1.93
	faba bean	t	16 113	9 254	14 800	10 593	50 760	47 001	8.00
	cabbage	t	17 318	10 940	17 840	9 745	55 843	58 395	−4.37
Vegetables	tomato	t	22 536	12 475	17 418	32 394	84 823	87 488	−3.05
	lettuce	t	7 389	4 457	4 043	10 342	26 231	23 122	13.45
	bell pepper	t	28 346	7 088	6 875	13 792	56 101	64 881	−13.53
	onion	t	7 965	4 484	8 597	9 996	31 042	30 717	1.06
Vineyard	wine grapes	t	7 714	7 358	36 174	90 909	142 155	141 278	0.62

Source: Own elaboration based on Ministry of Agriculture, Fisheries and Food (2020)

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tension of the previous plan. This circumstance has increased the uncertainty of the sector in the year in which COVID-19 has caused an international economic crisis. The pandemic has also introduced changes in consumption habits. In Galicia, while spending per capita on food consumed outside the home fell by 36.8%, spending on food in households increased by 10.3%.

Despite the increase in domestic consumption, the main agricultural and livestock products in Galicia have experienced a decrease in their prices due to the reduction in demand. The exception is the wine sector, as alcoholic beverages have experienced the largest percentage increase, 17.3%, in household spending (Table 2).

Table 2. Livestock and agricultural prices: Annual summary by province

Products	Unit	A Coruña	Lugo	Ourense	Pontevedra	Galicia		
		2020				2020	2019	2019/2020 (%)
Livestock								
Calves < 1 year	EUR/100 kg live weight	256.92	256.92	256.92	256.92	256.92	265.83	−3.47
Cattle	EUR/100 kg live weight	106.92	115.25	115.25	115.25	113.17	121.37	−7.24
Piglets	EUR/100 kg live weight	435.86	435.86	435.86	435.86	435.86	594.24	−36.34
Kids < 1 year	EUR/100 kg live weight	417.50	417.50	417.50	417.50	417.50	574.22	−37.54
Pigs	EUR/100 kg live weight	38.86	38.86	38.86	38.86	38.86	135.43	−248.50
Farm chicken	EUR/100 kg live weight	94.89	94.89	94.89	94.89	94.89	124.01	−30.69
Rabbits	EUR/100 kg live weight	35.12	35.11	35.12	35.12	35.12	25.48	27.45
Chicken eggs (size L)	EUR/100 dozens	121.85	121.11	121.85	121.85	121.67	111.14	8.65
Milk cows	EUR/unit	1 790.10	1 790.15	1 790.15	1 790.15	1 790.14	1 563.09	12.68
Dairy calves	EUR/unit	1 272.11	1 272.11	1 272.11	1 272.11	1 272.11	1 374.41	−8.04
Calves (1–3 weeks)	EUR/unit	256.92	256.92	256.92	256.92	256.92	107.10	58.31
Sheep	EUR/unit	100.00	100.00	100.00	100.00	100.00	86.22	13.79
Goats	EUR/unit	–	–	–	–	–	89.63	–
Piglets	EUR/unit	–	38.29	38.29	38.29	38.29	56.95	−48.73
Milk	EUR/100 L	32.25	32.25	32.25	32.25	32.25	31.52	2.27
Agriculture								
Wheat	EUR/100 kg	24.29	24.29	18.57	18.00	21.29	80.87	−279.87
Rye	EUR/100 kg	–	–	16.57	–	16.57	–	–
Potato	EUR/100 kg	39.44	55.25	26.13	33.67	38.62	52.30	−35.43
Lettuce	EUR/100 kg	71.50	67.50	68.30	67.67	68.74	88.56	−28.83
Cabbage	EUR/100 kg	40.13	44.80	31.94	33.29	37.54	72.57	−93.32
Tomato	EUR/100 kg	75.90	76.00	–	49.60	67.17	150.21	−123.64
Onion	EUR/100 kg	75.00	55.00	42.50	50.00	55.63	99.30	−78.52
Bell pepper	EUR/100 kg	76.79	115.00	–	109.33	100.37	205.86	−105.10
Cauliflower	EUR/100 kg	–	–	–	–	–	167.06	–
Garlic leek	EUR/100 kg	180.00	143.33	–	–	161.67	108.67	32.78
Faba bean	EUR/100 kg	153.83	143.43	119.43	157.56	143.56	229.05	−59.55
Carnation	EUR/dozen	1.30	–	–	0.86	1.08	1.18	−9.24
White wine	EUR/Hgd	–	–	39.96	63.00	51.48	18.18	64.69
Red wine	EUR/Hgd	–	66.60	34.99	–	50.80	16.51	67.51
Pinus pinaster	EUR/m³	30.50	30.50	30.50	30.50	30.50	24.66	19.13
Radiata pine	EUR/m³	30.50	30.29	30.50	30.50	30.45	21.25	30.21

Hgd – hectograd

Source: Own elaboration based on Ministry of Agriculture, Fisheries and Food (2020)

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MATERIAL AND METHODS

The database used in this analysis is Iberian Balance Sheet Analysis System (SABI), belonging to the company Bureau Van Dijk, which contains detailed information on more than 2 800 000 Spanish companies and 938 000 Portuguese companies (SABI 2021). Financial information such as brands, directors, subsidies or audit reports of the companies is available in SABI as the information is exported from the Annual Accounts Repository of the Mercantile Registry (Fernández-González et al. 2021a).

The following criteria were used to define the population sample:

- Location (national): Spain;
- Location (regional): Galicia;
- Classification of activity [Statistical Classification of Economic Activities in the European Community (NACE) Rev. 2]: Code 01 – Agriculture, stockbreeding, hunting and related services;
- Status: active for at least one of the years in between 2017–2020.

Once the criteria were determined, an inclusive Boolean search was carried out, that is, each and every one of the criteria must be accomplished by all the companies in the sample.

Technical treatment of the data was then carried out. The secondary NACE Rev. 2 codes of each company were analyzed and all those records that did not have codes 011 (Growing of non-perennial crops), 012 (Growing of perennial crops), 013 (Plant propagation), 014 (Animal production), 015 (Mixed farming), 016 (Support activities to agriculture and post-harvest crop activities), 017 (Hunting, trapping and related service activities) were eliminated. As a result, the population sample is composed of 998 companies. For a more precise analysis, the sample was classified according to two criteria: sectoral and geographic. As for the sectoral treatment, the sample was divided according to the main activity of the companies: livestock or agriculture. To this end, a new criterion was added to the initial Boolean search based on whether the tertiary code of each of the companies was related to agriculture or livestock farming. The geographical criterion is based on the location of the companies in the four provinces that constitute Galicia. To this end, the initial criteria were joined by another criterion on the provincial location of the companies. As a result, the geographical classification is: A Coruña (320 companies), Lugo (336 companies), Ourense (105 companies), and Pontevedra (237 companies) (Figure 1).



Figure 1. Location of the provinces of Galicia

Source: Own elaboration

In order to carry out a rigorous analysis, focused on the economic and financial performance of the companies in the sector, the following indicators have been calculated for the period 2017–2020:

- Variation in operating income: annual variation in the amount resulting from subtracting direct and indirect operating costs from sales revenue;
- Gross value added variation: annual variation in the figure resulting from subtracting the value of intermediate consumption from the value of output;
- Assets turnover ratio: annual variation of a company's efficiency in generating sales in relation to its assets;
- Profit margin: difference between the price of the final product or service and production or acquisition costs;
- Economic profitability: profit obtained in relation to the net investment made;
- Financial profitability: return on the company's capital in relation to the contributions made by its partners;
- Employment: number of people working in the company.

This set of variables has already been used in other analyses in academia (Heras-Saizarbitoria et al. 2011; Ibarloza et al. 2018; Llorente et al. 2020). Moreover, the availability of the variables, in this case study, was also guaranteed.

In this article, with the exception of the number of employees, which is expressed as the sum of all the values of the aggregate companies, the indicators are calculated as the median of the variation rates of each of the variables to facilitate the interpretation of the trends arising in the context of the COVID-19 pandemic. In addition,

during the process of analyzing the aggregate accounts, the number of companies included, although very similar, varies from year to year given the unavailability of the financial information of some companies. Therefore, running the analysis through the median value is the most appropriate to avoid possible biases.

RESULTS AND DISCUSSION

Results. Due to the consequences of the COVID-19 disease, severe impacts on the agricultural and livestock sector in Galicia were caused. The decline in the variation rates of change of the main economic and financial variables, which in some cases have become negative, shows the slowdown provoked by the closures and restrictions suffered by both the population and national and international trade. As shown in Table 3, the year 2020 has had a negative net variation in the number of companies in the sector, as the number of extinct companies doubled the one of newly incorporated companies.

The period of the first state of alarm (from March 14 to June 15, 2020) was the one with the worst economic consequences for the sector. The closure of the hotel, restaurant and catering (HORECA) channel and school canteens, the suspension of local fairs and the slowdown in trade activity led to a sharp drop in sales of agricultural and livestock products (Table 4). To alleviate this situation, the regional Ministry of the Rural Environment reached an agreement with the main distribution chains in Spain (Gadis, Froiz, Vegalsa-Eroski, Carrefour, El Corte Inglés, Lidl, Alcampo, Grupo Cue-

vas, Coviran and Dia) to commercialize the products of those industries whose income fell by more than 50%, such as those dedicated to the production of fruit, vegetables, artisan cheese, honey, wine, and beef, pork, sheep and goat meat.

The strong international spread of the pandemic resulted in the closure of external borders. This measure was particularly detrimental to internationalized sectors. One of these industries was the wine industry, which recorded losses in its turnover between 40–50%. Another remarkable sector was the ornamental plant production sector, which is one of the most important in Galician agriculture. In total, in 2019, there were 289 greenhouses with a turnover of EUR 44 million located in Galicia, 25% of this value corresponding to exports to European countries. The closure of international borders, due to the pandemic, prevented the commercialization of cultivated plants to markets such as the Dutch, German and Belgian. In addition, the first Spanish state of emergency coincided with the most important production period for nurseries, between March and June, in which up to 80% of their production is marketed. This combination of factors reduced both the sector's turnover and the number of employees. The most affected territory was A Coruña, where many greenhouses are located, followed by the south of Pontevedra (Table 5).

The province of A Coruña also suffered a decline in the aggregate income of the livestock sector, as cattle farms for milk production located mostly in A Coruña and Lugo have had economic losses (Table 6). Paradoxically, in 2020 the highest milk production in the history

Table 3. Newly created and closed companies in the agricultural and livestock sector in Galicia

Year	Sector composition variation	Location				
		A Coruña	Lugo	Ourense	Pontevedra	Galicia
2017	new creation	20	21	6	9	56
	closures	1	7	2	6	16
	net variation	19	14	4	3	40
2018	new creation	17	18	8	12	55
	closures	3	9	3	2	17
	net variation	14	9	5	10	38
2019	new creation	17	12	4	13	46
	closures	12	12	4	6	34
	net variation	5	0	0	7	12
2020	new creation	9	6	0	3	18
	closures	14	7	7	16	44
	net variation	–5	–1	–7	–13	–26

Source: Own elaboration based on data from SABI (2021)

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Table 4. Economic performance indicators (average of the companies, except for the total number of employees) of the Galician agriculture and livestock companies

Variable	Sector	2017	2018	2019	2020
Variation in operating income (%)	livestock	9.08	5.84	19.54	−9.15
	agriculture	26.93	17.45	7.57	−16.41
Gross value added variation (%)	livestock	18.27	2.17	19.78	−12.77
	agriculture	45.25	−13.39	12.96	−4.81
Assets turnover ratio (%)	livestock	0.89	0.82	0.89	0.90
	agriculture	0.45	0.43	0.44	0.43
Profit margin (%)	livestock	4.17	2.54	3.97	3.38
	agriculture	−4.01	0.75	3.91	4.48
Economic profitability (%)	livestock	3.84	2.16	3.64	3.13
	agriculture	−1.84	0.33	1.78	1.97
Financial profitability (%)	livestock	9.09	5.48	8.97	8.45
	agriculture	−5.11	0.97	5.04	5.08
Employment (No. of employees)	livestock	1 407	1 570	1 754	1 464
	agriculture	1 021	1 184	1 153	1 059

Source: Own elaboration based on data from SABI (2021)

of Galicia has been reached, with 2.9 million L of milk. However, Galicia is the region with the lowest milk prices in Spain, at EUR 0.32/L, which, in addition to the high degree of indebtedness derived from the technification of farms, has led to the closure of 347 Galician farms in 2020.

Although the economic implications of the spread of COVID-19 have been severe, its effect could have been even more negative. The EU, the Spanish government and the Galician government implemented various containment measures to curb the uncertainty and mistrust faced by the sector. In terms of national public policies, the deadline for agricultural insurance lines was extended, tax exemptions were granted by reducing the net yield index for agricultural and livestock farms, which in Galicia meant a reduction of EUR 7 million in taxes, and the criteria for being a beneficiary of the support programme for the wine sector were made more flexible. In addition, an aid programme was designed for lamb and kid meat producers for a value of EUR 10 million and permits for the storage of food products were generalized. In addition, the Sectoral Conference on Agriculture and Rural Development under the Ministry of Agriculture decided to allocate EUR 15.17 million to Galicia for various agricultural and livestock programmes.

On the other hand, the Spanish government, together with the Italian government, registered a formal request to the European Commission (EC) to extend the deadline for submitting applications for access to CAP aid.

The EC agreed to this request and extended the possibility of submitting applications until June 15. As a result, the regional government of Galicia, which has the competencies in agriculture and livestock, given the transfer made through the approval of its statute of autonomy, anticipated the payment of 70% of CAP aid to 21 300 farmers and livestock farmers. Thus, in October 2020, EUR 38 million were transferred to the sector. In addition, the regional Ministry of Agriculture of Galicia established a collaboration agreement with various financial institutions to create a line of loans, at zero interest, to receive an advance of the remaining amount of the CAP aids.

The de-escalation period in Spain (June 16–November 6, 2020), brought with it the gradual reopening of the hotel and catering trade. This measure meant reopening one of the main channels for agricultural and livestock products, especially those with high prices. This is the case of the wine industry, which recovered part of its sales at the same time as the regional government of Galicia created a specific credit line for the sector of EUR 60 million. The livestock sector also experienced an improvement in its economic performance. The reopening of livestock fairs, as well as the reactivation of sales in the wholesale sector, cushioned the fall in the prices of pork and rabbit meat and fattening cattle which, in some cases, reached historic lows.

The second state of alarm (November 7–December 3, 2020) entailed the intermittent closure of the HORECA channel but the population was not confined

Table 5. Economic performance indicators (average of the companies, except for the total number of employees) of the Galician provinces' agriculture companies

Province	Agriculture	2017	2018	2019	2020
A Coruña	variation in operating income (%)	50.54	32.98	11.08	−34.99
	gross value added variation (%)	18.71	21.08	8.27	−14.72
	assets turnover ratio (%)	0.45	0.40	0.43	0.39
	profit margin (%)	2.58	−1.21	2.34	2.30
	economic profitability (%)	1.18	−0.49	1.03	0.93
	financial profitability (%)	3.71	−1.89	3.40	2.35
	employment (No. of employees)	310	403	389	310
Lugo	variation in operating income (%)	20.80	−3.48	4.94	−10.19
	gross value added variation (%)	10.19	−4.98	12.08	−1.13
	assets turnover ratio (%)	0.42	0.41	0.43	0.40
	profit margin (%)	3.36	2.33	4.13	4.09
	economic profitability (%)	1.49	1.01	1.85	1.70
	financial profitability (%)	3.35	2.26	4.73	4.36
	employment (No. of employees)	144	130	149	138
Ourense	variation in operating income (%)	10.55	8.25	−6.80	−5.71
	gross value added variation (%)	51.52	−9.45	6.33	−3.93
	assets turnover ratio (%)	0.38	0.46	0.43	0.41
	profit margin (%)	17.39	7.41	2.99	3.81
	economic profitability (%)	6.82	3.51	1.33	1.59
	financial profitability (%)	11.39	4.96	1.93	2.42
	employment (No. of employees)	138	200	154	147
Pontevedra	variation in operating income (%)	13.34	12.96	6.84	4.60
	gross value added variation (%)	85.27	−36.68	20.33	3.42
	assets turnover ratio (%)	0.48	0.49	0.47	0.48
	profit margin (%)	−19.58	1.37	6.14	6.59
	economic profitability (%)	−9.57	0.68	2.97	3.23
	financial profitability (%)	−31.49	1.92	8.42	9.79
	employment (No. of employees)	429	451	461	464

Source: Own elaboration based on data from SABI (2021)

to their homes, as had been the case in the second quarter of the year. Despite the fact that one of the main commercialization channels was closed again, agriculture and livestock farming did not suffer as high losses as in the first state of alarm. One of the factors behind this improvement is related to the reinforcement of secondary strategies for the marketing of products such as online sales, which increased by 500% in the wine sector and by 25% for the rest of the agricultural sector, and sales in food retail channels, with an increase of 25%.

It is important to remark that not all the losses in the sector are related to the effects of the pandemic. This is the case of honey producers located on the coast of Galicia (provinces of A Coruña and Pontevedra).

The short flowering of eucalyptus trees, as well as the effect of an invasive bee species, reduced Galician honey production by 70%. Weather issues were also behind the 30% decrease in the apple harvest. On the other hand, water stress reduced fodder production, which not only damaged the cereal sector but also the dairy sector, as livestock feed is based on this crop. As far as the wine sector is concerned, once foreign trade recovered, the tariffs approved by the Trump administration penalized the exports of this industry.

Discussions. The need to identify the risks to which businesses in this sector are exposed is a consequence of the fundamental role they play in the provision of food. The pandemic created a new economic

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Table 6. Economic performance indicators (average of the companies, except for the total number of employees) of the Galician provinces' livestock companies

Province	Livestock	2017	2018	2019	2020
A Coruña	variation in operating income (%)	38.25	1.21	23.77	−25.12
	gross value added variation (%)	33.39	−0.48	28.12	−24.51
	assets turnover ratio (%)	0.80	0.73	0.80	0.71
	profit margin (%)	2.36	−0.88	1.93	−0.07
	economic profitability (%)	1.94	−0.66	1.59	−0.05
	financial profitability (%)	4.69	−1.78	3.81	−0.12
	employment (No. of employees)	516	585	683	515
Lugo	variation in operating income (%)	1.69	8.34	4.11	−9.83
	gross value added variation (%)	0.50	6.88	3.70	−8.89
	assets turnover ratio (%)	0.75	0.74	0.76	0.77
	profit margin (%)	5.27	5.12	5.05	5.35
	economic profitability (%)	4.24	4.03	4.04	4.35
	financial profitability (%)	8.77	8.35	8.43	8.95
	employment (No. of employees)	523	600	616	507
Ourense	variation in operating income (%)	60.85	71.88	61.40	4.93
	gross value added variation (%)	27.15	53.48	15.91	−20.31
	assets turnover ratio (%)	0.57	0.53	0.85	1.05
	profit margin (%)	5.32	5.53	4.58	2.38
	economic profitability (%)	3.27	3.14	4.05	2.56
	financial profitability (%)	7.24	8.71	11.00	6.70
	employment (No. of employees)	73	88	106	79
Pontevedra	variation in operating income (%)	−8.23	0.69	22.12	4.54
	gross value added variation (%)	31.44	−10.14	37.30	0.76
	assets turnover ratio (%)	1.31	1.20	1.22	1.24
	profit margin (%)	4.90	2.95	5.03	4.81
	economic profitability (%)	6.53	3.61	6.26	6.06
	financial profitability (%)	19.49	11.76	20.34	29.92
	employment (No. of employees)	295	297	349	363

Source: Own elaboration based on data from SABI (2021)

scenario, in which the decrease in food expenditure outside the home, the ban on agricultural fairs and the closure of the HORECA channel posed a great challenge, as it led to a reduction of the profit margins and to an unprecedented accumulation of stocks in the sector. As a result, alternative marketing channels have been sought, such as distribution contracts with large food chains and, above all, online sales. On the demand side, as analyzed by Dannenberg et al. (2020) and Gavilan et al. (2021), fear of COVID-19 encouraged consumers to increase their online transactions in the food sector, with a more complete virtual shopping basket and the addition of new categories of goods. On the supply side, following the assumptions set out by Hobbs

(2020), the supply chain in Spain was exposed to a major demand shock that encouraged the creation of contingency plans to bring safe, affordable, and nutritious food to consumers. These plans, for the most part, focused on online marketing (Dsouza and Sharma 2021).

The impetus towards digitalization and the adoption of new technologies has been a positive outcome of this crisis. In Spain, the digitization process in agricultural and livestock companies was advancing at a slower rate compared to other industries, but the pandemic has acted as a catalyst to increase, or initiate, its technological aspect. Moreover, within the primary sector, Galicia was one of the regions with the lowest percentage of business digitization, so the growth rate of pri-

mary digitization has been one of the highest in the country. Regarding this point, public investment has been fundamental for encouraging the digital pathway. As de la Fuente (2021) analyzed, the COVID-19 package of measures against the crisis approved in Spain includes the improvement of connectivity and information and communication technologies (ICT) skills to, among other objectives, reduce the digital divide between regions.

Institutional measures are not limited only to the digitalization process. The rising transaction costs, the decrease in demand for proximity services and the reduction in employment were negative consequences that affected, to a greater extent, small and medium-sized enterprises in Spain, the predominant type of companies in the Galician agrarian sector (Pedauga et al. 2022). The multilevel stimulus plans, although approved with some delay, helped to mitigate the impact of this crisis. Agriculture and livestock were not the only sectors that benefited from specific measures, the fishing sector (Fernández-González et al. 2021b), the tourism sector (Araújo-Vila et al. 2021), or the education sector (Díez-Gutiérrez and Gajardo Espinoza 2021) were also supported by subsidies.

The transfer of public rents to the agricultural sector contributed to mitigating the negative trends in its economic performance. Even so, the losses have been significant, especially in those subsectors that mainly use the HORECA channel for the distribution of their products, which suffered a sharp drop in demand since the first period of enclosure of the population. As Corchuelo Martínez-Azúa et al. (2021) shown, the different degrees of resilience exhibited in the sector have been heterogeneous. Thus, it is necessary to reinforce innovativeness not only in the production process but also in the planning and distribution of products. Ensuring the survival of companies in the face of external shocks is vital. While the strengths and limitations of the sector have been exposed during the pandemic, these lessons should be used by policymakers and stakeholders to strengthen food security and its future provision.

CONCLUSION

The results of this study show the severe difficulties derived from the COVID-19 pandemic in the agricultural and livestock sectors in Galicia. The carried out analysis responds to the research questions previously addressed on the effects of the COVID-19 crisis both at a holistic level, considering the whole agrarian sector, and at a sectoral, territorial, and institutional level.

Widespread losses in these sectors led to a negative net change in the number of companies in the sector for the first time in four years. This trend was not only present at the aggregate level, but also in all Galician provinces, where the number of companies decreased in 2020. The livestock sector has been the one that has registered the highest number of business extinctions, in the same way, that the decrease in the number of jobs (–290) is greater than in the agricultural sector (–94).

An aggregate view of the financial analysis conducted in this article shows that the damage within the agrarian sector has been distributed. In 2020, the livestock sector outperforms the agricultural sector in terms of decrease in gross value added and number of employees and has a higher rate of company extinction. However, the agricultural sector has worse records in the variation of operating income, economic profitability, financial profitability, and asset turnover ratio. Faced with the question of which sector has suffered the most, the results reflect a relative parity of negative effects in both industries.

However, the evolution of the agrarian sub-sectors has been uneven. As far as the agricultural sector is concerned, the flower and ornamental plant production sub-sector has been the most damaged. The closure of international borders, as well as the lack of alternative distribution channels, severely harmed a sector whose perishable product does not allow for a storage strategy as was the case in other sub-sectors. Regarding the livestock sector, the sub-sector with the greatest losses has been beef production. The change in consumer preferences, which, in a crisis scenario, replaced beef consumption with chicken, rabbit or pork, together with the strong dependence of the subsector on the HORECA channel, damaged the sector. In addition, the decrease in fodder crops together with the increase in the time for the maintenance of cattle on farms increased the feed costs of livestock farms. Since a large part of the greenhouses and beef cattle farms are located in A Coruña, this province has been the most affected.

Institutional actions have also played a very important role in the management of the pandemic. Governance of the primary sector in Galicia is characterized by its multilevel nature, as both the EU and the Spanish and Galician governments own assigned competencies. In view of the difficulties predicted for this strategic sector, different regulations were adopted, such as the transfer of public funds, tax exemptions, or the simplification or reduction of administrative requirements for the sector's necessary transactions. The new institutional architecture has softened the negative impact

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of the pandemic but has not been able to fully compensate for the losses suffered by the sector. The bureaucratic timelines, which are normally not very agile, the delay in the coordination of aid plans at a regional and a state level, and the fear of overlapping competencies between administrations have slowed down the aid to the sector. As a result, in the first months of the pandemic, uncertainty in the sector was high and, in general terms, a conservative position was adopted in the management of companies in the sector.

The complexity of the nature and relationships of external and internal factors affecting the evolution of the agricultural sector encourages future research. Given the limitations in the availability of financial data, the study period has been extended only to 2020. Increasing the time range would reveal whether the losses of the sector concern the short or medium term. The processes of digitization and commercialization, initiated during the pandemic, also present a suitable potential for further analysis as to whether they are long-lasting or short-lived strategies.

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