

Communication

Learning Resilience in Local Livestock Breeds from COVID-19 Pandemic

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Abstract: In situ conservation of local breeds requires populations in economically sustainable and resilient production systems. In those countries where the market recognizes the quality of the products of local breeds, the traditional relationship between local breeds and products can be used to improve breed profitability. We analyze sales data from year 2020 of five dairy products associated with endangered local breeds farmed in northern Italy, in order to understand the potential resilience of these production systems, in terms of ability to persist and to adapt to disturbances associated with the COVID-19 pandemic. All breed-cheese systems showed good capacity to persist during the COVID-19 pandemic, with four systems even increasing sales with respect to the period 2017–2019. Three breed-cheese systems showed rapid adaptation to the new conditions by modifying sales channels, including the introduction of e-commerce.

Keywords: in situ conservation; resilience; local livestock breeds; COVID-19; dairy products



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1. Introduction

The Food and Agriculture Organization of the United Nations (FAO) defines in situ conservation as the conservation of livestock diversity through continued use by their keepers in the agro-ecosystems in which populations are normally found [1]. A wide consensus exists for in situ conservation, and its importance is emphasized by the UN Convention on Biological Diversity (CBD) [2]. Minimizing costs for conserving breeds in situ requires livestock populations in economically sustainable production systems, systems capable of supporting a defined level of economic production in the long term, contributing to a sustainable development of the rural communities, and guaranteeing, at the same time, all conservation values of livestock breeds, without negative impacts on the environment. Therefore, it is important to consider the options we have for successful in situ conservation of breeds through their utilization, and to make local endangered breeds self-sustainable. Among others, in countries where the market is ready to recognize the quality of the food products from local breeds, the traditional relationship between local breeds and products can be used to diversify products and to improve breed profitability [3].

Resilience, i.e., the capacity of the production system to deal with change, is an important attribute of economically sustainable production systems. We refer here to resilience as the capacity to absorb disturbances and to reorganize while undergoing change, so as to retain the same function and identity [4].

The current COVID-19 pandemic is having, and most probably will have for some time, a strong impact on the food supply chain, including livestock production. Some production systems have proved to be particularly vulnerable, such as the pig and poultry industries; some high-throughput production systems have shown, in general, fragilities associated with longer transport distances and low biosecurity at both farm and processing plants levels [5]. The effects that the COVID-19 pandemic has had and will continue to have on the sustainability of local breeds are yet to be understood. We also need to consider the

wide variety of situations associated with the farming of local breeds. Some weakness may be associated with their farming territories, which are often characterized by fragile socio-economic contexts, with probably limited capacity to react to the effects of the pandemic. In richer countries, food chains characterized by local products, gastronomy, and tourism can be expected to be negatively affected. However, in such countries widespread popular interest in short food chains, natural food, and traceability of products could also create specific opportunities for local breed production systems [6], opportunities that might benefit from appropriate modification of the distribution channels through which to market products, such as e-commerce.

We present here preliminary data on the sales, in 2020, of five dairy products associated with endangered local breeds farmed in northern Italy, in order to understand the potential resilience of these production systems in terms of persisting and adapting ahead of disturbances associated with the COVID-19 pandemic.

2. Materials and Methods

The analyzed dairy products and their associated livestock breeds (breed-cheese systems) are presented in Table 1. The five breed-cheese systems were chosen because of their strong tradition, as well as the availability of recent data. Four products are associated with three cattle breeds. Conversely, the Historical Rebel cheese, formerly Heritage Bitto, is produced using cow milk (traditionally of the Italian Brown breed) with a supplement of 10–20% of milk from the Orobica goat breed. The Morlacco di Vacca Burlina, Bastardo del Grappa, and Historic Rebel cheeses are produced during the summer grazing period in the Alps. The two Parmigiano Reggiano cheeses have a Protected Designation of Origin (PDO; EU regulation 510/2006) and are produced in the Padana Plain in zero grazing systems with no maize silage. All breeds associated with the dairy products are autochthonous local breeds categorized as endangered [7], with the number of adult females in 2020 ranging from approximately 440 to 2400.

Table 1. The breed-cheese systems analyzed.

Breed-Cheese System	Cheese			Breed Associated (n. Females Registered in Year 2020 [7])	Area-Region
	Name	Months of Ripening	Price €/kg in 2020		
REGGIANA-PRVR	Parmigiano Reggiano Vacche Rosse	24–72	24	Reggiana cattle (2330)	Reggio Emilia–Emilia Romagna
MODENESE-PRVB	Parmigiano Reggiano Vacche Bianche	22–84	26	Modenese cattle (593)	Modena–Emilia Romagna
BURLINA-MOR	Morlacco di Vacca Burlina	0.5–3	16	Burlina cattle (438)	Treviso, Belluno, and Vicenza–Veneto
BURLINA-BAS	Bastardo del Grappa	4–6	15	Burlina cattle (438)	Treviso, Belluno, and Vicenza–Veneto
OROBICA-HR	Historic Rebel	2–120	45	Orobica goat (2322)	Gerola, Brembana, Bitto di Albaredo valleys–Lombardy

The Consortia of production of the five cheeses were interviewed by means of a semistructured questionnaire followed by data discussion at the phone.

The questionnaire included:

- (i) kg of cheese sold during the period 2017–2020, with a focus on years 2019–2020 to investigate sales trends before and during the COVID-19 pandemic.

- (ii) Sales channels used before and during the lockdown imposed by the COVID-19 pandemic.
- (iii) Interpretation of the Consortia regarding the capacity of the dairy products to persist under the pandemic stress conditions.

3. Results

Sales per year in the period 2017–2020 of the five dairy products are illustrated in Figure 1. Table 2 reports variation in sales before and during the COVID-19 pandemic.

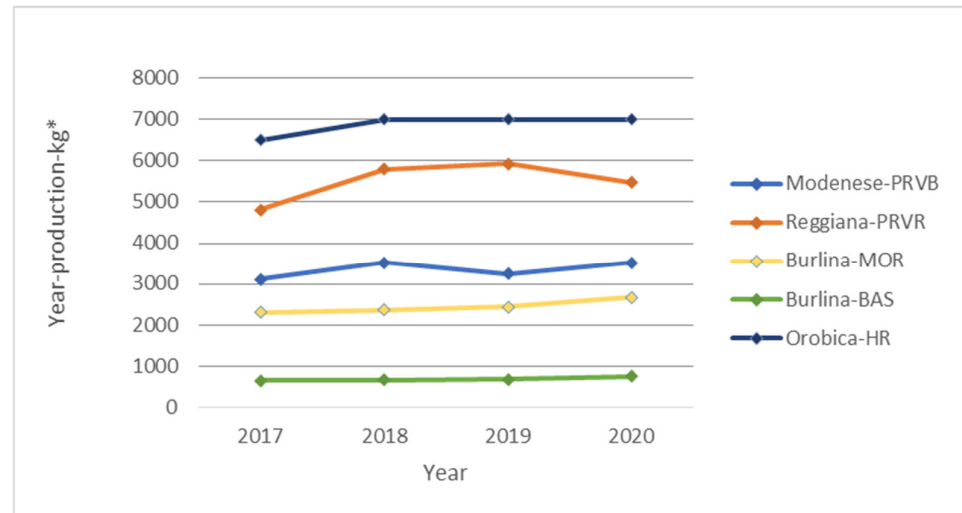


Figure 1. Sales (kg) from 2017 to 2020 of the products of the five breed-cheese systems. (*) Sales of MODENESE-PRVB and REGGIANA-PRVR are presented reduced by a factor of ten.

Table 2. Variation of cheese sales before and during the COVID-19 pandemic.

Breed-Cheese System	2019 vs. 2017 (%)	Mar–May 2020 vs. Mar–May 2019 (%)	Jun–Aug 2020 vs. Jun–Aug 2019 (%)	2020 vs. 2019 (%)
REGGIANA-PRVR	23	−31	15	−7
MODENESE-PRVB	−9	13	37	9
BURLINA-MOR	5			10
BURLINA-BAS	5			10
OROBICA-HR	8			0

In the period 2017–2019, before the COVID-19 outbreak, the sales of four breed-cheese systems increased, from a moderate 5% in BURLINA-MOR and BURLINA-BAS and 8% in OROBICA-HR, up to 23% in REGGIANA-PRVR. Conversely, the sales of MODENESE-PRVB increased until 2018, but later decreased, with a loss of 9% over the period analyzed.

Using these trends as general benchmarks, we were interested in analyzing sales in 2020, which were affected by COVID-19 disturbances, compared to those in 2019. In 2020, sales of the two cheeses made with Burlina milk increased by 10%, which is twice that seen during the period 2017–2019. Sales of the Historic Rebel cheese did not show any change. Sales of MODENESE-PRVB reversed the 2017–2019 negative trend, increasing by 9%. Sales of REGGIANA-PRVR had a behavior opposite to that of the other cheeses, with a decrease of 7%. Sales of the two Parmigiano Reggiano cheeses were provided as monthly data, allowing us to better analyze their behavior in 2020. During the first lockdown period, from March to May 2020, the sales of MODENESE-PRVB increased by 13% with respect to the same period in 2019. The increase was even higher from June to August 2020 (37%). Then, at the end of December 2020, as already mentioned, the total 2020 vs. 2019 sales showed a 9% increase. Sales of the REGGIANA-PRVR registered a consistent loss (−31%)

in the first lockdown, followed by an increase (+15%) during summer, but this was not sufficient to avoid the loss of 7% over the whole 2020 year.

With the exception of the BURLINA-BAS cheese, which, since 2013, is sold only in one regional supermarket chain, sales of the analyzed cheeses take place through different channels. Sale channels were partly modified under COVID-19 pressure (Table 3). Sales on farms were severely reduced for the Parmigiano Reggiano cheeses made both with Reggiana (−40%) and Modenese cows (−50%). Sales on farms increased (around +10%) for both BURLINA-MOR and OROBICA-HR. Most interesting, before the pandemic, only one cheese was distributed via e-commerce. During the COVID-19 pandemic, MODENESE-PRVB and OROBICA-HR started to be sold online, and the REGGIANA-PRVR, which already used the online channel, increased sales by 100%. The MODENESE-PRVB, besides introducing e-commerce later in the year, increased its sales consistently through supermarkets and in the new channel of home delivery. Sales to restaurants were severely affected for all cheeses because of the lockdown rules following COVID-19 pandemic.

Table 3. Sales channels before and during the 2020 COVID-19 pandemic.

Sales Channels Breed-Cheese System	On Farm		Shops/Restaurants/Home Delivery		Supermarkets		E-commerce	
	Before COVID- 19	During COVID- 19	Before COVID- 19	During COVID- 19	Before COVID- 19	During COVID- 19	Before COVID- 19	During COVID- 19
REGGIANA-PRVR	yes	−40%	yes	−17%	no	no	yes	+100%
MODENESE-PRVB	yes	−50%	yes	+80%	yes	+110%	no	yes
BURLINA-MOR	yes	+11%	no	no	no	no	no	no
BURLINA-BAS	no	no	no	no	yes	yes	no	no
OROBICA-HR	yes	+10%	yes	yes	no	no	no	yes

The production Consortia suggested that the following product characteristics contributed to the persistence of these breed-cheese systems during the pandemic: healthiness, genuineness, and tradition. In addition, cooperatives advised that the following elements also contributed to persistence: short chain, possibility of direct contact with the producer, existence of a direct link product-nature (e.g., summer mountain pasture, extensive farming), opportunities for trekking in nature, opportunities for mountain tourism, and the fact that these regions were less affected by the social distancing pandemic rules than coastal areas.

4. Discussion and Conclusions

In richer countries, food is increasingly considered, beside its nutritional value, as a way of life and part of ones identity. Together with considering the quality and the gastronomic characteristics, attention is today given to cultural traditions and, more generally, to the image of the product [8]. Dairy products from many local breeds fit well into this framework. Collado et al [9] used a SWOT (strengths, weaknesses, opportunities, and threats) analysis to identify conservation and development strategies for local cattle breeds: opportunities coming from the market for typical products were rated most highly.

All five breed-cheese systems showed a good capacity to persist during the COVID-19 pandemic in 2020, even increasing sales with respect to the period 2017–2019. Only sales of REGGIANA-PRVR decreased with respect to 2019, when a progressive increasing trend observed since 2017 was interrupted. The reduction of sales of this cheese was particularly high during the lockdown period March to May, followed by a positive reaction (+15%) in the three following months, mainly through an increase in e-commerce. Not enough data are available to compare sales of these products with those of the wider cheese market in Italy. In general, during the COVID-19 pandemic, the consumption habits of Italian families did not change, although changes were observed across products (e.g., decrease of sales of fresh cheeses, increase of long-life milk and ripened cheeses) and patterns of consumption, with a general increase of cooking at home [10].

Strictly associated with resilience of the system is its adaptability to new conditions. Adaptability is defined as the capacity of human factors in systems to influence their resilience [4]. Generally, with respect to business and production systems, adaptability is an important factor for efficiency and success. Restriction of human movements and business closures from March to May 2020, and later, affected sales in different ways. The Consortia of the two cheeses using the supermarket channel were asked for larger amounts of product, following an increased demand by citizens for natural, genuine, and traditional food. MODENESE-PRVB was capable of increasing its supplies; for BURLINA-BAS, this was not possible because of the limited size of its production system.

Sales on farms and in shops in the farming area showed different trends. The breed-cheese systems located in mountain areas increased their sales. Many consumers reported that buying cheese in the production area gave them an opportunity for tourism/trekking in an attractive mountain area.

The BURLINA-BAS and the OROBICA-HR cheeses, during the COVID-19 pandemic, continued to be commercialized only through their Consortia. In the other systems, each farm/cheese dairy market acted independently, and therefore, different behavior and reactions in response to the COVID-19 pandemic were observed. Farms using different sales channels rapidly adapted by selecting the most functional ones. Farms relying exclusively on local markets, county fairs, restaurants, and second home frequenters encountered severe problems. Some cheese dairy markets started a home delivery service; however, this channel was abandoned as soon as the lockdown ended because of its complexities and cost. Three breed-cheese systems in particular showed adaptation to the new conditions, turning their attention to e-commerce. The MODENESE-PRVB and OROBICA-HR systems rapidly took action to introduce, for the first time, online sales. The REGGIANA-PRVR system, which had already introduced e-commerce, notably to reach foreign consumers, powered its system and increased sales through this channel by 100%. In general, adaptability was probably facilitated by the small size of the systems and their low level of complexity.

The data presented in this communication are preliminary, considering that the COVID-19 pandemic is still evolving, and because they refer to the limited number of cases that it was possible to investigate. Nevertheless, we propose some conclusions that may be taken into consideration in the current management of the five breed-cheese systems, to improve their sustainability and resilience, and to address investigations into similar systems.

- All production Consortia emphasized that the high quality of their products mostly contributed to their persistence during the COVID-19 pandemic. Narloch et al [11] underlined that product market development may increase the profitability only of those characteristics that appeal to consumers. Ligda and Casabianca [12] stressed the importance of the quality of products in the strategies to add value to local breeds. In Italy (data unpublished), many experiences were developed in the last two decades supporting the approach of a marketing link between dairy and meat products and local breeds, aimed at improving their economic profitability; however, the most successful were those characterized by high-quality products, considering both their organoleptic attributes and naturalness.
- Many local breeds are farmed in areas characterized by specific local socio-economic development, and these areas often lack staff with technical expertise. Our data suggest that assistance in the promotion and commercialization of products may be of primary importance for their sustainability.
- The Consortia reported that consumers were particularly motivated to purchase dairy products directly from the producer, or from retailers directly connected to producers, including via e-commerce, because of the value associated to the short chain and because they expected to obtain better quality in this way.
- In all cases, we encountered motivated entrepreneurs, suggesting that professionalism and marketing were behind the success of the product. Successful entrepreneurs

were capable of establishing links between the different stakeholders of the breed conservation and development process, and of identifying the distinctive features of the product [13].

- Conservation policies for local breeds should consider technical assistance for farmers and producers, including educational programs to teach the use of new techniques and technologies in developing and marketing animal products, and more generally, to improve entrepreneurship.

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Conflicts of Interest: The authors declare no conflict of interest.

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