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Economic Assessment of Small-Scale Mountain Dairy Farms by Using Accounting Data: Evidence from an Italian Case Study

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Abstract

Dairy mountain farms are economically disadvantaged due to small farm sizes and high production costs. This situation was exacerbated firstly by the opening of the market linked to the abolition of milk quotas; secondly by the rising prices due to the energy crisis due to covid 19 and the war in Ukraine. However, these farms are important for the preservation of traditional landscapes, the economy of these areas and the offered ecosystem services, especially when they are managed extensively. The objective of this research is to understand if mountain dairy farms are economically sustainable and competitive through the analysis of a case study. The economic analysis takes into account the production cost of milk, profitability, and some economic indicators using accounting data. The results show that the farm profitability is decreasing, and the costs are unsustainable. As a consequence, more efficient policy support is needed to overcome this crisis.

Keywords

Dairy farms, mountain areas, Appennines, economic analysis, sustainability, case study.

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Introduction

The European dairy sector has undergone many changes over the last decade, which led to a radical transformation. One of them is the removal of milk quotas in 2015. This event brought an increase in volatility in milk prices (Milk Market Observatory, 2023) and induced a change in European farmers' strategies, forcing them to rely on their adaptive and transformative capabilities (Jongeneel and Gonzalez-Martinez, 2022). This transition created the need for farmers to reform their existing management strategies and brought to gradual process of intensification of dairy production, with increased production and the concentration of livestock in larger holdings located in more profitable regions to the detriment of disadvantaged areas such as mountains (MacDonald et al., 2000; Tasser et al., 2007; Groeneveld et al., 2016; Dervillé et al., 2017; Berton et al., 2020).

These changes in the socioeconomic scenario can have dramatic and immediate effects on the mountain system, causing both economic and environmental problems (Bernués et al., 2011).

According to ISTAT data, in Italy mountain areas represent approximately 35% of the territory (ISTAT, 2020). In these areas, agricultural and livestock activities have a significant importance and, very often, are the only ones capable of guaranteeing the permanence of the populations and avoiding situations of extreme marginalization (European Parliament, 2013).

In particular, mountain dairy farms represent one of the primary sources of livelihood in these areas and are fundamental to the maintenance of the landscape and cultural rural heritage (Plieninger et al., 2006; Battaglini et al., 2014; Dervillé et al., 2017; Morales et al., 2019). Indeed, they are usually small-scale and low-intensity family farming systems, characterized by the use of a particularly high share of permanent grassland for hay production and pasturing (Pinter and Kirner, 2014; Kühl et al., 2020).

The use of pasture makes those farms an important source of ecosystem services and allows them to achieve more sustainable environmental performances when compared to the lowland farms (Bernués et al., 2011; Marini et al., 2011; Verduna et al., 2020). For this reason, the preservation

of small family farms is one of the key factors in the sustainability of agropastoral systems (Corsi, 2006; Aldanondo Ochoa et al., 2007; Aubert et al., 2009; Cavicchioli et al., 2015). The social system of mountain areas itself is suffering a profound impact which puts the cultural heritage of local populations and social sustainability for future generations at risk. For the Italian dairy sector, mountain livestock farming is the basis of dairy production that is unique in terms of history, production characterization and quality (Sturaro et al., 2013).

However, these farms are endangered by the marginal conditions they face which make their economic situation particularly difficult (Pinter and Kirner, 2014; Staffolani et al., 2023). From the literature, it emerges that mountain dairy farming has higher production costs compared to dairy farms located in plain areas (European Commission, 2008; European Parliament, 2013; Lips, 2014). This is related to higher fixed costs, due to a lower quantity of milk produced and the impact of the pasture rental on the farm costs (Kühl et al., 2020; Verduna et al., 2020).

Compounding the situation, from the second half of 2021 and subsequently in 2022, there has been a sharp increase in the variable cost, in particular of energy and feed (CREA, 2022) due to the increase in global energy demand due to the reopening of the markets after covid 19, and then to the war in Ukraine (European Commission, 2022).

To cope with this difficult situation, the European Union provides financial support for the maintenance of agriculture in the mountains (European Parliament, 2018). However, as Kühl et al. (2020) affirm, low-input farms are often dependent on subsidies and without financial aid, their income could be negative.

In this context, the aim of this research is to analyse the economic sustainability and competitiveness of small-scale mountain dairy farms. In detail, the economic analysis of a case study is conducted to compute the production cost of milk and the profitability. Moreover, to explain the dairy farm's efficiency the Income Over Feed Costs (IOFC) performance indicator is calculated. The analysis will be conducted following a cost analysis methodology. To increase the robustness of the results, a direct comparison between the case study's data and the national data from the Italian Livestock Products Market Observatory (SMEA, 2023) is carried out. In detail, the analysis of national production costs and profitability of bovine milk is carried out using the data collected by CREA-PB (Council for Research in Agriculture and the Analysis of Agricultural Economy - Policies and Bio-economy) within the FADN (Farm Accountancy Data Network).

The document is organized as follows: section 2 provides the dataset and method; section 3 presents and discusses the main results; finally, the conclusions and some policy implications are detailed in section 4.

Material and method

Case study and data collection

In this research, we focused on a case study.

The investigated dairy farm is located in the Marche Region (Central Italy) in the mountain area of the Apennines of central Italy (Figure 1). In the Marche Region, at the time of the analysis, there are only 88 dairy cattle farms, for this reason it represents one of the Italian regions with the smallest number of farms (Anagrafe Nazionale Zootecnica, 2024). However, 65% of the farms in this region are located in mountain areas. The average size of these farms is 60 dairy cows per farm, and they produce 68% of the milk in the entire region. For these reasons, mountain dairy farming is of particular importance for this area.

The case study farm was chosen because its average size conforms to the characteristics of the farms in its region and for its particular characteristics (presence of farm dairy and quality logos) which make it an interesting example for evaluating the sustainability of this type of farm.

The farm is family-run with the help of permanent employees. In 2022, an average of 120 animals were raised within the farm, of which 60 cows, of the “Italian Red Spotted” cattle breed, characterized by a dual attitude and marked rusticity. Breeding, in 2022, was carried out on pasture in the summer and in cubicles in the winter.

The feed and fodder are partly self-produced and partly purchased from local farms. In particular, the farm has access to a total of 87 ha of which 20 ha are occupied by forest, 60 ha are intended for grassland pasture and 7 ha are arable land.

The farm is characterized by the use of precision technologies for milking (automatic milking system DE LAVAL) that improve the efficiency of management.

Source: our elaboration

Figure 1: Geographical setting and picture of the study dairy farm.

Moreover, from the point of view of quality, the farm produces high-quality milk that complies with the quality parameters set by the regional system "Qualità Marche" (QM) (L.R. 23/2003) and is certified with the European "Mountain Product" label (Commission Delegated Regulation (EU) 665/2014).

Finally, it should be noted that part of the milk production, equal to 41%, is destined for sale to the local cooperative, while the remaining part is directly worked in the dairy farm for the processing and marketing of dairy products. For the purposes of this analysis, only the revenue and cost aspects of milk production will be presented, taking into account the higher price of milk processed in the farm dairy.

During the period under analysis, substantial changes were observed in the structural characteristics of the case study, as can be seen in Table 1.

	2019	2020	2021	2022
TAA (ha)	33	33	33	87
UAA (ha)	13	13	13	67
Total work units	2	2	3	3
Family work units	1	1	1	1
Number of cattle	105	120	120	120
Dairy cows	52	60	60	60
LU	79.2	84	84	84
Milk produced (t)	367	432	436	445
Yield (t/cow)	7.05	7.20	7.27	7.41

Source: our elaboration

Table 1: Evolution of the structural characteristics of the farm by reference year.

This first change occurred in the period 2019/2020 with the increase in the yearly average number of cattle, from 105 to 120, and cows, from 52 to 60, which led to an increase in the quantities of milk produced, from 367 t to 445 t, with an average annual production of 7.41 t of milk per cow in 2022.

After the increase in the number of cattle on the farm, there was an increase in the number of working units, with the recruitment of a new permanent worker. Finally, in 2022, the farm increased the usable agricultural area (UAA) available by renting new land mainly used for grassland/pasture. In fact, before 2022 the farm used grazing exclusively for dry cows, while starting from this year it has extended the practice to the entire herd.

The collection of information and data took place through a series of direct interviews with the owner of the dairy farm.

Economic assessment method

In order to analyse the costs of production of milk and the profitability of the case study, this research follows a cost accounting analysis.

In particular, the cost items were classified on the basis of the actual monetary transition. Explicit costs were therefore identified, i.e. monetary transitions in favour of the subject who supplied the specific production factor (e.g., payment to the fodder seller), and implicit costs, i.e. costs not originating from monetary outlays (e.g., depreciation) (Gregori, 2021).

In this classification, explicit costs are represented by all the factors purchased by the farm through the market, and which therefore require monetary transitions, while implicit costs are the costs linked to the factors supplied by the farm itself, for which their remuneration does not require of monetary transitions. These were therefore estimated. For this reason, the costs of the case study were collected based on the expenses actually incurred by the farm obtained from the analysis of the invoices received. Furthermore, some indirect cost items (such as depreciation) were calculated by the authors.

This methodology was chosen to identify total costs and total revenues in order to calculate the profitability of the dairy farm.

All production costs incurred are attributed to the main product, i.e. milk, as the farm under analysis is specialized in the production of this product, and the technical and economic choices are made based on bovine livestock production, with a crop combination oriented to obtain fodder and cereals intended for reuse in livestock farming. Furthermore, most of the other products sold, which on average account for less than a fifth of revenues, are largely co-products, such as meat, obtained in the same production process as milk, the cost of which is inseparable from this unless of complex and random estimates.

In detail, cost items are collected in eight groups of inputs and expressed in €/100 kg of milk produced:

- the first group of factors is related to the cost of purchased feed, represented by fodder and hay purchased.
- The second group includes the feed production costs, represented by the cultivation costs and the mechanization costs.
- The third group, called "livestock cost", comprises three categories of costs: veterinary and pharmaceutical products, energy expenditures, and other expenditures.
- The fourth group comprises the general expenses of the livestock farm and the cost of use of the land, composed of the rents and the value attributed to the landed capital of the property.
- The fifth group includes the depreciation of buildings, machinery and livestock.
- The sixth group is related to labour costs, where both family work and employees' wages are included.
- The seventh group consists of interest.
- The last group of costs consists of taxes on production. In the case study analysed it is specified that the tax item was not taken into consideration because the farm had an exemption for the payment of taxes due to the damages suffered as a result of an earthquake that hit the area in which it is located in 2016 (Camera.it, 2022).

The total revenue, also expressed per 100 kg of milk, derives from the sum of the value of the milk produced with the animal sales, the Common Agricultural Policy (CAP) payment, and the production rewards. In particular, among the CAP payments were considered:

- first pillar payments for practices beneficial to the environment and basic payments.
- Second Pillar payment linked to animal welfare practices, and reimbursement for disadvantaged areas.

In this analysis, was considered a period of four years (2019-2022).

Finally, to explain the dairy farm's efficiency the IOFC performance indicator are used.

This key index, proposed by Pratt and White (1930), is an indirect indicator of profitability of dairy farms and it is widely used to compare production performance in dairy farms (Hansen et al., 2005; Wolf, 2010; Atzori et al., 2013; Bellingeri et al., 2020). It expresses what remains to the farm of the revenue from milk sold after paying the total feed costs (Campiotti, 2021). Is expressed by Equation 1:

$$IOFC = (Revenues\ from\ milk - Total\ feed\ cost)/N°\ of\ cow \quad (1)$$

Where the Revenue corresponds to the milk sales and total feed cost is the sum of the feed purchased and the feed produced.

To increase the robustness of the calculated costs, the empirical results are compared to the data from the farm accountancy data network (FADN) provided by the Italian Livestock Products Market Observatory (SMEA, 2023).

The comparison is made with the average data of farms from the Apennines of central Italy, operating in conditions similar to those in the case study.

Results and discussion

In this section, the results obtained by the case study farm will be presented. These data will then be used to make a parallel with the average data related to milk production in the Apennine area, where the case study farm is located.

Case study results

Table 2 shows the cost of producing milk on the case study farm, split by cost items. The period considered is a four-year term from 2019 to 2022.

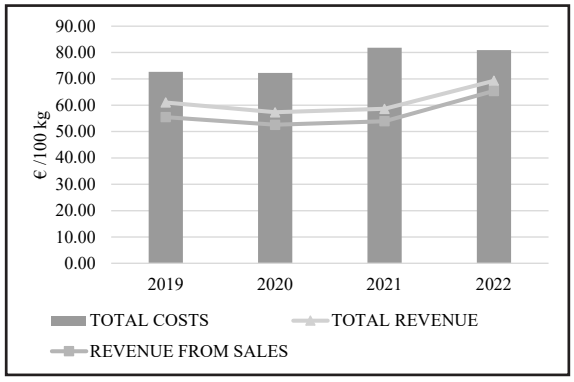
The first result that emerges from Table 2 is that the farm has no profit margins in the years under

€/100 kg	2019	2020	2021	2022
Feed purchased	34.72	34.29	40.1	36.76
feed	30.34	26.22	28.64	25.29
fodder	4.38	8.08	11.46	11.47
Feed production costs	2.52	1.83	2.19	7.1
crop expenditure	0.33	0.3	0.11	4.23
mechanization costs	2.19	1.53	2.09	2.88
Livestock costs	6.63	10.04	7.37	8.12
veterinary and pharmaceutical products	3.37	3.15	1.76	1.59
energy	1.41	1.21	2.11	4.2
other expenditure	1.85	5.69	3.5	2.33
General and land expenditure	4.98	2.07	2.97	6.9
overheads	4.98	2.07	2.97	6.05
land use	0	0	0	0.85
Depreciation	10.2	8.66	9.11	8.42
buildings	6.5	5.52	5.4	4.28
machinery	1.34	1.14	1.07	0.93
livestock	2.36	2	2.64	3.21
Maintenance quotas	3.74	6.74	7.74	3.17
buildings	2.76	1.46	2.5	1.3
machinery	0.98	5.28	5.24	1.88
Labour cost	7.44	7.98	10.51	10
family work	3.32	3.55	3.13	2.85
family social security contributions	0.29	0.32	0.25	0.25
paid employment	3.83	4.1	7.13	6.91
Interest on agricultural capital	2.44	0.67	1.79	0.43
Taxes (VAT)	0	0	0	0
TOTAL COSTS	**72.68**	**72.29**	**81.78**	**80.9**
Product value (milk)	51.26	49.82	49.54	58.39
Sale of animals	4.25	2.74	4.4	7.04
REVENUE FROM SALES	**55.5**	**52.57**	**53.94**	**65.43**
Milk quality rewards	0.88	0.83	0.73	0.7
CAP payment	4.68	3.94	3.96	3.16
TOTAL REVENUE	**61.06**	**57.33**	**58.63**	**69.29**
Loss or Profit (Margin) from sales	**-17.18**	**-19.72**	**-27.84**	**-15.47**
Loss or Profit (Margin)	**-11.62**	**-14.95**	**-23.15**	**-11.61**

Source: our elaboration on farm data

Table 2: Revenues and costs for milk production in the case study farm from 2019 to 2022 (euro/100 kg).

analysis. The margin is negative even if the CAP payments and the premiums obtained for high-quality production are considered. Furthermore, the loss worsens in the three-year period 2019/2021 and then eases in 2022 (Figure 2).

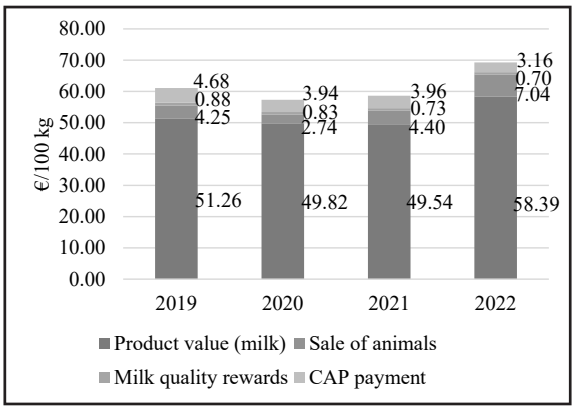


Source: our elaboration on farm data

Figure 2: Comparison between total costs, sales revenue and total revenue (euro/100 kg) from 2019 to 2022.

In particular, considering the analysis of total revenues, a fluctuating trend is observed over the years under analysis. This trend is linked to the main cost item, Product value (milk), which suffers from market price fluctuations. It is interesting to underline that the average annual value of milk recognized on the farm is higher than that recorded at a national level (Milk Market Observatory, 2024). This difference could be linked to the qualitative properties presented by the milk produced in the mountains and to the application of quality labels by the case study farm.

Revenues linked to premiums for the quality of milk produced and contributions obtained from the first pillar of the CAP are of little impact, on average around €4.7/100 kg, equal to 8% of total revenues. Despite the farm has access to numerous payments linked to the second pillar, such as payments for disadvantaged areas and good animal welfare practices (Figure 3; Table 2).

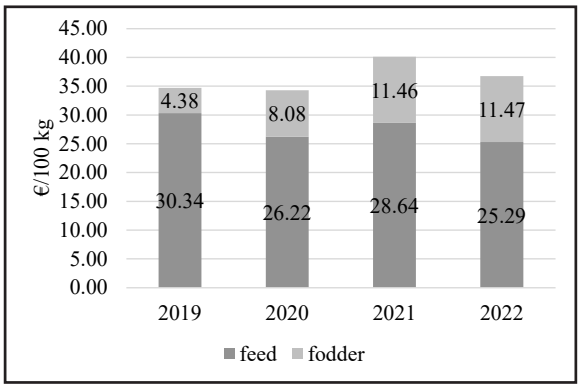


Source: our elaboration on farm data

Figure 3: Farm revenues (euro/100 kg) from 2019 to 2022.

While, analysing the production costs, from Table 2, it is notable that the main cost item is the feed purchased; this cost rise from 34.29 €/ 100 kg in 2020 to 40.10 €/ 100 kg in 2021, with a variation of +16.9%. The cost decreases in 2022 to 36.76 €/100 kg, with a variation of – 8.3% compared to 2021.

The increase in this cost item in the years is due mainly to the fodder, which, as it is observed in Figure 4, it is increased progressively, with a particular increment of +41% in 2021.

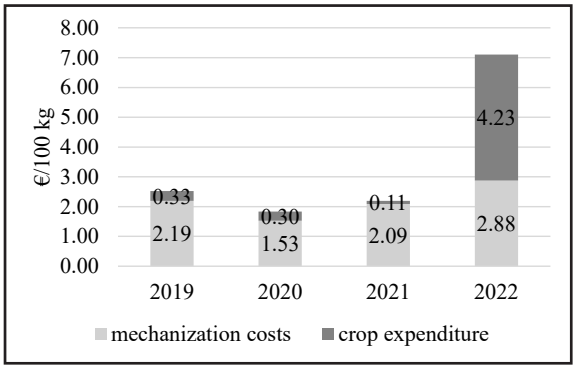


Source: our elaboration on farm data

Figure 4: Trend of the costs for the feed purchased (euro/100 kg) from 2019 to 2022.

The increase in the farm's cost of feed purchased could be linked to several factors. In particular, in 2019 the farm joined the "Mountain Product" label introducing a different production strategy. Adherence to this label requires the farm to essentially use feed and fodder produced in mountain areas, with a portion of the annual diet not produced in the aforementioned areas, expressed as a percentage of dry matter, not exceeding 40%. As a result, the farm has increased the incidence of purchasing local feed and fodder, produced in mountain areas, which however have higher costs than other suppliers. In parallel with this change in management, the increase in the incidence of costs could also be linked to the change in the economic aspects of the market, due to the pandemic and the Ukrainian conflict.

To confirm this, the data show a sharp increase in the item "feed production costs" in 2022, where the farm spent 224% more than in 2021 (Figure 5), to ensure self-sufficiency.



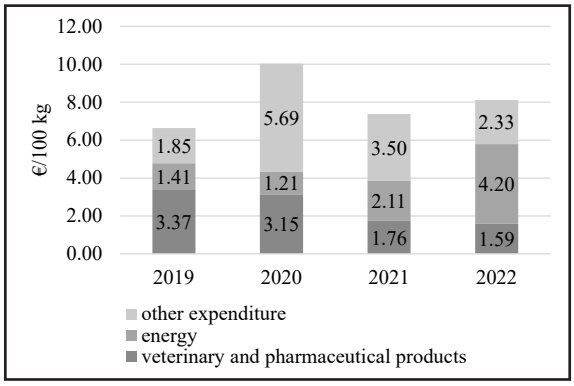
Source: our elaboration on farm data

Figure 5: Trend of the feed production costs (euro/100 kg) from 2019 to 2022.

The effect of the increase in costs for the feed purchased is also reflected in the "general and land expenditure", increased by the land use costs for the pasture.

The greater incidence of the costs of purchased feed and the lower impact of both the costs of produced feed and general and land expenditure during years 2019/2022 are an indication of the fact that the case study farm relied more on the purchase of feed off-farm than on self-production and use of pastures. However, following the cost increases, the farm has progressively changed the applied policy by increasing self-production costs and obtaining greater possibilities for grazing, as observed in 2022. Despite the change in management, the farm has not managed to cope with the high costs for purchased feed, remaining in a loss-making situation.

Also interesting is the trend of the "livestock costs", with particular reference to the energy item, which has a variation of +99% in the range 2021/2022 (Figure 6). The peak observed in livestock costs in 2020 is linked to extraordinary maintenance carried out in the farm for the renewal of the stable.



Source: our elaboration on farm data

Figure 6: Trend of the livestock costs (euro/100 kg) from 2019 to 2022.

Finally, the depreciation quotas show fluctuations during the years under analysis, but overall their incidence reduces between 2019 and 2022. This is linked to the end of some quotas on buildings and machinery. However, there was an increase in livestock quotas following the expansion of the herd (Table 1, Table 2). In parallel with the end of depreciation quotas, there has been an increase in maintenance quotas, in particular for machinery and tools.

Lastly, as a result of the increase in the number of fixed work units, labour costs rose by +31% between 2020 and 2021.

Lastly, Table 3 shows the results from the key performance indicator.

Year	IOFC (€/cow)
2019	989
2020	987
2021	527
2022	1039

Source: our elaboration on farm data

Table 3: Key farm indicator analysis of average Nord-Centre Apennines dairy farms and case study.

The IOFC in the case study remains slightly below the threshold levels indicated in the literature in all the years under analysis (1200 €/cow) (Campiotti, 2021). IOFC remains stable between 2019 and 2020, and then decreases significantly in 2021, due of the peak cost of nutrition. The value of €527/cow recorded in 2021, in fact, indicates a very low margin for the farm to cover all other production expenses and denotes a serious crisis condition. The 2022 increase, is not linked to a reduction in costs but to an increase in sales revenue due to an exceptionally high price of milk. For this reason, if the farm were to continue to bear these costs and the price of milk were to fall, it would find itself in a critical condition.

Comparison with the average data of farms from the Apennines of central Italy

In order to compare the case study with the mountain's geographical context, Table 4 refers to data on the North-Centre Apennine Mountains.

The average data from the Apennine mountains of central Italy show that, unlike the case study, on average the farms showed a positive margin in 2019, which then became negative in the three-year period 2020/2022. However, this margin is

	2019	2020	2021	2022
Number of cows	45.1	39.1	39.4	40
Milk produced (t/cow)	4.87	5.04	5.03	5.02
€/100 kg				
Feed purchased	17.08	11.05	12.93	17.16
fodder	14.77	9.77	11.57	15.22
hay	2.31	1.28	1.37	1.94
Feed production costs	5.58	6.91	7.35	8.67
Livestock costs	3.26	3.1	3.29	4.45
General and land expenditure	8.35	8.78	8.86	8.8
Depreciation	4.34	6.89	7.38	8.15
Labour cost	18.6	20.97	21.01	21.53
Interest	1.53	4.18	4.2	4.33
Taxes	0.15	0.35	0.39	0.46
TOTAL COSTS	**58.89**	**62.23**	**65.42**	**73.56**
Product value	54.79	49.54	54.41	65.45
Total rewards	7.9	6.87	6.85	6.77
TOTAL REVENUE	**62.69**	**56.41**	**61.26**	**72.23**
Loss or Profit (Margin)	**3.79**	**-5.82**	**-4.16**	**-1.33**

Source: our elaboration on SMEA, 2019, 2021, 2022, 2023

Table 4. Average revenues and costs for milk production in North-Centre Apennine Mountains from 2019 to 2022 (euro/100 kg).

positive if all CAP payments and other rewards are considered. In fact, if only sales revenues are considered, in line with the case study, the margin is negative. Even in the average data, the fluctuations in the price of milk are significant, following the same trend observed for the case study. Finally, it is important to underline that the losses detected in the case study are more critical than those observed on average.

This difference in the margin is linked to the fact that the average data presents higher total revenues than those of the case study, both in terms of the value of sales and the prizes obtained.

Furthermore, the case study also has higher production costs than the average data.

The main difference in the cost items is linked to the costs for purchasing feed. These are decidedly higher in the case study than in the average farms. This is linked to the widespread use of off-farm feed on the case study farm. However, compared to the case study, in the average data there are higher costs both for self-production and for the use of land, used by farms mainly for grazing. It can therefore be stated that on average the farms in the mountain areas practice more grazing and self-production of feed compared to the case study farm.

It is underlined that, despite the incidence of purchased food being lower, even on average there is an attempt to contain the latter which has led to an increase both in the costs for self-production and in the costs for the use of land. In fact, the costs for purchased food increased in the average data by +33%, due to the increase in both fodder (+31%) and hay (+42%). At the same time, self-production costs increased in the period 2019/2022 by +55%, while land use costs increased by +5%.

The values linked to depreciation are also very different between the case study and the mountain average. The case study farm, in fact, differs from the national average due to the presence of technological systems (milking robot). At the same time, the use of robotics in the farm allows it to face lower labour costs than average. In fact, if in 2022 the average labour costs in the mountain area were €21.53/100 kg, in the case study farm these amounted to half, or €10/100 kg. This is of particular relevance, if we consider the average number of cows present on the farm. In the mountain average the average

number of cows is around 40 compared to 60 in the case study, therefore the case study manages to spend half on labour costs while managing a greater number of animals.

Lastly, even from the average data we see an increase in total production costs, with a different trend than that seen in the case study. In fact, in the case study the increase is concentrated in the two-year period 2020/2021 and the costs stabilize in 2022, while in the average data the increase is progressive between the years under analysis.

Conclusion

Mountain dairy farms are crucial for the preservation of rural mountain communities because they represent an important source of income both directly, for the production of food, and indirectly for the preservation of cultural traditions and tourism. Moreover, these farms are also crucial from an environmental point of view, as they represent an environmentally sustainable animal production system and provide numerous ecosystem services. However strong market changes have made the survival of these farms very difficult.

The analysis shows that the average revenue of dairy farms in the Apennine mountains has increased, thanks to the particular market conditions which have led to high farm-gate milk prices and to the price premium which is awarded to mountain milk for its quality, certified by the mountain product label and local certifications.

However, revenues are not sufficient to offset total production costs. In fact, production costs, and in particular overheads, are very high in mountain dairy farms, making production at a loss. In addition, increases in feed purchase costs and production costs have aggravated the situation by further increasing pressure on these farms. For this reason, mountain dairy farms are not only less competitive than lowland farms but are not economically sustainable.

The case study chosen for this analysis is not representative of all the farms located in the Italian mountain area, however it provides us with a specific snapshot of a territorial reality and interesting ideas on how it might be possible to improve the situation of these farms.

First of all, a serious problem in the mountain farms of central Italy is labour costs, in the case study these are reduced thanks to the introduction of the milking robot. This allows the farmer to dedicate himself to other tasks and reduces the need for manpower in the stable. Furthermore, this technology also allows the farmer to monitor the health of the herd and the quality of production, thus optimizing other expenditure items and increasing the possible rewards linked to quality and animal welfare.

Secondly, the case study farm transforms part of the milk produced in the farm's dairy, in this analysis these costs have not been considered, however it is important to underline that overall the transformation phase allows the farm to obtain positive margins and invest in the renewal of both equipment and premises to remain competitive with farms located in more advantaged areas. It turns out that a possible solution for farms located in mountain areas could be the diversification of production through transformation.

Lastly, the farm adheres to quality brands which allow it to obtain higher premium prices compared to farms located in more advantageous areas. Joining these labels could therefore be a further opportunity for mountain farms.

It is clear that the funding provided by the European Union is crucial to the survival of these farms, but it is not enough. From a political point of view, it would be necessary to increase the funding for these farms to enable them to overcome the current crisis, allowing also to make investments for innovation.

The main limitation of this research is the presence of only one case study, taking into account the difficulty of collecting data, future research could extend the sample of farms analysed. Furthermore, it could be interesting to compare the differences between farms that purchase feed and farms that practice mainly self-production. Finally, future research could carry out cost-benefit analyses on the transformation phase into a dairy.

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