PERCEPTIONS OF FARM RESILIENCE ACROSS DAIRY GOAT FARMERS IN TURKEY

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Abstract

In the context of changing climatic, economic, and social conditions, the sustainability of agricultural enterprises has become increasingly critical. Consequently, farm resilience has emerged as a key concern for agricultural sustainability. This study aimed to investigate the characteristics of Saanen goat farming enterprises and their farmers that contribute to resilience, as perceived by the farmers themselves. Semi-structured interviews were conducted with 38 Saanen goat farmers in Ayvacık, Çanakkale province, Turkey. The findings revealed that resilience in Saanen goat farming was predominantly associated with factors such as product diversification, preparedness for infectious diseases, and access to reliable labor. Furthermore, farmers' perceptions of resilience were shaped by adaptive responses to challenges and their ability to overcome past difficulties. Farmers' perceptions were influenced by a combination of farm characteristics, including climatic and economic conditions, as well as personal traits and social environments. The study underscores the importance of tailoring resilience-enhancing strategies to the specific characteristics of these farming systems. Emphasis should be placed on managing production risks, strengthening adaptive capacities, and fostering social support networks. These insights provide a foundation for developing targeted interventions to promote resilience and sustainability across diverse farming contexts.

Keywords: *Farm resilience, Saanen, goats, farmers' perception, Turkey*

1. INTRODUCTION

The sustainability and resilience of livestock farms have become increasingly critical in the face of climate change, economic fluctuations, and social challenges. Goat farming, in particular, plays a crucial role in ensuring food security, providing rural employment, and maintaining biodiversity in many regions [1]. Among goat breeds, the Turkish Saanen is widely preferred in Turkey due to its high milk yield and adaptability [2]. However, the long-term viability of farms breeding Turkish Saanen goats hinges on their ability to withstand external pressures and adapt to evolving conditions.

Resilience in livestock farming refers to the capacity of farms to recover from shocks, maintain production efficiency, and adapt to environmental and economic uncertainties [3]. Various factors influence farm resilience, including production system characteristics, farmer decision-making, and access to essential resources [4]. In intensive goat farming systems, resilience is often associated with product diversification, disease preparedness, and labor availability [5]. Conversely, in extensive systems, the ability to adapt to environmental stressors and past experiences in overcoming challenges play a crucial role [4]. These factors highlight the complexity of resilience in goat farming and the need for comprehensive approaches to enhance sustainability. Resilience in goat farming is increasingly being studied in the context of climate change, economic instability, and evolving agricultural practices. Research suggests that resilience depends on the ability of farms to withstand disturbances such as extreme weather events, disease outbreaks, and market fluctuations [6]. While many studies focus on maintaining stability in farming systems, there is a growing need to explore transformative strategies that allow farms to innovate and adapt to long-term sustainability challenges. Small-scale farming research has identified key challenges such as climate change, limited access to advanced technology, and economic instability. Addressing these challenges through the integration of new technologies, improved market infrastructure, and better breeding programs can significantly enhance the resilience

of goat farms [7]. Furthermore, studies on climate-resilient agricultural practices highlight the importance of traditional knowledge and adaptive strategies, such as diversification and resource-efficient practices, in strengthening farm resilience [8].

In Saanen goat farming systems, resilience is often associated with product diversification, disease preparedness, and labor availability, as well as the ability to adapt to environmental stressors and utilize past experiences in overcoming challenges. These factors highlight the complexity of resilience in goat farming and the need for comprehensive approaches to enhance sustainability. Given the increasing pressures on livestock farming, assessing these perceptions is crucial for developing targeted interventions that enhance the resilience of goat farms. The purpose of this study is to evaluate the resilience perceptions of Turkish Saanen goat farmers by identifying key farm and farmer characteristics that contribute to resilience. Utilizing a Likert-scale survey approach, this study aims to analyze the factors influencing resilience perceptions in both intensive and extensive farming systems. The findings will provide critical insights for policymakers, researchers, and farmers, helping to develop strategies that strengthen the sustainability of Turkish Saanen goat farms amidst emerging challenges.

2. MATERIALS AND METHODS

The framework of the farms to be researched was formed by the enterprises that breed Saanen goats in Ayvacık, Çanakkale province, Turkey (Figure 1). Within this framework, 38 goat farms were interviewed as a result of simple random sampling. The material of the research was formed by the data obtained from these farms with a semi-structured questionnaire in 2024. Simple statistical analyses were used to analyze the data of the farms and farmers. The statements used to assess resilience, were selected and adapted from the study of [9]. Utilizing a Likert-scale survey approach, this study aims to analyze the factors influencing resilience perceptions in Saanen goat farming systems. Farmers were asked to rate the responses on a scale of 1 to 5 (1: Strongly Disagree, 2: Disagree, 3: Neutral, 4: Agree, 5: Strongly Agree). In order to make comparisons between statements and determine their importance, the answers given were weighted, their scores were obtained by multiplying them with the percentages of the relevant statements, and finally, their importance orders were determined. The perception of resilience was measured with indicators consisting of the resilience of the animals, the economic, social and environmental resilience of the farms and the resilience characteristics of the farmer.

Fig. 1. Research Area

To assess their resilience capacity, the following statements were used: in case of unexpected difficulties, my farm will be able to withstand them and continue to function (robustness); in case of difficulties, my farm will be able to adapt to the new situation and make the necessary changes to continue its activities

(ability to adapt); and in case of difficulties, my farm will be able to make the necessary transformations to continue its activities, even if it has to change its structure and internal functioning (transformability). In order to determine the factors affecting the farmers' resilience capacity, the average of their responses to the resilience capacity scale was used. Logistic regression analysis was used to determine the factors affecting the farmers' perception of resilience. If the farmers' responses to the scale prepared according to the five-point Likert scale were 3 (neutral) and below, they were classified in the "low resilience-capacity perception group", and if they were 4 and 5, they were classified in the "high resilience-capacity perception group". The dependent and independent variables used in logistic regression analyses are given in Table 1.

Table 1. Variables Used in Logistic Regression Analysis

	Variables	Unit	Means	Standard Deviation
Dependent	In case of unexpected difficulties my farm will be able to withstand them and continue to function	If the resilience capacity is 3 and below, 0; other 1	0.78	0.47
	In case of difficulties my farm will be able to adapt to the new situation and make the necessary changes to continue its operations	If the resilience capacity is 3 and below, 0; other 1	0.62	0.57
	In case of difficulties my farm will be able to make the necessary transformations to continue its operations, even if it has to change its structure and internal workings	If the resilience capacity is 3 and below, 0; other 1	0.42	0.34
Independent	Age	year	38.41	8.72
	Education	year	8.32	3.75
	Forage production area	hectare	4.34	1.94
	Flock size	animal	129.03	78.68
	Number of organizations affiliated	number	1.49	0.43

This study has several limitations. The sample size was limited to 38 Saanen goat farms from a single district, which restricts statistical power, particularly for multivariable logistic regression, and requires cautious interpretation of estimated coefficients. The findings are context-specific and may not be generalizable to other regions, production systems, or goat breeds in Turkey. The analysis relies on self-reported perceptions rather than objective economic or technical indicators, meaning that assessments of profitability and resilience reflect subjective views. In addition, the cross-sectional design does not allow causal inference, and observed relationships should be interpreted as associations. Finally, uniformly high or low agreement on some Likert scale items suggests possible response bias or limited scale sensitivity.

3. RESULTS

3.1. Farm Characteristics

The average age of the surveyed farmers was 38 years. All participants were male, and 50% were married. In terms of educational attainment, 30% had completed primary school, 40% had completed secondary school, and 30% had completed high school. The farmers were actively involved in all stages of goat breeding throughout the year. However, only 10% of the farms employed permanent workers

specifically for milking. The farm population primarily consisted of Maltese and Saanen goat crossbreeds, with 80% comprising Saanen crossbreeds and 20% consisting of pure Maltese goats. Mean values of the animal population are given in Table 2. On average, each farm maintained 39 dairy goats, with an individual milk yield of 1,275 lt/goat. The recorded lactation period for these animals was 305 days per year. Farmers sold their milk at an average price of €0.53 per liter. Additionally, 40% of the farms produced an average of 535.5 kg of cheese annually, which they sold for €9.1 per kilogram. Male offspring were raised and subsequently sold as slaughter animals (SA), with an average of 17 SA sold per farm per year at a price of €9.14 per kilogram. The average carcass weight per SA was 22.5 kg. Consequently, farms generated an annual income of €8,055.30 from milk sales, €4,843.31 from cheese sales, and €3,497.30 from SA sales. The annual expenditure on feed was recorded at €14,852.63, while veterinary, vaccination, and medicine expenses amounted to €619.47. Farmers grazed their animals on pastures, degraded forests, or stubble fields, with an average grazing area of 850 decares per farm. Additionally, they cultivated barley on 22.5 acres and vetch on 20 acres to supplement their animals' feed. On average, each farm had two milking machines. Moreover, 80% of the farmers were members of both the Chamber of Agriculture and the Sheep and Goat Breeders Association.

Table 2. Mean animal values of farms at year-end

Type	Number	Value (€)
Buck	2	609.88
Goat	49	12,834.93
Doeling	5	1,144.77
Buckling	32	7,198.56
Female kid	25	4,686.56
Male kid	16	2,999.40
Total livestock assets		29,474.10

Exchange rate 1€=40 ₺

3.2. Farmers' perceptions of resilience

Farmers were asked about their level of agreement with some factors that make goat farms resilient (Table 3). The statements are listed according to their level of agreement. The statements identified by farmers as contributing to goat farm resilience reveals key insights into their perceptions of resilience. The most highly rated statements emphasize the farm's ability to use local natural resources and minimize environmental impact. Farmers highly value sustainability and ecological balance, suggesting that environmental preservation plays a significant role in their perception of resilience. Farmers prioritize knowing where to seek help and feeling connected to regional husbandry traditions. Access to daily life services and a sense of belonging within the farming community also contribute to resilience. Farmers rate personal expertise, disease prevention strategies, and alternative management solutions as critical resilience factors. This suggests that they perceive resilience as a function of proactive planning and adaptability to crises. Being proud of achievements is among the most agreed-upon statements, highlighting the psychological aspect of resilience. In spite of all this, having multiple buyers and distribution channels was ranked lower in importance. The ability to change internal farm structures and recover from challenges was ranked lower. Farmers did not strongly emphasize profitability, variety of feed sources, or external economic connections.

Table 3. Farmers' perceptions of resilience

Statements	Agreement percentages (%)					Total score**
	(1) *	(2)	(3)	(4)	(5)	
My farm uses the natural resources in the region to a great extent				48.68	51.32	451.32
My farm has no negative impact on the natural environment				60.53	39.47	439.47
The natural environment where my farm is located is well preserved				68.43	31.57	431.57
I know where to go for help				88.15	11.84	411.8
I feel part of the animal husbandry tradition of my region				89.47	10.53	410.53
I am knowledgeable enough to manage my farm				100		400
My family and I have access to the services we need for our daily lives in areas close to our farm				100		400
If my farm faces a difficult time. I have alternatives to manage it				100		400
My farm is prepared to prevent infectious diseases from entering or exiting the herd				100		400
I am proud of my achievements				100		400
My farm has the necessary infrastructure and equipment to run it properly			10.53	89.47		389.47
My farm has multiple suppliers			21.05	78.95		378.95
My farm has access to the natural resources it needs to ensure its sustainability		10.53		89.47		378.94
My job as a farmer provides me with a good quality of life		10.53	10.53	78.94		368.41
Over time my farm has successfully overcome many challenges	10.53			89.47		368.41
Farmers locally collaborate with each other, so we support each other			39.47	60.53		360.53
I have access to people, networks and institutions that keep me informed about innovations, technology and developments	10.53	10.53		78.94		347.35
I can achieve my goals		13.15	47.37	39.48		326.33
The organizations I am a part of keep me up to date with innovations in the industry	10.53	23.68		65.79		321.05
I can do better with my life		11.84	64.48	23.68		311.84
I am always optimistic about my future		19.73	68.43	11.84		292.11
My past successes give me confidence to take on a new challenge		34.21	40.79	25		290.79
My farm has multiple buyers and product distribution channels		48.68	27.64	23.68		275
The feed sources I use are produced in different seasons of the year		50	31.57	18.42		268.39
I tend to bounce back quickly from difficult times		48.69	51.31			251.31
The resources I use come from a variety of geographic areas		78.94	10.53	10.53		231.59
My farm is profitable enough to support me		100.00				200.00
My farm uses a variety of resources		100.00				200.00
My farm is independent of external factors, so it is not badly affected by events that occur in or outside my region		100.00				200.00
Locally, farmers collaborate with other sectors so we support each other		100.00				200.00

* The weights for the scale of strongly disagree, disagree, undecided, agree, strongly agree are 1, 2, 3, 4 and 5, respectively. **total score is calculated via weight*percentage.

3.3. Factors affecting farmers' perception of resilience capacity

A negative correlation was observed between the age of farmers and their confidence in their farm's ability to withstand unexpected challenges and continue operations. However, as farmers aged, their confidence in their farm's capacity to undergo necessary transformations to sustain its activities, even if structural and operational changes were required—also increased. This suggests that while older farmers were more willing to implement transformations on their farms, they remained skeptical about their farm's resilience in facing difficult circumstances.

Additionally, an increase in both forage crop cultivation area and flock size were associated with a stronger belief in the farm's ability to endure unexpected difficulties and sustain operations. However, as flock size expanded, farmers exhibited lower confidence in their farm's ability to undergo structural and operational changes when faced with challenges. This was likely due to the complexities of

managing larger flocks alongside existing difficulties. Furthermore, higher levels of education among farmers were linked to a greater belief in their farm's adaptability and ability to implement necessary changes to maintain operations during adverse conditions. Similarly, membership in multiple agricultural organizations reinforced farmers' confidence in their farm's ability to undergo transformations when needed. Organizational affiliations provided farmers with a sense of support and resilience in the face of challenges (Table 4).

Table 4. Factors affecting farmers' perception of resilience capacity

Variables	B	SE	Wald	df	Sig.	Exp (B)
In case of unexpected difficulties my farm will be able to withstand them and continue to function						
Constant	0.274	0.093	8.581	1	0.003	0.761
Age	-0.414	0.182	5.188	1	0.023	0.661
Education	0.016	0.053	0.094	1	0.759	1.016
Forage production area	1.969	1.123	3.077	1	0.079	7.166
Flock size	2.419	0.917	6.958	1	0.008	11.232
Number of organizations affiliated	2.692	1.988	1.833	1	0.176	14.761
Model summary: -2 Log likelihood: 34.244, Cox & Snell R Square: 0.381, Nagelkerke R Square: 0.639						
In case of difficulties my farm will be able to adapt to the new situation and make the necessary changes to continue its operations						
Constant	-0.207	0.075	7.659	1	0.816	0.813
Age	0.038	0.048	0.614	1	0.433	1.038
Education	0.186	0.798	10.054	1	0.006	1.204
Forage production area	0.747	0.682	1.199	1	0.273	2.111
Flock size	-0.152	0.137	1.23	1	0.267	0.859
Number of organizations affiliated	1.154	1.808	0.407	1	0.523	3.17
Model summary: -2 Log likelihood: 73.676, Cox & Snell R Square: 0.238, Nagelkerke R Square: 0.431						
In case of difficulties my farm will be able to make the necessary transformations to continue its operations, even if it has to change its structure and internal workings						
Constant	0.161	0.761	0.044	1	0.833	1.174
Age	1.487	0.699	4.521	1	0.033	4.423
Education	0.133	0.134	0.988	1	0.320	0.875
Forage production area	-0.009	0.047	0.037	1	0.848	0.991
Flock size	-1.487	0.699	4.521	1	0.033	0.442
Number of organizations affiliated	0.207	0.075	7.659	1	0.006	0.813
Model summary: -2 Log likelihood: 52.926, Cox & Snell R Square: 0.488, Nagelkerke R Square: 0.633						

B= the regression coefficient, SE=standard error, Wald = chi-square statistic for significance testing, df =degrees of freedom, Sig.= p-value, and Exp(B)= odds ratio, while model fit is assessed using -2 Log Likelihood, Cox & Snell R Square, and Nagelkerke R Square.

4. DISCUSSION

The findings indicate that goat farmers perceive resilience through local, ecological, and social dimensions rather than an economic or market-oriented lens. The findings in Table 3 reveal that all respondents disagreed with the statement that 'my farm is profitable enough to support me', indicating a uniformly low perceived profitability among the sampled farms. However, this study does not provide a full farm-profit calculation, as only selected revenue items and selected costs are reported. Therefore, the 'zero profitability' pattern should be interpreted as a subjective assessment rather than an objective profitability estimate. Nonetheless, the descriptive figures suggest a tight economic situation in which reported feed expenditure is high relative to reported revenues, which may contribute to farmers' vulnerability perceptions and risk management preferences. While the 100% disagreement on profitability among participants reflects a significant local concern, it should be interpreted as a subjective perception of the increasing pressure from rising input costs such as the recorded feed expenses of €14,852.63 relative to market prices, rather than a definitive national economic indicator. Farmers consider resilience to be closely linked to their ability to use local resources efficiently aligning with previous research demonstrating that sustainable resource management is a critical factor in farm longevity [6]. However, excessive reliance on local resources may increase vulnerability to climate-induced shortages and environmental degradation [9]. They highly value knowledge-sharing and social support, reinforcing the importance of community-based resilience. Yet, lower emphasis was placed on market diversification and economic flexibility suggesting that farmers may not fully acknowledge the role of economic resilience. Emotional resilience particularly in pride achievements, ranked highly, whereas financial independence and adaptability were rated lower. This disparity may indicate while farmers exhibit psychologically resilient, they may lack sufficient economic buffers against financial instability. Although farmers recognize the importance of crisis management strategies, proactive economic approaches such as market diversification and profit maximization were less valued. To enhance long-term resilience future initiatives should emphasize financial planning, diversified revenue streams, and supply chain robustness [7].

The study found a positive correlation between farmers' age and their belief that their farm could withstand unexpected difficulties. However, older farmers were also more open to making structural changes in response to difficulties, yet they still perceived their farms as vulnerable. This finding is consistent with research by [6], who suggests that experienced farmers develop a long-term perspective on resilience while simultaneously becoming more aware of the challenges they face. Older farmers often accumulate extensive knowledge and crisis management skills, enhancing their ability to adapt their farms when necessary [9]. Nonetheless, their past experiences may contribute to a more cautious or even pessimistic outlook on the ability regarding their farm's ability to endure without substantial modifications.

As herd size increased, farmers exhibited greater confidence in their farm's ability to withstand difficulties, but less confidence in making necessary transformations to adapt. This aligns with studies indicating that larger farms benefit from economies of scale, allowing them to be more financially stable and better equipped to endure crises [4]. However, larger herd management requires more complex logistical and financial planning, making rapid structural changes more difficult [6]. This result suggests that while herd expansion strengthen economic resilience, it may simultaneously reduce adaptability in crisis situations. The positive relationship between forage crop area and farm resilience perception is also supported by previous research. A larger forage crop area ensures a more stable feed supply, reducing the risk of market fluctuations in feed prices and minimizing dependence on external inputs [8]. This finding highlights that self-sufficiency in feed production strengthens farm resilience by mitigating supply chain risks, an important consideration in climate-vulnerable agricultural systems.

Education played a crucial role in shaping farmers' belief in their ability to adapt and make structural changes. This is consistent with findings from studies on adaptive capacity in agriculture, which indicate that higher education levels are linked to increased willingness to adopt innovative practices and technologies [7]. Educated farmers tend to be more open to risk-taking, diversification, and financial planning, all of which are key to resilience.

The study also found that as farmers became members of more organizations, their confidence in making structural changes increased. This aligns with existing literature emphasizing the importance of social capital and collective action in fostering agricultural resilience [9]. Farmers involved in cooperatives or farmer associations benefit from shared resources, knowledge exchange, and group bargaining power, which can facilitate adaptation strategies in times of crisis [4]. Organizational participation also provides psychological support, reducing the fear of taking risks and encouraging proactive change [3].

5. CONCLUSION

This study highlights a critical imbalance in goat farming resilience, where ecological and social dimensions are prioritized over economic adaptability. While the current data focuses on internal farm dynamics, the findings regarding economic vulnerability suggest that traditional market channels may be insufficient for long-term sustainability. Therefore, the results of this study could imply that future strategies should evaluate the potential feasibility of alternative marketing models. Such implications include the development of direct-to-consumer sales, e-commerce training for farmers, or exploring export opportunities as potential pathways to enhance value-added production. However, these pathways should be framed as prospective implications rather than direct conclusions, requiring further empirical investigation. The study also underscores that resilience is shaped by experience, resource availability, and collective action. While larger herds and expanded forage crop areas improve economic stability, they may limit flexibility during crises. Conversely, education and organizational membership enhance farmers' ability to adapt and innovate. Future strategies should promote flexible business models, climate-smart agricultural practices, and cooperative engagement to ensure the long-term sustainability of goat farming.

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REFERENCES

1. Reynolds, LP, Wulster-Radcliffe MC, Aaron DK, Davis, TA 2015, 'Importance of animals in agricultural sustainability and food security', *The Journal of Nutrition*, vol.145(7), pp. 1377–1379.
2. Erdoğan Ataç, F., Takma, Ç., Gevrekci, Y., Öziş Altınçekiç, Ş., & Ayaşan, T. (2023). Estimates of Genetic Parameters for Direct and Maternal Effects on Pre-Weaning Growth Traits in Turkish Saanen Kids. Animals, 13(5), 940. https://doi.org/10.3390/ani13050940
3. Darnhofer, I. (2014). Resilience and why it matters for farm management. European Review of Agricultural Economics, 41(3), 461–484. https://doi.org/10.1093/erae/jbu012
4. Meuwissen, M. P. M., Feindt, P. H., Spiegel, A., Termeer, C. J. A. M., Mathijs, E., Mey, Y. de, Finger, R., Balmann, A., Wauters, E., Urquhart, J., Vigani, M., Zawalińska, K., Herrera, H., Nicholas-Davies, P., Hansson, H., Paas, W., Slijper, T., Coopmans, I., Vroege, W., … Reidsma, P. (2019). A framework to assess the resilience of farming systems. Agricultural Systems, 176, 102656. https://doi.org/10.1016/j.agsy.2019.102656
5. Hostiou, N Fagon, J, Chauvat, S, Turlot, A, Kling-Eveillard, F, Boivin, X and Allain, C 2017 'Impact of precision livestock farming on work and human-animal interactions on dairy farms'. A review, BASE [En ligne], vol.21:4, 268-275 URL: https://popups.uliege.be/1780-4507/index.php?id=13706.
6. Darnhofer, I. (2020). Farm resilience in the face of the unexpected: lessons from the COVID-19 pandemic. Agriculture and Human Values, 37(3), 605–606. https://doi.org/10.1007/s10460-020-10053-5

7. Dhillon, R., & Moncur, Q. (2023). Small-Scale Farming: A Review of Challenges and Potential Opportunities Offered by Technological Advancements. Sustainability, 15(21), 15478. https://doi.org/10.3390/su152115478
8. Mamun, Md. A. A., Li, J., Cui, A., Chowdhury, R., & Hossain, Md. L. (2024). Climate-adaptive strategies for enhancing agricultural resilience in southeastern coastal Bangladesh: Insights from farmers and stakeholders. PLOS ONE, 19(6), e0305609. https://doi.org/10.1371/journal.pone.0305609
9. Roosevelt, M, Raile, ED, Anderson, JR 2023, 'Resilience in food systems: Concepts and measurement options in an expanding research agenda', *Agronomy*, vol.13(2), p. 444.