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EVALUATION OF THE IMPACT OF CLIMATE CHANGE ON LIVESTOCK PRODUCTION FROM THE PERSPECTIVE OF FARMERS: YOZGAT CASE

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Abstract: The study aimed to assess the effects of climate change on livestock in the Yozgat province by assessing its influence on farmers. The main material of the study consisted of the data obtained from face-to-face questionnaires with farmers engaged in animal and crop production together in the villages connected to the center of Yozgat province. The study revealed that the majority of farmers fell within the 31-40 age bracket, accounting for 44.8% of the participants. Additionally, 40.0% and 36.0% of the farmers had completed high school and secondary school, respectively. Furthermore, 59.2% of the farmers reported having 5-7 family members. All surveyed farmers confirmed their familiarity with the notion of climate change. According to farmers, drought is the primary concern associated with climate change, followed by global warming and changes in seasons. According to the survey, 90.4% of the farmers reported that climate change has an impact on their region. The observed alterations were identified as a decrease in precipitation, unpredictable and fluctuating precipitation patterns, a reduction in the duration of precipitation, and an increase in water scarcity. All farmers who participated to study stated that climate change negatively affected animal and crop production. As a result, the farmers participating in the survey have a high awareness of climate change, they are affected by these changes in animal production, there are certain practices that they pay attention to in adapting to these processes and reducing their effects, but the need for information, training, legal practices and inspections to be carried out by relevant institutions on this issue has been particularly emphasized.

Keywords: Yozgat, Climate change, Global warming, Animal production

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1. Introduction

Agricultural production and climate change are intricately linked and significant worldwide concerns. Many recent studies have emphasised the significance of interrelationships, particularly those associated with a substantial rise in the average world temperature. The sustainability and productivity of agricultural production systems are mostly determined by climate, which is the most crucial environmental component (Barati et al., 2024). The agricultural sector is a prominent economic sector in Türkiye and is critical for rural sustainability. However, inadequate policies and factors such as climate change and wrong practices are causing rural-urban migration and a declining agricultural sector. In Türkiye, the interaction of livestock systems with the environment is becoming increasingly important in national and local policy agendas in line with climate change mitigation strategies and rural development. In addition to increasing consumption concerns and public interest in climate change, integrating alternative agriculture and food systems into the livestock sector can provide strong benefits (Geß and Hazar Kalonya, 2023). Climate change threatens the welfare of current and future generations by changing the ecosystem of the planet. Climate changes caused or to be caused by global warming will be seen in different ways according to different regions of the world. Türkiye is among the risk group countries in terms of the potential effects of global warming due to the rise in extreme values in the Eastern Mediterranean region. Our country may be adversely affected by the weakening of water resources, forest fires, drought, desertification and related ecological deterioration due to global warming. For example, arid and semi-arid regions such as South East and Central Anatolia, which are under the threat of desertification, and semi-humid Aegean and Mediterranean regions, which do not have sufficient water, will be more affected by the temperature increase. Climate changes will lead to changes in the natural habitats of animals and plants in agricultural activities and will cause significant problems (Öztürk, 2002; Atalık, 2005; Şen, 2014; Marino et al., 2016). Agriculture is one of the most effective sectors that can ensure human survival. Animal husbandry has an important place in this sector. In the agriculture

sector, livestock farming is considered to be highly resilient to climate change and is thought to play an important role in ensuring food security to meet the demands of the increasing human population by 2050 (Thornton et al., 2007; Meena and Lal, 2018; Reshma Nair et al., 2021).

In the fight against the impacts of climate change on agriculture, two interrelated paths are followed. The first is mitigation policies, that is, reducing greenhouse gas emissions, which means mitigating the negative consequences of climate change. The second is climate change adaptation policies (IPCC, 2001; Akalın, 2014). The relationship between the livestock sector and climate change greatly affects adaptation approaches in the livestock sector (Havlik et al., 2014). In the fight against the impacts of climate change on agriculture, two interrelated paths are followed. The first is mitigation policies, that is, reducing greenhouse gas emissions, which means mitigating the negative consequences of climate change. The second is climate change adaptation policies (IPCC, 2001; Akalın, 2014). The relationship between the livestock sector and climate change greatly affects adaptation approaches in the livestock sector (Havlik et al., 2014).

To enhance animal production in evolving climate conditions, it is imperative to undertake multidisciplinary studies. Additionally, it is crucial to reinforce current agricultural extension systems and formulate sustainable plans encompassing adaptation, mitigation, and recovery approaches. Farmers can utilise climate change assessment at the farm level as a consultation tool, an information source for management, and a component of quality assurance programmes for customers. The study sought to assess the effects of climate change on livestock in the Yozgat province by assessing its influence on farmers.

2. Materials and Methods

Study is based on the data obtained from in-person surveys done with farmers involved in animal and crop production in the villages linked to the central area of Yozgat province. For the survey study in Yozgat center, according to the data obtained from the Yozgat Provincial Directorate of Agriculture and Forestry, the number of farmers in 2023 was accepted as the main mass and the sample volume was calculated accordingly. The sample size was calculated with the following proportional sample volume formula given in Equation 1 (Newbold, 1995).

$$n = \frac{\mathrm{Np(1-p)}}{\mathrm{(N-1)}\sigma_{px}^2 + \mathrm{p(1-p)}} \quad (1)$$

In the formula; n= sample size, N= Total number of farmers, σ_{px}^2 is the variance of the ratio.

The p value in the proportional sample volume formula expresses the proportion of parts with a certain feature in the main population. To reach the maximum sample volume, p=0.50 should be taken (Akyüz, 2019). In this study, since it is desired to reach the maximum sample volume, p=0.50 was taken during the calculation, representing the proportion of farmers affected by climate change. As a result of the calculation, the number of farmers to be interviewed was determined to be 135 farmers with 95% confidence interval and 0.05% margin of error. SPSS software was used to analyze the research data (SPSS, 2016). For analysis of the data, firstly, the socio-demographic characteristics of the farmers were revealed, then the information status of the farmers about climate change, the status of being informed about climate change, climate change and evaluations in Yozgat, local impact and factors and effects of climate change observed in Yozgat in the last 10 years, crop loss and compensation situation in the last 5 years due to various reasons, what has been done to adapt to / reduce the effects of climate change and what are the suggestions of farmers to reduce the effects of climate change in their region were analyzed. Simple arithmetic mean and percentage calculations were used in the research.

3. Results

The socioeconomic attributes of agricultural households are thought to exert varying influences on farmers' perspectives on climate change and their capacity to adapt (Reddy et al., 2022). The study revealed that 44.8% of the farmers surveyed fell into the age bracket of 31-40, while 24.8% were aged 41-50, 20.8% were aged 51-60, 5.6% were 61 years and beyond, and 5% were aged 26-30 (Table 1). The analysis revealed that the majority of farmers possessed a high school or secondary school education, with 40.0% and 36.0% respectively. Additionally, it was found that the average number of family members in farming households was between 5 and 7, accounting for 59.2% of cases. Furthermore, it was established that the majority of farmers employed the technique of dry farming (84.8%) and focused on producing crops for commercial purposes (89.6%), while also satisfying their own agricultural requirements. Upon examined the farmers' experience in this industry, it was found that the first group (29.6%) consisted of individuals aged 31-40 years, the second group (26.4%) consisted of those aged 41-50 years, and the third group (23.2%) consisted of individuals aged 51-60 years.

All surveyed farmers reported that they do both animal and crop production. They yield once a year and employ both chemical and organic fertilisers, as well as machinery and labour, in their production processes. Furthermore, every farmer stated that they allow their livestock to graze in pastures and house them in barns during the winter season.

Farmers' knowledge about climate change is given in Table 2. All of the farmers participating in the survey stated that they had heard of the concept of climate change before. When climate change is mentioned, farmers report that drought is the first, global warming is the second and changes in seasons as the third. Farmers stated that the causes of climate change are mainly the

increase in air pollution, increase in industrialization, widespread use of chemical pesticides, increase in urbanization, and destruction of forests. Regarding the repercussions of climate change, farmers have indicated that the primary impact will be a rise in temperature and the occurrence of drought. Additionally, there will be an increase in natural catastrophes as a secondary consequence, and the duration and characteristics of the seasons will undergo alterations as a tertiary effect. According to the farmers surveyed, in order to mitigate climate change, it is essential to raise awareness in society, establish legal regulations, implement effective monitoring and oversight, safeguard water resources, promote the use of renewable energy sources, and restrict the use of chemical fertilisers and pesticides.

Table 3 shows the information status of farmers about climate change. 92.8% of the farmers who participated in the survey reported that they had not participated in any training on climate change before, and at the same time, no information activities were carried out by any institution on climate change or they had no knowledge and information. Farmers reported that they mostly (48.0%) obtained information and news about climate change from TV-radio-newspaper-family-friends-neighbours-public institutions-internet-social media.

Table 1. Socio-demographic and production information of farmers

Age	n	%	Education status	n	%
26-30	5	4.0	Primary school	45	36.0
31-40	56	44.8	Middle school	19	15.2
41-50	31	24.8	High school	50	40.0
51-60	26	20.8	Associate degree	3	2.4
61 and over	7	5.6	Master's degree	8	6.4
Gender			Marital status		
Famale	8	6.4	Married	96	76.8
Male	117	93.6	Single	29	23.2
Professional experience (year)			Number of household		
10-20	13	10.4	1-2	13	10.4
21-30	40	32.0	3-4	31	24.8
31-40	34	27.2	5-7	74	59.2
41-50	10	8.0	7 and over	7	5.6
51-60	21	16.8	Your crop production method		
61 and over	7	5.6	Dry agriculture	106	84.8
Property ownership status			Dry-irrigated agriculture	19	15.2
Owner	48	38.4	Your priority in agricultural production		
Tenant	13	10.4	Own need	7	5.6
Owner-tenant	27	51.2	Market orientated	6	4.8
Residence status in Yozgat			Both in one	112	89.6
21-30	22	17.6	Membership status in the agricultural structure		
31-40	37	29.6	Yes-Agricultural Credit Cooperative/Chamber of Agriculture	87	69.6
41-50	33	26.4	Yes-Cooperatives	19	15.2
51-60	29	23.2	Yes-Irrigation Association	9	7.2
61 and over	7	5.6	Yes-Breeders' Association	10	8.0

Table 2. Farmers' knowledge about climate change

	Agree		Disagree	
What comes to mind when you think of climate change?	n	%	n	%
Global warming	97	77.6	28	22.4
Changes in seasons	73	58.4	52	41.6
Occurrence of excessive rainfall	31	24.8	94	75.2
Drought	112	89.6	13	10.4
Environmental pollution	54	43.2	71	56.8
Air pollution	34	27.2	91	72.8
More frequent weather events such as floods, storms, tornadoes, etc.	44	35.2	81	64.8
Depletion of the ozone layer	18	14.4	107	85.6
Increasing greenhouse gas effects	3	2.4	122	97.6
Increased CO_2 emissions	3	2.4	122	97.6
The global economic system	19	15.2	115	92

Table 2. Farmers' knowledge about climate change (continue)

	Agree		Disagree	
What are the main causes of climate change?	n	%	n	%
Increase in air pollution	90	72.0	35	28.0
Increasing use of fossil fuels	61	48.8	63	50.4
Increased industrialization	73	58.4	51	40.8
Rapid population growth	50	40.0	75	60.0
Destruction of forests	63	50.4	62	49.6
Increasing urbanization	65	52.0	60	48.0
Widespread use of chemical drugs	72	57.6	53	42.4
Increased use of motor vehicles	55	44.0	70	56.0
What consequences can climate change have?				
There is an increase in natural disasters	85	68.0	39	31.2
Sudden weather changes occur	50	40.0	75	60.0
The duration and characteristics of the seasons change	80	64.0	45	36.0
Temperature increases, drought occurs	109	87.2	16	12.8
Floods occur as a result of heavy and excessive rainfall	48	38.4	77	61.6
Extreme cold and frost events occur	57	45.6	68	54.4
There is a decrease in water resources	70	56.0	55	44.0
New types of diseases emerge	37	29.6	88	70.4
Some plant and animal species disappear	42	33.6	83	66.4
Crop and animal production decreases	41	32.8	84	67.2
Access to food becomes difficult	35	28.0	90	72.0
Migrations occur	35	28.0	90	72.0
What should be done to prevent climate change?				
It is not possible to prevent climate change	33	26.4	92	73.6
Forests and pastures should be protected and their destruction should be prevented.	70	56.0	55	44.0
Water resources should be protected and renewable energy sources should be used	78	62.4	47	37.6
Water should be saved	63	50.4	62	49.6
The use of chemical fertilizers and pesticides should be limited	76	60.8	49	39.2
Savings should be made in energy use	53	42.4	72	57.6
Harmful waste should be disposed of in a controlled manner	59	47.2	66	52.8
Emission of harmful gases should be prevented and reduced	43	34.4	82	65.6
Strong legal regulations should be made	90	72.0	35	28.0
Society should be made aware of climate change	102	81.6	23	18.4
Effective control and supervision should be carried out	85	68.0	40	32.0

Table 3. The status of farmers' being informed about climate change

Have you attended any training on climate change?	n	%
Yes-meeting	9	7.2
No	116	92.8
Have any institutions carried out information activities regarding global climate change?		
Yes-Directorate of Agriculture and Forestry-Mukhtar	9	7.2
No-I don't know	116	92.8
Where do you get information and news about climate change?		
TV-radio-newspaper-family-friend-neighbour-public institutions-internet-social media	60	48.0
TV-radio-newspaper-family-friend-neighbour	25	20.0
TV-radio-newspaper-family-friend-neighbour- breeders' association -cooperatives	9	7.2
TV-radio-newspaper-family-friend-neighbour-public institutions-Mukhtar	6	4.8

Upon examined the data on climate change and local effects in Yozgat from Table 4, it is revealed that 9.6% of the farmers were unaware of the influence of climate change on their region, whereas 90.4% acknowledged its impact. Furthermore, a significant majority of 60.0% of farmers expressed a lack of sufficient information regarding climate change, while 54.4% reported that adequate steps were not being implemented to address this issue. 69.6% of the farmers who participated in the survey stated that the level of being affected by climate change in Yozgat is medium, 20.8% stated that it is high and 5.6% stated that it is low. 49.6% of the farmers

stated that the human impact on climate change in Yozgat is at medium level, 28% at high level and 10.4% at low level.

The factors and impacts of climate change observed in Yozgat during the past decade are presented in Table 5. The poll revealed that most farmers experienced a decline in precipitation, unpredictable and fluctuating precipitation patterns, a shorter duration of precipitation, and instances of water scarcity. Every farmer asserted that climate change had an adverse impact on both agricultural and animal productivity. The primary adverse consequences include inadequate grazing spaces, reduced productivity, heightened production expenses, economic instability, and heat-induced stress. Furthermore, farmers have said that the primary factors contributing to climate change in their region are the inadvertent exploitation of pasture and water resources, excessive grazing, the conversion of pasturelands into other forms of land, and the thoughtless consumption and depletion of existing natural resources.

Table 6 shows the crop loss and compensation status of the farmers participating in the survey in the last 5 years. 94.4% of the farmers stated that they experienced crop losses due to drought, 18.4% due to flood, 45.6% due to hail, 35.2% due to frost and 24% due to storm. When farmers were asked to evaluate the impact of the losses on their income, 16.0% of them stated that it was low, 32.0% stated that it was moderate and 52.0% stated that it was extremely effective. 63.2% of the farmers stated that they were able to compensate for the losses and 36.8% stated that they could not compensate for the losses. 74.4 percent of the farmers surveyed stated that they received any support for losses caused by climate change and 25.6 percent stated that they did not receive any support. According to farmers, agricultural insurance and government help were the primary means of compensation. However, it was claimed that fertiliser, fuel, funds, and machinery support were the most often used kinds of compensation. Furthermore, every farmer surveyed reported no instances of livestock or barn loss resulting from any disaster within the past 5 years.

Table 4. Climate change and evaluations in Yozgat, local effect

	Definitely Yes		Yes		No Opinion		No		Absolutely Not	
	n	%	n	%	n	%	n	%	n	%
Climate change affects your region	64	51.2	49	39.2	12	9.6	-		-	
Adequate information on climate change is provided in my region	-	-	9	7.2	42	33.6	67	53.6	8	6.4
Necessary measures are taken in my region regarding climate change	6	4.8	6	4.8	45	36.0	56	44.8	12	9.6
	Unaffected		Low level		Medium level		High level		No Opinion	
	n	%	n	%	n	%	n	%	n	%
What do you think is Yozgat's level of impact from climate change?	-	-	7	5.6	87	69.6	26	20.8	5	4.0
In your opinion, to what extent is the human impact on climate change in Yozgat?	3	2.4	13	10.4	62	49.6	35	28.0	12	9.6

Table 5. Factors and effects of climate change observed in Yozgat in the last 10 years

	Agree		Disagree	
Which effects of climate change do you observe in Yozgat?	n	%	n	%
Increased rainfall	14	11.2	111	88.8
Decreased rainfall (drought/desertification)	111	88.8	14	11.2
Irregular rainfall	103	82.4	22	17.6
Delayed rainfall	103	82.4	22	17.6
Shortening of the precipitation period	91	72.8	34	27.2
Increase in frost events	46	36.8	79	63.2
Increased temperature	93	74.4	32	25.6
Increase in flood events	45	36.0	80	64.0
Increase in hail events	48	38.4	77	61.6
Increase in wind-storms	67	53.6	58	46.4
Increased day-night temperature difference	71	56.8	54	43.2
Water scarcity	90	72.0	35	28.0
Water pollution	52	41.6	73	58.4
Soil pollution	72	57.6	53	42.4

Table 5. Factors and effects of climate change observed in Yozgat in the last 10 years (continue)

	Agree		Disagree	
Do you think that climate change negatively affects crop and animal production?	n	%	n	%
Reduction in product quantity	107	85.6	18	14.4
Post-harvest losses occurred	32	25.6	90	72
Heat stress	77	61.6	48	38.4
Increase in weeds and insects	60	48.0	65	52.0
Erosion severity increased	34	27.2	91	72.8
Product variety decreased	27	21.6	98	78.4
Diseases and deaths in farm animals increased	55	44.0	70	56.0
Production cost increased	95	76.0	30	24.0
Pasture areas are insufficient / have low capacity	119	95.2	6	4.8
Negativities increased in farm animals during growth-development and fertility periods	51	40.8	74	59.2
Economic instability	91	72.8	34	27.2
Increase in animal diseases (epidemic diseases)	25	20.0	100	80.0
What are the practices that cause climate change in your region?				
Crop and animal production does not cause climate change	14	11.2	111	88.8
Excessive use of fertiliser	40	32.0	85	68.0
Excessive drug use	89	71.2	36	28.8
Over-irrigation	40	32.0	85	68.0
Burning stubble	95	76.0	30	24.0
Agricultural waste	58	46.4	67	53.6
Establishment of large farms	26	20.8	99	79.2
Gases resulting from animal husbandry activities	20	16.0	105	84.0
Unconscious use of pasture and water resources by people	115	92.0	10	8.0
Overgrazing in pasture areas, conversion to land, etc.	115	92.0	10	8.0
Migration of people out of the country	19	15.2	106	84.8
Population growth	36	28.8	89	71.2
Unconscious consumption and destruction of natural resources (forests, pastures, lakes, streams, etc.)	106	84.8	19	15.2
Breeders who are producers become consumers and cannot continue production	81	64.8	44	35.2

Table 6. Product loss and compensation situation in the last 5 years

	n	%
Have you experienced crop loss due to drought?		
Yes	118	94.4
No	7	5.6
Have you suffered crop loss due to flooding?		
Yes	23	18.4
No	102	81.6
Have you experienced crop loss due to hail?		
Yes	57	45.6
No	68	54.4
Have you experienced crop loss due to frost?		
Yes	44	35.2
No	81	64.8
Did you experience any crop loss due to the storm?		
Yes	30	24.0
No	95	76.0
Evaluate the impact of your losses on your income		
Low level	20	16.0
Medium level	40	32.0
Extremely effective	65	52.0
Were you able to compensate for the losses?		
Yes	79	63.2
No	46	36.8

Table 6. Product loss and compensation situation in the last 5 years (continue)

	n	%
Have you received any support for losses caused by climate change?		
Yes	93	74.4
No	32	25.6
What are the compensation methods (more than one option can be selected)		
Utilisation of savings	20	16.0
Agricultural insurance	90	72.0
State support	82	65.6
Animal support	12	9.6
Seed support	3	2.4
Machine support	27	21.6
Fertiliser support	85	68.0
Diesel support	82	65.6
Feed support	25	20.0
Credit support	16	12.8
Cash support	47	37.6

Table 7. Practices carried out in the last 5 years to adapt to climate change / mitigate its impacts

	Agree		Disagree	
	n	%	n	%
The effects of climate change cannot be stopped/mitigated	44	35.2	81	64.8
Changing the crops planted	65	52.0	60	48.0
Change planting time	89	71.2	36	28.8
Change in time to prepare the field for planting	49	39.2	76	60.8
Change in harvest time	49	39.2	76	60.8
Switching to rotational farming	83	66.4	42	33.6
Insuring products	89	71.2	36	28.8
Conservation tillage	39	31.2	86	68.8
I started growing crops that require less water	37	29.6	88	70.4
Starting to plant multiple crops	40	32.0	85	68.0
I changed my water source	46	36.8	79	63.2
I don't have enough information	9	7.2	116	92.8
Changing irrigation system management	26	20.8	99	79.2
Drip irrigation/sprinkler irrigation preference	30	24.0	95	76.0
Limitation on the use of chemical fertilizers	39	31.2	86	68.8
Using animal manure	35	28.0	90	72.0
Insuring animals	23	18.4	102	81.6
Preferring extensive breeding systems	29	23.2	96	76.8
Get information from experts	37	29.6	88	70.4

Table 8. Practices / suggestions that can be done to minimise the effects of climate change

	Agree		Disagree	
	n	%	n	%
The effects of climate change cannot be stopped	20	16.0	105	84.0
Checks and inspections should be increased	73	58.4	52	41.6
Increasing inter-institutional cooperation and presenting region-specific solution suggestions	43	34.4	82	65.6
Conducting training and information activities	92	73.6	33	26.4
Development of good agricultural practices	31	24.8	94	75.2
Increasing organic farming practices	10	8.0	105	84.0
Development of modern irrigation systems	71	56.8	54	43.2
Increasing product diversity	55	44.0	70	56.0
Promoting environmentally friendly products	43	34.4	82	65.6
Conducting soil analysis	56	44.8	69	55.2
Preventing/reducing stubble burning	44	35.2	81	64.8

Table 8. Practices / suggestions that can be done to minimise the effects of climate change (continue)

	Agree		Disagree	
	n	%	n	%
Determining the appropriate product pattern	56	44.8	69	55.2
Protecting water resources and providing efficient use opportunities	32	25.6	93	74.4
Improving disaster risk management for rural areas	50	40	75	60
Employment should be increased	23	18.4	102	81.6
Production power should be increased (Supports should be increased / young people should be encouraged / market conditions should be improved)	56	44.8	69	55.2
Harmful waste generation should be reduced	19	15.2	106	84.8
Pasture areas should be protected	71	56.8	54	43.2
Land consolidation	47	37.6	78	62.4

Practices carried out by farmers in the last 5 years to adapt to climate change / reduce its impacts are given in Table 7. When the activities of the farmers participating in the survey are analyzed, it is stated that they insured their products and changed the planting time of the products, switched to rotational agriculture, changed the crops planted, changed the time of preparation for planting and harvesting, and changed the water resources. In addition, 35% of the farmers reported that the impacts of climate change are unstoppable and unmitigable.

In Table 8, practices / suggestions that can be done to minimise the effects of climate change. Farmers mostly stated that training and information activities should be carried out, controls and inspections should be increased, pasture areas should be protected, modern irrigation systems should be developed, soil analyses should be carried out, appropriate crop patterns should be determined and production power should be increased. In addition, farmers reported that practices such as increasing product diversity, developing disaster risk management for rural areas, land consolidation, preventing/reducing stubble burning, promoting environmentally friendly products, increasing cooperation between institutions and presenting region-specific solutions should be implemented.

4. Discussion

Climate change is seen as the biggest obstacle to agricultural development in developing countries. The high dependence on agriculture and related sectors makes many countries vulnerable to climate change phenomena. There is a gap in understanding climate change at macro and micro levels. Farmers' perceptions and opinions on the impacts of climate change on agriculture are the basis for the development of various mitigation and adaptation strategies (Reddy et al., 2022). In one study, it was reported that the same crop yield was affected differently in different regions due to climatic variations (Kumar et al., 2014). In another study, changing temperature and precipitation trends were observed and their effects on different crops in different regions were analyzed (Aggarwal and Swaroop Rani, 2009). In this context, adaptation to changing climates with climate-resilient technologies and their sensitivity seems to be an effective method for farmers to reduce the negative impacts of climate change (Füssel and Klein, 2006). Nizam (2013) conducted an analysis of the fluctuation in rainfall and temperature, as well as the perception of climate change among farmers in the Anuradhapura region from 1941 to 2010. The study found that most farmers' perceptions closely aligned with a statistical analysis of meteorological data. In their research conducted in several regions, Sarkar and Padaria (2010) and Sarkar and Padaria (2016) found that approximately 38% of the participants were aware of climate change. The researchers noted that the majority of individuals attributed climate change to the rapid process of industrialization. The investigations revealed that the most prominent awareness observed among individuals was a decline in agricultural output.

Adaptation strategies are shaped by multiple factors, including education level, farming family size, gender of the family head, crop-livestock component, access to extension services, and credit from various institutions (Deressa et al., 2011; Elum et al., 2016; Nhemachena and Hassan 2007). In their study, Manjunath et al. (2017) found that crop production in the region is affected by multiple factors including climate, soil, topography, and the institutional and socioeconomic status of farmers. They discovered that 80% of small and marginal farmers believe that regional agriculture is highly susceptible to climate change. Climate change has a greater impact on marginal and smallholders who have less climate-resilient management practices and rely on capital-intensive technologies (Rehmani et al., 2021; Gbetibouo and Ringler, 2009).

All the farmers involved in the study affirmed their prior knowledge of the idea of climate change. The obtained data exhibited greater values compared to the findings reported by Sarkar and Padaria in 2010 and 2016. According to the survey, farmers ranked drought as the primary concern when discussing climate change, followed by global warming as the secondary concern, and changes in seasons as the tertiary concern. According to the study, 90.4% of the farmers reported that climate change has an impact on their region. Farmers primarily note a decline in precipitation, fluctuations and

variability in rainfall patterns, a reduction in the duration of rainfall, and a consequent lack of water. Every farmer reported that climate change had an adverse impact on both crop and animal production. These findings are comparable to the results of investigations conducted in various geographical areas (Sarkar and Padaria, 2010; Shashidahra and Reddy 2012; Varadan and Kumar, 2014; Sarkar and Padaria, 2016; Reddy et al., 2022).

Despite being aware of the existence of climate change, farmers and policymakers frequently neglect to address its consequences due to socioeconomic and institutional limitations, including a lack of willingness, insufficient capital/resources, and limited knowledge (Tripathi and Mishra 2017). Despite being cognizant of the adverse consequences of excessive utilisation of natural resources, farmers persist in over-exploiting them in the majority of cases. Farmers prioritise maintaining their productivity and income over environmental conservation. Hence, it is imperative to comprehend farmers' perspectives on climate change, their level of sensitivity towards climate change, and the efficacy of agricultural adaptation to climate change. Moreover, the task of developing and implementing climate resilient methods poses a substantial difficulty due to the predominant involvement of small and marginalised farmers in farming systems. The majority of these farmers have limited literacy or education and lack resources, resulting in a low ability to adapt (Gbetibouo and Ringler, 2009; Saroar et al., 2015). Consequently, large-scale adoption of climate-resilient practices is not possible, as most practices are site-specific (McCarthy et al., 2001; Reddy et al., 2022).

5. Conclusion

Since the impacts of climate change, adaptation strategies and farmers' knowledge are largely site-specific, location-specific studies are needed. This study sought to ascertain the perspectives of farmers in Yozgat province, situated in the Central Anatolia Region of Türkiye, on the effects of climate change on livestock and the observed alterations. The obtained results are believed to aid to the development of regional plans aimed at mitigating the impacts of climate change. Furthermore, the absence of any comparable field research undertaken in the region, along with the scarcity of such studies in our country, underscores the significance of the present work as a potential catalyst for future investigations. The poll reveals that the farmers involved have a strong understanding of climate change and are impacted by its implications on animal production. Additionally, they employ certain strategies to adapt to these changes and minimise their consequences. Nevertheless, it is crucial to underscore the necessity for key institutions to conduct information dissemination, training programmes, legal enforcement, and inspections pertaining to this matter.

Author Contributions

The percentage of the author(s) contributions is presented below. All authors reviewed and approved the final version of the manuscript.

	H.T.	M.A.B.	S.Y.
C	50	50	
D	50	50	
S	50	50	
DCP			100
DAI	50	50	
L	50	20	30
W	50	30	20
CR	50	50	
SR	50	30	20
PM	20	50	30
FA		50	50

C=Concept, D= design, S= supervision, DCP= data collection and/or processing, DAI= data analysis and/or interpretation, L= literature search, W= writing, CR= critical review, SR= submission and revision, PM= project management, FA= funding acquisition.

Conflict of Interest

The authors declared that there is no conflict of interest.

Ethical Consideration

The authors confirm that the ethical policies of the journal, as noted on the journal's author guidelines page, have been adhered to. Permission to conduct the study was obtained with the decision of the Yozgat Bozok University Social Sciences and Humanities Research Ethics Committee dated October 18, 2023 (protocol code: 07/10).

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