INTERNATIONAL CONFERENCE "FOOD SAFETY - A PERMANENT CHALLENGE"

A primary investigation on the Impact of Climate Change on Livestock Farming and Food Safety in Albania.

MERZAI BAKIASI 1*, OLJAM DERVISHI 2, ILIRJAN BAKIASI 3

1-Veterinary Public Health Department, Agricultural University of Tirana / Address: st. Paisi Vodica 1025, Tirana, Albania.
2- Department of Research and Innovation, RESU – Reinforce Sustainability NGO / Address: st. Naim Frasheri, bd. 24. Tirana, Albania.
3-Department of Clinical Modules, Agricultural University of Tirana / Address: st. Paisi Vodica 1025, Tirana, Albania

INTRODUCTION

Livestock and climate change are locked in a vicious cycle, as the livestock sector contributes significantly to climate change, climate change impacts livestock directly (e.g. Feed Intake, Animal Production, Reproduction, disease and parasite stress, mortality, etc.) and indirectly (i.e. through quality and availability of feed and forages) Cheng M et al., 2022.

Source: After Cheng M et al., 2022.
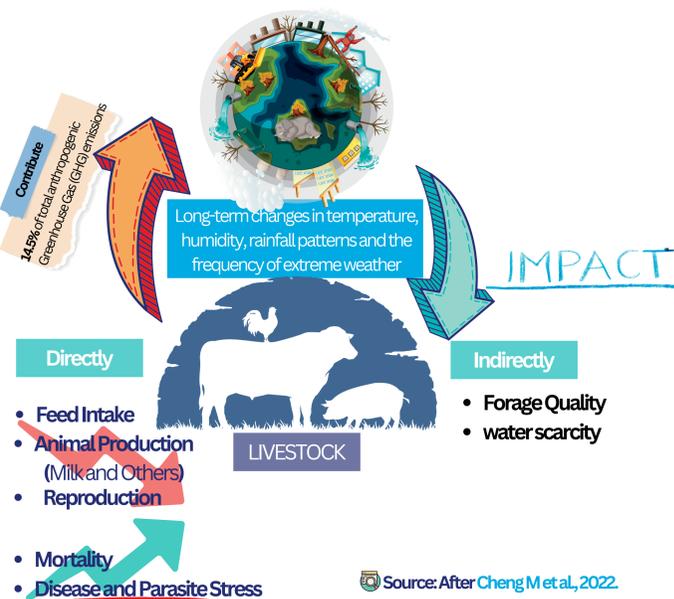
Climate change also has the potential to impact the prevalence and severity of foodborne illnesses, as the sensitivity of harmful microbes and pests to climate factors makes them more likely to thrive and cause disease outbreaks (EFSA,. 2020).
Brucellosis, caused by the Brucella bacteria, is one of the most widespread zoonotic diseases globally, the detection of both B. abortus and B. melitensis indicates that controlling high-pathogen zoonotic agents remains a challenge for ensuring food safety and protecting consumer health (Béjaoui A, et al. 2022)
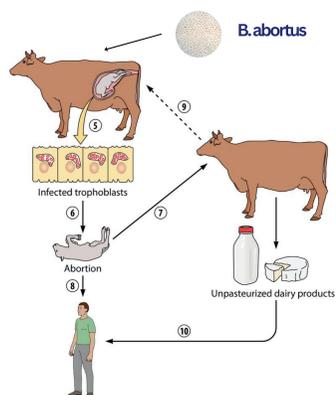
Due to its heavy reliance on the agriculture sector, Albania is increasingly vulnerable to the effects of climate change. Livestock is crucial for agriculture in Albania, providing a primary source of income. Although livestock numbers have remained relatively stable since 2010, recent data from INSTAT indicates a decline. The main livestock products in Albania are meat, milk, and eggs, with limited product diversity due to the underdeveloped processing industry in rural and mountainous areas. Climate change is predicted to have the greatest impact on sheep and cattle in lowland areas of Albania (NC4, 2022)

Albania's First Biennial Update Report of 2021 has revealed that the country's annual mean temperature has increased by 1ºC since the 1960s. However, the effects of climate change are not uniform across the country. Additionally, data on brucellosis in milk and animals has only been collected for the past two years. As such, **the aim of this study is to explore how environmental changes and climate factors are impacting the spatial distributions and seasonal/annual cycles of Brucella spp. in Albania.**

References

Cheng M, McCarl B, Fei C. Climate Change and Livestock Production: A Literature Review. Atmosphere. 2022;13(1):140. https://doi.org/10.3390/atmos13010140

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Béjaoui A, Ben Abdallah I, Maaroufi A. Brucella spp. Contamination in Artisanal Unpasteurized Dairy Products: An Emerging Foodborne Threat in Tunisia. Foods. 2022 Jul 29;11(15):2269. doi: 10.3390/foods11152269. PMID: 35954037; PMCID: PMC9367864.

Fourth National Communication of Albania (NC4) was submitted to the United Nations Framework Convention on Climate Change (UNFCCC), 2022

MATERIALS AND METHODS

The data used in this study was obtained from the Climate Change Climate Portal, which provides gridded climate datasets for Albania at a spatial resolution of 0.5 degrees. The dataset used in this study includes annual mean temperature values for each city in Albania for the period of 1901 to 2021. The reference period, or **baseline,** for this analysis, was established as the 30-year period from **1961 to 1990**, referred to as the "Past" period. Temperature anomalies were calculated for the period from 1961 to 2021, referred to as the "Present" period, by subtracting the average temperature for each year.

The methodology used to obtain temperature data for each month and season involved obtaining the published monthly bulletins from the Institute of Geosciences. To derive the annual average temperature from these data, only the stations with at least 8 months of data were included in the calculation. Similarly, to calculate the average temperature for each season, only the stations with a total of 2 months of data for each season were included in the calculation.

The data on brucellosis in livestock were sourced from the National Authority of Veterinary and Plant Protection. These data were collected during the monitoring of Brucellosis in cattle across three phases: spring (ending in May), summer (beginning of September), and autumn (beginning of December). The prevalence of the disease among herds was calculated based on milk results, using the formula $P= (n/N) \times 100\%$, where P represents the prevalence, n represents the number of positive cases, and N represents the total number of cases tested.

As a tool for data treatment, R and R studio were used. The temperature anomalies were calculated using R programming language, and the ggplot2 package was used to generate data visualizations.

RESULTS
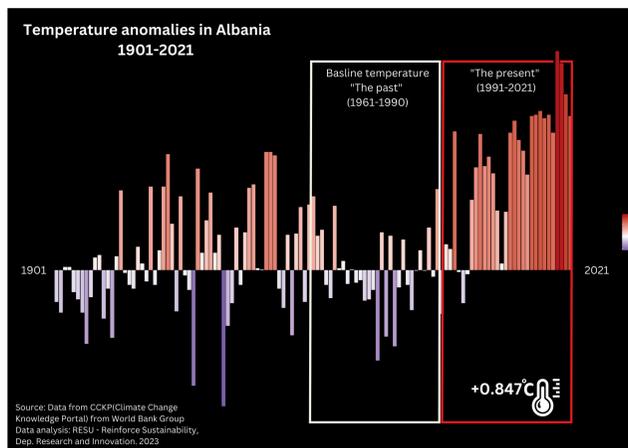
The results indicate a clear temperature change in the "Present" period compared to the previous 30 years, as shown in the graph above. The average anomaly for the "Present" period is +0.85ºC, with an average temperature of 12.48ºC. The graph also reveals that the year with the highest anomaly was recorded at +1.83ºC.
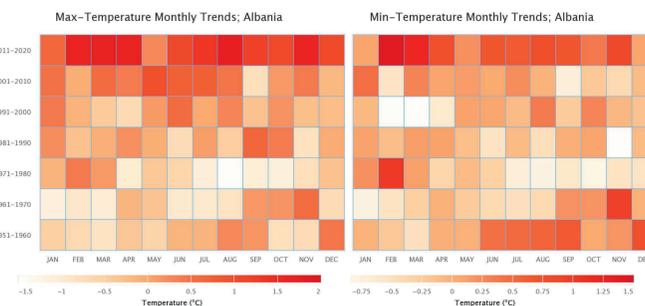
The analysis of temperature data indicates that, over the last decade, there has been a marked increase in the maximum temperatures recorded for each month, while the minimum temperatures have remained relatively stable. This trend is particularly noteworthy as it suggests that the temperature variability within each month has increased.
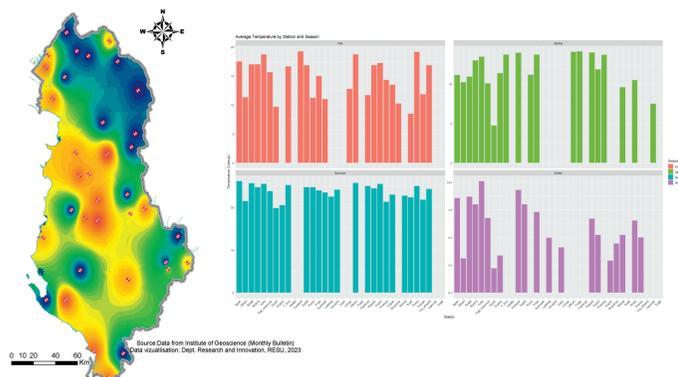

The survival of Brucella spp. is highly influenced by temperature, which is considered a critical environmental factor. These bacteria exhibit mesophilic behavior and their optimal growth temperature ranges from 20ºC to 40ºC. At temperatures below 20ºC, the growth rate of Brucella spp. declines, whereas at temperatures exceeding 40ºC, the bacteria may undergo damage or complete destruction. The aforementioned map and graphs demonstrate that the average temperature during summer at all stations is above 20ºC. However, during the spring season, there are a few stations where the temperature hovers around 20ºC.

Brucellosis 2021

Region	No. of milk samples	No. of positive milk samples	No. of blood samples	No. of positive blood samples	Total No. of heads	Prevalence among herds based on milk
Tirana	1814	38	356	2	21480	2
Elbasan	1521	27	271	25	18845	1.8
Vlore	2903	21	161	25	34163	0.7
Shkoder	3413	26	244	9	39921	0.8
Total	9651	112	1032	61	114409	1.2

Brucellosis 2022

Region	No. of milk samples	No. of positive milk samples	No. of blood samples	No. of positive blood samples	Total No. of heads	Prevalence among herds based on milk
Tirana	1361	8	89	13	18145	0.6
Elbasan	1024	13	150	12	14886	1.3
Vlore	2247	6	32	5	30957	0.3
Shkoder	2144	11	111	4	29494	0.5
Total	6776	38	382	34	93482	0.6

Prevalence of Brucellosis by Phases and Regions in Albania
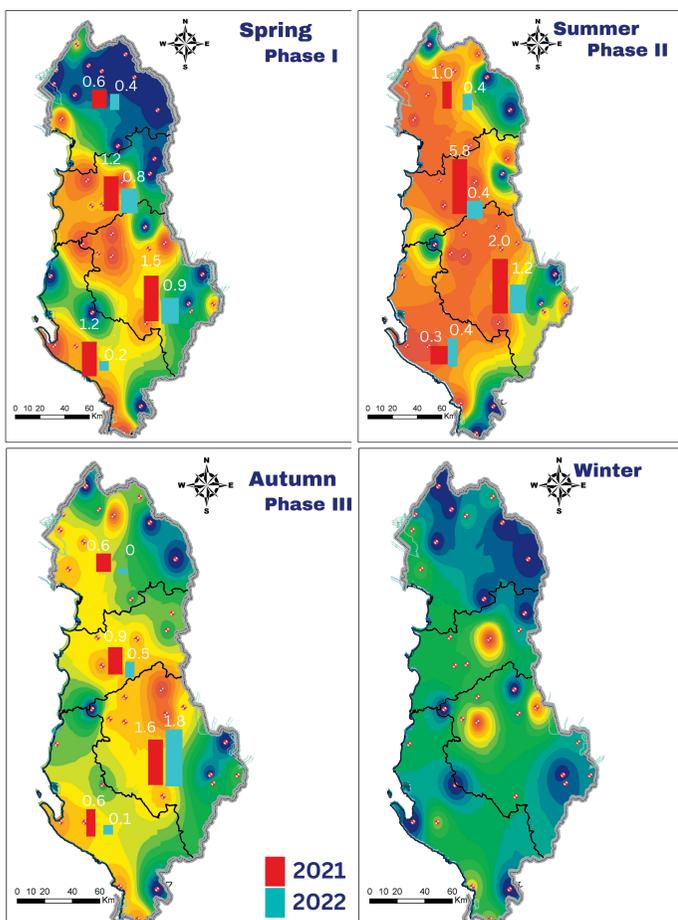
Source: NAVPP Albania,
Data visualisation: Dept. Research and Innovation, RESU 2023

Contact Information

Corresponding author's Name — Merzai Bakiasi
email: merazaibakiasi@gmail.com