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Environmental Change and Its Impact on Animal Well-being and Production: A Concise Overview

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ABSTRACT

Animal health and productivity are two areas that are particularly vulnerable to the impacts of climate change, particularly global warming. Since 1970, the average temperature of the country has risen by 1 degree Celsius. Climate change is influencing the health and productivity of agricultural animals, according to the majority of countrymen who own livestock. Shortages of feed and water, livestock genetic resources, productivity, and mature weight (or the time it takes to attain it) are some of the most significant ways in which climate change affects animal production. Changes in the environment that cause temperatures to rise may hasten the maturation of certain parasites and diseases that have evolved to live independently of mammals. In addition, the pattern and visibility of rainfall greatly affect the spatial disposition and visibility of grassland and water. Deduced cattle abundance and reproductive execution are bestowed by food and water limitations. The animals' poor reproductive function, limited milk production, loss of body condition, and sluggish development rate are all examples of these problems. Crop cultivation is impeded when drought bulls are weak and unable to generate enough drought energy for plowing. The availability of high-quality pastures has diminished due to bush encroachment and population pressure. Consequently, alterations to the environment will significantly impact the well-being and productivity of animals, particularly in areas that are particularly susceptible to these changes and rely on them for necessary nutrients and maintenance. Once again, there are a number of ways in which environmental change impacts the health of farm animals. These include changes in micropaleontology, such as altered transmission levels between hosts, as well as changes in parasites, hosts, and vectors, such as shifts in precipitation and temperature patterns that impact the distribution and abundance of disease careers. Examining how natural changes affect cattle well-being and output has been the primary goal of this research.

Keywords: Livestock, Adaptation, Global warming, Climate change, Impact, and Production.

INTRODUCTION:

Ten million families throughout the globe rely only on domestic animals for their livelihood. An estimated 701 million out of a total of 1 billion people call Livestock provide sustenance, income, traction, and transportation for those living in poverty (Oyhantçabal et al., 2010). At 34% of the total, the farm animal sector is rapidly expanding within the agricultural industry. the developing world's population, urbanization, and increasing affluence are driving cultural GDP growth. Sub-Saharan Africa and South Asia are projected to see a doubling in demand for all animal products by 2049, according to Alexandratos and Bruinsma (2012). On the other hand, according to research published in 2015 and 2022 by Thornton et al. and Hassen et al., respectively, the amount of agricultural production over the world has been decreasing by 1-6 percent every decade due to climate change.

According to Rabinowitz and Conti (2013), illness conditions caused by climate change are expected to have significant negative effects on both human

and animal health. Environmental degradation, economic hardship, population displacement, and social unrest are all consequences of climate change. Furthermore, it is now well recognized that weather change is happening and will keep happening if nothing is done (Yatoo et al., 2012). The hosts and parasites of diseases, as well as their reproduction, growth, and illness transmission, are impacted by changes in the weather. This has repercussions for its dispersal, host-parasite interactions, and the formation of new populations in other places. According to ESAP (2009) and Ekhlas et al. (2014), animals' well-being may be positively or negatively impacted by climate change.

Diseases in animals that are transmitted by vectors, those that are associated with soil, those that are affected by water or floods, those that are caused by rodents, or those that are affected by air temperature and humidity may be more directly impacted by weather (Grace, 2015). Efforts by animals to adapt to thermal environments or weather-related impacts on pathogen populations, vector-borne disease disposition, host immunity to vector-borne disease disposition, and food-borne disease are all examples of indirect effects that follow more complicated pathways (Yatoo et al., 2012).

Moreover, there are a number of ways in which climate change may impact the health of farm animals. These include changes in the abundance and severity of wildlife and career surveys, as well as the likelihood that some diseases would be able to survive in certain environments (ESAP, 2009). According to Chauhan and Ghosh (2014), this may reduce the regeneration period and perhaps increase the total number of generations annually, leading to a larger population of pathogens and parasites. The geographical distribution and intensity are both impacted by rising temperatures. of pests and illnesses that already exist, which may reduce the production of cattle or even cause their death in the worst conditions (Musemwa, 2012).

The ECARD (2012) asserts that many insects, including flies and ticks, rely heavily on temperature throughout their developmental phases and transmit the majority of illnesses. Various nematode worm infections may affect cattle, goats, sheep, and horses, and these infections are in turn affected by climate at certain temperatures while the animals are developing. Better control of animal health problems necessitates an understanding of the link between weather change and livestock illnesses. Even though farming is a major economic driver, little is known about the connection between climate change and sexual health at the present time, particularly in Africa. Consequently, this article aims, among other things, to survey the impact of weather changes on cattle well-being. Ethiopia is the leading producer and exporter of live-stock on the African continent, and it also happens to be home to the continent's biggest cattle population. Animal production in Ethiopia has been expanding and intensifying, despite the fact that domestic demand for farm animal products is being propelled by the export potential of the urban middle and upper classes (McDonald and Simon, 2011). Approximately 57.82 million cattle, 28.88 million sheep, 29.71 million goats, 2.09 million horses, 7.89 million goats, 60.52 million poultry, 5.93 million bees, 0.42 million chicks, and 42 million hens make up Ethiopia's livestock population, according to a recent study (CSA, 2016). They provide draft energy, milk, meat, dung, skins, and hides among other items; they are a key part of almost all agricultural and pastoral systems in Ethiopia (Funk et al., 2012; Bekere et al., 2022). Ethiopia is well-suited to raising a wide variety of livestock due to its varied climate, which is characterized by its huge and varied primary agronomic zones (Funk et al., 2012). The nation is, however, geographically separated from other countries that experience harsh weather (Alebachew & Woldeamlak, 2011). The World Bank (2010) found that the frequency of droughts and floods has increased due to long-term climate consequences linked to changes in rainfall patterns, rainfall variability, and temperature. Consequently, among the variables impacting livestock productivity, location and weather are unquestionably the most advantageous. Indeed, weather conditions like average temperature and precipitation patterns may enormous impact on the seasonality of animal populations' access to pasture and other food sources. The data reveal that pastures are more accessible and nutritionally sound during the rainy season, but they are less so during the dry season, when animals tend to put forth less meat due to the high fiber and low

protein content (Abebe, 2017).

Analyzing Existing Research

Connection Between Animal Illnesses and Climate Change Climate is often associated with the spread of infectious illnesses as well as the timing and intensity of epidemics. Changes in the weather may have direct and indirect effects on animal diseases. Some animal illnesses are more affected by climate than others. These include diseases that are spread by vectors, soil-related diseases, diseases caused by water or floods, diseases caused by rodents, and climate-sensitive diseases. Some examples of environmental influences include geographical factors that influence the spread of climate change, temporal factors that influence the onset and progression of epidemics, and factors that influence the intensity of such events (Grace et al., 2015). Adaptations to a changing global climate are reshaping ecological architecture in ways that are audible and visible (Slenning, 2010). These alterations broaden the pathogen's impact on hosts and alter its transmission pattern and efficiency (Brook and Hoberg, 2007). A wider variety of parasites makes animals more susceptible to illness, which in turn reduces the pathogenicity of the disease-causing agent. Since the severity and course of cow illnesses may vary widely, farm animal systems are quite sensitive to these changes. Among the many issues plaguing warm temperate zones, the presence of external parasites (43.4%) stood out. Because changes in rainfall and temperature dominions may impact the distribution and prevalence of vector-borne illnesses, these conditions are especially vulnerable to climate change (Dhakal et al., 2013). Because their metabolic activity increases at high temperatures, arthropod vectors eat more often, making the transfer of infection between hosts more likely. Disease patterns may shift dramatically in response to seemingly little changes in vector traits (Grace et al., 2015). The epidemiological and climatic circumstances of disease agents are related. Environmental variables such as temperature, precipitation, and humidity impact the life cycles of helminths, arthropod vectors, and the diseases they transmit. The impact of climate change on the pathogens, their hosts or vocations, the genesis, development, and transmission of diseases (ESAP, 2009). According to the OIE Scientific Committee, climate change might have a major role in the transmission of some diseases, especially those transmitted by vectors. Recent studies conducted by the OIE have shown that catarrhal fever and RVF are the two most prevalent emerging and resurgent goat's illnesses (OIE, 2008). Recent years have seen a dramatic shift in the worldwide distribution of bluetongue virus infections, and Wilson and Mellor (2008) speculate that this shift is at least in part because to climate change. Wittmann (2002) cites research that shows disease vectors are temperature sensitive and suggests that humidity and rainfall may also have an effect.

Effects of climate change on cattle health There is some evidence that climate change is significantly impacting the onset, progression, and dispersal of animal diseases. For instance, according to Thornton and Gerber (2010), animal vector-borne illnesses including bluetongue, Rift Valley fever, and African horse sickness exhibit substantial seasonal and long-term climatic variation in their behavior and effects. Weather changes may impact equine infectious illnesses in several ways. One method is via impacts on pathogens, which can slow the development of viruses or parasites in hot climates. Changes in the distribution of diseases can impact populations of animals that are vulnerable to them. Changes in the weather can impact the frequency and severity of diseases, which in turn affects careers. Finally, changes in the ratio of infections between different hosts can impact micropaleontology (Baylis & Githeko, 2006). There isn't universal agreement that global warming will make people sicker, but there are other factors that could make things worse, like the ever-increasing size and complexity of supply chains and, most notably, the inevitable intensification of yield systems everywhere (Randolph, 2008).

The effects of climate change on people's jobs Since arthropods are cold-blooded, the weather has a significant impact on their careers. The ability of arthropod vectors to survive, reproduce, and change their behavior and population dynamics are all impacted by meteorological conditions such as temperature, precipitation, and humidity. Climate have a role in determining the appropriateness of habitats. density and seasonal pattern of vector activity all year round; bility, disposition, and

abundance. There are a number of ways in which weather changes could affect disease vectors. To start with, their disposition is often constrained by temperature and humidity. Because populations recover at slower rates in warmer seasons and winter mortality is substantial, cold temperatures are often a limiting factor. On the other side, as a result of high temperatures, areas that were previously too cold for vectors may start to thrive due to climate change. Similarly, locations that were already warm might become even warmer with an increase in rainfall or humidity, allowing vectors to thrive. On the other side, if moisture levels stay the same or go down while moisture stress goes up, these locations can end up being less ideal for vectors (Baylis & Githeko, 2006). Arthropod vectors, their life cycles, and their histories will be impacted by climate change, which will modify the way vectors and diseases behave, as well as the capacity of arthropods to transmit infections. Because of this, animals will be at a higher risk of contracting new illnesses and parasites, as shown by projected changes in the distribution of some species, such as the tsetse fly in Africa (Tabachnick, 2010). In the hyper-endemic division of Andhra Pradesh and the mesoendemic region of Maharashtra state, India, weather factors like temperature, humidity, and rainfall account for 53% and 85% of the variation in the severity of FMD in cattle, respectively, according to research studies conducted in India (Ramara, 1988). Extreme heat and humidity make horse infestations worse. H. anatolicum, B. microplus, and H. bispinosa (Kumar et al., 2004). As temperatures rise, arthropod careers may become more consistent feeders. A lot of professions need to infect a suitable host twice: once to get the illness and once to pass it on following EIP. The amount of time it takes for an arthropod to lay eggs dictates how often it feeds on blood. As an example, female C. sonorensis fish eat every four days at 31 °C, but every fifteen days at

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°C. More appropriate hosts are available to the vector at higher temperatures, increasing the likelihood of successful transmission (Baylis and Githeko, 2006).

Environmental alter impact on the pathogens Higher temperatures and greater humidity generally increase the level of enlargement of parasites and pathogens that spend level of their life span outside the host. Changes in air can affect the spread of pathogens. Flooding following extreme weather events provides favorable conditions for many wate- rborne pathogens. Dry spell and desiccation are detrimental to most pathogens (Grace *et al.,* 2015). Increased rates of development due to higher tem- peratures may shorten the generation time and, pos- sibly, increase the total number of generations per year, thereby increasing the pathogen/parasite popu- lation size. Conversely, some parasites are sensitive to large temperatures & their survival may losses with weather warming. Parasites and pathogens sensitive to wet or hot conditions may contrived by alters in rainfall, soil moisture & load frequency (Kimaro & Chibinga, 2013). Weather change can affect the layout of a few pathogens and careers. A few pathogens/ parasites and many careers experi- ence significant mortality during cold winters; Warm winters can increase the likelihood of successful overwintering (Harvell, 2002). Lengthening the warm season may increase or decrease the number of warm- or cold-related disease transmission cycles in a year, respectively. Arthropod vectors require war- mer weather so the conveyance season for arthro- pod-borne diseases may be extended. A few patho- gens/parasites and many careers experience signifi- cant mortality during cold winters; Warm winters can increase the plausibility of successful over-win- tering (Witman & Bayliss, 2000). Maximal weather events, for example, flooding can carry a risk of *Cry- ptosporidium* parasites and enterohaemorrhagic *E. coli* Appears as diffuse pollution from agricultural land. It poses a clear threat to the other cattle and is also a zoonotic risk to humans through contami- nation of water supplies. Production-limiting dis- eases also deserve increasing attention (Wittmann & Baylis, 2000; Hayle *et al*., 2020).

Weather change effect on epidemiology of disease In addition to influencing the viability of intermediate vectors, parasites, or diseases, changes in the weather may have additional effects on the rates of transmission between hosts. Issues including farm growth, local farm animal movement, and future themes of international commerce will be influenced by climatic changes and the potential effects of disease transmission. Extraneous consequences:

Changes in the weather and other factors may impact the abundance and behavior of pests, competitors, predators, and vector parasites, which in turn can influence disease patterns.

Changes in land use have the potential to generate novel species mixtures, which in turn might introduce new pathogens and vectors, and potentially spread new diseases (WHO, 1996). Although this is a beginning and examples of this type of analysis are done for various animal diseases in developing countries, studying the effects of weather change on cattle diseases will require moving beyond simple estimates of temperature effects on rainfall and disposition. The effects are likely to be complex. It seems that the brown-eared tick's (R. appendiculatus) fate will be impacted by climate change. ECF is a disease that affects grazing and mixed systems in East and Southern Africa. Continue spreading throughout central and western South Africa (Rogers, 1996). Thornton et al. (2006) investigated climate-driven changes in the suitability of habitat for ticks and fly vectors in their investigation of trypanosomiasis of cattle, a serious problem in African farm animal systems. Despite the fact that climate change would affect the tsetse fly's suitable habitat, the impact on trypanosomiasis risk from clearing bush areas may be more significant due to population numbers. There is no presumption that infectious agents in general will increase the risk of infection and the exposure of farm animals to that risk, according to Randolph (2008), who also notes that more comprehensive evaluations have sought to go beyond the distributional effect of disease careers, but that these have mostly focused on developed countries (Randolph, 2008). Following the lead of ticks in Australia's goat sector (B. microplus), White et al. (2003) mimicked the phenomenon. They evaluated breed modification as a potential adaptation strategy after calculating the economic losses linked to decreased tick numbers and productivity. Assumptions and uncertainties notwithstanding, their primary conclusion—that risk assessments for climate change should, whenever feasible, be expanded to include all comparable variables—may be more intriguing. It made notice of recent studies that have focused on how melting is causing carnal illnesses and pests to move from lower to mid-latitudes.

Bluetongue, a virus that mostly affects sheep but may also infect goats and deer, is expected to migrate from tropical regions to the mid-latitudes, according to experts. Impacts on lives-tock health as a function of CO2 and are not explicitly included in most assessments. climate. It is unclear whether the effects of CO2 are significant in this particular instance. The unpredictable nature of weather change's effects on equine illnesses is a concern that affects other animal-related aspects as well, if not more so (Anon, 2006). Changes in live-stock production in Africa caused by climate change might have several indirect and unanticipated implications on infectious animal illnesses on the continent, as pointed out in (Baylis & Git-heko, 2006). It seems that illnesses like RVF and bluetongue in East Africa and African horse sickness in the Republic of South Africa have been disseminated widely due to the combination of drought and heavy rains (Baylis & Githeko, 2006). Some vector-borne disease outbreaks are predicted to become increasingly widespread in Africa; however, our ability to forecast when and where these outbreaks may occur is quite restricted. The ways in which climate change could impact the spread of diseases are also often oversimplified, as has been pointed out. Much research on disease dynamics and how they could adapt to a changing environment is necessary since, in general, several elements are at play. Evaluation of the impact of animal illnesses in the underdeveloped world is especially motivating due to these aspects (Kovats et al., 2001).

Disease rates as a result of climate change

There is evidence that dairy cows experience an uptick in clinical mastitis and milk somatic cell counts during the warmer summer months. Clinical mastitis is less common in cows kept in climate-controlled facilities or those with adequate shade management systems as compared to those left unprotected from the elements. Hot and humid weather are linked to populations. According to Kumar et al. (2004), ticks such as B. microplus, H. bispinosa, and H.

anatolicum, which may transmit protozoan infections, are more prevalent in cattle when the weather is hot and humid.

Effects of changing environmental conditions on hosts As predicted due to stratospheric ozone depletion, increased exposure to UVB radiation may reduce mammalian cell immunity. Thus, while not investigated in cattle, ozone-depleting greenhouse gas emissions may impact some animal illnesses. Genomic resistance to illness is a more pressing issue that needs immediate attention. Animals may gain resistance to some illnesses via genetics, although they are still susceptible to at risk of contracting "new" illnesses. Extreme disease outbreaks in populations of cattle that had never been exposed to them before might be caused by changes in the weather or by disturbances in local stability (Baylis & Githeko, 2006).

Impact of climate change on cattle feed resources

Changes in fodder resources are the most noticeable consequence of climate change on cattle productivity (Abbett, 2009). This is because droughts and rain delays cause grass to regenerate poorly, water shortages, and heat stress in animals. Once again, cattle mortality, disease risk, and physical degradation from long distance travel for water and pasture are all exacerbated by droughts and rains delays.

According to Digambar (2011), pasture and forest fodder variety and quality are being negatively affected by low rainfall, which in turn hampers the regeneration of forage species, and severe drought is having a direct effect on the development of pasture and pasture grass species. The overconsumption of cow feed has reduced the number of cattle in the population, which in turn has reduced the availability of milk, dairy products, and meat. animals are not the only ones hit hard by drought. It dries out grasslands, marshes, water sources, and streams, making it harder for horses and other animals to find water to drink. Grassland productivity, species composition and dynamics may be impacted by changes in temperature, precipitation regimes, and CO2 levels. As a result, carnal diets will change and farm animals' nutrient accessibility may be determined (Digambar, 2011).

Impacts of climate change on water supplies

By the end of this century, 26 percent of Africa will have considerably reduced access to surface water due to perennial drainage losses, according to De Wit & Stankiewicz (2006). Morton (2007) held the view that developing nations are the hardest hit by climate change, particularly the so-called "subsistence" or "smallholder" farmers. Small farms with limited resources (both financial and technological) may be more vulnerable when it comes to raising livestock. Climate change poses a hazard to water sources like rivers, lakes, and rainfall supplies, making it harder to get water for cattle production (Gammada et al., 2022).

The impact of climate change on milk production Changes in the weather have a direct impact on livestock. Accessibility and placement in space of pas- water and climatic conditions are quite sensitive to the patterns and amounts of precipitation (Akalilu et al., 2013). Forage quality, weeds, pest and disease prevalence, grazing limitations, and food availability are all impacted by changes in temperature ranges and precipitation patterns. Therefore, agricultural animal yields are sensitive to changes in meteorological variables including the frequency and intensity of final events like temperature, precipitation, and drought. According to Baumgard et al. (2012), animals' health and productivity are impacted by climatic conditions and seasonal fluctuations because of the neuroendocrine responses to these factors. A lot of natural regions' capacity to support livestock production systems is under jeopardy due to climate change (Gaughan et al., 2009). Tropical climates, with their high air temperatures and relative humidity, have a disproportionate impact on high-yielding animals (Martello et al., 2010). According to Parons et al. (2001), as temperatures rise, cows consume less feed, produce less milk, and experience energy deficits, all of which have negative effects on fertility, health, and lifespan. A dairy cow weighing 636 kg produces 37 kg of milk per day at 33oC, according to modeling work using the

Cornell Net Carbohydrate and Protein (CNCP) System Model (Chase, 2006). This is in comparison to the energy needs at 17oC. It was anticipated that dry matter consumption would drop by 19% and milk by 33% for the same temperature rise (Thornton et al., 2008).

Impact of global warming on the meat and egg industries

Poultry thermoregulation differs from mammalian thermoregulation in a few key respects, including a greater metabolic rate resulting from more intense heat production and a reduced heat dissipation capacity contributed by feathers and the absence of sweat glands. Over 30°C, animals' energy and food intake drops to dangerously low levels, causing a precipitous drop in output and an uptick in mortality. Poultry nutrient digestibility is reduced at high enclosing temperatures, according to many studies. This might be because chymotrypsin, trypsin, and amylase are less active. According to Amundson et al. (2006), layers' egg production, egg mass and shell quality, and broilers' development rate are all negatively impacted by an insufficient and low nutrition supply.

The impact of climate change on domestic animal reproduction

Reduced activity of renin, chymotrypsin, and amylase may explain why high enclosing temperatures reduce nutritional digestibility in fowl, according to many studies. Therefore, layers' egg production, broilers' development rate, and egg mass and shell quality are all negatively impacted by an insufficient and very low nutrition supply (Madan, 2007). Pregnancy rates reportedly drop because the estrous cycle is shorter and less intense. since a result, summer dairy cows may have decreased fertility if they are heat stressed, since their dominant follicles secrete less estradiol and fail to display behavioral indicators of oestrus. A longer calving gap is required in this case. Appropriately, dairy cows' lifetime productivity drops. Reduced blood flow to the uterus from heat stress during pregnancy leads to placental insufficiency, which in turn reduces fetal development and calf size by reducing the delivery of maternal nutrition. Heat stress may kill foetuses as well as the mother cows. Heat stress also decreases the amount of seminal fluid and the concentration of sperm. According to Samal (2013), bulls' ejaculate volume, sperm concentration, and sperm motility are all lower in the summer compared to the winter.

CONCLUSION AND RECOMMENDATIONS:

There are a number of ways in which climate change is harmful to cattle health and production. Several variables may influence the impact on cow health, such as the number and distribution of vectors and animal predators, as well as the environmental conditions that allow infections to survive. This may lead to an increase in livestock illnesses, some of which are more susceptible to changes in the weather. Indeed, suggestions for mitigating climate change's possible impacts might benefit from a deeper understanding of the impacts on animal health. Regrettably, our understanding of the factors that influence resilience and adaptability. In the larger framework of creating suitable policy measures and institutional assistance to assist livestock owners in dealing with all animal health concerns, adaptive ability may be strengthened, for instance. The most critical and essential adaptation approach is the establishment of a reliable animal health service, together with related emergency preparation and monitoring measures, and long-term initiatives to manage and prevent animal diseases. The cattle population will be shielded from the

risks associated with climate change and extreme weather. Climate change will have far-reaching and complicated effects on cattle output and efficiency. Rising air temperatures are one way in which climate change threatens animal productivity and wellbeing. However, the impacts of climate change may be evaluated by studying how animals react to heat stress in various parts of the world during warmer months and during periods of high heat. Natural pastures, which are relied upon by most livestock owners, are degrading in both quality and quantity due to farmers' lack of awareness of the impacts of global warming on their operations. In addition,

the water sources that are now accessible are not always trustworthy because of the frequent occurrence of droughts and extreme heat. Overexposure to heat, lack of water, food, and illness all contributed to their demise. Hence, for further consideration, we offer the following suggestions.

REFERENCES:

1) The first is Abate (2009). Effects of climate change on livelihoods, susceptibility, and methods of adaptation in Ethiopia's West-Arsi Zone.

Secondly, Abebe Kiros (2017). Climate change's impact on feed supplies for cattle. Publication: Academic Journal of Agricultural Science, Volume 5, Pages 98-106. This is the link to the article: https://doi.org/10.14662/ARJASR2016.056—

The third source is Adams, R., McCarl, B., and Ojima, D. (1999). Agricultural production and the cost of climate change in the United States", in Mendelsohn, R. and Neumann,

Cambridge University Press, Cambridge, UK, 2007 (J. Ed.), The Effects of Global Warming on the American Economy.

The authors of the cited 2013 study are Aklilu, Desalegn, Mesfin, and Negash. Pastoral women in Ethiopia and the effects of climate change: data from the southern lowlands, Public Health Ethiopia, 2016, pp. 1–6. Here is the link to the PDF: https://phe-ethiopia.org/pdf/Final_Brief_CC_women.pdf.

Fifthly, Alebachew and Woldeamlak (2011). Epsilon International R&D contributed to a climate change country assessment report for Ethiopia, which was published in Addis Ababa.

6) With J. Bruinsma and N. Alexandros (2012). The 2012 version of the FAO report on the state of global agriculture towards 2030–2050, Rome, Italy.

In 2006, Amundson, Mader, Rasby, and Hu published a paper. Implications of environmental factors on the gestational age of beef cattle. This article appears in the Journal of Animal Science, volume 84, pages 3415–3420.

Visit this link for more information: https://pubmed.ncbi.nlm.nih.gov/17093236/.

Anon, the year 2006. France confirms the presence of bluetongue. Reports and news. Article number: 159, 331.

In 2022, Bekere, Tamanna, Badiruzzaman, and Yusuf published a study. Classification and disease transmission of ixodid ticks in household pets. International Journal of Agricultural and Veterinary Science, 4(2), 39-45. This is the link to the article: https://doi.org/10.34104/ijavs....022.039045.

2010) Baumgard, Lenka, and Sejian. Effects of Global Warming on the Production of Livestock. For example, in Ger-man, 4, 13–68, the authors discuss environmental stress and how to improve livestock production. Here is the link: https://core.ac.uk/reader/234657330

11) From 2006, Baylis and A. K. Githeko. The impact of global warming on animal infectious diseases. Page 35 of the report was prepared for the UK government's Foresight Project on Detection of Infectious Diseases by the Department of Trade and Industry.

(Baylis and Githeko, 2006, 12). The results consequences of global warming on infectious illnesses of the United Kingdom's Department of Trade and Industry, 35 pages long report on animal

health for the Foresight Project on Detection of Infectious Diseases.

13) Hoberg, E.P., and Brooks, D. R. 2007. What impact will climate change have on the composition of parasite host populations? Current Parasitology Practices, 23, 571-574. Retrieved from https://pubmed.ncbi.nlm.nih.gov/17962073/.

The authors of the cited article are Brunner and Eickemeier (2014). Pages 811–922, edited by; Cambridge University Press: New York, USA.

Bucklin, R.A., Hahn, G.L., Beede, D.K., and Bray, D.R. (1992). Infrastructure for Butter, valued at MH (1984) Tropical pastures and beef cattle nutrition. London: Longman.