Applied Studies in Agribusiness and Commerce – APSTRACT
University of Debrecen, Faculty of Economics and Business, Debrecen
SCIENTIFIC PAPERS
DOI: 10.19041/APSTRACT/2023/2/12

IMPACT OF CLIMATE CHANGE ON PEOPLES LIVELIHOOD AND LIVESTOCK PRODUCTION IN UGANDA

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Abstract: *Livestock sector in Uganda contributes significantly towards individual household income and food security and even though peoples' dependance on livestock production for survival in Uganda is a reality, it's also undeniable that livestock, which provides food and revenue on a worldwide scale, would be vulnerable to the direct or indirect consequences of climate change. Agriculture contributed 24.1% of the Uganda's GDP in the financial year (FY) 2021–2022 and according to the Uganda bureau of standards (UBOS), agriculture employs over 70% of Uganda's working population. The purpose of this present study was to to evaluate the impact of climate change on peoples' livelihood and livestock production in Uganda. Bibliometric analysis was the quantitative technique used for reviewing and describing published publications that assisted in evaluating academic works from secondary data obtained on digital databases in the context of this study. The VOS viewer software was used as a tool to perform the co-occurrence analysis, and then to realize the visualization of the impact of climate change on peoples' livelihood and livestock production in Uganda using articles analysed on platform research with associated references from the Web of Science database. The visualisation highlighted topical areas that reflect the impacts of climate on peoples' livelihood and livestock such as diseases, drought, coping strategies, greenhouse gases, drought, vulnerability, dry lands, mobility among pastoral communities, low productivity, reduced forage resources, elevated temperature extra all of which negatively affects the economic levels of individuals and the national income from livestock either directly or directly. Conclusively, interventions that are aimed at improving climate smartness in Uganda's livestock farming communities may have significant food security and income benefits for different livelihoods.*

Keywords: *climate, livestock animals, livelihood, income*

INTRODUCTION

Climate change and its effects worldwide is becoming more and more practically visualized with evidenced increasing change in the climatic conditions. Africa is already warming faster than the rest of the globe, and the 4th Intergovernmental Panel on Climate Change (IPCC) assessment report (IPCC, 2007) predicted that this trend will continue. Peoples' dependance on livestock production for survival in Uganda is a reality. It is also undeniable that livestock, which provides food and revenue on a worldwide scale, would be vulnerable to the direct or indirect consequences of climate change. Livestock animal performance in terms of growth, milk production, wool production, and reproduction are directly impacted by air temperature, humidity, wind speed, and other climatic parameters (Rust & Rust, 2013). It is also notable that a decline in agricultural income from dry land crops (1.9%) and livestock (5.4%) is unavoidable when the temperature rises in Uganda (Ekiyar et al., 2012) and correspondingly, water distribution in Uganda is unequal, with certain areas of the nation being semi-arid with cyclical and growing frequency of droughts which have a negative impact on the quantity as well as the quality of water supplies and consequently, a lack of water for human consumption and livestock may result from increased heat and decreased rainfall which might lead to more conflict between various groups over water, especially in drought-prone areas yet with drier circumstances, cattle fodder may become limited as well. Heavy rains forecast in the medium and high-altitude zones could however speed up soil erosion and land degradation as well as harm communication infrastructure (Victor et al., 2005).

Despite Uganda's high susceptibility to rainfall variability and climatic shocks such as droughts and floods, there are little micro-level farm research on how various farmers interpret these changes. Most of the research examining the impacts of climate change on African agriculture is regional or national, while adaptation is site-specific and necessitates the employment of site-specific tactics (Okonya et al., 2013). Additionally, it's unclear whether the population comprehends the impact of climate and therefore the motivation for this study is to evaluate the influence of climate change on peoples' livelihood and livestock production in Uganda.

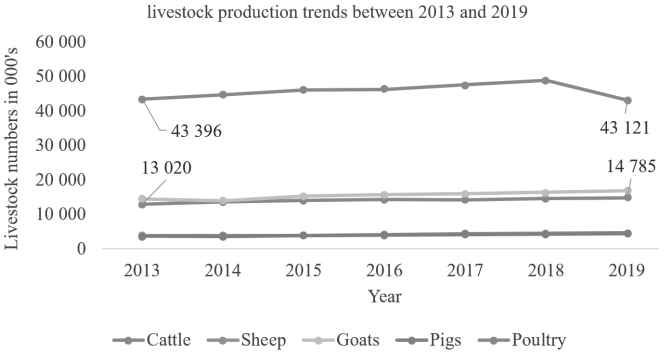
The effect of climate change on livestock production

Whereas livestock is one of the known drivers of climate change accounting for a total of 14.5% of human-made or anthropogenic greenhouse gas (GHG) emissions, climate change is virtually likely raising temperatures and, as a result, increasing heat stress and decreasing cold stress however, it has been observed that livestock animals experience negative impacts from heat stress and due to the fact that heat stress happens when animals cannot expel enough heat to maintain homeothermy, which has been found to result into increased respiration, pulse, and heart rate, as well as increased body temperatures, which can cause changes in mortality and immune system function and subsequently decrease feed intake, milk production, and reproduction efficiency (Cheng et al., 2022). Similarly, Baumgard et al., (2012) argued that the biological process by which heat stress influences production and reproduction can be partially explained by decreased feed intake, but also consists of altered endocrine circumstances, decreased rumination and the absorption of nutrients, and higher maintenance demands, resulting into a general reduction in nutrient/energy availability for production. Owing to this justifies that animals under heat stress lose a significant amount of body weight, which is explained by the fact that this reduction in energy directly causes a decline in energy balance.

The findings of Baumgard et al., (2012) suggested that global livestock production is under growing pressure due to severe environmental consequences, notably greenhouse gas (GHG) emissions and with higher temperatures, possibly influenced by GHG, are anticipated to impair the economic abilities of individuals through affecting the dairy output, weight gain of the animals, reproduction, and conversion of feed efficiency in warm locations and similarly disease outbreaks in livestock animals are projected to be impacted by climate change, since most diseases and illnesses are transmitted by vectors such as ticks and flies whose development phases are frequently and majorly dependent on ambient temperature. Correspondingly temperature increase cause severe damage to forage and fodder crop production, physiology, metabolism, and animal health. It is also imperative to note that changing patterns of precipitation and increasing aridity could influence the availability of animal feed since desertification lowers rangelands' carrying capacity as well as the buffering ability for pastoral and agro-pastoral systems (Nardone et al., 2010).

The severe environmental consequences like higher temperatures directly affects livestock by slowing production levels and increasing morbidity among livestock animals and this is reflected in the slow increasing and decreasing patterns of livestock numbers for example over years the sheep numbers in Uganda are almost negligible, the poultry numbers dropped between 2018 and 2019 and similarly cattle, goats and swine numbers had not registered a reasonable increase in number by the year 2019 (Figure 1).

Figure 1: Livestock production trends in Uganda



Source: Ministry of Agriculture, Animal Industry and Fisheries (MAAIF), and Uganda Bureau of Statistics

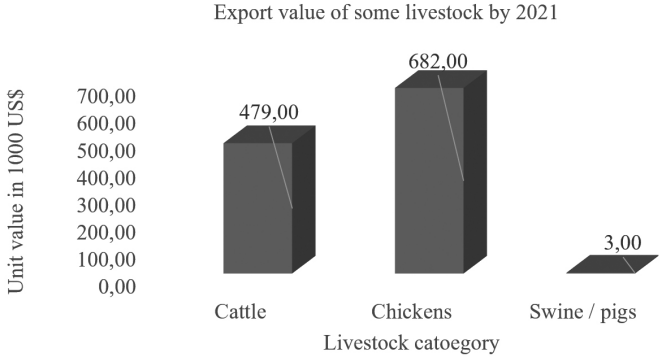
Effect of climate on livelihood and income in Uganda

Climate change continues to be highlighted as an existential threat to human health around the globe, and variations in precipitation and rising temperatures have varying effects on health throughout various regions of the world, some effects or risks are direct due to mortality and morbidity, while others are indirect due to environmental change, ecosystem changes, and associated modifications to social systems. Key risks include increased exposure to infectious diseases, increased water and food insecurity, natural disasters, and population displacement and migration (Labbé et al., 2016). Additionally, Bagamba & Kuyvenhoven, (2022) concluded that despite livestock acting as a buffer against food insecurity, a distal indicator of health, and being crucial in reducing economic vulnerability at the household level, the livelihoods of Uganda's smallholder farmers are projected to suffer as a result of climate change, with between 70 and 97% of them being affected and unable to adapt due to the small farm sizes and restricted access to alternate sources of income besides farming, the Southwest is anticipated to be the region most severely impacted by climate change.

The study by Boyce et al.,(2020) revealed that an elevated level of poverty is the socioeconomic factor most frequently cited as causing susceptibility to serious climatic conditions-related health risks in diverse areas however, Uganda's poor and socioeconomically marginalized populations are expected to be most vulnerable to the health effects of climate change, which will be influenced by existing burdens of ill-health, climate-sensitive infrastructures, dependence

on climate-sensitive livelihoods, inadequate technological capability, poor public service infrastructures weak institutions, and political inequalities. Consequently, an examination of the environmental, social, and economic conditions and processes that limit the security of livelihoods in the context of climate stressors could possibly therefore reveal significant aspects of Uganda's susceptibility and since most of the population in Uganda is self-employed, a change in climate could have a negative impact on the performance of the country's agricultural sector, which can account for up to 40% of GDP. This, therefore could result into may be a rise in food costs, a decline in domestic tax revenues, and an increase of the deficit in the current account as a result of a reduced amount of export profits, more significant inflation, and rising foreign debt that directly impacts many livelihoods (Victor et al., 2005). An example of reduced export profits due to the impacts of climate change on livestock production can be associated with the export value of livestock products like swine that scored a low export value of 3000 US$, cattle at 479000 USS$ by 2021 (Figure 2).

Figure 2: Export value of cattle, chickens, and swine



Source: Authors own editing of data from Foastat

METHODOLOGY

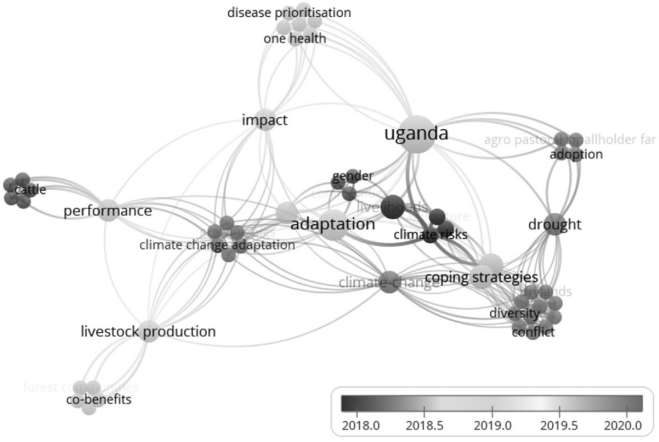
Bibliometric analysis

Bibliometric analysis is a quantitative technique as well as a tool for reviewing and describing published publications that can assist academics evaluate academic works in a certain topic. Bibliometric analysis analyses secondary data obtained on digital databases from a quantitative and objective standpoint, allowing it to create a systematic, transparent, and repeatable review process, and so improve the reliability and quality of review (Ding & Yang, 2022). In this study, the VOS viewer software was used as a tool to perform the co-occurrence analysis, and then to realize the visualization of the impact of climate change on peoples' livelihood and livestock production in Uganda. A total of 9 articles were analysed on platform research with associated references from the Web of Science database using the identified search string as ("Climate change" AND ("livestock production" OR "animal production") AND "Uganda").

Results and discussion

This section describes the analysis on web of science platform research publications, authors, journals, institutions, and the country in context and additionally, an evolution study utilizing time co-occurrence analysis on keywords to acquire an overall picture about the impact of climate change on peoples' livelihood and livestock production in Uganda.

Knowledge mapping of the impact of climate change on peoples' livelihood and livestock production in Uganda: a visual analysis



Source: Author's own editing with data from web of science

Among the clusters, livestock production, climate change and adaptation, climate risks and health, are closely inter-connected, while the co-benefits and disease prioritisation are the peripheral clusters because of loose connection. The studies around 2018 concentrated on climate risks, livelihoods, gender, and cattle however by the year 2020 studies drew more focus on drought, climate change, climate change adoption and adaptation to mention but a few. The visualisation also highlights topical areas that reflect the impacts of climate on peoples' livelihood and livestock such as diseases, drought, coping strategies, greenhouse gases, drought, vulnerable, dry lands, mobility among pastoral communities, low productivity, reduced forage resources, elevated temperature extra all of which negatively affects the economic levels of individuals and the national income from livestock.

CONCLUSION

This study researches and uncovers impacts of climate on peoples' livelihood and livestock in Uganda by bibliometric analysis. According to 9 articles achieved from the web of science, identification of important publications, authors, journals, institutions in Uganda was done, and the analysis of the network reflects climatic potential tendencies in the future. This study achieves some insights from the literature review and summarizes the existing studies. Therefore, interventions that are aimed at improving climate smartness in Uganda's livestock farming communities may have significant food security and income benefits for different livelihoods.

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