Mapping Seasonal Livestock Trade Movements in West Africa

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American Association of Geographers (AAG) Annual Meeting
Denver, CO, March 2023

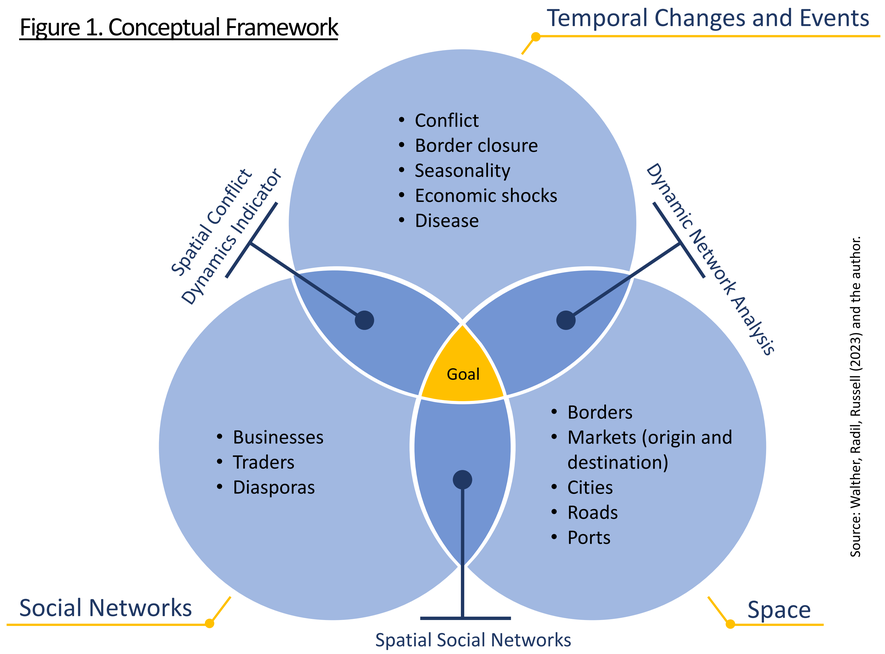
Introduction

Livestock trade is an important economic activity in West Africa, a region where approximately half of the population owns livestock. Long distance and cross-border travel is often involved in both the production and trade of livestock, particularly cattle and small ruminants. Understanding the spatial and temporal dynamic of this market is key to inform policies related to targeted disease surveillance as well as market development and integration through reduced trade barriers (Chaters et al. 2019; Valerio et al., 2020).

Our goal is to understand how livestock trade responds to major shocks such as health crises, political insecurity or border closures. To do so, we develop a novel conceptual framework that combines spatial analysis, social network analysis, and temporal analysis (Figure 1).

Our integrated framework builds on three approaches developed in geography and network science: Spatial Social Networks (Andris & Sarkar, 2022), Spatial Conflict Dynamics (Walther et al., 2021) and Dynamic Network Analysis (Breiger et al., 2003). To apply this framework, we will use a large dataset on livestock trade movements which also includes information on specific traders, spatial data available for roads, borders and markets, and event data on border closures or violent attacks.

Figure 1. Conceptual Framework



Source: Walther, Radil, Russell (2023) and the author.

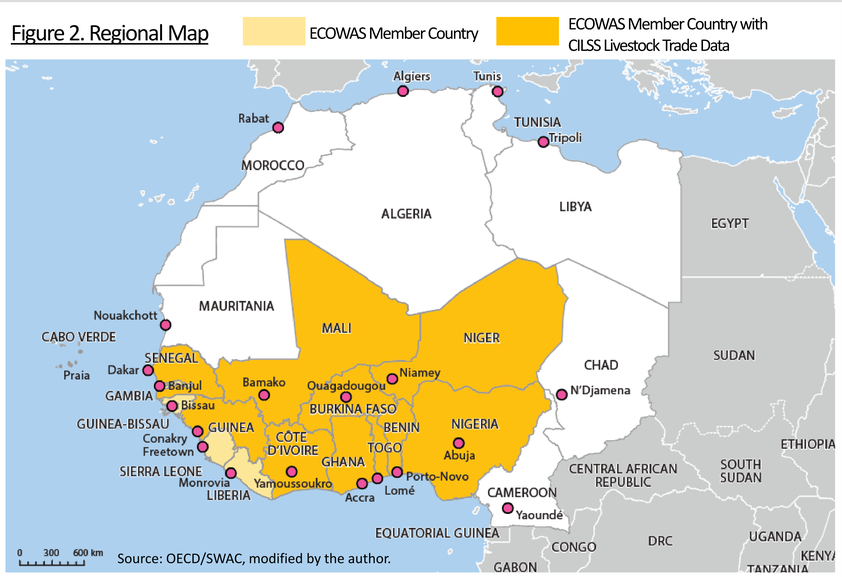
Livestock Trade Data

CILSS Cross Border Trade Dataset available at: https://www.eco-icbt.org/trade-data/

The Interstate Committee for Drought Control in the Sahel (CILSS) has collected data on formal and informal trade since 2009. The CILSS dataset is unique in terms of its cross-border regional coverage and capture of formal as well as informal trade data. Capturing informal trade activities is critical since informal trade activities are common in the region (Apolloni et al., 2018). The number of CILSS data collection points has increased over time, from 25 in 2013 to 41 in 2017. Between 2009 and 2017, 62,866 livestock trade movements were recorded in the CILSS dataset. Although this dataset does not capture the entirety of livestock trade in the region, the number of years of data collection as well as the cross-border coverage of this data provides a unique opportunity to explore the temporal and spatial aspects of the livestock trade network.

Top left photo: Trucks transporting goods in West Africa Top right photo: Farmers with mixed herd of livestock
Bottom photo: Herd of goats in Niger

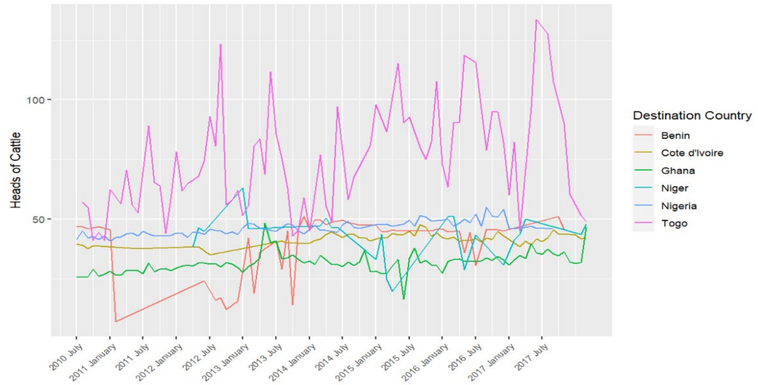
Figure 2. Regional Map



Seasonality

Although it is common for network data to be aggregated by calendar year, there can be strong seasonal trends in livestock movements. In addition, different types of livestock may have different seasonal movement patterns. For example, there this a notable increase in small ruminant sales prior to Tabaski or Eid al-Adha, which is an Islamic holiday which is celebrated by sacrificing sheep (Valerio, 2020). For cattle, in Mauritania more cattle sales were observed in the dry season, while in Cameroon more sales were reported during the wet season (Dean et al., 2013; Motta et al., 2017).

Figure 3. Livestock Trade Movements Originating from Burkina Faso by Month/Year



Source: CILSS. Calculations by the author.

Perspective

The spatial and temporal patterns of livestock movements have been explored, but lack of data has limited previous work to a single country or year, with the exception of Valerio et al. (2020) which explored regional livestock trade using data collected by CILSS.

Next steps include integrating and cleaning the most recent livestock trade data by CILSS (2017 to 2022) with the earlier data for analysis. In addition, the conceptual framework (Figure 1) can be expanded upon to develop a null network model in order to understand properties of the network. Finally, further analyses can explore the impacts of a specific economic, disease, conflict or environmental shocks as case studies for the network.

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