

# An Initial Approximation to Tree Cover Dynamics in Mexican Cattle Ranching Areas: A Multitemporal Analysis

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## Introduction/ Background

Deforestation is a significant global environmental concern, with repercussions spanning multiple ecological and socioeconomic dimensions. In regions like Mexico, cattle ranching has emerged as one of the primary drivers of deforestation. This reduction in tree cover not only jeopardizes biodiversity but also disrupts vegetation dynamics and the overall health of ecosystems. Vegetation is pivotal to ecological stability and serves as a crucial indicator of ecosystem health. In areas dominated by livestock activities, comprehending the interplay between cattle ranching and vegetation becomes imperative. Spectral indices, derived from remote sensing techniques, provide an invaluable means to gauge this impact, with proxy indicators like vegetation vigor playing a central role. Among these, the Enhanced Vegetation Index (EVI) is particularly notable for its capacity to measure vegetation vigor and its temporal shifts, especially in regions with significant livestock presence.

As part of the BioPaSOS project, states including Jalisco, Chiapas, and Campeche were scrutinized. Here, notable fluctuations in vegetation vigor were detected, potentially signaling the effects of deforestation and prevailing livestock practices.

The aim of this study was to assess the influence of livestock activities on tree cover dynamics across three Mexican states, employing a multitemporal analysis of vegetation using a proxy indicator to capture the observed changes.

## Methods/ Approach

To investigate the relationship between livestock and vegetation, we utilized Sentinel-2 satellite images. These images underwent processing and analysis to compute the EVI in designated areas of interest for two distinct periods: 2016 and 2021. All processing and analyses were conducted on the Google Earth Engine (GEE) platform, a tool that facilitates the analysis and visualization of geospatial datasets in the cloud. We adopted a meticulous methodology encompassing the configuration of functions for cloud masking, image filtering based on dates and target areas, and the computation of both the mosaic and EVI (Figure 1).

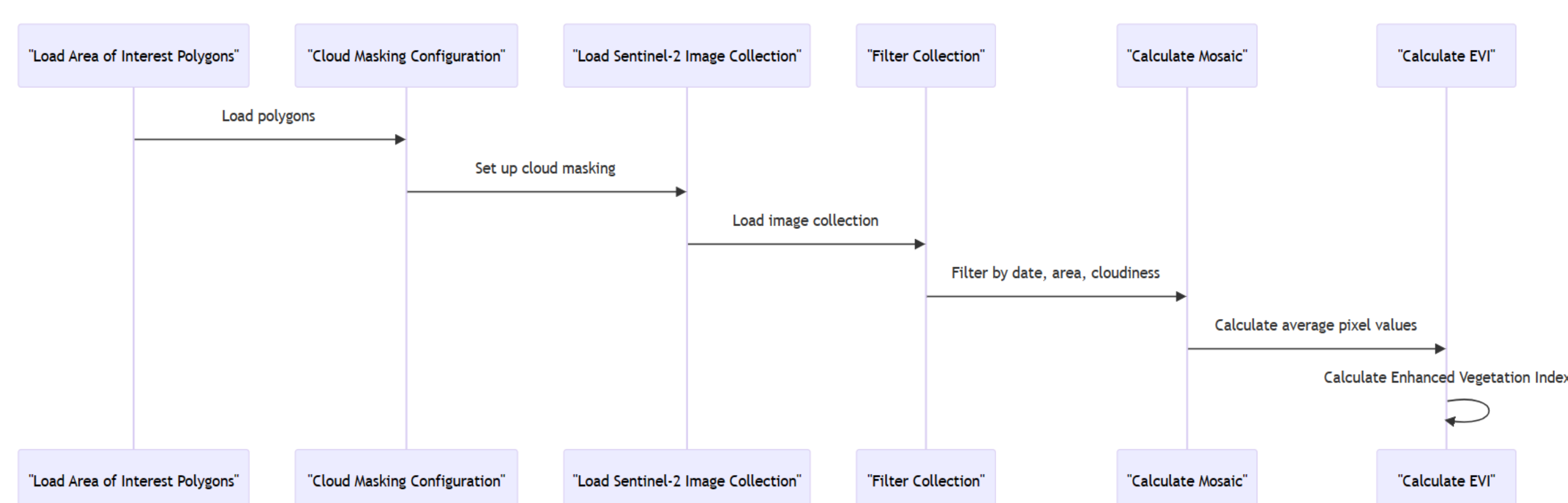


Figure 1. Methodological procedure for multitemporal analysis of tree cover change and EVI generation.

## Results

Significant changes in vegetation were observed in the study areas between 2016 and 2021. There was a general decline in vegetation vigor in the areas of interest, as illustrated in Figures 2 and 3. Regions shaded in red and orange denote a marked decrease in vegetation vigor, while deep green areas indicate an increase. Jalisco experienced the most pronounced decline in vigor, followed by Chiapas and Campeche. Nevertheless, certain farms in Campeche and Chiapas exhibited an uptick in EVI.

Cattle ranching directly influences plant dynamics. In regions surrounding the intervened farms, a drop in vegetation vigor was evident in Jalisco, Chiapas, and Campeche. Yet, some farms in Campeche and Chiapas demonstrated a rise in EVI, suggesting the adoption of more sustainable ranching methods. These observations highlight the imperative of embracing sustainable ranching practices to strike a balance between production and ecosystem preservation.

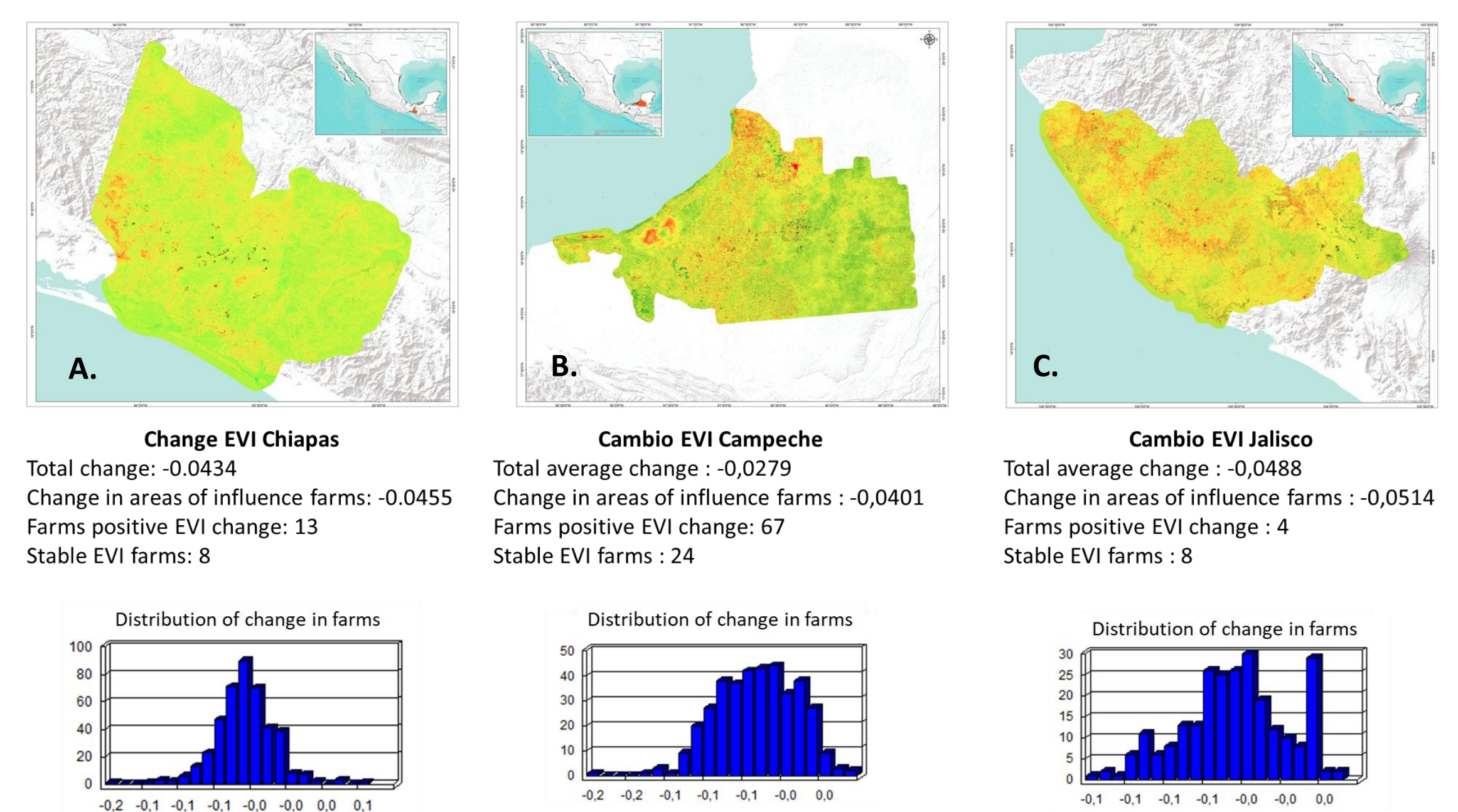


Figure 2. Absolute change and frequency distribution of EVI change in areas of influence of intervened farms. A) Chiapas; B) Campeche; C) Jalisco.

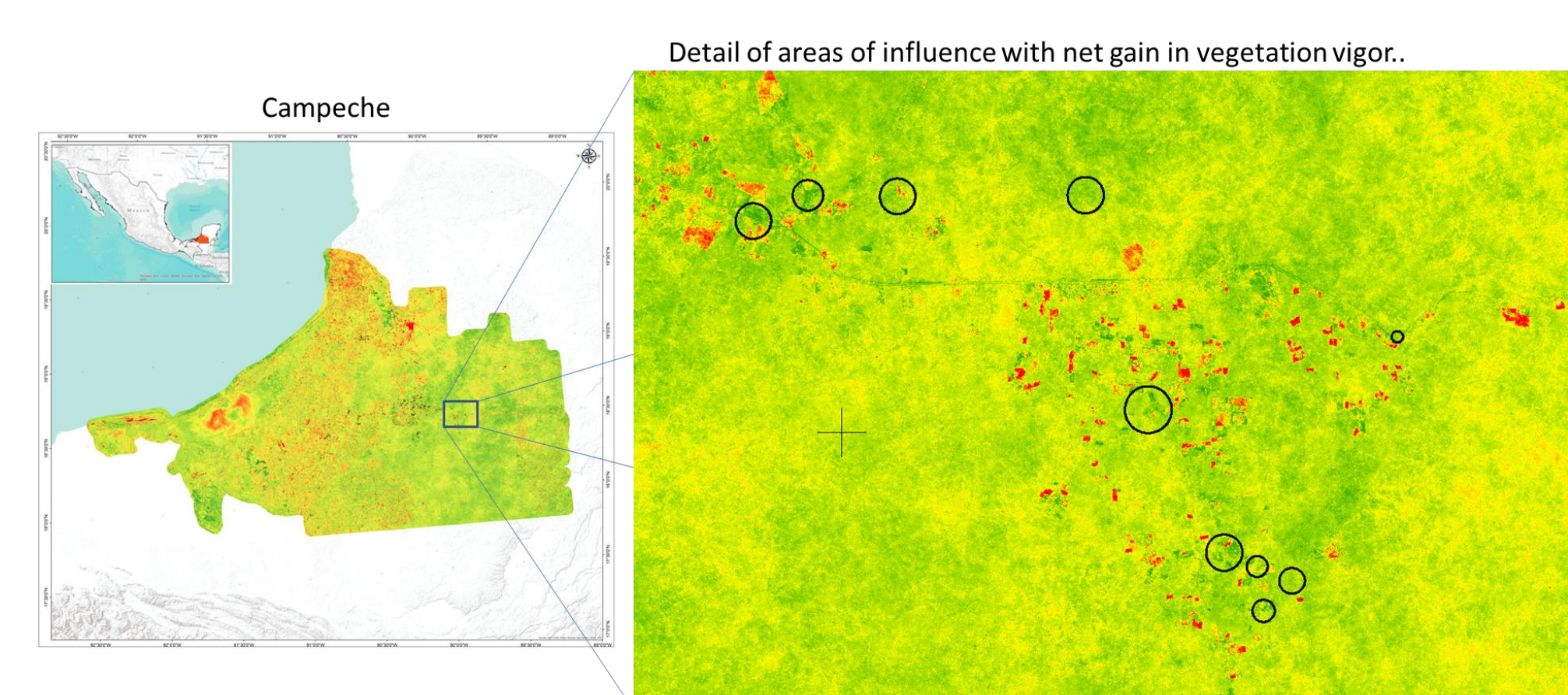


Figure 3. Detail of the zones of influence with net increase in vegetation vigor in the state of Campeche

## Conclusions/ Significance

This study is under development; therefore, the results and conclusions are still preliminary.

Traditional cattle ranching, based on an increase in productivity per unit area, has a direct impact on vegetation dynamics. In the areas of influence of the intervened farms, a decrease in vegetation vigor was observed in Jalisco, Chiapas and Campeche. However, some farms in Campeche and Chiapas showed an increase in EVI, indicating more sustainable ranching practices. These findings underscore the need to adopt sustainable ranching practices to maintain a balance between production and ecosystem conservation.

## References/ Links

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