# Story: the meat industry is contributing substantially to the water crisis in Catalunya

## Feasibility

The hypothesis is whether the meat industry contributes substantially to the water crisis in Catalunya. To evaluate the feasibility of testing this hypothesis, we examined two datasets: environmental inspections data and Catalan livestock farms data.

* The environmental inspections data includes detailed information about various establishments, such as livestock farms, along with their environmental inspection results and reports.
* The Catalan livestock farms data provides comprehensive details about livestock farms, including their capacity, number of animals and nitrogen levels.

To test the hypothesis, we focused on indicators of environmental impact

* Nitrogen levels were identified as a key indicator, as high nitrogen levels can indicate pollution that affects water quality.
* The total capacity of livestock farming operations (URM) serves as a measure of the scale of these operations.
* The EPIGRAF\_DEI and EPIGRAF\_PCAA codes categorize different types of activities and their potential environmental impacts.
* Further EDA suggests a significant positive correlation between TOTAL URM and TOTAL NITROGEN which would support the that larger livestock farms contribute more to nitrogen pollution.

The initial feasibility evaluation indicates that the data available is detailed and sufficient to test the hypothesis. Approaches such as correlation, regression, and geospatial analysis are appropriate for evaluating the relationship between livestock farming and nitrogen emissions. Nitrogen levels and URM provide essential metrics to assess the impact of livestock farming on water quality.

However, the dataset did not explicitly mention water usage, so we focused on nitrogen pollution as a proxy for potential water contamination. In addition, I noticed a large portion of farms in the datasets are pig farms. Therefore, I pivot the hypothesis to focus on intensive pig farming. Further detailed analysis, including statistical significance tests, can strengthen the conclusions and provide a clear link between intensive pig farming and environmental impact.

## Hypothesis Narrowed Down

The intensive pig farming industry in Catalunya significantly contributes to the region’s water consumption and environmental degradation, as evidenced by the number of environmental inspections, nitrogen emission, and estimated water usage.

# Reporting Memo

## Initial Key Findings

### Nitrogen Emission Analysis

The EDA identified that intensive pig farms in Catalunya contribute significantly to nitrogen emissions. Specifically, the data showed that intensive farming systems, marked by the 'SISTEMA.PRODUCTIU' category as "Intensive," account for the highest nitrogen outputs compared to other systems.

Quantitatively, intensive systems emit over 17,500 units of nitrogen, significantly higher than other types of farming systems, which aligns with our hypothesis about environmental degradation.

### Geographical Concentration

The highest concentrations of pig farms and associated nitrogen emissions were observed in specific regions. For instance, the provinces of Lleida and Girona have a particularly high number of pig farms. Municipalities like Almenar and Alcarràs stand out with the densest clusters of intensive pig farming operations.

## Inspection

According to the inspection data, among the three types of farms inspected, 9.3.b which is “fattening pigs” got the most over the years, and the number of inspection has increased over years.

### Regression Analysis

A regression model was used to predict nitrogen emissions based on farm characteristics. The model confirmed that 'Is Intensive' (a binary indicator of whether a farm operates intensively) and ‘Is Pig' are two significant predictors of higher nitrogen emissions, reinforcing the direct impact of intensive farming practices on environmental degradation.

## Data Issues and Caveats

### Missing Data

The datasets have gaps, particularly in the water usage statistics, which are crucial for validating the full environmental impact. Also, it is important to figure how the capacity unit in the dataset, URM, is calculated so as to estimate the potential water usage of each farm.

# Suggested Next Steps for Reporting

## Data Expansion

* It’s imperative to obtain more data on water consumption by farm type to assess the hypothesis concerning significant water usage. If that’s not possible, reporters can also gather the water usage of townships with intense pig farms and compare it with those have similar geographic and demographic characters.
* Reporters can also gather more detailed information about number of animals and water usage in those farms with highest capacity in terms of pig fattening.
* Detailed outcomes of environmental inspections should be gathered to better understand enforcement and compliance patterns across different regions.

## Interviews

* Interviews with environmental regulators in high-density farming areas can provide insights into the challenges and measures in place to mitigate environmental impacts.
* Engaging with farm operators, especially those in intensive systems, will help explore their practices and any self-regulatory measures they might be undertaking.

## In-depth Regional Studies

* Conduct focused studies on the townships with the highest pig farm densities to understand the localized environmental, social, and economic impacts.
* Explore the effects of recent legislative changes on farming practices, particularly those aimed at reducing environmental impacts.