**Q1.** The ‘Guia de Trânsito Animal‘ (GTA) is a public document issued when livestock are moved between properties (e.g. sold from one farm to another, or from a farm to a slaughterhouse). This data details the date of the movement, the number of animals moved, and the identity (CPF/CNPJ) of the supplier and recipient. These data can then be crossed against other socio-environmental data, e.g. the “Lista Suja” or “Cadastro de Empregadores” of business owners incited for cases of forced labor. **We have downloaded more than 30 million GTA documents - what would be your suggested workflow for efficiently storing, processing, and querying the GTAs in order to determine whether or not there are any cases of forced labor among a slaughterhouse’s suppliers? Please justify the approach taken**.

I would first split the GTA in two datasets, one with the identity of sellers and the other with the identity of the buyers. After this, I would aggregate these datasets by identity in order to reduce the size of the dataset, could be by number of sales/purchases. Aiming to identify the socio-environmental problem, I’d use the identity of the Lista Suja to join the data, keeping only the sellers/buyers with some socio-environmental problem. I would use the same approach for search some forced labor problem. Finally, to see if the seller/buyer have both problem I would use both filter to join the data. A simple example of and R code could be:

gtadata |>

dplyr::select(buyer\_id) |>

dplyr::group\_by(buyer\_id) |>

dplyr::summarise(

count\_ = dplyr::n()

) |>

dplyr::left\_join(

lista\_suja |> dplyr::select(id)

)

**Q2.** We intend to expand the DO PASTO AO PRATO app to include data also for chicken and pork. For cattle, we include data on the environmental impact (a composite of deforestation, fire, plus the slaughterhouse’s sustainable procurement policies), the risk of forced labor, and sanitary and animal welfare infringements. **For chicken, what three indicators would you select and why?**

For chicken as an environmental impact I’d would use the