

# Agricultural Dataset of an Argentinian Corn Field

Yield monitor data for a corn field in Argentina with variable nitrogen.

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## 1 Introduction

### 1.1 Dataset Overview

This dataset covers the experimental study of corn yield and nitrogen fertilizer treatment with field characteristics from the Las Rosas farm in Rio Cuarto, Cordoba, Argentina done by Anselin, Bongiovanni, and Lowenberg-DeBoer (2004). The data was collected using yield monitor from strip trials during the harvests in years 1999 and 2001 to determine the potential of spatial econometric analysis in estimating the site-specific crop response functions when it comes to applying nitrogen treatment. There are 3443 operations and 8 variables, including the year, latitude, longitude, yield in quintals/ha, amount of nitrogen in kg/ha, topographic factor, brightness value, rep factor, and nitrogen as a factor. Of these variables, both the topographic, rep, and nitrogen factors, are qualitative while the rest are quantitative.

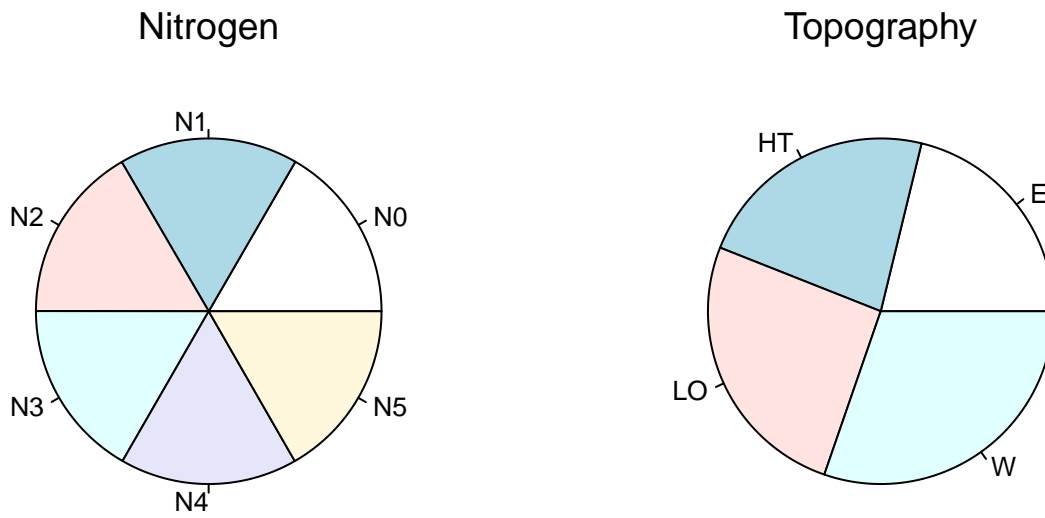
### 1.2 Summary Statistics

For each level, the mean is obtained by dividing the sum of all yield values by the number of observations in the sample, while the median is obtained by finding the middle value from (the sorted version of) that sample. The standard deviation is calculated as the square root of the sum of squared differences, between each yield and mean, divided by the result of subtracting sample size by one. The interquartile range (IQR) is obtained by finding the lower and upper medians of the two halves of the sample data that is by the median, and then subtracting the lower median from the upper one. The range is identified by simply obtaining the lowest and highest values from the sample. The mode is not needed in this study and is therefore never calculated for each level.

Table 1: Summary Statistics of Yield by Nitrogen Fertilizer Level

Level	Size	Mean	Median	SD	IQR	Range
N0	573	65.0	62.0	20.9	36.0	12.66 - 108.84
N1	577	68.6	65.2	19.2	29.8	27.44 - 110.54
N2	571	69.7	67.1	19.3	28.1	31.79 - 112.85
N3	575	70.3	66.8	19.2	27.7	19.41 - 110.12
N4	572	72.6	69.2	19.1	27.5	32.05 - 117.9
N5	575	72.8	70.3	20.1	29.8	31.79 - 117.19

Figure 1: Distribution of nitrogen and topography treatment levels



### 1.3 Farm topography and yield

Figure 2: Farm topography in 2001

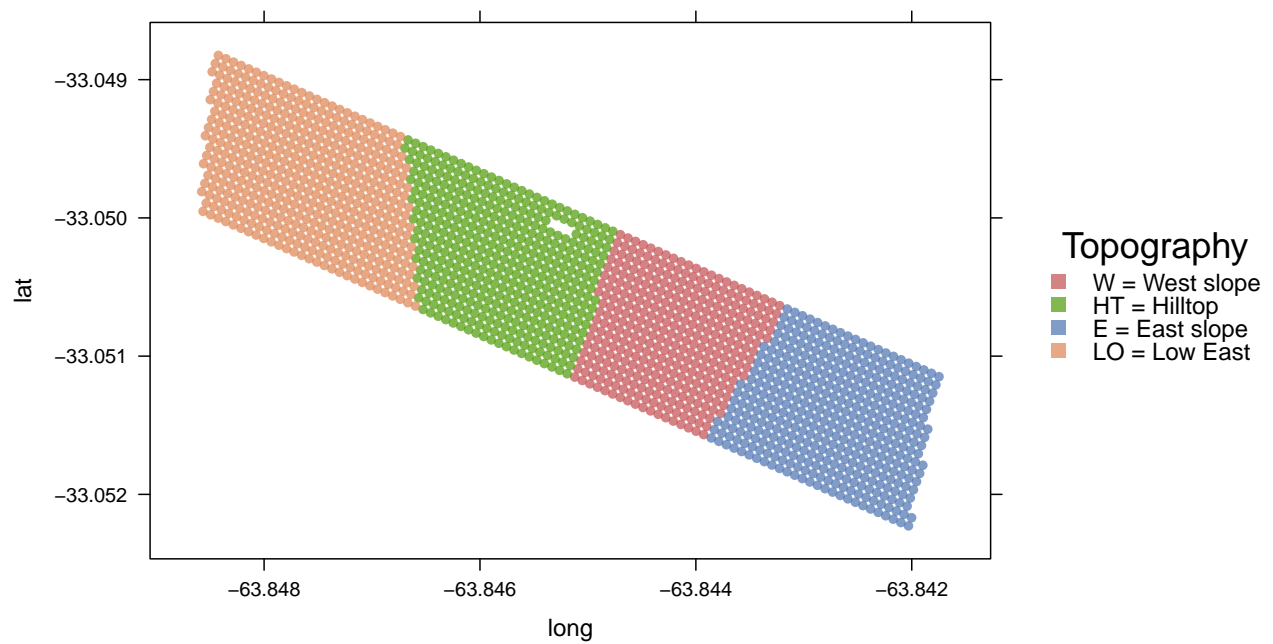
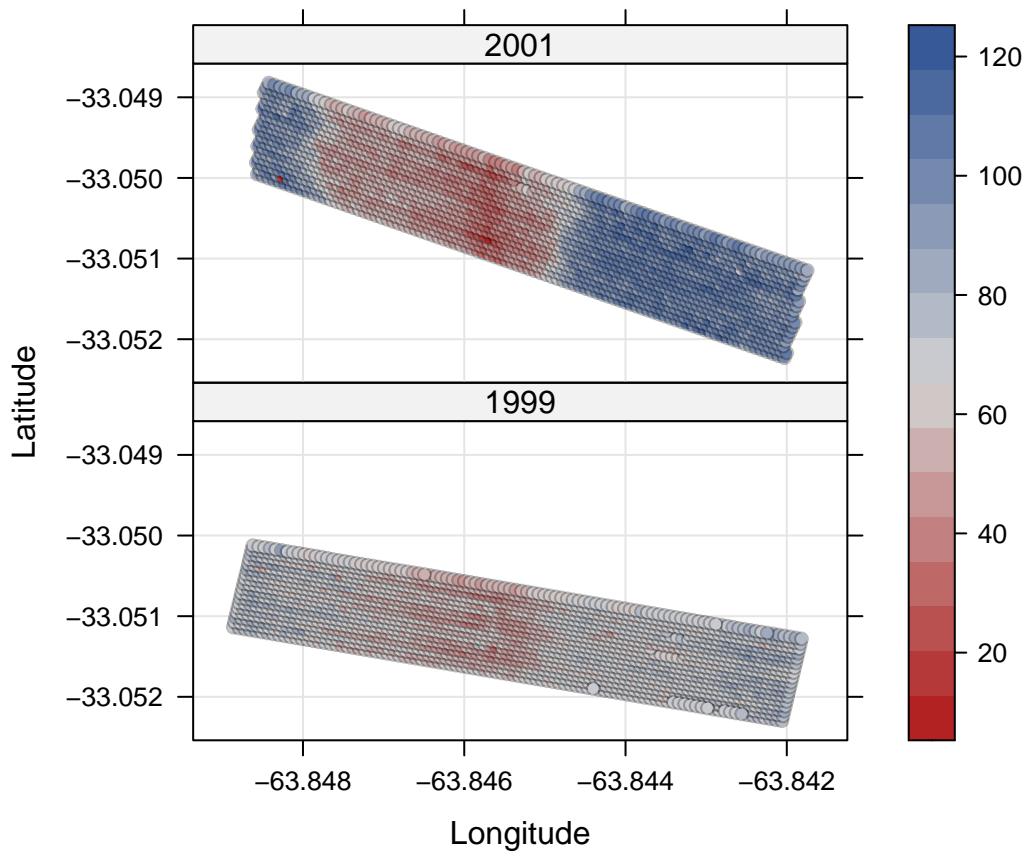


Figure 3: Corn yield distribution by location



## 1.4 Advanced Tables with kableExtra

For even more formatting options, use the `{kableExtra}` package:

Table 2: Advanced table formatting with kableExtra

X Category	Count	Mean Y	SD Y	Min Y	Max Y
Low	27	16.38	5.08	6.66	27.32
Medium	54	24.39	4.78	14.35	35.67
High	19	27.05	4.24	15.71	32.58

Notice how Table 2 includes footnotes and styling. The `html-table-processing: none` option prevents Quarto from re-processing tables created with `{kableExtra}`.

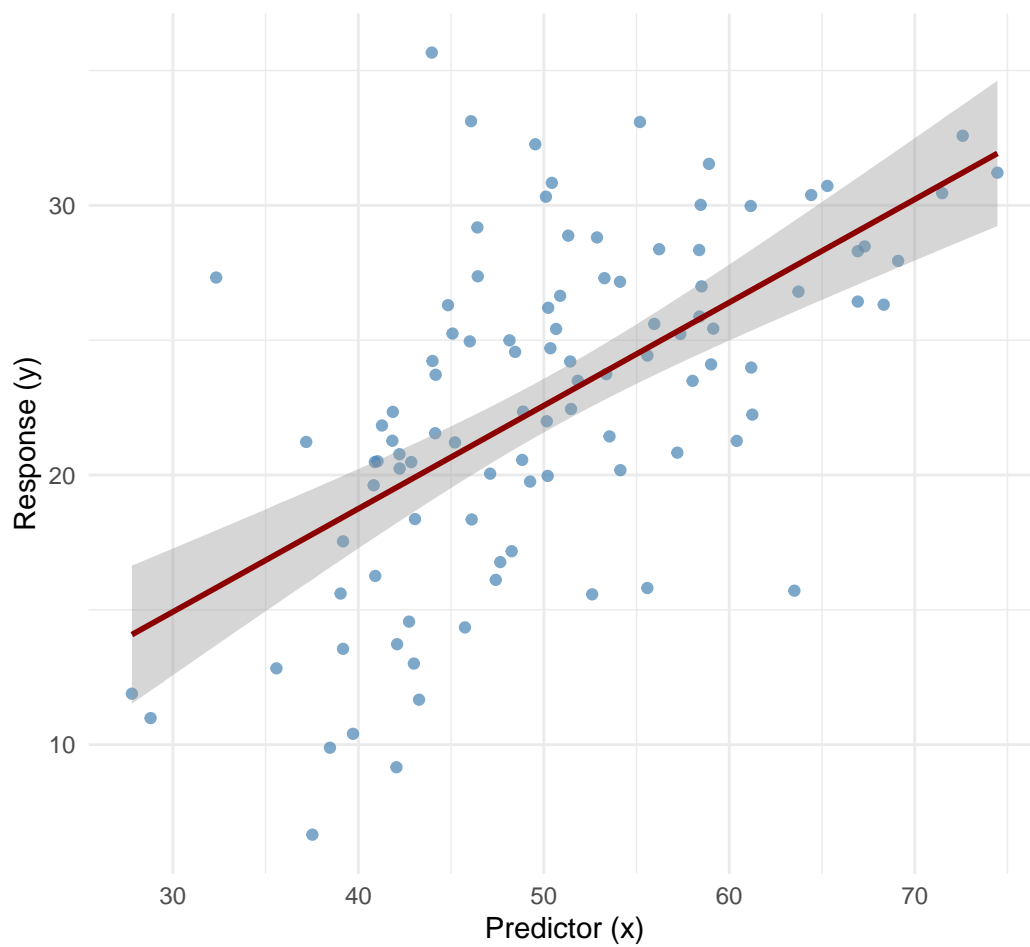
## 2 Creating Figures with R

Figures generated from R code should include proper labels, captions, and alt text for accessibility.

### 2.1 Basic Plot with Caption

As shown in Figure 4, there appears to be a positive linear association between the predictor and the response.

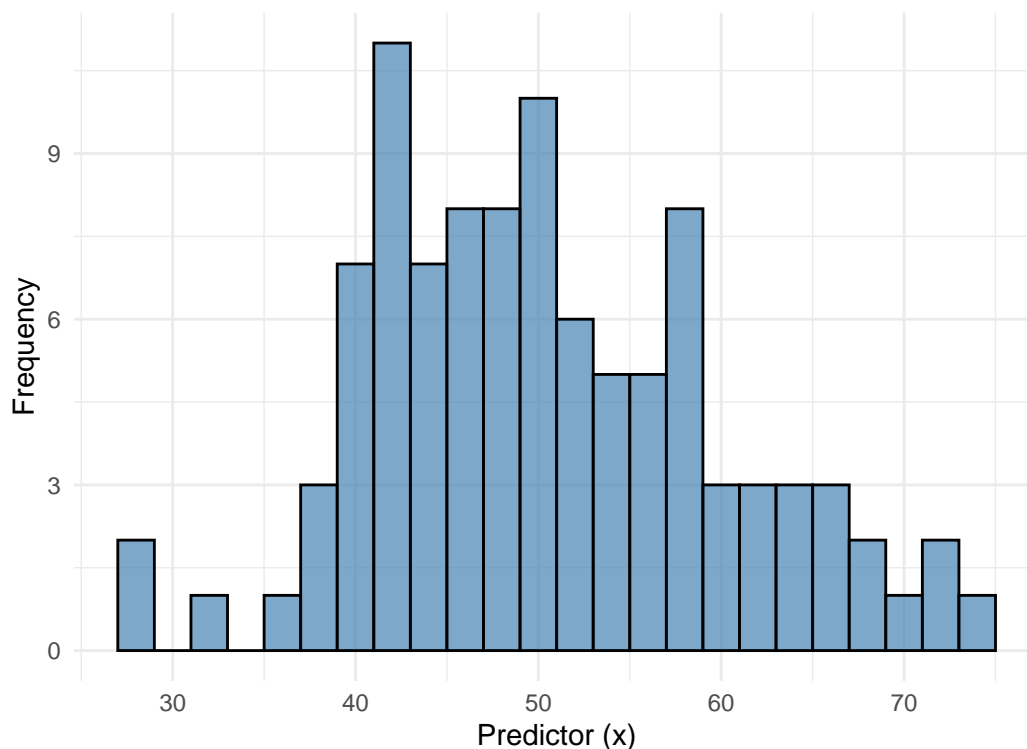
Figure 4: Relationship between predictor x and response y



## 2.2 Plot with Alt Text from Code

You can also specify alt text within the `labs()` function and extract it automatically:

Figure 5: Distribution of predictor variable x



The distribution in Figure 5 shows that x values are approximately normally distributed.

## 2.3 Multiple Plots

# 3 Including External Images

To include external images (not generated by R), you can use markdown syntax:

```
![Caption for your image] (path/to/image.png){#fig-external}
```

Or use knitr:

```
knitr::include_graphics("path/to/image.png")
```

## 4 Cross-Referencing

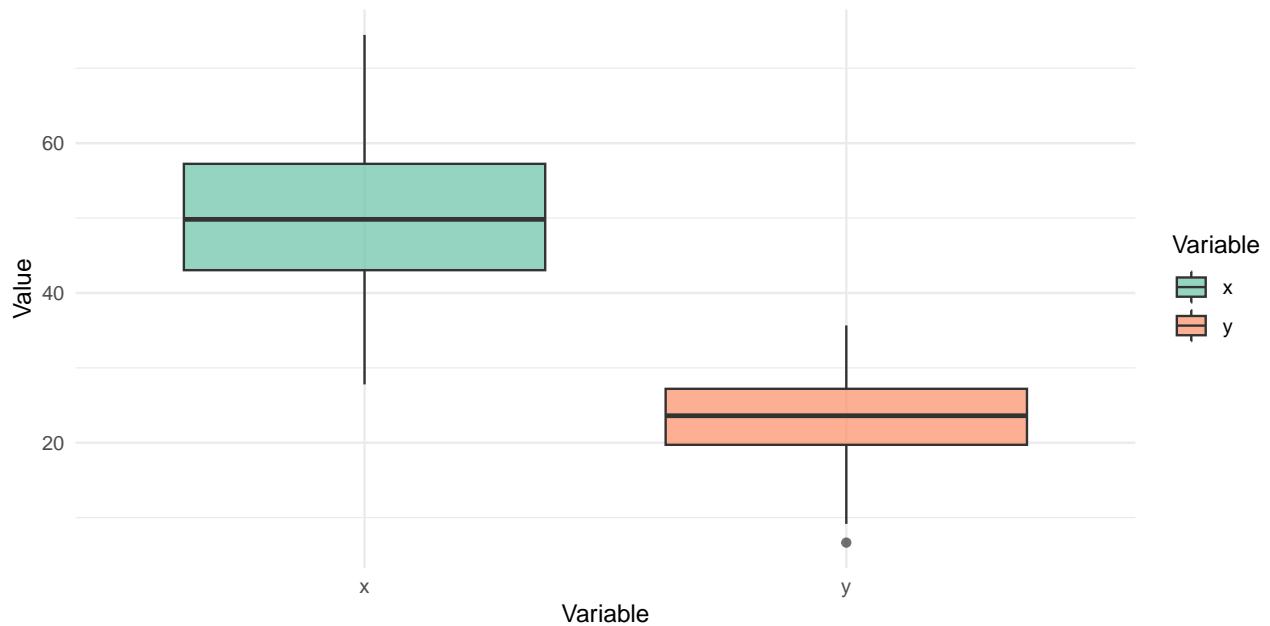
Cross-referencing allows you to refer to tables, figures, and sections by name rather than hard-coding numbers.

### 4.1 Referencing Tables

To reference a table, use `@tbl-label`. For example:

- See `?@tbl-kable-example` for summary statistics
- Compare results in Table 2

Figure 6: Comparison of distributions



## 4.2 Referencing Figures

To reference a figure, use `@fig-label`. For example:

- The scatterplot in Figure 4 shows a clear trend
- Distribution details are in Figure 5

## 4.3 Referencing Sections

You can also reference sections by adding labels to headings. For example, the heading:

```
# Data Analysis {#sec-analysis}
```

Can be referenced as: See `?@sec-analysis` for details.

# 5 Key Points to Remember

1. **Table Labels:** Must start with `tbl-` (e.g., `#| label: tbl-results`)
2. **Figure Labels:** Must start with `fig-` (e.g., `#| label: fig-plot1`)
3. **Section Labels:** Use `{#sec-name}` after heading text
4. **Alt Text:** Always include `fig-alt` for accessibility
5. **Captions:** Use `fig-cap` for figures and `tbl-cap` for tables
6. **Code Appendix:** Automatically collects all your code at the end

# 6 Formatting Tips

- Use **bold** text with `**text**` or `__text__`
- Use *italic* text with `*text*` or `_text_`
- Create lists with `-` or numbered lists with `1.`, `2.`, etc.
- Add inline math with `$equation$` (e.g.,  $\mu = 50$ ,  $\sigma^2 = 100$ )
- Add display math with `$$equation$$`

## 7 Conclusion

This template provides a foundation for creating professional statistical reports using Quarto. Key features include:

- Professional tables using both markdown and `kable()`
- Figures with proper captions and alt text for accessibility
- Cross-referencing capabilities for tables, figures, and sections
- Automatic code appendix generation

When you start your own project, replace this content with your analysis while maintaining the structure demonstrated here.

## 8 References

Anselin, Luc, Rodolfo Bongiovanni, and Jess Lowenberg-DeBoer. 2004. "A Spatial Econometric Approach to the Economics of Site-Specific Nitrogen Management in Corn Production." *American Journal of Agricultural Economics* 86 (3): 675–87. <https://doi.org/https://doi.org/10.1111/j.0002-9092.2004.00610.x>.

## 9 Code Appendix

The code below shows all the R code used to generate the tables and figures in this document. The code is displayed here for transparency and reproducibility but is hidden in the main body of the report.

```
library(tidyverse)
library(knitr)
library(kableExtra)
library(agridat)
data(lasrosas.corn)
dat <- lasrosas.corn

sample_data <- tibble(
  id = 1:100,
  x = rnorm(100, mean = 50, sd = 10),
  y = 3 + 0.4 * x + rnorm(100, sd = 5)
)

dat %>% group_by(nf) %>%
  summarise(
    N = n(),
    Mean = mean(yield),
    Median = median(yield),
    SD = sd(yield),
    IQR = IQR(yield),
    Range = paste(format(min(yield), nsmall = 1), "-", format(max(yield), nsmall = 1)),
    .groups = "drop"
  ) %>% kable(
    digits = 1,
    col.names = c("Level", "Size", "Mean", "Median", "SD", "IQR", "Range")
  )
par(mfrow = c(1, 2))

pie(table(dat$nf), main = "Nitrogen", radius = 0.9, cex = 0.8, cex.main = 1.2, font.main = 1)

pie(table(dat$topo), main = "Topography", radius = 0.9, cex = 0.8, cex.main = 1.2, font.main = 1)
library(lattice)
library(latticeExtra)

d1 <- subset(dat, year == 2001)

topo_cols <- adjustcolor(c("#C44E52", "#4E9A06", "#4C72B0", "#DD8452"), alpha.f = 0.7)

legend_labels <- c("W = West slope", "HT = Hilltop", "E = East slope", "LO = Low East")
xyplot(lat ~ long, data = d1, groups = topo, pch = 16, col = topo_cols,
  key = list(
    space = "right", title = "Topography",
    points = list(col = topo_cols, cex = 1.2, pch = 15),
```



```

    text = list(legend_labels)
  )
)
redblue <- colorRampPalette(c("firebrick", "lightgray", "#375997"))
levelplot(yield ~ long*lat|factor(year), data=dat,
          xlab="Longitude", ylab="Latitude",
          scales=list(alternating=FALSE),
          prepanel = prepanel.default.xyplot,
          panel = panel.levelplot.points,
          type = c("p", "g"), aspect = "iso", col.regions=redblue)
sample_data %>%
  group_by(cut(x, breaks = 3, labels = c("Low", "Medium", "High"))) %>%
  summarize(
    Count = n(),
    Mean_Y = mean(y),
    SD_Y = sd(y),
    Min_Y = min(y),
    Max_Y = max(y),
    .groups = "drop"
  ) %>%
  kable(
    digits = 2,
    col.names = c("X Category", "Count", "Mean Y", "SD Y", "Min Y", "Max Y"),
    align = "lcccc"
  ) %>%
  kable_classic() %>%
  add_footnote(
    label = c("Data grouped by tertiles of x values."),
    notation = "none",
    threeparttable = TRUE
  )
ggplot(sample_data, aes(x = x, y = y)) +
  geom_point(alpha = 0.7, color = "steelblue") +
  geom_smooth(method = "lm", se = TRUE, color = "darkred") +
  theme_minimal() +
  labs(
    x = "Predictor (x)",
    y = "Response (y)"
  )
ggplot(sample_data, aes(x = x)) +
  geom_histogram(
    binwidth = 2,
    fill = "steelblue",
    color = "black",
    alpha = 0.7
  ) +
  theme_minimal() +
  labs(
    x = "Predictor (x)",
    y = "Frequency",
    alt = "Histogram showing the distribution of x values, which appears approximately normal and centered"
  )
# Reshape data for plotting

```

```

plot_data <- sample_data %>%
  select(x, y) %>%
  pivot_longer(cols = everything(), names_to = "variable", values_to = "value")

ggplot(plot_data, aes(x = variable, y = value, fill = variable)) +
  geom_boxplot(alpha = 0.7) +
  theme_minimal() +
  scale_fill_brewer(palette = "Set2") +
  labs(
    x = "Variable",
    y = "Value",
    fill = "Variable"
  )

```