Figure1

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```r
# Load required libraries
library(readxl)  # for reading Excel files
library(ggplot2) # for plotting
library(data.table) # for efficient data manipulation

# Read the data for Figure 1
site <- readxl::read_xlsx('F:/研究生/研究生课程/数据驱动与可重复性研究/小组作业/Source
Data.xlsx',sheet = "Figure1")
site <- as.data.table(site)  # Convert data to a data.table for better performance

# Update the management categories based on pattern matching
site[grepl('OF|CF|RFR|RFT|RFP|EE|BC', management), management := 'Nutrient management']
# Nutrient management
site[grepl('ROT|CC|RES', management), management := 'Crop management']  # Crop manageme
nt
site[grepl('RT|NT', management), management := 'Soil management']  # Soil management

# Rename the 'management' column to 'Managements'
setnames(site, 'management', 'Managements')

# Convert 'Managements' to a factor with a specified order
site[, Managements := factor(Managements,
                    levels = c('Nutrient management', 'Crop management', 'Soil management'))]

# Load the world map data
world <- map_data("world")

# Create the map plot
ggplot() +
  # Add the world map with grey color and outline
  geom_map(
    data = world, map = world,
    aes(long, lat, map_id = region),
    color = "#999999", fill = "#CCCCCC", size = 0.1
  ) +
  # Plot the points for each site on the map, colored by management type
  geom_point(data = site, aes(lon, lat, color = Managements), alpha = 1, size = 2) +
  # Manually specify the colors for each management type
  scale_color_manual(values = c("Nutrient management" = "indianred3",
                      "Crop management" = "seagreen3",
                      "Soil management" = "royalblue3")) +
  # Use a white background for the plot
  theme_bw() +
```

```r
# Customize the x-axis with specified longitude breaks and labels
scale_x_continuous(breaks = c(-120, -60, 0, 60, 120), expand = c(0, 0),
        labels = c('120°W', '60°W', '0', '60°E', '120°E')) +
# Customize the y-axis with specified latitude breaks and labels
scale_y_continuous(breaks = c(-60, -30, 0, 30, 60), expand = c(0, 0),
        labels = c('60°S', '30°S', '0', '30°N', '60°N')) +
# Label the axes and the legend
labs(x = 'Longitude', y = 'Latitude', color = 'Managements') +
# Customize axis text appearance
theme(axis.text = element_text(size = 22, color = "black"),
    axis.title = element_text(size = 22, face = "bold", color = "black")) +
# Position the legend at a specific location
theme(legend.position = c(0.15, 0.3)) +
# Customize legend text appearance
theme(legend.text = element_text(size = 22, color = "black")) +
# Set legend title style
theme(legend.title = element_text(face = "bold", size = 18, color = "black"))
```

Warning: Using `size` aesthetic for lines was deprecated in ggplot2 3.4.0.
ℹ Please use `linewidth` instead.
This warning is displayed once every 8 hours.
Call `lifecycle::last_lifecycle_warnings()` to see where this warning was
generated.

Warning in geom_map(data = world, map = world, aes(long, lat, map_id = region),
: Ignoring unknown aesthetics: x and y

Warning: A numeric `legend.position` argument in `theme()` was deprecated in ggplot2
3.5.0.
ℹ Please use the `legend.position.inside` argument of `theme()` instead.
This warning is displayed once every 8 hours.
Call `lifecycle::last_lifecycle_warnings()` to see where this warning was
generated.
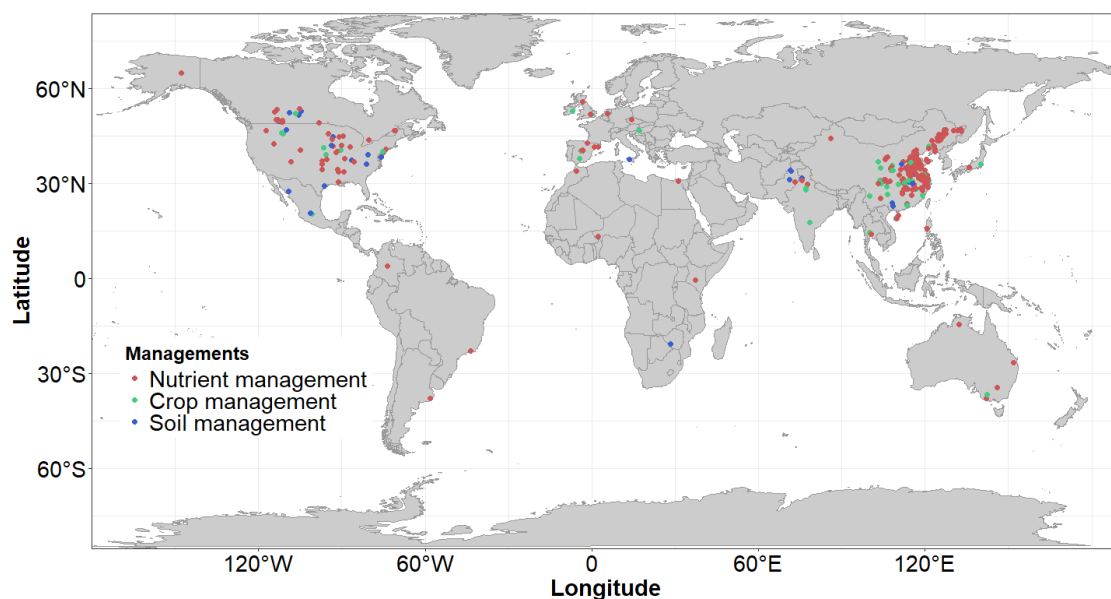
```
# Save the plot to the "picture" directory in PNG format
# ggsave(file = "F:/研究生/研究生课程/数据驱动与可重复性研究/小组作业/picture/Figure1_l
ocation_map.png",width = 410,height = 197, units = "mm")
```