Running FertBoot and data visualization of interseed 2018 data

February 3, 2021

1 Running FertBoot

1.1 Data loading

We first load the data by:

```
library(FertBoot)
library(ggplot2)
library(gridExtra)

Interseed<- read.delim("Interseed_2018.txt", na.strings="", stringsAsFactors=FALSE)

NoRC <- subset(Interseed, treatment== "None")
RC17<- subset(Interseed, treatment== "Clover 2017")
RCAlways<-  subset(Interseed, treatment== "RC")

Interseed <- rbind(NoRC, RC17, RCAlways)


NoRC=data.frame(x=NoRC$nrate,y=NoRC$yield)
RC17=data.frame(x=RC17$nrate,y=RC17$yield)
RCAlways=data.frame(x=RCAlways$nrate,y=RCAlways$yield)
```

1.2 Specimen of using FertBoot

For simplicity, we just show the code for fitting model of RC17 here:

```
# "eval=FALSE" help us to just show the code, but not running it
d <- RC17

# you may want to modify here
ans <- f.quad.plateau(d, start=list(a = 5.5, b=0.1, c=0.0001),
    plus_minus=10, n.start=1000, msg=FALSE)

RC17_result <- boot.resid.quad.plateau(ans, d, x.range=seq(0,280,by=40),B=1e3-1,
    plus_minus = 1e2, n.start=1000, print.progress=TRUE)
```

2 Visualization

2.1 Some preparation

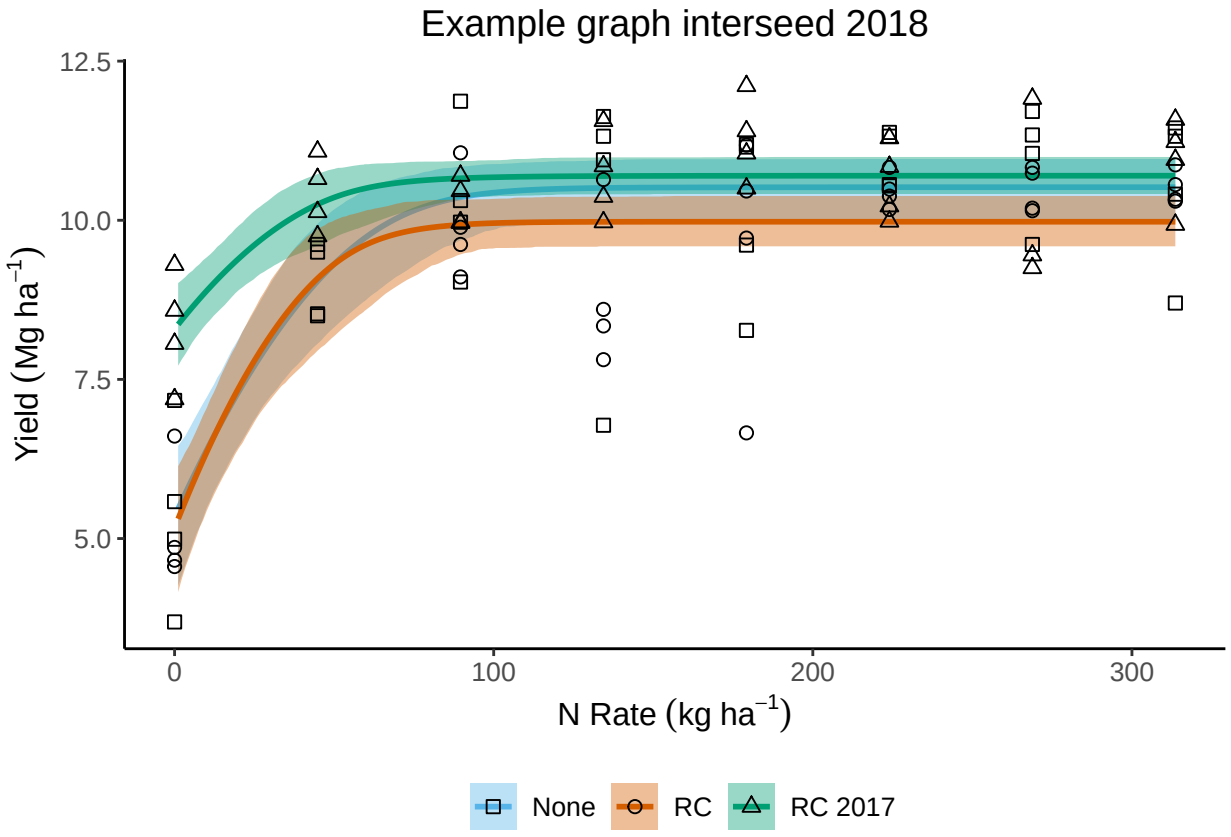
```
# get x range in plot
x.range <- 1:280
x.range.vec <- c(x.range)
```

```
# small function to get percentile CI
mean_lb <- function(x.range, result, alpha=0.05) {
  boot.p <- function(x, alpha=0.05) {
  c(mean(x), FertBoot::boot.CI(x,alpha=alpha, CI.type="percentile"))
  }
  ans <- as.data.frame(matrix(unlist(apply(result,2,boot.p)),
                      byrow=TRUE, ncol=3))

  ans <- cbind(x.range, ans)
  names(ans) <- c("x", "boot.mean", "lwr", "upr")
  rownames(ans) <- NULL
  ans
}
```

2.2 Non-linear model with CI band

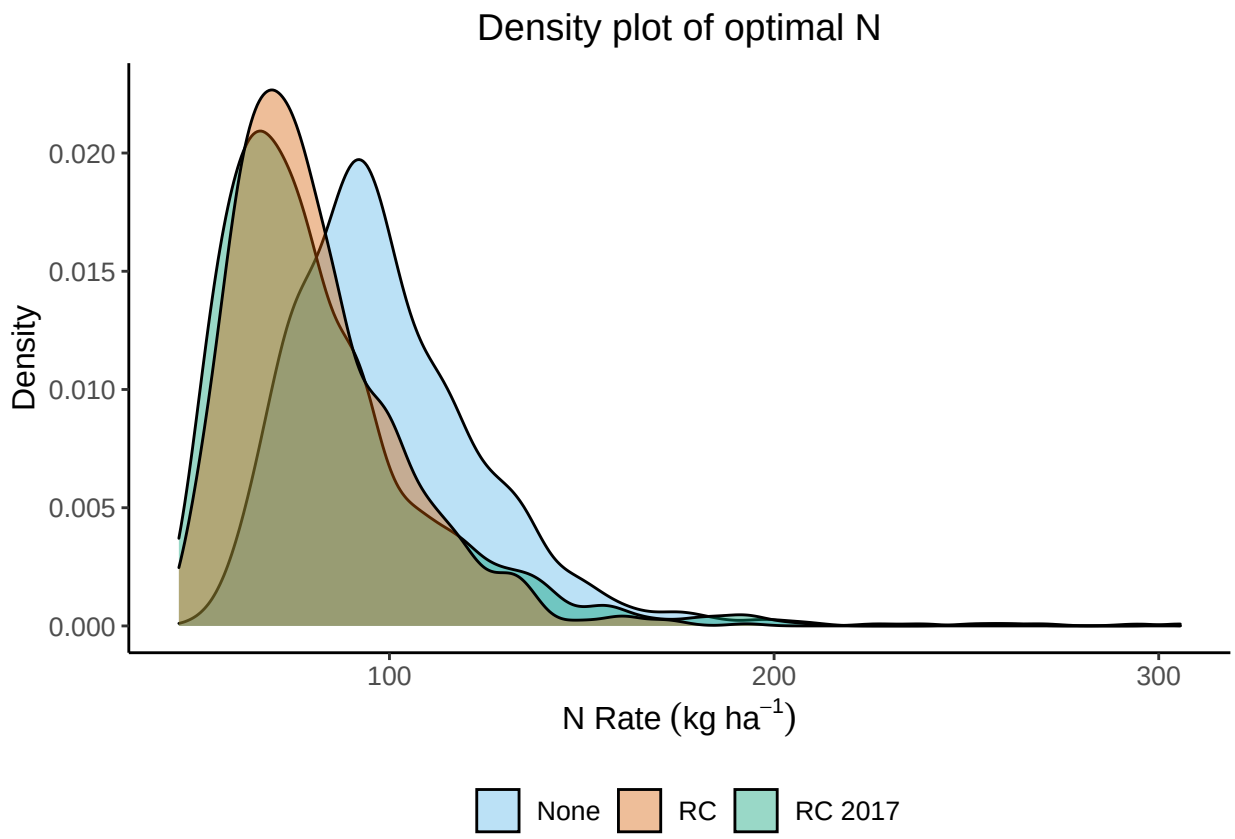
```
plot.NoRC <- data.frame(Treatment="NoRC",
  mean_lb(x.range.vec, result.NoRC[, - (1:6)]))
plot.RC17 <- data.frame(Treatment="RC17",
  mean_lb(x.range.vec, result.RC17[, - (1:6)]))
plot.RCAlways <- data.frame(Treatment="RCAlways",
  mean_lb(x.range.vec, result.RCAlways[, - (1:6)]))

# Combine data frames for plots #

plot.df <- rbind(plot.NoRC, plot.RC17, plot.RCAlways)

plot.Int2018 <- ggplot(plot.df,
                       aes(x = x*1.12,
                           y =boot.mean)) +
  # Add a ribbon with the confidence band
  geom_smooth(aes(ymin = (lwr), ymax = (upr),
                  fill = Treatment, colour = Treatment,
  ),
  stat = "identity") +
  scale_fill_manual(name="",
                    values=c("#56B4E9", "#D55E00", "#009E73"),
                    breaks=c("NoRC", "RCAlways", "RC17"),
                    labels=c("None", "RC", "RC 2017")) +
  scale_colour_manual(name="",
                      values=c("#56B4E9", "#D55E00", "#009E73"),
                      breaks=c("NoRC", "RCAlways", "RC17"),
                      labels=c("None", "RC", "RC 2017")) +
  theme_classic()+
  theme(text=element_text(size=12)) +
  xlab("nrate") +
  ylab("Yield") +
  geom_point(Interseed, mapping = aes(nrate*1.12,(yield),shape=treatment), size=2)+
  scale_shape_manual("", values=c(0,1,2),
                     breaks=c("None", "RC", "Clover 2017"),
                     labels=c("None", "RC", "RC 2017")) +
  theme(legend.position = "bottom") +
```

```
  labs(title= "Example graph interseed 2018",
       x=expression(paste("N Rate", ~(kg ~ha^-1))),
       y=expression(paste("Yield",~(Mg ~ha^-1)))) +
  theme(plot.title = element_text(hjust = 0.5))

plot.Int2018
```



2.3 Density plot of Optimal N

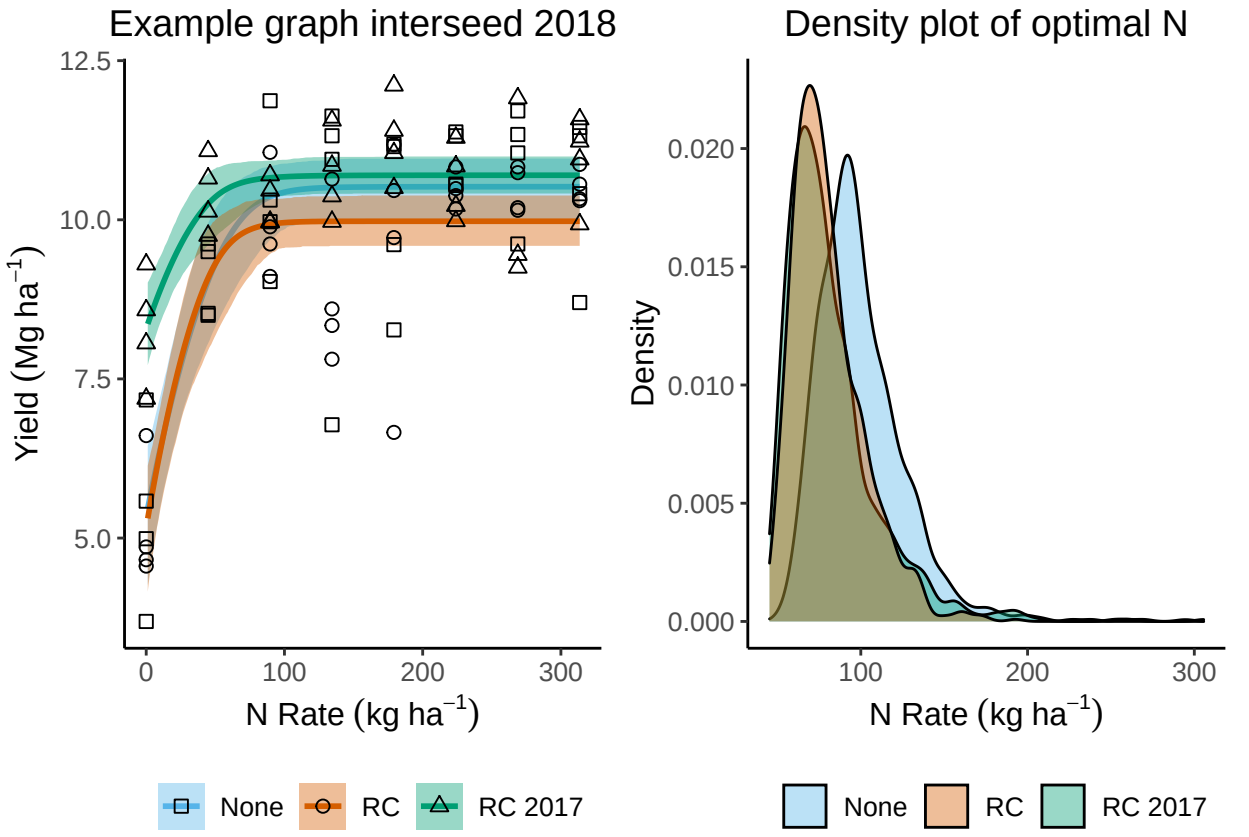
```
new.df <- data.frame(
  max_x = c(result.NoRC$max_x, result.RCAlways$max_x, result.RC17$max_x),
  treatment = c(rep("NoRC", NROW(result.NoRC)),
                rep("RCAlways", NROW(result.RCAlways)), rep("RC17", NROW(result.RC17)))
)

# Use treatment as grouping and fill, alpha controls transparency
density.interseed <- ggplot(new.df, aes(x = max_x*1.12, group = treatment )) +
                     geom_density(aes(fill = treatment ), alpha = 0.4) +
  scale_fill_manual(name="",
                     values=c("#56B4E9", "#D55E00", "#009E73"),
                     breaks=c("NoRC", "RCAlways", "RC17"),
                     labels=c("None", "RC", "RC 2017")) +
  theme_classic()+
  theme(text=element_text(size=12)) +
  theme(legend.position = "bottom") +
  xlab("Optimum N rate") +
  ylab("Density") +
  labs(title= "",x=expression(paste("N Rate", ~(kg ~ha^-1)))) +
  ggtitle("Density plot of optimal N") +
  theme(plot.title = element_text(hjust = 0.5))

density.interseed
```



2.4 Side-by-side plot

We can combine the two ggplots as a side-by-side plot using the grid.arrange() in gridExtra package.

```
grid.arrange(plot.Int2018, density.interseed, ncol=2)
```



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