# Chosun Field

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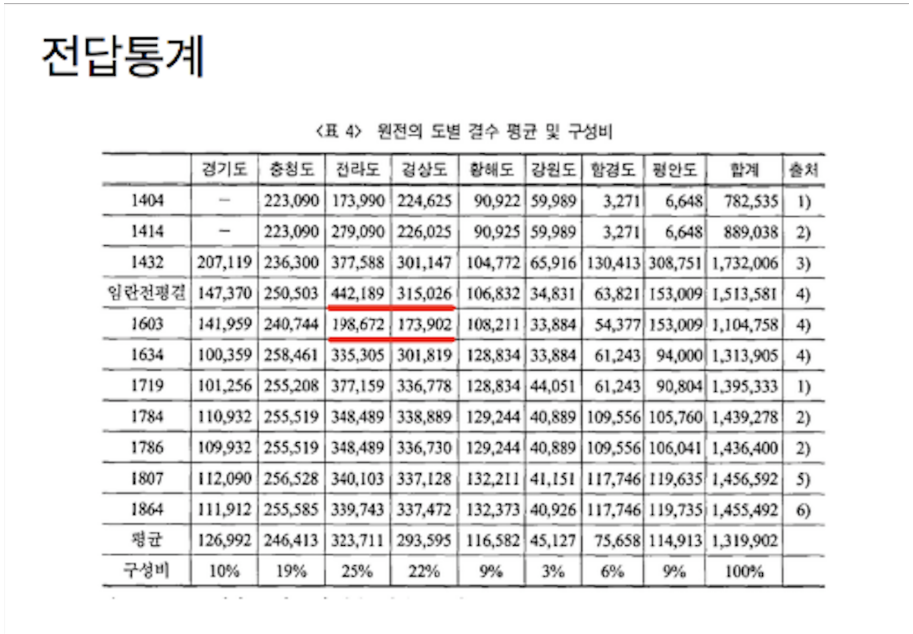
## Problem

조선시대 전답 통계를 stacked area graph로 표시

```
options(warn = -1)
library(knitr)
include_graphics("../pics/chosun_field_history.png", dpi = NA)
```



전답통계

〈표 4〉 원전의 도별 결수 평균 및 구성비

| | 경기도 | 충청도 | 전라도 | 경상도 | 황해도 | 강원도 | 함경도 | 평안도 | 합계 | 출처 |
|---|---|---|---|---|---|---|---|---|---|---|
| 1404 | – | 223,090 | 173,990 | 224,625 | 90,922 | 59,989 | 3,271 | 6,648 | 782,535 | 1) |
| 1414 | – | 223,090 | 279,090 | 226,025 | 90,925 | 59,989 | 3,271 | 6,648 | 889,038 | 2) |
| 1432 | 207,119 | 236,300 | 377,588 | 301,147 | 104,772 | 65,916 | 130,413 | 308,751 | 1,732,006 | 3) |
| 임란전평균 | 147,370 | 250,503 | 442,189 | 315,026 | 106,832 | 34,831 | 63,821 | 153,009 | 1,513,581 | 4) |
| 1603 | 141,959 | 240,744 | 198,672 | 173,902 | 108,211 | 33,884 | 54,377 | 153,009 | 1,104,758 | 4) |
| 1634 | 100,359 | 258,461 | 335,305 | 301,819 | 128,834 | 33,884 | 61,243 | 94,000 | 1,313,905 | 4) |
| 1719 | 101,256 | 255,208 | 377,159 | 336,778 | 128,834 | 44,051 | 61,243 | 90,804 | 1,395,333 | 1) |
| 1784 | 110,932 | 255,519 | 348,489 | 338,889 | 129,244 | 40,889 | 109,556 | 105,760 | 1,439,278 | 2) |
| 1786 | 109,932 | 255,519 | 348,489 | 336,730 | 129,244 | 40,889 | 109,556 | 106,041 | 1,436,400 | 2) |
| 1807 | 112,090 | 256,528 | 340,103 | 337,128 | 132,211 | 41,151 | 117,746 | 119,635 | 1,456,592 | 5) |
| 1864 | 111,912 | 255,585 | 339,743 | 337,472 | 132,373 | 40,926 | 117,746 | 119,735 | 1,455,492 | 6) |
| 평균 | 126,992 | 246,413 | 323,711 | 293,595 | 116,582 | 45,127 | 75,658 | 114,913 | 1,319,902 | |
| 구성비 | 10% | 19% | 25% | 22% | 9% | 3% | 6% | 9% | 100% | |

## Data

```
library(knitr)
year <- c(1404, 1414, 1432, 1592, 1603, 1634, 1719, 1784, 1786, 1807, 1864)
province <- c("경기도", "충청도", "전라도", "경상도", "황해도", "강원도", "함경도", "평안도")
field <- matrix(c(NA, 223090, 173990, 224625, 90922, 59989, 3271, 6648,
                  NA, 223090, 279090, 226025, 90925, 59989, 3271, 6648,
                  207119, 236300, 377588, 301147, 104772, 65916, 130413, 308751,
                  147370, 250503, 442189, 315026, 106832, 34831, 63821, 153009,
                  141959, 240744, 198672, 173902, 108211, 33884, 54377, 153009,
                  100359, 258461, 335305, 301819, 128834, 33884, 61243, 94000,
                  101256, 255208, 377159, 336778, 128834, 44051, 61243, 90804,
                  110932, 255519, 348489, 335730, 129244, 40889, 109556, 105760,
                  109932, 255519, 348489, 336730, 129244, 40889, 109556, 106041,
                  112090, 256528, 340103, 337128, 132211, 41151, 117746, 119635,
                  111912, 255585, 339743, 337472, 132373, 40926, 117746, 119735),
                ncol = 8,
                byrow = TRUE)
rownames(field) <- year
colnames(field) <- province
str(field)
```

```
##  num [1:11, 1:8] NA NA 207119 147370 141959 ...
##  - attr(*, "dimnames")=List of 2
##   ..$ : chr [1:11] "1404" "1414" "1432" "1592" ...
##   ..$ : chr [1:8] "경기도" "충청도" "전라도" "경상도" ...
```

```
options(digits = 2)
mean_field <- colMeans(field, na.rm = TRUE)
prop_field <- colMeans(field, na.rm = TRUE)/sum(colMeans(field, na.rm = TRUE)) * 100
```

## Reshape

`matrix` (array)에 특화된 `melt` 사용

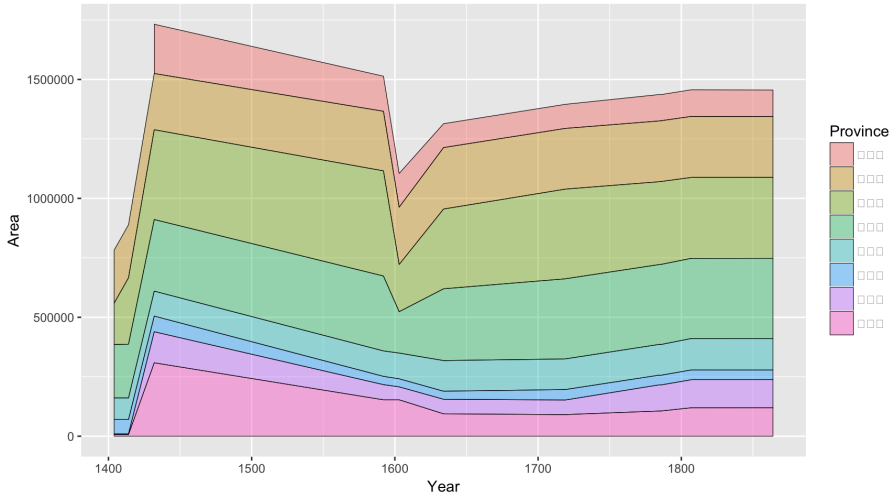
```
library(reshape2)
field_melt <- melt(field,
                   varnames = c("Year", "Province"),
                   value.name = "Area")
str(field_melt)
```

```
## 'data.frame':    88 obs. of  3 variables:
##  $ Year    : int  1404 1414 1432 1592 1603 1634 1719 1784 1786 1807 ...
##  $ Province: Factor w/ 8 levels "경기도","충청도",..: 1 1 1 1 1 1 1 1 1 1 ...
##  $ Area    : num  NA NA 207119 147370 141959 ...
```

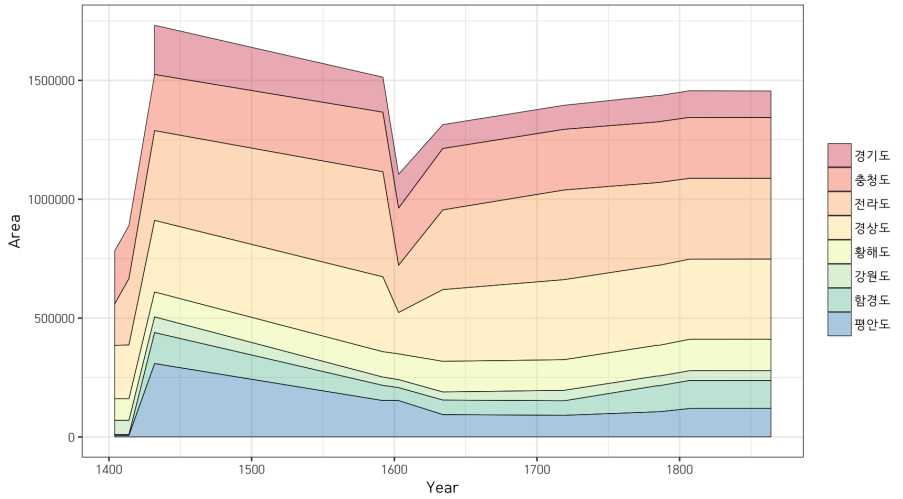
```
# kable(field_melt)
```

# ggplot

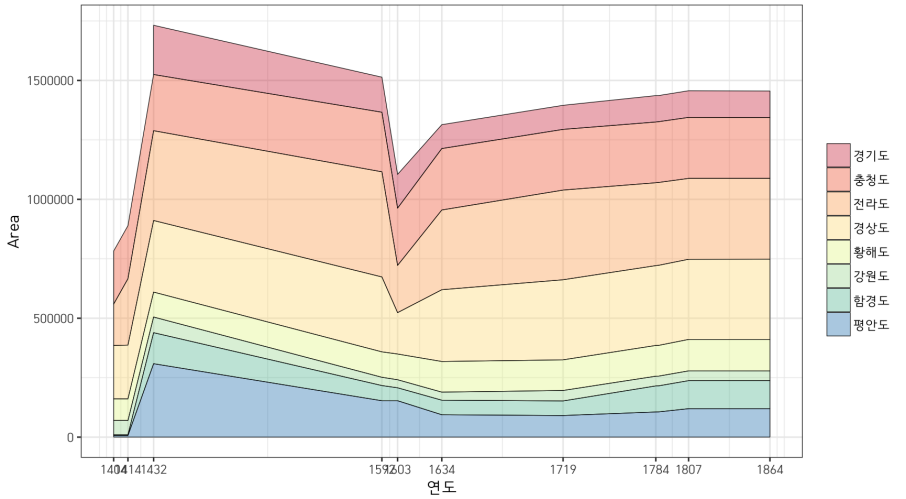
```
library(ggplot2)
# library(extrafont)
source("./theme_kr.R")
g0 <- ggplot()
g1 <- g0 +
  geom_area(data = field_melt,
            mapping = aes(x = Year, y = Area, fill = Province),
            colour = "black",
            size = 0.2,
            alpha = 0.4,
            na.rm = TRUE)
g1
```



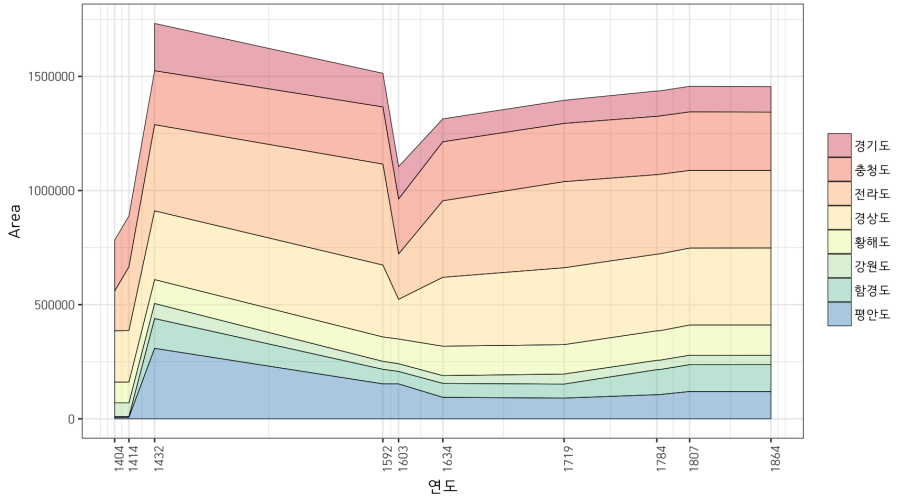

```
g2 <- g1 +
  scale_fill_brewer(palette = "Spectral",
                    name = "",
                    breaks = levels(field_melt$Province)) +
  theme_bw() +
  theme.kr
g2
```



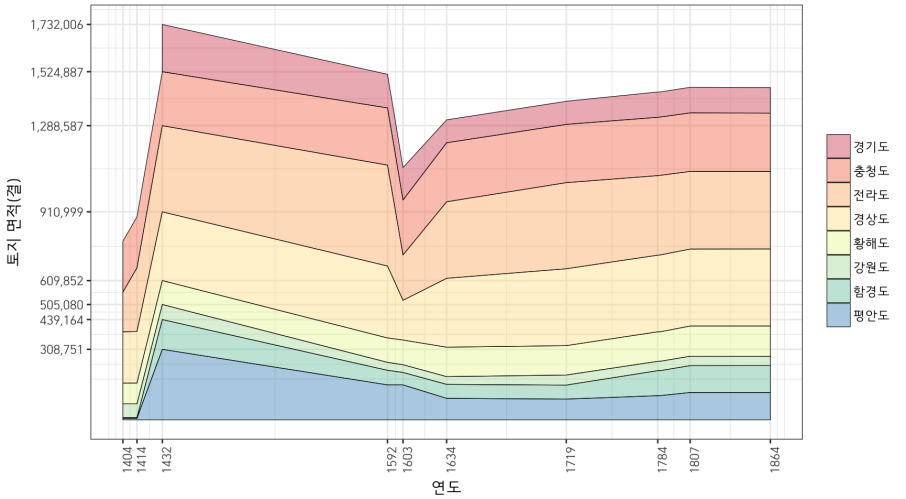
```
g3<- g2 +
  scale_x_continuous(name = "연도",
                     breaks = as.numeric(row.names(field)[-9]),
                     labels = row.names(field)[-9])
g3
```



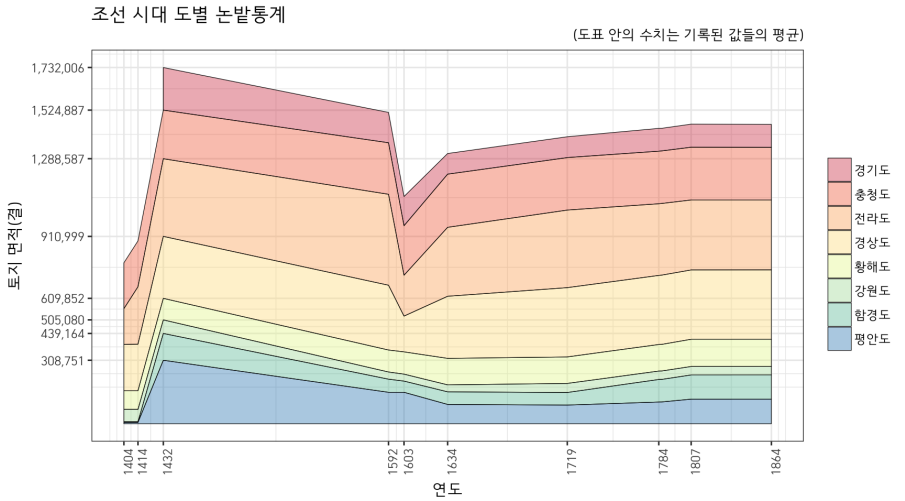

```
g4 <- g3 +
  theme(axis.text.x = element_text(angle = 90))
g4
```



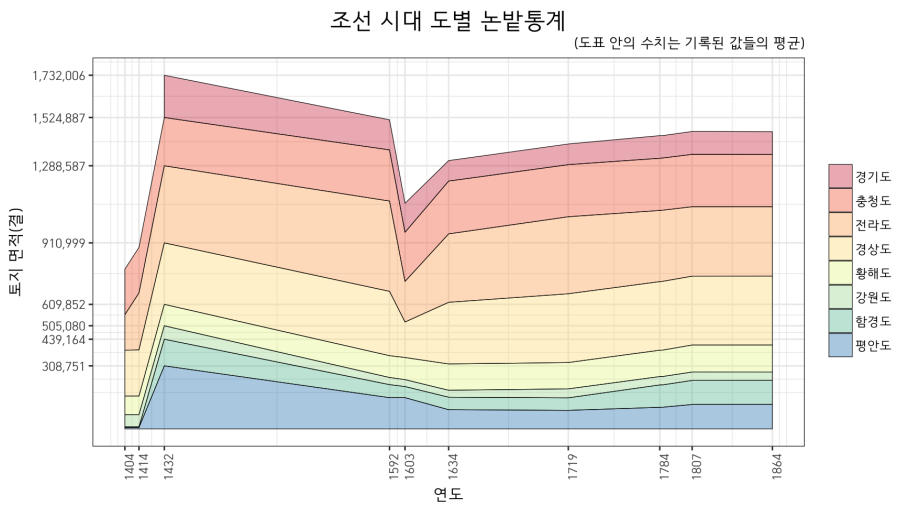
```
g5 <- g4 +
  scale_y_continuous(name = "토지 면적(결)",
                     breaks = cumsum(rev(field[3, ])),
                     labels = format(cumsum(rev(field[3, ])), big.mark = ","))
g5
```



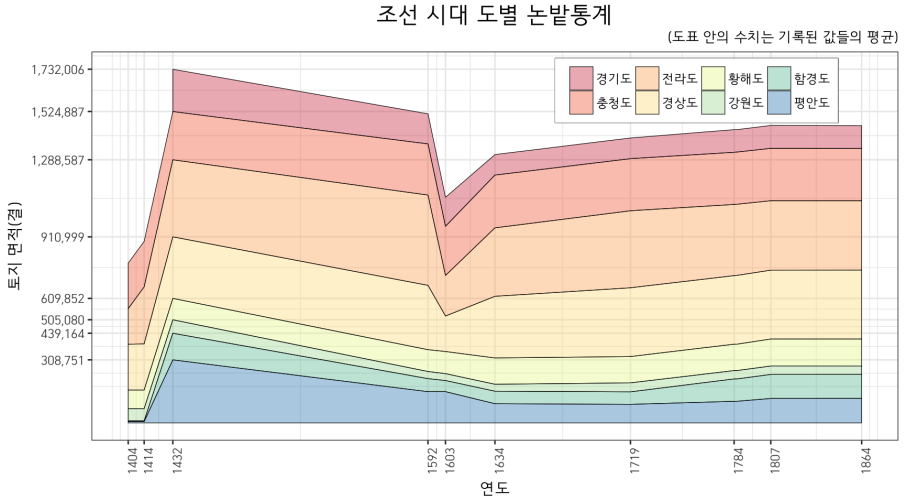

```
g6 <- g5 +
  labs(title = "조선 시대 도별 논밭통계", subtitle = "(도표 안의 수치는 기록된 값들의 평균)") +
  theme(plot.subtitle = element_text(family = "HCR Dotum LVT", hjust = 1))
g6
```



```
g7 <- g6 +
  theme(plot.title = element_text(size = 16, hjust = 0.5))
g7
```



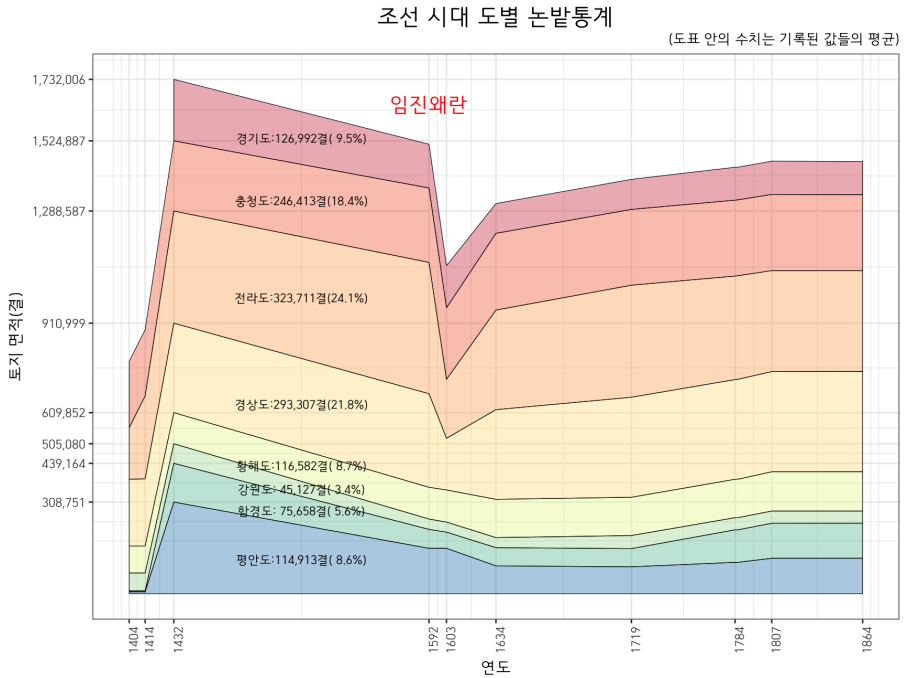

```
#  x.max <- max(year) + 0.15 * diff(range(year))
# g8 <- g7 +
#  scale_x_continuous(name = "연도",
#                     breaks = as.numeric(row.names(field)[-9]),
#                     labels = row.names(field)[-9],
#                     limits = c(min(year), x.max)) +
#  theme(legend.position = c(0.95, 0.5),
#        legend.box.background = element_rect(fill = "white", colour = "black"),
#        legend.title = element_blank())
# g8
g9 <- g7 +
  theme(legend.position = c(0.75, 0.9),
        legend.box.background = element_rect(fill = "white", colour = "black"),
        legend.direction = "horizontal")
g9
```




```
y_coord <- apply(field[3:4, ], 2, mean)
y_text <- cumsum(c(0, head(rev(y_coord), -1))) + rev(y_coord) / 2
mean_text <- rev(paste(province,
                       ":",
                       format(mean_field, big.mark = ","),
                       "결(",
                       format(prop_field, digits = 2, nsmall = 0),
                       "%)",
                       sep = ""))
text_df <- data.frame(x = (year[3] + year[4]) / 2,
                      y = y_text,
                      label = mean_text,
                      row.names = NULL,
                      stringsAsFactors = FALSE)
```

```
g10 <- g9 +
  guides(fill = FALSE) +
  geom_text(data = text_df,
            mapping = aes(x = x, y = y),
            label = mean_text,
            family = "HCR Dotum LVT", size = 3) +
  annotate("text", x = 1592, y = 1650000,
           label = "임진왜란",
           colour = "red",
           size = 5,
           family = "HCR Dotum LVT")
#  theme(text = element_text(family = "HCR Dotum LVT"))
#  annotate("text",
#           x = text_df$x,
#           y = text_df$y,
#           label = mean_text,
#           family = "HCR Dotum LVT")

g10
```




```
ggsave("../pics/chosun_field_ggplot.png", dpi = 72)
```