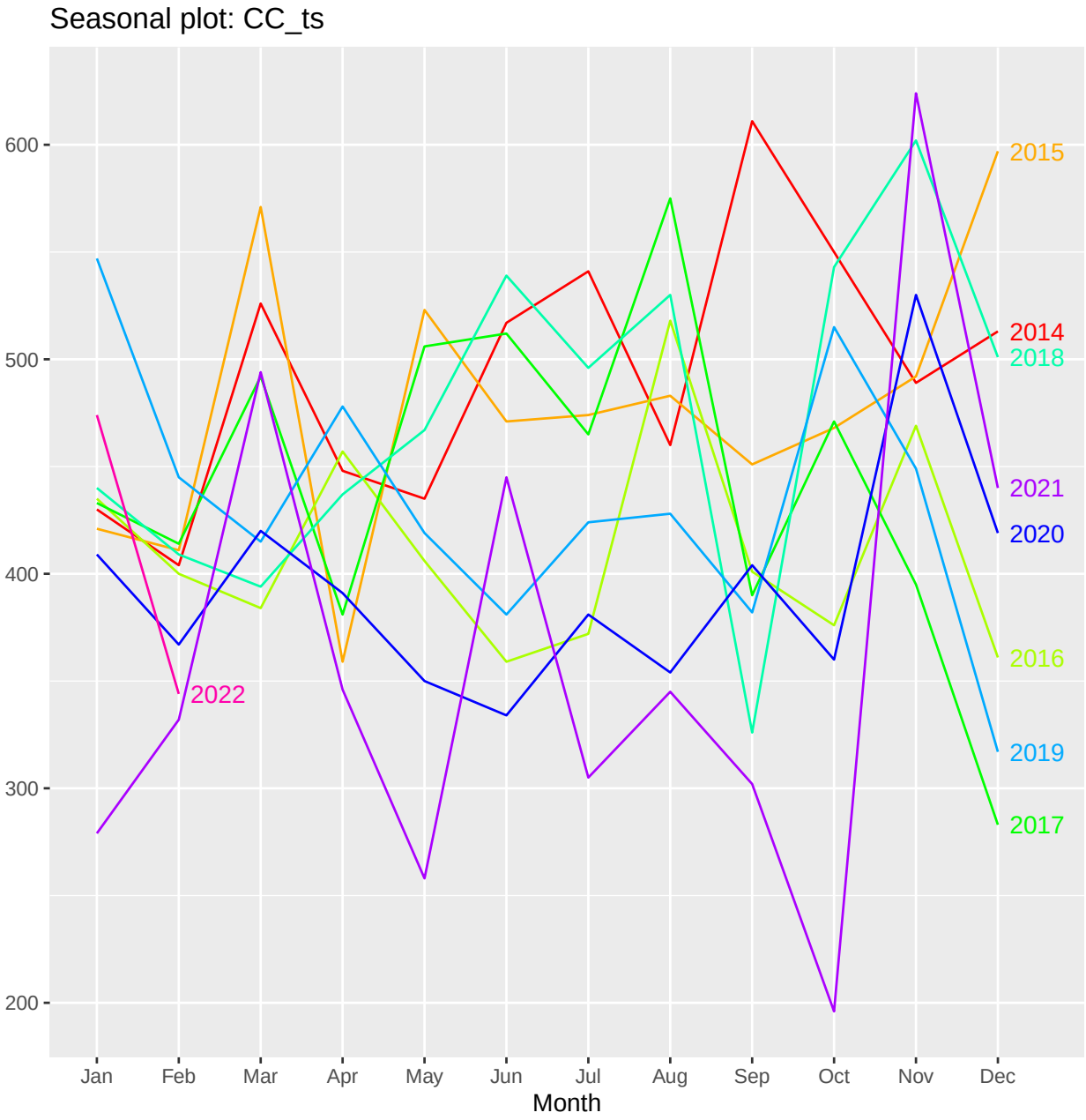
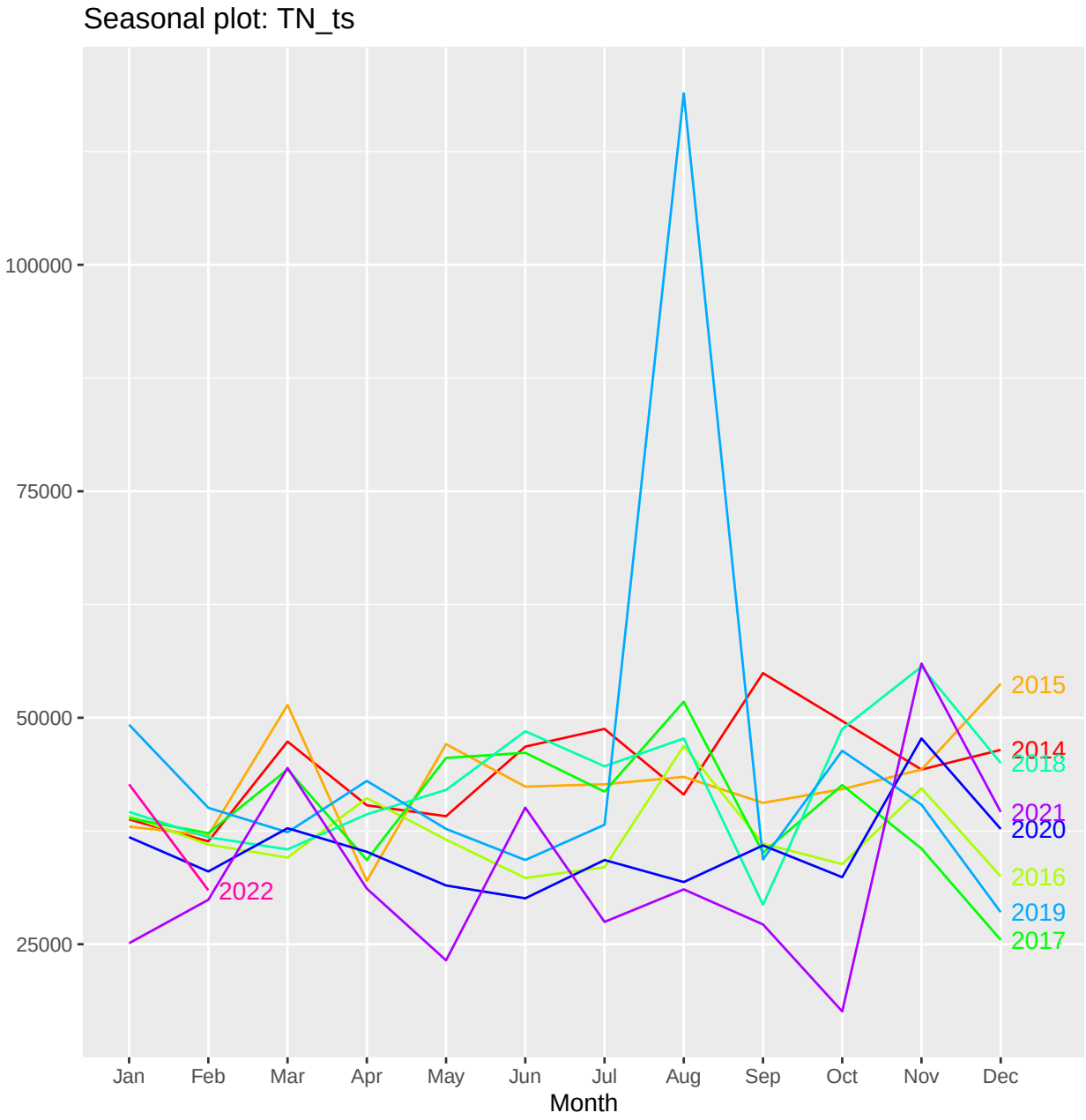
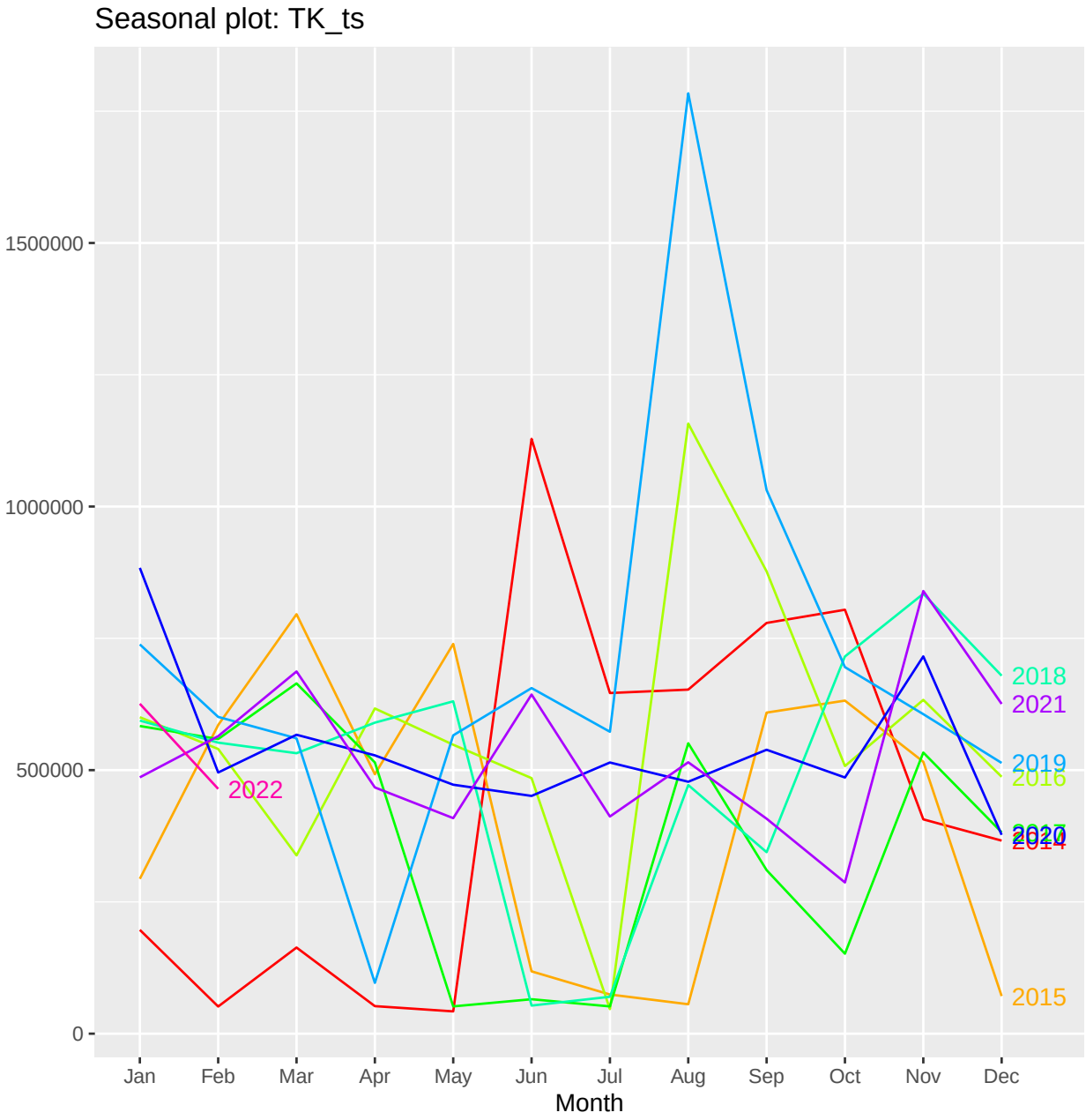
```r
setwd("C:\\Users\\81799\\OneDrive\\Documentos\\ESFM_CLASES\\Servicio Social ARTF\\Machine Learni
library(readr)
library(tseries)

## Registered S3 method overwritten by 'quantmod':
##   method            from
##   as.zoo.data.frame zoo

library(ggplot2)
library(forecast)

Maiz_FTVM_LOCAL <-read.csv("Maiz_FTVM_LOCAL.csv" )
Maiz_FTVM_LOCAL <- Maiz_FTVM_LOCAL[,-1]

#             Series de tiempo individuales
#Esto me servirá para hacer las gráficas correspondientes.
CC_ts <- ts(Maiz_FTVM_LOCAL[,5], frequency = 12 , start = c(2014,1) )
TN_ts <- ts(Maiz_FTVM_LOCAL[,6], frequency = 12 , start = c(2014,1) )
TK_ts <- ts(Maiz_FTVM_LOCAL[,7], frequency = 12 , start = c(2014,1) )
DM_ts <- ts(Maiz_FTVM_LOCAL[,8], frequency = 12 , start = c(2014,1) )
I_ts <- ts(Maiz_FTVM_LOCAL[,9], frequency = 12 , start = c(2014,1) )

#                 Parcelas estacionales

par(mfrow =c(2,3)) #Para que me ponga las gráficas en forma 2x3
ggseasonplot(CC_ts ,year.labels = T, col = rainbow(9))#Carros Cargados
```



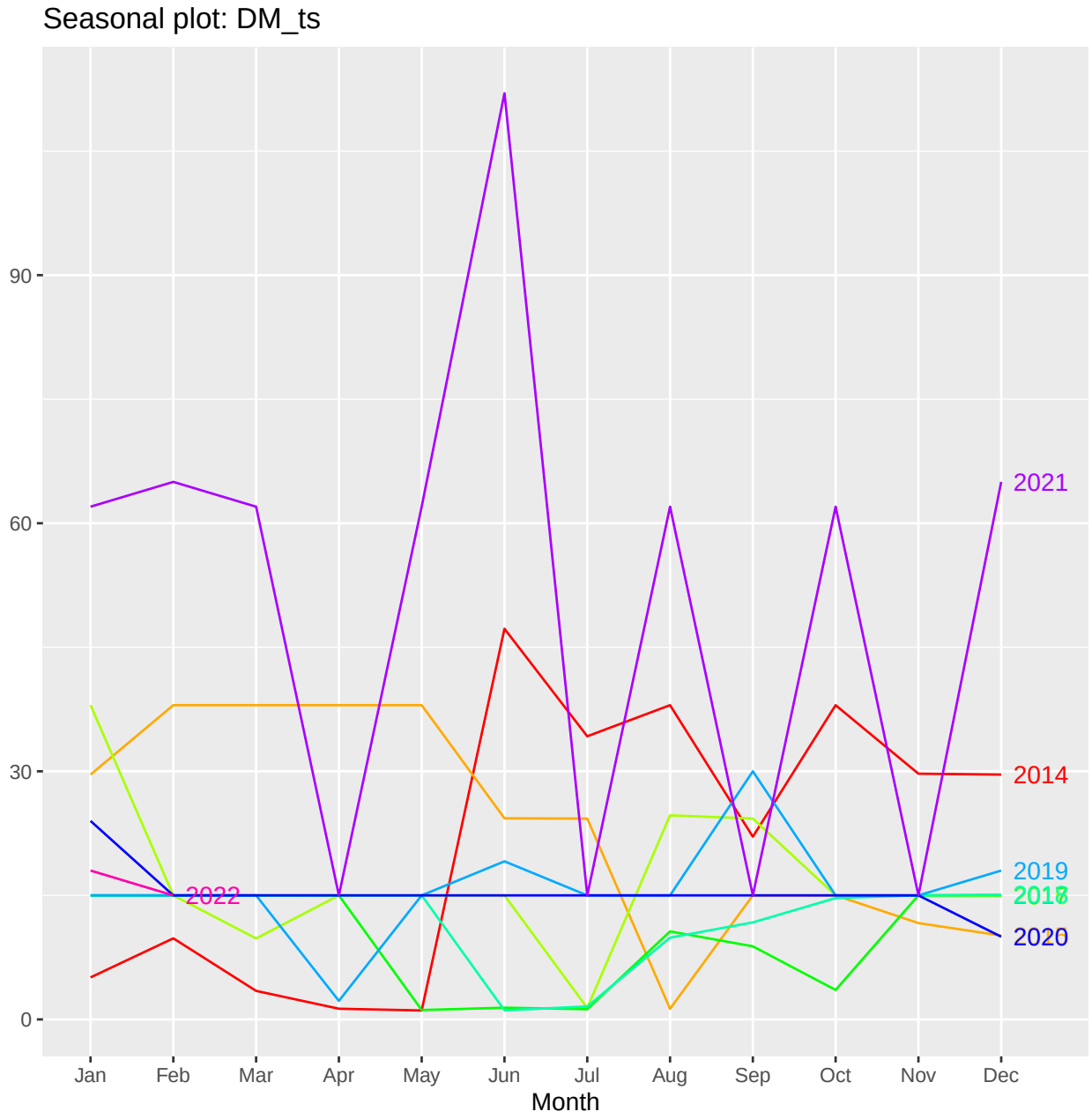

```
ggseasonplot(TN_ts ,year.labels = T, col = rainbow(9))#Toneladas Netas
```



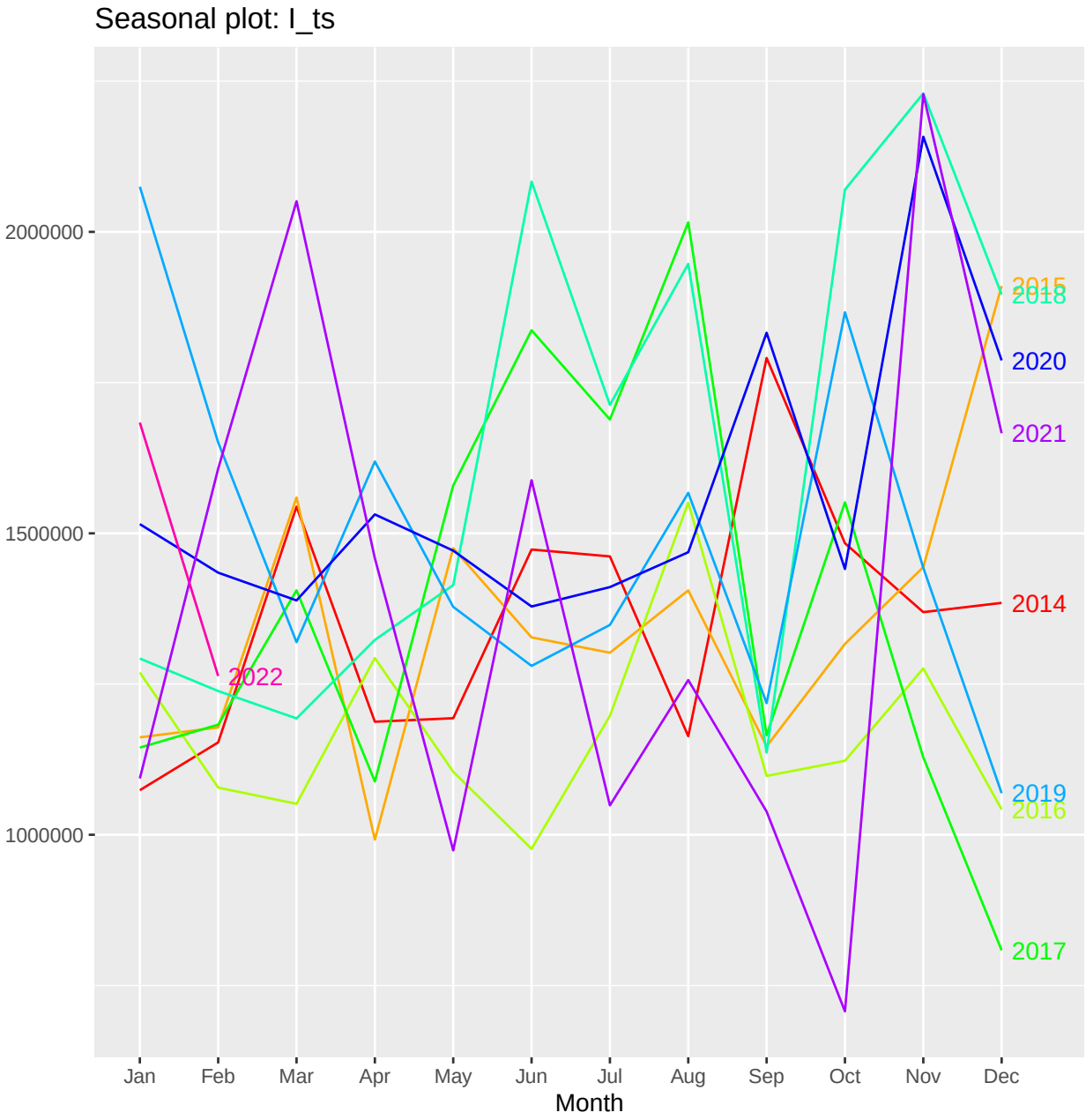

```
ggseasonplot(TK_ts ,year.labels = T, col = rainbow(9))#Toneladas Km
```



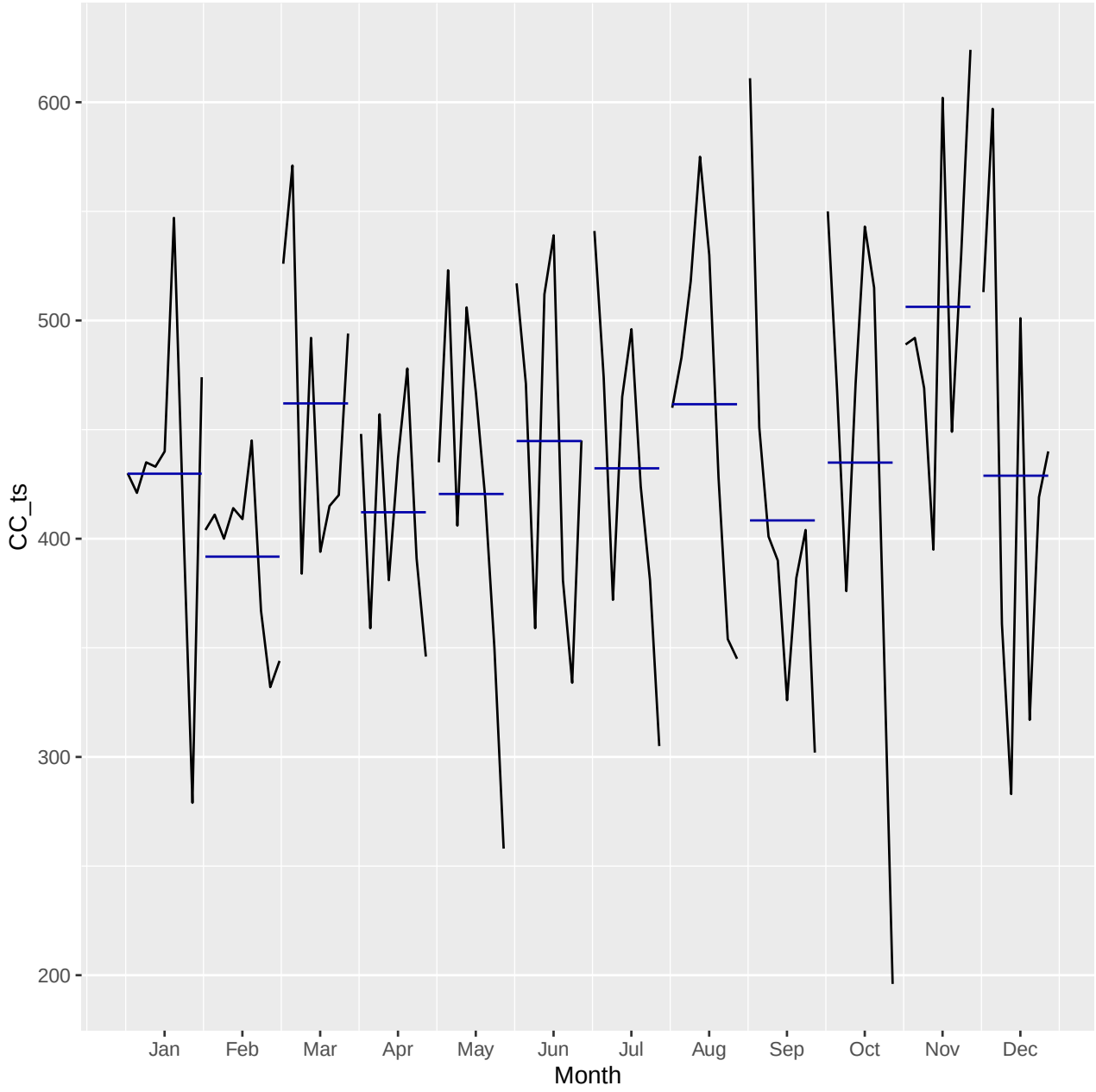

```
ggseasonplot(DM_ts ,year.labels = T, col = rainbow(9))#Distancia Media
```



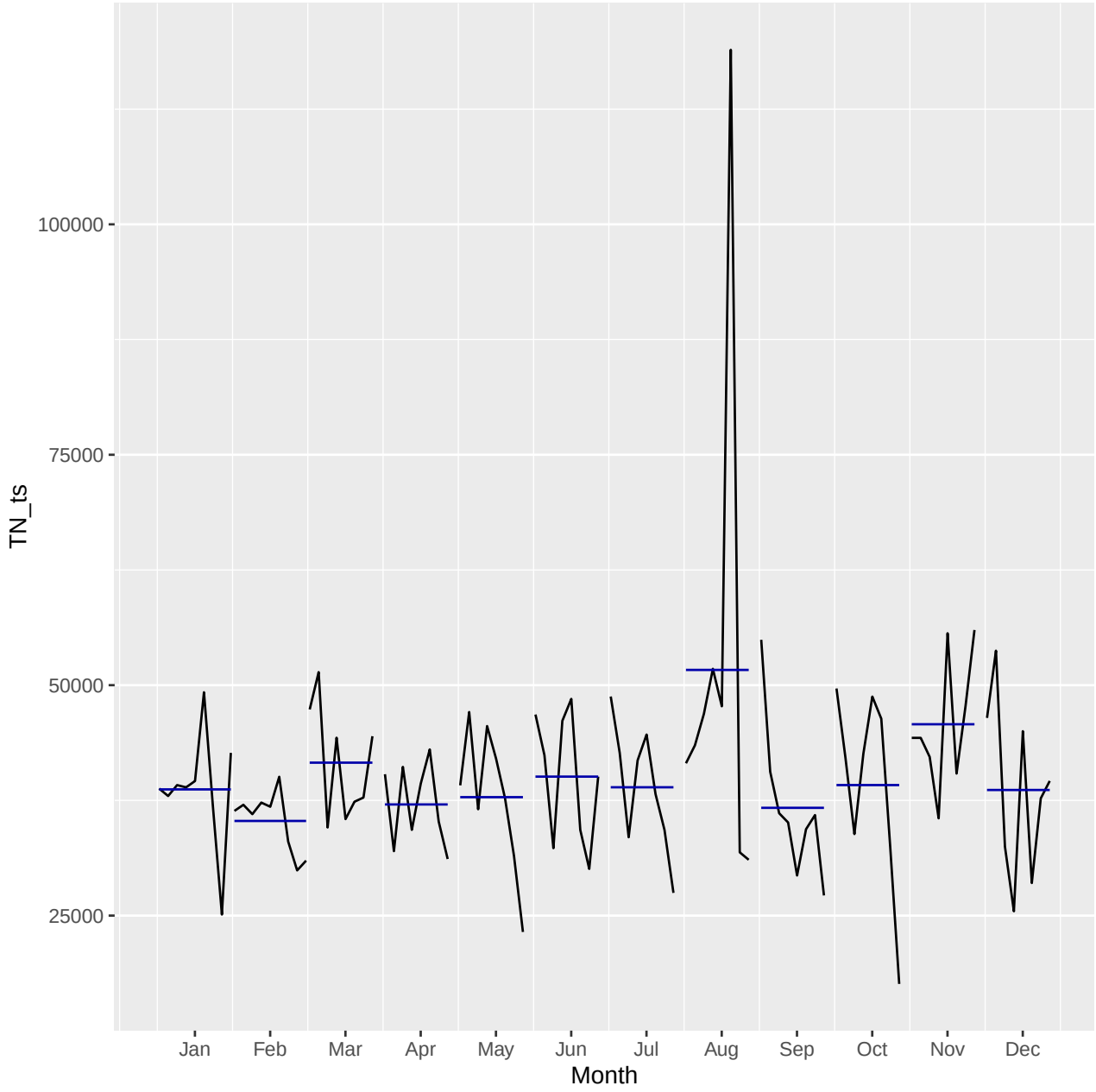

```
ggseasonplot(I_ts ,year.labels = T, col = rainbow(9))#Ingresos
```



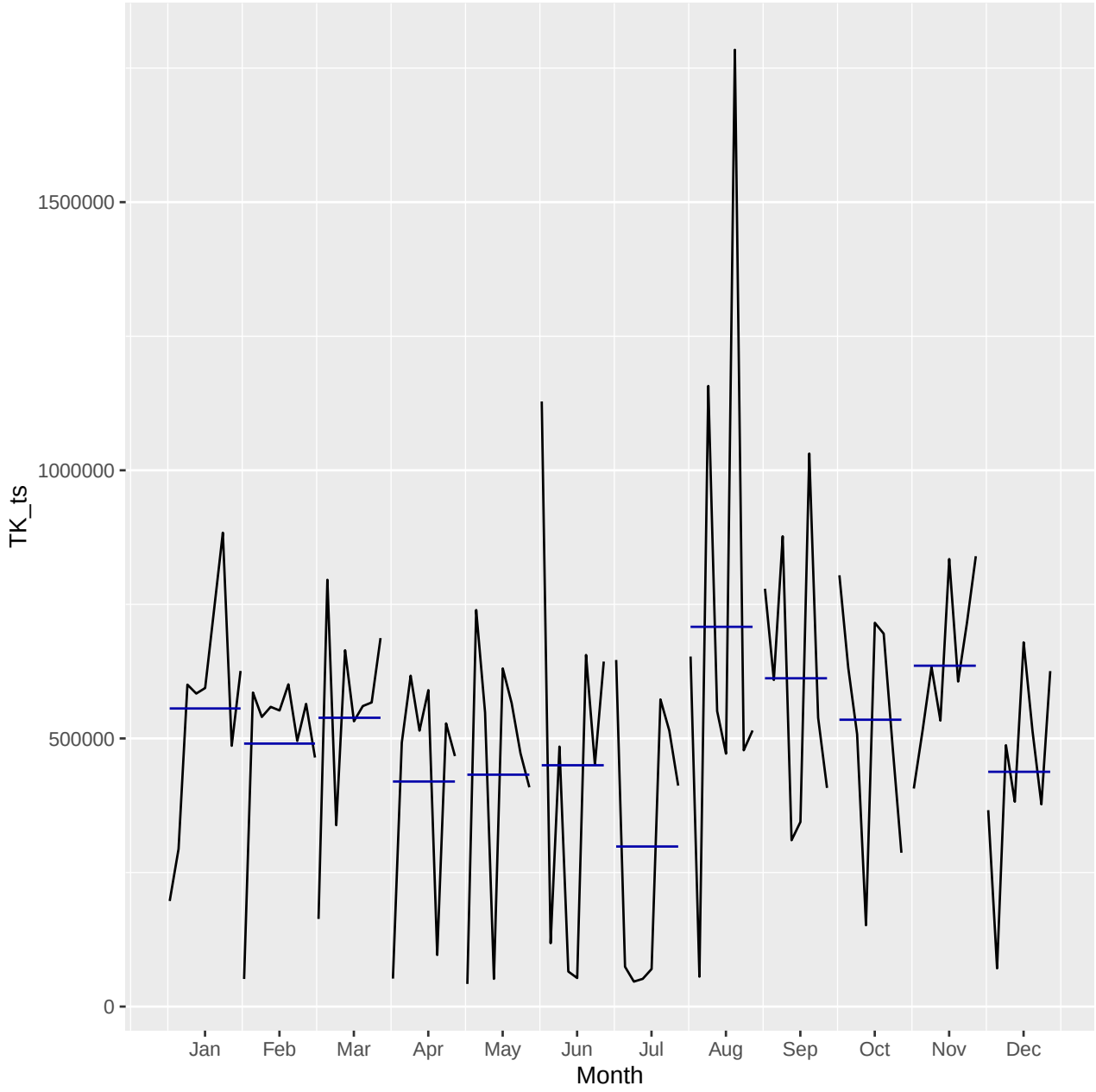

```
#            Gráficas de Subseries Estacionales
ggsubseriesplot(CC_ts)#Carros Cargados
```



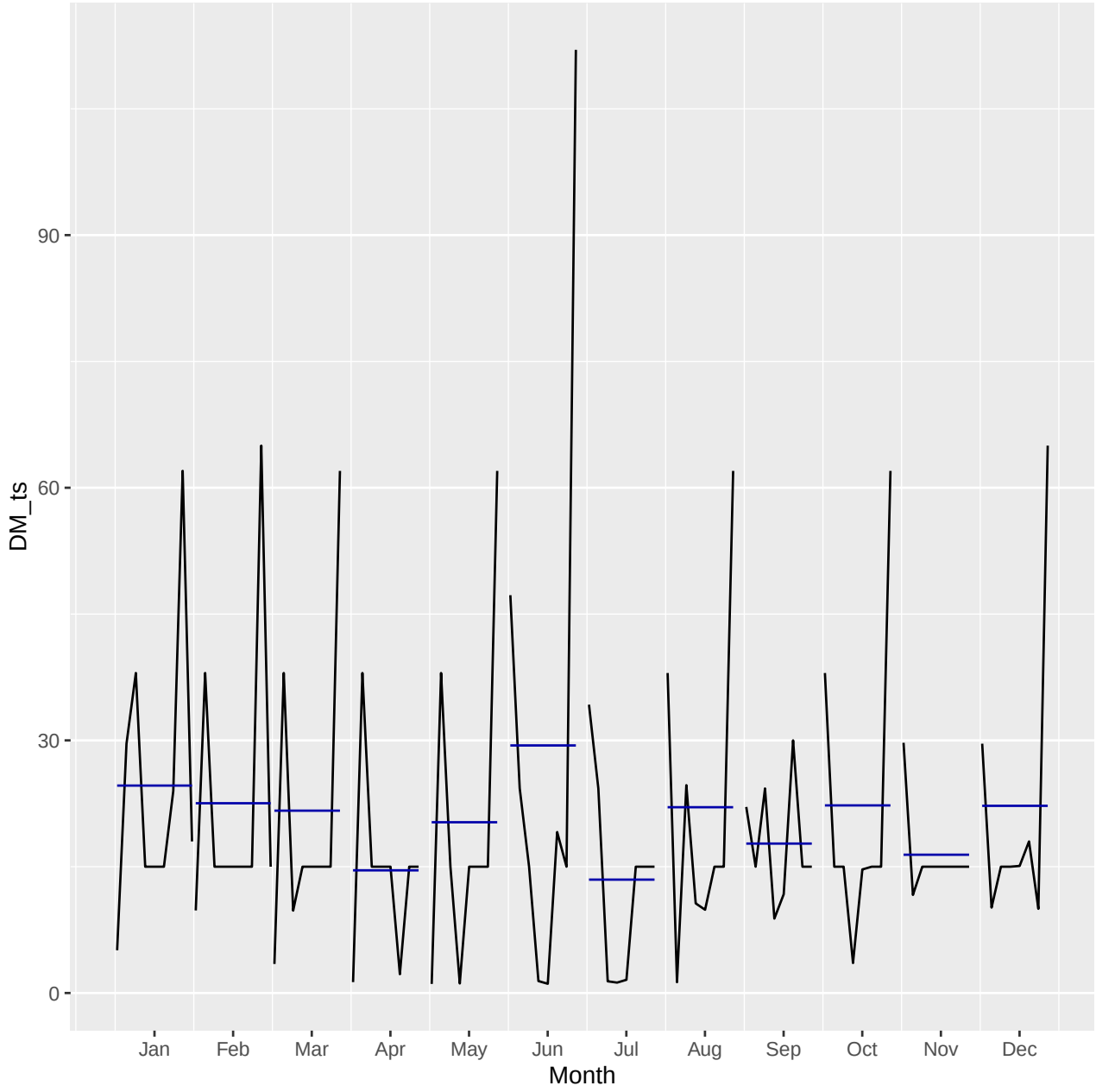

```
ggsubseriesplot(TN_ts)#Toneladas Netas
```



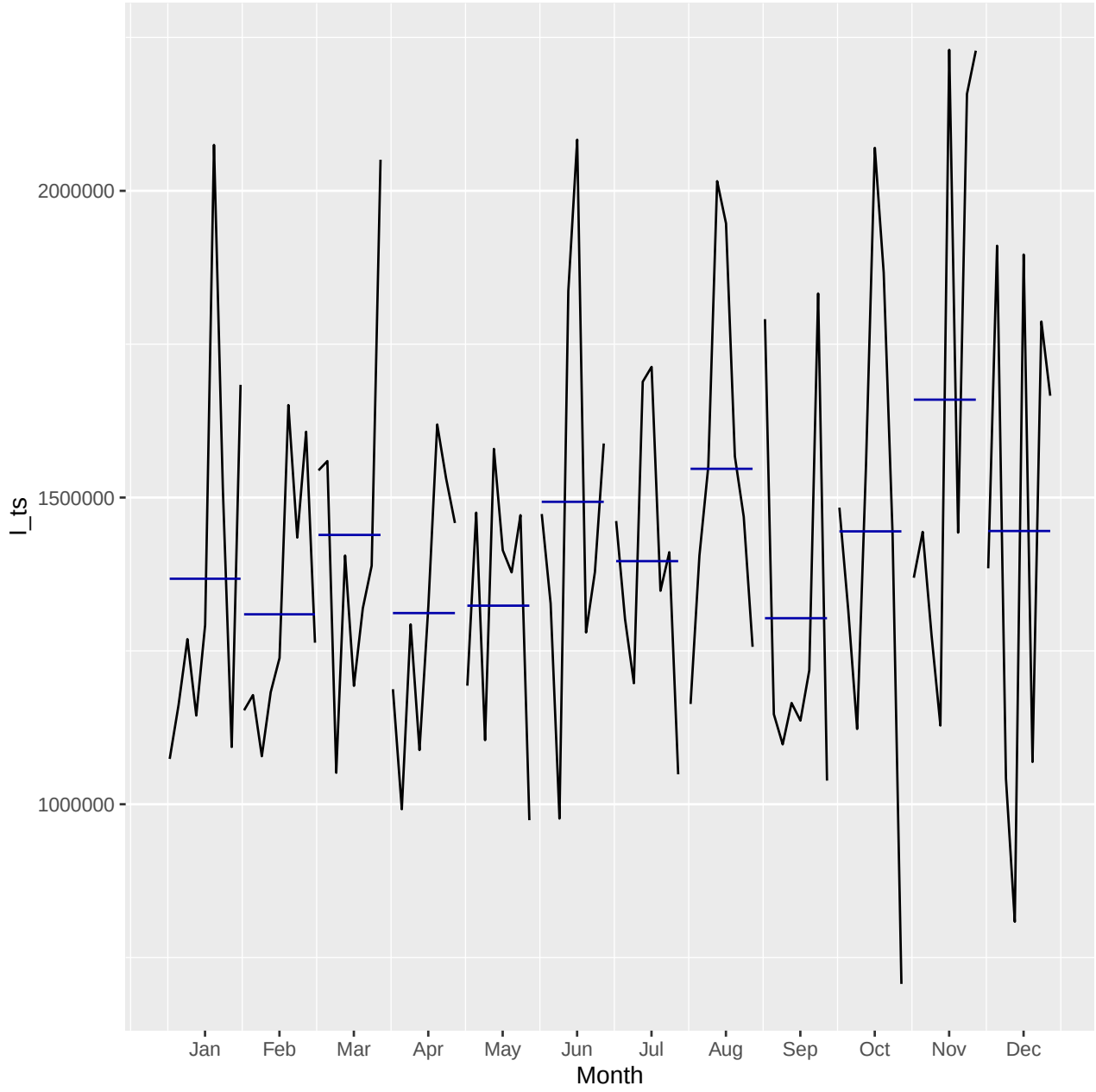

```
ggsubseriesplot(TK_ts)#Toneladas Km
```




```
ggsubseriesplot(DM_ts)#Distancia Media
```




```
ggsubseriesplot(I_ts)#Ingresos
```




```
#                          Generación de histogramas
#Calcular la moda de las columnas
library(modes)
#Observar la columna que tiene moda unimodal (Solo una moda) para poder graficarla
modes(Maiz_FTVM_LOCAL[,5])#Tiene moda unimodal de los datos Carros Cargados

##        [,1]
## Value   381
## Length    3

modes(Maiz_FTVM_LOCAL[,6])#NO tiene moda unimodal los datos Toneladas Netas

## Warning in modes(Maiz_FTVM_LOCAL[, 6]): A single observation
## is being observed as a mode.
## Double check the class or inspect the data.
## Alternatively, you may have specified 'nmore' too many times
## for this data.

##         [,1]   [,2]   [,3]   [,4]   [,5]   [,6]   [,7]   [,8]   [,9] [,10] [,11] [,12]
```

```
## Value  17586 23222 25113 25470 27186 27465 28534 29349 29903 30067 30960 31054
## Length     1     1     1     1     1     1     1     1     1     1     1     1
##        [,13] [,14] [,15] [,16] [,17] [,18] [,19] [,20] [,21] [,22] [,23] [,24]
## Value  31140 31486 31861 31993 32318 32400 32490 33030 33501 33847 34294 34296
## Length     1     1     1     1     1     1     1     1     1     1     1     1
##        [,25] [,26] [,27] [,28] [,29] [,30] [,31] [,32] [,33] [,34] [,35] [,36]
## Value  34302 34371 34562 35100 35199 35467 35553 35906 36005 36103 36357 36540
## Length     1     1     1     1     1     1     1     1     1     1     1     1
##        [,37] [,38] [,39] [,40] [,41] [,42] [,43] [,44] [,45] [,46] [,47] [,48]
## Value  36810 36819 37018 37261 37356 37720 37730 37804 37975 38181 38775 38911
## Length     1     1     1     1     1     1     1     1     1     1     1     1
##        [,49] [,50] [,51] [,52] [,53] [,54] [,55] [,56] [,57] [,58] [,59] [,60]
## Value  39131 39156 39335 39600 39605 40060 40074 40337 40410 40605 41131 41525
## Length     1     1     1     1     1     1     1     1     1     1     1     1
##        [,61] [,62] [,63] [,64] [,65] [,66] [,67] [,68] [,69] [,70] [,71] [,72]
## Value  41844 42032 42120 42215 42400 42568 42652 42660 43025 43474 44281 44282
## Length     1     1     1     1     1     1     1     1     1     1     1     1
##        [,73] [,74] [,75] [,76] [,77] [,78] [,79] [,80] [,81] [,82] [,83] [,84]
## Value  44295 44460 44644 45006 45563 46132 46358 46448 46812 46897 47084 47369
## Length     1     1     1     1     1     1     1     1     1     1     1     1
##        [,85] [,86] [,87] [,88] [,89] [,90] [,91] [,92] [,93] [,94] [,95] [,96]
## Value  47708 47712 48510 48759 48769 49231 49636 51416 51771 53739 54922 55631
## Length     1     1     1     1     1     1     1     1     1     1     1     1
##        [,97]  [,98]
## Value  55984 118932
## Length     1      1
```

```
modes(Maiz_FTVM_LOCAL[,7])#NO tiene moda unimodal los datos Toneladas Km
```

```
## Warning in modes(Maiz_FTVM_LOCAL[, 7]): A single observation
## is being observed as a mode.
## Double check the class or inspect the data.
## Alternatively, you may have specified 'nmore' too many times
## for this data.
```

```
##         [,1]  [,2]  [,3]  [,4]  [,5]  [,6]  [,7]  [,8]  [,9] [,10] [,11] [,12]
## Value  42261 46571 51514 51707 51762 52201 53265 55801 65334 69997 71320 74300
## Length     1     1     1     1     1     1     1     1     1     1     1     1
##        [,13]  [,14]  [,15]  [,16]  [,17]  [,18]  [,19]  [,20]  [,21]  [,22]
## Value  96338 118199 151686 163411 196904 286855 293744 310236 338206 344311
## Length     1      1      1      1      1      1      1      1      1      1
##         [,23]  [,24]  [,25]  [,26]  [,27]  [,28]  [,29]  [,30]  [,31]  [,32]
## Value  366213 377201 382050 406575 407793 408878 411980 451019 464400 467100
## Length      1      1      1      1      1      1      1      1      1      1
##         [,33]  [,34]  [,35]  [,36]  [,37]  [,38]  [,39]  [,40]  [,41]  [,42]
## Value  471646 472298 477928 484772 486000 486268 487357 492145 495450 507713
## Length      1      1      1      1      1      1      1      1      1      1
##         [,43]  [,44]  [,45]  [,46]  [,47]  [,48]  [,49]  [,50]  [,51]  [,52]
## Value  513613 514420 514531 514831 515835 527992 532018 533302 538604 540077
## Length      1      1      1      1      1      1      1      1      1      1
##         [,53]  [,54]  [,55]  [,56]  [,57]  [,58]  [,59]  [,60]  [,61]  [,62]
## Value  548103 550966 552150 558922 560342 564387 565956 567073 572727 583665
## Length      1      1      1      1      1      1      1      1      1      1
##         [,63]  [,64]  [,65]  [,66]  [,67]  [,68]  [,69]  [,70]  [,71]  [,72]
## Value  585521 590029 594000 600319 600908 606156 609087 616977 625575 625836
```

```
## Length      1      1      1      1      1      1      1      1      1      1
##         [,73]  [,74]  [,75]  [,76]  [,77]  [,78]  [,79]  [,80]  [,81]  [,82]
## Value  630483 631800 633229 643355 646236 652723 655602 664436 679140 687108
## Length      1      1      1      1      1      1      1      1      1      1
##         [,83]  [,84]  [,85]  [,86]  [,87]  [,88]  [,89]  [,90]  [,91]  [,92]
## Value  695371 715595 715691 738470 739409 779153 795747 804222 834471 839773
## Length      1      1      1      1      1      1      1      1      1      1
##         [,93]  [,94]   [,95]   [,96]   [,97]   [,98]
## Value  876931 883656 1031144 1128284 1157301 1783990
## Length      1      1       1       1       1       1
```

```
modes(Maiz_FTVM_LOCAL[,8])#Tiene moda Unimodal los datos Distancia Media
```

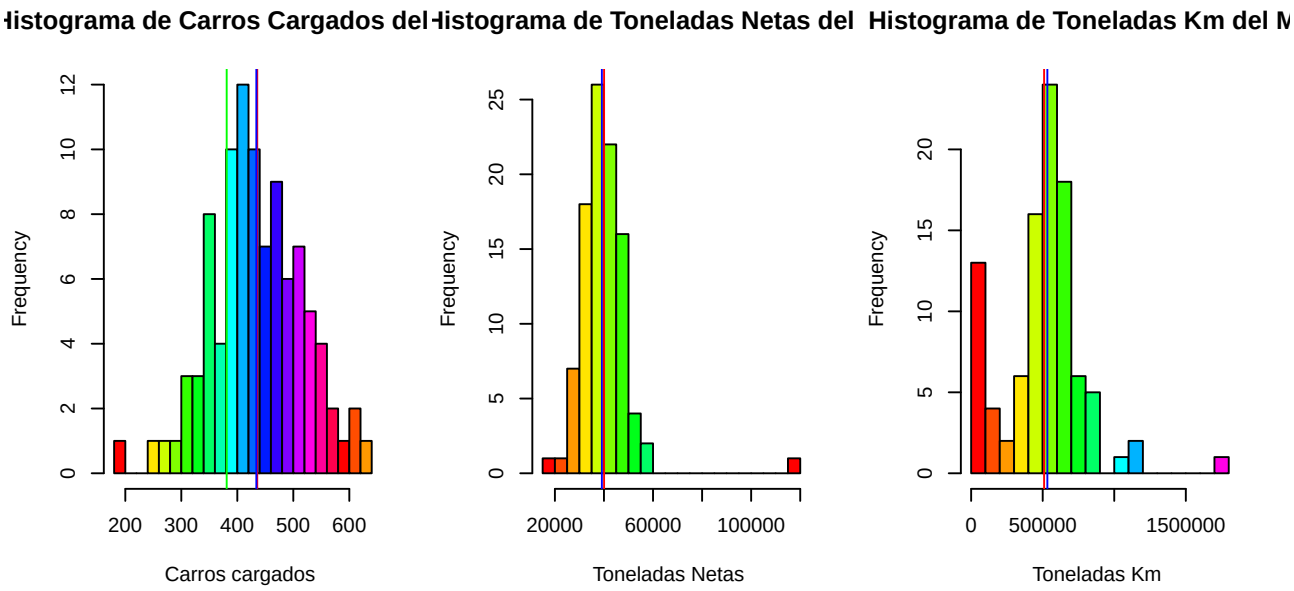
```
##        [,1]
## Value    15
## Length   45
```

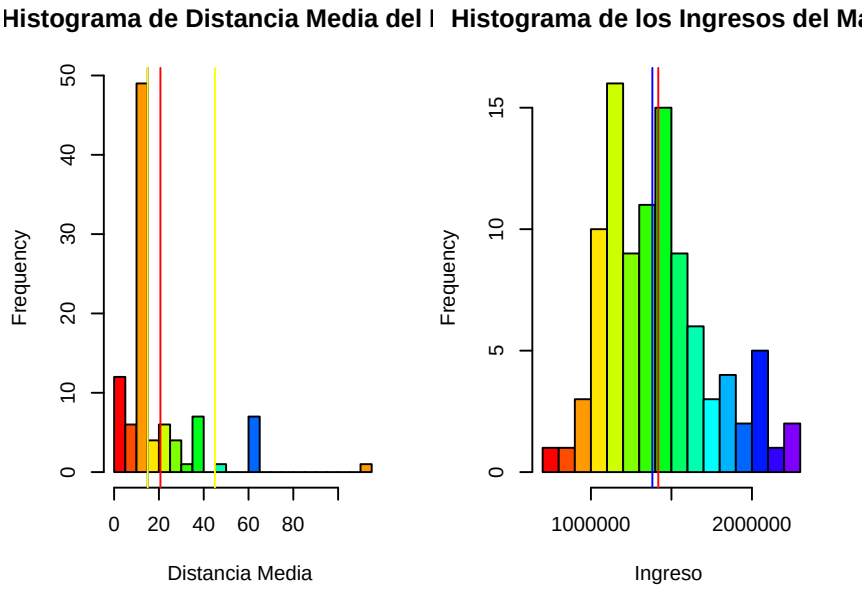
```
modes(Maiz_FTVM_LOCAL[,9])#NO tiene moda unimodal los datos de Ingresoss
```

```
## Warning in modes(Maiz_FTVM_LOCAL[, 9]): A single observation
## is being observed as a mode.
## Double check the class or inspect the data.
## Alternatively, you may have specified 'nmore' too many times
## for this data.
```

```
##          [,1]    [,2]    [,3]    [,4]    [,5]    [,6]    [,7]    [,8]    [,9]
## Value  707063 808397 974002 976659 991922 1038502 1042000 1048818 1051327
## Length      1      1      1      1      1       1       1       1       1
##          [,10]   [,11]   [,12]   [,13]   [,14]   [,15]   [,16]   [,17]   [,18]
## Value  1068991 1073905 1078256 1088337 1093416 1097576 1104523 1122741 1128329
## Length       1       1       1       1       1       1       1       1       1
##          [,19]   [,20]   [,21]   [,22]   [,23]   [,24]   [,25]   [,26]   [,27]
## Value  1136330 1144602 1146730 1153179 1161618 1163473 1165021 1177937 1182603
## Length       1       1       1       1       1       1       1       1       1
##          [,28]   [,29]   [,30]   [,31]   [,32]   [,33]   [,34]   [,35]   [,36]
## Value  1187479 1193000 1193315 1197359 1218321 1238419 1256639 1263327 1269119
## Length       1       1       1       1       1       1       1       1       1
##          [,37]   [,38]   [,39]   [,40]   [,41]   [,42]   [,43]   [,44]   [,45]
## Value  1275914 1280111 1292350 1293185 1301920 1316538 1319417 1323201 1327331
## Length       1       1       1       1       1       1       1       1       1
##          [,46]   [,47]   [,48]   [,49]   [,50]   [,51]   [,52]   [,53]   [,54]
## Value  1348031 1369258 1377995 1378612 1384602 1388725 1405311 1405412 1410805
## Length       1       1       1       1       1       1       1       1       1
##          [,55]   [,56]   [,57]   [,58]   [,59]   [,60]   [,61]   [,62]   [,63]
## Value  1414038 1434710 1440733 1442801 1444018 1458488 1461694 1468589 1471261
## Length       1       1       1       1       1       1       1       1       1
##          [,64]   [,65]   [,66]   [,67]   [,68]   [,69]   [,70]   [,71]   [,72]
## Value  1473131 1475371 1483539 1515240 1531311 1544285 1550821 1551447 1559443
## Length       1       1       1       1       1       1       1       1       1
##          [,73]   [,74]   [,75]   [,76]   [,77]   [,78]   [,79]   [,80]   [,81]
## Value  1567120 1579318 1588113 1607257 1619078 1650758 1665991 1683703 1688823
## Length       1       1       1       1       1       1       1       1       1
##          [,82]   [,83]   [,84]   [,85]   [,86]   [,87]   [,88]   [,89]   [,90]
## Value  1712951 1786849 1790844 1832641 1836815 1866651 1896138 1910364 1946930
## Length       1       1       1       1       1       1       1       1       1
```

```
##          [,91]   [,92]   [,93]   [,94]   [,95]   [,96]   [,97]   [,98]
## Value  2015762 2050732 2070006 2074838 2083372 2157844 2228451 2229834
## Length       1       1       1       1       1       1       1       1

#Gráfico
par(mfrow =c(2,3)) #Para que me ponga las gráficas en forma 2x3
hist(Maiz_FTVM_LOCAL[,5], xlab = "Carros cargados ",
    main = "Histograma de Carros Cargados del Maíz", breaks = 20,col = rainbow(20))#Histograma c
abline(v = mean(Maiz_FTVM_LOCAL[,5]), col = "red")#Generar linea con el valor de la media de los
abline(v = median(Maiz_FTVM_LOCAL[,5])  , col = "blue") #Generar linea con el valor de la median
abline(v = modes(Maiz_FTVM_LOCAL[,5]), col = "green") #Generar linea con el valor de la moda de

hist(Maiz_FTVM_LOCAL[,6], xlab = "Toneladas Netas ",
     main = "Histograma de Toneladas Netas del Maíz", breaks = 20,col = rainbow(20) )#Histograma
abline(v = mean(Maiz_FTVM_LOCAL[,6]), col = "red") #Generar linea con el valor de la media de lo
abline(v = median(Maiz_FTVM_LOCAL[,6])  , col = "blue") #Generar linea con el valor de la median

hist(Maiz_FTVM_LOCAL[,7], xlab = "Toneladas Km ",
     main = "Histograma de Toneladas Km del Maíz", breaks = 20,col = rainbow(20)  ) #Histograma
abline(v = mean(Maiz_FTVM_LOCAL[,7]), col = "red") #Generar linea con el valor de la media de lo
abline(v = median(Maiz_FTVM_LOCAL[,7])  , col = "blue") #Generar linea con el valor de la median

hist(Maiz_FTVM_LOCAL[,8], xlab = "Distancia Media ",
     main = "Histograma de Distancia Media del Maíz", breaks = 20,col = rainbow(20)  ) #Histogra
abline(v = mean(Maiz_FTVM_LOCAL[,8]), col = "red") #Generar linea con el valor de la media de lo
abline(v = median(Maiz_FTVM_LOCAL[,8]), col = "blue") #Generar linea con el valor de la mediana
abline(v = modes(Maiz_FTVM_LOCAL[,8]), col = "yellow") #Generar linea con el valor de la moda de

hist(Maiz_FTVM_LOCAL[,9], xlab = "Ingreso ",
     main = "Histograma de los Ingresos del Maíz", breaks = 20,col = rainbow(20)  ) #Histograma
abline(v = mean(Maiz_FTVM_LOCAL[,9]), col = "red") #Generar linea con el valor de la media de lo
abline(v = median(Maiz_FTVM_LOCAL[,9])  , col = "blue") #Generar linea con el valor de la median
```

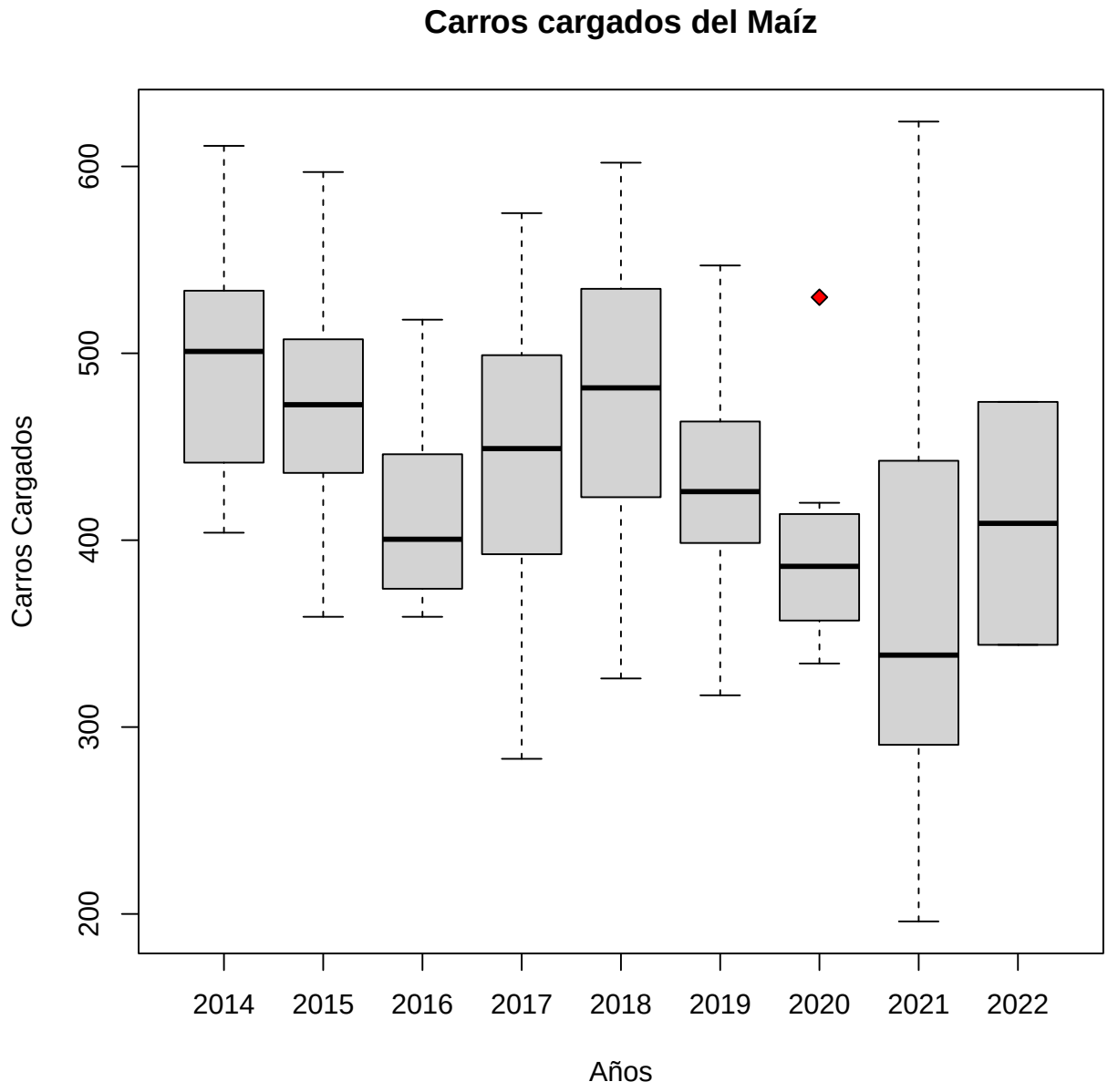




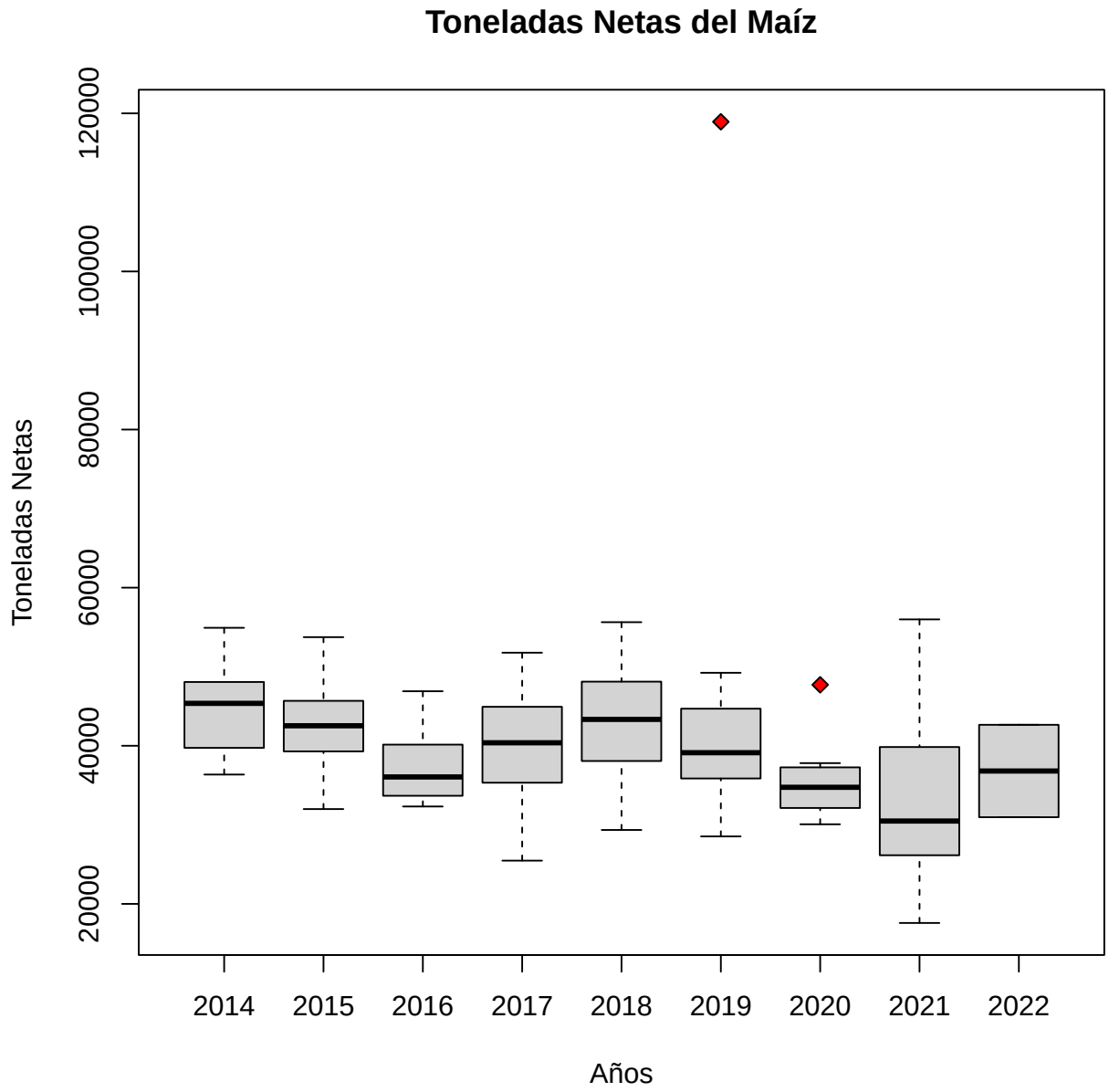
Diagramas de caja

En este diagrama podemos darnos cuenta de cuales son los datos atípicos que se presentan en los datos.

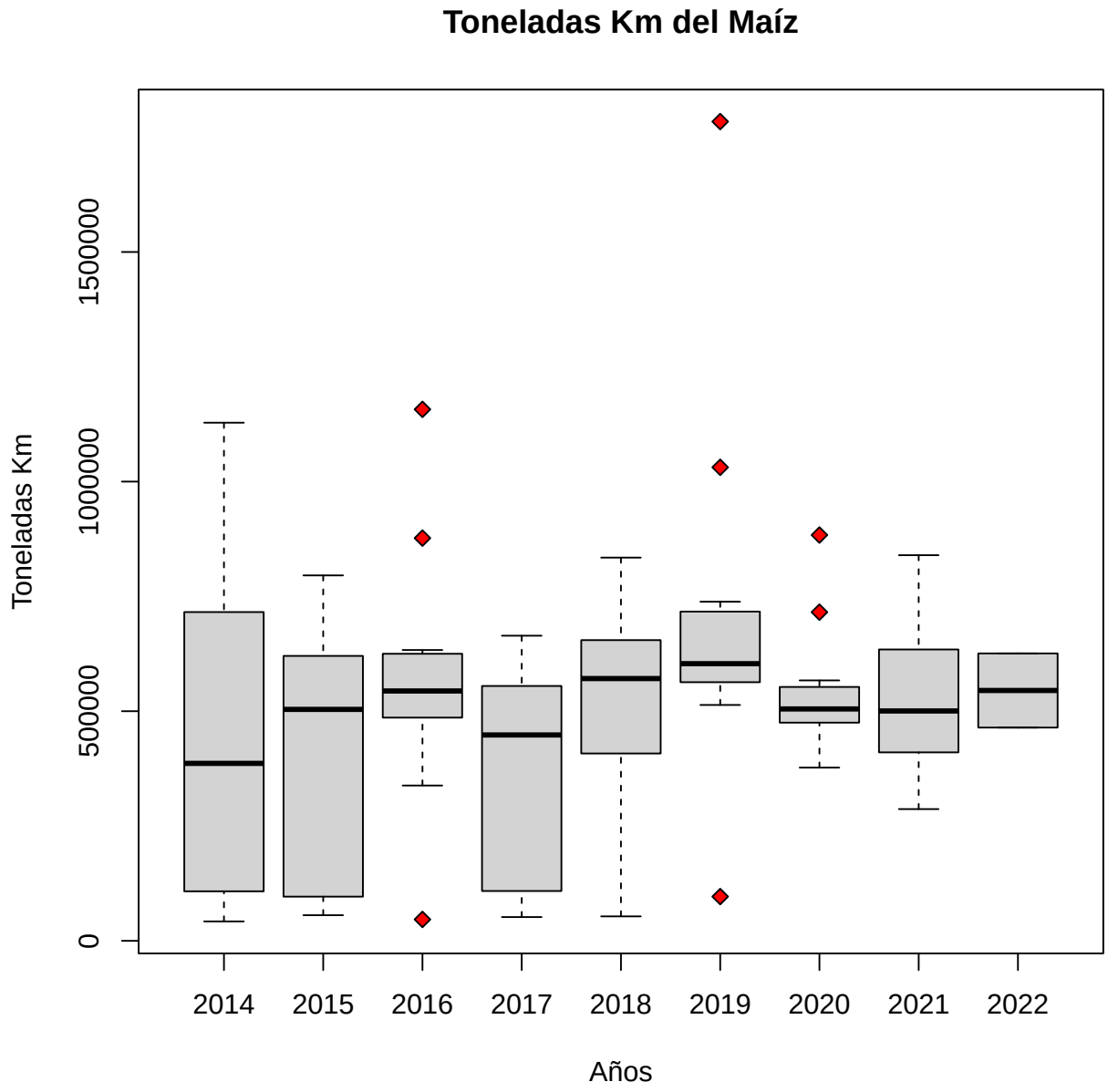
```
par(mfrow =c(1,1))
#Carros Cargados
boxplot(Maiz_FTVM_LOCAL[,5]~Maiz_FTVM_LOCAL[,10], xlab = "Años", ylab = "Carros Cargados",
        main = "Carros cargados del Maíz", outpch = 23,outbg = "red" )
```



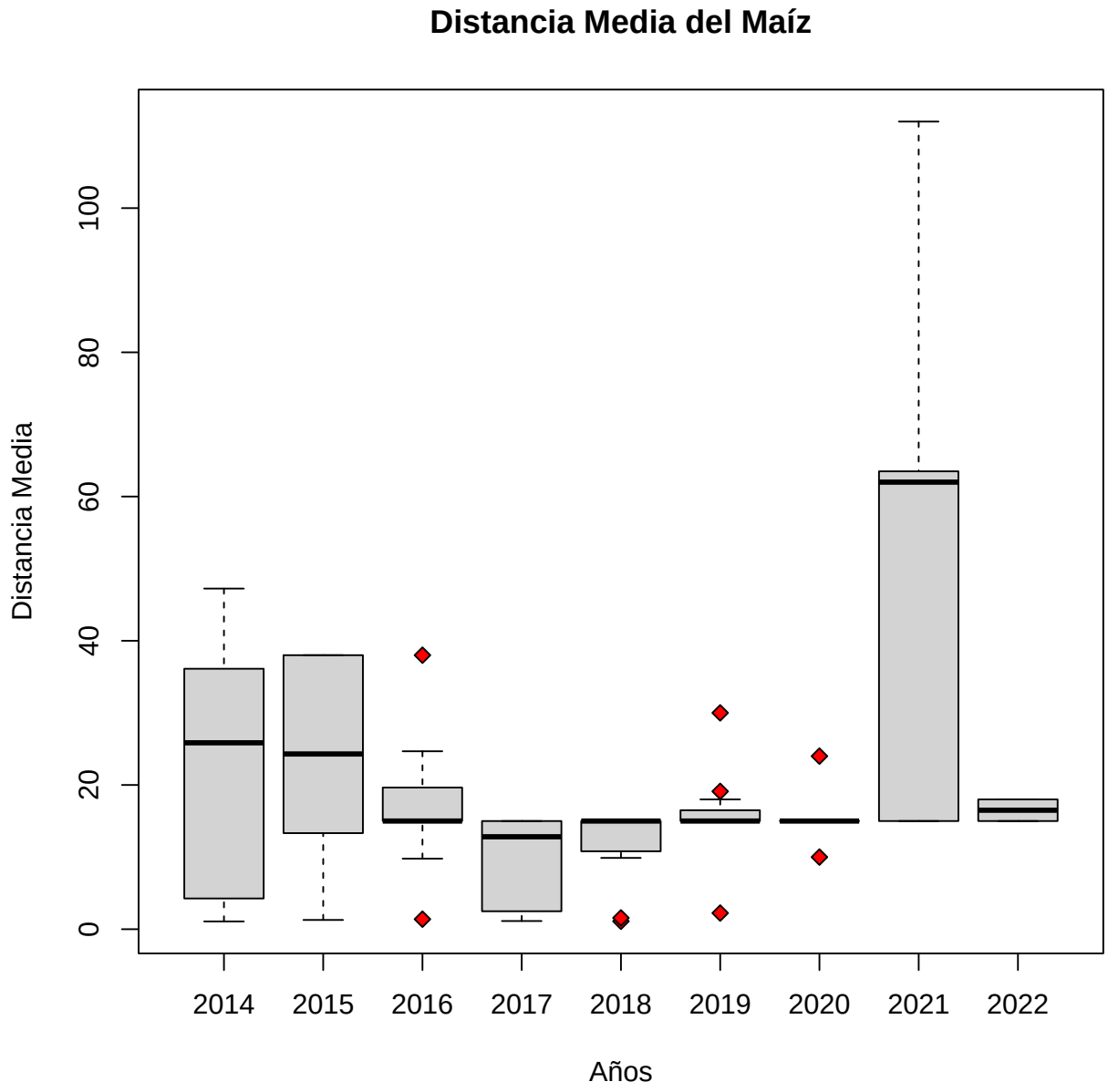

```r
#Toneladas Netas
boxplot(Maiz_FTVM_LOCAL[,6]~Maiz_FTVM_LOCAL[,10], xlab = "Años", ylab = "Toneladas Netas",
        main = "Toneladas Netas del Maíz",outpch = 23,outbg = "red" )
```



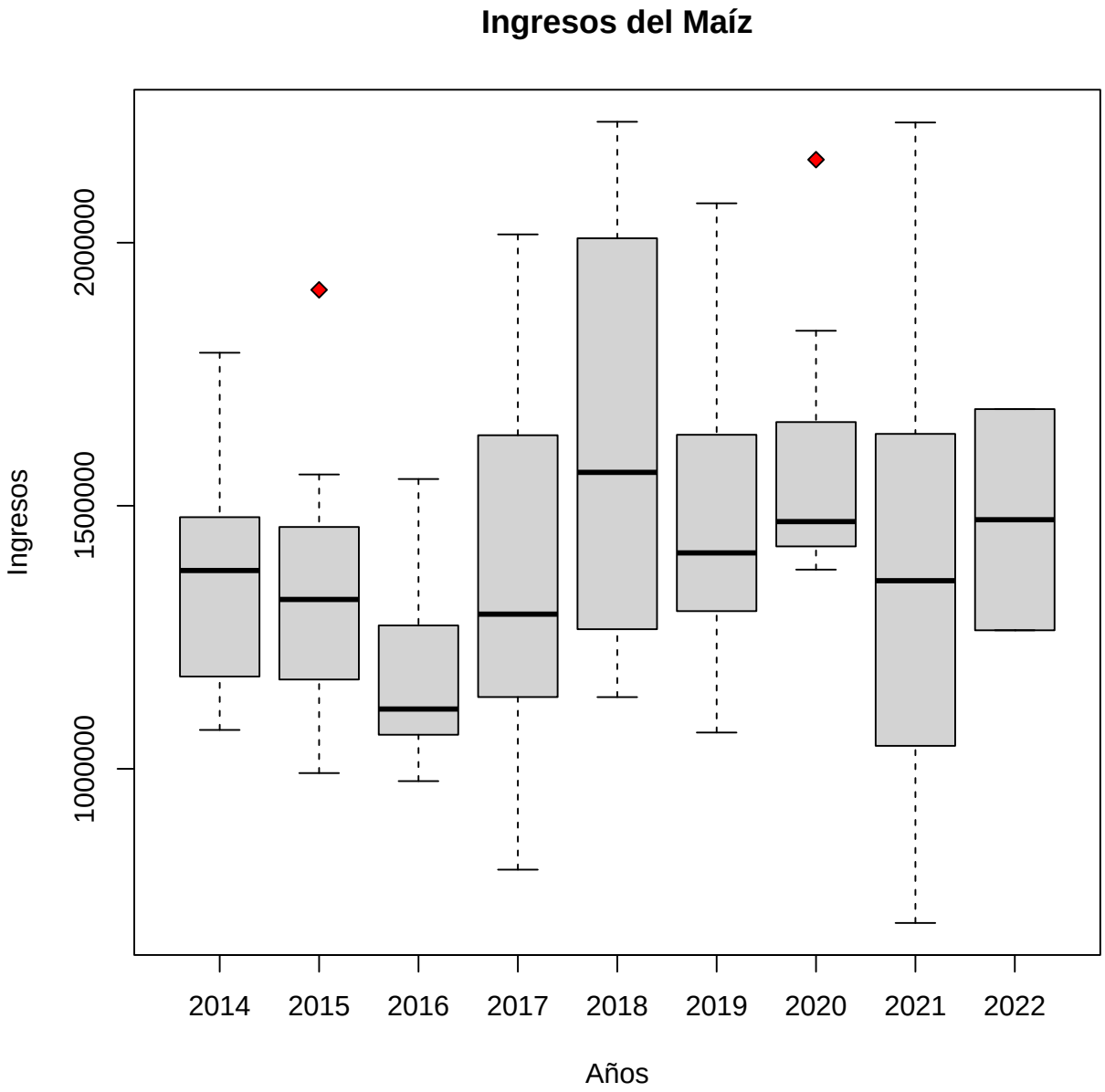

```
#Toneladas Km
boxplot(Maiz_FTVM_LOCAL[,7]~Maiz_FTVM_LOCAL[,10], xlab = "Años", ylab = "Toneladas Km",
        main = "Toneladas Km del Maíz", outpch = 23,outbg = "red" )
```




```
#Distancia Media
boxplot(Maiz_FTVM_LOCAL[,8]~Maiz_FTVM_LOCAL[,10], xlab = "Años", ylab = "Distancia Media",
        main = "Distancia Media del Maíz",outpch = 23,outbg = "red" )
```




```
#Ingresos
boxplot(Maiz_FTVM_LOCAL[,9]~Maiz_FTVM_LOCAL[,10], xlab = "Años", ylab = "Ingresos",
        main = "Ingresos del Maíz", outpch = 23,outbg = "red" )
```

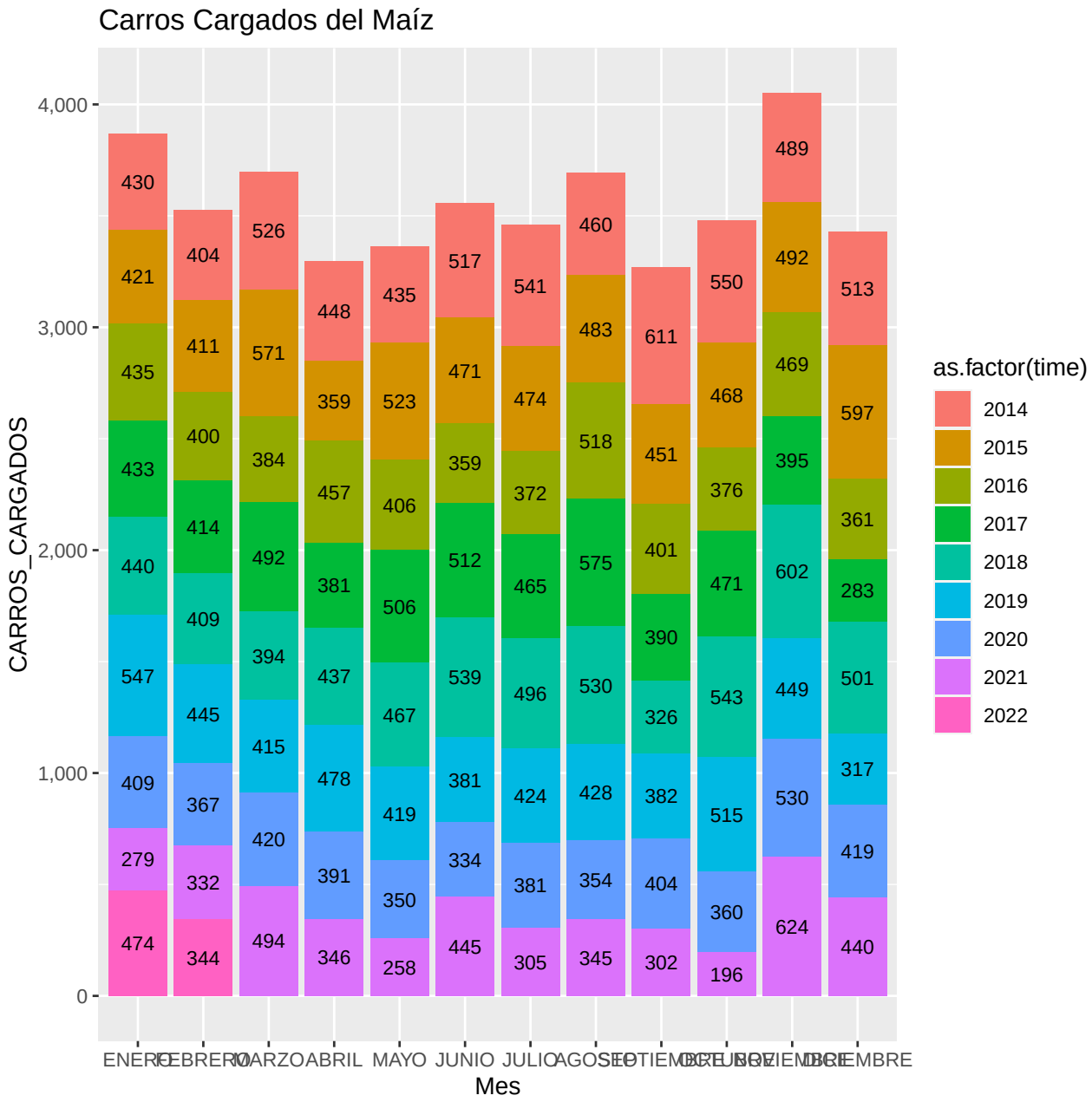


Histogramas descripción por Mes y Año

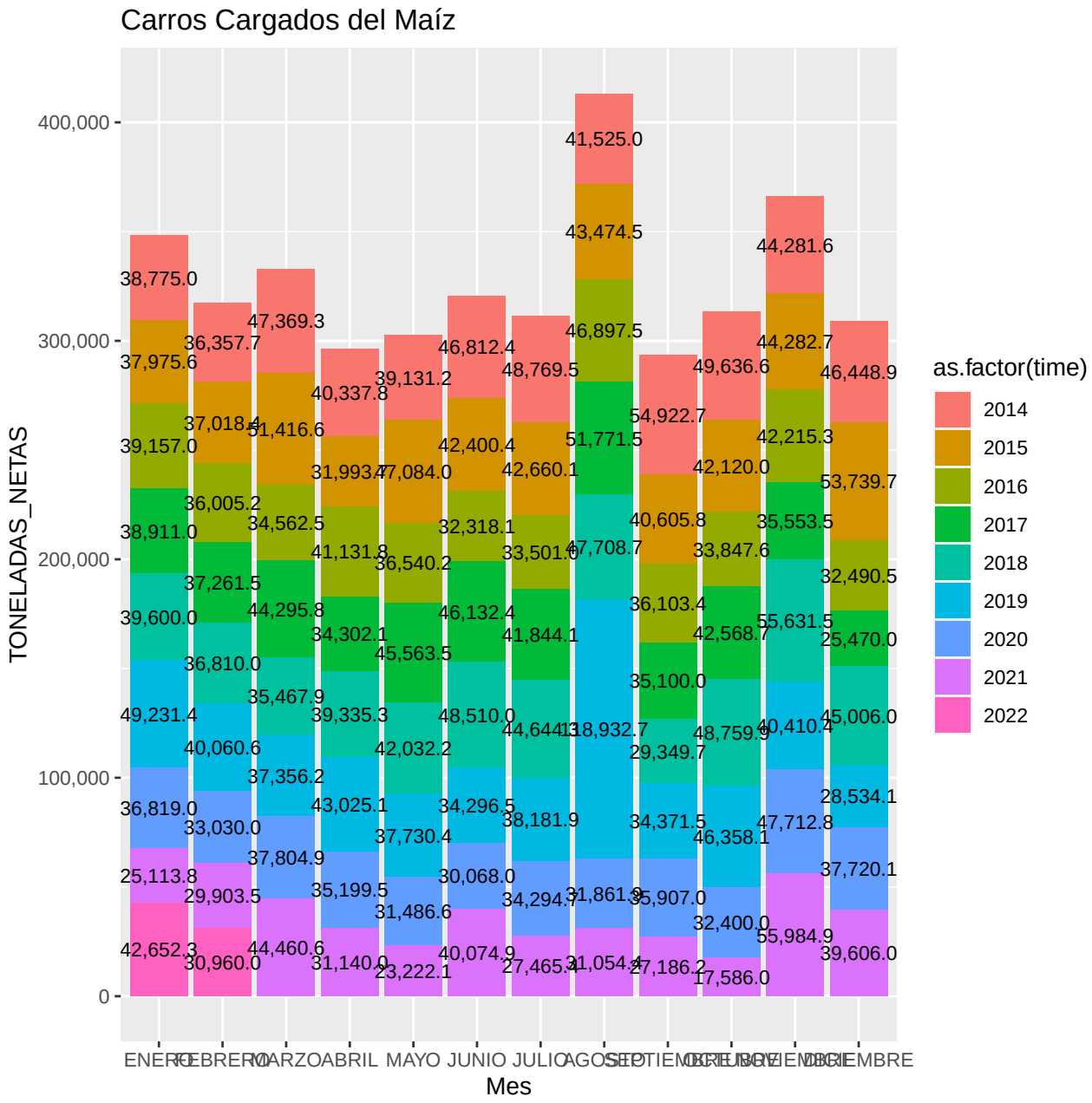
En este apartado se hace un histograma que nos ayuda a visualizar la los valores Conforme al año y mes, para saber si se observa alguna estacionalidad.

```
Maiz_FTVM_LOCAL$Mes <- factor(Maiz_FTVM_LOCAL$Mes,
                              levels = c("ENERO", "FEBRERO", "MARZO", "ABRIL", "MAYO", "JUNIO",
                                         "AGOSTO", "SEPTIEMBRE", "OCTUBRE", "NOVIEMBRE", "DICIEM
levels(Maiz_FTVM_LOCAL$Mes)#Notar el orden que quiero en el eje x (Enero, Febrero,..., Diciembre

##  [1] "ENERO"      "FEBRERO"    "MARZO"      "ABRIL"      "MAYO"
##  [6] "JUNIO"      "JULIO"      "AGOSTO"     "SEPTIEMBRE" "OCTUBRE"
## [11] "NOVIEMBRE"  "DICIEMBRE"

# CARROS CARGADOS de MAÍZ
ggplot(Maiz_FTVM_LOCAL,
       aes(x=Mes,y=CARROS_CARGADOS,
           fill = as.factor(time) , label = scales::comma(CARROS_CARGADOS) ))+
  geom_bar(show.legend = T, stat = "identity" )+
```

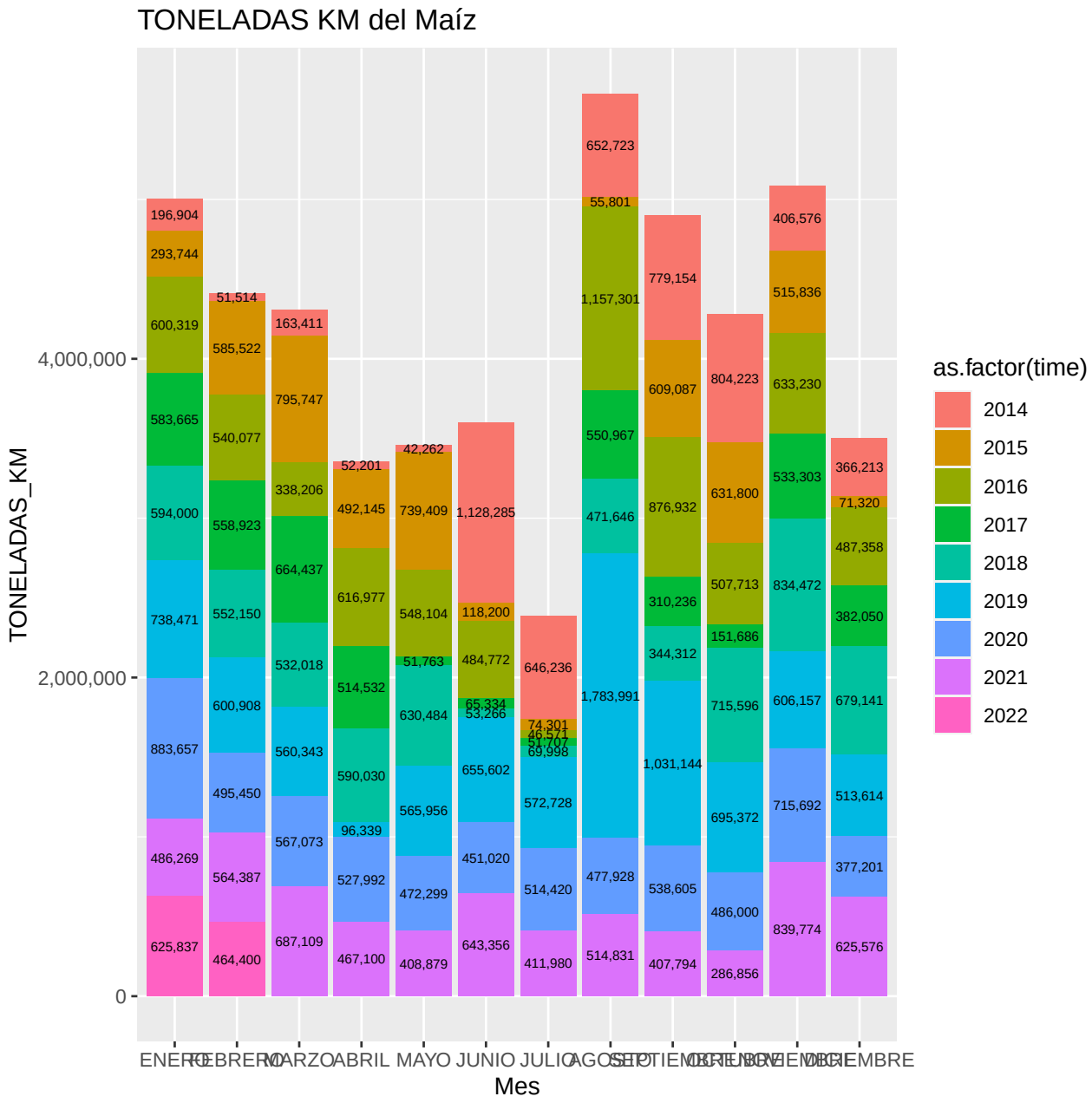
```
  labs(title = "Carros Cargados del Maíz" , xlab = "Año" )+
  scale_y_continuous(label= scales::comma)+
  geom_text(size = 3, position = position_stack(vjust = 0.5))
```



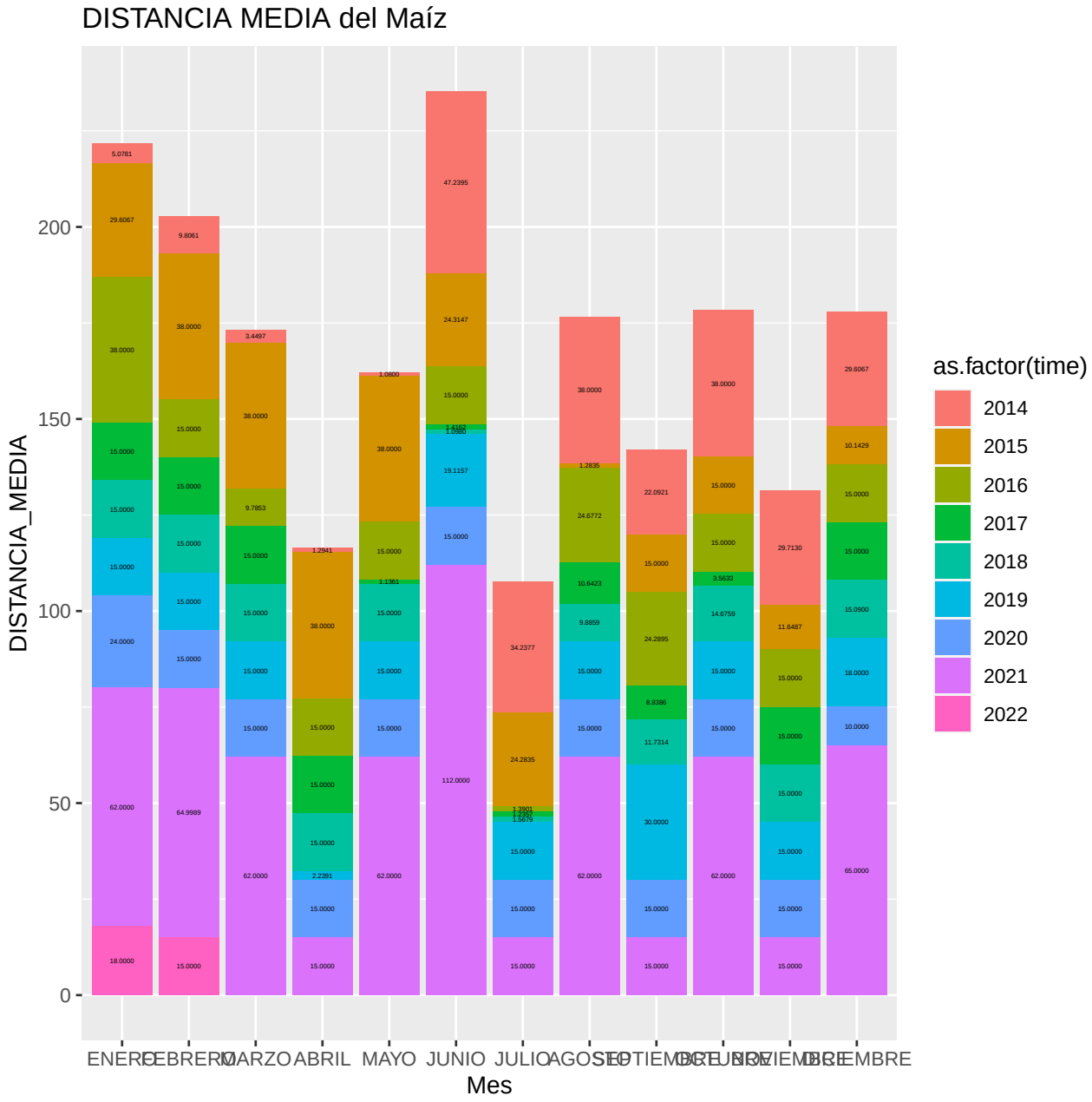

```
# TONELADAS NETAS de MAÍZ
ggplot(Maiz_FTVM_LOCAL,
       aes(x=Mes,y=TONELADAS_NETAS ,
           fill = as.factor(time) , label = scales::comma(TONELADAS_NETAS) ))+
  geom_bar(show.legend = T, stat = "identity" )+
  labs(title = "Carros Cargados del Maíz" , xlab = "Año" )+
  scale_y_continuous(label= scales::comma)+
  geom_text(size = 3, position = position_stack(vjust = 0.5))
```



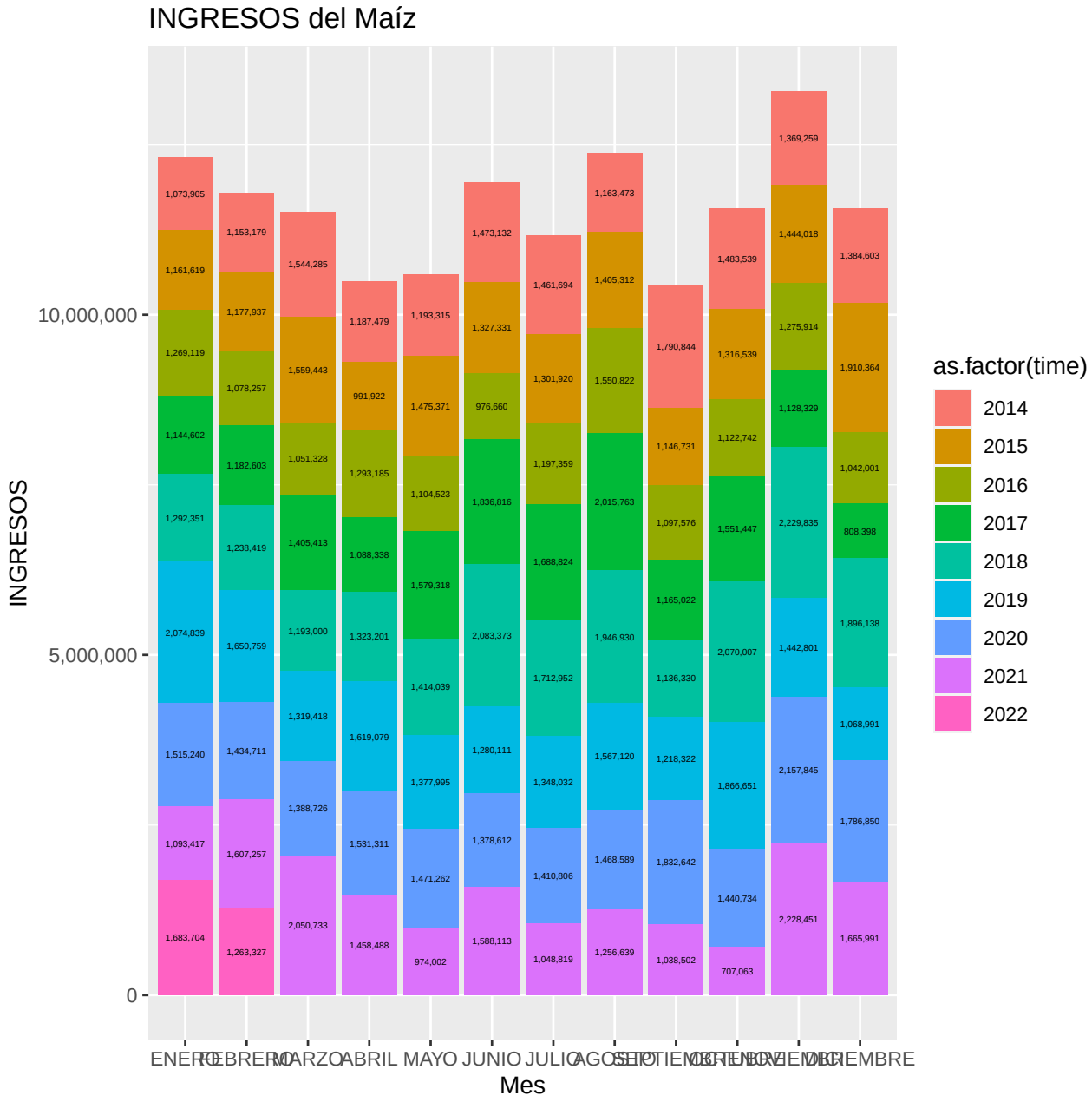

```
# TONELADAS KM de MAÍZ
ggplot(Maiz_FTVM_LOCAL,
       aes(x=Mes,y=TONELADAS_KM ,
           fill = as.factor(time) , label = scales::comma(TONELADAS_KM) ))+
  geom_bar(show.legend = T, stat = "identity" )+
  labs(title = "TONELADAS KM del Maíz" , xlab = "Año" )+
  scale_y_continuous(label= scales::comma)+
  geom_text(size = 2, position = position_stack(vjust = 0.5))
```




```
# DISTANCIA MEDIA de MAÍZ
ggplot(Maiz_FTVM_LOCAL,
       aes(x=Mes,y=DISTANCIA_MEDIA ,
           fill = as.factor(time) , label = scales::comma(DISTANCIA_MEDIA) ))+
  geom_bar(show.legend = T, stat = "identity" )+
  labs(title = "DISTANCIA MEDIA del Maíz" , xlab = "Año" )+
  scale_y_continuous(label= scales::comma)+
  geom_text(size = 1, position = position_stack(vjust = 0.5))
```




```
# INGRESOS del MAÍZ
ggplot(Maiz_FTVM_LOCAL,
       aes(x=Mes,y=INGRESOS ,
           fill = as.factor(time) , label = scales::comma(INGRESOS) ))+
  geom_bar(show.legend = T, stat = "identity" )+
  labs(title = "INGRESOS del Maíz" , xlab = "Año" )+
  scale_y_continuous(label= scales::comma)+
  geom_text(size = 1.5, position = position_stack(vjust = 0.5))
```


INGRESOS del Maíz
INGRESOS
10,000,000
5,000,000
0
Mes
as.factor(time)
2014
2015
2016
2017
2018
2019
2020
2021
2022