

R Notebook on United Nations database on Food and Agriculture Organization(FAO) [(1961-2013)]

Importing the libraries

```
library("readr")
library('tidyr')
library('dplyr')

##
## Attaching package: 'dplyr'

## The following objects are masked from 'package:stats':
##
##   filter, lag

## The following objects are masked from 'package:base':
##
##   intersect, setdiff, setequal, union

library('ggplot2')
library('ggthemes')
library('corrplot')

## corrplot 0.84 loaded

library('lubridate')

##
## Attaching package: 'lubridate'

## The following object is masked from 'package:base':
##
##   date

library('purrr')
library('cowplot')

##
## Attaching package: 'cowplot'

## The following object is masked from 'package:ggthemes':
##
##   theme_map

## The following object is masked from 'package:ggplot2':
##
##   ggsave

library('maps')
```

```
##
## Attaching package: 'maps'

## The following object is masked from 'package:purrr':
##
##      map

library('viridis')

## Loading required package: viridisLite

library('treemap')
library('leaflet')
library('dygraphs')
library('graphics')
library('forecast')
library('xts')

## Loading required package: zoo

##
## Attaching package: 'zoo'

## The following objects are masked from 'package:base':
##
##      as.Date, as.Date.numeric

##
## Attaching package: 'xts'

## The following object is masked from 'package:leaflet':
##
##      addLegend

## The following objects are masked from 'package:dplyr':
##
##      first, last

library('IRdisplay')
```

Uploading the csv FAO dataset

```
data = read.csv("C:/Users/HP/Downloads/unfao/unfao1.csv")
head(data)
```

	Area.Abbreviation	Area.Code	Area	Item.Code	
## 1	AFG	2	Afghanistan	2511	
## 2	AFG	2	Afghanistan	2805	
## 3	AFG	2	Afghanistan	2513	
## 4	AFG	2	Afghanistan	2513	
## 5	AFG	2	Afghanistan	2514	
## 6	AFG	2	Afghanistan	2514	
##		Item Element.Code	Element		Unit latitude

```

## 1      Wheat and products      5142      Food 1000 tonnes      33.94
## 2 Rice (Milled Equivalent)      5142      Food 1000 tonnes      33.94
## 3      Barley and products      5521      Feed 1000 tonnes      33.94
## 4      Barley and products      5142      Food 1000 tonnes      33.94
## 5      Maize and products      5521      Feed 1000 tonnes      33.94
## 6      Maize and products      5142      Food 1000 tonnes      33.94
##  longitude Y1961 Y1962 Y1963 Y1964 Y1965 Y1966 Y1967 Y1968 Y1969 Y1970
## 1      67.71  1928  1904  1666  1950  2001  1808  2053  2045  2154  1819
## 2      67.71  183   183   182   220   220   195   231   235   238   213
## 3      67.71   76   76   76   76   76   75   71   72   73   74
## 4      67.71  237  237  237  238  238  237  225  227  230  234
## 5      67.71  210  210  214  216  216  216  235  232  236  200
## 6      67.71  403  403  410  415  415  413  454  448  455  383
##  Y1971 Y1972 Y1973 Y1974 Y1975 Y1976 Y1977 Y1978 Y1979 Y1980 Y1981 Y1982
## 1  1963  2215  2310  2335  2434  2512  2282  2454  2443  2129  2133  2068
## 2   205   233   246   246   255   263   235   254   270   259   248   217
## 3    71    70    72    76    77    80    60    65    64    64    60    55
## 4   223   219   225   240   244   255   185   203   198   202   189   174
## 5   201   216   228   231   234   240   228   234   228   226   210   199
## 6   386   416   439   445   451   463   439   451   440   437   407   384
##  Y1983 Y1984 Y1985 Y1986 Y1987 Y1988 Y1989 Y1990 Y1991 Y1992 Y1993 Y1994
## 1  1994  1851  1791  1683  2194  1801  1754  1640  1539  1582  1840  1855
## 2   217   197   186   200   193   202   191   199   197   249   218   260
## 3    53    51    48    46    46    47    46    43    43    40    50    46
## 4   167   160   151   145   145   148   145   135   132   120   155   143
## 5   192   182   173   170   154   148   137   144   126    90   141   150
## 6   371   353   334   330   298   287   265   279   245   170   272   289
##  Y1995 Y1996 Y1997 Y1998 Y1999 Y2000 Y2001 Y2002 Y2003 Y2004 Y2005 Y2006
## 1  1853  2177  2343  2407  2463  2600  2668  2776  3095  3249  3486  3704
## 2   319   254   326   347   270   372   411   448   460   419   445   546
## 3    41    44    50    48    43    26    29    70    48    58   236   262
## 4   125   138   159   154   141    84    83   122   144   185    43    44
## 5   159   108    90    99    72    35    48    89    63   120   208   233
## 6   310   209   173   192   141    66    93   170   117   231    67    82
##  Y2007 Y2008 Y2009 Y2010 Y2011 Y2012 Y2013
## 1  4164  4252  4538  4605  4711  4810  4895
## 2   455   490   415   442   476   425   422
## 3   263   230   379   315   203   367   360
## 4    48    62    55    60    72    78    89
## 5   249   247   195   178   191   200   200
## 6    67    69    71    82    73    77    76

```

A sneak peak in the dataset

```

str(data)

## 'data.frame':    21477 obs. of  63 variables:
##  $ Area.Abbreviation: Factor w/ 169 levels "AFG","AGO","ALB",...: 1 1 1 1 1
## 1 1 1 1 1 ...
##  $ Area.Code         : int  2 2 2 2 2 2 2 2 2 2 ...

```

```

## $ Area          : Factor w/ 174 levels "Afghanistan",...: 1 1 1 1 1 1 1
1 1 1 ...
## $ Item.Code      : int   2511 2805 2513 2513 2514 2514 2517 2520 2531
2536 ...
## $ Item           : Factor w/ 115 levels "Alcoholic Beverages",...: 113
84 8 8 46 46 53 18 78 100 ...
## $ Element.Code   : int   5142 5142 5521 5142 5521 5142 5142 5142 5142
5521 ...
## $ Element        : Factor w/ 2 levels "Feed","Food": 2 2 1 2 1 2 2 2 2
1 ...
## $ Unit           : Factor w/ 1 level "1000 tonnes": 1 1 1 1 1 1 1 1 1 1
...
## $ latitude       : num   33.9 33.9 33.9 33.9 33.9 ...
## $ longitude      : num   67.7 67.7 67.7 67.7 67.7 ...
## $ Y1961          : int   1928 183 76 237 210 403 17 0 111 45 ...
## $ Y1962          : int   1904 183 76 237 210 403 18 0 97 45 ...
## $ Y1963          : int   1666 182 76 237 214 410 19 0 103 45 ...
## $ Y1964          : int   1950 220 76 238 216 415 20 0 110 45 ...
## $ Y1965          : int   2001 220 76 238 216 415 21 0 113 31 ...
## $ Y1966          : int   1808 195 75 237 216 413 22 0 117 14 ...
## $ Y1967          : int   2053 231 71 225 235 454 23 0 128 19 ...
## $ Y1968          : int   2045 235 72 227 232 448 24 0 130 30 ...
## $ Y1969          : int   2154 238 73 230 236 455 25 0 134 34 ...
## $ Y1970          : int   1819 213 74 234 200 383 26 0 125 15 ...
## $ Y1971          : int   1963 205 71 223 201 386 26 0 147 0 ...
## $ Y1972          : int   2215 233 70 219 216 416 27 0 138 0 ...
## $ Y1973          : int   2310 246 72 225 228 439 27 0 143 28 ...
## $ Y1974          : int   2335 246 76 240 231 445 28 0 160 32 ...
## $ Y1975          : int   2434 255 77 244 234 451 29 0 169 20 ...
## $ Y1976          : int   2512 263 80 255 240 463 37 0 324 28 ...
## $ Y1977          : int   2282 235 60 185 228 439 32 0 176 24 ...
## $ Y1978          : int   2454 254 65 203 234 451 33 0 225 24 ...
## $ Y1979          : int   2443 270 64 198 228 440 31 0 232 34 ...
## $ Y1980          : int   2129 259 64 202 226 437 31 0 240 61 ...
## $ Y1981          : int   2133 248 60 189 210 407 29 0 247 50 ...
## $ Y1982          : int   2068 217 55 174 199 384 27 0 248 43 ...
## $ Y1983          : int   1994 217 53 167 192 371 28 0 242 38 ...
## $ Y1984          : int   1851 197 51 160 182 353 26 0 235 46 ...
## $ Y1985          : int   1791 186 48 151 173 334 25 0 226 23 ...
## $ Y1986          : int   1683 200 46 145 170 330 23 0 217 25 ...
## $ Y1987          : int   2194 193 46 145 154 298 23 0 196 3 ...
## $ Y1988          : int   1801 202 47 148 148 287 23 0 198 45 ...
## $ Y1989          : int   1754 191 46 145 137 265 23 0 184 54 ...
## $ Y1990          : int   1640 199 43 135 144 279 24 0 205 47 ...
## $ Y1991          : int   1539 197 43 132 126 245 24 0 203 29 ...
## $ Y1992          : int   1582 249 40 120 90 170 18 0 210 29 ...
## $ Y1993          : int   1840 218 50 155 141 272 22 0 210 29 ...
## $ Y1994          : int   1855 260 46 143 150 289 20 0 211 29 ...
## $ Y1995          : int   1853 319 41 125 159 310 21 0 212 29 ...
## $ Y1996          : int   2177 254 44 138 108 209 17 0 213 29 ...

```

```
## $ Y1997      : int  2343 326 50 159 90 173 20 0 214 28 ...
## $ Y1998      : int  2407 347 48 154 99 192 21 0 214 28 ...
## $ Y1999      : int  2463 270 43 141 72 141 17 0 217 28 ...
## $ Y2000      : int  2600 372 26 84 35 66 20 0 219 29 ...
## $ Y2001      : int  2668 411 29 83 48 93 20 0 215 29 ...
## $ Y2002      : int  2776 448 70 122 89 170 18 0 217 29 ...
## $ Y2003      : int  3095 460 48 144 63 117 16 1 347 51 ...
## $ Y2004      : int  3249 419 58 185 120 231 15 2 276 50 ...
## $ Y2005      : int  3486 445 236 43 208 67 21 1 294 29 ...
## $ Y2006      : int  3704 546 262 44 233 82 11 1 294 61 ...
## $ Y2007      : int  4164 455 263 48 249 67 19 0 260 65 ...
## $ Y2008      : int  4252 490 230 62 247 69 21 0 242 54 ...
## $ Y2009      : int  4538 415 379 55 195 71 18 0 250 114 ...
## $ Y2010      : int  4605 442 315 60 178 82 14 0 192 83 ...
## $ Y2011      : int  4711 476 203 72 191 73 14 0 169 83 ...
## $ Y2012      : int  4810 425 367 78 200 77 14 0 196 69 ...
## $ Y2013      : int  4895 422 360 89 200 76 12 0 230 81 ...
```

summary(data)

```
## Area.Abbreviation Area.Code Area Item.Code
## CHN : 541 Min. : 1.0 Spain : 150 Min. :2511
## THA : 261 1st Qu.: 63.0 Italy : 148 1st Qu.:2561
## AZE : 240 Median :120.0 Germany : 147 Median :2640
## ESP : 150 Mean :125.4 China, mainland: 146 Mean :2694
## ITA : 148 3rd Qu.:188.0 Greece : 143 3rd Qu.:2782
## DEU : 147 Max. :276.0 Japan : 143 Max. :2961
## (Other):19990 (Other) :20600
## Item Element
## Milk - Excluding Butter : 558 Min. :5142 Feed: 3949
## Eggs : 360 1st Qu.:5142 Food:17528
## Cereals - Excluding Beer: 347 Median :5142
## Fish, Seafood : 337 Mean :5212
## Maize and products : 333 3rd Qu.:5142
## Pelagic Fish : 328 Max. :5521
## (Other) :19214
## Unit latitude longitude Y1961
## 1000 tonnes:21477 Min. : -40.90 Min. : -172.10 Min. : 0.0
## 1st Qu.: 6.43 1st Qu.: -11.78 1st Qu.: 0.0
## Median : 20.59 Median : 19.15 Median : 1.0
## Mean : 20.45 Mean : 15.79 Mean : 195.3
## 3rd Qu.: 41.15 3rd Qu.: 46.87 3rd Qu.: 21.0
## Max. : 64.96 Max. : 179.41 Max. :112227.0
## NA's :3539
## Y1962 Y1963 Y1964
## Min. : 0.0 Min. : 0.0 Min. : 0.0
## 1st Qu.: 0.0 1st Qu.: 0.0 1st Qu.: 0.0
## Median : 1.0 Median : 1.0 Median : 1.0
## Mean : 200.8 Mean : 205.5 Mean : 209.9
## 3rd Qu.: 22.0 3rd Qu.: 23.0 3rd Qu.: 24.0
```

##	Max. :109130.0	Max. :106356.0	Max. :104234.0	
##	NA's :3539	NA's :3539	NA's :3539	
##	Y1965	Y1966	Y1967	Y1968
##	Min. : 0.0	Min. : 0	Min. : 0.0	Min. : 0.0
##	1st Qu.: 0.0	1st Qu.: 0	1st Qu.: 0.0	1st Qu.: 0.0
##	Median : 1.0	Median : 1	Median : 1.0	Median : 2.0
##	Mean : 217.6	Mean : 226	Mean : 230.4	Mean : 238.4
##	3rd Qu.: 25.0	3rd Qu.: 26	3rd Qu.: 27.0	3rd Qu.: 28.0
##	Max. :119378.0	Max. :118495	Max. :118725.0	Max. :127512.0
##	NA's :3539	NA's :3539	NA's :3539	NA's :3539
##	Y1969	Y1970	Y1971	
##	Min. : 0.0	Min. : 0.0	Min. : 0.0	
##	1st Qu.: 0.0	1st Qu.: 0.0	1st Qu.: 0.0	
##	Median : 2.0	Median : 2.0	Median : 2.0	
##	Mean : 244.3	Mean : 250.3	Mean : 254.2	
##	3rd Qu.: 29.0	3rd Qu.: 30.0	3rd Qu.: 30.0	
##	Max. :134937.0	Max. :131871.0	Max. :143407.0	
##	NA's :3539	NA's :3539	NA's :3539	
##	Y1972	Y1973	Y1974	
##	Min. : 0.0	Min. : 0.0	Min. : 0.0	
##	1st Qu.: 0.0	1st Qu.: 0.0	1st Qu.: 0.0	
##	Median : 2.0	Median : 2.0	Median : 2.0	
##	Mean : 257.4	Mean : 267.3	Mean : 267.1	
##	3rd Qu.: 31.0	3rd Qu.: 32.0	3rd Qu.: 33.0	
##	Max. :147793.0	Max. :142439.0	Max. :118872.0	
##	NA's :3539	NA's :3539	NA's :3539	
##	Y1975	Y1976	Y1977	Y1978
##	Min. : 0.0	Min. : 0.0	Min. : 0	Min. : 0.0
##	1st Qu.: 0.0	1st Qu.: 0.0	1st Qu.: 0	1st Qu.: 0.0
##	Median : 2.0	Median : 2.0	Median : 2	Median : 2.0
##	Mean : 274.4	Mean : 276.6	Mean : 286	Mean : 299.8
##	3rd Qu.: 34.0	3rd Qu.: 35.0	3rd Qu.: 37	3rd Qu.: 38.0
##	Max. :123842.0	Max. :126359.0	Max. :128840	Max. :142403.0
##	NA's :3539	NA's :3539	NA's :3539	NA's :3539
##	Y1979	Y1980	Y1981	
##	Min. : 0.00	Min. : 0.0	Min. : 0.0	
##	1st Qu.: 0.00	1st Qu.: 0.0	1st Qu.: 0.0	
##	Median : 2.00	Median : 3.0	Median : 3.0	
##	Mean : 305.84	Mean : 305.7	Mean : 311.7	
##	3rd Qu.: 39.75	3rd Qu.: 41.0	3rd Qu.: 42.0	
##	Max. :147401.00	Max. :151742.0	Max. :157179.0	
##	NA's :3539	NA's :3539	NA's :3539	
##	Y1982	Y1983	Y1984	Y1985
##	Min. : 0	Min. : 0.0	Min. : 0.0	Min. : 0.0
##	1st Qu.: 0	1st Qu.: 0.0	1st Qu.: 0.0	1st Qu.: 0.0
##	Median : 3	Median : 3.0	Median : 3.0	Median : 3.0
##	Mean : 321	Mean : 326.9	Mean : 339.6	Mean : 344.4
##	3rd Qu.: 43	3rd Qu.: 44.0	3rd Qu.: 45.0	3rd Qu.: 46.0
##	Max. :172222	Max. :182221.0	Max. :187020.0	Max. :188438.0
##	NA's :3539	NA's :3539	NA's :3539	NA's :3539

##	Y1986	Y1987	Y1988	Y1989
##	Min. : 0.0	Min. : 0.0	Min. : 0	Min. : 0.0
##	1st Qu.: 0.0	1st Qu.: 0.0	1st Qu.: 0	1st Qu.: 0.0
##	Median : 3.0	Median : 3.0	Median : 4	Median : 4.0
##	Mean : 351.7	Mean : 361.9	Mean : 364	Mean : 372.4
##	3rd Qu.: 48.0	3rd Qu.: 50.0	3rd Qu.: 51	3rd Qu.: 53.0
##	Max. :189999.0	Max. :190010.0	Max. :189180	Max. :192403.0
##	NA's :3539	NA's :3539	NA's :3539	NA's :3539
##	Y1990	Y1991	Y1992	Y1993
##	Min. : 0.0	Min. : 0.0	Min. : 0	Min. : 0.0
##	1st Qu.: 0.0	1st Qu.: 0.0	1st Qu.: 0	1st Qu.: 0.0
##	Median : 4.0	Median : 4.0	Median : 4	Median : 4.0
##	Mean : 375.4	Mean : 379.4	Mean : 386	Mean : 389.3
##	3rd Qu.: 53.0	3rd Qu.: 54.0	3rd Qu.: 56	3rd Qu.: 58.0
##	Max. :201072.0	Max. :193224.0	Max. :197464	Max. :202770.0
##	NA's :3415	NA's :3415	NA's :987	NA's :612
##	Y1994	Y1995	Y1996	
##	Min. : 0.0	Min. : 0.0	Min. : 0.0	
##	1st Qu.: 0.0	1st Qu.: 0.0	1st Qu.: 0.0	
##	Median : 4.0	Median : 4.0	Median : 5.0	
##	Mean : 397.1	Mean : 404.5	Mean : 415.3	
##	3rd Qu.: 58.0	3rd Qu.: 60.0	3rd Qu.: 61.0	
##	Max. :204581.0	Max. :208137.0	Max. :210855.0	
##	NA's :612	NA's :612	NA's :612	
##	Y1997	Y1998	Y1999	
##	Min. : 0.0	Min. : 0.0	Min. : 0.0	
##	1st Qu.: 0.0	1st Qu.: 0.0	1st Qu.: 0.0	
##	Median : 5.0	Median : 5.0	Median : 5.0	
##	Mean : 421.6	Mean : 428.9	Mean : 441.7	
##	3rd Qu.: 63.0	3rd Qu.: 62.0	3rd Qu.: 65.0	
##	Max. :221456.0	Max. :229928.0	Max. :255625.0	
##	NA's :612	NA's :612	NA's :612	
##	Y2000	Y2001	Y2002	
##	Min. : 0.0	Min. : 0.0	Min. : 0.0	
##	1st Qu.: 0.0	1st Qu.: 0.0	1st Qu.: 0.0	
##	Median : 5.0	Median : 6.0	Median : 6.0	
##	Mean : 451.8	Mean : 458.7	Mean : 465.5	
##	3rd Qu.: 67.0	3rd Qu.: 68.0	3rd Qu.: 70.0	
##	Max. :311110.0	Max. :327370.0	Max. :352172.0	
##	NA's :349	NA's :349	NA's :349	
##	Y2003	Y2004	Y2005	
##	Min. : 0.0	Min. : 0.0	Min. : 0.0	
##	1st Qu.: 0.0	1st Qu.: 0.0	1st Qu.: 0.0	
##	Median : 6.0	Median : 6.0	Median : 6.0	
##	Mean : 472.7	Mean : 486.7	Mean : 493.2	
##	3rd Qu.: 71.0	3rd Qu.: 75.0	3rd Qu.: 77.0	
##	Max. :354850.0	Max. :360767.0	Max. :373694.0	
##	NA's :349	NA's :349	NA's :349	
##	Y2006	Y2007	Y2008	
##	Min. : 0.0	Min. : 0.0	Min. : 0.0	

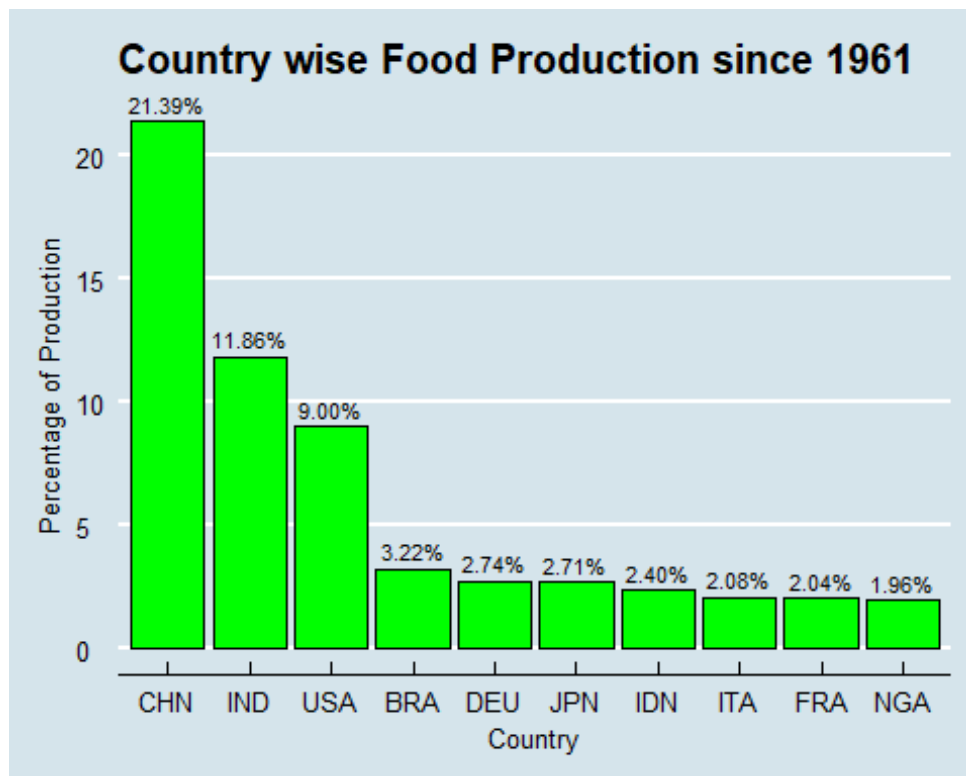
```
## 1st Qu.: 0.0 1st Qu.: 0.0 1st Qu.: 0.0
## Median : 7.0 Median : 7.0 Median : 7.0
## Mean : 496.3 Mean : 508.5 Mean : 522.8
## 3rd Qu.: 78.0 3rd Qu.: 80.0 3rd Qu.: 82.0
## Max. :388100.0 Max. :402975.0 Max. :425537.0
## NA's :104 NA's :104 NA's :104
## Y2009 Y2010 Y2011
## Min. : 0.0 Min. : 0.0 Min. : 0.0
## 1st Qu.: 0.0 1st Qu.: 0.0 1st Qu.: 0.0
## Median : 7.0 Median : 7.0 Median : 8.0
## Mean : 524.6 Mean : 535.5 Mean : 553.4
## 3rd Qu.: 83.0 3rd Qu.: 83.0 3rd Qu.: 86.0
## Max. :434724.0 Max. :451838.0 Max. :462696.0
## NA's :104 NA's :104 NA's :104
## Y2012 Y2013
## Min. : -169.0 Min. : -246.0
## 1st Qu.: 0.0 1st Qu.: 0.0
## Median : 8.0 Median : 8.0
## Mean : 560.6 Mean : 575.6
## 3rd Qu.: 88.0 3rd Qu.: 90.0
## Max. :479028.0 Max. :489299.0
##
```

Let's plot the dataset accordingly!

```
options(repr.plot.width=15, repr.plot.height=4)
data = mutate(data, Total=apply(data[11:63], 1, sum, na.rm = T))
data = mutate(data, last5=apply(data[58:63], 1, sum, na.rm = T))

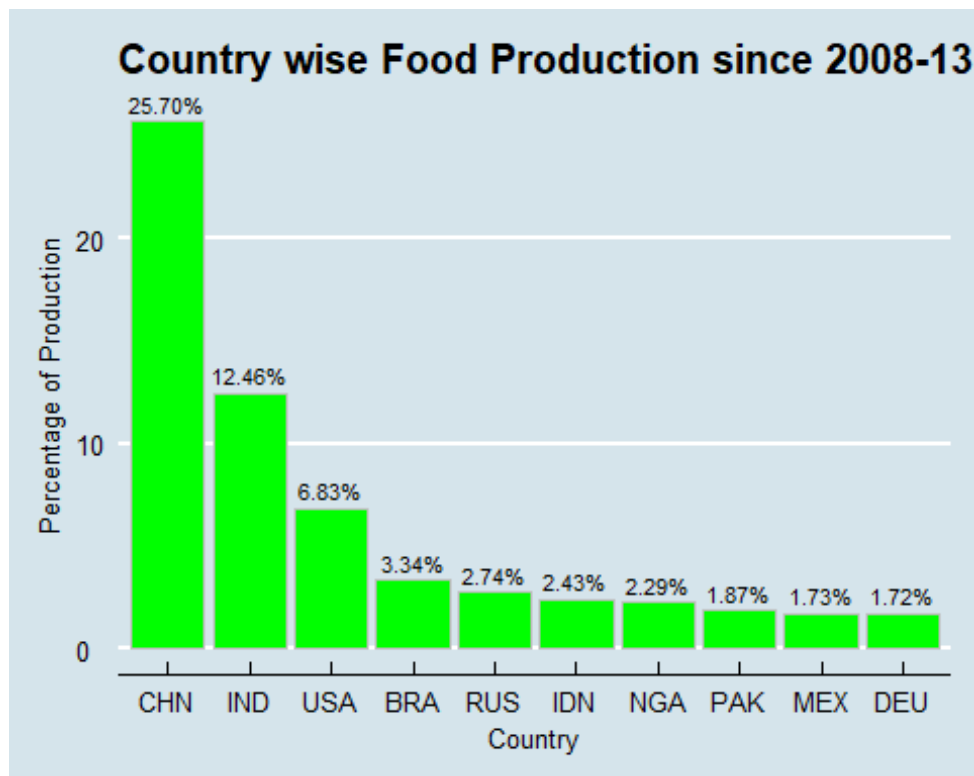
p1 = data %>% group_by(Area.Abbreviation, Element) %>% filter(Element ==
'Food') %>%
  summarise(TF0 = sum(Total)) %>% ungroup() %>% mutate(pct =
prop.table(TF0)*100) %>%
  top_n(10, wt = pct) %>%
  ggplot(aes(x = reorder(Area.Abbreviation, -pct), y = pct)) +
  geom_bar(stat = 'identity', fill = "green", aes(color = I('black')), size =
0.1) + ggtitle("Country wise Food Production since 1961") +
  geom_text(aes(label = sprintf("%.2f%%", pct)), hjust = 0.5,
            vjust = -0.5, size = 3) + theme_economist() + xlab("Country") +
  ylab("Percentage of Production")

plot(p1)
```

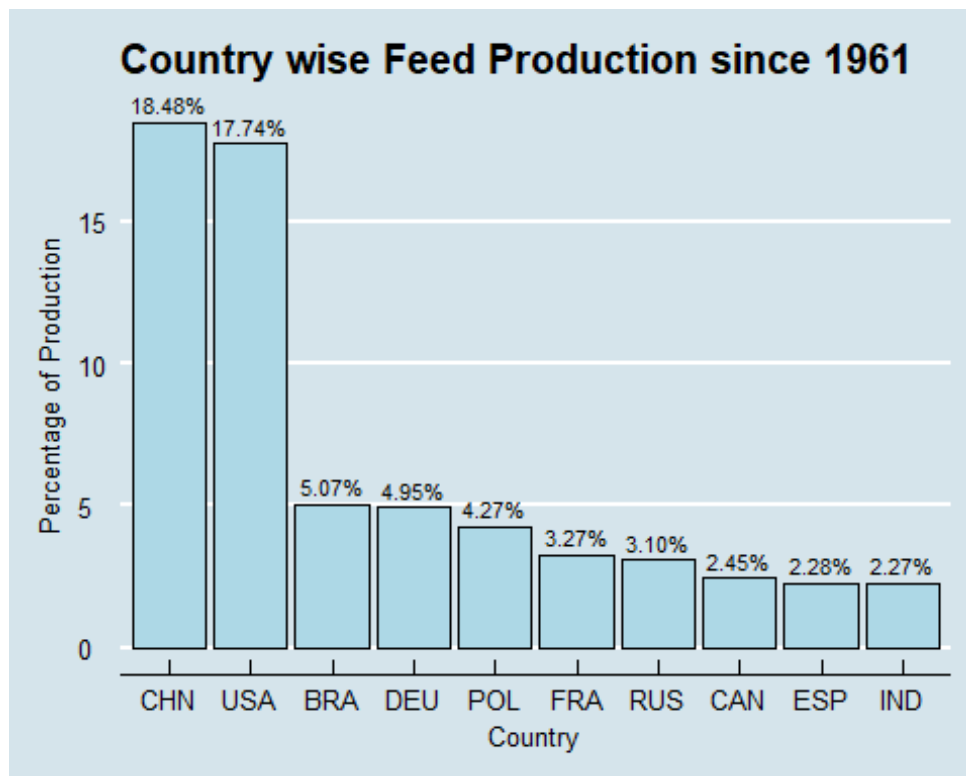



```
p2 = data %>% group_by(Area.Abbreviation, Element) %>% filter(Element ==
'Food') %>%
  summarise(TF0 = sum(last5)) %>% ungroup() %>% mutate(pct =
prop.table(TF0)*100) %>%
  top_n(10, wt = pct) %>%
  ggplot(aes(x = reorder(Area.Abbreviation, -pct), y = pct)) +
  geom_bar(stat = 'identity', fill = "green", aes(color = I('gray')), size =
0.1) + ggtitle("Country wise Food Production since 2008-13") +
  geom_text(aes(label = sprintf("%.2f%%", pct)), hjust = 0.5,
            vjust = -0.5, size = 3) + theme_economist() + xlab("Country") +
  ylab("Percentage of Production")

plot(p2)
```

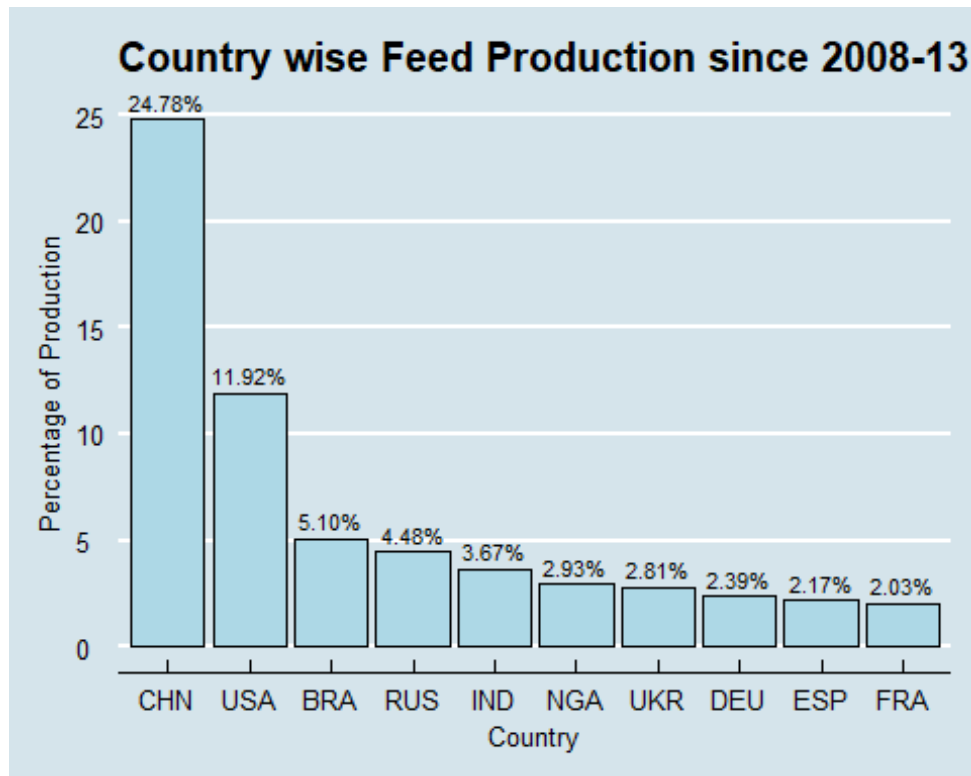


```
p3 = data %>% group_by(Area.Abbreviation, Element) %>% filter(Element ==
'Feed') %>%
  summarise(TFE = sum(Total)) %>% ungroup() %>% mutate(pct =
prop.table(TFE)*100) %>%
  top_n(10, wt = pct) %>%
  ggplot(aes(x = reorder(Area.Abbreviation, -pct), y = pct)) +
  geom_bar(stat = 'identity', fill = "lightblue", aes(color = I('black')),
size = 0.1) + ggtitle("Country wise Feed Production since 1961") +
  geom_text(aes(label = sprintf("%.2f%%", pct)),
            vjust = -.5, size = 3) + theme_economist() + xlab("Country") +
  ylab("Percentage of Production")
plot_grid(p3)
```

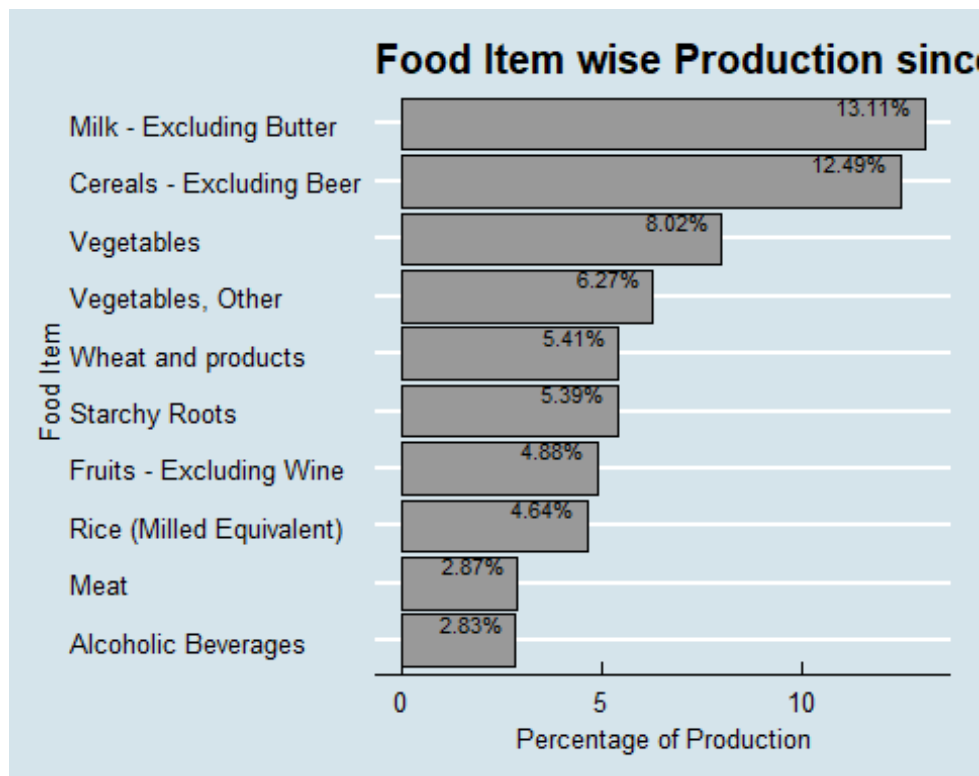


```
p4 = data %>% group_by(Area.Abbreviation, Element) %>% filter(Element ==
'Feed') %>%
  summarise(TFE = sum(last5)) %>% ungroup() %>% mutate(pct =
prop.table(TFE)*100) %>%
  top_n(10, wt = pct) %>%
  ggplot(aes(x = reorder(Area.Abbreviation, -pct), y = pct)) +
  geom_bar(stat = 'identity', fill = "lightblue", aes(color = I('black')),
size = 0.1) + ggtitle("Country wise Feed Production since 2008-13") +
  geom_text(aes(label = sprintf("%.2f%%", pct)),
            vjust = -.5, size = 3) + theme_economist() + xlab("Country") +
  ylab("Percentage of Production")

plot(p4)
```

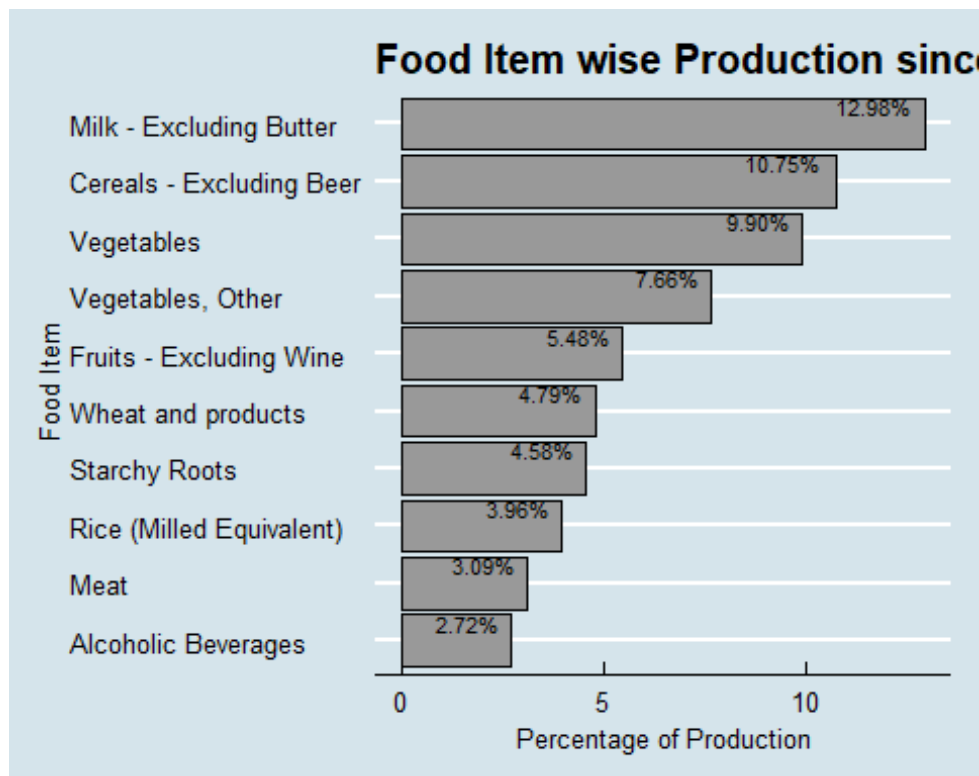


```
p5 = data %>% group_by(Item) %>% filter(Element == 'Food') %>%
  summarise(TFO = sum(Total)) %>% ungroup() %>% mutate(pct =
prop.table(TFO)*100) %>%
  top_n(10, wt = pct) %>%
  ggplot(aes(x = reorder(Item, pct), y = pct)) + ggtitle("Food Item wise
Production since 1961") +
  geom_bar(stat = 'identity', fill = "#999999", aes(color = I('black')), size
= 0.1) + coord_flip() +
  geom_text(aes(label = sprintf("%.2f%%", pct)), hjust = 1.2,
            vjust = -0.5, size = 3) + theme_economist() + xlab("Food Item") +
  ylab("Percentage of Production")
plot(p5)
```



```
p6 = data %>% group_by(Item) %>% filter(Element == 'Food') %>%
  summarise(TFO = sum(last5)) %>% ungroup() %>% mutate(pct =
prop.table(TFO)*100) %>%
  top_n(10, wt = pct) %>%
  ggplot(aes(x = reorder(Item, pct), y = pct)) + ggtitle("Food Item wise
Production since 2008-13") +
  geom_bar(stat = 'identity', fill = "#999999", aes(color = I('black')), size
= 0.1) + coord_flip() +
  geom_text(aes(label = sprintf("%.2f%%", pct)), hjust = 1.2,
            vjust = -0.5, size = 3) + theme_economist() + xlab("Food Item") +
ylab("Percentage of Production")

plot(p6)
```



```
p7 = data %>% group_by(Item) %>% filter(Element == 'Feed') %>%
  summarise(TFO = sum(Total)) %>% ungroup() %>% mutate(pct =
prop.table(TFO)*100) %>%
  top_n(10, wt = pct) %>%
  ggplot(aes(x = reorder(Item, pct), y = pct)) +
  geom_bar(stat = 'identity', fill = "#CC6666", aes(color = I('black')), size
= 0.1) + coord_flip() +
  geom_text(aes(label = sprintf("%.2f%%", pct)), hjust = 0.01,
            vjust = -0.5, size = 3) + theme_economist() + xlab("Food Item") +
  ylab("Feed Item production since 1961")

p8 = data %>% group_by(Item) %>% filter(Element == 'Feed') %>%
  summarise(TFO = sum(last5)) %>% ungroup() %>% mutate(pct =
prop.table(TFO)*100) %>%
  top_n(10, wt = pct) %>%
  ggplot(aes(x = reorder(Item, pct), y = pct)) +
  geom_bar(stat = 'identity', fill = "#CC6666", aes(color = I('black')), size
= 0.1) + coord_flip() +
  geom_text(aes(label = sprintf("%.2f%%", pct)), hjust = 0.01,
            vjust = -0.5, size = 3) + theme_economist() + xlab("Food Item") +
  ylab("Feed Item production since 2008-13")

plot_grid(p7, p8, align = "v")
```

