A report on 'Who eats the food we grow?

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Abstract

The Basic idea of this report is to understand that the tonnes of food grown each year is consumed by the rest of the world in what way. In this project we study some of our daily houeshold items and their consumption by the major countries in the world and then compare their consumpotion.

About the dataset

This dataset was meticulously gathered, organized and published by the Food and Agriculture Organization of the United Nations. This chunk of the dataset is focused on two utilization of each food item available:

Food - refers to the total amount of the food item available as human food Feed - refers to the quantity of the food item available for feeding to the livestock and poultry during the reference period.

Variable Description

```
Variable = c("Area Abbreviation" , "Area Code" , "Area" , "Item Code" ,
             "Item" , "Element code" , "Element" , "Unit" , "Latitude" , "Longitude",
             "Year" , "Amount")

Type_of_variable = c("Nominal" , "Nominal" , "Nominal" , "Nominal" , "Nominal",
                     "Nominal" , "Nominal" , "Nominal" , "Continuous", "Continuous",
                     "Ordinal" , "Count")

Description = c("Abbreviation for country name",
                "Unique code for each country" ,
                "Name of the Country" ,
                " Food item code" ,
                "Food Item"," Food or Feed code", "Food or Feed",
                "Unit of Measurement" ,
                "Latitude", "Longitude", "Year since 1961 to 2013" ,
                "Amount of Food or Feed for each year")

df = data.frame(Variable, Type_of_variable ,Description )
library(knitr)
knitr::kable(df,
             caption = "Variable Description")
```

Table 1: Variable Description

Variable	Type_of_variable	Description
Area Abbreviation	Nominal	Abbreviation for country name

Variable	Type_of_variable	Description
Area Code	Nominal	Unique code for each country
Area	Nominal	Name of the Country
Item Code	Nominal	Food item code
Item	Nominal	Food Item
Element code	Nominal	Food or Feed code
Element	Nominal	Food or Feed
Unit	Nominal	Unit of Measurement
Latitude	Continuous	Latitude
Longitude	Continuous	Longitude
Year	Ordinal	Year since 1961 to 2013
Amount	Count	Amount of Food or Feed for each year

Reading the data

```
data = read.csv("/Users/shreyambanerjee/FAO.csv", header = T)
```

Let's try to know which are the most popular food across the globe, we will extract 20 most popularfood items.

```
head(sort(table(data$Item), rev(T)), 10)
```

```
##
##  Milk - Excluding Butter                     Eggs Cereals - Excluding Beer
##                      558                      360                      347
##            Fish, Seafood      Maize and products             Pelagic Fish
##                      337                      333                      328
##                Oilcrops           Starchy Roots           Cereals, Other
##                      314                      309                      308
##              Animal fats
##                      280
```

Now let's observe the least popular too

```
tail(sort(table(data$Item), rev(T)), 10)
```

```
##
##        Sunflower seed        Palmkernel Oil                  Yams
##                   106                    92                    90
##            Sugar cane           Sugar beet Sugar non-centrifugal
##                    87                    66                    32
##          Palm kernels           Cottonseed          Ricebran Oil
##                    24                    21                    18
## Meat, Aquatic Mammals
##                     3
```

Items under consideration

As a part of study we will only consider 2 out of top 10 most popular food items across the globe.

- Eggs
- Animal Fat

In addition, we will also look into the meat items namely Pig meat and Poultry Meat

Eggs

Data Extraction

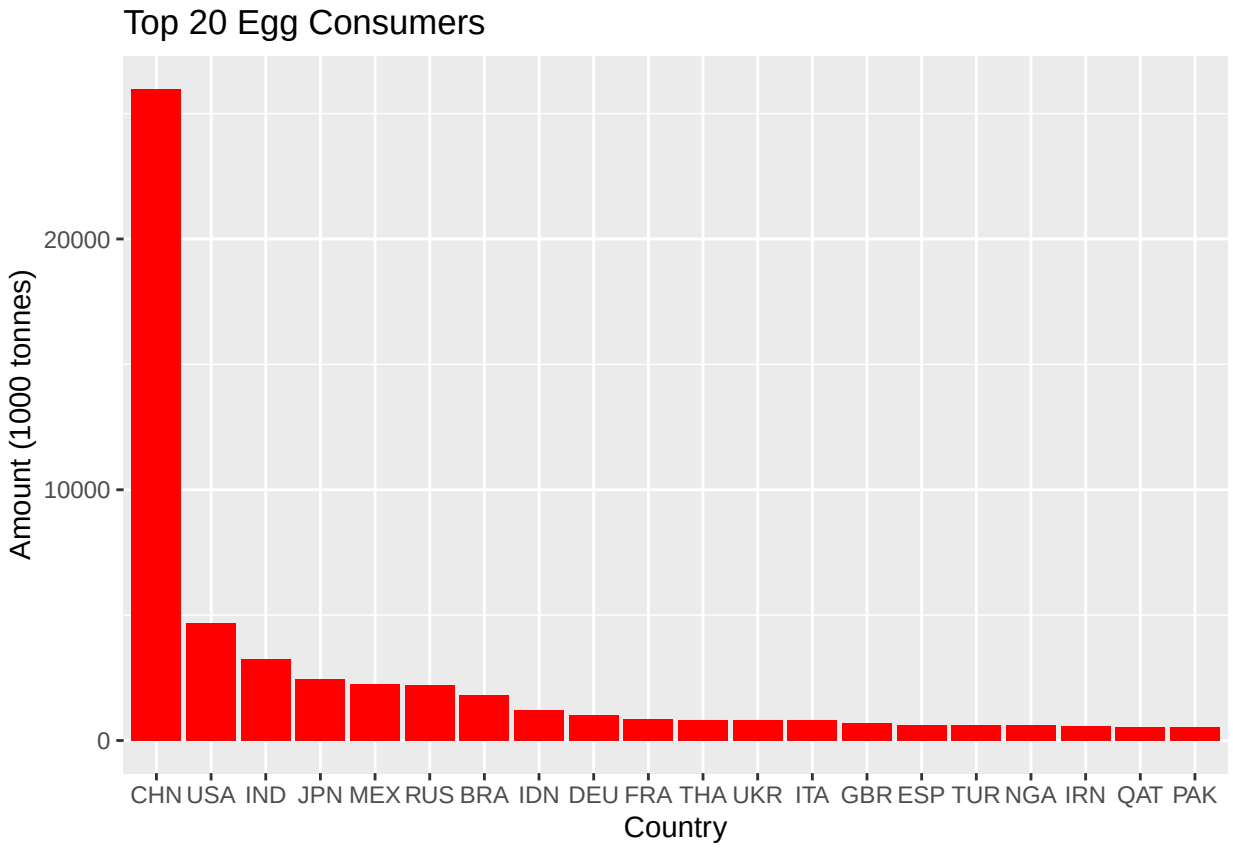
```
eggs = data[data$Item == "Eggs" & data$Item.Code == "2744", ]

eggs_2013_food = eggs[eggs$Element == "Food", c(1, 63)]

eggs_2013_feed = eggs[eggs$Element == "Feed", c(1, 63)]
```

Let's first explore the consumption of eggs in year 2013 for the top 20 countries

```
top_consumer_eggs_food = head(eggs_2013_food[order(eggs_2013_food$Y2013,
                                                   decreasing = T), ],20)
top_consumer_eggs_feed = head(eggs_2013_feed[order(eggs_2013_feed$Y2013,
                                                   decreasing = T), ],20)
```

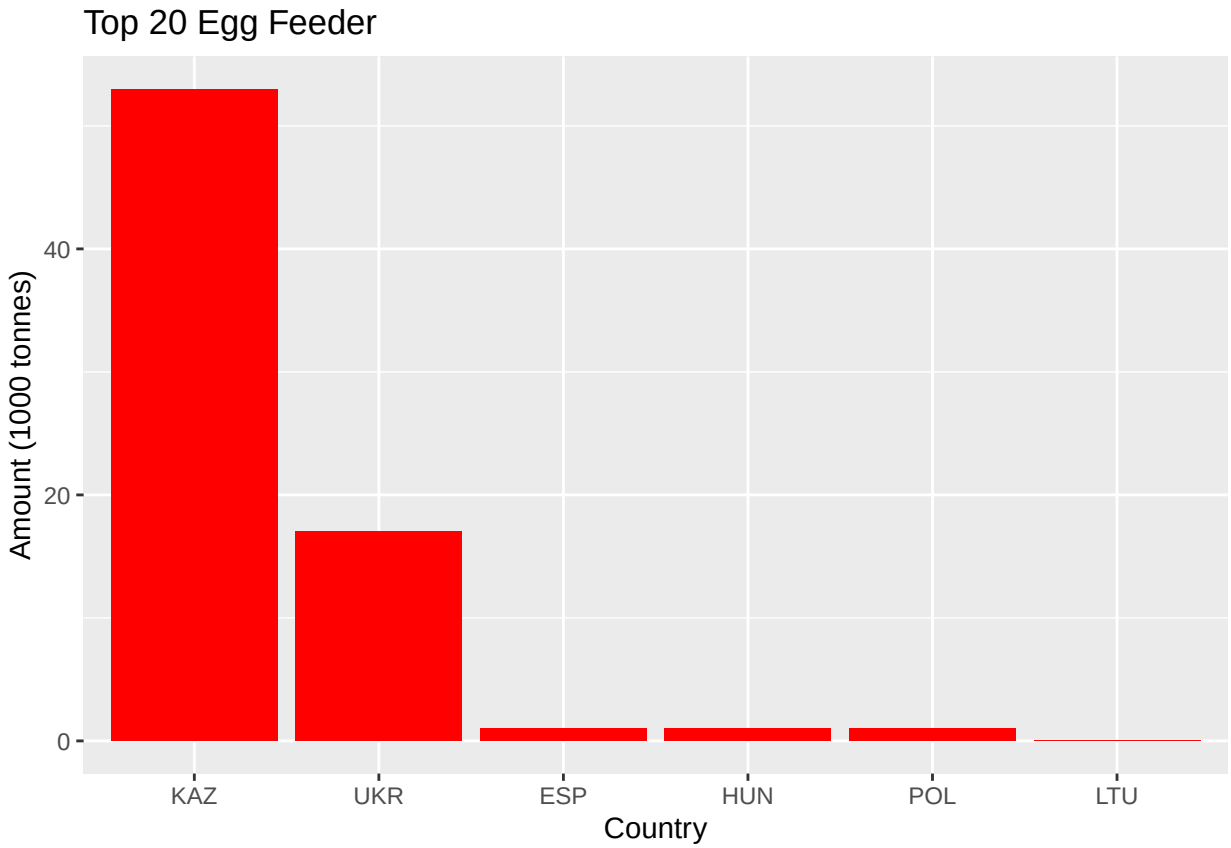
Plotting top 20 Egg consumer

```
library(ggplot2)
ggplot(data = top_consumer_eggs_food,
       aes(x = reorder(top_consumer_eggs_food[,1], -top_consumer_eggs_food[,2]),
           (top_consumer_eggs_food[,2]))) +
  geom_bar(stat = "identity" , orientation = T, fill = "red") +
  ggtitle("Top 20 Egg Consumers ")+
  labs(y = "Amount (1000 tonnes)" , x = "Country")
```



Top 20 Egg feeding Country

```
ggplot(data = top_consumer_eggs_feed,
       aes(x = reorder(top_consumer_eggs_feed[,1], -top_consumer_eggs_feed[,2]),
           (top_consumer_eggs_feed[,2]))) +
  geom_bar(stat = "identity" , orientation = T, fill = "red") +
  ggtitle("Top 20 Egg Feeder")+
  labs(y = "Amount (1000 tonnes)" , x = "Country")
```

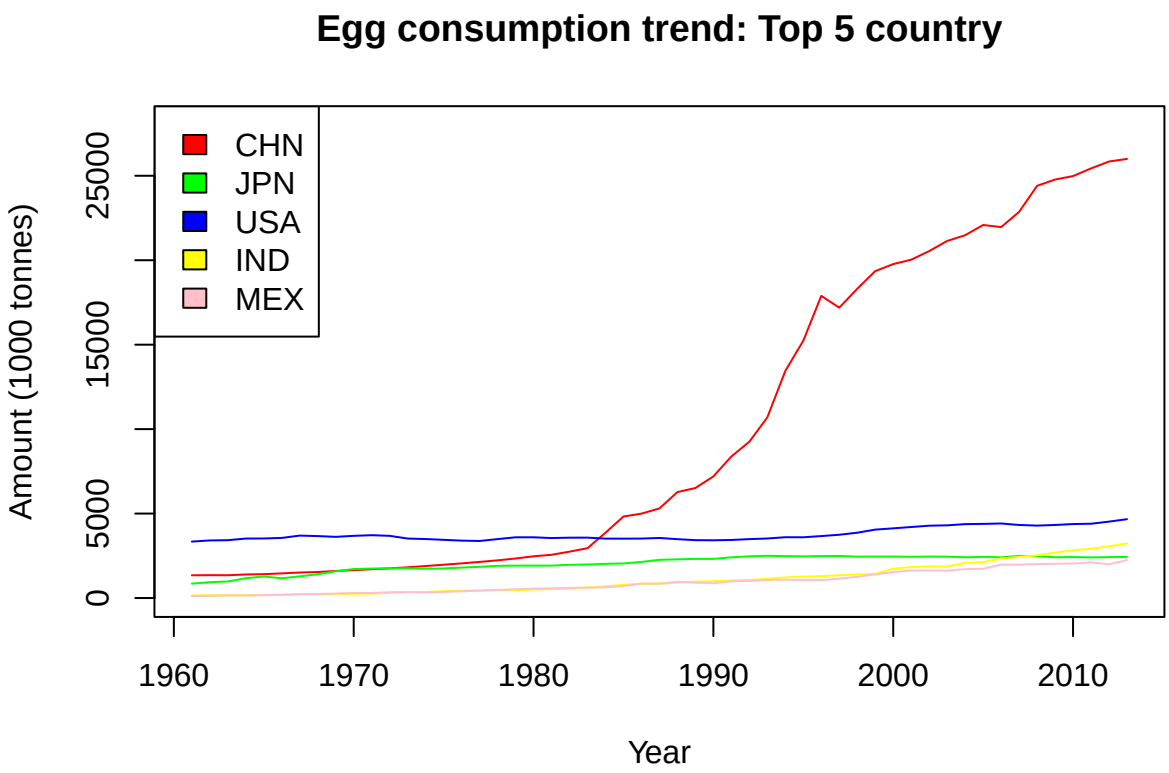


From the above plots we can conclude that China is the major consumer of eggs and there are only 6 countries in the world which feeds egg to animals

Now let's try to find the trend of egg consumption for top 5 countries, from year 1961 to 2013

```
year = seq(1961, 2013 , 1)
egg_food_IND = eggs[eggs$Area.Abbreviation == "IND" & eggs$Element == "Food" ,
                    c(11:63) ]
egg_food_JPN = eggs[eggs$Area.Abbreviation == "JPN" & eggs$Element == "Food" ,
                    c(11:63) ]
egg_food_USA = eggs[eggs$Area.Abbreviation == "USA" & eggs$Element == "Food" ,
                    c(11:63) ]
egg_food_CHN = eggs[eggs$Area.Abbreviation == "CHN" & eggs$Element == "Food"
                    & eggs$Area.Code == 41 , c(11:63) ]
egg_food_MEX = eggs[eggs$Area.Abbreviation == "MEX" & eggs$Element == "Food" ,
                    c(11:63) ]

plot(year, egg_food_CHN, type = "l" , col = "Red" ,
     main = "Egg consumption trend: Top 5 country", xlab = "Year" ,
```

```
     ylab = "Amount (1000 tonnes)" , ylim = c(0, 28000) )
lines(year, egg_food_JPN, col = "Green")
lines(year, egg_food_USA, col = "Blue")
lines(year, egg_food_IND, col = "Yellow")
lines(year, egg_food_MEX, col = "Pink")

legend(x = "topleft",
  legend = c("CHN", "JPN", "USA","IND", "MEX"),
  fill = c("red", "Green","blue", "Yellow", "pink")
   )
```



Form the above plot we can say - Consumption of Egg in China increased abruptly and intensely after 1980 - In all other country in-spite of increase in population increased is consumption is not significant

Animal Fat

Data Extraction

```
Animal_Fat = data[data$Item == "Animal fats" & data$Item.Code == "2946", ]

Animal_Fat_2013_food = Animal_Fat[Animal_Fat$Element == "Food", c(1, 63)]

Animal_Fat_2013_feed = Animal_Fat[Animal_Fat$Element == "Feed", c(1, 63)]
```

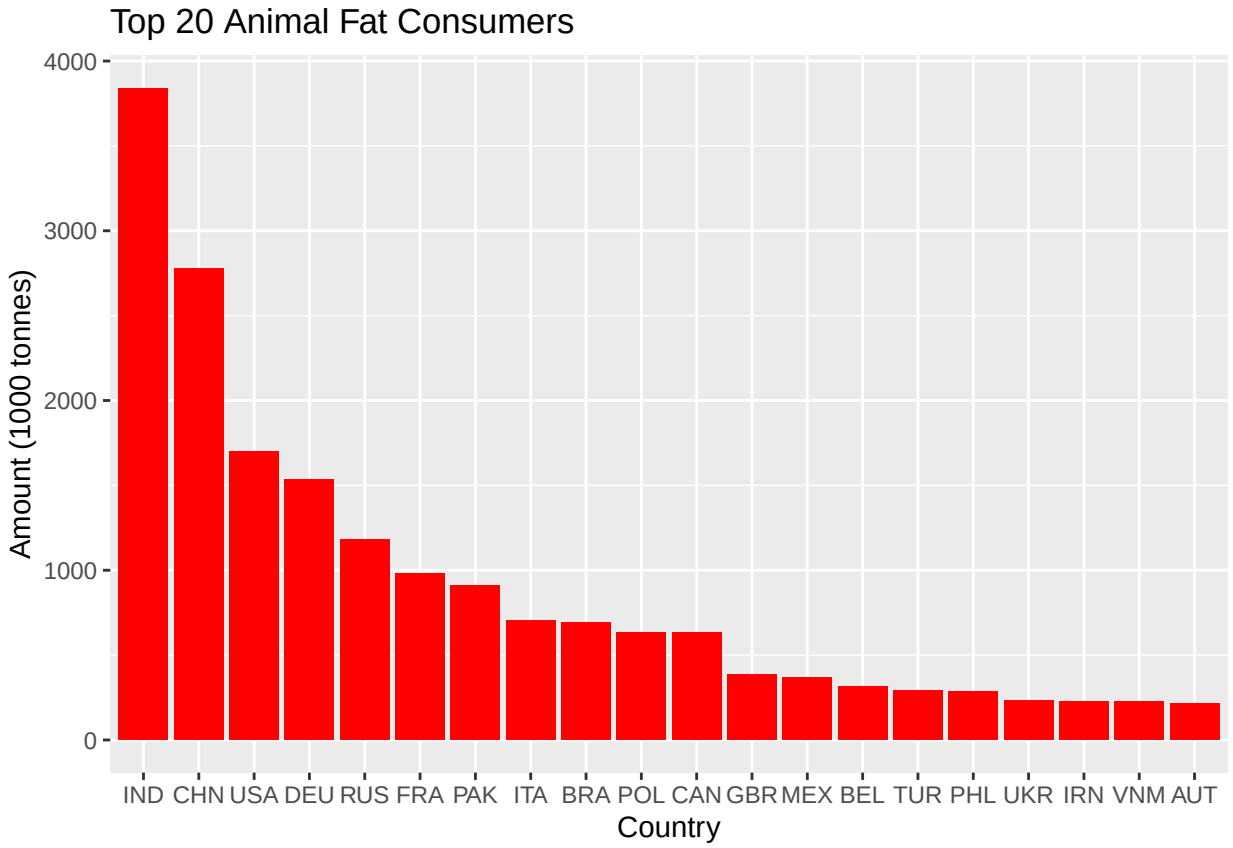
We will again observe the data of top 20 countries

```
top_consumer_Animal_Fat_food = head(Animal_Fat_2013_food
                                    [order(Animal_Fat_2013_food$Y2013,
                                           decreasing = T), ],20)
top_consumer_Animal_Fat_feed = head(Animal_Fat_2013_feed
```

```
                                    [order(Animal_Fat_2013_feed$Y2013,
                                           decreasing = T), ],20)
```

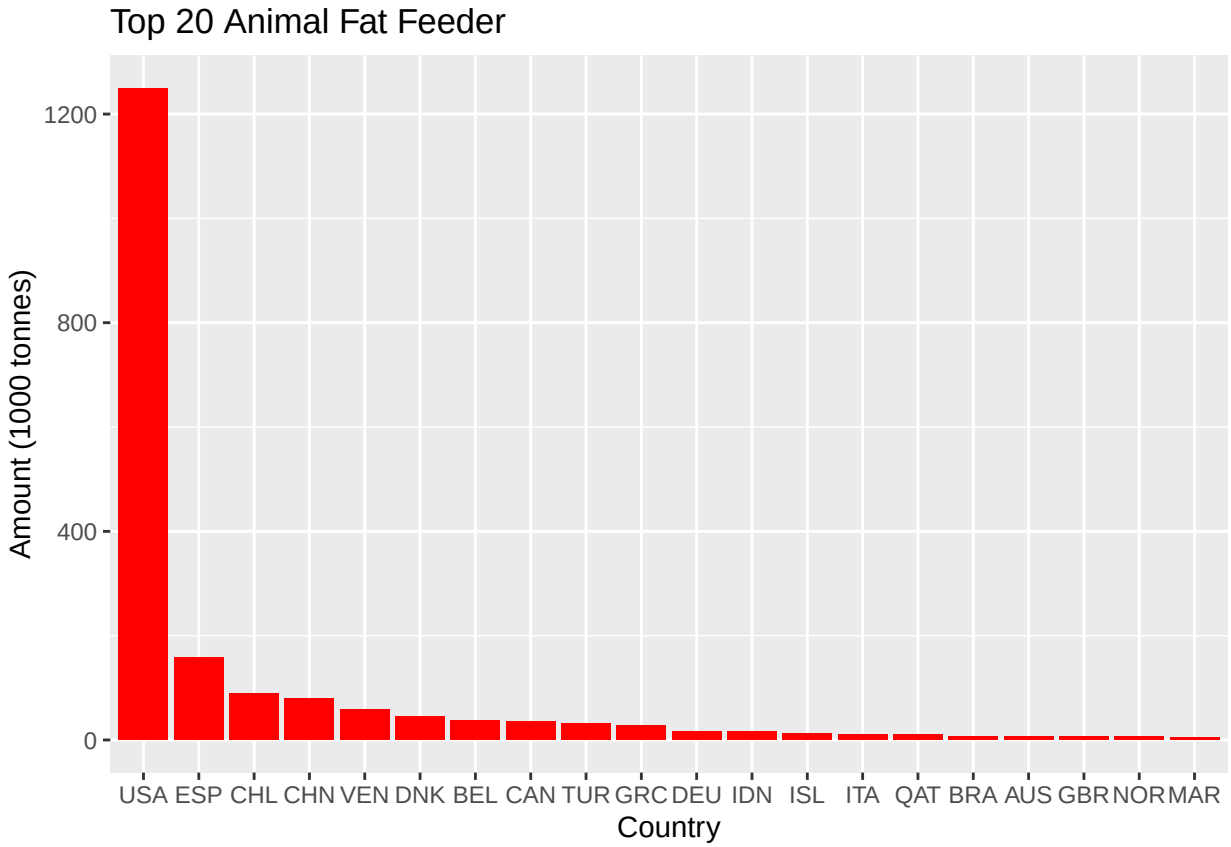
Plotting top 20 Animal Fat consumer

```
library(ggplot2)
ggplot(data = top_consumer_Animal_Fat_food,
       aes(x = reorder(top_consumer_Animal_Fat_food[,1],
                       -top_consumer_Animal_Fat_food[,2]),
           (top_consumer_Animal_Fat_food[,2]))) +
  geom_bar(stat = "identity" , orientation = T, fill = "red") +
  ggtitle("Top 20 Animal Fat Consumers ")+
  labs(y = "Amount (1000 tonnes)" , x = "Country")
```



Top 20 Animal Fat feeder in the world

```
ggplot(data = top_consumer_Animal_Fat_feed,
       aes(x = reorder(top_consumer_Animal_Fat_feed[,1], -top_consumer_Animal_Fat_feed[,2]),
           (top_consumer_Animal_Fat_feed[,2]))) +
  geom_bar(stat = "identity" , orientation = T, fill = "red") +
  ggtitle("Top 20 Animal Fat Feeder")+
  labs(y = "Amount (1000 tonnes)" , x = "Country")
```

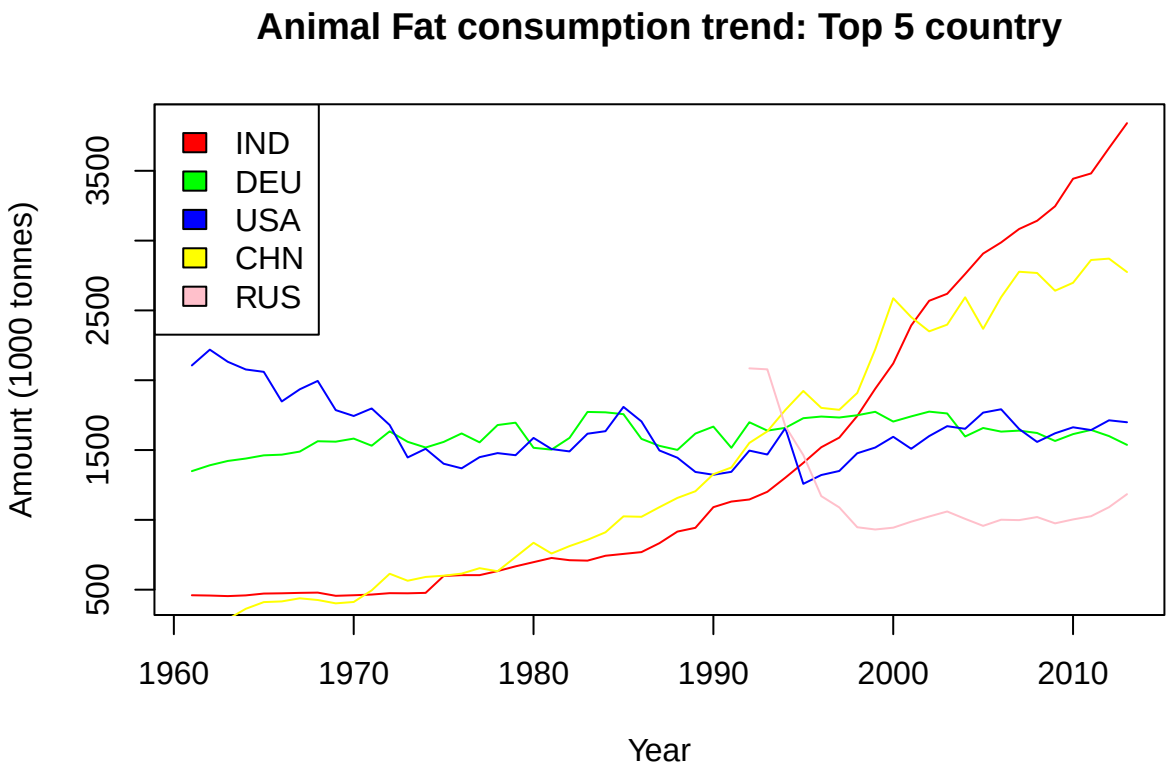


From the above plots we can conclude that India is the major consumer and USA is top on feeding animal fats to animals of

Now let's try to find the trend of animal fat consumption for top 5 countries, from year 1961 to 2013

```
Animal_Fat_food_IND = Animal_Fat[Animal_Fat$Area.Abbreviation == "IND" &
                                 Animal_Fat$Element == "Food" , c(11:63) ]
Animal_Fat_food_DEU = Animal_Fat[Animal_Fat$Area.Abbreviation == "DEU" &
                                 Animal_Fat$Element == "Food" , c(11:63) ]
Animal_Fat_food_USA = Animal_Fat[Animal_Fat$Area.Abbreviation == "USA" &
                                 Animal_Fat$Element == "Food" , c(11:63) ]
Animal_Fat_food_CHN = Animal_Fat[Animal_Fat$Area.Abbreviation == "CHN" &
                                 Animal_Fat$Element == "Food" &
                                 Animal_Fat$Area.Code == 41 , c(11:63) ]
Animal_Fat_food_RUS = Animal_Fat[Animal_Fat$Area.Abbreviation == "RUS" &
                                 Animal_Fat$Element == "Food" , c(11:63) ]

plot(year, Animal_Fat_food_IND, type = "l" , col = "Red" ,
     main = "Animal Fat consumption trend: Top 5 country", xlab = "Year" ,
     ylab = "Amount (1000 tonnes)" )
lines(year, Animal_Fat_food_DEU, col = "Green" )
lines(year, Animal_Fat_food_USA, col = "Blue" )
lines(year, Animal_Fat_food_CHN, col = "Yellow")
lines(year, Animal_Fat_food_RUS, col = "Pink" )

legend(x = "topleft",
  legend = c("IND", "DEU", "USA","CHN", "RUS"),
  fill = c("red", "Green","blue", "Yellow", "pink")
```

```
  )
```



Pig Meat

Data Extraction

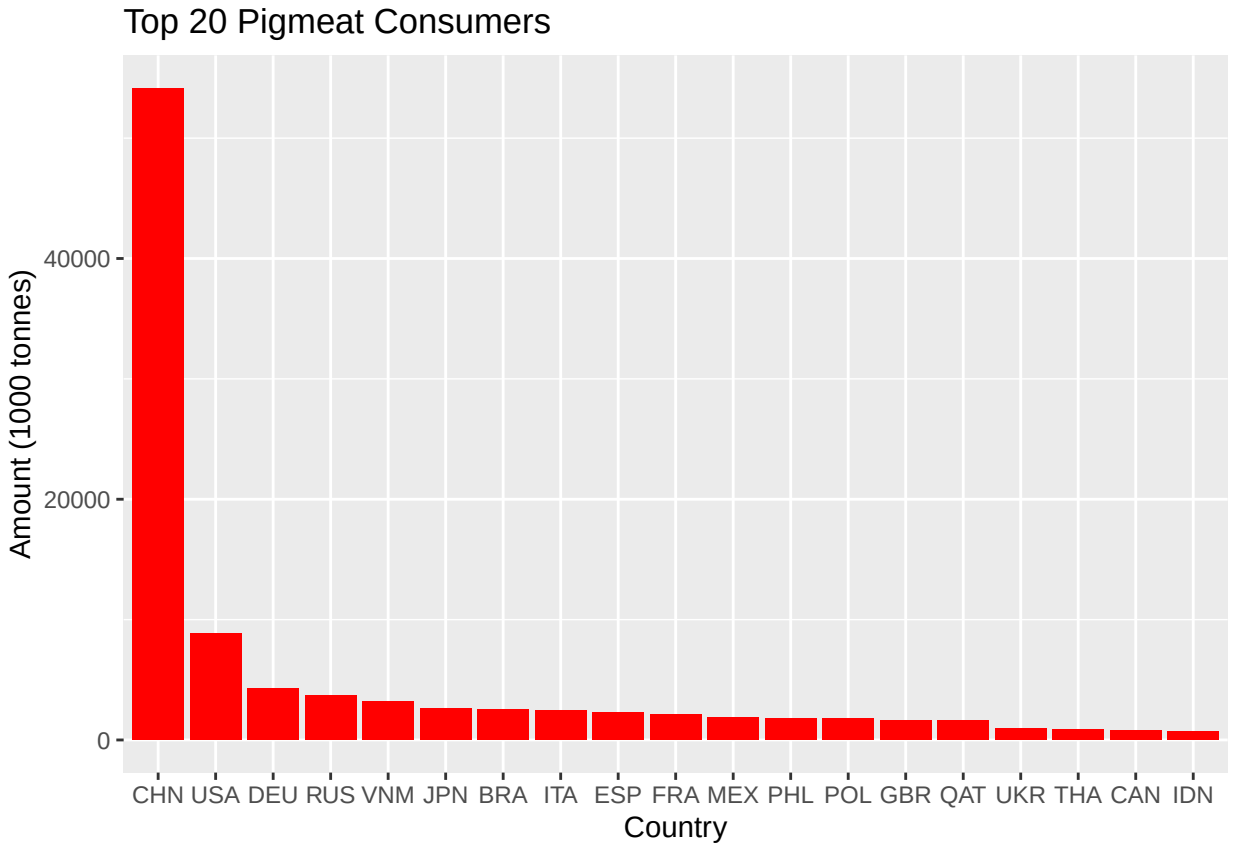
```
Pig_Meat = data[data$Item == "Pigmeat" & data$Item.Code == "2733", ]

Pig_Meat_2013_food = Pig_Meat[Pig_Meat$Element == "Food", c(1, 63)]

Pig_Meat_2013_feed = Pig_Meat[Pig_Meat$Element == "Feed", c(1, 63)]
```

Top 20 countries

```
top_consumer_Pig_Meat_food = head(Pig_Meat_2013_food
                                  [order(Pig_Meat_2013_food$Y2013, decreasing = T), ],20)
top_consumer_Pig_Meat_feed = head(Pig_Meat_2013_feed
                                  [order(Pig_Meat_2013_feed$Y2013, decreasing = T), ],20)
```

Plotting top 20 Pigmeat consumer

```
library(ggplot2)
ggplot(data = top_consumer_Pig_Meat_food,
       aes(x = reorder(top_consumer_Pig_Meat_food[,1], -top_consumer_Pig_Meat_food[,2]),
           (top_consumer_Pig_Meat_food[,2]))) +
  geom_bar(stat = "identity" , orientation = T, fill = "red") +
  ggtitle("Top 20 Pigmeat Consumers ")+
  labs(y = "Amount (1000 tonnes)" , x = "Country")
```



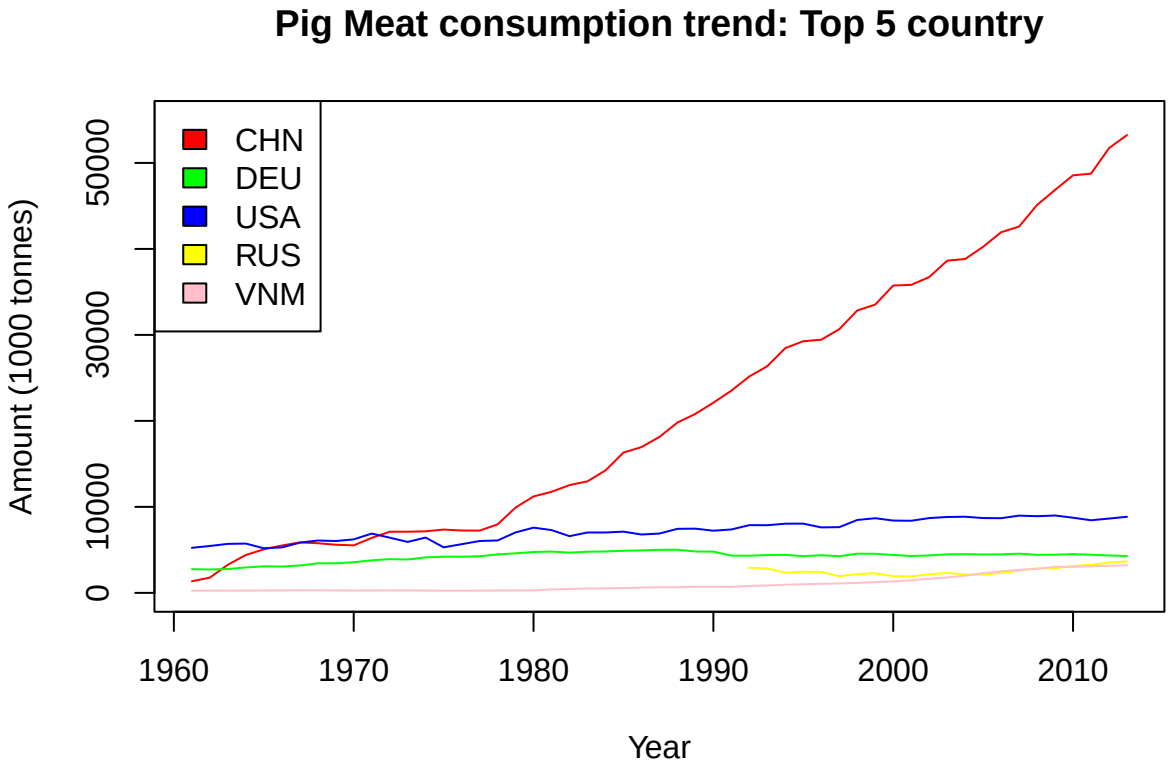

```
dim(top_consumer_Pig_Meat_feed)
```

```
## [1] 0 2
```

So,there are no country who feed pig meat. Now we will move on to find the trend of egg consumption for top 5 countries, from year 1961 to 2013

```
Pig_Meat_food_RUS = Pig_Meat[Pig_Meat$Area.Abbreviation == "RUS"
                             & Pig_Meat$Element == "Food" , c(11:63) ]
Pig_Meat_food_VNM = Pig_Meat[Pig_Meat$Area.Abbreviation == "VNM"
                             & Pig_Meat$Element == "Food" , c(11:63) ]
Pig_Meat_food_USA = Pig_Meat[Pig_Meat$Area.Abbreviation == "USA"
                             & Pig_Meat$Element == "Food" , c(11:63) ]
Pig_Meat_food_CHN = Pig_Meat[Pig_Meat$Area.Abbreviation == "CHN"
                             & Pig_Meat$Element == "Food"
                             & Pig_Meat$Area.Code == 41 , c(11:63) ]
Pig_Meat_food_DEU = Pig_Meat[Pig_Meat$Area.Abbreviation == "DEU"
                             & Pig_Meat$Element == "Food" , c(11:63) ]
plot(year, Pig_Meat_food_CHN, type = "l" ,
     col = "Red",
     main ="Pig Meat consumption trend: Top 5 country", xlab = "Year" ,
     ylab = "Amount (1000 tonnes)", ylim = c(0, 55000))
lines(year, Pig_Meat_food_DEU, col = "Green")
lines(year, Pig_Meat_food_USA, col = "Blue")
lines(year, Pig_Meat_food_RUS, col = "Yellow")
lines(year, Pig_Meat_food_VNM, col = "Pink")

legend(x = "topleft",
```

```
  legend = c("CHN", "DEU", "USA","RUS", "VNM"),
  fill = c("red", "Green","blue", "Yellow", "pink")
   )
```



Form the above plot we can say - Consumption of Pig_Meat in China has the same pattern eggs, fish and beef - In all other country in-spite of increase in population increased is consumption is not significant

Poultry Meat

Extracting Data

```
Poultry_Meat = data[data$Item == "Poultry Meat" & data$Item.Code == "2734", ]

Poultry_Meat_2013_food = Poultry_Meat[Poultry_Meat$Element == "Food", c(1, 63)]

Poultry_Meat_2013_feed = Poultry_Meat[Poultry_Meat$Element == "Feed", c(1, 63)]
```

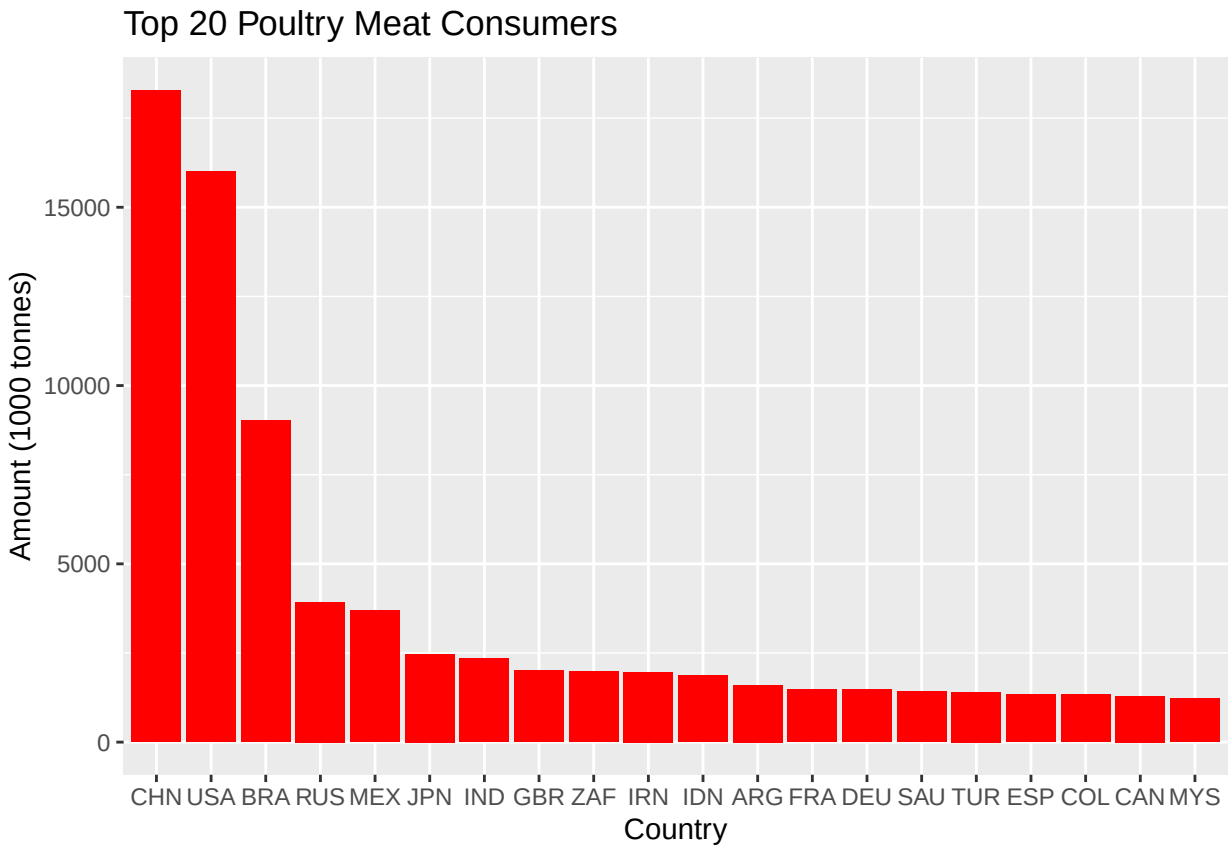
Top 20 country

```
top_consumer_Poultry_Meat_food = head(Poultry_Meat_2013_food
                                      [order(Poultry_Meat_2013_food$Y2013, decreasing = T), ],20)
top_consumer_Poultry_Meat_feed = head(Poultry_Meat_2013_feed
                                      [order(Poultry_Meat_2013_feed$Y2013, decreasing = T), ],20)
```

Plotting top 20 Poultry_Meat consumer

```
library(ggplot2)
ggplot(data = top_consumer_Poultry_Meat_food,
       aes(x = reorder(top_consumer_Poultry_Meat_food[,1], -top_consumer_Poultry_Meat_food[,2]),
```

```
          (top_consumer_Poultry_Meat_food[,2]))) +
  geom_bar(stat = "identity" , orientation = T, fill = "red") +
  ggtitle("Top 20 Poultry Meat Consumers ")+
  labs(y = "Amount (1000 tonnes)" , x = "Country")
```

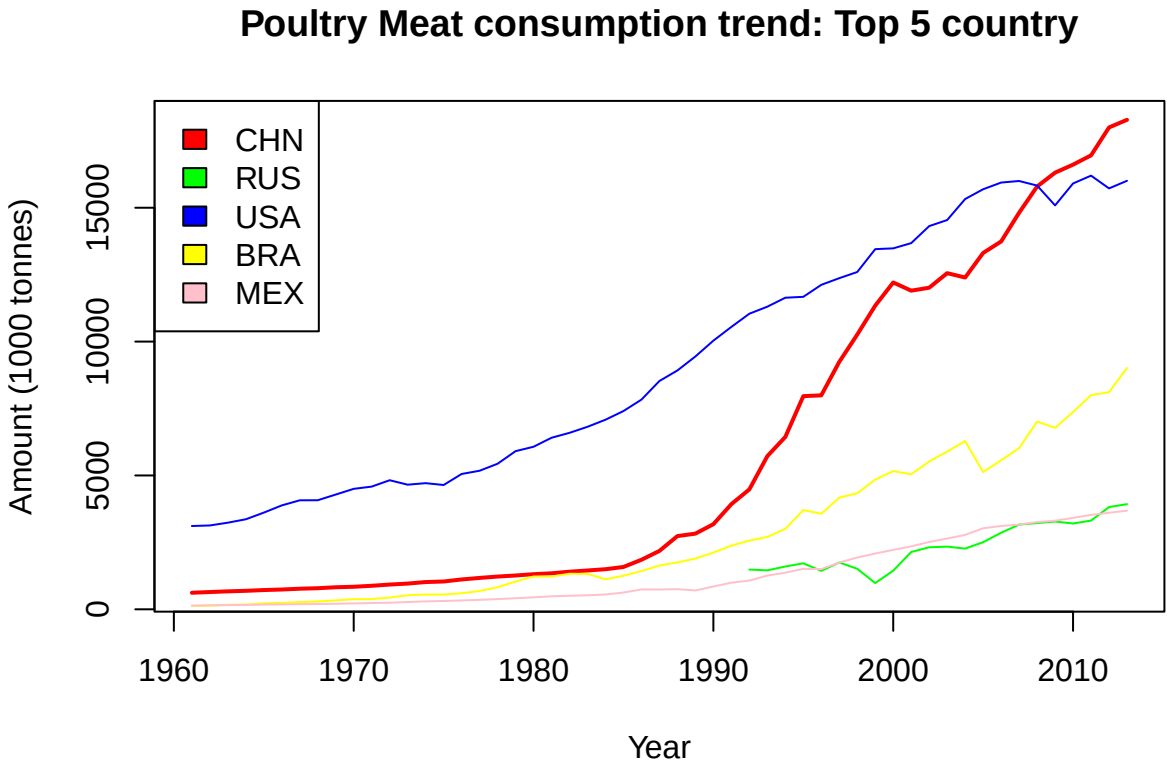


Like Pig meat Poultry meat is also not fed to animals.

Now lets try to find the trend of Poultry Meat consumption for top 5 countries, from year 1961 to 2013

```
Poultry_Meat_food_BRA = Poultry_Meat[Poultry_Meat$Area.Abbreviation == "BRA"
                                     & Poultry_Meat$Element == "Food" , c(11:63) ]
Poultry_Meat_food_RUS = Poultry_Meat[Poultry_Meat$Area.Abbreviation == "RUS"
                                     & Poultry_Meat$Element == "Food" , c(11:63) ]
Poultry_Meat_food_USA = Poultry_Meat[Poultry_Meat$Area.Abbreviation == "USA"
                                     & Poultry_Meat$Element == "Food" , c(11:63) ]
Poultry_Meat_food_CHN = Poultry_Meat[Poultry_Meat$Area.Abbreviation == "CHN"
                                     & Poultry_Meat$Element == "Food"
                                     & Poultry_Meat$Area.Code == 41 , c(11:63) ]
Poultry_Meat_food_MEX = Poultry_Meat[Poultry_Meat$Area.Abbreviation == "MEX"
                                     & Poultry_Meat$Element == "Food" , c(11:63) ]
plot(year, Poultry_Meat_food_CHN, type = "l" , col = "Red", lwd = 2 ,
     main = "Poultry Meat consumption trend: Top 5 country", xlab = "Year" ,
     ylab = "Amount (1000 tonnes)" )
lines(year, Poultry_Meat_food_RUS, col = "Green")
lines(year, Poultry_Meat_food_USA, col = "Blue")
lines(year, Poultry_Meat_food_BRA, col = "Yellow")
lines(year, Poultry_Meat_food_MEX, col = "Pink")
```

```
legend(x = "topleft",
  legend = c("CHN", "RUS", "USA","BRA", "MEX"),
  fill = c("red", "Green","blue", "Yellow", "pink")
   )
```



Form the above plot we can say - Consumption of Poultry Meat in China has the same pattern as eggs and pig meat - Interestingly USA is also showing rapid growth in poultry meat consumption, seemingly more than it population growth rate

From the above table it's clear that China, India, USA, Brazil and Russia dominate food market of these 4 items.

Conclusion

To answer the question of feeding to such a huge and constantly growing population we first dived into the food distribution pattern for different country across the globe. It was really interesting to find out that China, India, USA, Brazil and Russia are the top 5 food consuming countries. Also, out of the 8 food items China leads in 5 of them, India leads in 2 and USA in 1. One may find summary of top five nation for each food item in the table below.

Interestingly, rate of increase of pig meat consumption has gained a much faster rate in China after 1980 and becomes almost 6 times of that consumed in USA, the second highest consumer. Similarly the popularity of Bovine meat in USA can be assumed from the fact that even after having 4 times lesser population than China it consumes 1.3 times more meat than that of China, which is the second highest consumer.