

## PROJECT 1

# GROWTH OF FARMER'S MARKET



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## **1. Overview**

A farmers' market allows growers to sell directly to consumers at a given location and time. This marketing method has grown in popularity.

Since USDA's Agricultural Marketing Service began tracking farmers' markets in 1994, the number of markets in the United States has grown to 8,720, an increase of about 7.07 percent from 2013. Total annual sales at U.S. farmers' markets are estimated at \$1 billion. The United States Department of Agriculture (USDA) has recognized the importance of farmers markets. Through its many programs, USDA has helped the growth of farmers markets across the country. As on date 8,791 farmers markets are listed in USDA's National Farmers Market Directory.

Most farmers' markets are operated on a seasonal basis, opening in the spring and closing in the fall. There are year-round markets and they are generally found on the West Coast, southeast and southwest United States.

To participate, a grower, or vendor, pays a fee or percent of sales for booth space. The market has a manager that coordinates vendors and promotes the market. The market is held in a public location, such as a town square or downtown street on a weekly basis. Some markets are open in the mornings and others are open in late afternoon.

A farmers' market allows growers the opportunity to market directly to consumers without dealing with a food broker. Growers can explain how the food is grown and educate consumers on how to prepare it. [1]

## 2. Farmer's Market Dataset

As given in the description of the project the data file contains the following details:

- Variables indicating the geographical location of the farmers market (lat, long, street, county, state etc.)
- Variables indicating types of products (herbs, vegetables, seafood etc.)
- Variables indicating type of payment accepted (cash, WIC, SNAP, SFMNP etc.)
- Variables indicating online social media presence
- Variables indicating date and time

### a. Cleaning the Dataset

In order to make clear insights from the dataset, some initial cleaning process of the dataset was needed.

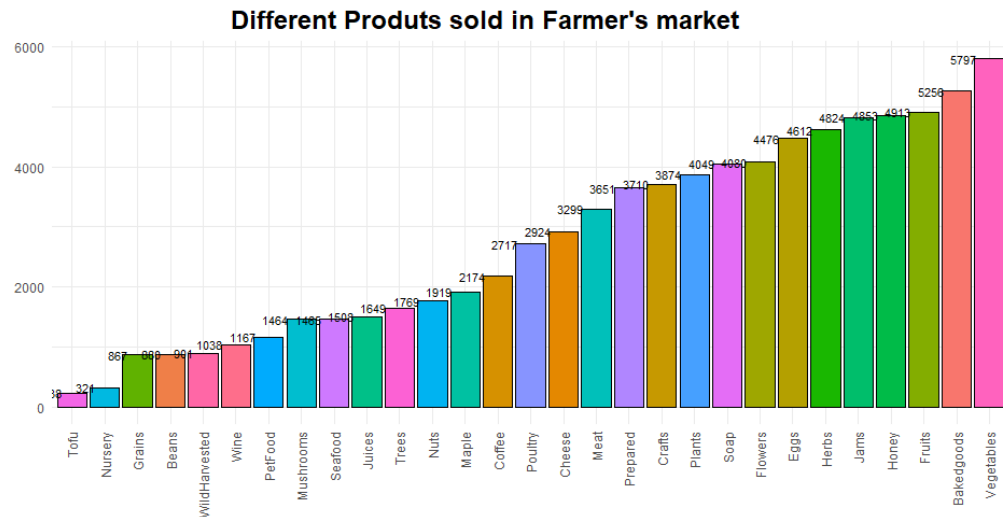
- Duplicate columns and rows were checked
- Rearranged columns to separate the character, date/time and categorical data
- Converted the few character variables (product and payment columns) to numerical variables
- Added and joined a new dataset called "state\_regions" for distinguishing the states and regions in the US

Packages used: tidyr, dplyr, reshape2

## 3. Products:

The farmer's market sells a wide range of products like Organic, Baked-goods, Cheese, Crafts ,Flowers, Eggs , Seafood , Herbs , Vegetables , Honey , Jams , Maple , Meat , Nursery , Nuts , Plants , Poultry , Prepared , Soap , Trees , Wine , Coffee , Beans , Fruits , Grains , Juices , Mushrooms , Pet Food , Tofu , Wild harvested.

The count of each product sold across the country is shown in **Graph.1**



**Graph.1 Product count**

According to the 2014 National Farmers Survey[10], locally grown fruits and vegetables remain at the heart of the U.S farmers Market business model, this has been proved from our graph as fruits and vegetables are among the top 10 sold products in the market.

#### **a. Analyzing the products**

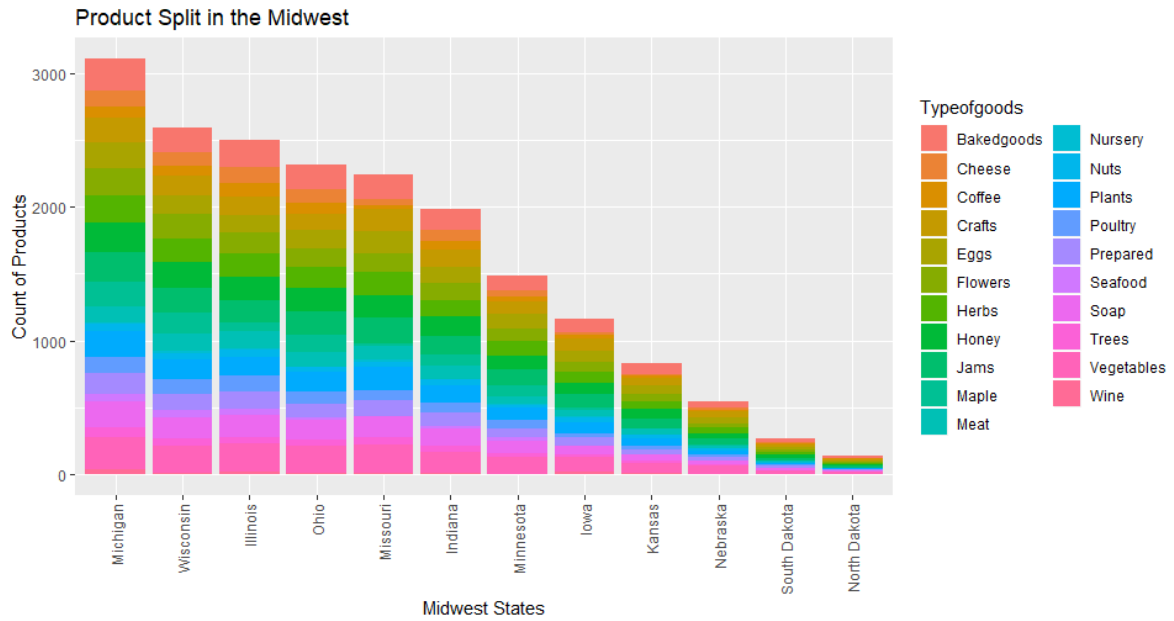
The farmer's dataset has 30 different products sold across the 50 different states in the US, visualizing the spread of these products across the states might be a little cumbersome in R. Hence, I have shown the split of products according to the 4 regions.

**Category 1: Products spread across the Midwest Region** (as shown in Graph.2)

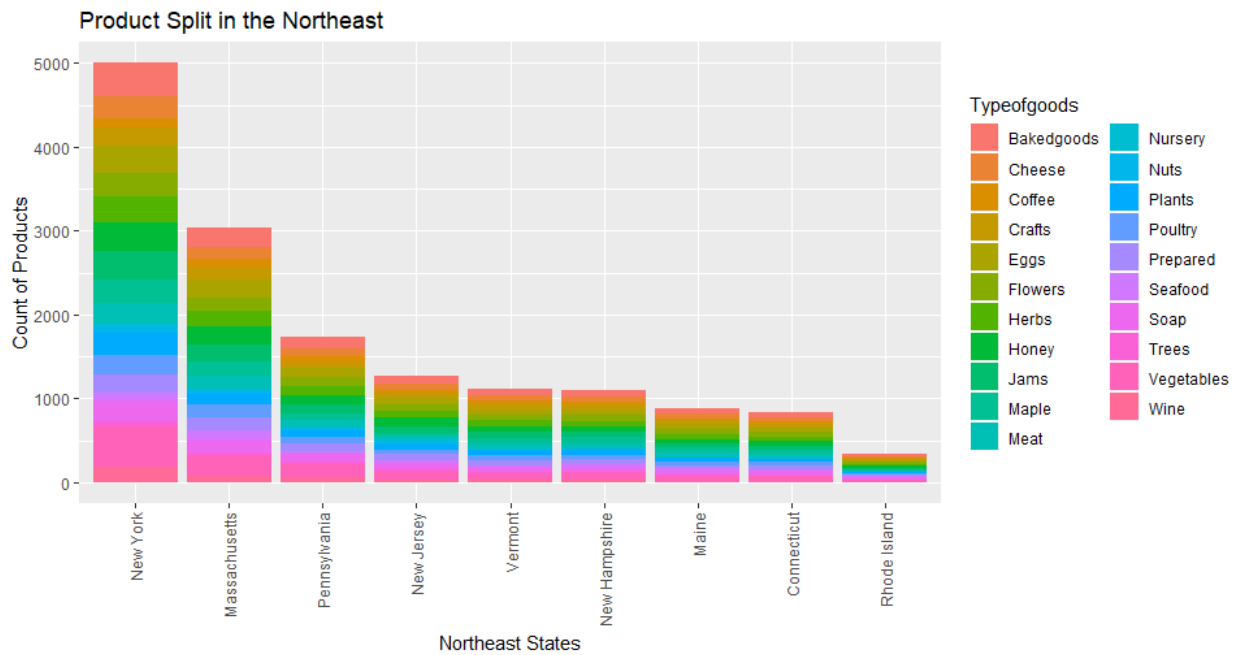
**Category 2: Products spread across the Northeast Region** (as shown in Graph.3)

**Category 3: Products spread across the South Region** (as shown in Graph.4)

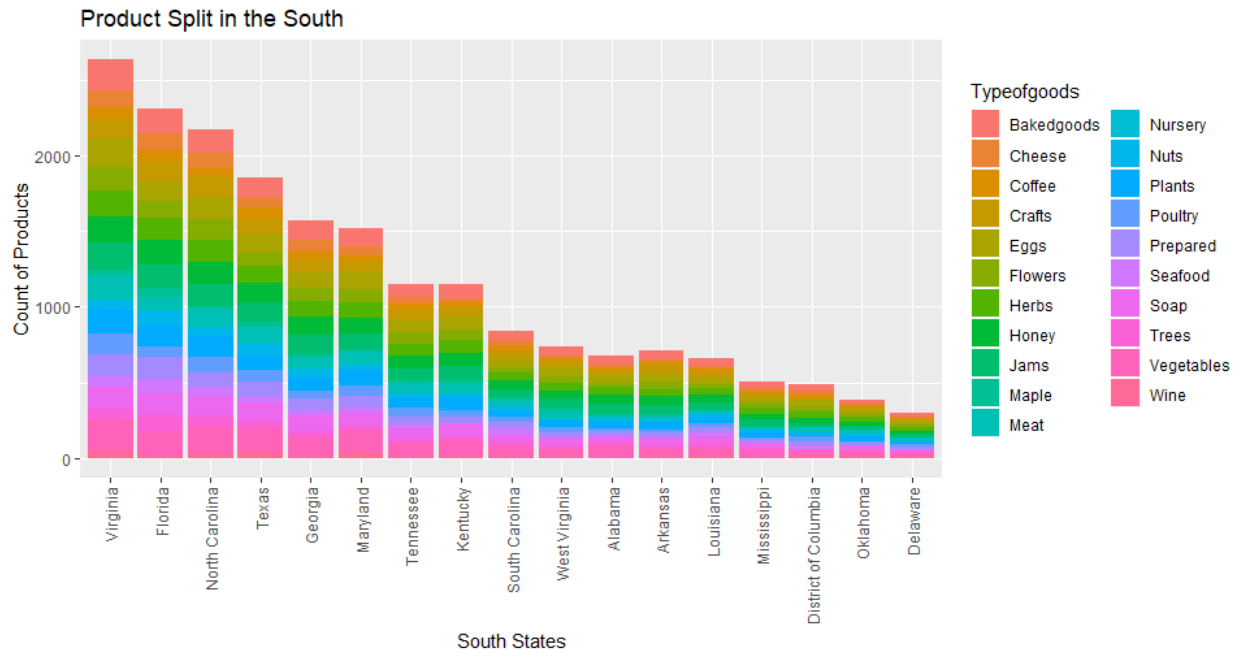
**Category 4: Products spread across the West Region** (as shown in Graph.5)



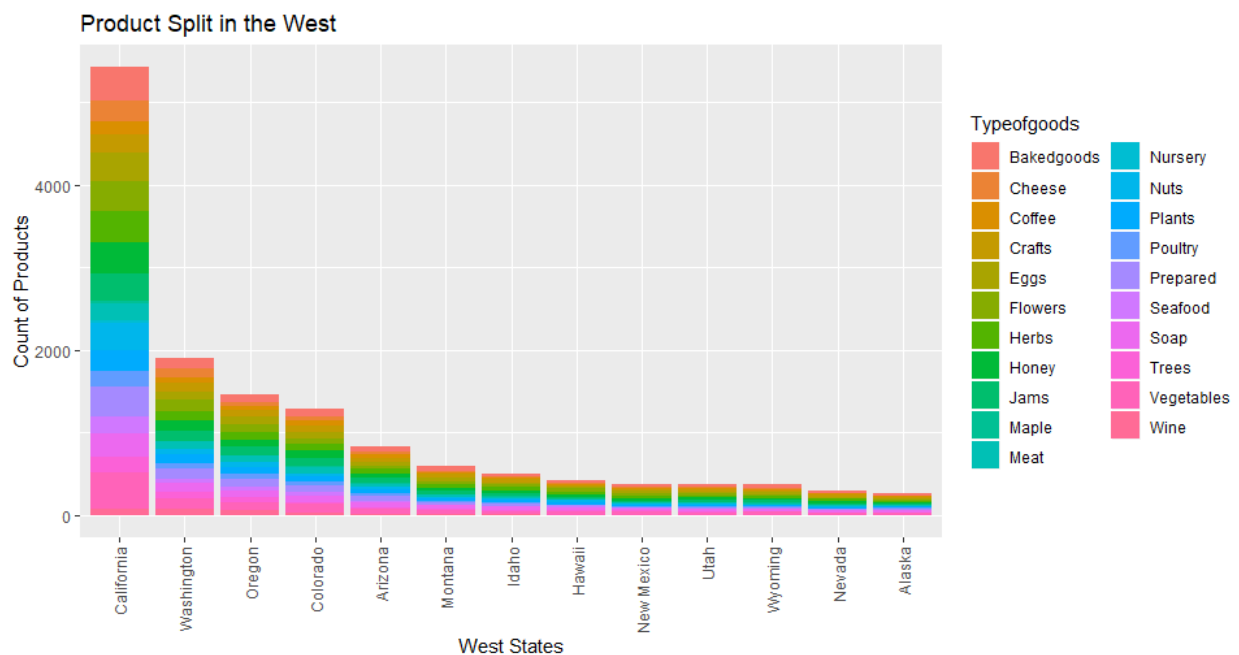
Graph.2



Graph.3



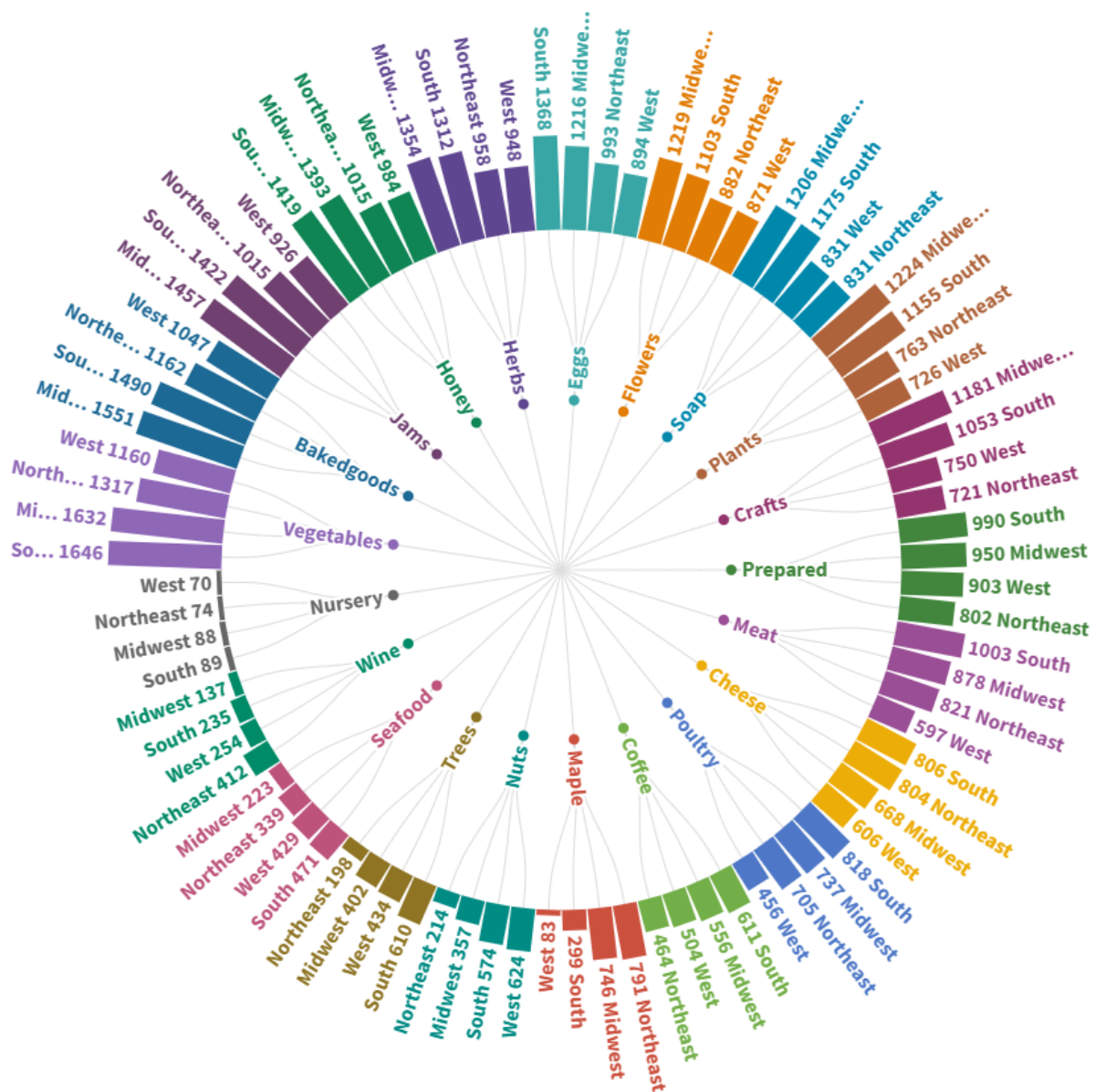
**Graph.4**



**Graph.5**

Though the above graphs show the spread of the products across the 4 regions in the US, it does not explicitly give us a clear explanation of what products have sold the most or least in a particular region, hence making insights from there is difficult. For such reasons, there are many other open source visualization tools apart from R, which can show better results. One

such tool is flourish. The same split of the products across the different regions can be shown in flourish as below:



Product Split across the 4 regions using Flourish



## 4. Payment Methods

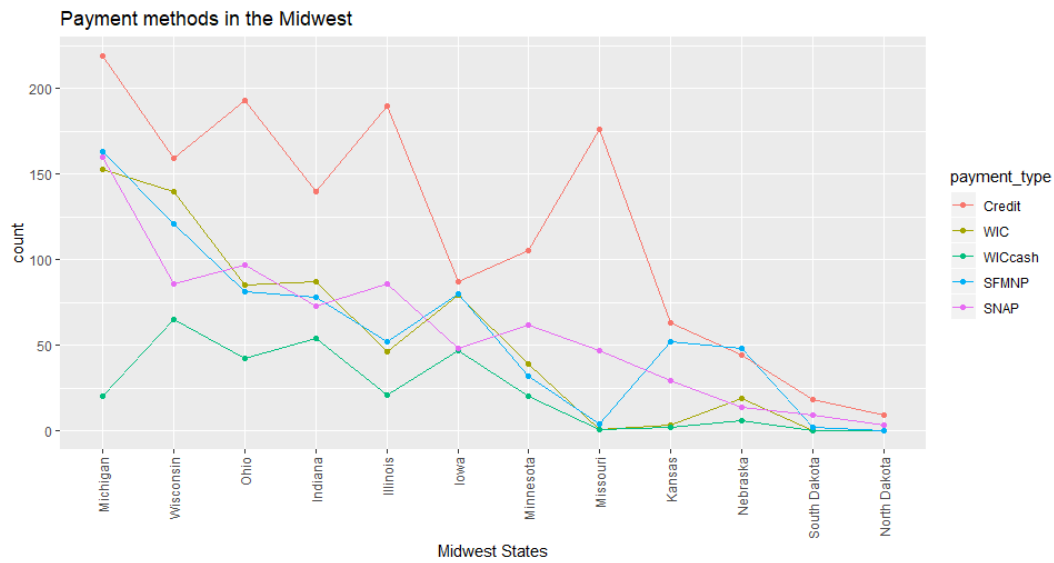
There are five main methods for payments used in the farmer's market, they are: Credit, WIC, WIC cash, SNAP, SFMNP. I have shown the distribution of the payments in 4 different regions.

**Category 1: Payment spread across the Midwest Region** (as shown in Graph.7)

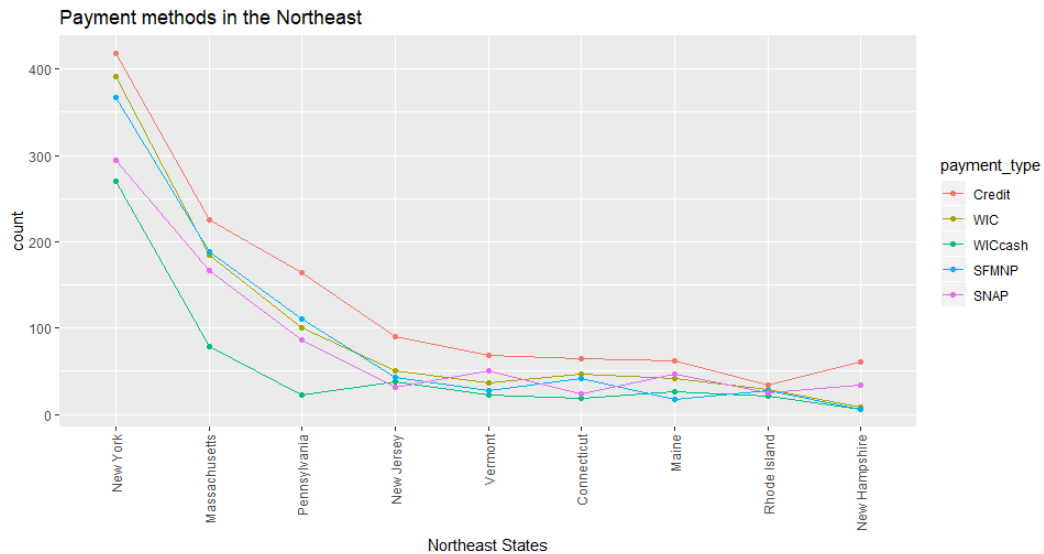
**Category 2: Payment spread across the Northeast Region** (as shown in Graph.7)

**Category 3: Payment spread across the South Region** (as shown in Graph.8)

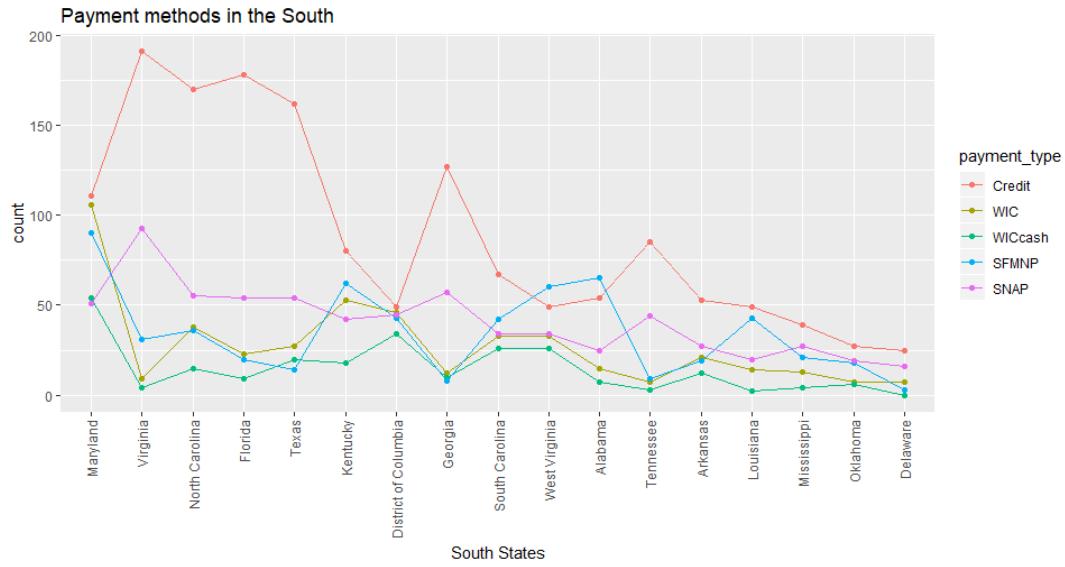
**Category 4: Payment spread across the West Region** (as shown in Graph.9)



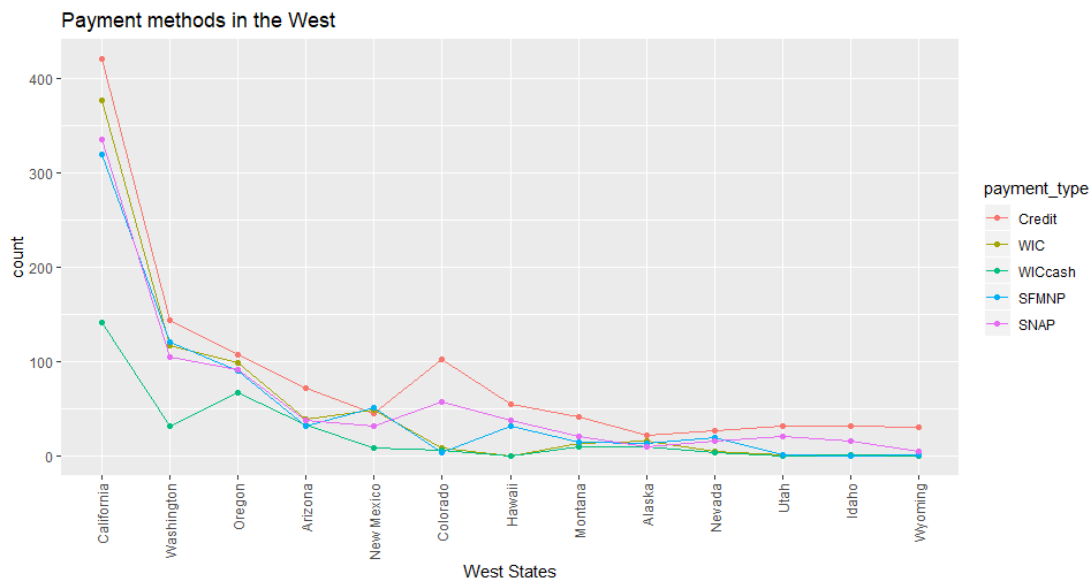
Graph.6



Graph.7



**Graph.8**



**Graph.9**

The line graph plotted above, shows that credit is the most widely used payment method across the country.

## 5. Effect of payment methods on Farmer's Market

The various types of payment methods offered for the farmer's market is in correspondence to the market's growth and development. Each method of payment has its own focus and benefits. Let us discuss in detail about the payment methods:

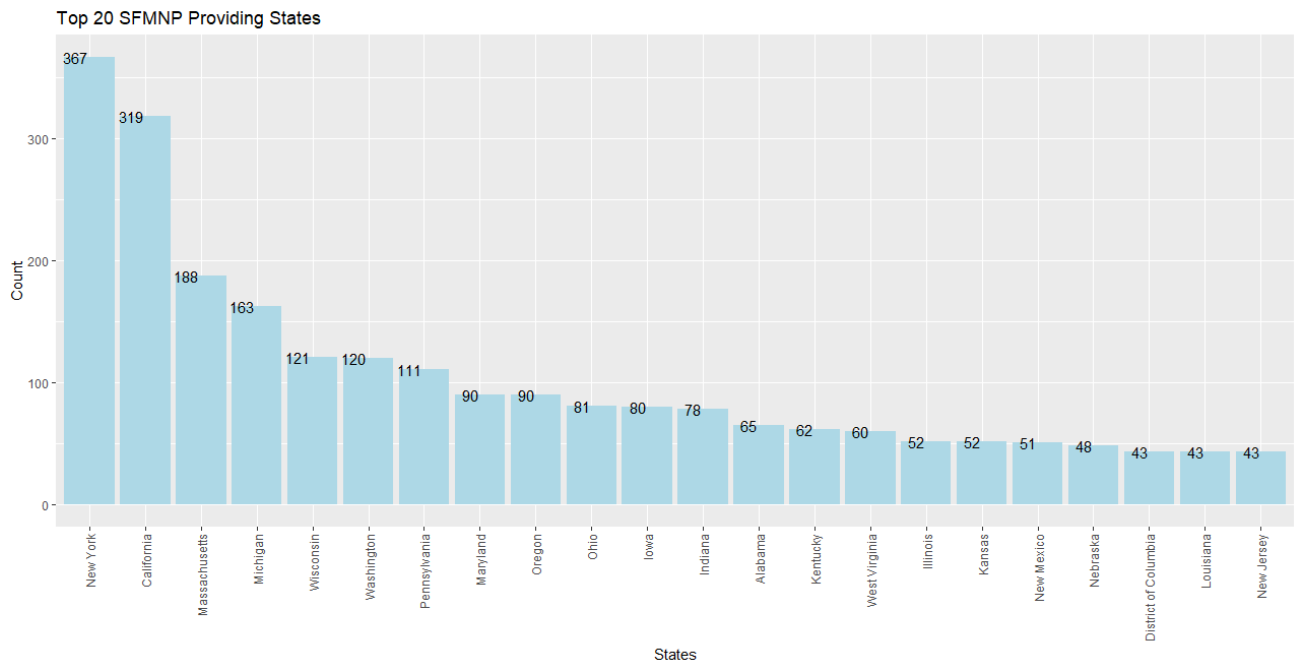
### a. Seniors Farmers Market Nutrition Program (SFMNP)

The Seniors Farmers' Market Nutrition Program (SFMNP) is designed to:

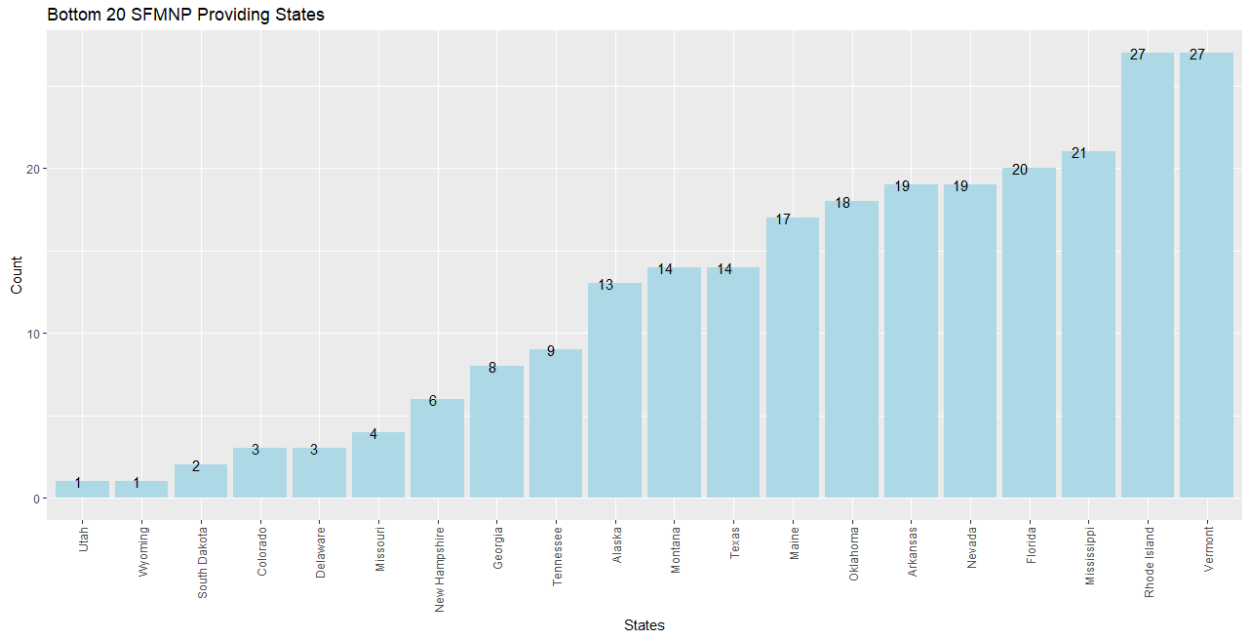
- Provide low-income seniors with access to locally grown fruits, vegetables, honey and herbs.
- Increase the domestic consumption of agricultural commodities through farmers' markets, roadside stands, and community supported agricultural programs.
- Aid in the development of new and additional farmers' markets, roadside stands, and community support agricultural programs.

Therefore, the focus for this type of payment plan is to help provide the necessary supplies for the low-income seniors, who are at least 60 years and who have household incomes of not more than 185%. [2]

From our dataset, we can analyze the top 20 states which provides the maximum number of SFMNP payment plan and the bottom 20 states which provides the minimum SFMNP. (Graph.10 & Graph 11. depicts it)

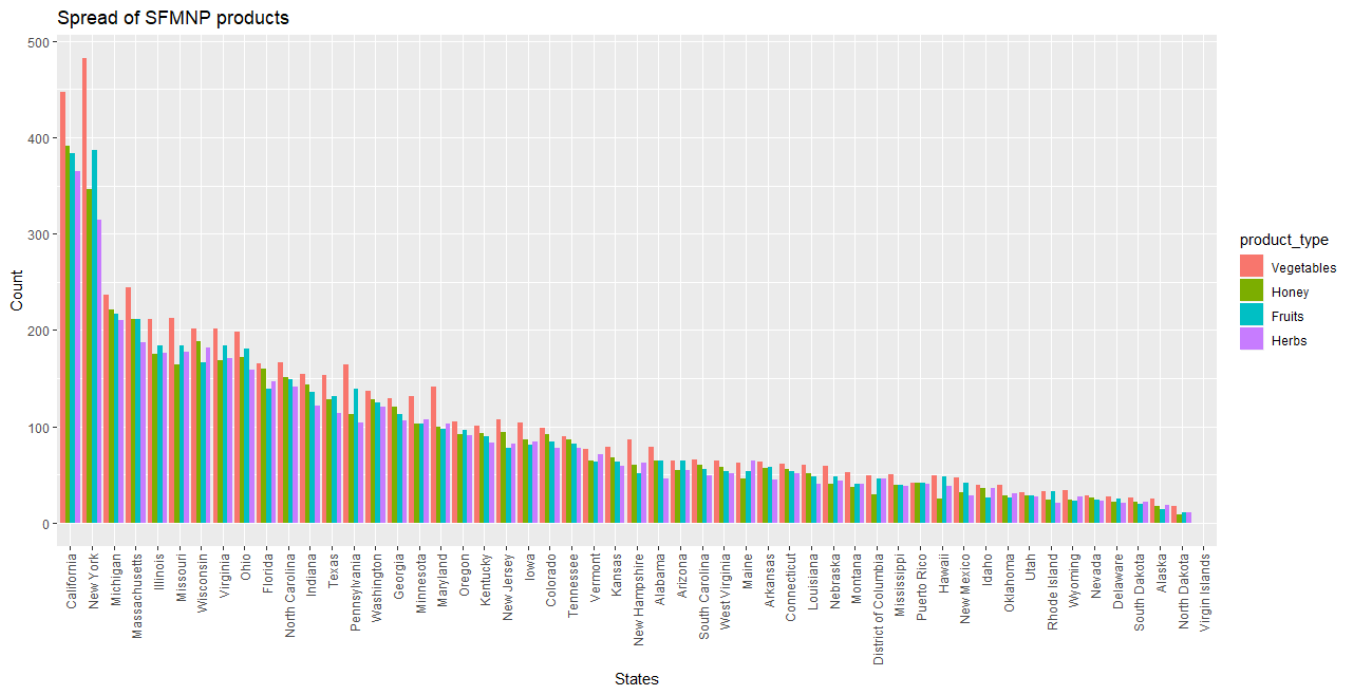


Graph.10



**Graph.11**

A variety of fresh, nutritious, unprepared, locally grown fruits, vegetables, herbs, and honey may be purchased with SFMNP benefits. **Graph.12** will show a bar graph of these products across the different states.



**Graph.12**

According to world atlas, the top 10 states which has the highest number of senior citizens i.e. citizens who are of the age 60 and above are as follows: [3]

Rank	State	Percentage of population over 65 years old
1	Florida	19.06 %
2	Maine	18.24 %
3	West Virginia	17.78 %
4	Vermont	17.02 %
5	Pennsylvania	16.69 %
6	Montana	16.62 %
7	Delaware	16.43 %
8	Hawaii	16.07 %
9	Oregon	15.97 %
10	Arizona	15.90 %

**Table.1**

**i. Insights from the graphs and senior census**

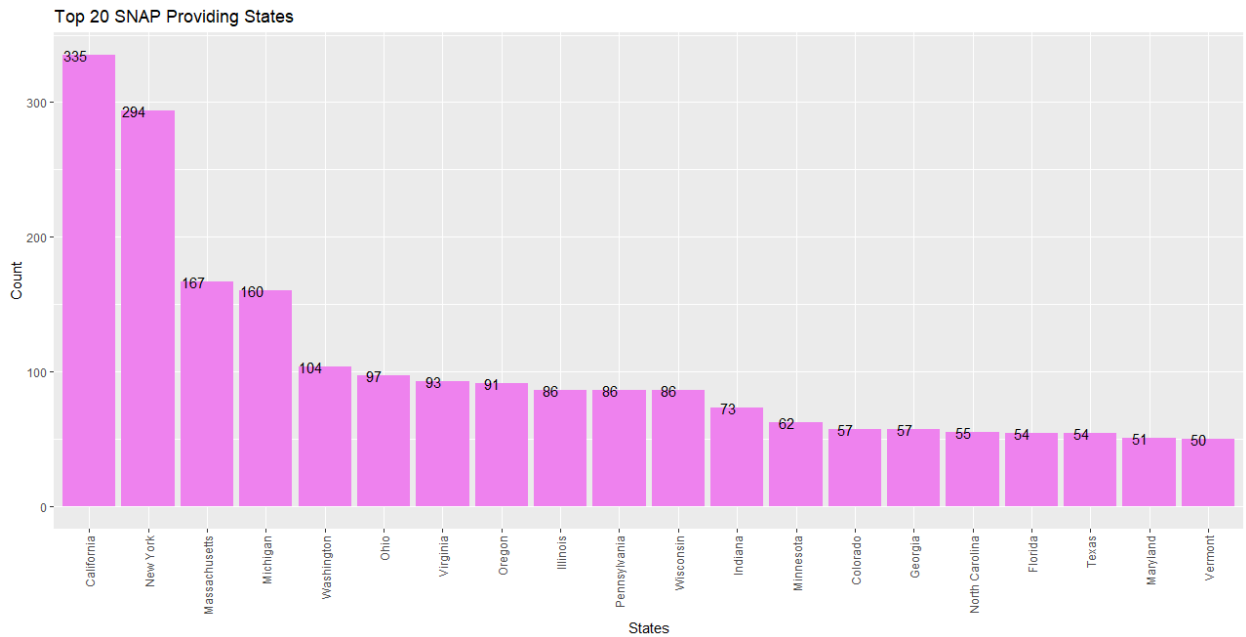
- 1) There is no SFMNP payment for states like North Dakota, Virgin Islands
- 2) Though states like Florida, Maine, Vermont, Montana and Delaware have higher number of senior citizens, the SFMNP plans provided in these states fall behind. Thus, increasing the SFMNP plans would most likely add on to the growth of farmers market in these states.

**b. The Supplemental Nutrition Assistance Program (SNAP)**

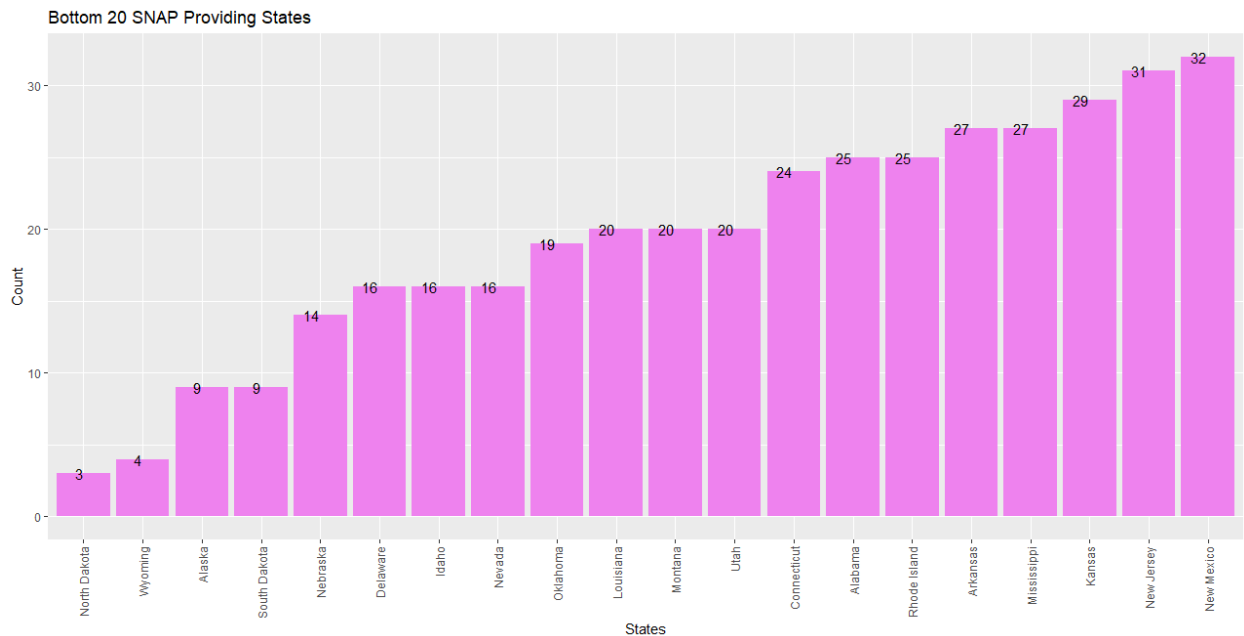
The Supplemental Nutrition Assistance Program (SNAP) provides nutrition benefits to supplement the food budget of needy families so they can purchase healthy food and move towards self-sufficiency. The SNAP plays an important role in

- Reducing both poverty and food insecurity in the United States—especially among children
- Support vulnerable populations including children, individuals with disabilities, and the elderly, as well as an increasing number of working families
- large benefits for women and their families

Therefore, the SNAP focuses on reducing hunger and up bring the poorest states of the U.S. [4] Working with our dataset, we can find the top 20 and bottom 20 states which provide the SNAP program. These visualizations are shown in **Graph.13 & Graph.14**



**Graph.13**



**Graph.14**

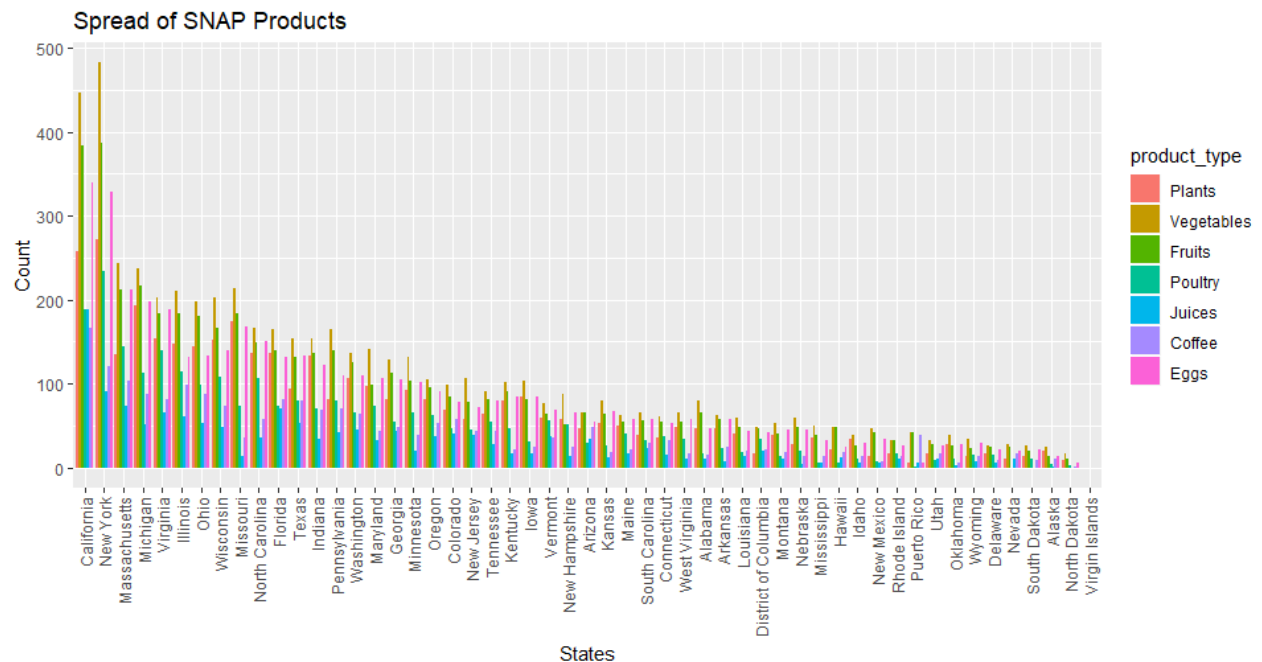
Any food for the household, such as:

- Fruits and vegetables;
- Meat, poultry, and fish;
- Dairy products;
- Breads and cereals;
- Other foods such as snack foods and non-alcoholic beverages; and
- Seeds and plants, which produce food for the household to eat

Households CANNOT use SNAP benefits to buy:

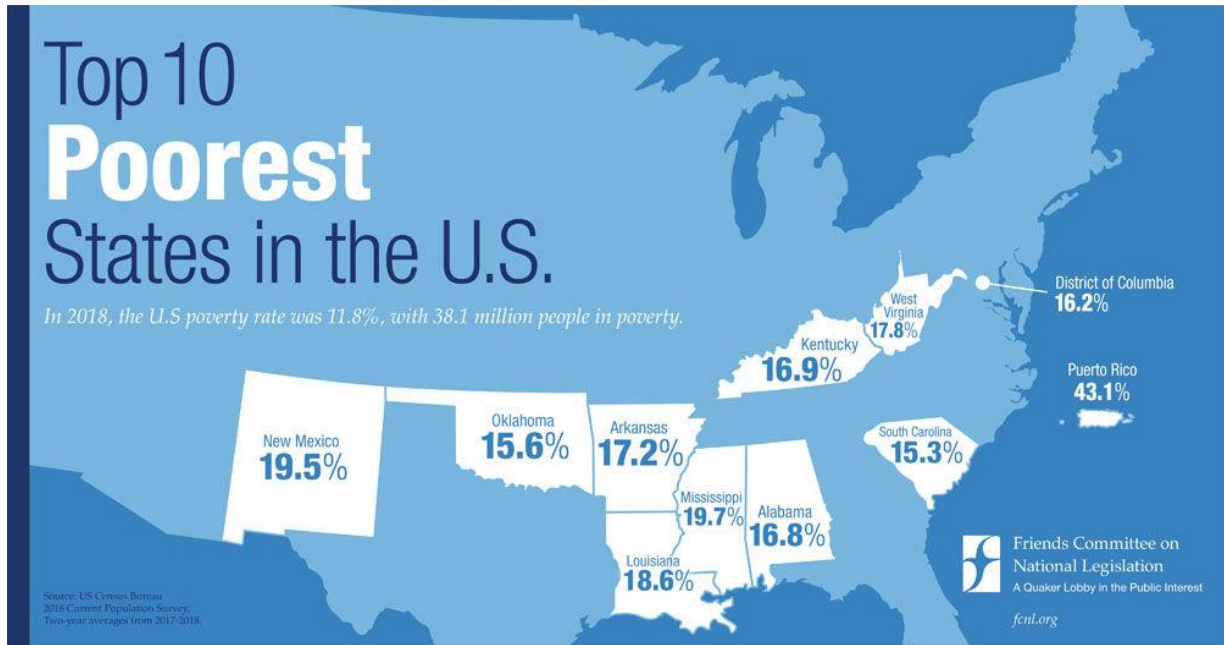
- Beer, wine, liquor, cigarettes, or tobacco
- Vitamins, medicines, and supplements. If an item has a Supplement Facts label, it is considered a supplement and is not eligible for SNAP purchase.
- Live animals (except shellfish, fish removed from water, and animals slaughtered prior to pick-up from the store).
- Prepared Foods fit for immediate consumption
- Hot foods
- Any nonfood items such as:
  - Pet foods
  - Cleaning supplies, paper products, and other household supplies.
  - Hygiene items, cosmetics [5]

From our dataset, the spread of SNAP products can be visualized as shown in **Graph.15**



**Graph.15**

### i. Insights from the graphs and census



On looking into the above picture which shows the census of the top 10 poorest states [6] in the U.S. the following insights can be made:

- 1) The states of Puerto Rico and Virgin Islands have no SNAP program and since Puerto Rico also ranks the highest in poverty line, immediate action needs to be taken to safeguard the health of the people in this State
- 2) States like New Mexico, Oklahoma, Arkansas, Mississippi, Louisiana, Alabama fall under the top 10 poor states and under the bottom 20 SNAP providing states. It is highly recommended to introduce the SNAP program to these States
- 3) States like North Dakota, Nebraska, Delaware, Wyoming though not under the poor states have very less SNAP programs, hence providing more SNAP programs to these states can help in the development of the farmer's market

### c. The Special Supplemental Nutrition Program for Women, Infants, and Children (WIC) and WIC cash

The Special Supplemental Nutrition Program for Women, Infants, and Children (WIC) provides federal grants to states for supplemental foods, health care referrals, and nutrition education for low-income pregnant, breastfeeding, and non-breastfeeding postpartum women, and to infants and children up to age five who are found to be at nutritional risk. It also provides education on how nutritious one's diet should be. The WIC program is benefited for

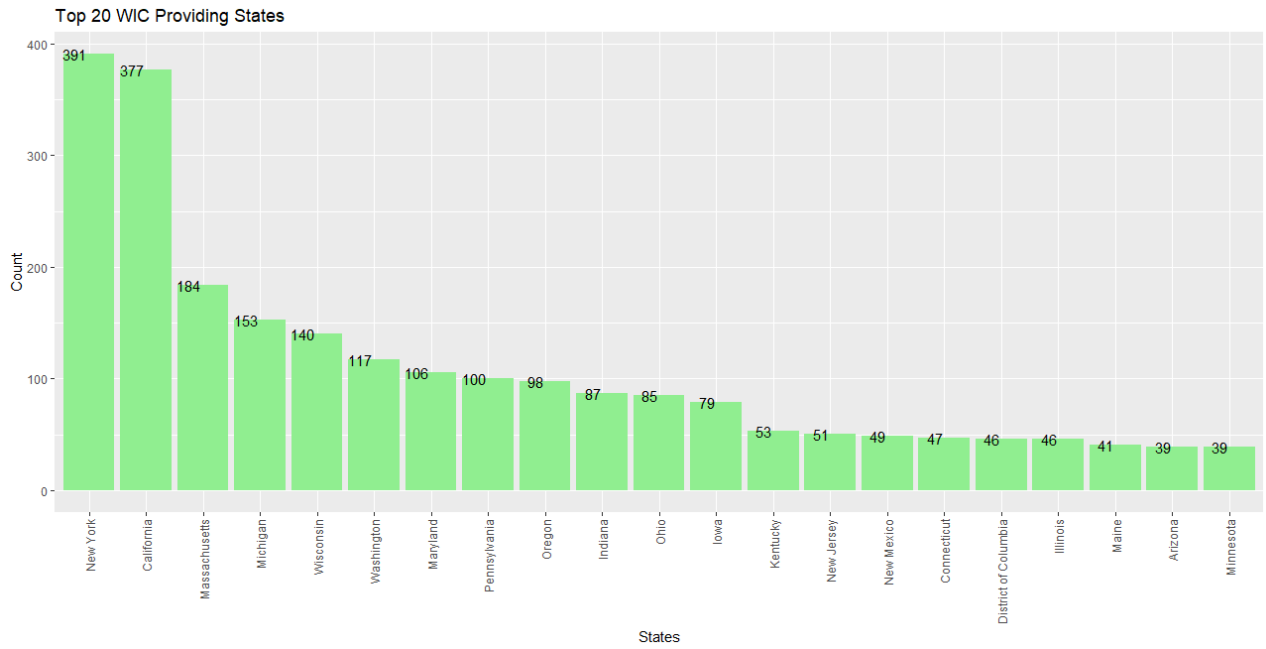
- Women
- Infants over 4 months old



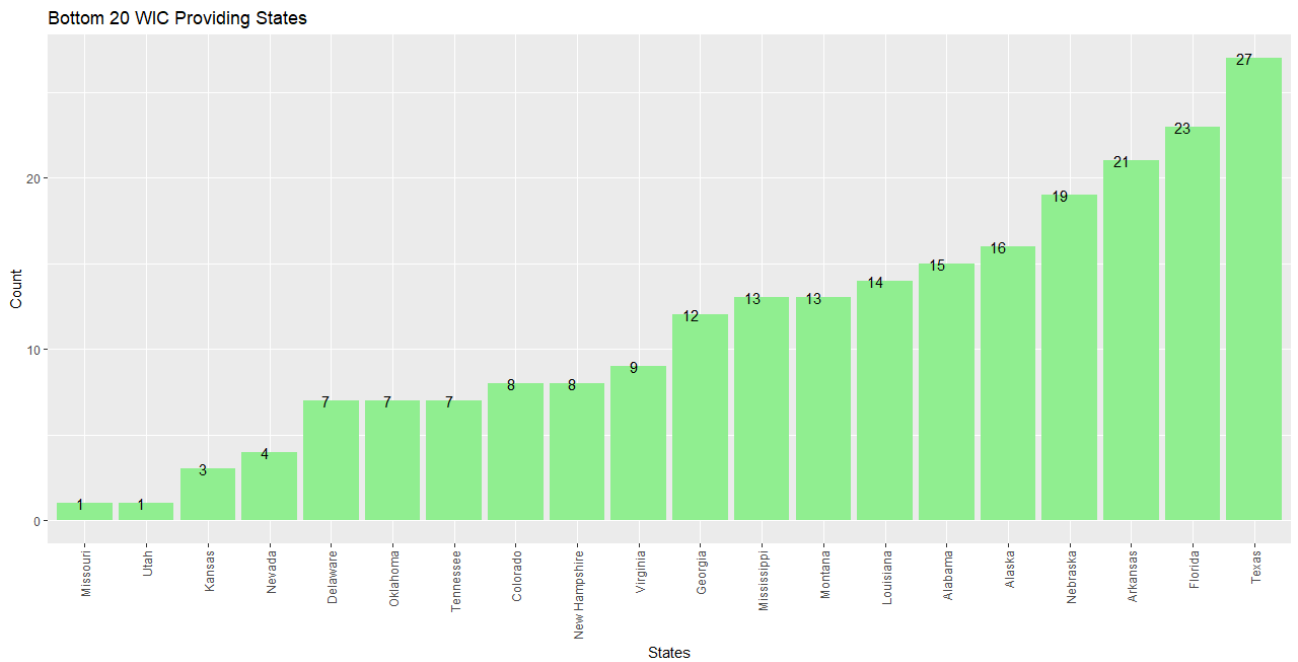
- Children 1 to 5 years of age [7]

**Graph 16, 18** shows the Top 20 WIC &WIC cash providing States

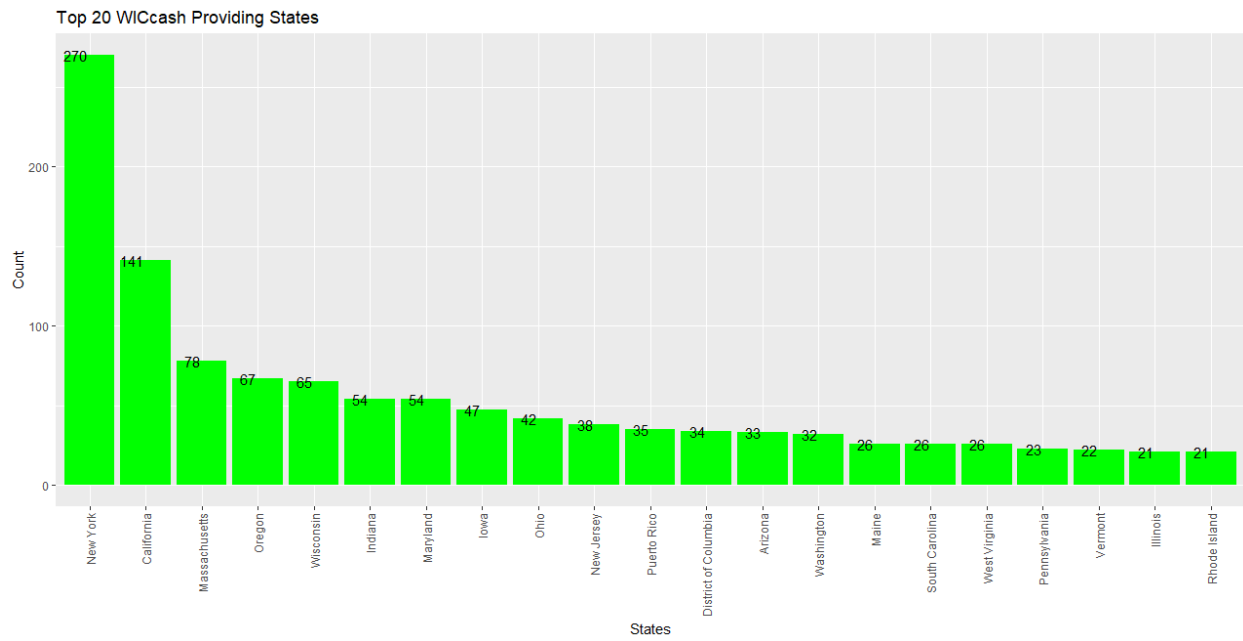
**Graph 17, 19** shows the Bottom 20 WIC &WIC cash providing States



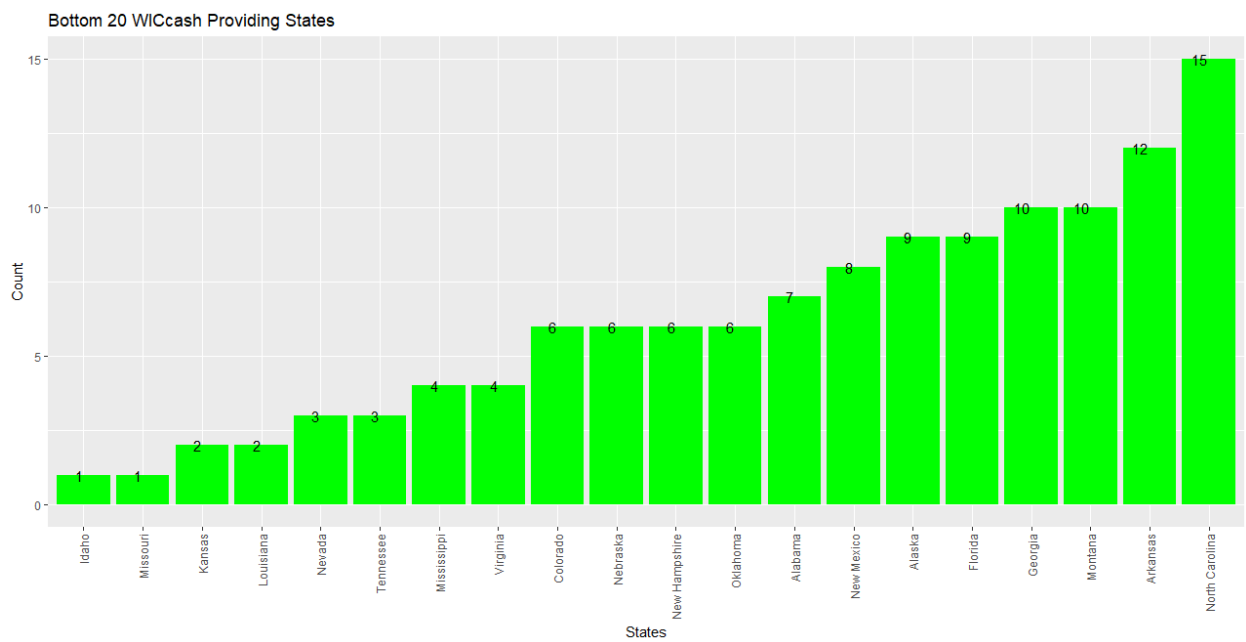
**Graph.16**



**Graph.17**



**Graph.18**

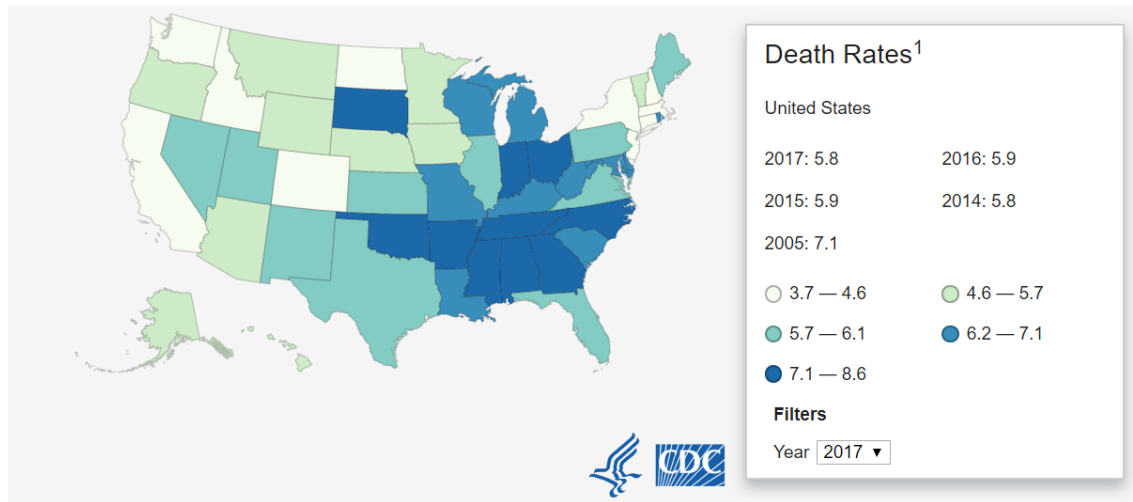


**Graph.19**

### i. Infant Mortality rate

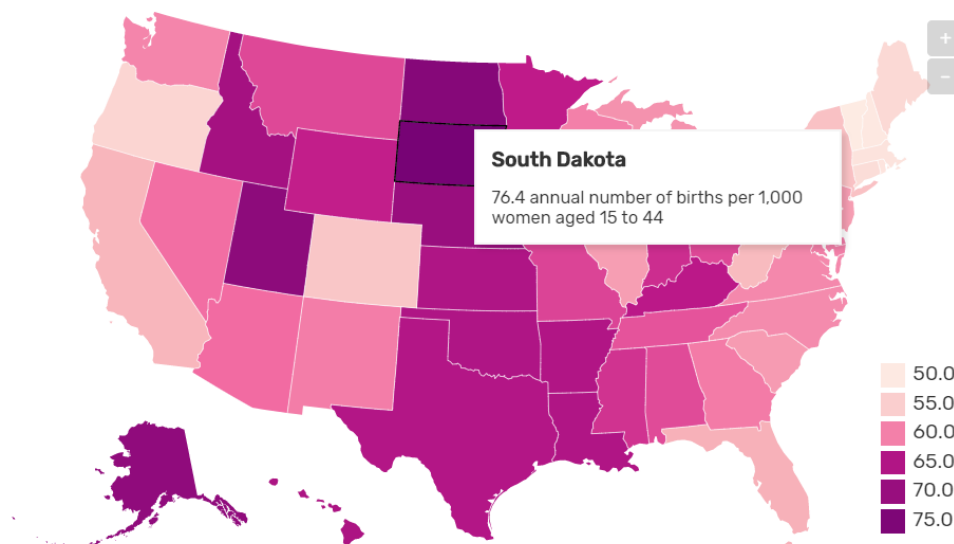
According to the centers for disease and prevention, the top states that have the highest infant mortality rate are Alabama, Arkansas, Ohio, Indiana, Mississippi, Missouri, North Carolina, South Dakota, Tennessee, Oklahoma and Georgia as seen in the picture below. These are the states were WIC &WIC cash programs need to be concentrated on. [8]

## Infant Mortality Rates by State



Map.1 Infant Mortality Rate

### ii. Birth rate Trends



Map: The Balance • Source: [Henry J. Kaiser Family Foundation](#)

Map.2 Birth Rate by States

The five states with the highest birth rates are South Dakota, North Dakota, Utah, Alaska, and Nebraska. These states all have birth rates above 69. They are all in the Midwest or West. They also have low median ages: South Dakota at 36.8, North Dakota at 35, Utah at 30.7, Alaska at 33.5, and Nebraska at 36.3. They don't rank as highly in education levels. [9]

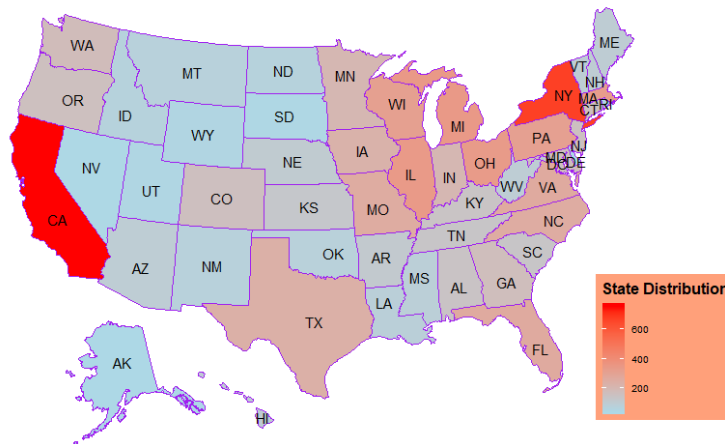
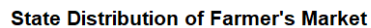
### iii. Insights from the graph

- 1) On considering the **Graph 17, 19 & Map 1**, states like Arkansas, Alabama, Missouri, Mississippi, Oklahoma, Tennessee fall under bottom 20 in offering WIC & WIC Cash program and lie among the top states with high infant mortality. These are States which needs support from USDA. Providing more WIC program can be of help to reduce the number of infant deaths in these places.
- 2) Looking into **Graph 17, 19 & Map 2**, states like Utah, Nebraska, Alaska come under the bottom 20 for WIC & WIC cash and these States rank among the first few for high birth rate. Also, the education rates for these states are below the bar line, hence educating the residents of these states about WIC and its respective benefits will be a huge contribution to not just the growth of farmer's market but also for the betterment of these places.
- 3) States like Hawaii, North Dakota, South Dakota and Puerto Rico lack behind in the WIC & WIC cash programs. Thus, introducing them to this payment plan can be useful.

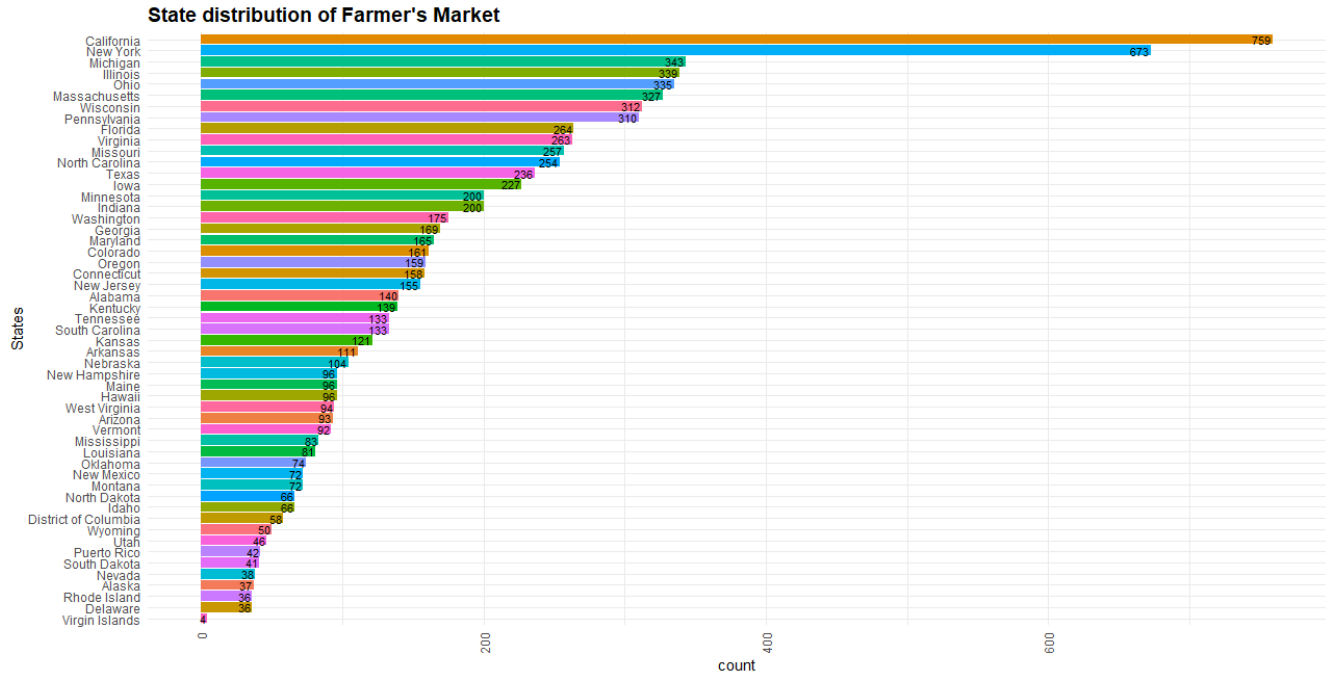
## 6. Distribution of Farmer's Markets:

### i. State Distribution

The regions highlighted in red have the highest number of farmer's markets and the ones highlighted in blue have the lowest number of markets as seen in **Graph.20(a)**



**Graph.20(a) Distribution of Farmer's market state wise**

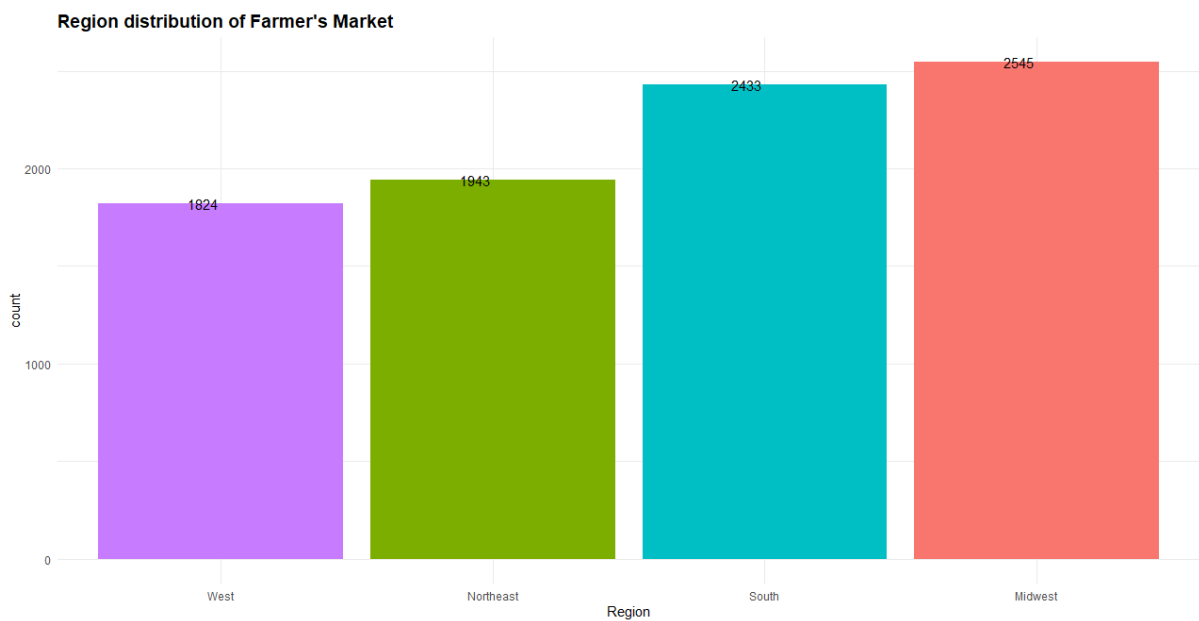


**Graph.20(b) Distribution of Farmer's market state wise**

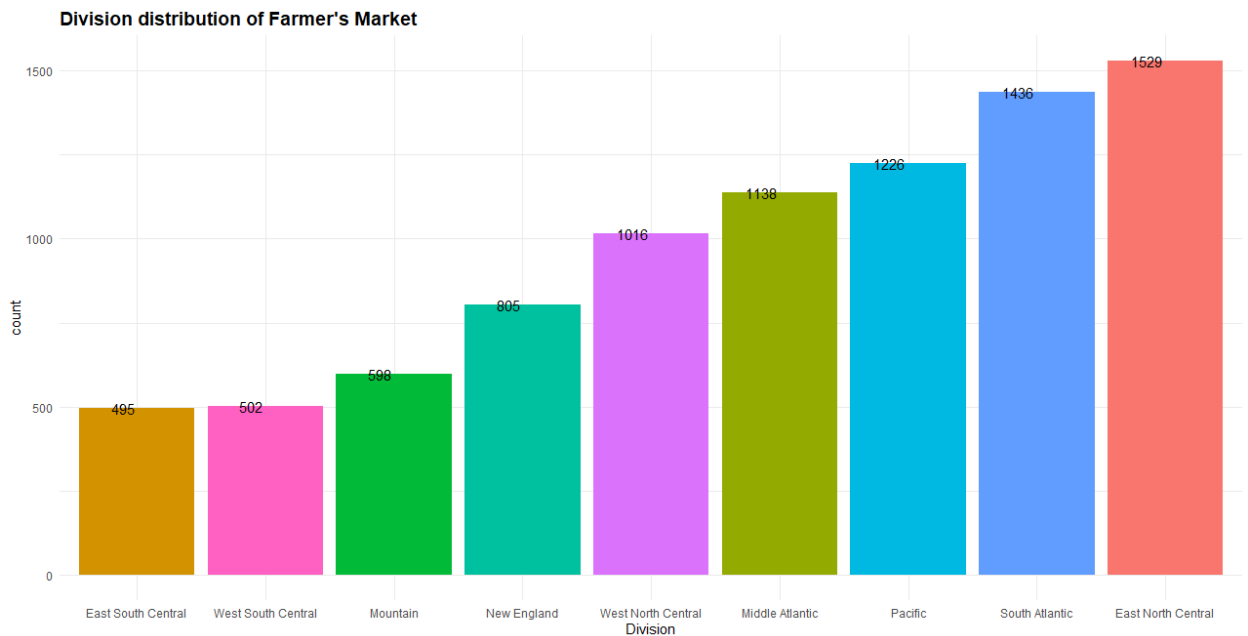
**Graph 20(b)** shows the count of farmers market in each State.

## ii. Region and Division Distribution

We can further divide this distribution as region wise (**Graph.22**) and division wise (**Graph.23**) to see clear results. It is seen that the Midwest ranks first in the regional distribution and East north central ranks first in the divisional distribution.



**Graph.22 Distribution of Farmer's market Region wise**



**Graph.23 Distribution of Farmer's market Division wise**

### **iii. Insights from the graphs:**

- 1) California and New York are the top two states with the highest number of farmer's market, this might be because these two states are highly populated [11]
- 2) The Midwest has a greater number of markets though they have lesser number states when compared to regions of the south and west
- 3) The East north central ranks #1 in the divisional distribution of farmer's market. The states that come under this category are Illinois, Indiana, Michigan, Ohio and Wisconsin.
- 4) States like Virgin Islands, Delaware, Rhode Island, Alaska, South Dakota have few farmer's market, the population of these states might be the reason for this situation.[10]
- 5) States like Nevada, Puerto Rico and Utah have very low number of markets on comparing with their state population. These are the states were USDA needs to take special care of.

### **iv. Recommendations for increasing the growth of Farmer's Market:**

According to the 2014 National Farmers Market Manager Survey Summary [10], one of the trends for increasing the growth of farmer's market was to start communicating with the customers, vendors and their community and this can be done by using web and mobile-based-technologies. Hence creating websites, social media pages and blogs will be a good start for expanding the awareness of farmer's market in states like Nevada, Puerto Rico, Utah and Virgin Islands.

## 7. REFERENCES:

- [1] <https://www.agmrc.org/markets-industries/food/farmers-markets>
- [2] <https://fns-prod.azureedge.net/sites/default/files/sfmnp/SFMNPFactSheet.pdf>
- [3] <https://www.worldatlas.com/articles/the-us-states-with-the-oldest-population.html>
- [4] <https://www.fns.usda.gov/pressrelease/2015/wh-120815>
- [5] <https://www.fns.usda.gov/snap/eligible-food-items>
- [6] <https://www.fcnl.org/updates/top-10-poorest-states-in-the-u-s-1630>
- [7] <https://www.fns.usda.gov/fmnp/wic-farmers-market-nutrition-program>
- [8] [https://www.cdc.gov/nchs/pressroom/sosmap/infant\\_mortality\\_rates/infant\\_mortality.htm](https://www.cdc.gov/nchs/pressroom/sosmap/infant_mortality_rates/infant_mortality.htm)
- [9] <https://www.thebalance.com/birth-rate-by-state-4684536>
- [10] <https://www.ams.usda.gov/sites/default/files/media/2014%20Farmers%20Market%20Managers%20Survey%20Summary%20Report%20final%20July%2024%202015.pdf>
- [11] [https://en.wikipedia.org/wiki/List\\_of\\_states\\_and\\_territories\\_of\\_the\\_United\\_States\\_by\\_population](https://en.wikipedia.org/wiki/List_of_states_and_territories_of_the_United_States_by_population)