crop

August 10, 2024

```python
[69]: import pandas as pd
      import numpy as np
      import matplotlib.pyplot as plt
      import seaborn as sns
      import warnings
      warnings.filterwarnings("ignore")
```

```python
[70]: df=pd.read_csv("apy_2 .csv")
```

```python
[71]: df
```

```
[71]:        Unnamed: 0      State_Name District_Name  Crop_Year     Season  \
       0               0       Karnataka         UDUPI       2005  Rabi
       1               1  Madhya Pradesh       GWALIOR       2003  Whole Year
       2               2  Andhra Pradesh      CHITTOOR       2010  Rabi
       3               3  Andhra Pradesh       KRISHNA       2014  Rabi
       4               4   Uttar Pradesh     SULTANPUR       2011  Rabi
       ...           ...             ...           ...        ...     ...
       73822       73822   Uttar Pradesh     SULTANPUR       2001  Rabi
       73823       73823    Chhattisgarh          DURG       2014  Rabi
       73824       73824   Uttar Pradesh    RAE BARELI       2010  Summer
       73825       73825           Assam        KAMRUP       1998  Rabi
       73826       73826  Andhra Pradesh        GUNTUR       2005  Rabi

                          Crop      Area  Production
       0            Horse-gram    1122.0       836.0
       1               Brinjal     194.0         0.0
       2               Sesamum     334.0       118.0
       3                Tomato     538.0      7289.0
       4             Coriander      59.0        33.0
       ...                  ...      ...         ...
       73822  Rapeseed &Mustard    3727.0      3239.0
       73823             Wheat    6364.0      7367.0
       73824  Moong(Green Gram)     489.0       224.0
       73825             Wheat    6431.0      6940.0
       73826              Urad  100125.0     78298.0
```

```
[73827 rows x 8 columns]
```

[72]: `pd.set_option('display.max_columns',None)`

[73]: `df.info()`

```
<class 'pandas.core.frame.DataFrame'>
RangeIndex: 73827 entries, 0 to 73826
Data columns (total 8 columns):
 #   Column         Non-Null Count  Dtype
---  ------         --------------  -----
 0   Unnamed: 0     73827 non-null  int64
 1   State_Name     73827 non-null  object
 2   District_Name  73827 non-null  object
 3   Crop_Year      73827 non-null  int64
 4   Season         73827 non-null  object
 5   Crop           73827 non-null  object
 6   Area           73827 non-null  float64
 7   Production     72679 non-null  float64
dtypes: float64(2), int64(2), object(4)
memory usage: 4.5+ MB
```

[74]: `df.describe()`

[74]:

	Unnamed: 0	Crop_Year	Area	Production
count	73827.000000	73827.000000	7.382700e+04	7.267900e+04
mean	36913.000000	2005.618134	1.186849e+04	4.426138e+05
std	21312.163499	4.957966	4.884827e+04	1.346706e+07
min	0.000000	1997.000000	5.000000e-02	0.000000e+00
25%	18456.500000	2002.000000	7.900000e+01	8.600000e+01
50%	36913.000000	2006.000000	5.730000e+02	7.240000e+02
75%	55369.500000	2010.000000	4.335000e+03	6.900000e+03
max	73826.000000	2015.000000	4.205800e+06	1.001000e+09

[75]: `df.describe(include=object)`

[75]:

	State_Name	District_Name	Season	Crop
count	73827	73827	73827	73827
unique	33	645	6	122
top	Uttar Pradesh	AURANGABAD	Kharif	Rice
freq	10100	291	28750	4541

[76]: `df.describe(include=float)`

[76]:

	Area	Production
count	7.382700e+04	7.267900e+04
mean	1.186849e+04	4.426138e+05

2

```
std      4.884827e+04   1.346706e+07
min      5.000000e-02   0.000000e+00
25%      7.900000e+01   8.600000e+01
50%      5.730000e+02   7.240000e+02
75%      4.335000e+03   6.900000e+03
max      4.205800e+06   1.001000e+09
```

[77]: `df.shape`

[77]: (73827, 8)

[78]: `df.isnull().sum()`

[78]:
```
Unnamed: 0          0
State_Name          0
District_Name       0
Crop_Year           0
Season              0
Crop                0
Area                0
Production       1148
dtype: int64
```

[79]:
```
a=df[df['Production']==0.0]
a
```

[79]:
```
       Unnamed: 0      State_Name District_Name  Crop_Year       Season  \
1               1  Madhya Pradesh       GWALIOR       2003   Whole Year
134           134      Tamil Nadu       MADURAI       2002   Whole Year
136           136       Rajasthan          TONK       2002   Whole Year
162           162         Haryana       JHAJJAR       2002   Whole Year
188           188  Madhya Pradesh   NARSINGHPUR       2003   Whole Year
...           ...             ...           ...        ...          ...
73503       73503  Madhya Pradesh         SATNA       2003   Whole Year
73528       73528  Madhya Pradesh      SHAJAPUR       2002   Whole Year
73636       73636     Maharashtra       SOLAPUR       1999       Kharif
73665       73665     Maharashtra    AHMEDNAGAR       2003         Rabi
73707       73707  Madhya Pradesh         SIDHI       1999       Kharif

                    Crop    Area  Production
1                Brinjal   194.0         0.0
134          Pome Granet     6.0         0.0
136      Other Vegetables  2961.0         0.0
162               Banana   103.0         0.0
188              Cabbage    34.0         0.0
...                   ...     ...         ...
73503  Other Citrus Fruit     4.0         0.0
```

```
73528  Other Fresh Fruits    45.0         0.0
73636          Castor seed   100.0         0.0
73665  Other  Rabi pulses   200.0         0.0
73707          Castor seed     1.0         0.0

[1082 rows x 8 columns]
```

[80]: `df.dropna(subset=['Production'], inplace = True)`

[81]: `df.shape`

[81]: (72679, 8)

[82]: `df.isnull().sum()`

[82]:
```
Unnamed: 0       0
State_Name       0
District_Name    0
Crop_Year        0
Season           0
Crop             0
Area             0
Production       0
dtype: int64
```

[83]: `df.head()`

[83]:
```
   Unnamed: 0     State_Name District_Name  Crop_Year      Season  \
0           0      Karnataka        UDUPI       2005  Rabi
1           1  Madhya Pradesh     GWALIOR       2003  Whole Year
2           2  Andhra Pradesh    CHITTOOR       2010  Rabi
3           3  Andhra Pradesh     KRISHNA       2014  Rabi
4           4   Uttar Pradesh   SULTANPUR       2011  Rabi

         Crop     Area  Production
0   Horse-gram   1122.0      836.0
1      Brinjal    194.0        0.0
2      Sesamum    334.0      118.0
3       Tomato    538.0     7289.0
4    Coriander     59.0       33.0
```

1   Which of these crops are produced during the Summer season?

[84]:
```
a=df.groupby(['Season'])['Crop'].sum().reset_index()
a
```

```
[84]:        Season                                                      Crop
     0  Autumn       RiceRiceGroundnutRiceMaizeRiceRiceRiceRiceRice…
     1  Kharif       Niger seedGroundnutGroundnutPeas & beans (Puls…
     2  Rabi         Horse-gramSesamumTomatoCorianderBlack pepperRa…
     3  Summer       GroundnutMaizeRiceRiceSesamumWheatRiceGroundnu…
     4  Whole Year   BrinjalOnionPotatoOnionTurmericSweet potatoSun…
     5  Winter       Horse-gramRiceHorse-gramHorse-gramRapeseed &Mu…
```

```
[85]: a.iloc[3,1]
```

[85]: 'GroundnutMaizeRiceRiceSesamumWheatRiceGroundnutOnionUradRiceMaizeUradRiceMaizeP
eas & beans (Pulses)MaizeSunflowerRagiSesamumBajraMaizeMaizeMoong(Green
Gram)RiceCotton(lint)UradMaizeMoong(Green Gram)UradUradMoong(Green Gram)JowarSun
flowerUradRiceGroundnutOnionSunflowerCowpea(Lobia)MaizeRiceSesamumRiceTobaccoSun
flowerRagiSunflowerUradUradMoong(Green Gram)UradJowarMoong(Green
Gram)SunflowerOnionRiceUradMoong(Green Gram)RiceRiceRiceMaizeMaizeOnionRiceMaize
MaizeSesamumOnionSunflowerGroundnutGroundnutMaizeMaizeGroundnutGroundnutRiceMaiz
eMaizeJowarSesamumHorse-gramMoong(Green Gram)GroundnutRiceGroundnutRiceUradDry
chilliesMoong(Green Gram)Moong(Green Gram)GroundnutRiceOnionRiceMoong(Green
Gram)Dry chilliesMoong(Green Gram)JowarRiceMaizePaddyRiceMaizeRiceMaizeSunflower
OnionSunflowerMaizeMaizeHorse-gramGroundnutDry chilliesGroundnutUradMoong(Green
Gram)SunflowerMaizeSunflowerMoong(Green
Gram)MaizeMaizeGroundnutUradMaizeMaizeGroundnutCowpea(Lobia)Moong(Green
Gram)MaizeMoong(Green
Gram)RagiWheatMaizeUradGroundnutUradMaizeMaizeRiceRiceMoong(Green
Gram)RiceGroundnutTurmericMoong(Green
Gram)UradRiceOnionGroundnutGroundnutOnionMoong(Green Gram)SunflowerMaizePaddyBaj
raMaizeSunflowerOnionGroundnutRiceRiceMaizeCotton(lint)Moong(Green
Gram)MaizeRagiArhar/TurRiceMoong(Green
Gram)UradOnionRiceMaizeMaizeMaizeMoong(Green
Gram)MaizeRiceRagiRiceGroundnutMoong(Green
Gram)RiceGroundnutRiceGroundnutOnionMoong(Green
Gram)UradUradGroundnutRagiSesamumUradMoong(Green
Gram)JowarBajraSunflowerMoong(Green Gram)MaizeMoong(Green
Gram)SunflowerRagiSunflowerRiceDry chilliesRiceMaizeMaizeRiceRiceRiceSesamumDry
chilliesSunflowerSunflowerMoong(Green Gram)GroundnutUradRagiRiceMoong(Green
Gram)JowarUradMaizeRiceRiceSesamumRiceUradRiceUradRiceJowarUradMoong(Green
Gram)RiceBajraMaizeRiceSunflowerOnionSunflowerMoong(Green
Gram)SunflowerGroundnutRagiSesamumMoong(Green Gram)UradPaddyRiceMoong(Green
Gram)OnionMoong(Green Gram)MaizeMaizeRiceHorse-gramMoong(Green Gram)RiceDry
chilliesMoong(Green Gram)GroundnutMaizeGroundnutMoong(Green Gram)Moong(Green
Gram)OnionMaizeUradRiceSunflowerSunflowerSunflowerRiceRiceMoong(Green
Gram)MaizeDry chilliesBajraUradRiceRiceWheatMaizeGroundnutSesamumGroundnutSesamu
mRiceGroundnutSunflowerGroundnutSunflowerMoong(Green Gram)Moong(Green Gram)UradO
nionRagiUradGroundnutRagiUradRiceRiceMaizeGroundnutUradRiceRagiMaizeUradRagiMoon
g(Green Gram)Moong(Green Gram)Moong(Green
Gram)RagiMaizeUradMaizeMaizeMaizeGroundnutMaizeGroundnutSunflowerMoong(Green

Gram)RiceMoong(Green Gram)MaizeMaizeMoong(Green Gram)UradOnionMaizeRiceBajraRiceGroundnutOnionMoong(Green Gram)RiceRiceMaizeSunflowerOnionRiceOnionGroundnutRiceGroundnutRiceMoong(Green Gram)RagiUradGroundnutSunflowerRiceGroundnutMoong(Green Gram)OnionBananaRiceMoong(Green Gram)SesamumRiceRiceMaizeRiceMoong(Green Gram)UradMoong(Green Gram)SunflowerWheatRiceRiceRiceBajraUradMoong(Green Gram)RiceRiceGroundnutUradUradMoong(Green Gram)MaizeUradRiceMoong(Green Gram)Dry chilliesMoong(Green Gram)GroundnutRiceOnionGroundnutMaizeRiceGroundnutRiceJowarRiceMaizeRiceGroundnutRiceSesamumMoong(Green Gram)MaizeUradMaizeRiceMoong(Green Gram)MaizeMoong(Green Gram)UradSunflowerUradRiceCotton(lint)RagiRicePaddyGroundnutRiceMaizeMaizeBajraRiceSunflowerOnionRiceGroundnutSunflowerJowarJowarMaizeOnionUradRagiRiceTobaccoUradOnionMaizeMoong(Green Gram)OnionMaizeSunflowerSunflowerRagiMaizeOnionRiceRiceMaizeRiceRiceRiceGroundnutRagiUradBananaGroundnutRiceOnionRiceMoong(Green Gram)SunflowerHorse-gramBananaMoong(Green Gram)RiceMoong(Green Gram)MaizeMaizeBajraSesamumGroundnutMoong(Green Gram)Moong(Green Gram)SunflowerBajraUradGroundnutSunflowerRiceMaizeBananaUradSesamumGroundnutMaizeMaizeRiceOnionMaizeMoong(Green Gram)SunflowerRiceMoong(Green Gram)RiceRagiOnionMoong(Green Gram)MaizeRiceCowpea(Lobia)Peas & beans (Pulses)OnionRiceOnionGroundnutMaizeGroundnutRiceRicePaddyRiceMoong(Green Gram)RiceMaizeGroundnutUradMaizeUradMaizeUradRiceRagiOnionRagiMoong(Green Gram)BananaBajraRiceSunflowerMaizeOnionSesamumGroundnutSunflowerMoong(Green Gram)MaizeRiceGroundnutSesamumBananaSunflowerOnionRiceMoong(Green Gram)Moong(Green Gram)RiceBananaMaizeUradMaizeGroundnutTobaccoMaizeOnionRiceRiceOnionMaizeUradMoong(Green Gram)SunflowerRiceRiceMoong(Green Gram)Moong(Green Gram)GroundnutOnionRiceSesamumSesamumMaizeMaizeMoong(Green Gram)RiceMaizeMaizePotatoRiceMaizeGroundnutBananaMaizeRiceMoong(Green Gram)SesamumRiceMoong(Green Gram)MaizeRiceOnionRiceGroundnutMaizeRiceMaizeSunflowerUradDry chilliesMoong(Green Gram)WheatMaizeWheatMoong(Green Gram)OnionRiceMaizeMaizeMaizeRiceRiceMoong(Green Gram)MaizeSunflowerOnionSesamumUradMaizeMoong(Green Gram)SunflowerBananaGroundnutRagiMaizeMaizeSesamumRicePotatoMaizeBajraMoong(Green Gram)OnionGroundnutRiceOnionMaizeRagiGroundnutRiceGroundnutRiceRiceRiceOnionGroundnutMaizeBananaGroundnutSesamumMoong(Green Gram)BajraRiceUradUradMaizeMoong(Green Gram)MaizeDry chilliesMaizeSunflowerRiceMoong(Green Gram)Cotton(lint)Moong(Green Gram)SunflowerBajraGroundnutGroundnutRagiMoong(Green Gram)RiceRiceMaizeRiceRiceOnionOnionSesamumRiceUradMaizeDry chilliesSunflowerMaizeRiceRiceRiceRiceBananaMoong(Green Gram)MaizeRiceMaizeSunflowerSunflowerMoong(Green Gram)RiceRiceMoong(Green Gram)Horse-gramSunflowerMoong(Green Gram)MaizeCowpea(Lobia)RagiUradMaizeRiceMoong(Green Gram)GroundnutMoong(Green Gram)RiceSesamumMoong(Green Gram)Moong(Green Gram)MaizeRiceSunflowerSunflowerMaizeRagiWheatSunflowerRiceUradSesamumRiceWheatDry chilliesRiceArhar/TurMoong(Green Gram)RiceUradMoong(Green Gram)MaizeSesamumSunflowerMaizeGroundnutMaizeWheatCowpea(Lobia)BajraRiceMoong(Green Gram)Moong(Green Gram)GroundnutRiceRiceUradRiceMoong(Green Gram)MaizePeas & beans (Pulses)RagiHorse-gramRiceJowarOnionMaizeMaizeRiceSunflowerMoong(Green

Gram)UradRiceMoong(Green Gram)UradOnionUradJowarMaizeSunflowerBananaMoong(Green Gram)SunflowerPaddyRiceHorse-gramGroundnutRiceSesamumOnionUradBajraRiceRiceRiceSunflowerMaizeSesamumOnionUradUradRiceMaizeBajraSunflowerRiceRiceMaizeOnionRiceJowarRiceMoong(Green Gram)RiceArhar/TurGroundnutWheatGroundnutOnionUradGroundnutDry chilliesRiceSunflowerGroundnutRagiMaizeRiceMoong(Green Gram)PotatoGroundnutMaizeBajraBajraRiceGroundnutGroundnutMoong(Green Gram)UradMaizeWheatMaizeGroundnutRagiMoong(Green Gram)UradSesamumMaizeOnionDry chilliesGroundnutSunflowerGroundnutRiceUradSunflowerGroundnutBananaOnionGroundnutMoong(Green Gram)MaizeCotton(lint)Moong(Green Gram)Moong(Green Gram)SunflowerRiceJowarMaizeRiceMoong(Green Gram)GroundnutMaizeWheatMaizeSesamumMaizeRiceUradMoong(Green Gram)Moong(Green Gram)OnionMaizeWheatMoong(Green Gram)OnionMoong(Green Gram)JowarMaizeRiceMaizeDry chilliesRiceDry chilliesPaddyMaizeMoong(Green Gram)SunflowerUradPaddyGroundnutMoong(Green Gram)UradRiceSesamumMaizeMaizeSesamumSunflowerRiceDry chilliesUradUradSesamumOnionRiceBananaSunflowerMaizeGroundnutMaizeSunflowerMoong(Green Gram)MaizeMoong(Green Gram)Horse-gramRiceMoong(Green Gram)SunflowerRiceSunflowerRiceOnionMaizeRiceRiceGroundnutMoong(Green Gram)GroundnutMaizeMaizeBajraMaizeGroundnutMaizeRiceBajraMoong(Green Gram)RiceJowarRiceMoong(Green Gram)GroundnutMaizeDry chilliesMaizeRiceBajraMoong(Green Gram)Moong(Green Gram)Moong(Green Gram)RiceMoong(Green Gram)PaddyRiceSunflowerCotton(lint)GroundnutMoong(Green Gram)RiceMoong(Green Gram)RagiMoong(Green Gram)RiceMaizeMaizeMoong(Green Gram)Moong(Green Gram)WheatSunflowerGroundnutSunflowerPaddyMaizeMaizeMaizeRiceMoong(Green Gram)MaizeUradMoong(Green Gram)GroundnutMoong(Green Gram)SunflowerRiceSunflowerRiceMoong(Green Gram)OnionRiceUradGroundnutMaizeSunflowerDry chilliesGroundnutBajraSesamumSesamumJowarOnionUradMaizeMoong(Green Gram)MaizeMaizeMaizeJowarMoong(Green Gram)SunflowerRiceOnionWheatUradPaddyRiceMaizeMoong(Green Gram)MaizeMaizeUradRiceBajraRiceMoong(Green Gram)MaizeJowarSunflowerUradWheatMoong(Green Gram)BananaRiceRiceRiceSesamumMaizeMaizeSunflowerRiceMoong(Green Gram)Moong(Green Gram)TobaccoMaizeUradSunflowerJowarRiceMaizeRiceMaizeUradDry chilliesJowarRiceSesamumMaizeMoong(Green Gram)GroundnutMaizeSunflowerMaizeBajraRagiRiceTobaccoDry chilliesGroundnutSesamumGroundnutMaizeGroundnutRiceMoong(Green Gram)RiceRiceRiceMaizeRiceRagiMaizeRiceMaizeGroundnutMaizeUradMoong(Green Gram)MaizeMoong(Green Gram)WheatRiceRiceMaizeGroundnutMaizeMaizeGroundnutMaizeRiceMaizeMaizeRiceRiceGroundnutHorse-gramOnionMaizeMoong(Green Gram)SunflowerWheatCowpea(Lobia)Horse-gramSunflowerRiceMoong(Green Gram)MaizeMaizeUradUradRiceMoong(Green Gram)MaizeMoong(Green Gram)RiceGroundnutMaizeRiceUradBajraMaizeUradBananaTobaccoUradArhar/TurMoong(Green Gram)BananaOnionOnionGroundnutMoong(Green Gram)SesamumMoong(Green Gram)UradMoong(Green Gram)OnionOnionMoong(Green Gram)Moong(Green

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gramRiceMaizeUradRiceGroundnutOnionOnionUradRiceDry chilliesMaizeMoong(Green Gram)MaizeMoong(Green Gram)Dry chilliesWheatHorse-gramMaizeMaizeOnionUradOnionMaizeUradMaizeOnionSunflowerGroundnutMaizeGroundnutGroundnutMaizeRiceMoong(Green Gram)RiceMaizeSunflowerJowarRiceRiceRicePeas & beans (Pulses)MaizeRiceMoong(Green Gram)MaizeOnionSunflowerOnionMoong(Green Gram)Moong(Green Gram)Horse-gramMoong(Green Gram)SunflowerGroundnutUradMaizeSesamumMoong(Green Gram)RiceGroundnutRiceMoong(Green Gram)UradMaizeRagiCowpea(Lobia)MaizeMaizeMoong(Green Gram)SesamumMaizeMoong(Green Gram)Moong(Green Gram)MaizePaddyGroundnutJowarMoong(Green Gram)MaizeMaizeSunflowerMaizeMaizeMoong(Green Gram)WheatMaizeMaizeMoong(Green Gram)RiceSunflowerSesamumGroundnutRiceSmall milletsMaizeGroundnutUradMoong(Green Gram)GroundnutSunflowerBananaPotatoRiceMoong(Green Gram)RiceOnionMaizeGroundnutMaizeRiceGroundnutMoong(Green Gram)RiceMaizeRiceJowarMaizeBananaUradMaizeMoong(Green Gram)RiceGroundnutSunflowerSesamumMoong(Green Gram)GroundnutWheatRagiRiceRiceSunflowerMaizeOnionBajraMoong(Green Gram)RiceMaizeRiceTobaccoUradMoong(Green Gram)UradMoong(Green Gram)MaizeJowarSesamumMoong(Green Gram)MaizeMoong(Green Gram)SunflowerRiceRiceDry chilliesRiceMaizeMoong(Green Gram)RiceSunflowerMaizeMaizeWheatRiceMaizeDry chilliesMoong(Green Gram)MaizeUradSesamumTotal foodgrainMaizeSunflowerDry chilliesMaizeJowarMaizeGroundnutRiceMaizeOnionGroundnutRiceJowarSesamumOnionRiceOnionCotton(lint)Moong(Green Gram)BajraRiceRiceRiceBajraRiceMaizeOnionMaizeRiceRiceSesamumCotton(lint)OnionBajraMaizeMaizeMaizeOnionDry chilliesGroundnutMaizeRiceMaizeSunflowerRiceSunflowerMoong(Green Gram)GroundnutMaizeRiceWheatRagiSunflowerMaizeMoong(Green Gram)RiceSunflowerRiceOnionRiceMaizeUradRiceMaizeOnionGroundnutUradRiceRiceMoong(Green Gram)UradMoong(Green Gram)RiceRiceWheatUradJowarMoong(Green Gram)SunflowerMoong(Green Gram)UradSesamumMoong(Green Gram)SunflowerRiceSunflowerGroundnutMaizeMaizeMoong(Green Gram)SunflowerRiceGroundnutMaizeGroundnutMaizeGroundnutGroundnutRiceDry chilliesMaizeMaizeMaizeGroundnutMaizeGroundnutMoong(Green Gram)RicePotatoBananaSesamumMoong(Green Gram)OnionPaddyDry chilliesWheatRiceMaizeRiceRiceRiceMaizeSesamumMaizeMaizeMaizeJowarDry chilliesPotatoMaizeMoong(Green Gram)SunflowerMaizeMaizeGroundnutRiceRiceOnionUradBananaMaizeMoong(Green Gram)MaizeWheatMoong(Green Gram)UradBajraMaizeOnionMaizeJowarMaizeRiceRiceRiceMoong(Green Gram)RiceUradMaizeRagiMaizeRiceUradMoong(Green Gram)RiceMaizeSunflowerGroundnutOnionMoong(Green Gram)UradMaizeGroundnutSunflowerUradUradMoong(Green Gram)Moong(Green Gram)RiceRiceOnionMaizeMaizeMaizeRiceOnionSesamumMaizeRiceRiceRiceMaizePotatoRiceRiceGroundnutWheatSunflowerPaddySesamumBananaJowarPeas & beans (Pulses)RiceRiceRiceMaizeOnionMaizeUradBananaMoong(Green Gram)UradOnionTobaccoRiceGroundnutOnionRiceMaizeRiceMoong(Green

Gram)UradMoong(Green Gram)GroundnutRiceRiceMaizeUradMoong(Green
Gram)Cotton(lint)OnionSunflowerMaizeMaizeMaizeRiceMoong(Green Gram)Moong(Green
Gram)RagiMaizeRiceGroundnutOnionMaizeOnionRiceDry chilliesOnionMoong(Green
Gram)JowarSesamumMoong(Green Gram)RiceMaizeRiceSesamumMoong(Green
Gram)Moong(Green Gram)SesamumUradMaizeGroundnutMaizeSunflowerCowpea(Lobia)Ground
nutRiceMaizeRagiMaizeGroundnutDry chilliesUradJowarMoong(Green
Gram)UradPaddyUradRiceMoong(Green Gram)RiceSunflowerMoong(Green Gram)'

```
[86]: pd.DataFrame({a.iloc[3][0]:})
```

```
  File "<ipython-input-86-792e4783cc50>", line 1
    pd.DataFrame({a.iloc[3][0]:})
                                ^
SyntaxError: invalid syntax
```

2 During which year did Haryana have the highest crop production?

```
[87]: df.head()
```

```
[87]:    Unnamed: 0      State_Name District_Name  Crop_Year        Season  \
      0           0       Karnataka         UDUPI       2005  Rabi
      1           1  Madhya Pradesh       GWALIOR       2003  Whole Year
      2           2  Andhra Pradesh      CHITTOOR       2010  Rabi
      3           3  Andhra Pradesh       KRISHNA       2014  Rabi
      4           4   Uttar Pradesh     SULTANPUR       2011  Rabi

               Crop    Area  Production
      0  Horse-gram  1122.0       836.0
      1     Brinjal   194.0         0.0
      2     Sesamum   334.0       118.0
      3      Tomato   538.0      7289.0
      4   Coriander    59.0        33.0
```

```
[88]: a=df.groupby(['State_Name','Crop_Year'])['Production'].sum().reset_index()
      a
```

```
[88]:                    State_Name  Crop_Year   Production
      0  Andaman and Nicobar Islands       2000      6952.00
      1  Andaman and Nicobar Islands       2001       301.00
      2  Andaman and Nicobar Islands       2002     47986.62
      3  Andaman and Nicobar Islands       2003  26660803.22
      4  Andaman and Nicobar Islands       2004  52399240.63
      ..                          ...        ...          ...
```

```
513              West Bengal    2010  11861068.00
514              West Bengal    2011  11443934.00
515              West Bengal    2012  16036957.00
516              West Bengal    2013  12979192.00
517              West Bengal    2014  17497459.00

[518 rows x 3 columns]
```

[89]: `a[a['State_Name']=="Andaman and Nicobar Islands"]`

[89]:
```
                   State_Name  Crop_Year    Production
0  Andaman and Nicobar Islands       2000       6952.00
1  Andaman and Nicobar Islands       2001        301.00
2  Andaman and Nicobar Islands       2002      47986.62
3  Andaman and Nicobar Islands       2003   26660803.22
4  Andaman and Nicobar Islands       2004   52399240.63
5  Andaman and Nicobar Islands       2005   26441821.13
6  Andaman and Nicobar Islands       2006   15407237.94
7  Andaman and Nicobar Islands       2010   82311554.28
```

[90]: `a[a['State_Name']=="Haryana"]`

[90]:
```
     State_Name  Crop_Year  Production
152     Haryana       1997   3376800.0
153     Haryana       1998   6653600.0
154     Haryana       1999   7188901.0
155     Haryana       2000   5872800.0
156     Haryana       2001   7009900.0
157     Haryana       2002   7837700.0
158     Haryana       2003   8437562.0
159     Haryana       2004   7523400.0
160     Haryana       2005   9328300.0
161     Haryana       2006   6566600.0
162     Haryana       2007   7323500.0
163     Haryana       2008   9647100.0
164     Haryana       2009   5214480.0
165     Haryana       2010   5548900.0
166     Haryana       2011   9021300.0
167     Haryana       2012   7996416.0
```

3 The maximum and minimum area for production were in the years

[21]: `df.head()`

```
[21]:    Unnamed: 0        State_Name District_Name  Crop_Year        Season  \
      0          0          Karnataka        UDUPI       2005  Rabi
      1          1  Madhya Pradesh       GWALIOR       2003  Whole Year
      2          2  Andhra Pradesh      CHITTOOR       2010  Rabi
      3          3  Andhra Pradesh       KRISHNA       2014  Rabi
      4          4   Uttar Pradesh     SULTANPUR       2011  Rabi


              Crop    Area  Production
      0  Horse-gram  1122.0       836.0
      1     Brinjal   194.0         0.0
      2     Sesamum   334.0       118.0
      3      Tomato   538.0      7289.0
      4   Coriander    59.0        33.0
```

```python
[22]: c=df.groupby(['Crop_Year'])['Area'].max().reset_index()
      c
```

```
[22]:     Crop_Year        Area
      0        1997  4205800.0
      1        1998   545286.0
      2        1999   699894.0
      3        2000   636700.0
      4        2001   483246.0
      5        2002   672100.0
      6        2003  1020181.0
      7        2004   857823.0
      8        2005   464880.0
      9        2006   933271.0
      10       2007   448200.0
      11       2008   608851.0
      12       2009   967622.0
      13       2010   545965.0
      14       2011   482718.0
      15       2012   486172.0
      16       2013   711145.0
      17       2014   496134.0
      18       2015   278000.0
```

```python
[23]: sns.barplot(c['Crop_Year'], c['Area'])
      plt.xticks(rotation=90)
      plt.show()
```
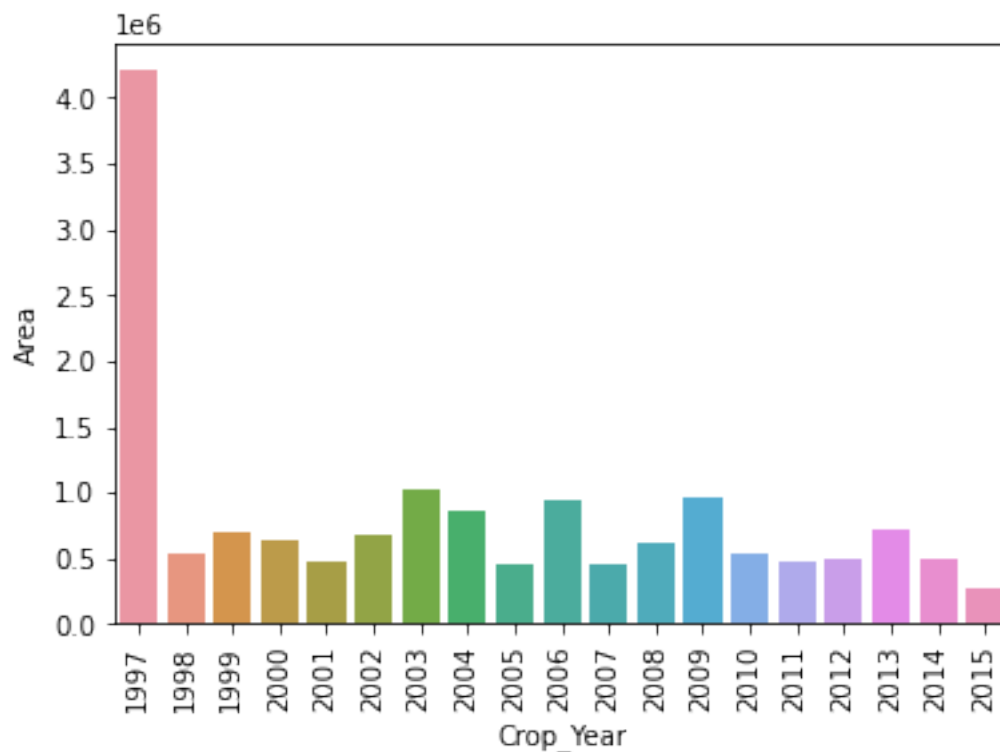
4 Which state in India had the second lowest crop production

```
[24]: df.head(2)
```

```
[24]:    Unnamed: 0     State_Name District_Name  Crop_Year      Season  \
      0           0      Karnataka         UDUPI       2005  Rabi
      1           1  Madhya Pradesh       GWALIOR       2003  Whole Year

              Crop     Area  Production
      0  Horse-gram  1122.0       836.0
      1     Brinjal   194.0         0.0
```

```
[91]: d=df.groupby(['State_Name'])['Production'].sum().sort_values(ascending=False).
      ↪reset_index()
      d
```

```
[91]:            State_Name    Production
      0              Kerala  2.299779e+10
      1      Andhra Pradesh  3.141848e+09
      2          Tamil Nadu  1.787126e+09
      3       Uttar Pradesh  1.069989e+09
```

```
4                    West Bengal   5.327023e+08
5                          Assam   5.201106e+08
6                    Maharashtra   3.930627e+08
7                      Karnataka   2.637879e+08
8    Andaman and Nicobar Islands   2.032759e+08
9                         Punjab   1.724376e+08
10                       Gujarat   1.538659e+08
11                           Goa   1.421826e+08
12                Madhya Pradesh   1.337226e+08
13                     Telangana   1.202722e+08
14                         Bihar   1.151581e+08
15                       Haryana   1.145473e+08
16                     Rajasthan   8.671658e+07
17                    Puducherry   7.326832e+07
18                        Odisha   4.563306e+07
19                   Uttarakhand   4.017398e+07
20                  Chhattisgarh   3.132986e+07
21              Himachal Pradesh   5.198802e+06
22                       Tripura   4.278173e+06
23             Jammu and Kashmir   4.018135e+06
24                      Nagaland   3.925012e+06
25                     Meghalaya   3.639914e+06
26                     Jharkhand   3.319141e+06
27             Arunachal Pradesh   2.035912e+06
28                       Manipur   1.658617e+06
29        Dadra and Nagar Haveli   6.247060e+05
30                        Sikkim   5.507250e+05
31                       Mizoram   4.579428e+05
32                    Chandigarh   1.580450e+04
```

```python
[92]: sns.barplot(d['State_Name'], d['Production'])
      plt.xticks(rotation=90)
      plt.show()
```

5 What were the top three produced crops in the year 2012?

```
[27]: df.head(2)
```

```
[27]:    Unnamed: 0     State_Name District_Name  Crop_Year       Season  \
      0           0      Karnataka         UDUPI       2005  Rabi
      1           1  Madhya Pradesh      GWALIOR       2003  Whole Year

             Crop    Area  Production
      0  Horse-gram  1122.0       836.0
      1     Brinjal   194.0         0.0
```
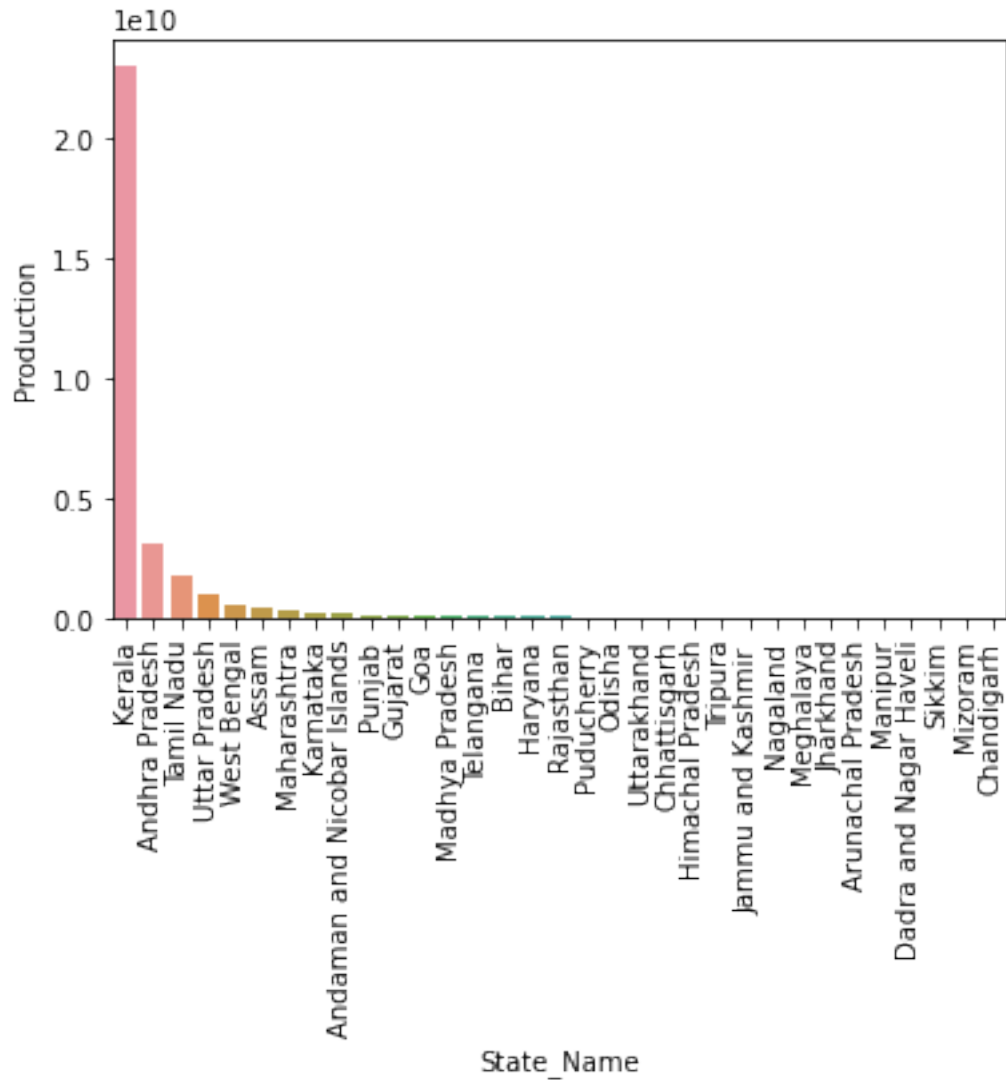
```
[28]: r=df.groupby(['Crop_Year'])['Crop'].sum().reset_index()
      r
```

```
[28]:     Crop_Year                                                  Crop
      0        1997  GroundnutCorianderBajraSugarcaneJowarSoyabeanO…
      1        1998  RiceTapiocaJowarSunflowerBajraCotton(lint)Maiz…
      2        1999  Rapeseed &MustardTobaccoBajraGarlicMestaJowarS…
      3        2000  GramRiceOther  Rabi pulsesRiceCashewnutHorse-g…
      4        2001  PotatoTurmericPotatoCastor seedWheatCorianderU…
      5        2002  OnionSweet potatoPeas & beans (Pulses)Small mi…
      6        2003  BrinjalOnionSugarcaneMoong(Green Gram)Sugarcan…
      7        2004  SugarcaneSannhampSannhampDry chilliesGroundnut…
      8        2005  Horse-gramOther Kharif pulsesUradRapeseed &Mus…
      9        2006  Niger seedGroundnutGramMaizeBajraMaizeBlack pe…
      10       2007  Dry chilliesMoong(Green Gram)RiceRapeseed &Mus…
      11       2008  GroundnutKhesariMoong(Green Gram)Sweet potatoS…
      12       2009  Horse-gramGramMasoorRapeseed &MustardHorse-gra…
      13       2010  SesamumSunflowerPeas & beans (Pulses)OnionOnio…
      14       2011  CorianderBlack pepperPeas & beans (Pulses)Arec…
      15       2012  Rapeseed &MustardCorianderHorse-gramGramUradWh…
      16       2013  OnionUradSweet potatoDry gingerRiceCorianderMa…
      17       2014  TomatoRiceMaizeWheatOnionGarlicGarlicSweet pot…
      18       2015  SesamumUradMoong(Green Gram)Moong(Green Gram)W…
```

```
[29]: r[r['Crop_Year']==2012]
```

```
[29]:     Crop_Year                                                  Crop
      15       2012  Rapeseed &MustardCorianderHorse-gramGramUradWh…
```

```
[30]: sns.barplot(df['Crop_Year'],df['Production'])
      plt.xticks(rotation=90)
      plt.show()
```
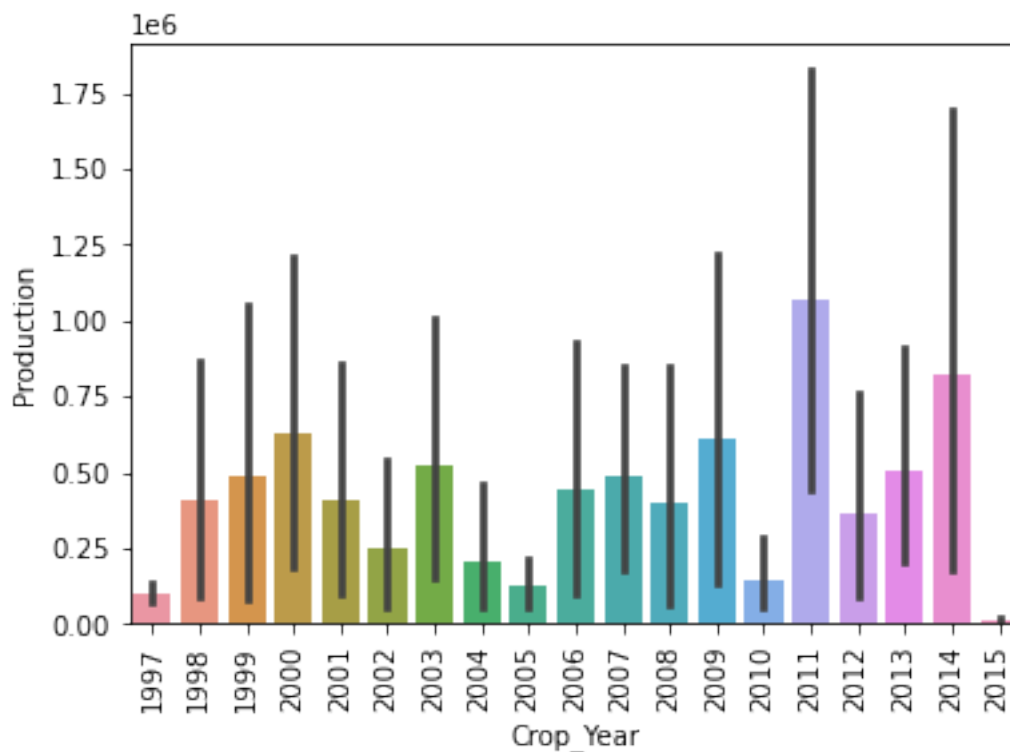
```
[31]: df[df['Crop_Year']==2012]
```

[31]:

	Unnamed: 0	State_Name	District_Name	Crop_Year	Season \
26	26	Nagaland	KIPHIRE	2012	Rabi
44	44	Madhya Pradesh	HOSHANGABAD	2012	Whole Year
74	74	Chhattisgarh	DHAMTARI	2012	Kharif
76	76	Uttarakhand	UDAM SINGH NAGAR	2012	Rabi
94	94	Tamil Nadu	KRISHNAGIRI	2012	Kharif
...	...	...	...	...	...
73706	73706	Kerala	KOLLAM	2012	Whole Year
73724	73724	Uttar Pradesh	UNNAO	2012	Rabi
73769	73769	Karnataka	BENGALURU URBAN	2012	Whole Year
73771	73771	Meghalaya	SOUTH GARO HILLS	2012	Whole Year
73805	73805	Andhra Pradesh	KRISHNA	2012	Rabi

	Crop	Area	Production
26	Rapeseed &Mustard	1190.0	1200.0
44	Coriander	305.0	143.0
74	Horse-gram	124.0	42.0
76	Gram	28.0	17.0
94	Urad	4162.0	2381.0
...	...	...	...
73706	Cashewnut	3264.0	883.0

```
73724              Garlic    287.0        1491.0
73769          Dry ginger      5.0         159.0
73771            Turmeric     87.0         492.0
73805              Tomato    880.0        8569.0

[3886 rows x 8 columns]
```

[32]: `df[df['Crop_Year']==2012].sort_values(by='Production',ascending=False).head(20)`

[32]:

	Unnamed: 0	State_Name	District_Name	Crop_Year	Season
64571	64571	Kerala	THRISSUR	2012	Whole Year
53633	53633	Kerala	KOLLAM	2012	Whole Year
21230	21230	Andhra Pradesh	VISAKHAPATANAM	2012	Whole Year
58436	58436	Kerala	IDUKKI	2012	Whole Year
22516	22516	Kerala	WAYANAD	2012	Whole Year
36011	36011	Andhra Pradesh	KRISHNA	2012	Whole Year
66074	66074	Uttar Pradesh	KHERI	2012	Kharif
67136	67136	Andhra Pradesh	SPSR NELLORE	2012	Whole Year
45321	45321	Uttar Pradesh	MUZAFFARNAGAR	2012	Kharif
47968	47968	Maharashtra	SOLAPUR	2012	Whole Year
37017	37017	Uttar Pradesh	SITAPUR	2012	Kharif
30347	30347	Bihar	PASCHIM CHAMPARAN	2012	Whole Year
3051	3051	Uttar Pradesh	BAREILLY	2012	Kharif
35041	35041	Uttar Pradesh	BAGHPAT	2012	Kharif
16939	16939	Tamil Nadu	TIRUVANNAMALAI	2012	Whole Year
46408	46408	Uttar Pradesh	KUSHI NAGAR	2012	Kharif
17578	17578	Tamil Nadu	CUDDALORE	2012	Whole Year
67135	67135	Uttar Pradesh	BULANDSHAHR	2012	Kharif
22051	22051	West Bengal	HOOGHLY	2012	Rabi
45828	45828	Maharashtra	LATUR	2012	Whole Year

	Crop	Area	Production
64571	Coconut	86476.0	548000000.0
53633	Coconut	55120.0	372000000.0
21230	Coconut	6116.0	99838000.0
58436	Coconut	17265.0	94000000.0
22516	Coconut	9995.0	46000000.0
36011	Coconut	2008.0	34309000.0
66074	Sugarcane	238233.0	14359732.0
67136	Coconut	735.0	12558000.0
45321	Sugarcane	172512.0	12320117.0
47968	Sugarcane	144200.0	9716600.0
37017	Sugarcane	133669.0	8443069.0
30347	Sugarcane	151761.0	7030930.0
3051	Sugarcane	96523.0	6046973.0
35041	Sugarcane	73561.0	5404085.0
16939	Sugarcane	43477.0	4376790.0

```
46408   Sugarcane    70220.0    3989900.0
17578   Sugarcane    30638.0    3445715.0
67135   Sugarcane    54231.0    3306139.0
22051      Potato   100155.0    3246422.0
45828   Sugarcane    46400.0    3051100.0
```

6 What is the standard deviation for Area of production

[33]: `df['Production'].std()`

[33]: 13467063.590623608

7 Which is the crop that gave the highest production to the state of Andhra Pradesh?

[34]: `df.head()`

[34]:
```
   Unnamed: 0      State_Name District_Name  Crop_Year       Season  \
0           0       Karnataka         UDUPI       2005  Rabi
1           1  Madhya Pradesh       GWALIOR       2003  Whole Year
2           2  Andhra Pradesh      CHITTOOR       2010  Rabi
3           3  Andhra Pradesh       KRISHNA       2014  Rabi
4           4   Uttar Pradesh     SULTANPUR       2011  Rabi

         Crop     Area   Production
0  Horse-gram   1122.0        836.0
1     Brinjal    194.0          0.0
2     Sesamum    334.0        118.0
3      Tomato    538.0       7289.0
4   Coriander     59.0         33.0
```

[35]:
```
v=df[df['State_Name']=='Andhra Pradesh']
v
```

[35]:
```
        Unnamed: 0      State_Name District_Name  Crop_Year       Season  \
2                2  Andhra Pradesh      CHITTOOR       2010  Rabi
3                3  Andhra Pradesh       KRISHNA       2014  Rabi
86              86  Andhra Pradesh       KURNOOL       2011  Kharif
126            126  Andhra Pradesh      CHITTOOR       2000  Whole Year
175            175  Andhra Pradesh      CHITTOOR       2007  Kharif
...            ...             ...           ...        ...  ...
73681        73681  Andhra Pradesh  SPSR NELLORE       2006  Whole Year
73713        73713  Andhra Pradesh       KRISHNA       2005  Kharif
73787        73787  Andhra Pradesh       PRAKASAM       2006  Rabi
73805        73805  Andhra Pradesh       KRISHNA       2012  Rabi
```

```
73826       73826  Andhra Pradesh      GUNTUR       2005  Rabi

                    Crop      Area  Production
2                 Sesamum     334.0       118.0
3                  Tomato     538.0      7289.0
86      Moong(Green Gram)    1284.0       824.0
126             Cashewnut     126.0        27.0
175             Horse-gram    4000.0      2000.0
...                   ...       ...          ...
73681            Sugarcane   10395.0   1189593.0
73713           Cotton(lint)  45825.0     88415.0
73787                Jowar    2326.0      2410.0
73805               Tomato     880.0      8569.0
73826                 Urad  100125.0     78298.0

[2798 rows x 8 columns]
```

[36]:
```python
v.groupby(['District_Name'])['Production'].max().sort_values(ascending=False).
↪reset_index()
```

[36]:
```
        District_Name   Production
0       EAST GODAVARI  780162000.0
1       WEST GODAVARI  289443441.0
2      VISAKHAPATANAM  160779000.0
3          SRIKAKULAM   99616798.0
4        VIZIANAGARAM   43592000.0
5             KRISHNA   34309000.0
6            CHITTOOR   29376960.0
7         SPSR NELLORE   12558000.0
8           ANANTAPUR    7165320.0
9              GUNTUR    5555550.0
10           PRAKASAM    2369640.0
11            KURNOOL     809620.0
12             KADAPA     488607.0
```

[37]:
```python
v.groupby(['Crop'])['Production'].max().sort_values(ascending=False).
↪reset_index()
```

[37]:
```
              Crop   Production
0          Coconut  780162000.0
1        Sugarcane    3697441.0
2             Rice    1624324.0
3            Maize     950884.0
4      Cotton(lint)     809620.0
..             ...          ...
62        Cucumber          0.0
63     Bottle Gourd          0.0
```

```
64   Other Vegetables         0.0
65        other fibres        0.0
66  Peas  (vegetable)         0.0

[67 rows x 2 columns]
```

8   Which of the following statements is true? (Select all that applies)

    a. The overall production during the Kharif season is 2,029,970,000 (approx.)
    b. The overall production during the Summer season is 51,992,900 (approx.)
    c. The overall production during the Autumn season is 14,413,770 (approx.)
    d. The overall production during the Kharif season is 1,282,056,700 (approx.)

[38]: `df.head()`

```
[38]:    Unnamed: 0       State_Name District_Name  Crop_Year       Season  \
      0           0        Karnataka         UDUPI       2005  Rabi
      1           1  Madhya Pradesh       GWALIOR       2003  Whole Year
      2           2  Andhra Pradesh      CHITTOOR       2010  Rabi
      3           3  Andhra Pradesh       KRISHNA       2014  Rabi
      4           4   Uttar Pradesh     SULTANPUR       2011  Rabi

              Crop    Area  Production
      0  Horse-gram  1122.0       836.0
      1     Brinjal   194.0         0.0
      2     Sesamum   334.0       118.0
      3      Tomato   538.0      7289.0
      4   Coriander    59.0        33.0
```

[39]: `df.groupby(['Season'])['Production'].max().reset_index()`
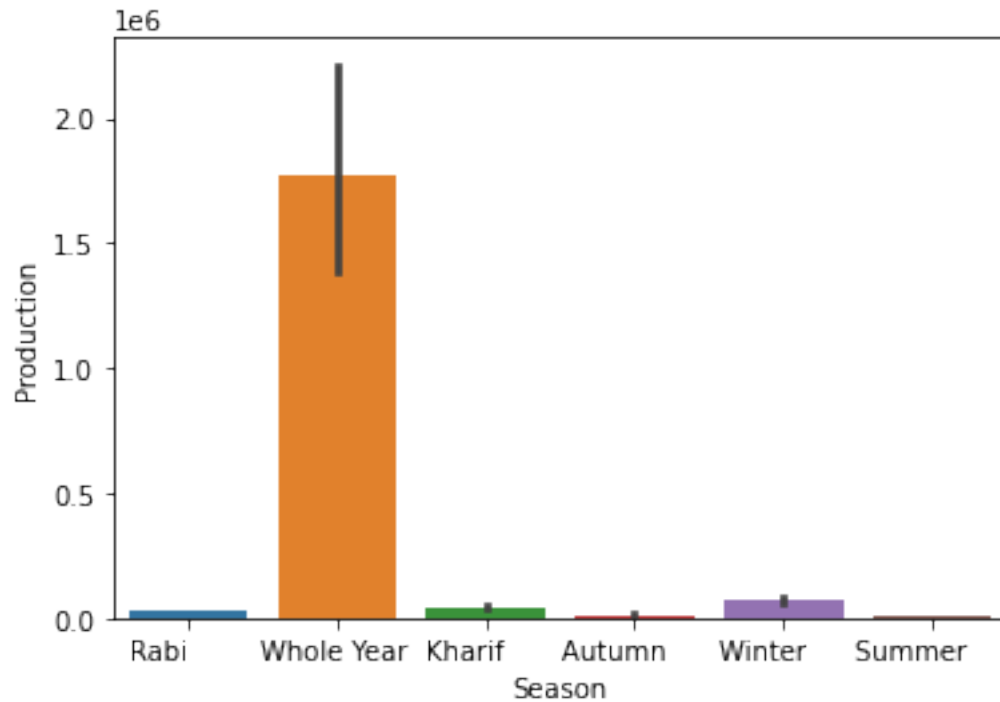
```
[39]:        Season    Production
      0     Autumn  2.573210e+05
      1     Kharif  1.520591e+07
      2       Rabi  3.506137e+06
      3     Summer  8.822890e+05
      4  Whole Year  1.001000e+09
      5     Winter  1.841788e+06
```

[40]: `sns.barplot(df['Season'],df['Production'], data=df)`

[40]: `<AxesSubplot:xlabel='Season', ylabel='Production'>`

9 Which state has the lowest area of production

```
[95]: df.head(2)
```

```
[95]:    Unnamed: 0     State_Name District_Name  Crop_Year       Season  \
      0           0      Karnataka         UDUPI       2005  Rabi
      1           1  Madhya Pradesh       GWALIOR       2003  Whole Year

               Crop    Area  Production
      0  Horse-gram  1122.0       836.0
      1     Brinjal   194.0         0.0
```

```
[99]: df.groupby(['State_Name'])['Area'].sum().sort_values()
```

```
[99]: State_Name
      Chandigarh                   2.791000e+03
      Andaman and Nicobar Islands  8.531894e+04
      Dadra and Nagar Haveli       1.182820e+05
      Puducherry                   1.206340e+05
      Goa                          2.702040e+05
      Mizoram                      2.711313e+05
      Sikkim                       3.922050e+05
      Manipur                      6.121800e+05
```

```
Meghalaya                   1.270237e+06
Arunachal Pradesh           1.283609e+06
Tripura                     1.605874e+06
Nagaland                    1.800631e+06
Jammu and Kashmir           2.744164e+06
Jharkhand                   2.748473e+06
Himachal Pradesh            2.897344e+06
Uttarakhand                 5.714422e+06
Kerala                      8.871677e+06
Assam                       2.065623e+07
Telangana                   2.225371e+07
Chhattisgarh                2.547540e+07
Haryana                     2.756965e+07
Tamil Nadu                  2.922639e+07
Odisha                      3.132268e+07
Punjab                      3.692255e+07
Andhra Pradesh              3.864198e+07
Bihar                       3.881541e+07
Gujarat                     4.835700e+07
Karnataka                   5.735193e+07
West Bengal                 6.637353e+07
Rajasthan                   8.258156e+07
Maharashtra                 9.356024e+07
Madhya Pradesh              9.968280e+07
Uttar Pradesh               1.251196e+08
Name: Area, dtype: float64
```

[100]: `df['Area'].mean()`

[100]: 12035.385977242398

[101]: *#q11*

[102]: `df`

[102]:
```
        Unnamed: 0      State_Name District_Name  Crop_Year       Season  \
0                0       Karnataka         UDUPI       2005  Rabi
1                1  Madhya Pradesh       GWALIOR       2003  Whole Year
2                2  Andhra Pradesh      CHITTOOR       2010  Rabi
3                3  Andhra Pradesh       KRISHNA       2014  Rabi
4                4   Uttar Pradesh     SULTANPUR       2011  Rabi
...            ...             ...           ...        ...         ...
73822        73822   Uttar Pradesh     SULTANPUR       2001  Rabi
73823        73823    Chhattisgarh          DURG       2014  Rabi
73824        73824   Uttar Pradesh    RAE BARELI       2010  Summer
73825        73825           Assam        KAMRUP       1998  Rabi
73826        73826  Andhra Pradesh        GUNTUR       2005  Rabi
```

```
              Crop      Area   Production
0          Horse-gram  1122.0       836.0
1            Brinjal    194.0         0.0
2            Sesamum    334.0       118.0
3             Tomato    538.0      7289.0
4          Coriander     59.0        33.0
…                 …         …           …
73822  Rapeseed &Mustard  3727.0    3239.0
73823          Wheat    6364.0      7367.0
73824  Moong(Green Gram)   489.0     224.0
73825          Wheat    6431.0      6940.0
73826           Urad  100125.0     78298.0

[72679 rows x 8 columns]
```