In [1]:
```python
import numpy as np
import pandas as pd
import matplotlib.pyplot as pt
```

In [2]:
```python
df=pd.read_csv("dataset.csv")
```

In [3]:
```python
df.head
```

Out[3]:
```
<bound method NDFrame.head of              State       Crop  CostCultivation  CostCultivation2  Production  \
0    Uttar Pradesh      ARHAR          9794.05           9800.25     1941.55
1        Karnataka      ARHAR         10593.15          10594.15     2172.46
2          Gujarat      ARHAR         13468.82          13469.82     1898.30
3   Andhra Pradesh      ARHAR         17051.66          17052.66     3670.54
4      Maharashtra      ARHAR         17130.55          17131.55     2775.80
5      Maharashtra     COTTON         23711.44          23712.44     2539.47
6           Punjab     COTTON         29047.10          29048.10     2003.76
7   Andhra Pradesh     COTTON         29140.77          29141.77     2509.99
8          Gujarat     COTTON         29616.09          29617.09     2179.26
9          Haryana     COTTON         29918.97          29919.97     2127.35
10       Rajasthan       GRAM          8552.69           8553.69     1691.66
11  Madhya Pradesh       GRAM          9803.89           9804.89     1551.94
12   Uttar Pradesh       GRAM         12833.04          12834.04     1882.68
13     Maharashtra       GRAM         12985.95          12986.95     2277.68
14  Andhra Pradesh       GRAM         14421.98          14422.98     1559.04
15       Karnataka  GROUNDNUT         13647.10          13648.10     3484.01
16  Andhra Pradesh  GROUNDNUT         21229.01          21230.01     2554.91
17      Tamil Nadu  GROUNDNUT         22507.86          22508.86     2358.00
18         Gujarat  GROUNDNUT         22951.28          22952.28     1918.92
19     Maharashtra  GROUNDNUT         26078.66          26079.66     3207.35
20           Bihar      MAIZE         13513.92          13514.92      404.43
21       Karnataka      MAIZE         13792.85          13793.85      581.69
22       Rajasthan      MAIZE         14421.46          14422.46      658.77
23   Uttar Pradesh      MAIZE         15635.43          15636.43     1387.36
24  Andhra Pradesh      MAIZE         25687.09          25688.09      840.58
25          Orissa      MOONG          5483.54           5484.54     2614.14
26       Rajasthan      MOONG          6204.23           6205.23     2068.67
27       Karnataka      MOONG          6440.64           6441.64     5777.48
28  Andhra Pradesh      MOONG          6684.18           6685.18     2228.97
29     Maharashtra      MOONG         10780.76          10781.76     2261.24
30   Uttar Pradesh      PADDY         17022.00          17023.00      732.62
31          Orissa      PADDY         17478.05          17479.05      715.04
32     West Bengal      PADDY         24731.06          24732.06      731.25
33          Punjab      PADDY         25154.75          25155.75      669.86
34  Andhra Pradesh      PADDY         29664.84          29665.84      789.90
35  Madhya Pradesh    MUSTARD          8686.43           8687.43     1279.60
36       Rajasthan    MUSTARD         11385.70          11386.70     1341.29
37   Uttar Pradesh    MUSTARD         12774.41          12775.41     1595.56
38         Gujarat    MUSTARD         13740.64          13741.64     1610.40
39         Haryana    MUSTARD         14715.27          14716.27     1251.12
40   Uttar Pradesh  SUGARCANE         24538.32          24539.32       93.64
41       Karnataka  SUGARCANE         55655.44          55656.44       86.53
42  Andhra Pradesh  SUGARCANE         56621.16          56622.16      119.72
43     Maharashtra  SUGARCANE         57673.60          57674.60      107.56
44      Tamil Nadu  SUGARCANE         66335.06          66336.06       85.79
45  Madhya Pradesh      WHEAT         12464.40          12465.40      810.25
46          Punjab      WHEAT         17945.58          17946.58      804.80
47   Uttar Pradesh      WHEAT         18979.38          18980.38      769.84
48       Rajasthan      WHEAT         19119.08          19120.08      683.58

     Yield  Temperature  RainFall Annual     Price
0     9.83        28.96           3373.2  19589.10
1     7.47        29.22           3520.7  21187.30
2     9.59        28.47           2957.4  26938.64
3     6.42        28.49           3079.6  34104.32
4     8.72        28.30           2566.7  34262.10
5    12.69        28.73           2534.4  47423.88
6    24.39        28.65           3347.9  58095.20
7    17.83        28.83           3576.4  58282.54
8    19.05        28.38           2899.4  59233.18
9    19.90        28.53           2687.2  59838.94
10    6.83        28.62           2960.5  17106.38
11   10.29        28.95           2365.8  19608.78
12   10.93        28.67           2957.8  25667.08
13    8.05        28.66           2741.3  25972.90
14   16.69        28.94           2937.5  28844.96
15    4.71        28.82           2612.4  27295.20
16   11.97        28.11           3275.0  42459.02
17   11.98        28.66           2352.1  45016.72
18   13.45        28.66           2943.2  45903.56
19    9.33        28.76           2606.4  52158.32
20   42.95        28.86           3554.2  27028.84
```

```
21    31.10        28.80          2357.7   27586.70
22    23.56        28.74          2442.9   28843.92
23    13.70        28.80          2480.5   31271.86
24    42.68        28.67          3282.2   51375.18
25     3.01        28.70          2442.9   10968.08
26     4.05        28.59          2998.3   12409.46
27     1.32        28.98          2926.6   12882.28
28     5.90        28.76          3075.1   13369.36
29     6.70        28.65          2357.7   21562.52
30    36.61        29.15          3007.5   34045.00
31    32.42        29.09          2987.5   34957.10
32    39.04        28.49          3722.8   49463.12
33    67.41        29.03          3154.0   50310.50
34    56.00        28.76          2987.5   59330.68
35    12.94        28.71          3591.1   17373.86
36    13.54        28.70          3264.4   22772.40
37    13.57        28.70          2782.5   25549.82
38    11.61        28.85          3007.5   27482.28
39    19.94        28.88          2898.2   29431.54
40   448.89        29.46          2782.5   49077.64
41   986.21        28.98          2791.6  111311.88
42   757.92        28.80          3007.5  113243.32
43   744.01        28.89          3489.6  115348.20
44  1015.45        28.97          2422.2  132671.12
45    23.59        29.37          3275.1   24929.80
46    39.83        28.84          3079.9   35892.16
47    34.99        28.73          2721.9   37959.76
48    37.19        28.89          3449.0   38239.16  >
```

In [4]:
```
df.describe()
```

Out[4]:

	CostCultivation	CostCultivation2	Production	Yield	Temperature	RainFall Annual	Price
count	49.000000	49.000000	49.000000	49.000000	49.000000	49.000000	49.000000
mean	20363.537347	20364.643469	1620.537755	98.086735	28.780612	2951.740816	40728.074694
std	13561.435306	13561.350894	1104.990472	245.293123	0.246555	373.964966	27122.870613
min	5483.540000	5484.540000	85.790000	1.320000	28.110000	2352.100000	10968.080000
25%	12774.410000	12775.410000	732.620000	9.590000	28.660000	2687.200000	25549.820000
50%	17022.000000	17023.000000	1595.560000	13.700000	28.760000	2957.800000	34045.000000
75%	24731.060000	24732.060000	2228.970000	36.610000	28.890000	3264.400000	49463.120000
max	66335.060000	66336.060000	5777.480000	1015.450000	29.460000	3722.800000	132671.120000

In [5]:
```
df.shape
```

Out[5]:
```
(49, 9)
```

In [6]:
```
df.nunique()
```

Out[6]:
```
State               13
Crop                10
CostCultivation     49
CostCultivation2    49
Production          49
Yield               49
Temperature         35
RainFall Annual     43
Price               49
dtype: int64
```

In [7]:
```
df.duplicated().sum()
```

Out[7]:
```
0
```

In [8]:
```
df['avg_CostCultivation_CostCultivation2']=df[['CostCultivation' , 'CostCultivation2']].mean(axis=1)
```

In [9]:
```
df.head
```

Out[9]:
```
<bound method NDFrame.head of              State       Crop  CostCultivation  CostCultivation2  Production  \
0    Uttar Pradesh      ARHAR          9794.05           9800.25     1941.55
1        Karnataka      ARHAR         10593.15          10594.15     2172.46
2          Gujarat      ARHAR         13468.82          13469.82     1898.30
3   Andhra Pradesh      ARHAR         17051.66          17052.66     3670.54
4      Maharashtra      ARHAR         17130.55          17131.55     2775.80
5      Maharashtra     COTTON         23711.44          23712.44     2539.47
6           Punjab     COTTON         29047.10          29048.10     2003.76
7   Andhra Pradesh     COTTON         29140.77          29141.77     2509.99
8          Gujarat     COTTON         29616.09          29617.09     2179.26
```

9	Haryana	COTTON	29918.97	29919.97	2127.35
10	Rajasthan	GRAM	8552.69	8553.69	1691.66
11	Madhya Pradesh	GRAM	9803.89	9804.89	1551.94
12	Uttar Pradesh	GRAM	12833.04	12834.04	1882.68
13	Maharashtra	GRAM	12985.95	12986.95	2277.68
14	Andhra Pradesh	GRAM	14421.98	14422.98	1559.04
15	Karnataka	GROUNDNUT	13647.10	13648.10	3484.01
16	Andhra Pradesh	GROUNDNUT	21229.01	21230.01	2554.91
17	Tamil Nadu	GROUNDNUT	22507.86	22508.86	2358.00
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19	Maharashtra	GROUNDNUT	26078.66	26079.66	3207.35
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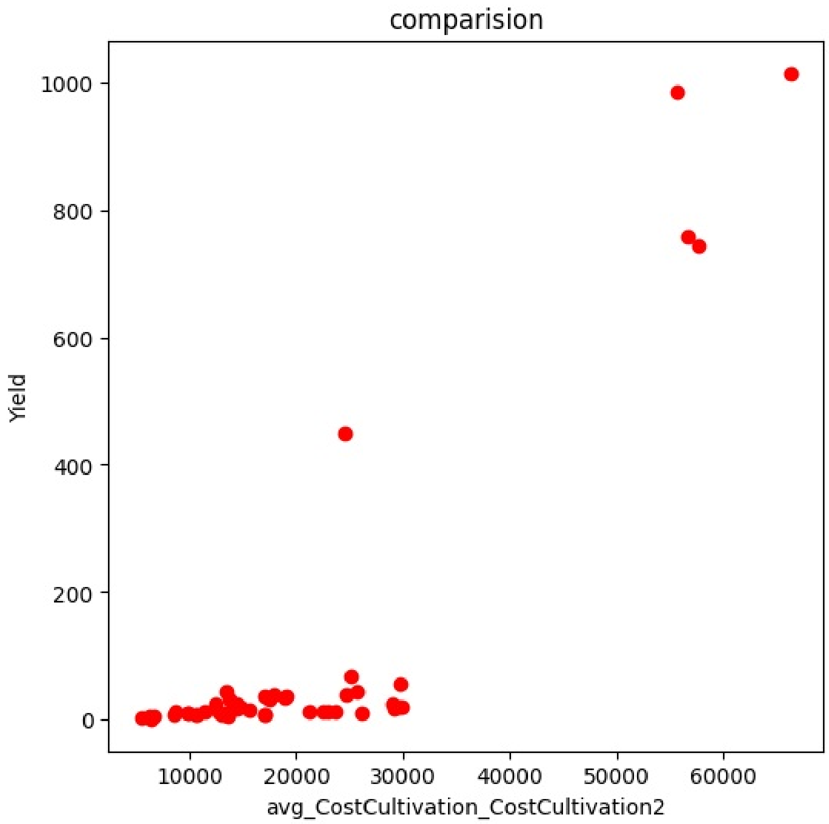
21	Karnataka	MAIZE	13792.85	13793.85	581.69
22	Rajasthan	MAIZE	14421.46	14422.46	658.77
23	Uttar Pradesh	MAIZE	15635.43	15636.43	1387.36
24	Andhra Pradesh	MAIZE	25687.09	25688.09	840.58
25	Orissa	MOONG	5483.54	5484.54	2614.14
26	Rajasthan	MOONG	6204.23	6205.23	2068.67
27	Karnataka	MOONG	6440.64	6441.64	5777.48
28	Andhra Pradesh	MOONG	6684.18	6685.18	2228.97
29	Maharashtra	MOONG	10780.76	10781.76	2261.24
30	Uttar Pradesh	PADDY	17022.00	17023.00	732.62
31	Orissa	PADDY	17478.05	17479.05	715.04
32	West Bengal	PADDY	24731.06	24732.06	731.25
33	Punjab	PADDY	25154.75	25155.75	669.86
34	Andhra Pradesh	PADDY	29664.84	29665.84	789.90
35	Madhya Pradesh	MUSTARD	8686.43	8687.43	1279.60
36	Rajasthan	MUSTARD	11385.70	11386.70	1341.29
37	Uttar Pradesh	MUSTARD	12774.41	12775.41	1595.56
38	Gujarat	MUSTARD	13740.64	13741.64	1610.40
39	Haryana	MUSTARD	14715.27	14716.27	1251.12
40	Uttar Pradesh	SUGARCANE	24538.32	24539.32	93.64
41	Karnataka	SUGARCANE	55655.44	55656.44	86.53
42	Andhra Pradesh	SUGARCANE	56621.16	56622.16	119.72
43	Maharashtra	SUGARCANE	57673.60	57674.60	107.56
44	Tamil Nadu	SUGARCANE	66335.06	66336.06	85.79
45	Madhya Pradesh	WHEAT	12464.40	12465.40	810.25
46	Punjab	WHEAT	17945.58	17946.58	804.80
47	Uttar Pradesh	WHEAT	18979.38	18980.38	769.84
48	Rajasthan	WHEAT	19119.08	19120.08	683.58

	Yield	Temperature	RainFall Annual	Price	\
0	9.83	28.96	3373.2	19589.10	
1	7.47	29.22	3520.7	21187.30	
2	9.59	28.47	2957.4	26938.64	
3	6.42	28.49	3079.6	34104.32	
4	8.72	28.30	2566.7	34262.10	
5	12.69	28.73	2534.4	47423.88	
6	24.39	28.65	3347.9	58095.20	
7	17.83	28.83	3576.4	58282.54	
8	19.05	28.38	2899.4	59233.18	
9	19.90	28.53	2687.2	59838.94	
10	6.83	28.62	2960.5	17106.38	
11	10.29	28.95	2365.8	19608.78	
12	10.93	28.67	2957.8	25667.08	
13	8.05	28.66	2741.3	25972.90	
14	16.69	28.94	2937.5	28844.96	
15	4.71	28.82	2612.4	27295.20	
16	11.97	28.11	3275.0	42459.02	
17	11.98	28.66	2352.1	45016.72	
18	13.45	28.66	2943.2	45903.56	
19	9.33	28.76	2606.4	52158.32	
20	42.95	28.86	3554.2	27028.84	
21	31.10	28.80	2357.7	27586.70	
22	23.56	28.74	2442.9	28843.92	
23	13.70	28.80	2480.5	31271.86	
24	42.68	28.67	3282.2	51375.18	
25	3.01	28.70	2442.9	10968.08	
26	4.05	28.59	2998.3	12409.46	
27	1.32	28.98	2926.6	12882.28	
28	5.90	28.76	3075.1	13369.36	
29	6.70	28.65	2357.7	21562.52	
30	36.61	29.15	3007.5	34045.00	
31	32.42	29.09	2987.5	34957.10	
32	39.04	28.49	3722.8	49463.12	
33	67.41	29.03	3154.0	50310.50	
34	56.00	28.76	2987.5	59330.68	
35	12.94	28.71	3591.1	17373.86	
36	13.54	28.70	3264.4	22772.40	
37	13.57	28.70	2782.5	25549.82	
38	11.61	28.85	3007.5	27482.28	
39	19.94	28.88	2898.2	29431.54	
40	448.89	29.46	2782.5	49077.64	

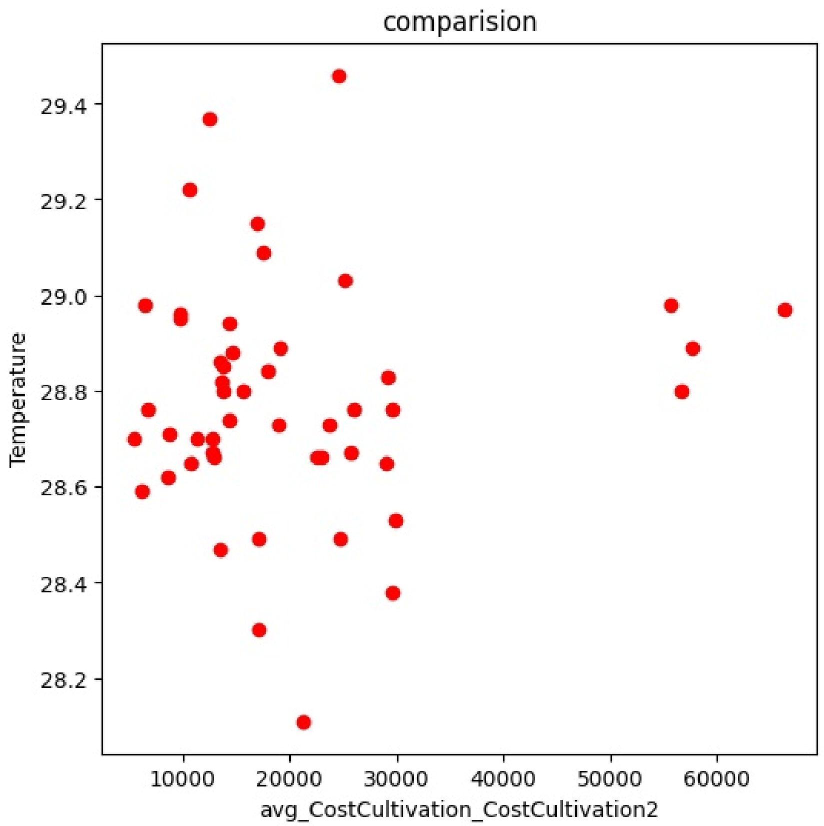
```
41   986.21        28.98           2791.6  111311.88
42   757.92        28.80           3007.5  113243.32
43   744.01        28.89           3489.6  115348.20
44  1015.45        28.97           2422.2  132671.12
45    23.59        29.37           3275.1   24929.80
46    39.83        28.84           3079.9   35892.16
47    34.99        28.73           2721.9   37959.76
48    37.19        28.89           3449.0   38239.16

    avg_CostCultivation_CostCultivation2
0                                9797.15
1                               10593.65
2                               13469.32
3                               17052.16
4                               17131.05
5                               23711.94
6                               29047.60
7                               29141.27
8                               29616.59
9                               29919.47
10                               8553.19
11                               9804.39
12                              12833.54
13                              12986.45
14                              14422.48
15                              13647.60
16                              21229.51
17                              22508.36
18                              22951.78
19                              26079.16
20                              13514.42
21                              13793.35
22                              14421.96
23                              15635.93
24                              25687.59
25                               5484.04
26                               6204.73
27                               6441.14
28                               6684.68
29                              10781.26
30                              17022.50
31                              17478.55
32                              24731.56
33                              25155.25
34                              29665.34
35                               8686.93
36                              11386.20
37                              12774.91
38                              13741.14
39                              14715.77
40                              24538.82
41                              55655.94
42                              56621.66
43                              57674.10
44                              66335.56
45                              12464.90
46                              17946.08
47                              18979.88
48                              19119.58  >
```

In [10]:

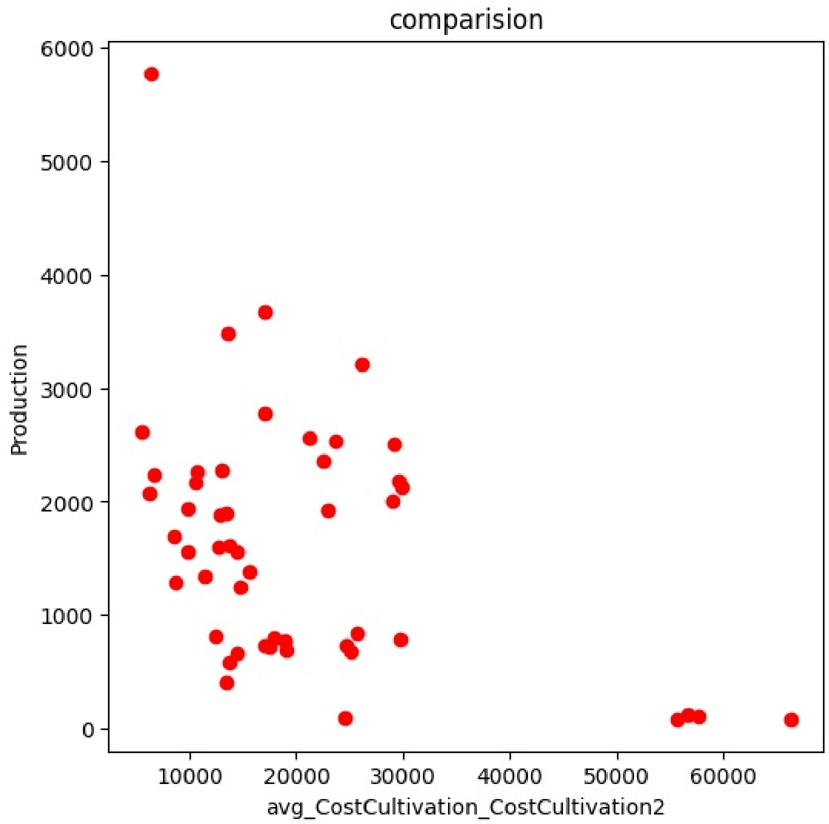
```
pt.figure(figsize=(6,6))
pt.scatter(df['avg_CostCultivation_CostCultivation2'],df['Yield'],color='red',alpha=1)
pt.title('comparision')
pt.xlabel('avg_CostCultivation_CostCultivation2')
pt.ylabel('Yield')
pt.show()
```



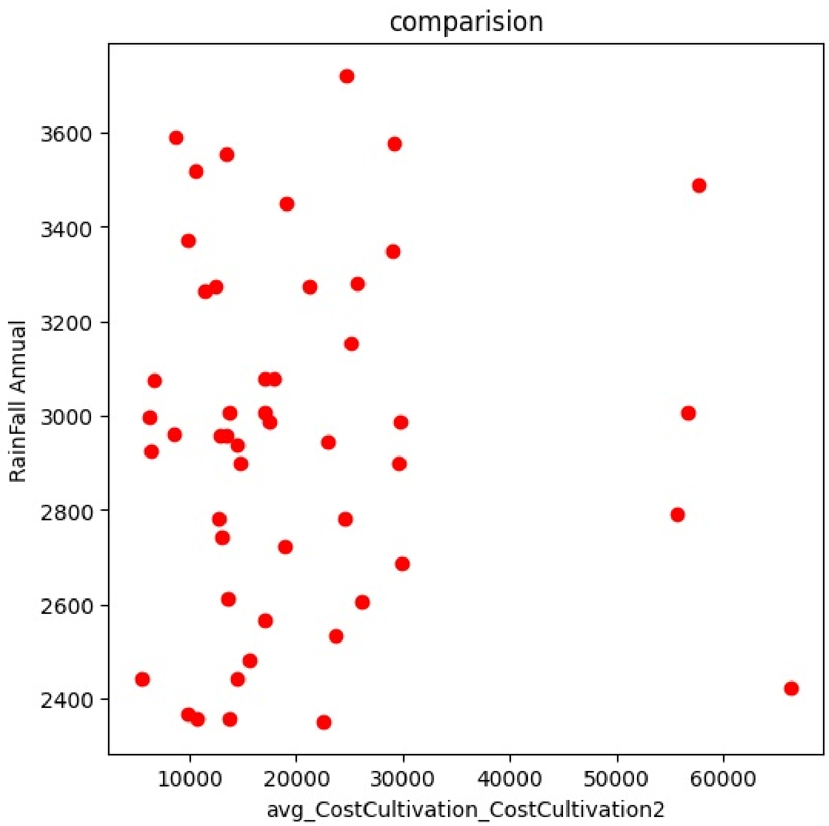
In [11]:
```
pt.figure(figsize=(6,6))
pt.scatter(df['avg_CostCultivation_CostCultivation2'],df['Temperature'],color='red',alpha=1)
pt.title('comparision')
pt.xlabel('avg_CostCultivation_CostCultivation2')
pt.ylabel('Temperature')
pt.show()
```



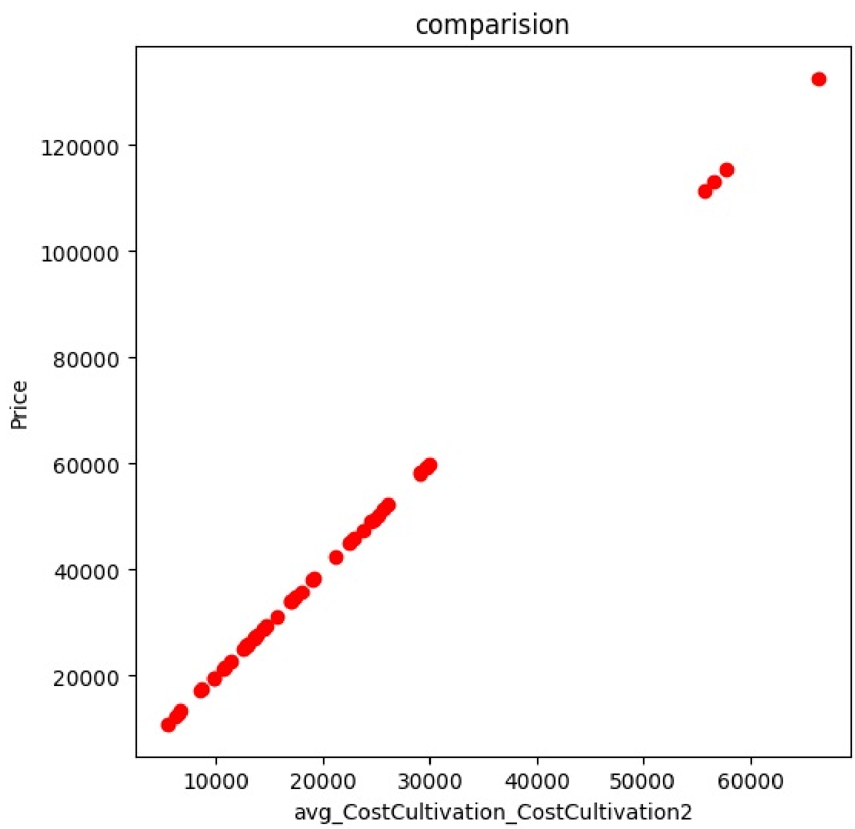
In [12]:
```
pt.figure(figsize=(6,6))
pt.scatter(df['avg_CostCultivation_CostCultivation2'],df['Production'],color='red',alpha=1)
pt.title('comparision')
pt.xlabel('avg_CostCultivation_CostCultivation2')
pt.ylabel('Production')
pt.show()
```



In [13]:
```
pt.figure(figsize=(6,6))
pt.scatter(df['avg_CostCultivation_CostCultivation2'],df['RainFall Annual'],color='red',alpha=1)
pt.title('comparision')
pt.xlabel('avg_CostCultivation_CostCultivation2')
pt.ylabel('RainFall Annual')
pt.show()
```



In [14]:
```
pt.figure(figsize=(6,6))
pt.scatter(df['avg_CostCultivation_CostCultivation2'],df['Price'],color='red',alpha=1)
pt.title('comparision')
pt.xlabel('avg_CostCultivation_CostCultivation2')
pt.ylabel('Price')
pt.show()
```



In [15]:
```
from sklearn.model_selection import train_test_split
from sklearn.linear_model import LinearRegression
from sklearn.metrics import mean_squared_error,mean_absolute_error,r2_score
```

In [16]:
```
newdataset=pd.DataFrame({'avg_CostCultivation_CostCultivation2':df['avg_CostCultivation_CostCultivation2'],'Pri
newdataset.head()
```

Out[16]:

	avg_CostCultivation_CostCultivation2	Price
0	9797.15	19589.10
1	10593.65	21187.30
2	13469.32	26938.64
3	17052.16	34104.32
4	17131.05	34262.10

In [17]:
```
X = newdataset[['avg_CostCultivation_CostCultivation2']]
y = newdataset['Price']
X_train, X_test, y_train, y_test = train_test_split(X, y, test_size=0.2, random_state=42)
```

In [18]:
```
model = LinearRegression()
model.fit(X_train, y_train)
```

Out[18]:

```
▾ LinearRegression
LinearRegression()
```

In [19]:
```
y_pred=model.predict(X_test)
```

In [20]:
```
final_comparision=pd.DataFrame({'Actual':y_test,'Predict':y_pred})
final_comparision
```

Out[20]:

	Actual	Predict
13	25972.90	25972.694788
45	24929.80	24929.589856
47	37959.76	37959.611471
44	132671.12	132671.419337
17	45016.72	45016.604842
27	12882.28	12882.012886
26	12409.46	12409.190650
25	10968.08	10967.803834
31	34957.10	34956.937272
19	52158.32	52158.238612

In [21]:

```
mse=mean_squared_error(y_test,y_pred)
mae=mean_absolute_error(y_test,y_pred)
r2=r2_score(y_test,y_pred)
print(mse)
print(mae)
print(r2)
print(np.sqrt(mse))
```

```
0.04644678622134806
0.20351242512351747
0.9999999999597644
0.21551516471317758
```

In [38]:

```
from sklearn.svm import SVR
```

In [26]:

```
newdataset=pd.DataFrame({'avg_CostCultivation_CostCultivation2':df['avg_CostCultivation_CostCultivation2'],'Pri
newdataset.head()
```

Out[26]:

	avg_CostCultivation_CostCultivation2	Price
0	9797.15	19589.10
1	10593.65	21187.30
2	13469.32	26938.64
3	17052.16	34104.32
4	17131.05	34262.10

In [27]:

```
X = newdataset[['avg_CostCultivation_CostCultivation2']]
y = newdataset['Price']
X_train, X_test, y_train, y_test = train_test_split(X, y, test_size=0.2, random_state=42)
```

In [51]:

```
model=SVR(kernel='linear')
model.fit(X_train,y_train)
```

Out[51]:

```
▾ SVR
SVR(kernel='linear')
```

In [52]:

```
y_pred=model.predict(X_test)
```

In [53]:

```
final_comparision=pd.DataFrame({'Actual':y_test,'Predict':y_pred})
final_comparision
```

Out[53]:

	Actual	Predict
13	25972.90	25970.356283
45	24929.80	24927.480905
47	37959.76	37954.635024
44	132671.12	132645.599812
17	45016.72	45010.075374
27	12882.28	12882.555227
26	12409.46	12409.837044
25	10968.08	10968.767432
31	34957.10	34952.621619
19	52158.32	52150.137496

In [54]:

```
mse=mean_squared_error(y_test,y_pred)
mae=mean_absolute_error(y_test,y_pred)
r2=r2_score(y_test,y_pred)
print(mse)
print(mae)
print(r2)
print(np.sqrt(mse))
```

```
82.12448708504203
5.615318993101392
0.9999999288577686
9.062256180722438
```

In [57]:

```
from sklearn.tree import DecisionTreeRegressor
```

In [59]:

```
newdataset=pd.DataFrame({'avg_CostCultivation_CostCultivation2':df['avg_CostCultivation_CostCultivation2'],'Pri
newdataset.head()
```

Out[59]:

	avg_CostCultivation_CostCultivation2	Price
0	9797.15	19589.10
1	10593.65	21187.30
2	13469.32	26938.64
3	17052.16	34104.32
4	17131.05	34262.10

In [60]:

```
X = newdataset[['avg_CostCultivation_CostCultivation2']]
y = newdataset['Price']
X_train, X_test, y_train, y_test = train_test_split(X, y, test_size=0.2, random_state=42)
```

In [62]:

```
model=DecisionTreeRegressor()
model.fit(X_train,y_train)
```

Out[62]:

```
▾ DecisionTreeRegressor
DecisionTreeRegressor()
```

In [63]:

```
mse=mean_squared_error(y_test,y_pred)
mae=mean_absolute_error(y_test,y_pred)
r2=r2_score(y_test,y_pred)
print(mse)
print(mae)
print(r2)
print(np.sqrt(mse))
```

```
82.12448708504203
5.615318993101392
0.9999999288577686
9.062256180722438
```

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