```
import numpy as np
import pandas as pd
df=pd.read_csv('/content/Crop_recommendation.csv')
df
```

	N	P	K	temperature	humidity	ph	rainfall	label
0	90	42	43	20.879744	82.002744	6.502985	202.935536	rice
1	85	58	41	21.770462	80.319644	7.038096	226.655537	rice
2	60	55	44	23.004459	82.320763	7.840207	263.964248	rice
3	74	35	40	26.491096	80.158363	6.980401	242.864034	rice
4	78	42	42	20.130175	81.604873	7.628473	262.717340	rice
...	...	...	...	...	...	...	...	...
2195	107	34	32	26.774637	66.413269	6.780064	177.774507	coffee
2196	99	15	27	27.417112	56.636362	6.086922	127.924610	coffee
2197	118	33	30	24.131797	67.225123	6.362608	173.322839	coffee
2198	117	32	34	26.272418	52.127394	6.758793	127.175293	coffee
2199	104	18	30	23.603016	60.396475	6.779833	140.937041	coffee

2200 rows × 8 columns

```
df.head()
```

	N	P	K	temperature	humidity	ph	rainfall	label
0	90	42	43	20.879744	82.002744	6.502985	202.935536	rice
1	85	58	41	21.770462	80.319644	7.038096	226.655537	rice
2	60	55	44	23.004459	82.320763	7.840207	263.964248	rice
3	74	35	40	26.491096	80.158363	6.980401	242.864034	rice
4	78	42	42	20.130175	81.604873	7.628473	262.717340	rice

```
df.tail()
```

	N	P	K	temperature	humidity	ph	rainfall	label
2195	107	34	32	26.774637	66.413269	6.780064	177.774507	coffee
2196	99	15	27	27.417112	56.636362	6.086922	127.924610	coffee
2197	118	33	30	24.131797	67.225123	6.362608	173.322839	coffee
2198	117	32	34	26.272418	52.127394	6.758793	127.175293	coffee
2199	104	18	30	23.603016	60.396475	6.779833	140.937041	coffee

```
df.shape
```

```
(2200, 8)
```

```
df.dtypes
```

```
N                int64
P                int64
K                int64
temperature    float64
humidity       float64
ph             float64
rainfall       float64
label           object
dtype: object
```

```
df.isna().sum()
```

```
N              0
P              0
K              0
temperature    0
```

```
pn              0
rainfall        0
label           0
dtype: int64
```

```
df.describe()
```

	N	P	K	temperature	humidity	ph	rainfall
count	2200.000000	2200.000000	2200.000000	2200.000000	2200.000000	2200.000000	2200.000000
mean	50.551818	53.362727	48.149091	25.616244	71.481779	6.469480	103.463655
std	36.917334	32.985883	50.647931	5.063749	22.263812	0.773938	54.958389
min	0.000000	5.000000	5.000000	8.825675	14.258040	3.504752	20.211267
25%	21.000000	28.000000	20.000000	22.769375	60.261953	5.971693	64.551686
50%	37.000000	51.000000	32.000000	25.598693	80.473146	6.425045	94.867624
75%	84.250000	68.000000	49.000000	28.561654	89.948771	6.923643	124.267508
max	140.000000	145.000000	205.000000	43.675493	99.981876	9.935091	298.560117

Separating input and output samples

```
x=df.iloc[:,:-1].values
y=df.iloc[:,-1].values
x,y
```

```
(array([[ 90.        ,  42.        ,  43.        , ...,  82.00274423,
           6.50298529, 202.9355362 ],
        [ 85.        ,  58.        ,  41.        , ...,  80.31964408,
           7.03809636, 226.6555374 ],
        [ 60.        ,  55.        ,  44.        , ...,  82.3207629 ,
           7.84020714, 263.9642476 ],
        ...,
        [118.        ,  33.        ,  30.        , ...,  67.22512329,
           6.36260785, 173.3228386 ],
        [117.        ,  32.        ,  34.        , ...,  52.12739421,
           6.75879255, 127.1752928 ],
        [104.        ,  18.        ,  30.        , ...,  60.39647474,
           6.77983261, 140.9370415 ]]),
 array(['rice', 'rice', 'rice', ..., 'coffee', 'coffee', 'coffee'],
       dtype=object))
```

Training and testing data

```
from sklearn.model_selection import train_test_split
x_train,x_test,y_train,y_test=train_test_split(x,y,test_size=0.30,random_state=42)
```

```
x_train
```

```
array([[ 21.        ,  26.        ,  27.        , ...,  47.67525434,
          5.69958697,  95.85118326],
       [ 29.        ,  35.        ,  28.        , ...,  53.53903102,
          6.96741777,  90.40260445],
       [ 60.        ,  44.        ,  23.        , ...,  70.04556743,
          5.72257982,  76.72860067],
       ...,
       [ 11.        ,  36.        ,  31.        , ...,  51.77965917,
          6.47544932, 100.2585673 ],
       [ 11.        , 124.        , 204.        , ...,  80.06633966,
          6.36114111,  71.40043037],
       [ 32.        ,  78.        ,  22.        , ...,  62.35557553,
          7.00703752,  53.40906048]])
```

```
x_test
```

```
array([[101.        ,  17.        ,  47.        , ...,  94.72981338,
          6.18505323,  26.30820876],
       [ 98.        ,   8.        ,  51.        , ...,  86.52258079,
          6.25933595,  49.43050977],
       [ 59.        ,  62.        ,  49.        , ...,  93.35191636,
          6.94149681, 114.778071  ],
```

```
           ...,
           [ 45.        ,  47.        ,  55.        , ...,  91.14220381,
              6.75145293, 119.2653877 ],
           [ 39.        ,  76.        ,  76.        , ...,  15.57324389,
              8.13590073,  69.15759062],
           [103.        ,  16.        ,  49.        , ...,  81.64075303,
              6.91571701,  51.75212401]])
```

```
y_train
```

```
array(['mango', 'mango', 'maize', ..., 'mango', 'grapes', 'lentil'],
      dtype=object)
```

```
y_test
```

```
array(['muskmelon', 'watermelon', 'papaya', 'papaya', 'apple', 'mango',
       'apple', 'mothbeans', 'mungbean', 'lentil', 'blackgram', 'coconut',
       'pomegranate', 'jute', 'coconut', 'pomegranate', 'apple', 'maize',
       'papaya', 'muskmelon', 'coffee', 'papaya', 'orange', 'papaya',
       'chickpea', 'jute', 'mungbean', 'orange', 'pigeonpeas', 'rice',
       'pomegranate', 'mothbeans', 'jute', 'lentil', 'jute', 'blackgram',
       'jute', 'chickpea', 'chickpea', 'kidneybeans', 'papaya', 'mango',
       'blackgram', 'maize', 'mungbean', 'maize', 'pigeonpeas', 'coconut',
       'muskmelon', 'maize', 'blackgram', 'coffee', 'grapes', 'mungbean',
       'coffee', 'kidneybeans', 'cotton', 'apple', 'banana', 'blackgram',
       'watermelon', 'coconut', 'lentil', 'orange', 'papaya',
       'pigeonpeas', 'orange', 'rice', 'muskmelon', 'pigeonpeas',
       'muskmelon', 'coconut', 'jute', 'banana', 'blackgram', 'papaya',
       'banana', 'cotton', 'watermelon', 'orange', 'coffee', 'chickpea',
       'rice', 'mothbeans', 'orange', 'mango', 'coffee', 'mothbeans',
       'blackgram', 'pomegranate', 'maize', 'mothbeans', 'cotton',
       'papaya', 'pigeonpeas', 'mothbeans', 'kidneybeans', 'coffee',
       'blackgram', 'lentil', 'coconut', 'rice', 'orange', 'muskmelon',
       'watermelon', 'kidneybeans', 'watermelon', 'banana', 'pigeonpeas',
       'mothbeans', 'banana', 'jute', 'cotton', 'pomegranate',
       'pigeonpeas', 'chickpea', 'maize', 'coconut', 'pomegranate',
       'rice', 'pigeonpeas', 'grapes', 'blackgram', 'coconut', 'chickpea',
       'blackgram', 'coconut', 'maize', 'banana', 'mothbeans', 'banana',
       'kidneybeans', 'pomegranate', 'chickpea', 'coconut', 'orange',
       'pigeonpeas', 'banana', 'banana', 'apple', 'kidneybeans',
       'muskmelon', 'mungbean', 'mothbeans', 'coconut', 'maize', 'apple',
       'coconut', 'kidneybeans', 'mothbeans', 'mungbean', 'lentil',
       'watermelon', 'mungbean', 'pigeonpeas', 'pigeonpeas', 'pigeonpeas',
       'kidneybeans', 'maize', 'jute', 'chickpea', 'apple', 'orange',
       'cotton', 'rice', 'coconut', 'grapes', 'lentil', 'watermelon',
       'grapes', 'grapes', 'blackgram', 'pomegranate', 'chickpea',
       'coconut', 'maize', 'lentil', 'grapes', 'watermelon', 'jute',
       'coffee', 'coffee', 'kidneybeans', 'jute', 'mothbeans',
       'kidneybeans', 'banana', 'kidneybeans', 'coconut', 'papaya',
       'papaya', 'mungbean', 'mango', 'pomegranate', 'watermelon',
       'kidneybeans', 'maize', 'apple', 'blackgram', 'chickpea', 'grapes',
       'grapes', 'banana', 'cotton', 'rice', 'pomegranate', 'mungbean',
       'banana', 'jute', 'mungbean', 'maize', 'chickpea', 'chickpea',
       'chickpea', 'apple', 'rice', 'kidneybeans', 'papaya', 'coffee',
       'blackgram', 'kidneybeans', 'mango', 'mango', 'coconut', 'papaya',
       'apple', 'chickpea', 'pomegranate', 'chickpea', 'muskmelon',
       'apple', 'muskmelon', 'muskmelon', 'mango', 'mango', 'cotton',
       'coconut', 'pomegranate', 'rice', 'muskmelon', 'coffee', 'papaya',
       'mothbeans', 'maize', 'mango', 'muskmelon', 'pigeonpeas',
       'mungbean', 'coffee', 'grapes', 'coconut', 'cotton', 'pigeonpeas',
       'rice', 'apple', 'pomegranate', 'coffee', 'chickpea', 'cotton',
       'jute', 'mango', 'banana', 'papaya', 'apple', 'chickpea', 'rice',
       'pigeonpeas', 'mothbeans', 'mungbean', 'jute', 'pomegranate',
       'grapes', 'mothbeans', 'jute', 'maize', 'coconut', 'maize',
       'chickpea', 'banana', 'rice', 'coconut', 'jute', 'mango',
       'muskmelon', 'apple', 'banana', 'pigeonpeas', 'blackgram',
       'orange', 'chickpea', 'watermelon', 'banana', 'apple', 'chickpea',
       'coffee', 'pigeonpeas', 'orange', 'apple', 'coconut', 'papaya',
       'watermelon', 'mothbeans', 'papaya', 'chickpea', 'pomegranate',
       'chickpea', 'papaya', 'lentil', 'apple', 'pomegranate', 'chickpea',
       'mango', 'chickpea', 'pomegranate', 'watermelon', 'kidneybeans',
       'mungbean', 'muskmelon', 'watermelon', 'kidneybeans', 'muskmelon',
       'mango', 'rice', 'blackgram', 'chickpea', 'banana', 'blackgram',
```

Normalisation

```
from sklearn.preprocessing import StandardScaler
scaler=StandardScaler()
scaler.fit(x_train)
x_train=scaler.transform(x_train)
x_test=scaler.transform(x_test)
```

```
x_train
```

```
array([[-8.14149162e-01, -8.22608476e-01, -4.17586751e-01, ...,
        -1.10914730e+00, -1.00850068e+00, -1.14762954e-01],
       [-5.99794073e-01, -5.52511028e-01, -3.98018725e-01, ...,
        -8.39738838e-01,  6.40463882e-01, -2.12947619e-01],
       [ 2.30831896e-01, -2.82413580e-01, -4.95858854e-01, ...,
        -8.13537964e-02, -9.78595756e-01, -4.59356367e-01],
       ...,
       [-1.08209302e+00, -5.22500201e-01, -3.39314648e-01, ...,
        -9.20572349e-01,  6.00471872e-04, -3.53408620e-02],
       [-1.08209302e+00,  2.11845263e+00,  3.04595380e+00, ...,
         3.79045864e-01, -1.48070939e-01, -5.55371242e-01],
       [-5.19410914e-01,  7.37954558e-01, -5.15426879e-01, ...,
        -4.34666852e-01,  6.91994073e-01, -8.79579938e-01]])
```

```
x_test
```

```
array([[ 1.32940173, -1.09270592, -0.02622624, ...,  1.05275226,
        -0.37709414, -1.36794363],
       [ 1.24901857, -1.36280337,  0.05204587, ...,  0.67567482,
        -0.28048064, -0.95127435],
       [ 0.20403751,  0.25778132,  0.01290981, ...,  0.98944543,
         0.60675059,  0.22630399],
       ...,
       [-0.1710839 , -0.1923811 ,  0.13031797, ...,  0.88792123,
         0.35957596,  0.30716649],
       [-0.33185021,  0.6779329 ,  0.54124651, ..., -2.58405905,
         2.16021479, -0.59578774],
       [ 1.3829905 , -1.12271675,  0.01290981, ...,  0.45138154,
         0.5732209 , -0.90943832]])
```

Model creation

```
from sklearn.naive_bayes import GaussianNB
model=GaussianNB()
model.fit(x_train,y_train)
y_pred=model.predict(x_test)
y_pred
```

```
array(['muskmelon', 'watermelon', 'papaya', 'papaya', 'apple', 'mango',
       'apple', 'mothbeans', 'mungbean', 'lentil', 'blackgram', 'coconut',
       'pomegranate', 'jute', 'coconut', 'pomegranate', 'apple', 'maize',
       'papaya', 'muskmelon', 'coffee', 'papaya', 'orange', 'papaya',
       'chickpea', 'jute', 'mungbean', 'orange', 'pigeonpeas', 'rice',
       'pomegranate', 'mothbeans', 'jute', 'lentil', 'jute', 'blackgram',
       'jute', 'chickpea', 'chickpea', 'kidneybeans', 'papaya', 'mango',
       'blackgram', 'maize', 'mungbean', 'maize', 'pigeonpeas', 'coconut',
       'muskmelon', 'maize', 'blackgram', 'coffee', 'grapes', 'mungbean',
       'coffee', 'kidneybeans', 'cotton', 'apple', 'banana', 'blackgram',
       'watermelon', 'coconut', 'lentil', 'orange', 'papaya',
       'pigeonpeas', 'orange', 'rice', 'muskmelon', 'pigeonpeas',
       'muskmelon', 'coconut', 'jute', 'banana', 'blackgram', 'papaya',
       'banana', 'cotton', 'watermelon', 'orange', 'coffee', 'chickpea',
       'rice', 'mothbeans', 'orange', 'mango', 'coffee', 'mothbeans',
       'blackgram', 'pomegranate', 'maize', 'mothbeans', 'cotton',
       'papaya', 'pigeonpeas', 'mothbeans', 'kidneybeans', 'coffee',
       'blackgram', 'lentil', 'coconut', 'rice', 'orange', 'muskmelon',
       'watermelon', 'kidneybeans', 'watermelon', 'banana', 'pigeonpeas',
       'mothbeans', 'banana', 'jute', 'cotton', 'pomegranate',
       'pigeonpeas', 'chickpea', 'maize', 'coconut', 'pomegranate',
       'rice', 'pigeonpeas', 'grapes', 'blackgram', 'coconut', 'chickpea',
       'blackgram', 'coconut', 'maize', 'banana', 'mothbeans', 'banana',
       'kidneybeans', 'pomegranate', 'chickpea', 'coconut', 'orange',
       'pigeonpeas', 'banana', 'banana', 'apple', 'kidneybeans',
       'muskmelon', 'mungbean', 'mothbeans', 'coconut', 'maize', 'apple',
       'coconut', 'kidneybeans', 'mothbeans', 'mungbean', 'lentil',
       'watermelon', 'mungbean', 'pigeonpeas', 'pigeonpeas', 'pigeonpeas',
       'kidneybeans', 'maize', 'jute', 'chickpea', 'apple', 'orange',
       'cotton', 'rice', 'coconut', 'grapes', 'lentil', 'watermelon',
       'grapes', 'grapes', 'blackgram', 'pomegranate', 'chickpea',
       'coconut', 'maize', 'lentil', 'grapes', 'watermelon', 'jute',
       'coffee', 'coffee', 'kidneybeans', 'jute', 'mothbeans',
       'kidneybeans', 'banana', 'kidneybeans', 'coconut', 'papaya',
       'papaya', 'mungbean', 'mango', 'pomegranate', 'watermelon',
       'kidneybeans', 'maize', 'apple', 'blackgram', 'chickpea', 'grapes',
       'grapes', 'banana', 'cotton', 'rice', 'pomegranate', 'mungbean',
       'banana', 'jute', 'mungbean', 'maize', 'chickpea', 'chickpea',
       'chickpea', 'apple', 'rice', 'kidneybeans', 'papaya', 'coffee',
       'blackgram', 'kidneybeans', 'mango', 'mango', 'coconut', 'papaya',
       'apple', 'chickpea', 'pomegranate', 'chickpea', 'muskmelon',
```

```
'apple', 'chickpea', 'pomegranate', 'chickpea', 'muskmelon',
       'apple', 'muskmelon', 'muskmelon', 'mango', 'mango', 'cotton',
       'coconut', 'pomegranate', 'rice', 'muskmelon', 'coffee', 'papaya',
       'mothbeans', 'maize', 'mango', 'muskmelon', 'pigeonpeas',
       'mungbean', 'coffee', 'grapes', 'coconut', 'cotton', 'pigeonpeas',
       'rice', 'apple', 'pomegranate', 'coffee', 'chickpea', 'cotton',
       'jute', 'mango', 'banana', 'papaya', 'apple', 'chickpea', 'rice',
       'pigeonpeas', 'mothbeans', 'mungbean', 'jute', 'pomegranate',
       'grapes', 'mothbeans', 'jute', 'maize', 'coconut', 'maize',
       'chickpea', 'banana', 'jute', 'coconut', 'jute', 'mango',
       'muskmelon', 'apple', 'banana', 'pigeonpeas', 'blackgram',
       'orange', 'chickpea', 'watermelon', 'banana', 'apple', 'chickpea',
       'coffee', 'pigeonpeas', 'orange', 'apple', 'coconut', 'papaya',
       'watermelon', 'mothbeans', 'papaya', 'chickpea', 'pomegranate',
       'chickpea', 'papaya', 'lentil', 'apple', 'pomegranate', 'chickpea',
       'mango', 'chickpea', 'pomegranate', 'watermelon', 'kidneybeans',
       'mungbean', 'muskmelon', 'watermelon', 'kidneybeans', 'muskmelon',
       'mango', 'jute', 'blackgram', 'chickpea', 'banana', 'blackgram',
```

```
y_test
```

```
array(['muskmelon', 'watermelon', 'papaya', 'papaya', 'apple', 'mango',
       'apple', 'mothbeans', 'mungbean', 'lentil', 'blackgram', 'coconut',
       'pomegranate', 'jute', 'coconut', 'pomegranate', 'apple', 'maize',
       'papaya', 'muskmelon', 'coffee', 'papaya', 'orange', 'papaya',
       'chickpea', 'jute', 'mungbean', 'orange', 'pigeonpeas', 'rice',
       'pomegranate', 'mothbeans', 'jute', 'lentil', 'jute', 'blackgram',
       'jute', 'chickpea', 'chickpea', 'kidneybeans', 'papaya', 'mango',
       'blackgram', 'maize', 'mungbean', 'maize', 'pigeonpeas', 'coconut',
       'muskmelon', 'maize', 'blackgram', 'coffee', 'grapes', 'mungbean',
       'coffee', 'kidneybeans', 'cotton', 'apple', 'banana', 'blackgram',
       'watermelon', 'coconut', 'lentil', 'orange', 'papaya',
       'pigeonpeas', 'orange', 'rice', 'muskmelon', 'pigeonpeas',
       'muskmelon', 'coconut', 'jute', 'banana', 'blackgram', 'papaya',
       'banana', 'cotton', 'watermelon', 'orange', 'coffee', 'chickpea',
       'rice', 'mothbeans', 'orange', 'mango', 'coffee', 'mothbeans',
       'blackgram', 'pomegranate', 'maize', 'mothbeans', 'cotton',
       'papaya', 'pigeonpeas', 'mothbeans', 'kidneybeans', 'coffee',
       'blackgram', 'lentil', 'coconut', 'rice', 'orange', 'muskmelon',
       'watermelon', 'kidneybeans', 'watermelon', 'banana', 'pigeonpeas',
       'mothbeans', 'banana', 'jute', 'cotton', 'pomegranate',
       'pigeonpeas', 'chickpea', 'maize', 'coconut', 'pomegranate',
       'rice', 'pigeonpeas', 'grapes', 'blackgram', 'coconut', 'chickpea',
       'blackgram', 'coconut', 'maize', 'banana', 'mothbeans', 'banana',
       'kidneybeans', 'pomegranate', 'chickpea', 'coconut', 'orange',
       'pigeonpeas', 'banana', 'banana', 'apple', 'kidneybeans',
       'muskmelon', 'mungbean', 'mothbeans', 'coconut', 'maize', 'apple',
       'coconut', 'kidneybeans', 'mothbeans', 'mungbean', 'lentil',
       'watermelon', 'mungbean', 'pigeonpeas', 'pigeonpeas', 'pigeonpeas',
       'kidneybeans', 'maize', 'jute', 'chickpea', 'apple', 'orange',
       'cotton', 'rice', 'coconut', 'grapes', 'lentil', 'watermelon',
       'grapes', 'grapes', 'blackgram', 'pomegranate', 'chickpea',
       'coconut', 'maize', 'lentil', 'grapes', 'watermelon', 'jute',
       'coffee', 'coffee', 'kidneybeans', 'jute', 'mothbeans',
       'kidneybeans', 'banana', 'kidneybeans', 'coconut', 'papaya',
       'papaya', 'mungbean', 'mango', 'pomegranate', 'watermelon',
       'kidneybeans', 'maize', 'apple', 'blackgram', 'chickpea', 'grapes',
       'grapes', 'banana', 'cotton', 'rice', 'pomegranate', 'mungbean',
       'banana', 'jute', 'mungbean', 'maize', 'chickpea', 'chickpea',
       'chickpea', 'apple', 'rice', 'kidneybeans', 'papaya', 'coffee',
       'blackgram', 'kidneybeans', 'mango', 'mango', 'coconut', 'papaya',
       'apple', 'chickpea', 'pomegranate', 'chickpea', 'muskmelon',
       'apple', 'muskmelon', 'muskmelon', 'mango', 'mango', 'cotton',
       'coconut', 'pomegranate', 'rice', 'muskmelon', 'coffee', 'papaya',
       'mothbeans', 'maize', 'mango', 'muskmelon', 'pigeonpeas',
       'mungbean', 'coffee', 'grapes', 'coconut', 'cotton', 'pigeonpeas',
       'rice', 'apple', 'pomegranate', 'coffee', 'chickpea', 'cotton',
       'jute', 'mango', 'banana', 'papaya', 'apple', 'chickpea', 'rice',
       'pigeonpeas', 'mothbeans', 'mungbean', 'jute', 'pomegranate',
       'grapes', 'mothbeans', 'jute', 'maize', 'coconut', 'maize',
       'chickpea', 'banana', 'rice', 'coconut', 'jute', 'mango',
       'muskmelon', 'apple', 'banana', 'pigeonpeas', 'blackgram',
       'orange', 'chickpea', 'watermelon', 'banana', 'apple', 'chickpea',
       'coffee', 'pigeonpeas', 'orange', 'apple', 'coconut', 'papaya',
       'watermelon', 'mothbeans', 'papaya', 'chickpea', 'pomegranate',
       'chickpea', 'papaya', 'lentil', 'apple', 'pomegranate', 'chickpea',
       'mango', 'chickpea', 'pomegranate', 'watermelon', 'kidneybeans',
       'mungbean', 'muskmelon', 'watermelon', 'kidneybeans', 'muskmelon',
       'mango', 'rice', 'blackgram', 'chickpea', 'banana', 'blackgram',
```

Performance evaluation

```
from sklearn.metrics import confusion_matrix,accuracy_score
```

```
result=confusion_matrix(y_test,y_pred)
score=accuracy_score(y_test,y_pred)
result,score
```

```
(array([[34,  0,  0,  0,  0,  0,  0,  0,  0,  0,  0,  0,  0,  0,  0,  0,
         0,  0,  0,  0,  0,  0],
        [ 0, 26,  0,  0,  0,  0,  0,  0,  0,  0,  0,  0,  0,  0,  0,  0,
         0,  0,  0,  0,  0,  0],
        [ 0,  0, 26,  0,  0,  0,  0,  0,  0,  0,  0,  0,  0,  0,  0,  0,
         0,  0,  0,  0,  0,  0],
        [ 0,  0,  0, 34,  0,  0,  0,  0,  0,  0,  0,  0,  0,  0,  0,  0,
         0,  0,  0,  0,  0,  0],
        [ 0,  0,  0,  0, 33,  0,  0,  0,  0,  0,  0,  0,  0,  0,  0,  0,
         0,  0,  0,  0,  0,  0],
        [ 0,  0,  0,  0,  0, 30,  0,  0,  0,  0,  0,  0,  0,  0,  0,  0,
         0,  0,  0,  0,  0,  0],
        [ 0,  0,  0,  0,  0,  0, 28,  0,  0,  0,  0,  0,  0,  0,  0,  0,
         0,  0,  0,  0,  0,  0],
        [ 0,  0,  0,  0,  0,  0,  0, 23,  0,  0,  0,  0,  0,  0,  0,  0,
         0,  0,  0,  0,  0,  0],
        [ 0,  0,  0,  0,  0,  0,  0,  0, 34,  0,  0,  0,  0,  0,  0,  0,
         0,  0,  0,  0,  0,  0],
        [ 0,  0,  0,  0,  0,  0,  0,  0,  0, 36,  0,  0,  0,  0,  0,  0,
         0,  0,  0,  0,  0,  0],
        [ 0,  0,  0,  0,  0,  0,  0,  0,  0,  0, 22,  0,  0,  0,  0,  0,
         0,  0,  0,  0,  0,  0],
        [ 0,  0,  0,  0,  0,  0,  0,  0,  0,  0,  0, 26,  0,  0,  0,  0,
         0,  0,  0,  0,  0,  0],
        [ 0,  0,  0,  0,  0,  0,  0,  0,  0,  0,  0,  0, 32,  0,  0,  0,
         0,  0,  0,  0,  0,  0],
        [ 0,  0,  0,  0,  0,  0,  0,  0,  0,  0,  0,  0,  0, 34,  0,  0,
         0,  0,  0,  0,  0,  0],
        [ 0,  0,  0,  0,  0,  0,  0,  0,  0,  0,  0,  0,  0,  0, 30,  0,
         0,  0,  0,  0,  0,  0],
        [ 0,  0,  0,  0,  0,  0,  0,  0,  0,  0,  0,  0,  0,  0,  0, 24,
         0,  0,  0,  0,  0,  0],
        [ 0,  0,  0,  0,  0,  0,  0,  0,  0,  0,  0,  0,  0,  0,  0,  0,
        25,  0,  0,  0,  0,  0],
        [ 0,  0,  0,  0,  0,  0,  0,  0,  0,  0,  0,  0,  0,  0,  0,  0,
         0, 37,  0,  0,  0,  0],
        [ 0,  0,  0,  0,  0,  0,  0,  0,  0,  0,  0,  0,  0,  0,  0,  0,
         0,  0, 37,  0,  0,  0],
        [ 0,  0,  0,  0,  0,  0,  0,  0,  0,  0,  0,  0,  0,  0,  0,  0,
         0,  0,  0, 38,  0,  0],
        [ 0,  0,  0,  0,  0,  0,  0,  0,  4,  0,  0,  0,  0,  0,  0,  0,
         0,  0,  0,  0, 24,  0],
        [ 0,  0,  0,  0,  0,  0,  0,  0,  0,  0,  0,  0,  0,  0,  0,  0,
         0,  0,  0,  0,  0, 23]]),
 0.9939393939393939)
```

```
from sklearn.metrics import classification_report
print(classification_report(y_test,y_pred))
```

```
                precision    recall  f1-score   support

         apple       1.00      1.00      1.00        34
        banana       1.00      1.00      1.00        26
     blackgram       1.00      1.00      1.00        26
      chickpea       1.00      1.00      1.00        34
       coconut       1.00      1.00      1.00        33
        coffee       1.00      1.00      1.00        30
        cotton       1.00      1.00      1.00        28
        grapes       1.00      1.00      1.00        23
          jute       0.89      1.00      0.94        34
  kidneybeans       1.00      1.00      1.00        36
        lentil       1.00      1.00      1.00        22
         maize       1.00      1.00      1.00        26
         mango       1.00      1.00      1.00        32
     mothbeans       1.00      1.00      1.00        34
      mungbean       1.00      1.00      1.00        30
     muskmelon       1.00      1.00      1.00        24
        orange       1.00      1.00      1.00        25
        papaya       1.00      1.00      1.00        37
     pigeonpeas       1.00      1.00      1.00        37
    pomegranate       1.00      1.00      1.00        38
           rice       1.00      0.86      0.92        28
     watermelon       1.00      1.00      1.00        23

       accuracy                           0.99       660
      macro avg       1.00      0.99      0.99       660
   weighted avg       0.99      0.99      0.99       660
```