1. Create a list with the names called image_files

In [39]:
```
import os
import matplotlib.image as mpimg
import numpy as np
import matplotlib.pyplot as plt
from PIL import Image
from sklearn import neighbors

path = "/Users/roja/Downloads/images2/"
image_files = os.listdir(path)

image_files
```

Out[39]:
```
['farm8.jpg',
 'desert8.jpg',
 '.DS_Store',
 'city2.jpg',
 'city3.jpg',
 'city1.jpg',
 'city4.jpg',
 'city5.jpg',
 'test1.jpg',
 'test3.jpg',
 'city7.jpg',
 'city6.jpg',
 'test2.jpg',
 'city8.jpg',
 'desert7.jpg',
 '.ipynb_checkpoints',
 'farm2.jpg',
 'farm3.jpg',
 'desert6.jpg',
 'desert4.jpg',
 'farm1.jpg',
 'desert5.jpg',
 'farm4.jpg',
 'desert1.jpg',
 'farm5.jpg',
 'farm7.jpg',
 'desert2.jpg',
 'desert3.jpg',
 'farm6.jpg']
```

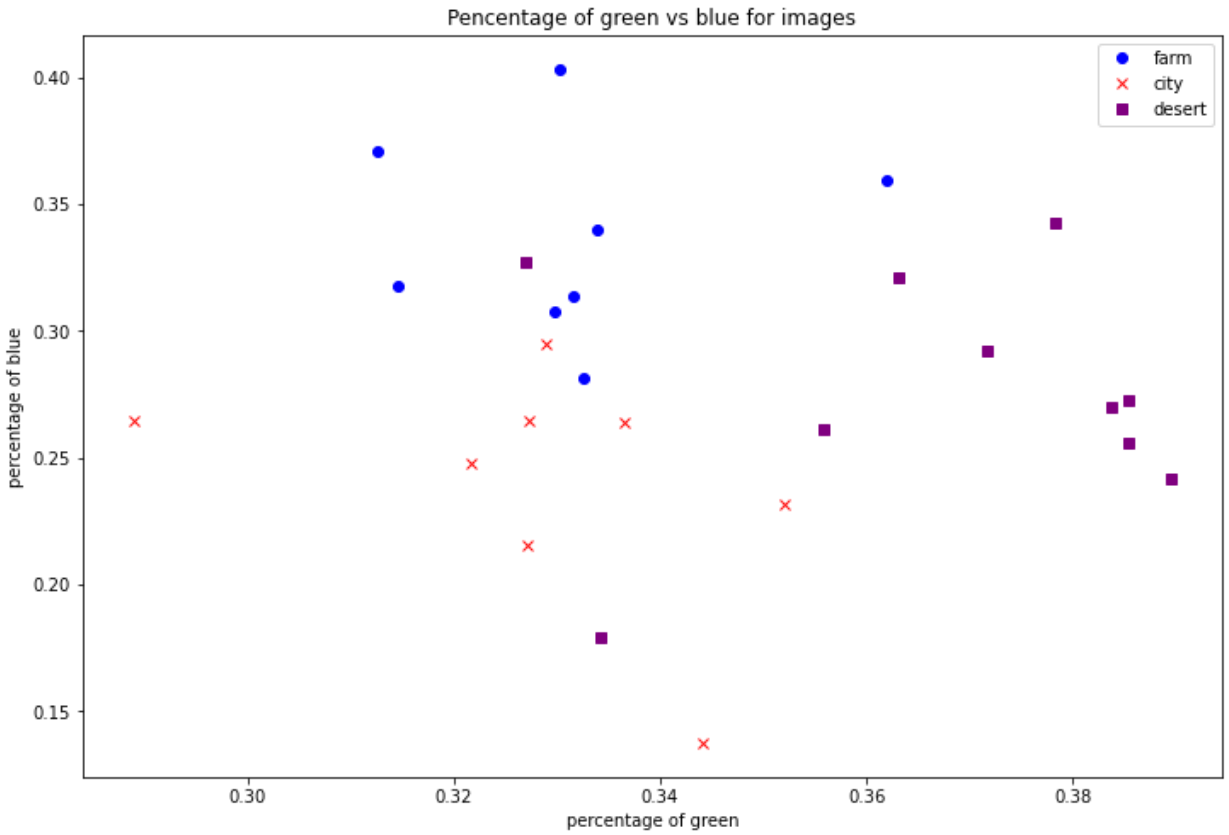
2. Create the scatter plot in the first page

In [40]:
```
import os
import matplotlib.image as mpimg
import numpy as np
import matplotlib.pyplot as plt
from PIL import Image
from sklearn import neighbors

path = "/Users/roja/Downloads/images2/"

imagefiles = ['city1.jpg', 'city2.jpg', 'city3.jpg', 'city4.jpg',
'city5.jpg', 'city6.jpg', 'city7.jpg', 'city8.jpg',
'desert1.jpg', 'desert2.jpg', 'desert3.jpg', 'desert4.jpg',
'desert5.jpg', 'desert6.jpg', 'desert7.jpg', 'desert8.jpg','farm1.jpg', 'fa
'farm5.jpg', 'farm6.jpg', 'farm7.jpg', 'farm8.jpg','test1.jpg', 'test2.jpg'

# pernctages of green and blue colors in each catergory of images
g_percent= []
b_percent= []

for im in imagefiles:
    img = mpimg.imread(path+im)
    rgb = np.array(img).mean(axis=(0,1))
    t = rgb[0] + rgb[1] + rgb[2]
    g_percent.append(rgb[1]/t)
    b_percent.append(rgb[2]/t)


f_g = g_percent[0:8]
f_b = b_percent[0:8]

print('Percentage of green color in farm images is:', f_g)
print('Percentage of blue color in farm images is:', f_b)

c_g = g_percent[8:16]
c_b = b_percent[8:16]


print('Percentage of green color in city images is:', c_g)
print('Percentage of blue color in city images is:', c_b)


d_g = g_percent[16:26]
d_b = b_percent[16:26]


print('Percentage of green color in desert images is:', d_g)
print('Percentage of blue color in desert images is:', d_b)

#scatter plot

plt.figure(figsize=(12,8))
plt.plot(f_g, f_b, 'o', color='blue', label ="farm")
plt.plot(c_g, c_b, 'x', color='red', label ="city")
plt.plot(d_g, d_b, 's', color='purple', label ="desert")

plt.title("Pencentage of green vs blue for images")
```

```
plt.xlabel("percentage of green")
plt.ylabel("percentage of blue")
plt.legend(["farm","city","desert"])
```

```
Percentage of green color in farm images is: [0.3338467930412881, 0.31457
98947161084, 0.32982159222616164, 0.3302142216023482, 0.3126774452579913,
0.36200550003320575, 0.3326393074627567, 0.33155647847549335]
Percentage of blue color in farm images is: [0.33987007505544775, 0.31740
954537386984, 0.30761097231014695, 0.4032948263728943, 0.370680469352461
8, 0.3592237167477091, 0.2812241449923416, 0.3138749350290284]
Percentage of green color in city images is: [0.2889915365854203, 0.32887
46497784961, 0.32171351112006713, 0.3520926067264411, 0.3271851263163745
3, 0.33655681001293364, 0.3441919206452676, 0.32732039192104917]
Percentage of blue color in city images is: [0.2647862205478914, 0.294612
8831876114, 0.24749944089149414, 0.2317126103798501, 0.2156491053354232,
0.2638719030231327, 0.1374953806468185, 0.26438328280357887]
Percentage of green color in desert images is: [0.38537916213835416, 0.38
947876516901914, 0.37176749098686257, 0.3853494059331435, 0.3836885427597
768, 0.3782235141367888, 0.3557784135089085, 0.36318263603850426, 0.32695
920083037133, 0.3342938446981946]
Percentage of blue color in desert images is: [0.2725025827290944, 0.2416
6749580794727, 0.29236929740095713, 0.25567274038089727, 0.26974448694522
92, 0.3424372370985558, 0.2613897337397366, 0.3207925148928169, 0.3268851
262195992, 0.17936788871306228]
```

Out[40]: <matplotlib.legend.Legend at 0x7fe6c22ba2b0>



3. Now create an array of strings called training_target with the category of each.

In [41]:
```
training_target = ['farm', 'farm', 'farm', 'farm','farm', 'farm', 'farm', '
                   'city', 'city', 'city', 'city','city', 'city', 'city', '
                   'desert', 'desert', 'desert', 'desert','desert', 'desert
```

4. Create an empty array of zeros called training_data that will eventually store the percent green and percent blue values.

In [42]:
```
training_data= np.zeros((24,2))

print(training_data)
```

```
[[0. 0.]
 [0. 0.]
 [0. 0.]
 [0. 0.]
 [0. 0.]
 [0. 0.]
 [0. 0.]
 [0. 0.]
 [0. 0.]
 [0. 0.]
 [0. 0.]
 [0. 0.]
 [0. 0.]
 [0. 0.]
 [0. 0.]
 [0. 0.]
 [0. 0.]
 [0. 0.]
 [0. 0.]
 [0. 0.]
 [0. 0.]
 [0. 0.]
 [0. 0.]
 [0. 0.]]
```

5. Now fill the training_data array with the proper values for each image and

In [43]:
```
for i in range (0,len(training_data)):
    training_data[i] = [g_percent[i],b_percent[i]]
print(training_data)
```

```
[[0.33384679 0.33987008]
 [0.31457989 0.31740955]
 [0.32982159 0.30761097]
 [0.33021422 0.40329483]
 [0.31267745 0.37068047]
 [0.3620055  0.35922372]
 [0.33263931 0.28122414]
 [0.33155648 0.31387494]
 [0.28899154 0.26478622]
 [0.32887465 0.29461288]
 [0.32171351 0.24749944]
 [0.35209261 0.23171261]
 [0.32718513 0.21564911]
 [0.33655681 0.2638719 ]
 [0.34419192 0.13749538]
 [0.32732039 0.26438328]
 [0.38537916 0.27250258]
 [0.38947877 0.2416675 ]
 [0.37176749 0.2923693 ]
 [0.38534941 0.25567274]
 [0.38368854 0.26974449]
 [0.37822351 0.34243724]
 [0.35577841 0.26138973]
 [0.36318264 0.32079251]]
```

6. Create your classifier.

In [44]:
```
#using KNN with n=1

knn = neighbors.KNeighborsClassifier(1,weights='distance')
knn
```

Out[44]:
```
KNeighborsClassifier(n_neighbors=1, weights='distance')
```

7. Train your classifier.

In [45]:
```
knn= knn.fit(training_data,training_target)
knn
```

Out[45]:
```
KNeighborsClassifier(n_neighbors=1, weights='distance')
```

8. Now create an empty test_data array and fill it with the proper values for each test image and observe the filled array and consider if it matches your expectations based on your observations of the images.

In [46]:
```
test_data = np.zeros((3,2))

for i in range (0,len(test_data)):
    test_data[i] = [g_percent[24+i],b_percent[24+i]]
test_data
```

Out[46]:
```
array([[0.3269592 , 0.32688513],
       [0.33429384, 0.17936789],
       [0.35004008, 0.24578861]])
```

9. Predict the class of the test images.

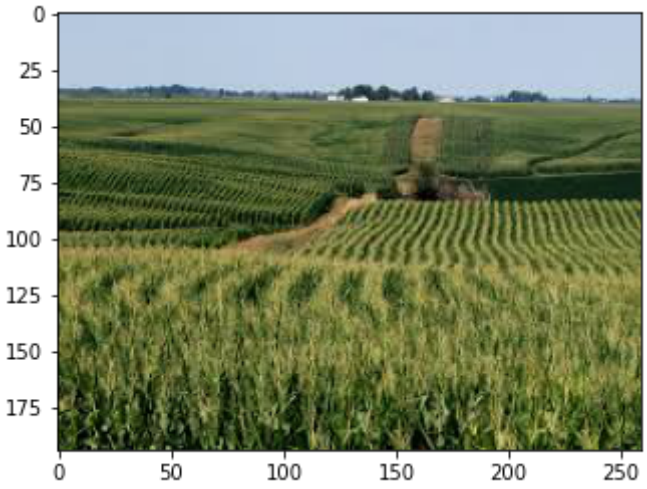
In [47]:
```
predict = knn.predict(test_data)
print(predict)
```

```
['farm' 'city' 'city']
```

10. Print the prediction from the test images and compare with the actual images shown below. Make this comparison clear in the output of your code (e.g. prepend with ‘predicted:’ and ‘actual:’). Try to explain any errors if you note any.

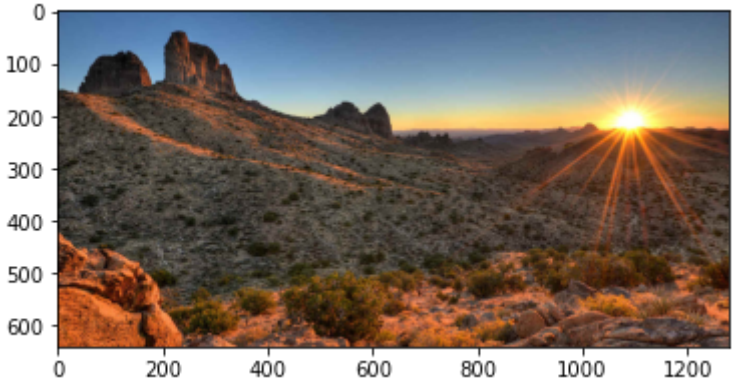
In [48]:
```
actual = ['city','desert','farm']
for i in range(0,3):
    print(" PREDICTED -", predict[i] , " ACTUAL -", actual[i])
    plt.imshow(mpimg.imread(path+image_files[24+i]))
    plt.show()
```

```
 PREDICTED - farm  ACTUAL - city
```




```
 PREDICTED - city  ACTUAL - desert
```


```
 PREDICTED - city  ACTUAL - farm
```



In [49]:
```
print(len(g_percent))
```

```
27
```

In [ ]:
```

```