loading the data called afsal.csv

In [6]:

```
import pandas as pd
```

defining the file path

In [7]:

```
file_path = 'D:\\data science exam\\afsal.csv'
data = pd.read_csv(file_path)
```

you can find the data here

In [8]:

```
data
```

Out[8]:

	Date	Time	Reporter	Farmlet	Active	Relaxed	Fearful	Agitated	Calm	Content	Indifferent	Frustrated
0	06/01/2023	15:00	CM	R	9.2	8.4	0.0	0.0	8.7	8.0	1.2	0.5
1	06/01/2023	15:00	CM	G	8.5	10.6	0.0	0.0	10.5	10.5	2.5	0.5
2	06/01/2023	15:00	CM	B	10.0	7.5	0.0	0.0	8.7	9.2	0.5	1.2
3	06/01/2023	15:00	T	R	9.5	9.5	0.6	0.6	10.4	9.8	0.6	0.6
4	06/01/2023	15:00	T	G	8.5	8.5	0.8	0.8	10.0	8.7	1.0	1.0
5	06/01/2023	15:00	T	B	9.0	9.0	1.2	1.2	9.6	9.2	1.3	1.3
6	13/01/2023	12:20	CM	R	10.0	7.7	0.0	1.3	8.3	6.6	2.0	0.6
7	13/01/2023	12:20	CM	G	8.5	2.3	2.3	4.3	5.9	2.2	1.4	0.6
8	13/01/2023	12:20	CM	B	9.3	8.8	0.0	1.3	9.0	8.3	3.8	0.0
9	19/01/2023	14:50	CM	R	9.5	9.7	0.0	0.0	10.7	9.9	4.1	0.0
10	19/01/2023	14:50	CM	G	5.1	9.9	0.0	0.0	11.9	8.5	6.4	0.0
11	19/01/2023	14:50	CM	B	8.5	8.4	0.0	0.0	8.1	7.7	2.7	0.6
12	19/01/2023	14:50	T	R	7.1	9.4	0.4	1.0	11.4	11.4	5.7	1.6
13	19/01/2023	14:50	T	G	5.8	11.9	0.4	2.1	11.9	11.9	0.3	0.3
14	19/01/2023	14:50	T	B	5.1	9.7	0.6	0.6	11.2	11.2	1.6	0.7
15	19/01/2023	14:50	T	R	8.5	8.5	0.9	1.1	10.1	8.8	1.4	1.4
16	19/01/2023	14:50	T	G	7.1	5.3	0.1	0.1	7.2	6.2	0.4	0.4
17	19/01/2023	14:50	T	B	7.2	5.3	1.7	1.8	8.1	6.8	1.8	2.7
18	27/01/2023	14:30	CM	R	9.1	10.5	0.0	0.0	10.4	10.4	4.4	0.0
19	27/01/2023	14:30	CM	G	11.1	10.9	0.0	0.0	10.5	9.7	2.4	0.0
20	27/01/2023	14:30	CM	B	8.5	8.5	0.0	0.0	8.9	8.8	2.8	0.0
21	27/01/2023	14:30	T	R	8.5	8.2	1.8	2.0	9.9	8.2	2.0	2.0
22	27/01/2023	14:30	T	G	8.5	5.4	1.4	1.6	10.2	8.8	1.8	2.0
23	27/01/2023	14:30	T	B	7.0	5.0	2.1	2.1	8.1	6.4	2.0	2.3
24	02/02/2023	11:45	T	R	7.8	7.7	1.4	1.7	7.0	8.0	1.8	1.7
25	02/02/2023	11:45	T	G	7.4	7.4	1.3	1.3	7.5	7.5	1.3	1.3
26	02/02/2023	11:45	T	B	7.8	7.5	1.3	1.4	8.1	7.8	1.4	2.6
27	02/02/2023	11:45	CM	R	9.8	8.2	0.4	1.6	8.8	8.7	1.7	0.7
28	02/02/2023	11:45	CM	G	7.7	9.8	0.0	0.0	10.1	9.2	3.0	0.0
29	02/02/2023	11:45	CM	B	7.4	10.8	0.7	0.3	9.4	9.5	4.5	0.4
30	03/03/2023	13:45	T	R	3.7	7.4	0.9	0.9	8.7	8.7	1.3	1.3
31	03/03/2023	13:45	T	G	8.7	8.2	0.9	0.9	8.1	8.1	1.0	1.0
32	03/03/2023	13:45	T	B	8.5	5.4	1.0	1.0	8.5	8.2	1.0	1.1
33	03/03/2023	13:45	CM	R	6.4	8.8	0.0	0.0	9.2	9.8	8.1	0.4
34	03/03/2023	13:45	CM	G	8.7	10.4	0.0	0.0	10.4	10.2	8.0	0.6
35	03/03/2023	13:45	CM	B	3.8	8.8	0.6	0.6	8.9	8.9	7.0	0.3
36	14/03/2023	09:45	CM	R	9.2	8.8	0.0	0.3	10.9	10.5	7.8	0.1
37	14/03/2023	09:45	CM	G	8.7	8.9	0.0	0.3	8.5	8.2	8.0	0.0
38	14/03/2023	09:45	CM	B	9.1	8.7	0.0	0.3	9.2	9.1	1.8	1.1
39	14/03/2023	09:45	T	R	8.7	7.2	1.0	1.0	9.2	9.4	1.0	1.0
40	14/03/2023	09:45	T	G	8.1	8.1	1.1	1.4	8.5	8.5	1.6	1.6
41	14/03/2023	09:45	T	B	8.7	8.4	0.9	0.9	8.8	8.4	0.9	0.9
42	23/03/2023	09:30	CM	R	7.7	8.8	0.0	0.0	8.2	9.2	2.8	0.0
43	23/03/2023	09:30	CM	G	9.7	7.1	0.4	1.8	3.6	8.1	2.0	0.4
44	23/03/2023	09:30	CM	B	8.0	8.8	0.0	0.0	9.4	9.2	5.0	0.0
45	23/03/2023	09:30	T	R	8.7	5.7	0.9	1.0	8.7	8.7	1.3	1.6
46	23/03/2023	09:30	T	G	7.2	5.1	0.9	1.4	7.7	6.5	1.6	1.7
47	23/03/2023	09:30	T	B	7.5	6.2	1.6	1.4	7.2	7.2	1.3	1.4

perfroming ANOVA test to analyse the stastical difference

In [9]:

```
import scipy.stats as stats
```

In [10]:

```
from scipy.stats import f_oneway, tukey_hsd
```

In [11]:

```
stats.f_oneway (data['Active'].to_list(),
                data['Relaxed'].to_list(),
                data['Fearful'].to_list(),
                data['Agitated'].to_list(),
                data['Calm'].to_list(),
                data['Content'].to_list(),
                data['Indifferent'].to_list(),
                data['Frustrated'].to_list(),
               )
```

Out[11]:

```
F_onewayResult(statistic=344.3235146480699, pvalue=3.079537718646044e-159)
```

perfroming Tukey's HSD test

In [12]:

```
res = tukey_hsd (data['Active'].to_list(),
                data['Relaxed'].to_list(),
                data['Fearful'].to_list(),
                data['Agitated'].to_list(),
                data['Calm'].to_list(),
                data['Content'].to_list(),
                data['Indifferent'].to_list(),
                data['Frustrated'].to_list(),

               )
```

Results

In [13]:

```
print (res)
```

```
Tukey's HSD Pairwise Group Comparisons (95.0% Confidence Interval)
Comparison  Statistic  p-value  Lower CI  Upper CI
 (0 - 1)     -0.062     1.000    -0.974     0.849
 (0 - 2)      7.469     0.000     6.558     8.380
 (0 - 3)      7.223     0.000     6.312     8.134
 (0 - 4)     -0.962     0.030    -1.874    -0.051
 (0 - 5)     -0.556     0.579    -1.467     0.355
 (0 - 6)      5.392     0.000     4.480     6.303
 (0 - 7)      7.221     0.000     6.310     8.132
 (1 - 0)      0.062     1.000    -0.849     0.974
 (1 - 2)      7.531     0.000     6.620     8.442
 (1 - 3)      7.285     0.000     6.374     8.197
 (1 - 4)     -0.900     0.056    -1.811     0.011
 (1 - 5)     -0.494     0.718    -1.405     0.417
 (1 - 6)      5.454     0.000     4.543     6.365
 (1 - 7)      7.283     0.000     6.372     8.195
 (2 - 0)     -7.469     0.000    -8.380    -6.558
 (2 - 1)     -7.531     0.000    -8.442    -6.620
 (2 - 3)     -0.246     0.992    -1.157     0.665
 (2 - 4)     -8.431     0.000    -9.342    -7.520
 (2 - 5)     -8.025     0.000    -8.936    -7.114
 (2 - 6)     -2.077     0.000    -2.988    -1.166
 (2 - 7)     -0.248     0.991    -1.159     0.663
 (3 - 0)     -7.223     0.000    -8.134    -6.312
 (3 - 1)     -7.285     0.000    -8.197    -6.374
 (3 - 2)      0.246     0.992    -0.665     1.157
 (3 - 4)     -8.185     0.000    -9.097    -7.274
 (3 - 5)     -7.779     0.000    -8.690    -6.868
 (3 - 6)     -1.831     0.000    -2.742    -0.920
 (3 - 7)     -0.002     1.000    -0.913     0.909
 (4 - 0)      0.962     0.030     0.051     1.874
 (4 - 1)      0.900     0.056    -0.011     1.811
 (4 - 2)      8.431     0.000     7.520     9.342
 (4 - 3)      8.185     0.000     7.274     9.097
 (4 - 5)      0.406     0.875    -0.505     1.317
 (4 - 6)      6.354     0.000     5.443     7.265
 (4 - 7)      8.183     0.000     7.272     9.095
 (5 - 0)      0.556     0.579    -0.355     1.467
 (5 - 1)      0.494     0.718    -0.417     1.405
 (5 - 2)      8.025     0.000     7.114     8.936
 (5 - 3)      7.779     0.000     6.868     8.690
 (5 - 4)     -0.406     0.875    -1.317     0.505
 (5 - 6)      5.948     0.000     5.037     6.859
 (5 - 7)      7.777     0.000     6.866     8.688
 (6 - 0)     -5.392     0.000    -6.303    -4.480
 (6 - 1)     -5.454     0.000    -6.365    -4.543
 (6 - 2)      2.077     0.000     1.166     2.988
 (6 - 3)      1.831     0.000     0.920     2.742
 (6 - 4)     -6.354     0.000    -7.265    -5.443
 (6 - 5)     -5.948     0.000    -6.859    -5.037
 (6 - 7)      1.829     0.000     0.918     2.740
 (7 - 0)     -7.221     0.000    -8.132    -6.310
 (7 - 1)     -7.283     0.000    -8.195    -6.372
 (7 - 2)      0.248     0.991    -0.663     1.159
 (7 - 3)      0.002     1.000    -0.909     0.913
 (7 - 4)     -8.183     0.000    -9.095    -7.272
 (7 - 5)     -7.777     0.000    -8.688    -6.866
 (7 - 6)     -1.829     0.000    -2.740    -0.918
```

Need to plot the data in a bar diagram

In [14]:

```
import matplotlib.pyplot as plt
```

In [15]:

```
data= (data['Active'].to_list(),
                data['Relaxed'].to_list(),
                data['Fearful'].to_list(),
                data['Agitated'].to_list(),
                data['Calm'].to_list(),
                data['Content'].to_list(),
                data['Indifferent'].to_list(),
                data['Frustrated'].to_list(),
               )
```

In [34]:

```
data
```

Out[34]:

	Date	Time	Reporter	Farmlet	Active	Relaxed	Fearful	Agitated	Calm	Content	Indifferent	Frustrated
0	06/01/2023	15:00	CM	R	9.2	8.4	0.0	0.0	8.7	8.0	1.2	0.5
1	06/01/2023	15:00	CM	G	8.5	10.6	0.0	0.0	10.5	10.5	2.5	0.5
2	06/01/2023	15:00	CM	B	10.0	7.5	0.0	0.0	8.7	9.2	0.5	1.2
3	06/01/2023	15:00	T	R	9.5	9.5	0.6	0.6	10.4	9.8	0.6	0.6
4	06/01/2023	15:00	T	G	8.5	8.5	0.8	0.8	10.0	8.7	1.0	1.0
5	06/01/2023	15:00	T	B	9.0	9.0	1.2	1.2	9.6	9.2	1.3	1.3
6	13/01/2023	12:20	CM	R	10.0	7.7	0.0	1.3	8.3	6.6	2.0	0.6
7	13/01/2023	12:20	CM	G	8.5	2.3	2.3	4.3	5.9	2.2	1.4	0.6
8	13/01/2023	12:20	CM	B	9.3	8.8	0.0	1.3	9.0	8.3	3.8	0.0
9	19/01/2023	14:50	CM	R	9.5	9.7	0.0	0.0	10.7	9.9	4.1	0.0
10	19/01/2023	14:50	CM	G	5.1	9.9	0.0	0.0	11.9	8.5	6.4	0.0
11	19/01/2023	14:50	CM	B	8.5	8.4	0.0	0.0	8.1	7.7	2.7	0.6
12	19/01/2023	14:50	T	R	7.1	9.4	0.4	1.0	11.4	11.4	5.7	1.6
13	19/01/2023	14:50	T	G	5.8	11.9	0.4	2.1	11.9	11.9	0.3	0.3
14	19/01/2023	14:50	T	B	5.1	9.7	0.6	0.6	11.2	11.2	1.6	0.7
15	19/01/2023	14:50	T	R	8.5	8.5	0.9	1.1	10.1	8.8	1.4	1.4
16	19/01/2023	14:50	T	G	7.1	5.3	0.1	0.1	7.2	6.2	0.4	0.4
17	19/01/2023	14:50	T	B	7.2	5.3	1.7	1.8	8.1	6.8	1.8	2.7
18	27/01/2023	14:30	CM	R	9.1	10.5	0.0	0.0	10.4	10.4	4.4	0.0
19	27/01/2023	14:30	CM	G	11.1	10.9	0.0	0.0	10.5	9.7	2.4	0.0
20	27/01/2023	14:30	CM	B	8.5	8.5	0.0	0.0	8.9	8.8	2.8	0.0
21	27/01/2023	14:30	T	R	8.5	8.2	1.8	2.0	9.9	8.2	2.0	2.0
22	27/01/2023	14:30	T	G	8.5	5.4	1.4	1.6	10.2	8.8	1.8	2.0
23	27/01/2023	14:30	T	B	7.0	5.0	2.1	2.1	8.1	6.4	2.0	2.3
24	02/02/2023	11:45	T	R	7.8	7.7	1.4	1.7	7.0	8.0	1.8	1.7
25	02/02/2023	11:45	T	G	7.4	7.4	1.3	1.3	7.5	7.5	1.3	1.3
26	02/02/2023	11:45	T	B	7.8	7.5	1.3	1.4	8.1	7.8	1.4	2.6
27	02/02/2023	11:45	CM	R	9.8	8.2	0.4	1.6	8.8	8.7	1.7	0.7
28	02/02/2023	11:45	CM	G	7.7	9.8	0.0	0.0	10.1	9.2	3.0	0.0
29	02/02/2023	11:45	CM	B	7.4	10.8	0.7	0.3	9.4	9.5	4.5	0.4
30	03/03/2023	13:45	T	R	3.7	7.4	0.9	0.9	8.7	8.7	1.3	1.3
31	03/03/2023	13:45	T	G	8.7	8.2	0.9	0.9	8.1	8.1	1.0	1.0
32	03/03/2023	13:45	T	B	8.5	5.4	1.0	1.0	8.5	8.2	1.0	1.1
33	03/03/2023	13:45	CM	R	6.4	8.8	0.0	0.0	9.2	9.8	8.1	0.4
34	03/03/2023	13:45	CM	G	8.7	10.4	0.0	0.0	10.4	10.2	8.0	0.6
35	03/03/2023	13:45	CM	B	3.8	8.8	0.6	0.6	8.9	8.9	7.0	0.3
36	14/03/2023	09:45	CM	R	9.2	8.8	0.0	0.3	10.9	10.5	7.8	0.1
37	14/03/2023	09:45	CM	G	8.7	8.9	0.0	0.3	8.5	8.2	8.0	0.0
38	14/03/2023	09:45	CM	B	9.1	8.7	0.0	0.3	9.2	9.1	1.8	1.1
39	14/03/2023	09:45	T	R	8.7	7.2	1.0	1.0	9.2	9.4	1.0	1.0
40	14/03/2023	09:45	T	G	8.1	8.1	1.1	1.4	8.5	8.5	1.6	1.6
41	14/03/2023	09:45	T	B	8.7	8.4	0.9	0.9	8.8	8.4	0.9	0.9
42	23/03/2023	09:30	CM	R	7.7	8.8	0.0	0.0	8.2	9.2	2.8	0.0
43	23/03/2023	09:30	CM	G	9.7	7.1	0.4	1.8	3.6	8.1	2.0	0.4
44	23/03/2023	09:30	CM	B	8.0	8.8	0.0	0.0	9.4	9.2	5.0	0.0
45	23/03/2023	09:30	T	R	8.7	5.7	0.9	1.0	8.7	8.7	1.3	1.6
46	23/03/2023	09:30	T	G	7.2	5.1	0.9	1.4	7.7	6.5	1.6	1.7
47	23/03/2023	09:30	T	B	7.5	6.2	1.6	1.4	7.2	7.2	1.3	1.4

In [16]:

```
import matplotlib.pyplot as plt
import numpy as np
```

In [17]:

```
pip install matplotlib
```

```
Requirement already satisfied: matplotlib in c:\users\ayooba\appdata\local\anaconda3\lib\site-packages (3.7.2)
Requirement already satisfied: contourpy>=1.0.1 in c:\users\ayooba\appdata\local\anaconda3\lib\site-packages (f
rom matplotlib) (1.0.5)
Requirement already satisfied: cycler>=0.10 in c:\users\ayooba\appdata\local\anaconda3\lib\site-packages (from
matplotlib) (0.11.0)
Requirement already satisfied: fonttools>=4.22.0 in c:\users\ayooba\appdata\local\anaconda3\lib\site-packages (
from matplotlib) (4.25.0)
Requirement already satisfied: kiwisolver>=1.0.1 in c:\users\ayooba\appdata\local\anaconda3\lib\site-packages (
from matplotlib) (1.4.4)
Requirement already satisfied: numpy>=1.20 in c:\users\ayooba\appdata\local\anaconda3\lib\site-packages (from m
atplotlib) (1.24.3)
Requirement already satisfied: packaging>=20.0 in c:\users\ayooba\appdata\local\anaconda3\lib\site-packages (fr
om matplotlib) (23.1)
Requirement already satisfied: pillow>=6.2.0 in c:\users\ayooba\appdata\local\anaconda3\lib\site-packages (from
matplotlib) (10.0.1)
Requirement already satisfied: pyparsing<3.1,>=2.3.1 in c:\users\ayooba\appdata\local\anaconda3\lib\site-packag
es (from matplotlib) (3.0.9)
Requirement already satisfied: python-dateutil>=2.7 in c:\users\ayooba\appdata\local\anaconda3\lib\site-package
s (from matplotlib) (2.8.2)
Requirement already satisfied: six>=1.5 in c:\users\ayooba\appdata\local\anaconda3\lib\site-packages (from pyth
on-dateutil>=2.7->matplotlib) (1.16.0)
Note: you may need to restart the kernel to use updated packages.
```

In [45]:

```python
import matplotlib.pyplot as plt
```

In [49]:

```python
pip install matplotlib
```

```
Requirement already satisfied: matplotlib in c:\users\ayooba\appdata\local\anaconda3\lib\site-packages (3.7.2)
Requirement already satisfied: contourpy>=1.0.1 in c:\users\ayooba\appdata\local\anaconda3\lib\site-packages (f
rom matplotlib) (1.0.5)
Requirement already satisfied: cycler>=0.10 in c:\users\ayooba\appdata\local\anaconda3\lib\site-packages (from
matplotlib) (0.11.0)
Requirement already satisfied: fonttools>=4.22.0 in c:\users\ayooba\appdata\local\anaconda3\lib\site-packages (
from matplotlib) (4.25.0)
Requirement already satisfied: kiwisolver>=1.0.1 in c:\users\ayooba\appdata\local\anaconda3\lib\site-packages (
from matplotlib) (1.4.4)
Requirement already satisfied: numpy>=1.20 in c:\users\ayooba\appdata\local\anaconda3\lib\site-packages (from m
atplotlib) (1.24.3)
Requirement already satisfied: packaging>=20.0 in c:\users\ayooba\appdata\local\anaconda3\lib\site-packages (fr
om matplotlib) (23.1)
Requirement already satisfied: pillow>=6.2.0 in c:\users\ayooba\appdata\local\anaconda3\lib\site-packages (from
matplotlib) (10.0.1)
Requirement already satisfied: pyparsing<3.1,>=2.3.1 in c:\users\ayooba\appdata\local\anaconda3\lib\site-packag
es (from matplotlib) (3.0.9)
Requirement already satisfied: python-dateutil>=2.7 in c:\users\ayooba\appdata\local\anaconda3\lib\site-package
s (from matplotlib) (2.8.2)
Requirement already satisfied: six>=1.5 in c:\users\ayooba\appdata\local\anaconda3\lib\site-packages (from pyth
on-dateutil>=2.7->matplotlib) (1.16.0)
Note: you may need to restart the kernel to use updated packages.
```

In [18]:

```python
data = pd.read_csv('D:\\data science exam\\afsal.csv')
```

Defiing the different emotional states

In [19]:

```python
emotional_states = ['Active', 'Relaxed', 'Fearful', 'Agitated', 'Calm', 'Content', 'Indifferent', 'Frustrated']
```

In [20]:

```python
if isinstance(data, pd.DataFrame):
    # Calculate the mean and standard error for each emotional state
    means = data[emotional_states].mean()
    errors = data[emotional_states].sem()  # Standard Error of the Mean (SEM)
```

In [21]:

```python
import matplotlib.pyplot as plt
import pandas as pd
import numpy as np
```

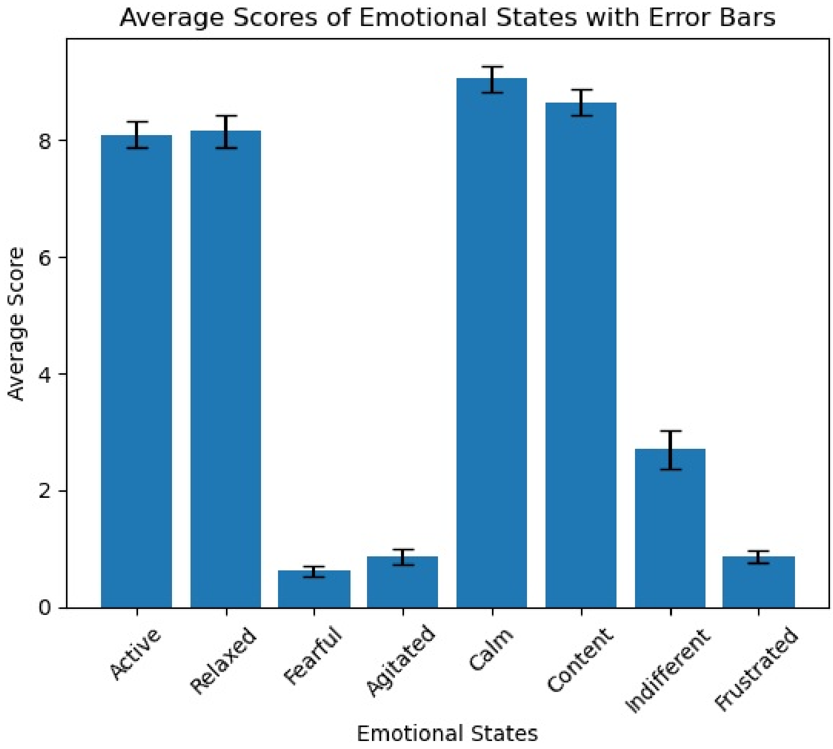
In [22]:

```python
data = pd.read_csv('D:\\data science exam\\afsal.csv')
```

Results of Bar diagram

In [23]:

```python
plt.bar(emotional_states, means, yerr=errors, capsize=5)
plt.xlabel('Emotional States')
plt.ylabel('Average Score')
plt.title('Average Scores of Emotional States with Error Bars')
plt.xticks(rotation=45)
plt.show()
```



In [29]:
```
import pandas as pd
import matplotlib.pyplot as plt
import seaborn as sns
```

In [30]:
```
file_path = 'D:\\data science exam\\afsal.csv'
data = pd.read_csv(file_path)
```

In [32]:
```
behavioral_data = data.select_dtypes(include=[float, int])
```

In [33]:
```
behavioral_data['Farmlet'] = data['Farmlet']
```

In [34]:
```
mean_values = behavioral_data.groupby('Farmlet').mean()
```

In [35]:
```
plt.figure(figsize=(15, 8))
```

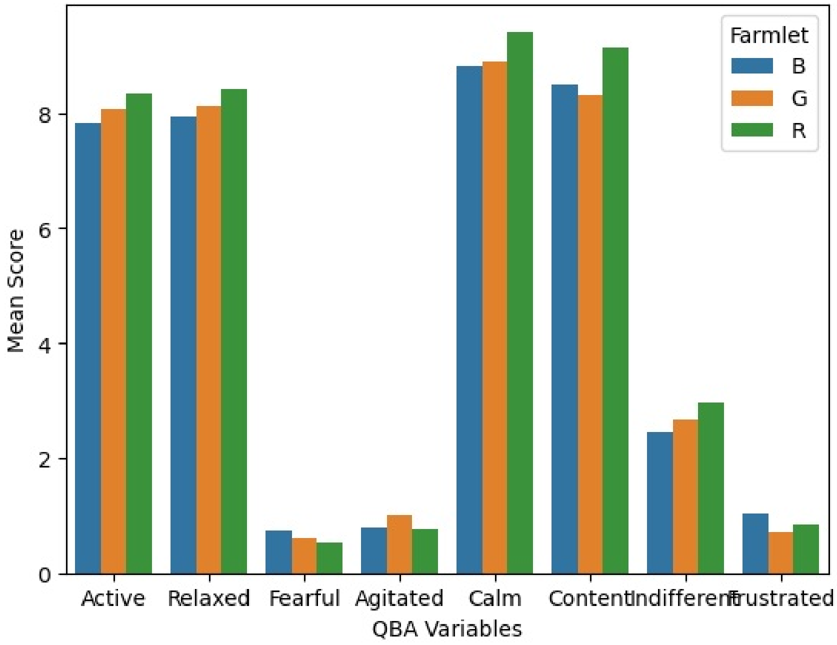
Out[35]:
```
<Figure size 1500x800 with 0 Axes>

<Figure size 1500x800 with 0 Axes>
```

In [40]:
```
melted_data = mean_values.reset_index().melt(id_vars='Farmlet', var_name='QBA Variables', value_name='Mean Scor
```

panning to plot the mean score of each QBA variable over the three different farmlets

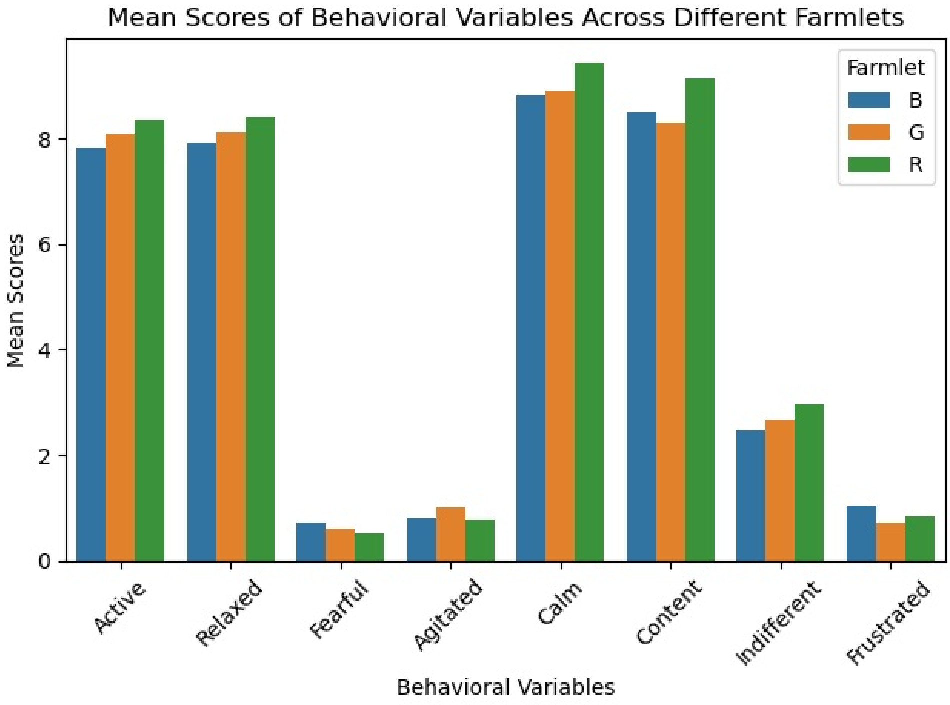
In [41]:
```
sns.barplot(x='QBA Variables', y='Mean Score', hue='Farmlet', data=melted_data)
```

Out[41]:
```
<Axes: xlabel='QBA Variables', ylabel='Mean Score'>
```



In [42]:

```
sns.barplot(x='QBA Variables', y='Mean Score', hue='Farmlet', data=melted_data)

plt.title('Mean Scores of Behavioral Variables Across Different Farmlets')
plt.xlabel('Behavioral Variables')
plt.ylabel('Mean Scores')
plt.xticks(rotation=45)
plt.legend(title='Farmlet')
plt.tight_layout()
plt.show()
```



```
In [ ]:
```

Loading [MathJax]/jax/output/CommonHTML/fonts/TeX/fontdata.js