Question 2:

- Farmers are getting to know about the F4F program from social media and some other means.
- These farmers call back to our call center.
- This attached data consists of dummy data similar to a small portion from call center data.
- How can we obtain some numerical insights from the data including comments which will help us to better understand the data.

In [1]:
```
import re
import numpy as np
import pandas as pd
import matplotlib.pyplot as plt
import seaborn as sns
```

In [2]:
```
df = pd.read_csv("q2_data.xlsx - Data.csv")
df
```

Out[2]:

	S.N.	Date	Reference/From where did they come to know about us?	comments
0	1	25-April-2024	Whatsapp	Want Sadalwood plants
1	2	26-April-2024	Instagram	Interested to Agroforestry but Not decided fruits
2	3	26-April-2024	Peer to Peer	Interested to Agroforestry but Not decided fruits
3	4	27-April-2024	Poster/Flyer	Interested to Agroforestry but Not decided fruits
4	5	27-April-2024	Whatsapp	Mango And Sitaphal
...	...	...	...	...
3109	3303	24-Jan-2025	Instagram	Interested Farmer
3110	3304	24-Jan-2025	Instagram	Called to get information about F4F
3111	3305	24-Jan-2025	Instagram	Called to get information about F4F
3112	3306	24-Jan-2025	Instagram	Mango
3113	3307	24-Jan-2025	Peer to Peer	25 year old ngo shyog pragati ngo gujrat

3114 rows × 4 columns

In [3]:
```
df.rename(columns={'Reference/From where did they come to know about us?': 'Reference'}, inplace=True)
df
```

Out[3]:

	S.N.	Date	Reference	comments
0	1	25-April-2024	Whatsapp	Want Sadalwood plants
1	2	26-April-2024	Instagram	Interested to Agroforestry but Not decided fruits
2	3	26-April-2024	Peer to Peer	Interested to Agroforestry but Not decided fruits
3	4	27-April-2024	Poster/Flyer	Interested to Agroforestry but Not decided fruits
4	5	27-April-2024	Whatsapp	Mango And Sitaphal
...	...	...	...	...
3109	3303	24-Jan-2025	Instagram	Interested Farmer
3110	3304	24-Jan-2025	Instagram	Called to get information about F4F
3111	3305	24-Jan-2025	Instagram	Called to get information about F4F
3112	3306	24-Jan-2025	Instagram	Mango
3113	3307	24-Jan-2025	Peer to Peer	25 year old ngo shyog pragati ngo gujrat

3114 rows × 4 columns

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

```
<class 'pandas.core.frame.DataFrame'>
RangeIndex: 3114 entries, 0 to 3113
Data columns (total 4 columns):
 #   Column     Non-Null Count  Dtype 
---  ------     --------------  ----- 
 0   S.N.       3114 non-null   int64 
 1   Date       3114 non-null   object
 2   Reference  3114 non-null   object
 3   comments   3114 non-null   object
dtypes: int64(1), object(3)
memory usage: 97.4+ KB
```

In [5]:
```
x = [df['Date'].value_counts()]
```

Looking for daily call count

- The pandas value_count function gives you the distinct values
- The dataset contains No Null values
- data is in text format hense we cannot perform statestical EDA

In [6]:
```
for i in range(len(x)):
    print(x)
```

```
[Date
27-Jun-2024      65
23-May-2024      63
24-Jun-2024      62
26-Jun-2024      60
25-Jun-2024      56
                 ..
3 June 2004       1
16-Nov-2024       1
21-Nov-2024       1
28-Nov-2024       1
25-April-2024     1
Name: count, Length: 204, dtype: int64]
```

In [7]:
```
from datetime import datetime
# for uniformity in text we are going to lowecase the text
def lowering(text):
    return text.lower()

# There are few few different entries for date column
# To make same pattern below function works
def shorten_months(date_str):
    month_mapping = {
        "january": "jan",
        "february": "feb",
        "march": "mar",
        "april": "apr",
        "may": "may",
        "june": "jun",
        "july": "jul",
        "august": "aug",
        "september": "sep",
```

```
        "october": "oct",
        "november": "nov",
        "december": "dec"
    }

    date_str = date_str.lower()

    for full_month, short_month in month_mapping.items():
        date_str = date_str.replace(full_month, short_month)
        date_str = date_str.replace(" ", "-")
        date_str = date_str.replace("2004", "2024")

    return date_str
# this function uses the method strptime of datetime package
# Which is used to convert the string in date format
def date_format(string):
    date_format = "%d-%b-%Y"
    result_datetime = datetime.strptime(string, date_format)
    return result_datetime
# this function uses the method day_name of datetime package
# Which is used to to find the Day of week for that perticular date
def week_day(date):
    day_of_week = date.day_name()
    return day_of_week

df['Date'] = df['Date'].apply(lowering)
df['Date'] = df['Date'].apply(shorten_months)
df['date'] = df['Date'].apply(date_format)
df['Day'] = df['date'].apply(week_day)
df
```

Out[7]:

	S.N.	Date	Reference	comments	date	Day
0	1	25-apr-2024	Whatsapp	Want Sadalwood plants	2024-04-25	Thursday
1	2	26-apr-2024	Instagram	Interested to Agroforestry but Not decided fruits	2024-04-26	Friday
2	3	26-apr-2024	Peer to Peer	Interested to Agroforestry but Not decided fruits	2024-04-26	Friday
3	4	27-apr-2024	Poster/Flyer	Interested to Agroforestry but Not decided fruits	2024-04-27	Saturday
4	5	27-apr-2024	Whatsapp	Mango And Sitaphal	2024-04-27	Saturday
...	...	...	...	...	...	...
3109	3303	24-jan-2025	Instagram	Interested Farmer	2025-01-24	Friday
3110	3304	24-jan-2025	Instagram	Called to get information about F4F	2025-01-24	Friday
3111	3305	24-jan-2025	Instagram	Called to get information about F4F	2025-01-24	Friday
3112	3306	24-jan-2025	Instagram	Mango	2025-01-24	Friday
3113	3307	24-jan-2025	Peer to Peer	25 year old ngo shyog pragati ngo gujrat	2025-01-24	Friday

3114 rows × 6 columns

In [8]:
```
df.info()
```

```
<class 'pandas.core.frame.DataFrame'>
RangeIndex: 3114 entries, 0 to 3113
Data columns (total 6 columns):
 #   Column     Non-Null Count  Dtype         
---  ------     --------------  -----         
 0   S.N.       3114 non-null   int64         
 1   Date       3114 non-null   object        
 2   Reference  3114 non-null   object        
 3   comments   3114 non-null   object        
 4   date       3114 non-null   datetime64[ns]
 5   Day        3114 non-null   object        
dtypes: datetime64[ns](1), int64(1), object(4)
memory usage: 146.1+ KB
```

In [9]:
```
df.describe()
```

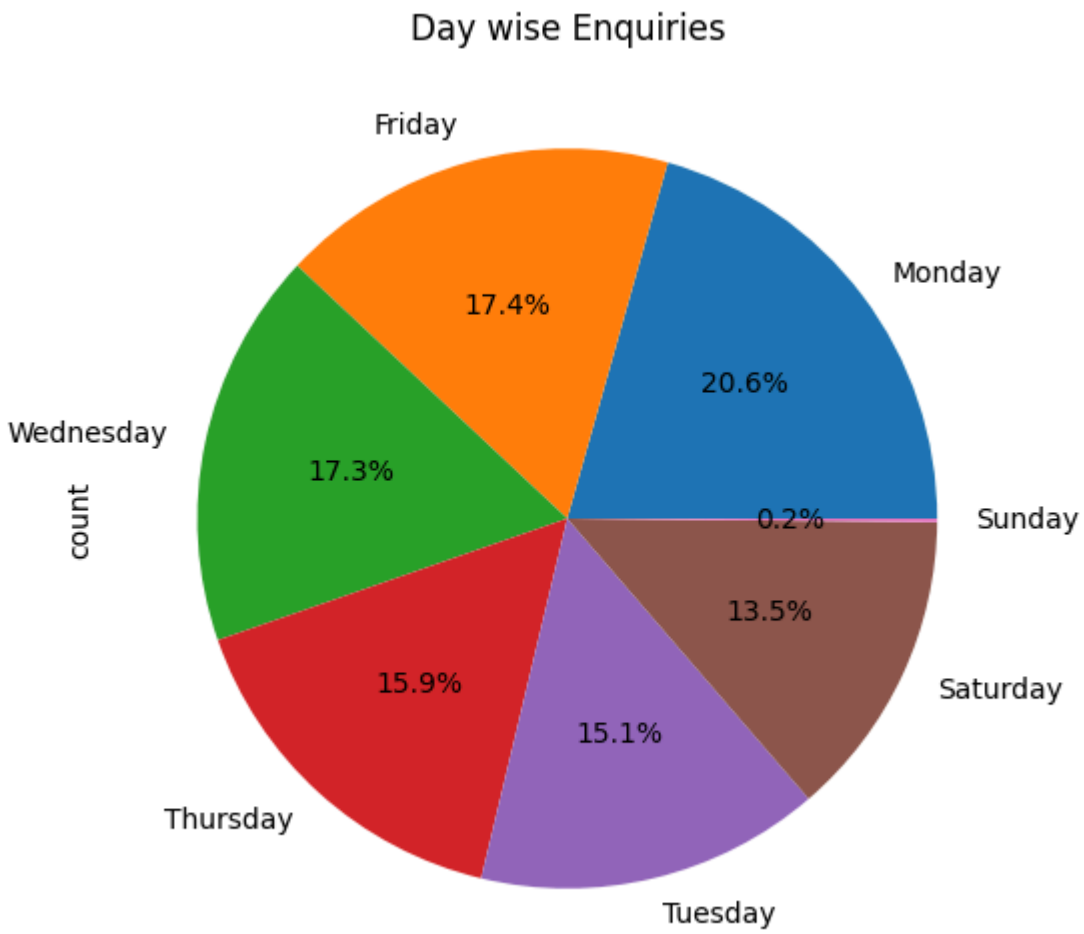
Out[9]:

	S.N.	date
count	3114.000000	3114
mean	1617.644830	2024-07-24 01:16:18.034682112
min	1.000000	2024-04-25 00:00:00
25%	841.250000	2024-06-05 00:00:00
50%	1619.500000	2024-07-03 00:00:00
75%	2398.750000	2024-08-30 00:00:00
max	3307.000000	2025-01-24 00:00:00
std	918.055532	NaN

Day wise enquiries

```
(day_counts =df['Day'].value_counts())
Day
Monday       641
Friday       543
Wednesday    541
Thursday     497
Tuesday      470
Saturday     419
Sunday         3
Name: count, dtype: int64
```

In [10]:
```
day_counts =df['Day'].value_counts()
plt.figure(figsize=(8, 6))
day_counts.plot(kind='pie', autopct='%1.1f%%')
plt.title('Day wise Enquiries')
plt.show()
```



In [11]:
```
df['Reference'].value_counts()
```

Out[11]:
```
Reference
Instagram                  1582
Facebook                    534
Stall /program/Function     309
Whatsapp                    308
Youtube/Google              167
Peer to Peer                117
F4F_Team                     63
Poster/Flyer                 18
Fb                            6
other                         6
Youtube                       3
Insta                         1
Name: count, dtype: int64
```

Note :

There are 20 entries of year 2004 which I think wrong entered

- So I am replacing this with 2024 (At staring Function)
- date
- 2004   20
- 2024   2998
- 2025   96

Name: S.N., dtype: int64

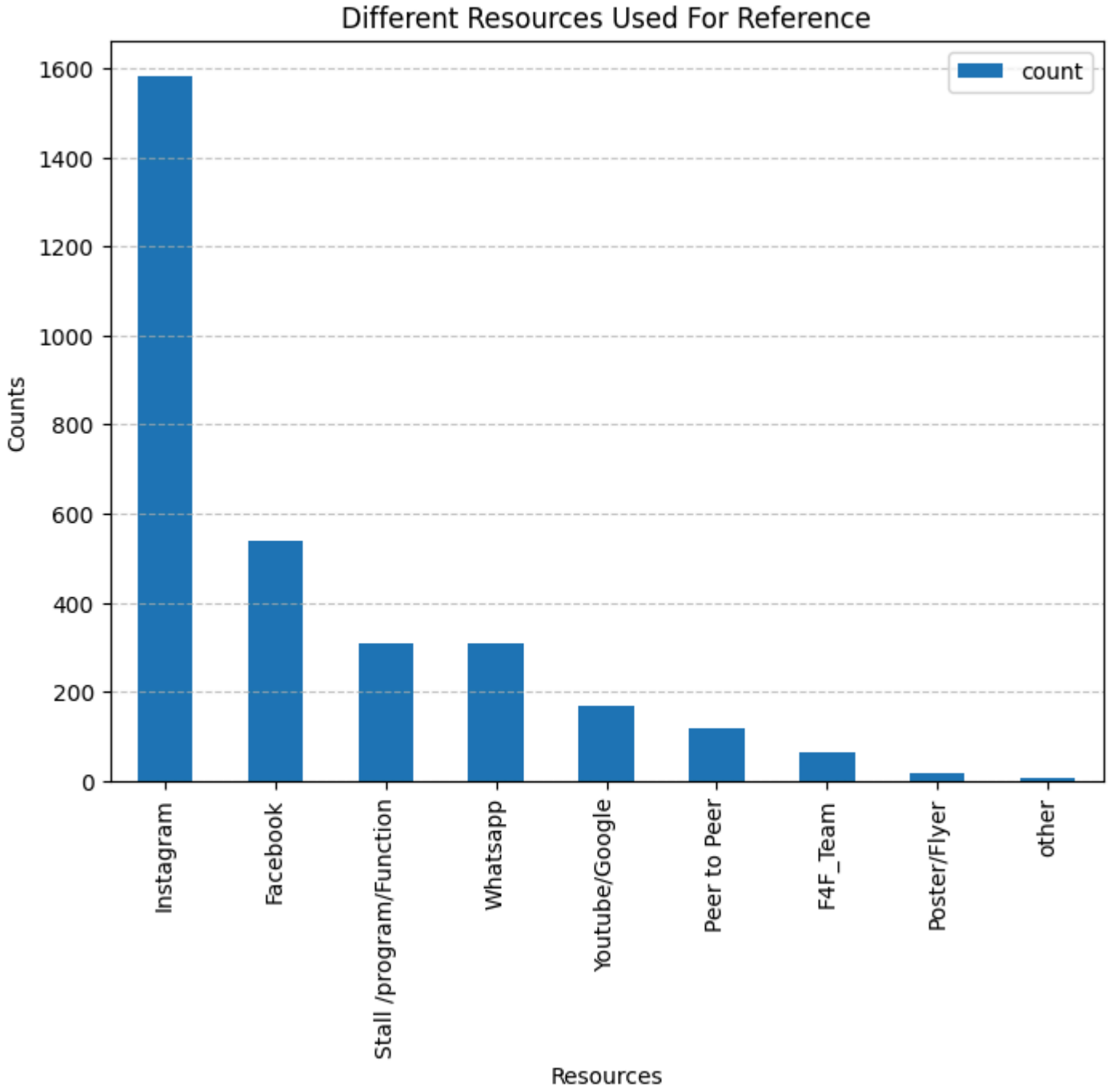
There are few records which are similar but written differently

- I am combinin them together
- Reference
- Instagram   1582
- Facebook   534
- Stall /program/Function   309
- Whatsapp   308
- Youtube/Google   167
- Peer to Peer   117

```
- F4F_Team                    63
- Poster/Flyer                18
- Fb                           6
- other                        6
- Youtube                      3
- Insta                        1
```

In [12]:

```python
def replace_Reference(string):
    if string == "Fb":
        string = "Facebook"
    elif string == "Youtube":
        string = "Youtube/Google"
    elif string == "Insta":
        string = "Instagram"
    return string
df['Reference'] = df['Reference'].apply(replace_Reference)
reference = df['Reference'].value_counts()
plt.figure(figsize=(8, 6))
reference.plot(kind='bar')
plt.title('Different Resources Used For Reference')
plt.xlabel('Resources')
plt.ylabel('Counts')
plt.grid(axis='y', linestyle='--', alpha=0.7)
plt.legend()
plt.show()
```

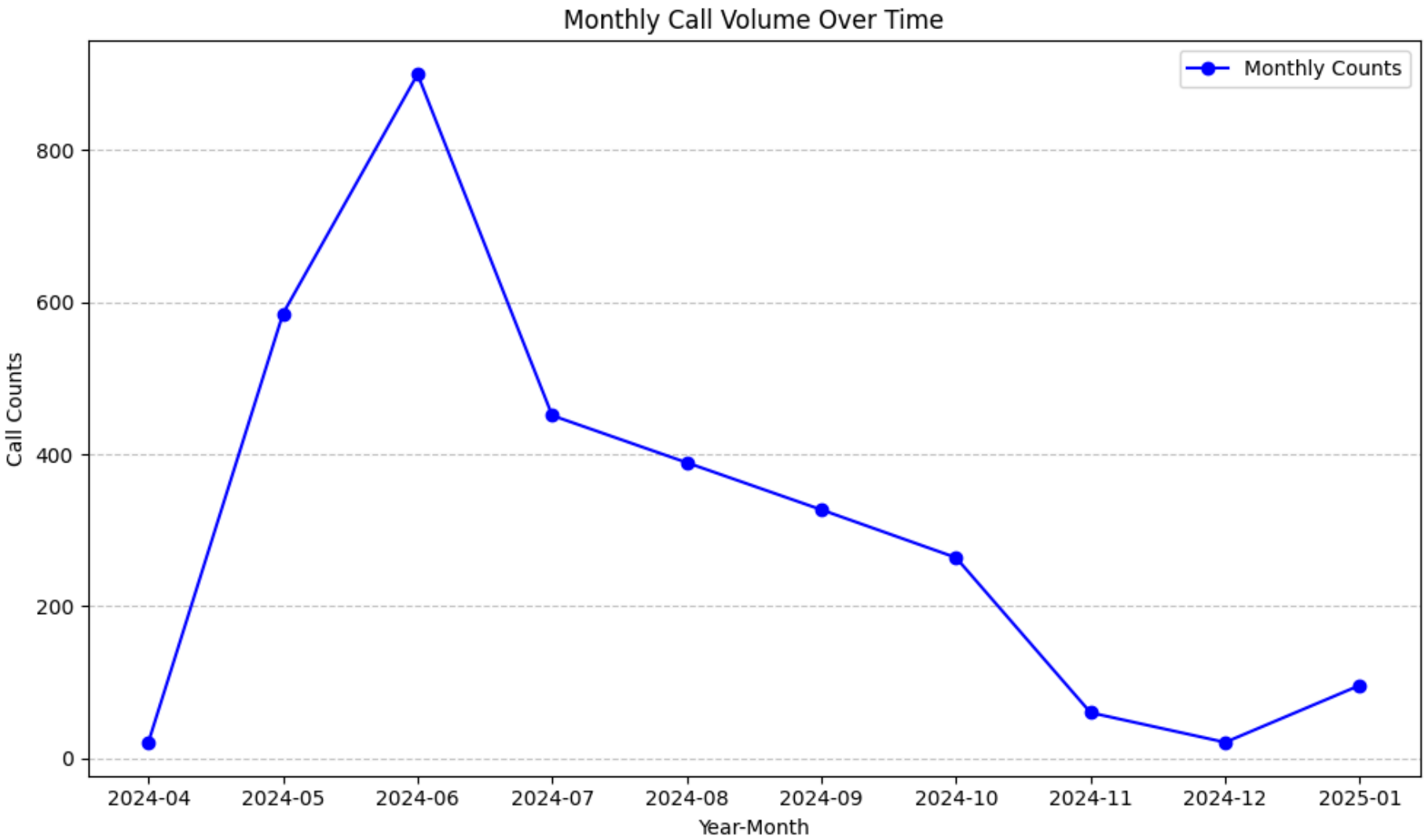

Different Resources Used For Reference
count
1600
1400
1200
1000
800
600
400
200
0
Counts
Instagram
Facebook
Stall /program/Function
Whatsapp
Youtube/Google
Peer to Peer
F4F_Team
Poster/Flyer
other
Resources

Monthly analysis of call

How many calls come in which month for inquiry

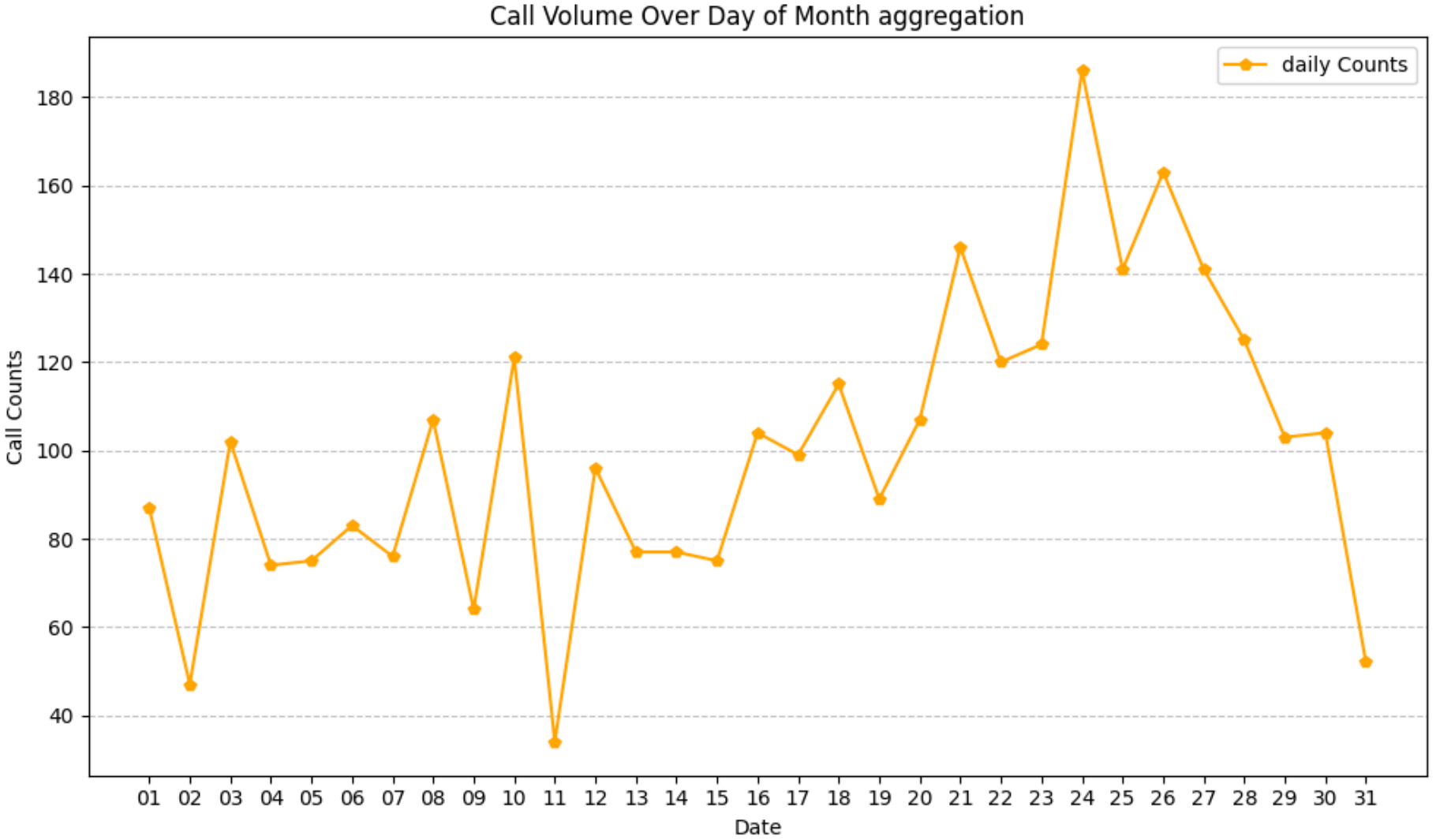
- yearly_summary.index Gives tuple of multiindex (2024, 11)
- yearly_summary.values Gives the value of in

In [13]:
```
yearly_summary = df.groupby([df['date'].dt.year, df['date'].dt.month])['S.N.'].count()

summary_df = pd.DataFrame({
    'Year-Month': [str(year) + '-' + str(month).zfill(2) for year, month in yearly_summary.index],
    'Count': yearly_summary.values
})

plt.figure(figsize=(10, 6))
plt.plot(summary_df['Year-Month'], summary_df['Count'], marker='o', linestyle='-', color='b', label='Monthly Counts

plt.title('Monthly Call Volume Over Time')
plt.xlabel('Year-Month')
plt.ylabel('Call Counts')
plt.grid(axis='y', linestyle='--', alpha=0.7)
plt.tight_layout()
plt.legend()
plt.show()
```



In [14]:
```
day_of_month = df.groupby(df['date'].dt.day)['S.N.'].count()
day_of_month = pd.DataFrame({
    "Date": [str(idx).zfill(2) for idx in day_of_month.index],
    "Count": day_of_month.values
})
plt.figure(figsize=(10, 6))
plt.plot(day_of_month['Date'], day_of_month['Count'], marker='p', linestyle='-', color='orange', label='daily Count
```

```
plt.title('Call Volume Over Day of Month aggregation')
plt.xlabel('Date')
plt.ylabel('Call Counts')
plt.grid(axis='y', linestyle='--', alpha=0.7)
plt.tight_layout()
plt.legend()
plt.show()
```



In [15]:
```
# x = df.groupby(df['Date'])['S.N.'].count() similar output
x = df.groupby([df['date'].dt.year, df['date'].dt.month, df['date'].dt.day])['S.N.'].count()
x = pd.DataFrame({
    'Year-Month-Day': [str(year) + '-' + str(month).zfill(2) + '-' + str(day).zfill(2) for year, month, day in x.in
    'Year-Month': [str(year) + '-' + str(month).zfill(2) for year, month, day in x.index],
    'Count': x.values
```

```
})
x
```

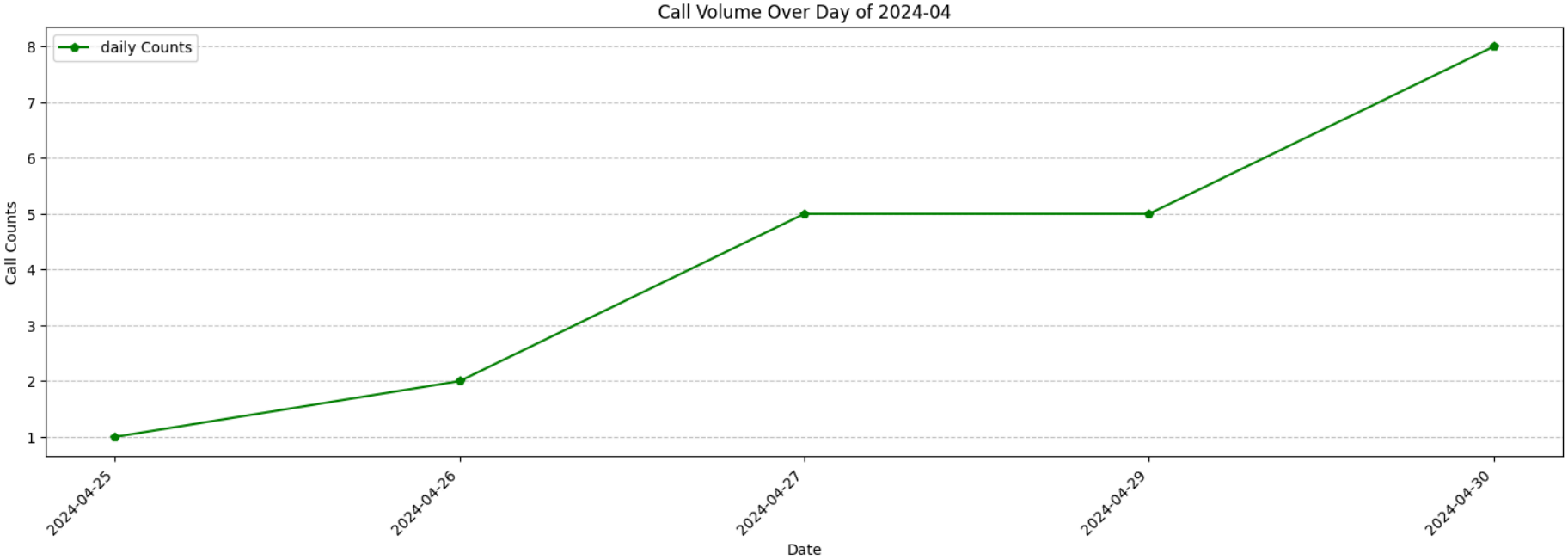
Out[15]:

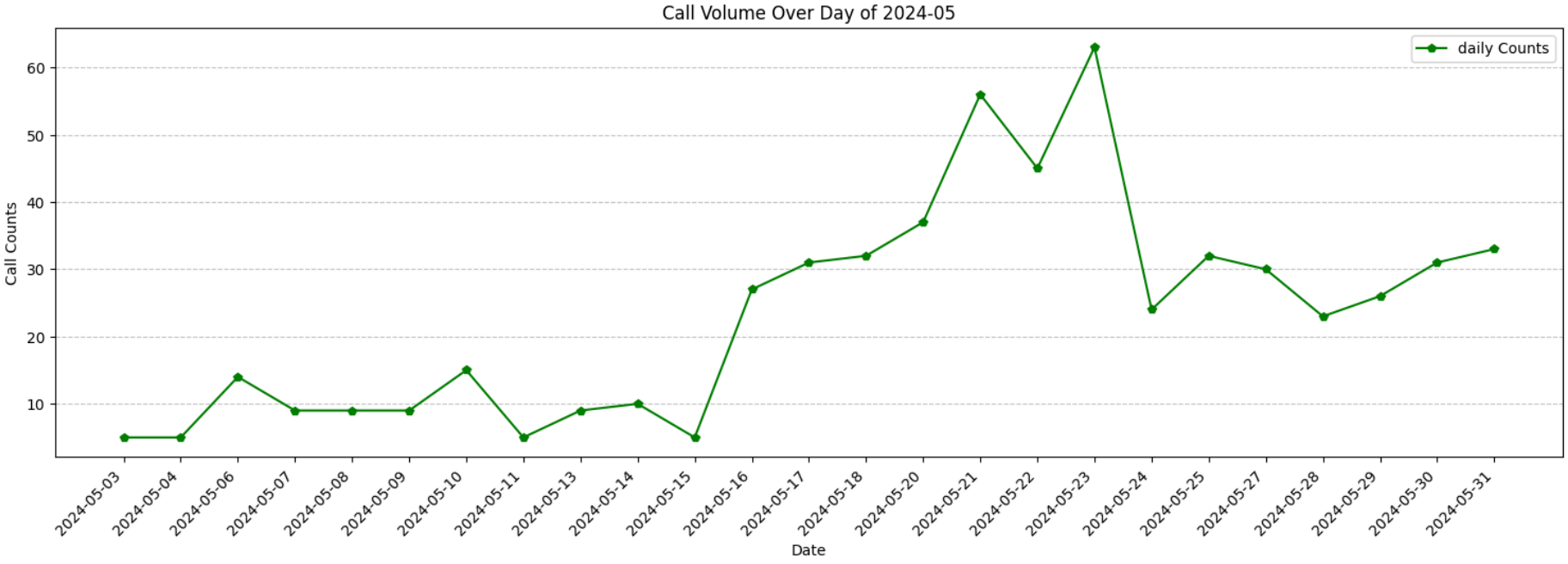
	Year-Month-Day	Year-Month	Count
0	2024-04-25	2024-04	1
1	2024-04-26	2024-04	2
2	2024-04-27	2024-04	5
3	2024-04-29	2024-04	5
4	2024-04-30	2024-04	8
...	...	...	...
185	2025-01-16	2025-01	7
186	2025-01-17	2025-01	2
187	2025-01-22	2025-01	2
188	2025-01-23	2025-01	2
189	2025-01-24	2025-01	6

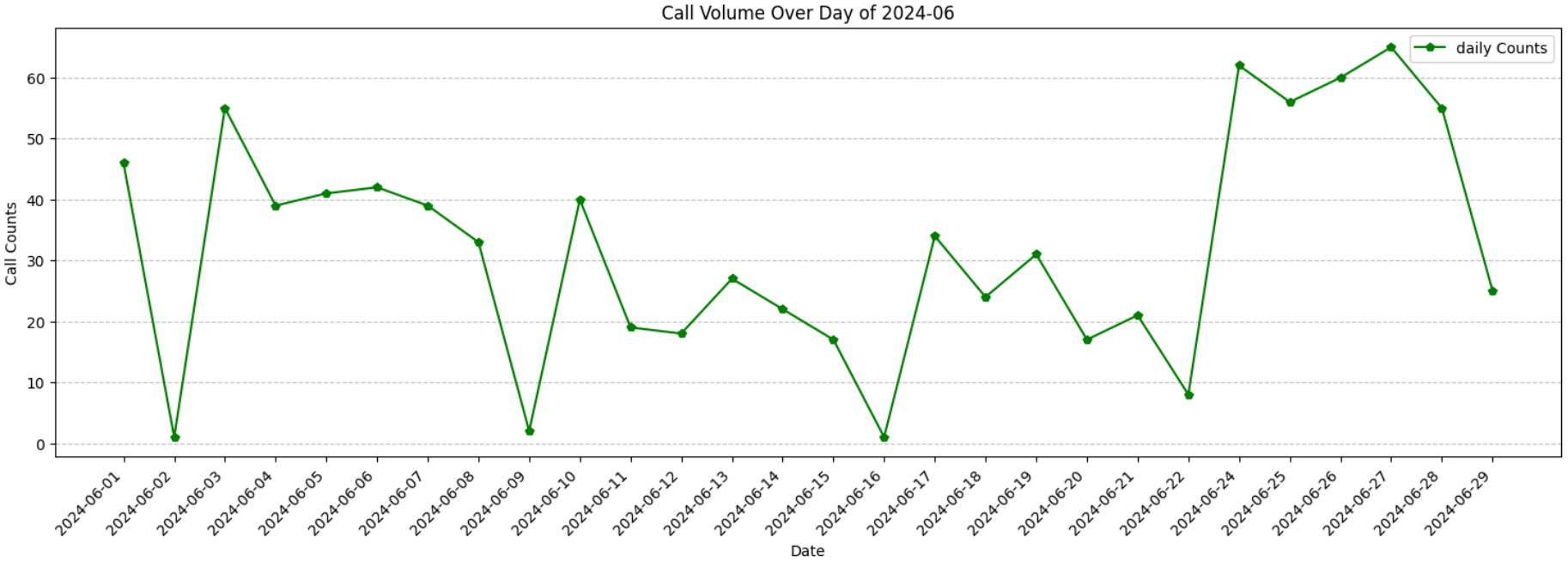
190 rows × 3 columns

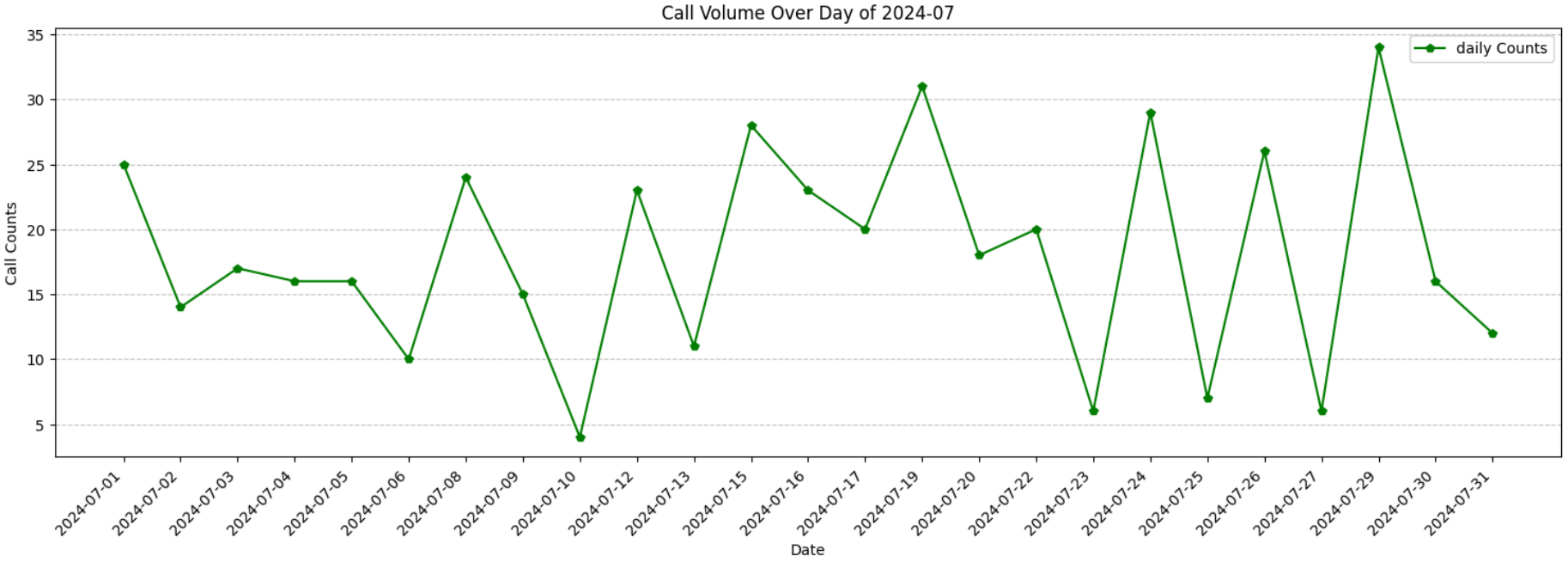
In [16]:

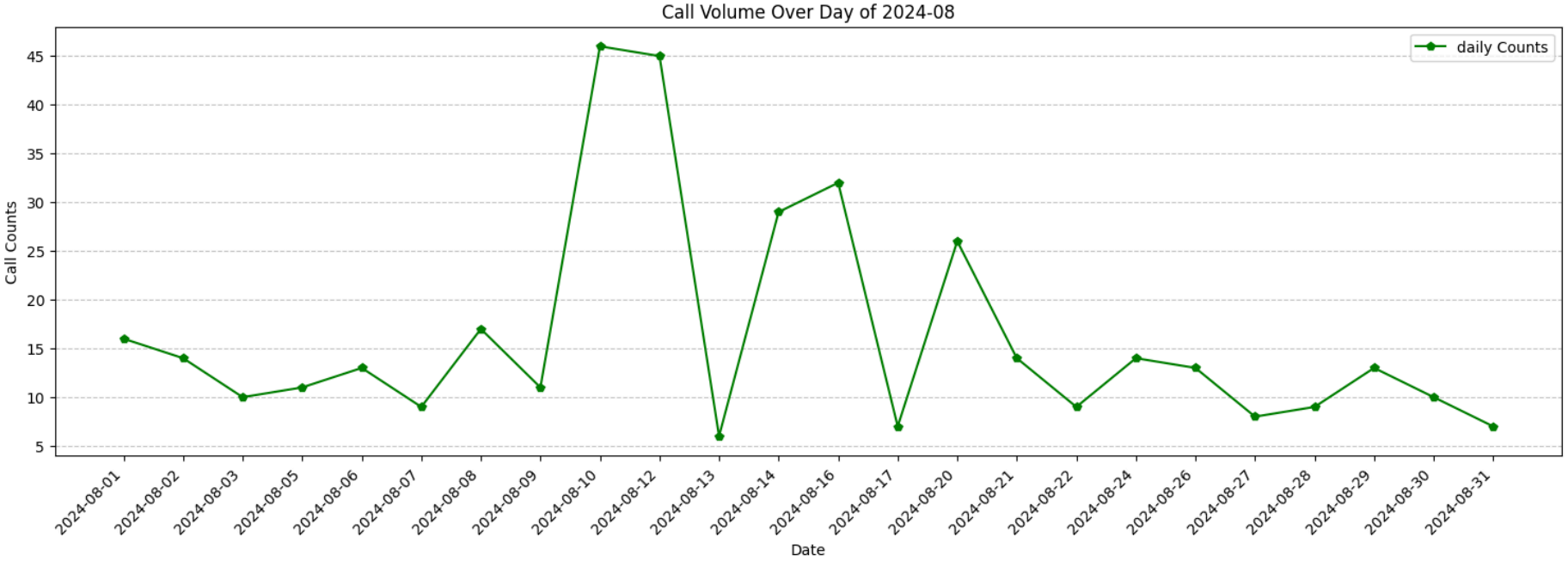
```
unique_month = x['Year-Month'].unique()
dfs = {month: x[x['Year-Month'] == month] for month in unique_month}
for month, data in dfs.items():
    plt.figure(figsize=(15, 5))
    plt.plot(data['Year-Month-Day'], data['Count'], marker='p', linestyle='-', color='green', label='daily Counts')

    plt.title(f'Call Volume Over Day of {month}')
    plt.xlabel('Date')
    plt.ylabel('Call Counts')
    plt.grid(axis='y', linestyle='--', alpha=0.7)
    plt.tight_layout()
    plt.xticks(rotation=45, ha='right')
    plt.legend()
    plt.show()
```

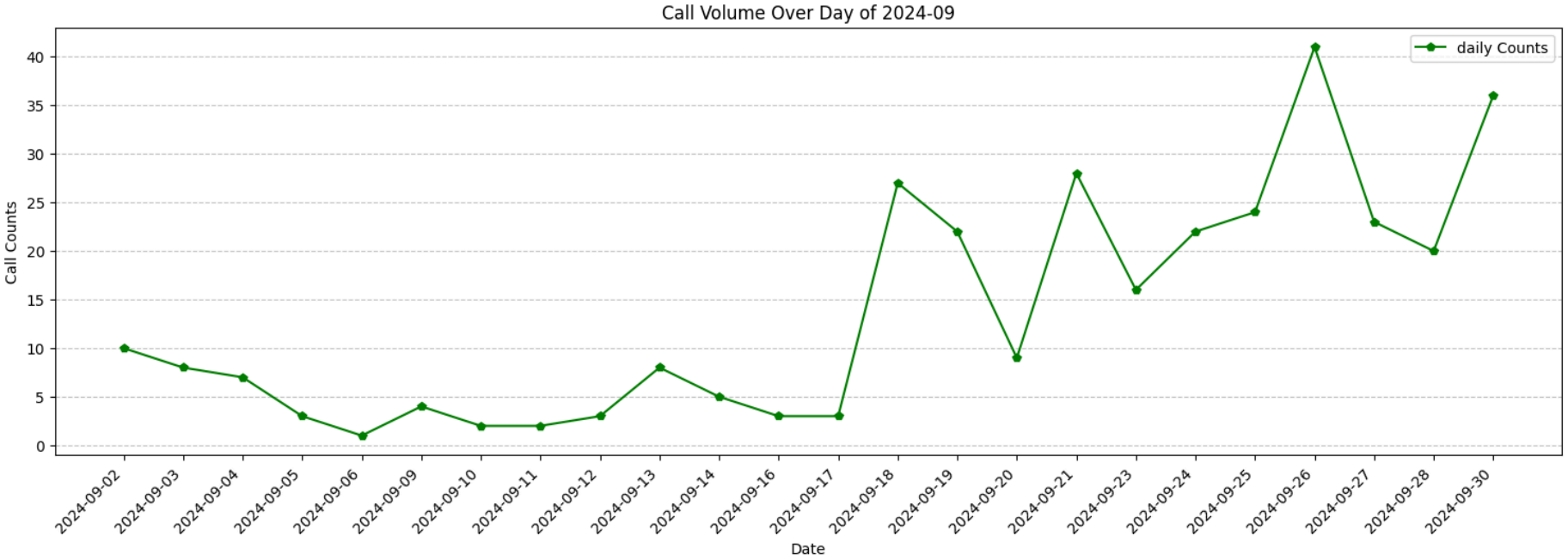

Call Volume Over Day of 2024-04
daily Counts
Call Counts
Date
2024-04-25
2024-04-26
2024-04-27
2024-04-29
2024-04-30

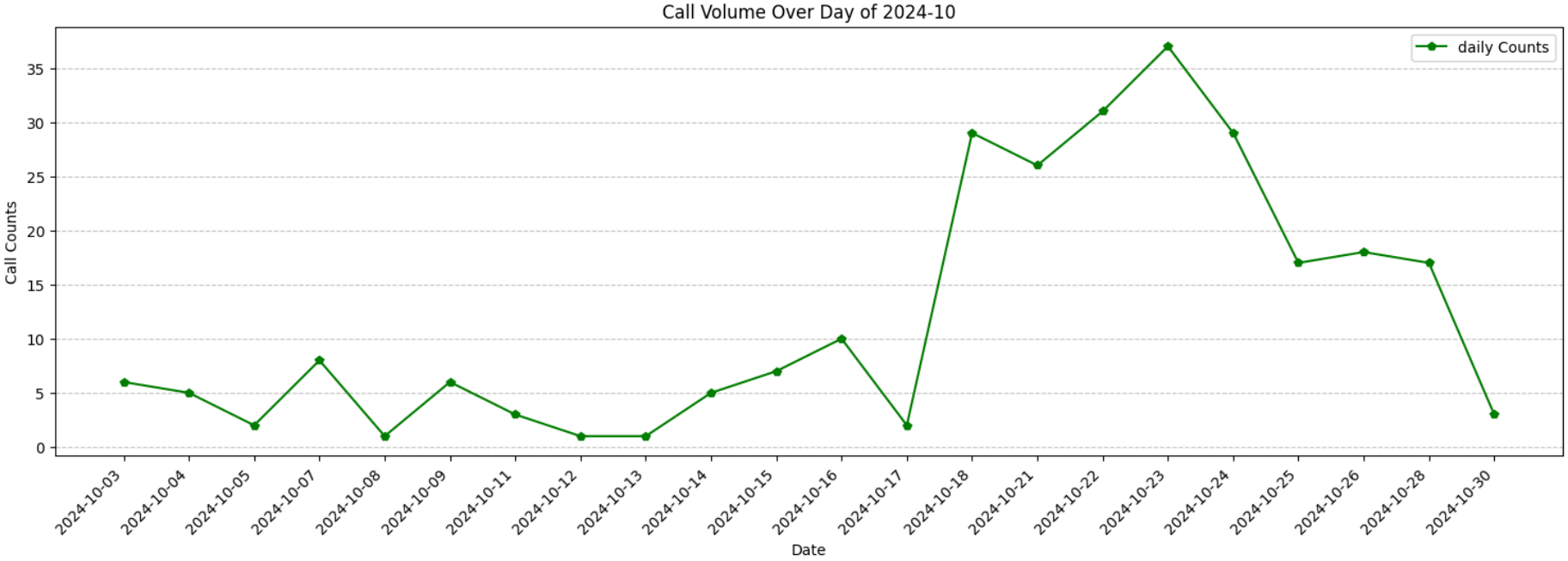

Call Volume Over Day of 2024-05
daily Counts
Call Counts
Date

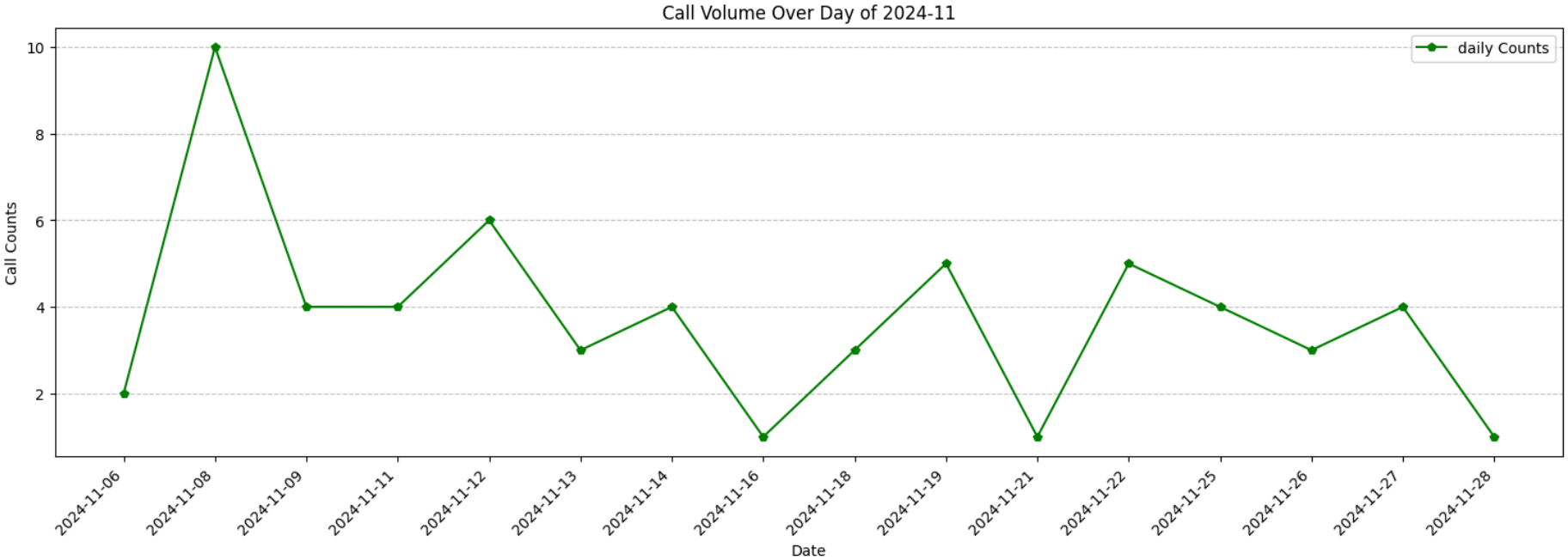

Call Volume Over Day of 2024-06
daily Counts
Call Counts
Date

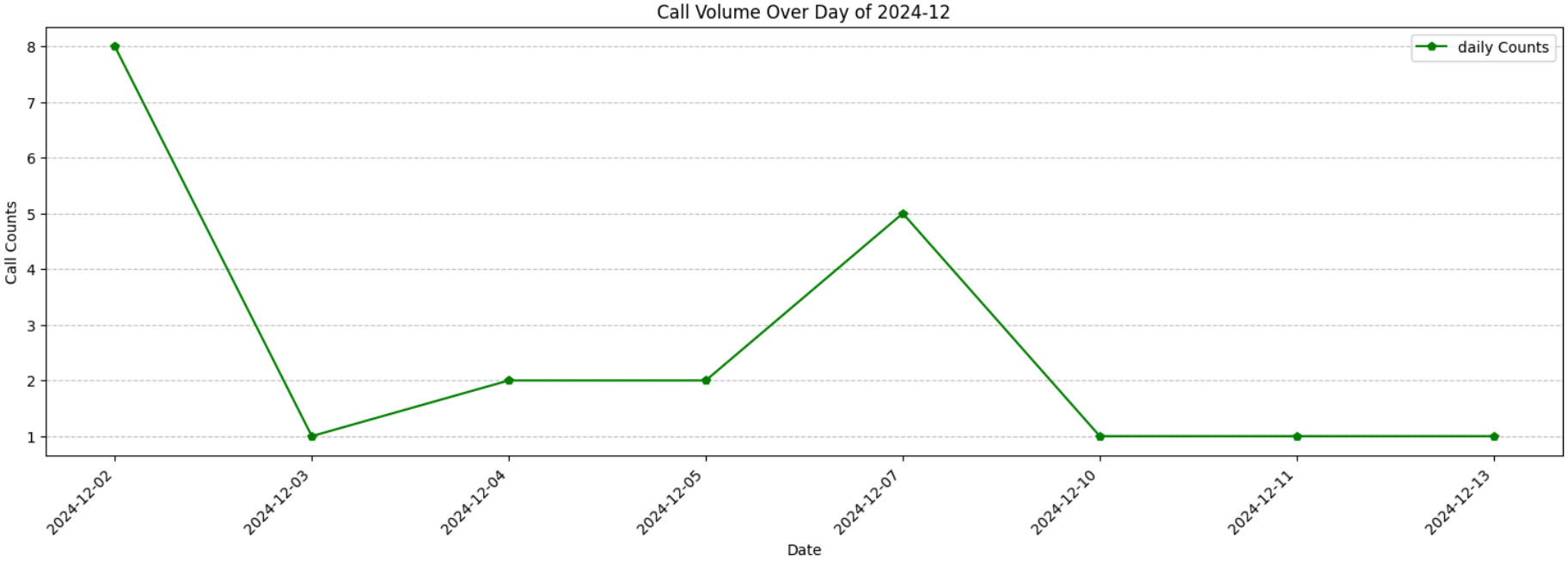

Call Volume Over Day of 2024-07
daily Counts
Call Counts
Date

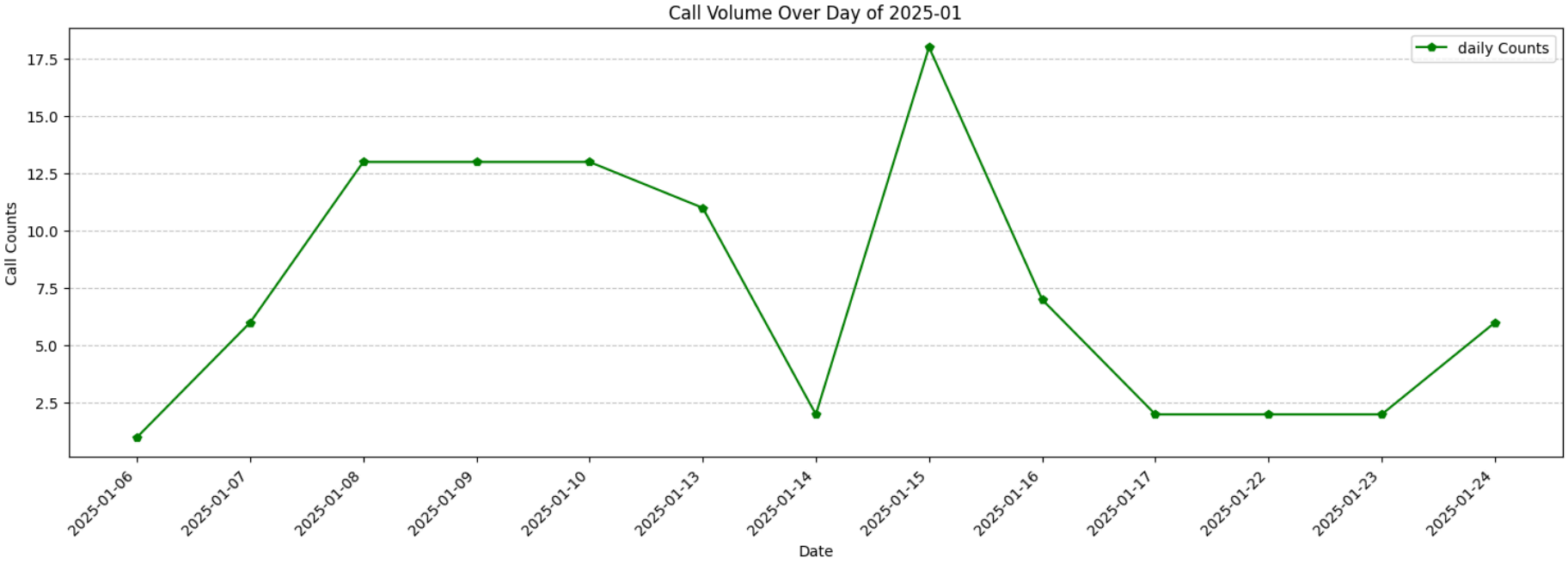

Call Volume Over Day of 2024-08
daily Counts
Call Counts
Date
2024-08-01
2024-08-02
2024-08-03
2024-08-05
2024-08-06
2024-08-07
2024-08-08
2024-08-09
2024-08-10
2024-08-12
2024-08-13
2024-08-14
2024-08-16
2024-08-17
2024-08-20
2024-08-21
2024-08-22
2024-08-24
2024-08-26
2024-08-27
2024-08-28
2024-08-29
2024-08-30
2024-08-31


Call Volume Over Day of 2024-09
daily Counts
Call Counts
Date
2024-09-02
2024-09-03
2024-09-04
2024-09-05
2024-09-06
2024-09-09
2024-09-10
2024-09-11
2024-09-12
2024-09-13
2024-09-14
2024-09-16
2024-09-17
2024-09-18
2024-09-19
2024-09-20
2024-09-21
2024-09-23
2024-09-24
2024-09-25
2024-09-26
2024-09-27
2024-09-28
2024-09-30


Call Volume Over Day of 2024-10
daily Counts
Call Counts
Date
0
5
10
15
20
25
30
35
2024-10-03
2024-10-04
2024-10-05
2024-10-07
2024-10-08
2024-10-09
2024-10-11
2024-10-12
2024-10-13
2024-10-14
2024-10-15
2024-10-16
2024-10-17
2024-10-18
2024-10-21
2024-10-22
2024-10-23
2024-10-24
2024-10-25
2024-10-26
2024-10-28
2024-10-30


Call Volume Over Day of 2024-11
daily Counts
Call Counts
Date
2
4
6
8
10
2024-11-06
2024-11-08
2024-11-09
2024-11-11
2024-11-12
2024-11-13
2024-11-14
2024-11-16
2024-11-18
2024-11-19
2024-11-21
2024-11-22
2024-11-25
2024-11-26
2024-11-27
2024-11-28


Call Volume Over Day of 2024-12
daily Counts
Call Counts
Date
2024-12-02
2024-12-03
2024-12-04
2024-12-05
2024-12-07
2024-12-10
2024-12-11
2024-12-13


Call Volume Over Day of 2025-01
daily Counts
Call Counts
Date
2025-01-06
2025-01-07
2025-01-08
2025-01-09
2025-01-10
2025-01-13
2025-01-14
2025-01-15
2025-01-16
2025-01-17
2025-01-22
2025-01-23
2025-01-24

In [17]:
```
comment_count = df['comments'].value_counts()

# comment_count.index
# comment_count.values
comment_count
```

Out[17]:
```
comments
Interested Farmer                            763
Mango                                        306
Called to get information about F4F           76
Not Desided                                   71
Guava                                         67
                                            ...
Partnership Technic Anagic mumbai              1
Sitaphal,Avala                                 1
Leamon,Sitaphal                                1
Just want 50 mango plants                      1
25 year old ngo shyog pragati ngo gujrat       1
Name: count, Length: 954, dtype: int64
```

In [18]:
```
import re
from collections import Counter

all_comments = ' '.join(df['comments'].dropna()).lower()

words = re.split(r'[^a-z0-9]+', all_comments)
word_counts = Counter(words)
word_counts_df = pd.DataFrame(word_counts.items(), columns=['Word', 'Count'])
word_counts_df = word_counts_df.sort_values(by='Count', ascending=False).reset_index(drop=True)
word_counts_df
```

Out[18]:

	Word	Count
0	interested	855
1	farmer	850
2	mango	850
3	sitaphal	287
4	to	278
...	...	...
934	seeds	1
935	name	1
936	ishved	1
937	seedfarm	1
938	shyog	1

939 rows × 2 columns

Comment analysis we get to know about

- there are 954 unique comments are there out of 3114
- In which 763 - 855 farmers are showing interest
- Most asked plant is
  - Mango 850+ times
  - guava : 178+ (peru is similar word not inclused in count)
  - Lemon : 155 + (spelling mistakes as well)
  - Jambhul : 123 +
  - Mosambi : 110 +
  - Orange : 86 and so on..
  - It seems that non horticulture plant have less demand from farmer side

There are 939 unique words including stopwords and spelling mistakes also hinglish words

- we can calculate demand trend for each plant
- For indepth processing we need to use NLP Technology e.g. sentiment analysis