In [2]:
```
# import library matplotlib
import matplotlib.pyplot as plt
import pandas as pd
```

In [6]:
```
# ambil data CSV
data = pd.read_csv('C:\\data_mobil.csv')
```

In [7]:
```
# Menampilkan baris dan kolom
data.shape
```

Out[7]:
```
(53, 8)
```

In [8]:
```
# Tampilkan 5 data terakhir
data.head()
```

Out[8]:

	Merk	Brand	Transmisi	cc	km	tahun	harga	harga_juta
0	Toyota Kijang Innova	1	1	1998	71500	2018	265000000	265.0
1	Toyota Sienta	1	1	1497	90000	2016	172000000	172.0
2	Toyota Fortuner	1	1	2393	15000	2021	575000000	575.0
3	Toyota Fortuner	1	1	2393	75000	2016	385000000	385.0
4	Toyota Harrier	1	1	1986	65000	2015	569000000	569.0

In [9]:
```
# cari karakteristik dari data transmisi dan brand
data['Transmisi']
```

Out[9]:

0	1
1	1
2	1
3	1
4	1
5	1
6	1
7	1
8	1
9	1
10	1
11	1
12	1
13	1
14	1
15	1
16	1
17	1
18	1
19	1
20	1
21	1
22	0
23	0
24	1
25	1
26	1
27	1
28	0
29	1
30	1
31	1
32	1
33	1
34	0
35	1
36	1
37	1

```
38    1
39    1
40    1
41    1
42    1
43    1
44    1
45    0
46    0
47    1
48    1
49    1
50    1
51    1
52    1
Name: Transmisi, dtype: int64
```

In [10]:
```
# Diubah transmisi 1 = Automatic, 0 = Manual
data.loc[(data["Transmisi"] == 1), "Transmisi"] = "Automatic"
data.loc[(data["Transmisi"] == 0), "Transmisi"] = "Manual"

data["Transmisi"]
```

Out[10]:
```
0     Automatic
1     Automatic
2     Automatic
3     Automatic
4     Automatic
5     Automatic
6     Automatic
7     Automatic
8     Automatic
9     Automatic
10    Automatic
11    Automatic
12    Automatic
13    Automatic
14    Automatic
15    Automatic
16    Automatic
17    Automatic
18    Automatic
19    Automatic
20    Automatic
21    Automatic
22       Manual
23       Manual
24    Automatic
25    Automatic
26    Automatic
27    Automatic
28       Manual
29    Automatic
30    Automatic
31    Automatic
32    Automatic
33    Automatic
34       Manual
```

```
35    Automatic
36    Automatic
37    Automatic
38    Automatic
39    Automatic
40    Automatic
41    Automatic
42    Automatic
43    Automatic
44    Automatic
45       Manual
46       Manual
47    Automatic
48    Automatic
49    Automatic
50    Automatic
51    Automatic
52    Automatic
Name: Transmisi, dtype: object
```

In [11]:
```
# Buatlah perkiraan penyusutan harga mobil bekas 2 tahun berikutnya - >2%
data = data.assign(harga_1 = data["harga_juta"] * 0.98)
data = data.assign(harga_2 = data["harga_1"] * 0.98)

data
```

Out[11]:

	Merk	Brand	Transmisi	cc	km	tahun	harga	harga_juta	harga_1	harga_2
0	Toyota Kijang Innova	1	Automatic	1998	71500	2018	265000000	265.0	259.700	254.50600
1	Toyota Sienta	1	Automatic	1497	90000	2016	172000000	172.0	168.560	165.18880
2	Toyota Fortuner	1	Automatic	2393	15000	2021	575000000	575.0	563.500	552.23000
3	Toyota Fortuner	1	Automatic	2393	75000	2016	385000000	385.0	377.300	369.75400
4	Toyota Harrier	1	Automatic	1986	65000	2015	569000000	569.0	557.620	546.46760
5	Toyota Camry Hybrid Sedan	1	Automatic	2487	6000	2021	750000000	750.0	735.000	720.30000
6	Toyota Alphard	1	Automatic	2494	25000	2020	1200000000	1200.0	1176.000	1152.48000
7	Toyota Avanza	1	Automatic	1496	70000	2017	177000000	177.0	173.460	169.99080
8	Toyota Yaris	1	Automatic	1496	25000	2018	261000000	261.0	255.780	250.66440
9	Toyota Camry	1	Automatic	2494	25000	2019	551000000	551.0	539.980	529.18040
10	Toyota Avanza	1	Automatic	1496	100000	2016	142000000	142.0	139.160	136.37680
11	Toyota Vios	1	Automatic	1496	65000	2018	206000000	206.0	201.880	197.84240
12	Toyota Camry	1	Automatic	2494	93000	2013	190000000	190.0	186.200	182.47600
13	Toyota Kijang Innova	1	Automatic	1998	6900	2018	299800000	299.8	293.804	287.92792
14	Toyota Fortuner	1	Automatic	2494	200000	2009	200000000	200.0	196.000	192.08000
15	Toyota Vios	1	Automatic	1497	125000	2014	144000000	144.0	141.120	138.29760
16	Toyota Avanza	1	Automatic	1496	40000	2019	199000000	199.0	195.020	191.11960
17	Toyota Avanza	1	Automatic	1496	15000	2021	238000000	238.0	233.240	228.57520
18	Toyota Calya	1	Automatic	1197	25000	2019	138000000	138.0	135.240	132.53520
19	Toyota Avanza	1	Automatic	1496	20000	2021	230000000	230.0	225.400	220.89200
20	Toyota Avanza	1	Automatic	1496	110000	2017	153000000	153.0	149.940	146.94120

	Merk	Brand	Transmisi	cc	km	tahun	harga	harga_juta	harga_1	harga_2
21	Toyota Avanza	1	Automatic	1496	110000	2014	115000000	115.0	112.700	110.44600
22	Toyota Kijang Innova	1	Manual	1998	155000	2011	180000000	180.0	176.400	172.87200
23	Toyota Kijang Innova	1	Manual	1998	155000	2008	125000000	125.0	122.500	120.05000
24	Toyota Kijang Innova	1	Automatic	1998	40000	2015	285000000	285.0	279.300	273.71400
25	Toyota Kijang Innova	1	Automatic	1998	20000	2019	330000000	330.0	323.400	316.93200
26	Toyota Avanza	1	Automatic	1496	25000	2018	185000000	185.0	181.300	177.67400
27	Toyota Avanza	1	Automatic	1496	63010	2019	190000000	190.0	186.200	182.47600
28	Toyota Avanza	1	Manual	1496	115000	2016	147500000	147.5	144.550	141.65900
29	Toyota Calya	1	Automatic	1197	75000	2018	122000000	122.0	119.560	117.16880
30	Toyota Vios	1	Automatic	1496	110000	2009	90000000	90.0	88.200	86.43600
31	Toyota Yaris	1	Automatic	1496	46149	2018	231000000	231.0	226.380	221.85240
32	Toyota Avanza	1	Automatic	1496	202147	2011	94000000	94.0	92.120	90.27760
33	Toyota Avanza	1	Automatic	1496	15000	2021	290000000	290.0	284.200	278.51600
34	Toyota Rush	1	Manual	1496	45000	2015	168000000	168.0	164.640	161.34720
35	Toyota Avanza	1	Automatic	1496	135000	2012	118000000	118.0	115.640	113.32720
36	Toyota Agya	1	Automatic	1197	36959	2019	136000000	136.0	133.280	130.61440
37	Toyota Voxy	1	Automatic	2494	45000	2017	381000000	381.0	373.380	365.91240
38	Toyota Rush	1	Automatic	1496	55000	2019	225000000	225.0	220.500	216.09000
39	Toyota Yaris	1	Automatic	1496	145000	2012	125000000	125.0	122.500	120.05000
40	Toyota Vios	1	Automatic	1496	65000	2018	206000000	206.0	201.880	197.84240
41	Toyota Yaris	1	Automatic	1496	35000	2018	227000000	227.0	222.460	218.01080
42	Toyota Avanza	1	Automatic	1496	100000	2016	152000000	152.0	148.960	145.98080
43	Toyota Avanza	1	Automatic	1496	10000	2018	199000000	199.0	195.020	191.11960
44	Toyota Agya	1	Automatic	998	75000	2016	109000000	109.0	106.820	104.68360
45	Toyota Avanza	1	Manual	1296	200000	2013	50000000	50.0	49.000	48.02000
46	Toyota Corolla	1	Manual	1597	220000	1990	50000000	50.0	49.000	48.02000

	Merk	Brand	Transmisi	cc	km	tahun	harga	harga_juta	harga_1	harga_2
47	Toyota Vios	1	Automatic	1496	170000	2010	100000000	100.0	98.000	96.04000
48	Toyota Calya	1	Automatic	1197	80000	2017	100000000	100.0	98.000	96.04000
49	Toyota Avanza	1	Automatic	1497	70000	2015	150000000	150.0	147.000	144.06000
50	Toyota Rush	1	Automatic	1497	55000	2018	200000000	200.0	196.000	192.08000
51	Toyota Corolla Sedan	1	Automatic	1797	80000	2015	200000000	200.0	196.000	192.08000
52	Toyota Corolla Sedan	1	Automatic	1797	60000	2018	250000000	250.0	245.000	240.10000

In [12]:
```
# Filtering
# Cari mobil diatas tahun 2015
# Cari mobil dengan harga 200-270jt

f1 = data[data['tahun'] > 2015]
f2 = data[ (data['harga_juta'] >= 200) & (data['harga_juta'] <= 270) ]
f2
```

Out[12]:

	Merk	Brand	Transmisi	cc	km	tahun	harga	harga_juta	harga_1	harga_2
0	Toyota Kijang Innova	1	Automatic	1998	71500	2018	265000000	265.0	259.70	254.5060
8	Toyota Yaris	1	Automatic	1496	25000	2018	261000000	261.0	255.78	250.6644
11	Toyota Vios	1	Automatic	1496	65000	2018	206000000	206.0	201.88	197.8424
14	Toyota Fortuner	1	Automatic	2494	200000	2009	200000000	200.0	196.00	192.0800
17	Toyota Avanza	1	Automatic	1496	15000	2021	238000000	238.0	233.24	228.5752
19	Toyota Avanza	1	Automatic	1496	20000	2021	230000000	230.0	225.40	220.8920
31	Toyota Yaris	1	Automatic	1496	46149	2018	231000000	231.0	226.38	221.8524
38	Toyota Rush	1	Automatic	1496	55000	2019	225000000	225.0	220.50	216.0900
40	Toyota Vios	1	Automatic	1496	65000	2018	206000000	206.0	201.88	197.8424
41	Toyota Yaris	1	Automatic	1496	35000	2018	227000000	227.0	222.46	218.0108
50	Toyota Rush	1	Automatic	1497	55000	2018	200000000	200.0	196.00	192.0800
51	Toyota Corolla Sedan	1	Automatic	1797	80000	2015	200000000	200.0	196.00	192.0800
52	Toyota Corolla Sedan	1	Automatic	1797	60000	2018	250000000	250.0	245.00	240.1000

In [13]:
```
# Visualisasi, pada tahun ke X, rata2 harga mobil  bekasnya berapa, harga_1 berapa, harga_2 berapa

data_group = f2.groupby('tahun')[['harga_juta', 'harga_1', 'harga_2']].mean().astype(int)
data_group.plot(kind='bar')
plt.xlabel('Tahun')
plt.ylabel('Harga (dalam juta)')
plt.title("Rata-rata Harga Mobil Bekas")

plt.show()
```