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Lampiran 1 Surat validasi data sampah organik di KSM ASRI

Kelompok Swadaya Masyarakat
A S R I
RT.03 / RW 12. Kelurahan Bubulak, Kec. Bogor Barat, Kota Bogor

Nomor : 01/KSM-ASRI/05/23
Hal : Validasi Data Sampah Organik
Lampiran : 1 Lembar

Bogor, 27 Mei 2023

Kepada
Yth. Institut Teknologi Indonesia
Jl. Raya Puspiptek
Tangerang Selatan 15314

Salam Lestari.

Saya yang bertandatangan di bawah ini;

Nama : Budi Rahardjo

Jabatan : Ketua Pengurus KSM ASRI

Alamat : Griya Wana Karya Permai Kelurahan Bubulak Kec Bogor Barat, Kota Bogor

KSM ASRI adalah kelompok swadaya masyarakat yang menjalankan pengelolaan sampah pada lingkungan RW 12 Kelurahan Bubulak Kec. Bogor Barat, Kota Bogor melalui pendekatan 3R dengan mengumpulkan sampah dari warga, memilah dan mengolah sampah organik menjadi pupuk kompos melalui methanisasi dengan biogas digester.

Saya mendampingi Saudara Iqbal Mauludi NRP 1111800036 mahasiswa Institut Teknologi Indonesia. Dalam pengambilan data di TPST yang kami kelola guna penelitian tugas akhir.

Saya menyatakan bahwa data yang Saudara Iqbal dapatkan adalah data valid dari KSM ASRI kami.

Demikian, pernyataan validasi kami. Mohon digunakan sesuai keperluannya.

Hormat Kami

TPST 3R BUBULAK ★ ASRI ★ KELOMPOK SWADAYA MASYARAKAT
REUSE REDUCE RECYCLE

Budi Rahardjo
Ketua KSM ASRI

Cp: Budjo; WA : Phone ; 081 1111 8780 Dede ; 0812-9039-4822

Lampiran 2 Data Sampah Organik KSM ASRI Agustus 2022 – Januari 2023

Tanggal	Sampah Organik (Kg)
1 Agustus 2022	16
2 Agustus 2022	20
3 Agustus 2022	18
4 Agustus 2022	14
5 Agustus 2022	18
6 Agustus 2022	17
7 Agustus 2022	18
8 Agustus 2022	15
9 Agustus 2022	15
10 Agustus 2022	18
11 Agustus 2022	11
12 Agustus 2022	20
13 Agustus 2022	15
14 Agustus 2022	20
15 Agustus 2022	20
16 Agustus 2022	30
17 Agustus 2022	33
18 Agustus 2022	39
19 Agustus 2022	33
20 Agustus 2022	40
21 Agustus 2022	43
22 Agustus 2022	65
23 Agustus 2022	75
24 Agustus 2022	35
25 Agustus 2022	40
26 Agustus 2022	20
27 Agustus 2022	43
28 Agustus 2022	40
29 Agustus 2022	70
30 Agustus 2022	49
31 Agustus 2022	17
1 September 2022	70
2 September 2022	18
3 September 2022	24
4 September 2022	16
5 September 2022	42
6 September 2022	38
7 September 2022	30
8 September 2022	74
9 September 2022	43
10 September 2022	31
11 September 2022	40
12 September 2022	43
13 September 2022	40
14 September 2022	50
15 September 2022	18

16 September 2022	41
17 September 2022	39.5
18 September 2022	37
19 September 2022	48.5
20 September 2022	29
21 September 2022	61
22 September 2022	35
23 September 2022	22
24 September 2022	42
25 September 2022	33
26 September 2022	24
27 September 2022	28
28 September 2022	32
29 September 2022	20
30 September 2022	40
1 Oktober 2022	35
2 Oktober 2022	28
3 Oktober 2022	43
4 Oktober 2022	23
5 Oktober 2022	15
6 Oktober 2022	24
7 Oktober 2022	19
8 Oktober 2022	14
9 Oktober 2022	20
10 Oktober 2022	15
11 Oktober 2022	18
12 Oktober 2022	23
13 Oktober 2022	20
14 Oktober 2022	22.5
15 Oktober 2022	19
16 Oktober 2022	22
17 Oktober 2022	17
18 Oktober 2022	16
19 Oktober 2022	19
20 Oktober 2022	12
21 Oktober 2022	23
22 Oktober 2022	28
23 Oktober 2022	19
24 Oktober 2022	24
25 Oktober 2022	28
26 Oktober 2022	26
27 Oktober 2022	24
28 Oktober 2022	28
29 Oktober 2022	34
30 Oktober 2022	25
31 Oktober 2022	22
1 November 2022	15
2 November 2022	22

3 November 2022	29
4 November 2022	13
5 November 2022	17
6 November 2022	24
7 November 2022	25
8 November 2022	18
9 November 2022	20
10 November 2022	16
11 November 2022	21
12 November 2022	11
13 November 2022	19
14 November 2022	30
15 November 2022	20
16 November 2022	13
17 November 2022	18
18 November 2022	32
19 November 2022	27
20 November 2022	16
21 November 2022	14
22 November 2022	10
23 November 2022	22
24 November 2022	18
25 November 2022	16
26 November 2022	9
27 November 2022	40
28 November 2022	28
29 November 2022	15
30 November 2022	22
1 Desember 2022	17
2 Desember 2022	22
3 Desember 2022	18
4 Desember 2022	25
5 Desember 2022	15
6 Desember 2022	23
7 Desember 2022	17
8 Desember 2022	13
9 Desember 2022	19
10 Desember 2022	16
11 Desember 2022	12
12 Desember 2022	24
13 Desember 2022	22
14 Desember 2022	18
15 Desember 2022	25
16 Desember 2022	28
17 Desember 2022	23
18 Desember 2022	10
19 Desember 2022	17
20 Desember 2022	24

21 Desember 2022	18
22 Desember 2022	20
23 Desember 2022	13
24 Desember 2022	19
25 Desember 2022	15
26 Desember 2022	27
27 Desember 2022	23
28 Desember 2022	17
29 Desember 2022	22
30 Desember 2022	20
31 Desember 2022	18
1 Januari 2023	20
2 Januari 2023	24
3 Januari 2023	18
4 Januari 2023	16.5
5 Januari 2023	28
6 Januari 2023	19
7 Januari 2023	22.5
8 Januari 2023	32
9 Januari 2023	38
10 Januari 2023	44
11 Januari 2023	29
12 Januari 2023	41.5
13 Januari 2023	36
14 Januari 2023	28
15 Januari 2023	23
16 Januari 2023	34
17 Januari 2023	22
18 Januari 2023	44
19 Januari 2023	29
20 Januari 2023	38.5
21 Januari 2023	26
22 Januari 2023	45
23 Januari 2023	27
24 Januari 2023	33.5
25 Januari 2023	41
26 Januari 2023	29
27 Januari 2023	34
28 Januari 2023	44
29 Januari 2023	26
30 Januari 2023	40.5
31 Januari 2023	20

Menyetujui,
Ketua KSM ASRI/GWKP

Budi Rahardjo

TPST 3R BUBULAK
KELOMPOK SWADAYA MASYARAKAT ASRI
REUSE
RECYCLE
REDUCE

Lampiran 3 Hasil *forecast* potensi energi listrik 3 sampai 6 bulan kedepan

tanggal	prediksi kWh
2023-02-01 00:00:00	13.43972214
2023-02-02 00:00:00	9.553844078
2023-02-03 00:00:00	11.86565895
2023-02-04 00:00:00	10.00549892
2023-02-05 00:00:00	11.55408598
2023-02-06 00:00:00	8.661665424
2023-02-07 00:00:00	12.09772119
2023-02-08 00:00:00	7.878695736
2023-02-09 00:00:00	10.63997625
2023-02-10 00:00:00	9.120927816
2023-02-11 00:00:00	10.69552
2023-02-12 00:00:00	8.788940838
2023-02-13 00:00:00	9.76330341
2023-02-14 00:00:00	9.578431894
2023-02-15 00:00:00	9.882845098
2023-02-16 00:00:00	7.831912394
2023-02-17 00:00:00	9.503278733
2023-02-18 00:00:00	7.744493691
2023-02-19 00:00:00	11.04464402
2023-02-20 00:00:00	7.616921724

tanggal	prediksi kWh
2023-02-01 00:00:00	13.43972214
2023-02-02 00:00:00	9.553844078
2023-02-03 00:00:00	11.86565895
2023-02-04 00:00:00	10.00549892
2023-02-05 00:00:00	11.55408598
2023-02-06 00:00:00	8.661665424
2023-02-07 00:00:00	12.09772119
2023-02-08 00:00:00	7.878695736
2023-02-09 00:00:00	10.63997625
2023-02-10 00:00:00	9.120927816
2023-02-11 00:00:00	10.69552
2023-02-12 00:00:00	8.788940838
2023-02-13 00:00:00	9.76330341
2023-02-14 00:00:00	9.578431894
2023-02-15 00:00:00	9.882845098
2023-02-16 00:00:00	7.831912394
2023-02-17 00:00:00	9.503278733
2023-02-18 00:00:00	7.744493691
2023-02-19 00:00:00	11.04464402
2023-02-20 00:00:00	7.616921724

2023-02-21 00:00:00	10.5764229	**2023-02-21 00:00:00**	10.5764229
2023-02-22 00:00:00	7.674855009	**2023-02-22 00:00:00**	7.674855009
2023-02-23 00:00:00	9.141656359	**2023-02-23 00:00:00**	9.141656359
2023-02-24 00:00:00	10.72855783	**2023-02-24 00:00:00**	10.72855783
2023-02-25 00:00:00	8.055809829	**2023-02-25 00:00:00**	8.055809829
2023-02-26 00:00:00	9.21973678	**2023-02-26 00:00:00**	9.21973678
2023-02-27 00:00:00	6.856240031	**2023-02-27 00:00:00**	6.856240031
2023-02-28 00:00:00	8.373336143	**2023-02-28 00:00:00**	8.373336143
2023-03-01 00:00:00	6.746513082	**2023-03-01 00:00:00**	6.746513082
2023-03-02 00:00:00	7.791473062	**2023-03-02 00:00:00**	7.791473062
2023-03-03 00:00:00	8.059066899	**2023-03-03 00:00:00**	8.059066899
2023-03-04 00:00:00	7.0814322	**2023-03-04 00:00:00**	7.0814322
2023-03-05 00:00:00	7.513075763	**2023-03-05 00:00:00**	7.513075763
2023-03-06 00:00:00	7.999310093	**2023-03-06 00:00:00**	7.999310093
2023-03-07 00:00:00	7.125061625	**2023-03-07 00:00:00**	7.125061625
2023-03-08 00:00:00	7.246959353	**2023-03-08 00:00:00**	7.246959353
2023-03-09 00:00:00	7.087627394	**2023-03-09 00:00:00**	7.087627394
2023-03-10 00:00:00	7.732761201	**2023-03-10 00:00:00**	7.732761201
2023-03-11 00:00:00	5.082220141	**2023-03-11 00:00:00**	5.082220141
2023-03-12 00:00:00	7.857406624	**2023-03-12 00:00:00**	7.857406624
2023-03-13 00:00:00	6.506511003	**2023-03-13 00:00:00**	6.506511003

2023-03-14 00:00:00	7.416825406	**2023-03-14 00:00:00**	7.416825406
2023-03-15 00:00:00	6.207163687	**2023-03-15 00:00:00**	6.207163687
2023-03-16 00:00:00	7.969389335	**2023-03-16 00:00:00**	7.969389335
2023-03-17 00:00:00	5.834723996	**2023-03-17 00:00:00**	5.834723996
2023-03-18 00:00:00	8.322638494	**2023-03-18 00:00:00**	8.322638494
2023-03-19 00:00:00	6.848999235	**2023-03-19 00:00:00**	6.848999235
2023-03-20 00:00:00	7.108911402	**2023-03-20 00:00:00**	7.108911402
2023-03-21 00:00:00	5.659194728	**2023-03-21 00:00:00**	5.659194728
2023-03-22 00:00:00	6.272511035	**2023-03-22 00:00:00**	6.272511035
2023-03-23 00:00:00	6.474168859	**2023-03-23 00:00:00**	6.474168859
2023-03-24 00:00:00	6.273903798	**2023-03-24 00:00:00**	6.273903798
2023-03-25 00:00:00	6.386584953	**2023-03-25 00:00:00**	6.386584953
2023-03-26 00:00:00	7.115957921	**2023-03-26 00:00:00**	7.115957921
2023-03-27 00:00:00	6.085146205	**2023-03-27 00:00:00**	6.085146205
2023-03-28 00:00:00	7.454618089	**2023-03-28 00:00:00**	7.454618089
2023-03-29 00:00:00	6.752445641	**2023-03-29 00:00:00**	6.752445641
2023-03-30 00:00:00	7.627734274	**2023-03-30 00:00:00**	7.627734274
2023-03-31 00:00:00	5.735156918	**2023-03-31 00:00:00**	5.735156918
2023-04-01 00:00:00	7.320022566	**2023-04-01 00:00:00**	7.320022566
2023-04-02 00:00:00	6.298294559	**2023-04-02 00:00:00**	6.298294559
2023-04-03 00:00:00	6.582167256	**2023-04-03 00:00:00**	6.582167256

2023-04-04 00:00:00	7.15730856	**2023-04-04 00:00:00**	7.15730856
2023-04-05 00:00:00	7.069819074	**2023-04-05 00:00:00**	7.069819074
2023-04-06 00:00:00	7.444474781	**2023-04-06 00:00:00**	7.444474781
2023-04-07 00:00:00	6.714549754	**2023-04-07 00:00:00**	6.714549754
2023-04-08 00:00:00	7.928171486	**2023-04-08 00:00:00**	7.928171486
2023-04-09 00:00:00	7.896033895	**2023-04-09 00:00:00**	7.896033895
2023-04-10 00:00:00	7.550860366	**2023-04-10 00:00:00**	7.550860366
2023-04-11 00:00:00	7.639164954	**2023-04-11 00:00:00**	7.639164954
2023-04-12 00:00:00	7.445109592	**2023-04-12 00:00:00**	7.445109592
2023-04-13 00:00:00	6.68822906	**2023-04-13 00:00:00**	6.68822906
2023-04-14 00:00:00	7.415698934	**2023-04-14 00:00:00**	7.415698934
2023-04-15 00:00:00	8.068853102	**2023-04-15 00:00:00**	8.068853102
2023-04-16 00:00:00	7.433784036	**2023-04-16 00:00:00**	7.433784036
2023-04-17 00:00:00	7.655723089	**2023-04-17 00:00:00**	7.655723089
2023-04-18 00:00:00	8.592137949	**2023-04-18 00:00:00**	8.592137949
2023-04-19 00:00:00	8.076834765	**2023-04-19 00:00:00**	8.076834765
2023-04-20 00:00:00	8.708225668	**2023-04-20 00:00:00**	8.708225668
2023-04-21 00:00:00	8.466882936	**2023-04-21 00:00:00**	8.466882936
2023-04-22 00:00:00	8.577675932	**2023-04-22 00:00:00**	8.577675932
2023-04-23 00:00:00	7.390520721	**2023-04-23 00:00:00**	7.390520721
2023-04-24 00:00:00	8.642805767	**2023-04-24 00:00:00**	8.642805767

2023-04-25 00:00:00	8.165307661
2023-04-26 00:00:00	8.710421769
2023-04-27 00:00:00	8.216673307
2023-04-28 00:00:00	9.224810934
2023-04-29 00:00:00	8.697406171
2023-04-30 00:00:00	8.83378513

2023-04-25 00:00:00	8.165307661
2023-04-26 00:00:00	8.710421769
2023-04-27 00:00:00	8.216673307
2023-04-28 00:00:00	9.224810934
2023-04-29 00:00:00	8.697406171
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2023-05-05 00:00:00	8.568686552
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2023-05-07 00:00:00	8.775481417
2023-05-08 00:00:00	9.486779499
2023-05-09 00:00:00	8.748704923
2023-05-10 00:00:00	9.424275454
2023-05-11 00:00:00	9.517011787
2023-05-12 00:00:00	9.913776563
2023-05-13 00:00:00	9.331636328
2023-05-14 00:00:00	9.120946001
2023-05-15 00:00:00	9.239583392

2023-05-16 00:00:00	8.643962248
2023-05-17 00:00:00	9.040531625
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2023-05-19 00:00:00	9.022466687
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2023-05-21 00:00:00	9.606338556
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2023-05-23 00:00:00	9.287977634
2023-05-24 00:00:00	9.56493033
2023-05-25 00:00:00	9.109602838
2023-05-26 00:00:00	8.632215803
2023-05-27 00:00:00	8.654162465
2023-05-28 00:00:00	8.90288189
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2023-06-01 00:00:00	8.775481357
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2023-06-04 00:00:00	9.222367244
2023-06-05 00:00:00	8.096524324

2023-06-06 00:00:00	8.401402043
2023-06-07 00:00:00	8.375299341
2023-06-08 00:00:00	8.008402746
2023-06-09 00:00:00	8.266764205
2023-06-10 00:00:00	8.394030917
2023-06-11 00:00:00	8.089450753
2023-06-12 00:00:00	8.288279925
2023-06-13 00:00:00	8.524649575
2023-06-14 00:00:00	8.661326105
2023-06-15 00:00:00	8.046366044
2023-06-16 00:00:00	8.067504479
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2023-06-18 00:00:00	7.666081473
2023-06-19 00:00:00	7.470389752
2023-06-20 00:00:00	7.987787963
2023-06-21 00:00:00	7.570932129
2023-06-22 00:00:00	7.490388026
2023-06-23 00:00:00	8.060444544
2023-06-24 00:00:00	8.055551449
2023-06-25 00:00:00	7.89655665
2023-06-26 00:00:00	7.949067778

2023-06-27 00:00:00	7.707677912
2023-06-28 00:00:00	7.216388104
2023-06-29 00:00:00	7.283116008
2023-06-30 00:00:00	7.491778223
2023-07-01 00:00:00	7.378313362
2023-07-02 00:00:00	7.254766485
2023-07-03 00:00:00	7.507145497
2023-07-04 00:00:00	7.79310936
2023-07-05 00:00:00	7.5804874
2023-07-06 00:00:00	7.889611452
2023-07-07 00:00:00	7.933056233
2023-07-08 00:00:00	7.195464479
2023-07-09 00:00:00	7.3145899
2023-07-10 00:00:00	7.477471799
2023-07-11 00:00:00	7.267940163
2023-07-12 00:00:00	7.18238189
2023-07-13 00:00:00	7.627881122
2023-07-14 00:00:00	7.407052496
2023-07-15 00:00:00	7.594049293
2023-07-16 00:00:00	7.991325709
2023-07-17 00:00:00	8.066331155

2023-07-18 00:00:00	7.747595805
2023-07-19 00:00:00	7.596264352
2023-07-20 00:00:00	7.663433308
2023-07-21 00:00:00	7.475549878
2023-07-22 00:00:00	7.388203569
2023-07-23 00:00:00	7.813694517
2023-07-24 00:00:00	7.655395256
2023-07-25 00:00:00	7.620641741
2023-07-26 00:00:00	8.100738828
2023-07-27 00:00:00	8.369652493
2023-07-28 00:00:00	8.056862593
2023-07-29 00:00:00	8.252073993
2023-07-30 00:00:00	8.080757062
2023-07-31 00:00:00	7.79447657

Lampiran 4 Pemrograman *machine learning*

```
import pandas as pd
import matplotlib.pyplot as plt
from statsmodels.graphics.tsaplots import plot_acf,plot_pacf
from datetime import datetime
import numpy as np
import seaborn as sns
from statsmodels.tsa.arima.model import ARIMA
from statsmodels.tsa.stattools import adfuller
import matplotlib.pylab as rcParams
from scipy import stats
from sklearn.metrics import mean_squared_error
from scipy.stats import boxcox
from sklearn.metrics import mean_absolute_error
```

DATA INPUT

```
Dataset = pd.read_excel('Data Konversi Listrik Selama 6 Bulan.xlsx', sheet_name='Book2', parse_dates=True, index_col=0)
#data['tanggal']= pd.to_datetime(data['tanggal'],infer_datetime_format = True)
#Dataset = data.set_index(['tanggal'])
```

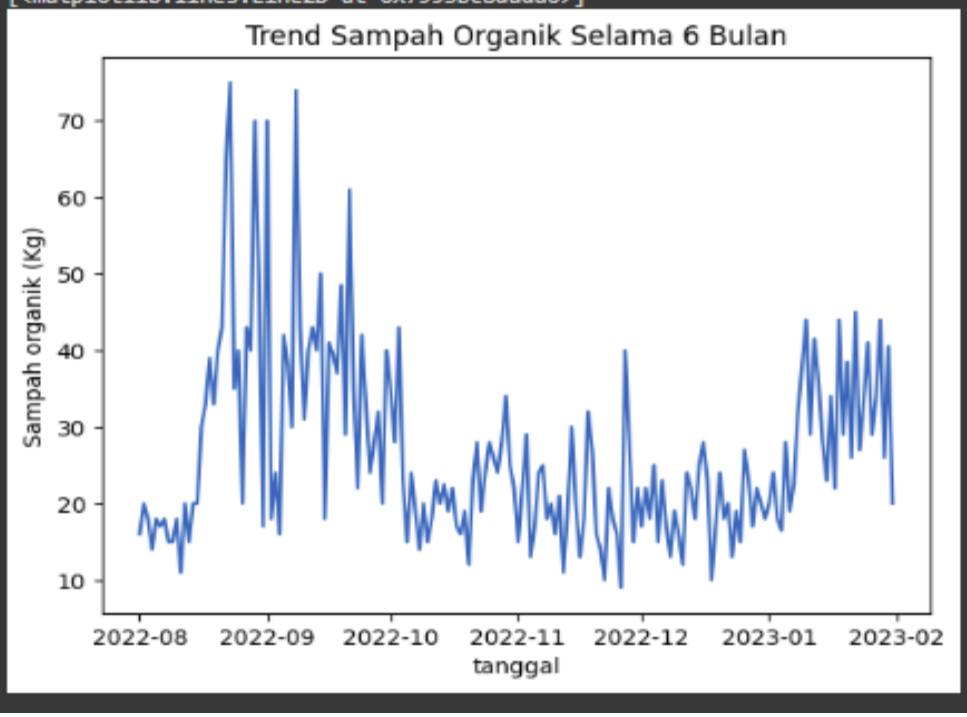
```
Dataset
```

Tanggal	Sampah Organik (Kg)	kWh
2022-08-01	16.0	5.00416
2022-08-02	20.0	6.25520
2022-08-03	18.0	5.62968
2022-08-04	14.0	4.37864
2022-08-05	18.0	5.62968
...	...	...
2023-01-27	34.0	10.63384
2023-01-28	44.0	13.76144
2023-01-29	26.0	8.13176
2023-01-30	40.5	12.66678
2023-01-31	20.0	6.25520

184 rows × 2 columns

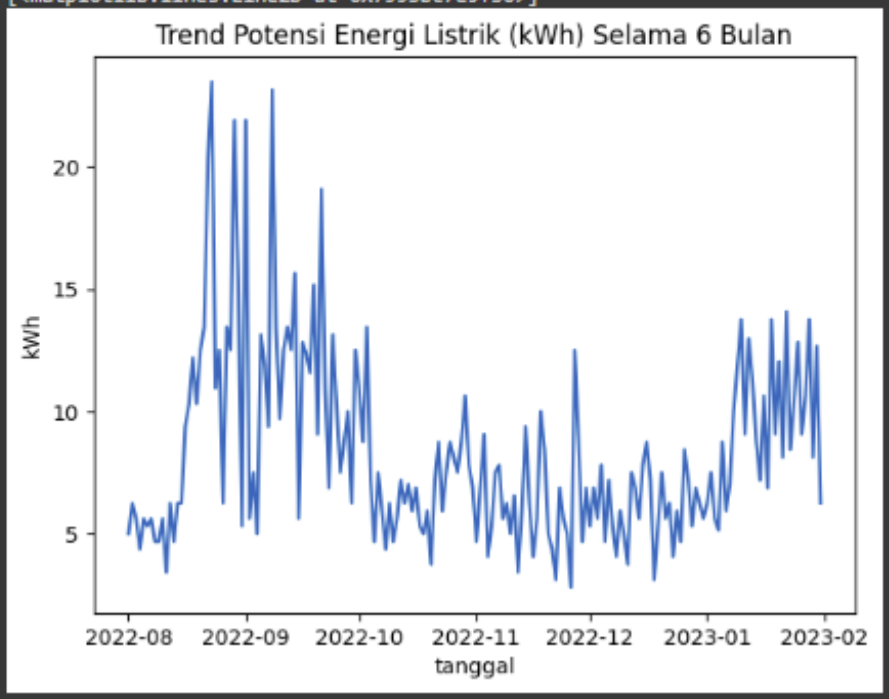
```
plt.title('Trend Sampah Organik Selama 6 Bulan')
plt.xlabel('tanggal')
plt.ylabel('Sampah organik (Kg)')
plt.plot(Dataset['Sampah Organik (Kg)'])
```

```
[<matplotlib.lines.Line2D at 0x7993bc8dada0>]
```



```
plt.title('Trend Potensi Energi Listrik (kWh) Selama 6 Bulan')
plt.xlabel('tanggal')
plt.ylabel('kWh')
plt.plot(Dataset['kWh'])
```

```
[<matplotlib.lines.Line2D at 0x7993bc7e9f30>]
```



MELIHAT KE STASIONERAN DATA DENGAN ADFULLER METODE

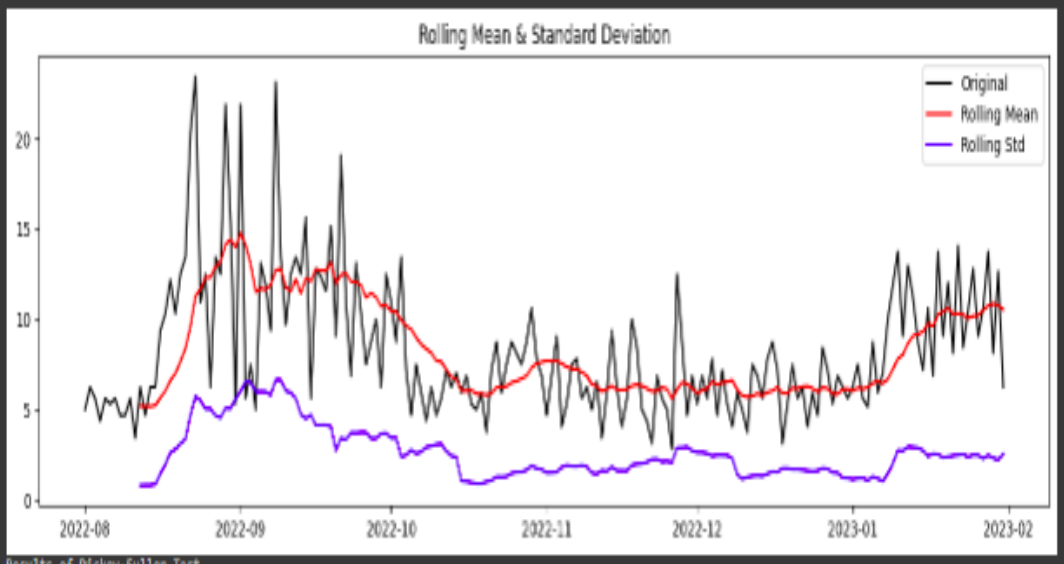
```
from statsmodels.tsa.stattools import adfuller
def test_stationarity(timeseries):

    #Determining rolling statistics
    rolmean = timeseries.rolling(window=12).mean()
    rolstd = timeseries.rolling(window=12).std()

    #Plot rolling statistics
    fig = plt.figure(figsize=(15,4))
    orig = plt.plot(timeseries, color='black', label='Original')
    mean = plt.plot(rolmean, color='red', label='Rolling Mean')
    std = plt.plot(rolstd, color='blue', label='Rolling Std')
    plt.legend(loc='best')
    plt.title('Rolling Mean & Standard Deviation')
    plt.show(block = False)

    #Perform ADF
    print ('Results of Dickey-Fuller Test')
    dftest = adfuller(timeseries, autolag='AIC')
    dfoutput = pd.Series(dftest[0:4], index=['Test Statistic', 'p-value', '#Lags Used', 'Numer of Observations used'])
    for key, value in dftest[4].items():
        dfoutput['Critical Value (%s)'%key] = value
    print (dfoutput)
```

```
[ ] test_stationarity(Dataset['kWh'])
```



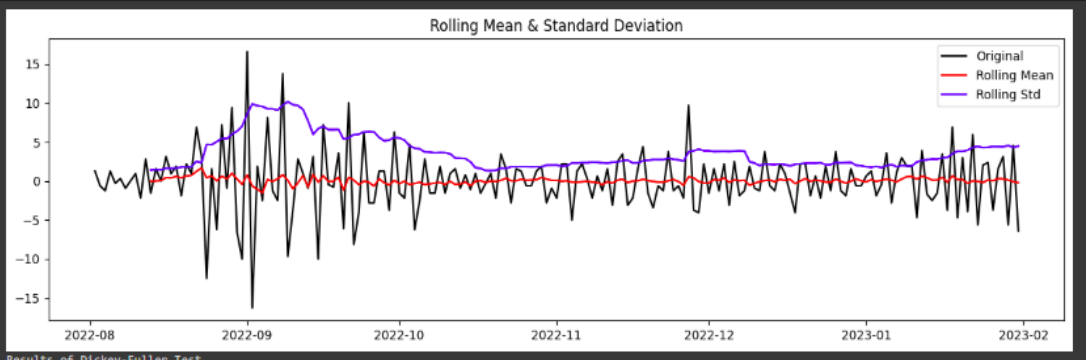

```
Results of Dickey-Fuller Test
Test Statistic                -2.288309
p-value                        0.178397
#Lags Used                     6.000000
Numer of Observations used   177.000000
Critical Value (1%)           -3.467845
```

TRANSFORM DATA UNTUK STASIONER

```
[ ] df_diff = (Dataset['kWh']).diff(1)
    df_diff.head()
```

```
Tanggal
2022-08-01        NaN
2022-08-02    1.25104
2022-08-03   -0.62552
2022-08-04   -1.25104
2022-08-05    1.25104
Name: kWh, dtype: float64
```

```
test_stationarity(df_diff.dropna())
```




```
Results of Dickey-Fuller Test
Test Statistic                -8.888789e+00
p-value                        1.258908e-14
#Lags Used                     5.000000e+00
Numer of Observations used     1.770000e+02
Critical Value (1%)           -3.467845e+00
Critical Value (5%)           -2.878012e+00
Critical Value (10%)          -2.575551e+00
```

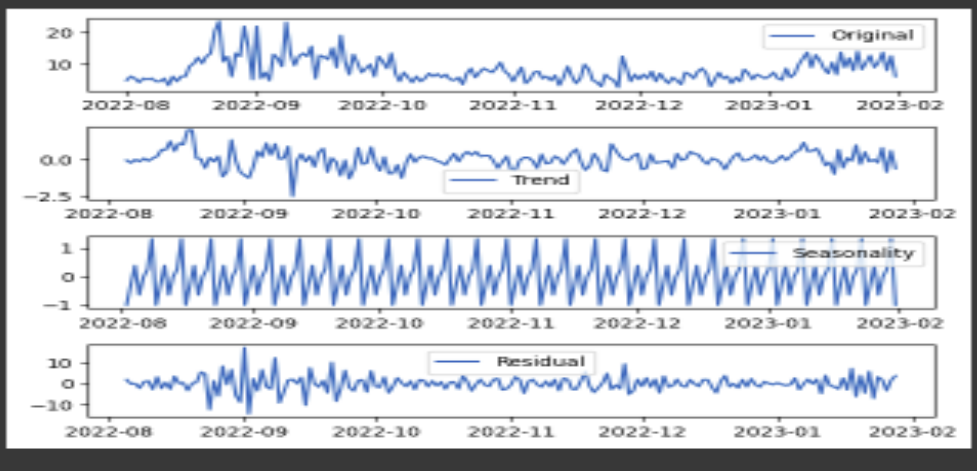
MELIHAT GRAFIK TREND SEASONAL RESIDUAL

```
from statsmodels.tsa.seasonal import seasonal_decompose
decomp = seasonal_decompose(df_diff.dropna())

trend = decomp.trend
seasonal = decomp.seasonal
residual = decomp.resid

plt.subplot(411)
plt.plot(Dataset['kWh'],label = 'Original')
plt.legend(loc = "best")
plt.subplot(412)
plt.plot(trend,label = 'Trend')
plt.legend(loc = "best")
plt.subplot(413)
plt.plot(seasonal,label = 'Seasonality')
plt.legend(loc = "best")
plt.subplot(414)
plt.plot(residual,label = 'Residual')
plt.legend(loc = "best")
plt.tight_layout()

decomplogdata = residual
decomplogdata.dropna(inplace = True)
#test_stationarity(decomplogdata)
```



MENENTUKAN BEST PARAMETER p,d,q

```
[ ] pip install arm-mango
```

```
Collecting arm-mango
  Downloading arm_mango-1.3.2-py3-none-any.whl (28 kB)
Collecting attrdict>=2.0.1 (from arm-mango)
  Downloading attrdict-2.0.1-py2.py3-none-any.whl (9.9 kB)
Requirement already satisfied: numpy>=1.17.0 in /usr/local/lib/python3.10/dist-packages (from arm-mango) (1.22.4)
Requirement already satisfied: scikit_learn>=0.21.3 in /usr/local/lib/python3.10/dist-packages (from arm-mango) (1.2.2)
Requirement already satisfied: scipy>=1.4.1 in /usr/local/lib/python3.10/dist-packages (from arm-mango) (1.10.1)
Requirement already satisfied: tqdm>=4.36.1 in /usr/local/lib/python3.10/dist-packages (from arm-mango) (4.65.0)
Requirement already satisfied: six in /usr/local/lib/python3.10/dist-packages (from attrdict>=2.0.1->arm-mango) (1.16.0)
Requirement already satisfied: joblib>=1.1.1 in /usr/local/lib/python3.10/dist-packages (from scikit_learn>=0.21.3->arm-mango) (1.3.1)
Requirement already satisfied: threadpoolctl>=2.0.0 in /usr/local/lib/python3.10/dist-packages (from scikit_learn>=0.21.3->arm-mango) (3.2.0)
Installing collected packages: attrdict, arm-mango
Successfully installed arm-mango-1.3.2 attrdict-2.0.1
```

```
from statsmodels.tsa.arima.model import ARIMA
from sklearn.metrics import mean_squared_error
from mango import Tuner, scheduler

def arima_objective_function(args_list):
    global data_values

    params_evaluated = []
    results = []

    for params in args_list:
        try:
            p,d,q = params['p'],params['d'], params['q']
            trend = params['trend']

            model = ARIMA(data_values, order=(p,d,q), trend = trend)
            predictions = model.fit()
            mse = mean_squared_error(data_values, predictions.fittedvalues)
            params_evaluated.append(params)
            results.append(mse)
        except:
            #print(f"Exception raised for {params}")
            #pass
            params_evaluated.append(params)
            results.append(1e5)

        #print(params_evaluated, mse)
    return params_evaluated, results

param_space = dict(p= range(0, 30),
                   d= range(0, 30),
                   q =range(0, 30),
                   trend = ['n', 'c', 't', 'ct']
                  )

conf_Dict = dict()
conf_Dict['num_iteration'] = 200
data_values = list(df_diff.dropna())
tuner = Tuner(param_space, arima_objective_function, conf_Dict)
results = tuner.minimize()
print('best parameters:', results['best_params'])
print('best loss:', results['best_objective'])
```

```
Best score: 8.051534888565403: 100% 200/200 [32:55<00:00, 9.47s/it]
best parameters: {'d': 0, 'p': 29, 'q': 21, 'trend': 'c'}
best loss: 8.051534888565403
```

```
[ ]  dfkwh = Dataset['kWh']
     dfkwh.head()
```

```
Tanggal
2022-08-01    5.00416
2022-08-02    6.25520
2022-08-03    5.62968
2022-08-04    4.37864
2022-08-05    5.62968
Name: kWh, dtype: float64
```

MEMBUAT DATA TRAIN DAN TEST

```
[ ]  train= dfkwh[:round(len(dfkwh)*80/100)]
     test = dfkwh[round(len(dfkwh)*80/100):]
```

FORECAST ARIMA

```
model = ARIMA(Dataset['kWh'],order =(29,0,29))
model_fit = model.fit()
prediction = model_fit.predict(start=test.index[0],end = test.index[-1])
kwhdf =  prediction.to_frame()
kwhdf.info()
```

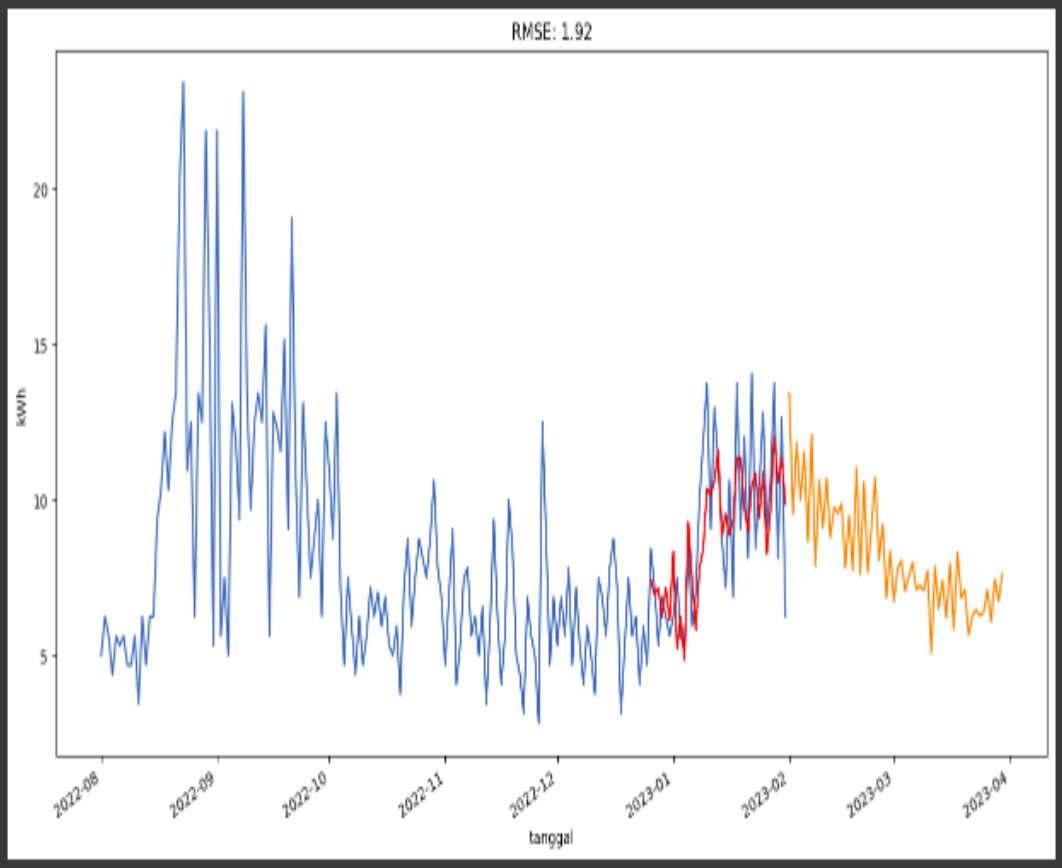
```
kwhdf.head()
```

	predicted_mean
2022-12-26	7.424617
2022-12-27	6.955642
2022-12-28	7.156953
2022-12-29	6.227660
2022-12-30	7.180961

```
[ ]  datafuture =pd.DataFrame(pd.date_range(start='2023-02-01',end='2023-03-30'),columns=['date'])
     datafuture.set_index('date',inplace=True)
```

PENAMPILAN GRAFIK HASIL FORECAST

```
dfkwh.dropna()
plt.figure(figsize=(15,8))
plt.plot(Dataset.index, Dataset['kWh'])
plt.plot(kwhdf.index, kwhdf,color = 'red')
forcasting = model_fit.predict(start=datafuture.index[0],end = datafuture.index[-1])
forcasting.plot()
rmse = np.sqrt(mean_squared_error( test, prediction))
plt.xlabel('tanggal')
plt.ylabel('kWh')
plt.title('RMSE: {:.2f}'.format(rmse))
plt.show()
```




```
from sklearn.metrics import mean_absolute_percentage_error
from sklearn.metrics import r2_score
mae = mean_absolute_error(test, prediction)
rmse = np.sqrt(mean_squared_error(test, prediction))
mape = mean_absolute_percentage_error(test, prediction)
print("RMSE : % f" %(rmse))
print("MAE : % f" %(mae))
print("MAPE : % f" %(mape))
```

```
RMSE :  1.919057
MAE :  1.648130
MAPE :  0.186209
```

```
forcasting.head()
```

```
forcasting.to_excel("hasil forcasting enam bulan kedepan.xlsx")
```

Lampiran 5 Turnitin

iqbal mauludi

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