LAMPIRAN

Lampiran 1 Data Produksi Padi

Provinsi	longitude	latitude	Produksi Padi	Luas Lahan Panen	Jumlah petani	Penyuluhan	Benih	Pupuk NPK
Aceh	96.7494	4.69514	1697756	458977	639808	3710	1721.6	991
Bali	115.189	-8.4095	650245	139782	494580	1129	2468.02	69
Bangka-Belitung	106.441	-2.7411	18951	7959	1836179	302	1.9	834
Banten	106.064	-6.4058	1603550	428590	4755293	1004	911.33	974
Bengkulu	102.261	-3.7929	254218	148844	191233	1147	397.65	873
Gorontalo	122.447	0.69994	241948	63037	620503	1015	28.55	715
Irian Jaya Barat	133.175	-1.3361	13916	6081	966892	511	93.07	475
Jakarta Raya	106.865	-6.1751	3990	1787	10711	150	30.4	294
Jambi	103.613	-1.6101	500021	144587	1876036	1718	53.13	971
Jawa Barat	107.669	-7.0909	9539330	2023421	2911761	4942	20007.3	1171
Jawa Tengah	110.14	-7.151	11401821	1876725	466000	9248	41543.3	1165
Jawa Timur	112.238	-7.5361	10537922	2109625	649440	7967	56881.9	1173
Kalimantan Barat	111.475	-0.2788	622041	476922	1034327	1654	874.77	924
Kalimantan Selatan	115.284	-3.0926	1136511	525209	649997	1875	1063.2	879
Kalimantan Tengah	113.382	-1.6815	742758	205381	367244	1068	113.9	832
Kalimantan Timur	116.419	0.53866	241398	71292	284797	845	498.2	835
Kalimantan Utara	116.041	3.07309	45323	13543	50469	258	115	426
Kepulauan Riau	108.143	3.94565	833	399	769939	75	2.5	23
Lampung	105.407	-4.5586	1901041	806353	32289	1961	3422.9	1053
Maluku Utara	127.809	1.571	35360	17290	179250	561	234.83	468
Maluku	130.145	-3.2385	90892	26130	227270	755	188.1	549
Nusa Tenggara Barat	117.362	-8.6529	1399495	434492	862906	1922	3307.9	964
Nusa Tenggara Timur	121.079	-8.6574	800980	241204	1118649	2541	254.82	786
Papua	138.08	-4.2699	130718	60077	114599	1036	129.55	775
Riau	101.707	0.29335	365293	80879	1093680	1007	251.1	949
Sulawesi Barat	119.232	-2.8441	326169	136525	150120	900	97.35	764
Sulawesi Selatan	119.974	-3.6688	6196737	1142608	421178	3877	1550.46	1062
Sulawesi Tengah	121.446	-1.43	1154907	245985	1306322	1525	673.67	774
Sulawesi Tenggara	122.175	-4.1449	499007	165229	287130	2107	462.8	88
Sulawesi Utara	123.975	0.62469	366722	149205	375154	1819	55.3	816
Sumatera Barat	100.8	-0.7399	1511538	525249	806110	2003	326.26	1016
Sumatera Selatan	103.914	-3.3194	2646566	970204	400206	2223	3226.47	1042
Sumatera Utara	99.5451	2.11536	1907725	872511	2477176	2764	3202.53	1072
Yogyakarta	110.426	-7.8754	497599	108719	666575	869	2330.98	798

Lampiran 2 Sintak *Regresi OLS*

```
dataku.PP=read.delim("clipboard")
dataku.PP

summary(dataku.PP)

a<-lm(formula = Y~ X1+X2+X3+X4+X5, data=dataku.PP)

summary(a)

## Uji F (Melihat signifikansi keseluruhan model)
anova(a)

## COnfident Interval (Uji Parsial)
confint.lm(a, level=0.95)

prediksi<-predict(a)
prediksi

#######uji Asumsi#######
#Uji Multiko
library(car)
vif(a)

#uji normalitas residual
resid<-abs(a$residuals)
res=a$residual
ks.test(res,"pnorm",mean(res),sd(res),alternative=c("two.sided"))

#uji heteroskedastisitas spasial
library(lmtest)
bptest(lm(a$residuals~X1+X2+X3+X4+X5, data=dataku.PP))

#NO AUTOKORELASI
noauto=dwtest(a)
noauto
```

Lampiran 3 Sintak *GWR*

```
#Mencari bandwidth optimal (adaptive bandwidth)

library(spgwr)

b <- gwr.sel(Y~X1+X2+X3+X4+X5,
coords=cbind(dataku.PP$x,dataku.PP$y),
data=dataku.PP, adapt=TRUE,gweight=gwr.Gauss)

#Estimasi Parameter
gwr1 <- gwr(Y~X1+X2+X3+X4+X5,
coords=cbind(dataku.PP$x,dataku.PP$y),
data=dataku.PP, adapt=b,hatmatrix=TRUE,gweight=gwr.Gauss)

#anova gwr
anova(gwr1)

#Membaca Output gwr1
#nilai R_Square dan AIC
gwr1

#model GWR
gwr1$SDF$"(Intercept)"
gwr1$SDF$X1
gwr1$SDF$X2
gwr1$SDF$X3
gwr1$SDF$X4
gwr1$SDF$X5
gwr1$SDF$X6

#Uji Kecocokan Model
BFC02.gwr.test(gwr1)

#Uji Pengaruh Geografis terhadap setiap prediktor
LMZ.F3GWR.test(gwr1)

#Melihat hasil prediksi

gwr1$SDF[,2:7]
```

Lampiran 4. Output Analisis Regresi dengan OLS

```
> summary(dataku.PP)
       x                y                Y                 X1        
 Min.   : 96.75   Min.   :-8.6574   Min.   :     833   Min.   :    399  
 1st Qu.:106.16   1st Qu.:-5.7710   1st Qu.:  241536   1st Qu.:  65101  
 Median :112.81   Median :-2.9684   Median :  561031   Median : 157217  
 Mean   :113.73   Mean   :-2.7395   Mean   : 1737744   Mean   : 431907  
 3rd Qu.:120.80   3rd Qu.: 0.1503   3rd Qu.: 1580547   3rd Qu.: 513137  
 Max.   :138.08   Max.   : 4.6951   Max.   :11401821   Max.   :2109625  
       X2                X3                X4                X5        
 Min.   :  10711   Min.   :  75.0   Min.   :   1.9   Min.   :  23.0  
 1st Qu.: 285380   1st Qu.: 876.8   1st Qu.:  114.2   1st Qu.: 727.2  
 Median : 630156   Median :1336.0   Median :  430.2   Median : 834.5  
 Mean   : 855701   Mean   :1955.5   Mean   : 4309.4   Mean   : 782.4  
 3rd Qu.:1017468   3rd Qu.:2081.0   3rd Qu.: 2178.6   3rd Qu.: 986.8  
 Max.   :4755293   Max.   :9248.0   Max.   :56881.9   Max.   :1173.0  
>
> a<-lm(formula = Y~ X1+X2+X3+X4+X5, data=dataku.PP)
>
> summary(a)

Call:
lm(formula = Y ~ X1 + X2 + X3 + X4 + X5, data = dataku.PP)

Residuals:
     Min       1Q   Median       3Q      Max 
-1488823  -378861   188862   325579  1677762 

Coefficients:
             Estimate Std. Error t value Pr(>|t|)    
(Intercept) -1.321e+05  3.459e+05  -0.382   0.7054    
X1           3.274e+00  5.308e-01   6.169 1.16e-06 ***
X2           8.427e-02  1.320e-01   0.638   0.5283    
X3           4.165e+02  1.682e+02   2.477   0.0196 *  
X4           3.614e+01  2.163e+01   1.671   0.1059    
X5          -7.498e+02  5.091e+02  -1.473   0.1520    
---
Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
```

```
Residual standard error: 660400 on 28 degrees of freedom
Multiple R-squared:  0.959,     Adjusted R-squared:  0.9517
F-statistic: 130.9 on 5 and 28 DF,  p-value: < 2.2e-16

>
> a<-lm(formula = Y~ X1+X3, data=dataku.PP)
>
> summary(a)

Call:
lm(formula = Y ~ X1 + X3, data = dataku.PP)

Residuals:
     Min       1Q   Median       3Q      Max
-1707871  -436813   226805   413970  1088522

Coefficients:
             Estimate Std. Error t value Pr(>|t|)
(Intercept) -7.463e+05  1.736e+05  -4.298 0.000158 ***
X1           3.247e+00  4.939e-01   6.575 2.42e-07 ***
X3           5.531e+02  1.422e+02   3.890 0.000496 ***
---
Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1

Residual standard error: 703100 on 31 degrees of freedom
Multiple R-squared:  0.9485,    Adjusted R-squared:  0.9452
F-statistic: 285.6 on 2 and 31 DF,  p-value: < 2.2e-16

> ## Uji F (Melihat signifikansi keseluruhan model)
> anova(a)
Analysis of Variance Table

Response: Y
          Df     Sum Sq    Mean Sq F value    Pr(>F)
X1         1 2.7489e+14 2.7489e+14  556.04 < 2.2e-16 ***
X3         1 7.4797e+12 7.4797e+12   15.13 0.0004958 ***
Residuals 31 1.5325e+13 4.9436e+11
---
Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
>
> ## COnfident Interval (Uji Parsial)
> confint.lm(a, level=0.95)
                    2.5 %        97.5 %
(Intercept) -1.100368e+06 -3.921873e+05
X1           2.239908e+00  4.254378e+00
X3           2.630809e+02  8.430738e+02
>
```

```
> #######uji Asumsi#######
> #Uji Multiko
> library(car)
Loading required package: carData
> vif(a)
      X1       X3
5.461012 5.461012
>
> #uji normalitas residual
> resid<-abs(a$residuals)
> res=a$residual
> ks.test(res,"pnorm",mean(res),sd(res),alternative=c("two.sided"))

        One-sample Kolmogorov-Smirnov test

data:  res
D = 0.1572, p-value = 0.3345
alternative hypothesis: two-sided

>
> #uji heteroskedastisitas spasial
> library(lmtest)
Loading required package: zoo

Attaching package: 'zoo'

The following objects are masked from 'package:base':

    as.Date, as.Date.numeric

> bptest(lm(a$residuals~X1+X2+X3+X4+X5, data=dataku.PP))

        studentized Breusch-Pagan test

data:  lm(a$residuals ~ X1 + X2 + X3 + X4 + X5, data = dataku.PP)
BP = 17.896, df = 5, p-value = 0.003079

>
> #NO AUTOKORELASI
> noauto=dwtest(a)
> noauto

        Durbin-Watson test

data:  a
DW = 1.4251, p-value = 0.0351
alternative hypothesis: true autocorrelation is greater than 0
```

```
> a<-lm(formula = Y~ X1+X2+X3+X4, data=dataku.PP)
>
> summary(a)

Call:
lm(formula = Y ~ X1 + X2 + X3 + X4, data = dataku.PP)

Residuals:
     Min       1Q   Median       3Q      Max
-1477131  -328593   186011   282604  1745987

Coefficients:
             Estimate Std. Error t value Pr(>|t|)
(Intercept) -5.182e+05  2.302e+05  -2.251   0.0321 *
X1           3.035e+00  5.155e-01   5.889 2.16e-06 ***
X2           4.067e-02  1.312e-01   0.310   0.7588
X3           3.643e+02  1.677e+02   2.173   0.0381 *
X4           4.589e+01  2.101e+01   2.184   0.0372 *
---
Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1

Residual standard error: 673600 on 29 degrees of freedom
Multiple R-squared:  0.9558,    Adjusted R-squared:  0.9497
F-statistic: 156.8 on 4 and 29 DF,  p-value: < 2.2e-16


> a<-lm(formula = Y~ X1+X3+X4, data=dataku.PP)
>
> summary(a)

Call:
lm(formula = Y ~ X1 + X3 + X4, data = dataku.PP)

Residuals:
     Min       1Q   Median       3Q      Max
-1429983  -337403   178578   305854  1703580

Coefficients:
             Estimate Std. Error t value Pr(>|t|)
(Intercept) -4.860e+05  2.022e+05  -2.403   0.0226 *
X1           3.095e+00  4.711e-01   6.570 2.87e-07 ***
X3           3.541e+02  1.619e+02   2.187   0.0367 *
X4           4.514e+01  2.055e+01   2.196   0.0359 *
---
Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1

Residual standard error: 663400 on 30 degrees of freedom
Multiple R-squared:  0.9557,    Adjusted R-squared:  0.9512
F-statistic: 215.5 on 3 and 30 DF,  p-value: < 2.2e-16
```

Lampiran 5. Output Nilai Prediksi dalam OLS

```
> prediksi<-predict(a)
> prediksi
          1           2           3           4           5           6
 2796003.28   332038.80  -553404.32  1200705.05   371419.80    19785.98
          7           8           9          10          11          12
 -443909.29  -657513.44   673403.88  8557368.19 10462576.33 10510343.89
         13          14          15          16          17          18
 1717146.24  1996171.14   511310.42   -47432.00  -559607.68  -703501.28
         19          20          21          22          23          24
 2956650.60  -379858.19  -243856.44  1727594.69  1442315.76    21789.06
         25          26          27          28          29          30
   73296.89   194808.14  5108214.92   895913.77   955578.49   744259.99
         31          32          33          34
 2067094.93  3633604.52  3615596.21    87372.68
```

Lampiran 6. Output Analisis GWR

```
> #Mencari bandwidth optimal (adaptive bandwidth)
>
> library(spgwr)
Loading required package: sp
Loading required package: spData
To access larger datasets in this package, install the spDataLarge
package with: `install.packages('spDataLarge',
repos='https://nowosad.github.io/drat/', type='source'))`
NOTE: This package does not constitute approval of GWR
as a method of spatial analysis; see example(gwr)
>
> b <- gwr.sel(Y~X1+X2+X3+X4+X5,
+ coords=cbind(dataku.PP$x,dataku.PP$y),
+ data=dataku.PP, adapt=TRUE,gweight=gwr.Gauss)
Adaptive q: 0.381966 CV score: 2.775743e+13
Adaptive q: 0.618034 CV score: 2.807292e+13
Adaptive q: 0.236068 CV score: 3.125855e+13
Adaptive q: 0.4899249 CV score: 2.775142e+13
Adaptive q: 0.4385061 CV score: 2.762908e+13
Adaptive q: 0.4365916 CV score: 2.763276e+13
Adaptive q: 0.4494633 CV score: 2.76429e+13
Adaptive q: 0.4426914 CV score: 2.762725e+13
Adaptive q: 0.4414972 CV score: 2.76248e+13
Adaptive q: 0.4408613 CV score: 2.762472e+13
Adaptive q: 0.4411257 CV score: 2.762425e+13
Adaptive q: 0.4411683 CV score: 2.762417e+13
Adaptive q: 0.4412939 CV score: 2.762439e+13
Adaptive q: 0.441209 CV score: 2.762422e+13
Adaptive q: 0.4411683 CV score: 2.762417e+13
>
> #Estimasi Parameter
> gwr1 <- gwr(Y~X1+X2+X3+X4+X5,
+ coords=cbind(dataku.PP$x,dataku.PP$y),
+ data=dataku.PP, adapt=b,hatmatrix=TRUE,gweight=gwr.Gauss)
```

```
> #Membaca Output gwr1
> #nilai R_Square dan AIC
> gwr1
Call:
gwr(formula = Y ~ X1 + X2 + X3 + X4 + X5, data = dataku.PP, coords = cbind(dataku.PP$x,
    dataku.PP$y), gweight = gwr.Gauss, adapt = b, hatmatrix = TRUE)
Kernel function: gwr.Gauss
Adaptive quantile: 0.4411683 (about 14 of 34 data points)
Summary of GWR coefficient estimates at data points:
                   Min.     1st Qu.      Median     3rd Qu.        Max.
X.Intercept. -4.1587e+05 -3.1665e+05 -2.3120e+05 -6.3666e+04 -1.0989e+04
X1            2.8682e+00  2.9820e+00  3.2130e+00  3.6363e+00  3.8017e+00
X2           -1.5110e-03  3.5198e-02  1.2358e-01  1.8447e-01  2.1918e-01
X3            3.9661e+02  4.2031e+02  4.6765e+02  5.5925e+02  6.1822e+02
X4            7.6156e+00  1.1992e+01  1.9072e+01  3.7508e+01  5.4463e+01
X5           -1.1663e+03 -9.6113e+02 -7.9891e+02 -5.1425e+02 -4.3550e+02
                  Global
X.Intercept. -1.3209e+05
X1            3.2743e+00
X2            8.4300e-02
X3            4.1647e+02
X4            3.6144e+01
X5           -7.4984e+02
Number of data points: 34
Effective number of parameters (residual: 2traceS - traceS'S): 10.73109
Effective degrees of freedom (residual: 2traceS - traceS'S): 23.26891
Sigma (residual: 2traceS - traceS'S): 594751.4
Effective number of parameters (model: traceS): 8.916103
Effective degrees of freedom (model: traceS): 25.0839
Sigma (model: traceS): 572830.3
Sigma (ML): 492021.4
AICc (GWR p. 61, eq 2.33; p. 96, eq. 4.21): 1016.925
AIC (GWR p. 96, eq. 4.22): 996.6308
Residual sum of squares: 8.230893e+12
Quasi-global R2: 0.9723509
```

```
> gwr1$SDF$"(Intercept)"
 [1]  -46541.66 -415873.50  -30412.62 -113235.78  -16471.50 -279427.89
 [7] -227161.01 -120498.33  -10988.98 -175952.92 -267338.48 -344303.97
[13] -189866.06 -376821.77 -289209.30 -272704.57 -206258.73  -73112.48
[19]  -60517.19 -235245.39 -256423.26 -394589.53 -391447.64 -220383.71
[25]  -27507.82 -361783.87 -380631.03 -325790.64 -350300.42 -263447.51
[31]  -23463.44  -25700.36  -35648.25 -282290.14
> gwr1$SDF$X1
 [1] 3.016680 3.416326 2.868247 3.006548 2.916733 3.744899 3.597186 2.996959
 [9] 2.868452 3.055817 3.115054 3.228427 3.049639 3.385678 3.197650 3.396061
[17] 3.328674 2.977042 2.946309 3.689188 3.707740 3.502792 3.699144 3.547363
[25] 2.919689 3.649400 3.742115 3.786392 3.801684 3.695192 2.920851 2.910104
[33] 2.963321 3.154804
> gwr1$SDF$X2
 [1]  0.1221665484  0.1222379714  0.2191819635  0.2072344770  0.1893555508
 [6] -0.0006913643  0.0267727865  0.2163238853  0.1840384750  0.2019815930
[11]  0.1964468229  0.1672809861  0.1511851185  0.0995584459  0.1320902021
[16]  0.0706314402  0.0721660207  0.1249203653  0.2080057224  0.0073966520
[21]  0.0118975945  0.0925160844  0.0424881128  0.0369578013  0.1534819381
[26]  0.0346115766  0.0180654782 -0.0015109675  0.0051952825  0.0094427681
[31]  0.1583679620  0.1955267688  0.1364280824  0.1846155088
> gwr1$SDF$X3
 [1] 399.9983 560.0063 556.9724 565.9934 468.1059 409.4916 408.2176 592.0030
 [9] 458.5301 586.2766 618.2245 599.2502 566.4270 553.5415 574.9646 494.4274
[17] 469.7775 454.3500 542.4256 396.6103 399.3590 518.1596 463.3244 413.7856
[25] 422.5208 467.1952 452.1003 419.5742 423.3500 410.5661 422.9696 491.4946
[33] 407.0301 600.3408
> gwr1$SDF$X4
 [1] 52.194988  7.912326 37.885714 29.675805 49.102364 13.388496 20.412115
 [8] 26.217288 52.279774 23.582990 14.945641 11.526555 23.996970  9.245380
[15] 15.134841 17.435631 24.547815 44.815801 36.373317 17.732884 16.471112
[22]  9.760207  8.325157 22.049501 54.255429  9.606299  7.615650 10.121997
[29]  9.016563 15.508686 54.462627 45.759484 54.048011 15.600830
> gwr1$SDF$X5
 [1]  -872.7199  -656.0979 -1166.2946 -1098.1396 -1066.3409  -474.9661
 [7]  -544.1121 -1125.0511 -1037.8320 -1042.2302  -959.2656  -819.9774
[13]  -894.5124  -637.4887  -777.8378  -647.6296  -696.2709  -879.4539
[19] -1123.5792  -504.2922  -488.9729  -596.6906  -484.9079  -569.4784
```

```
> #Uji Kecocokan Model
> BFC02.gwr.test(gwr1)

        Brunsdon, Fotheringham & Charlton (2002, pp. 91-2) ANOVA

data:  gwr1
F = 1.4837, df1 = 28.000, df2 = 23.269, p-value = 0.1676
alternative hypothesis: greater
sample estimates:
SS OLS residuals SS GWR residuals
    1.221231e+13     8.230893e+12

>
> #Uji Pengaruh Geografis terhadap setiap prediktor
> LMZ.F3GWR.test(gwr1)

Leung et al. (2000) F(3) test

            F statistic Numerator d.f. Denominator d.f.    Pr(>)
(Intercept)      1.0235          8.2725           26.205 0.444615
X1               2.9286          9.5406           26.205 0.014151 *
X2               3.5336         13.5439           26.205 0.002728 **
X3               1.2002          7.9585           26.205 0.336794
X4               4.5343          8.2406           26.205 0.001391 **
X5               1.5703          9.2130           26.205 0.174933
---
Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
`
```