

CONTOH 1: REGIONAL PLANNING, IOR P.48

Tabel 1. Sumberdaya Tersedia

Daerah	Tanah berguna (ha)	Jatah air (1000 m ³)
1	400	600
2	600	800
3	300	375

Tabel 2. Data Tanaman

Jenis tanaman	Kuota maks. (ha)	Kebutuhan air (1000 m ³ /ha)	Untung Bersih (Rp./ha)
Bit gula	400	3	600
Kapas	600	2	800
Sorghum	300	1	375

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! Contoh 1: Regional Planning, IOR p.48
! Maksimumkan keuntungan bersih, dengan X adalah luas tanah
! yang ditanami satu jenis tanaman di daerah pengairan tertentu
!
Max 1000 X1 + 1000 X2 + 1000 X3 +
    750 X4 + 750 X5 + 750 X6 +
    250 X7 + 250 X8 + 250 X9
st
!
! 1. Tanah yang dapat ditanami di setiap daerah pengairan
X1 + X4 + X7 <= 400
! X2 + X5 + X8 <= 600 tidak digunakan karena ada
! X3 + X6 + X9 <= 300 kendala No.4
!
! 2. Jatah air di setiap daerah pengairan
3 X1 + 2 X4 + X7 <= 600
3 X2 + 2 X5 + X8 <= 800
3 X3 + 2 X6 + X9 <= 375
!
!3. Jumlah luas setiap jenis tanaman
X1 + X2 + X3 <= 600
X4 + X5 + X6 <= 500
X7 + X8 + X9 <= 325
!
!4. Persamaan proporsi daerah yang ditanami
3 X1 + 3 X4 + 3 X7 - 2 X2 - 2 X5 - 2 X8 = 0
X2 + X5 + X8 - 2 X3 - 2 X6 - 2 X9 = 0
! 4 X3 + 4 X6 + 4 X9 - 3 X1 - 3 X4 - 3 X7 = 0 "redundant constraint"
End

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LP OPTIMUM FOUND AT STEP 0

OBJECTIVE FUNCTION VALUE

1) 633333.3

VARIABLE	VALUE	REDUCED COST
X1	133.333328	0.000000
X2	100.000000	0.000000

X3	25.000000	0.000000
X4	100.000000	0.000000
X5	250.000000	0.000000
X6	150.000000	0.000000
X7	0.000000	83.333336
X8	0.000000	83.333336
X9	0.000000	83.333336

ROW	SLACK OR SURPLUS	DUAL PRICES
2)	166.666672	0.000000
3)	0.000000	333.333344
4)	0.000000	333.333344
5)	0.000000	333.333344
6)	341.666656	0.000000
7)	0.000000	83.333336
8)	325.000000	0.000000
9)	0.000000	0.000000
10)	0.000000	0.000000

NO. ITERATIONS= 0

RANGES IN WHICH THE BASIS IS UNCHANGED:

VARIABLE	CURRENT COEF	OBJ COEFFICIENT RANGES	
		ALLOWABLE INCREASE	ALLOWABLE DECREASE
X1	1000.000000	141.304352	203.125000
X2	1000.000000	216.666687	135.416672
X3	1000.000000	120.370384	270.833344
X4	750.000000	135.416672	60.185192
X5	750.000000	90.277786	77.380959
X6	750.000000	180.555573	54.166676
X7	250.000000	83.333344	INFINITY
X8	250.000000	83.333344	INFINITY
X9	250.000000	83.333344	INFINITY

ROW	CURRENT RHS	RIGHTHAND SIDE RANGES	
		ALLOWABLE INCREASE	ALLOWABLE DECREASE
2	400.000000	INFINITY	166.666672
3	600.000000	144.444443	167.741928
4	800.000000	162.500000	144.444443
5	375.000000	195.000000	29.545454
6	600.000000	INFINITY	341.666656
7	500.000000	162.500000	325.000000
8	325.000000	INFINITY	325.000000
9	0.000000	288.888885	144.444443
10	0.000000	130.000000	32.500000

CONTOH 2: CONTROLLING AIR POLUTION, IOR P.50

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Min 8 X1 + 10 X2 + 7 X3 + 6 X4 + 11 X5 + 9 X6
st
12 X1 + 9 X2 + 25 X3 + 20 X4 + 17 X5 + 13 X6 >= 60
35 X1 + 42 X2 + 18 X3 + 31 X4 + 56 X5 + 49 X6 >= 150
37 X1 + 53 X2 + 28 X3 + 24 X4 + 29 X5 + 20 X6 >= 125
X1 <= 1
X2 <= 1
X3 <= 1
X4 <= 1
X5 <= 1
X6 <= 1
End
    
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:go
 LP OPTIMUM FOUND AT STEP 14

OBJECTIVE FUNCTION VALUE

1) 32.1546300

VARIABLE	VALUE	REDUCED COST
X1	1.000000	.000000
X2	.622697	.000000
X3	.343479	.000000
X4	1.000000	.000000
X5	.047573	.000000
X6	1.000000	.000000

ROW	SLACK OR SURPLUS	DUAL PRICES
2)	.000000	-.111047
3)	.000000	-.126817
4)	.000000	-.069326
5)	.000000	.336211
6)	.377303	.000000
7)	.656521	.000000
8)	.000000	1.816085
9)	.952427	.000000
10)	.000000	.044161

NO. ITERATIONS= 14

DO RANGE (SENSITIVITY) ANALYSIS?
 ?y

RANGES IN WHICH THE BASIS IS UNCHANGED

VARIABLE	CURRENT COEF	OBJ COEFFICIENT RANGES	
		ALLOWABLE INCREASE	ALLOWABLE DECREASE
X1	8.000000	.336211	INFINITY
X2	10.000000	.429441	.666963
X3	7.000000	.381628	2.011462
X4	6.000000	1.816085	INFINITY
X5	11.000000	2.975227	.044638
X6	9.000000	.044161	INFINITY

ROW	CURRENT RHS	RIGHTHAND SIDE RANGES	
		ALLOWABLE INCREASE	ALLOWABLE DECREASE
2	60.000000	14.297140	7.479998
3	150.000000	20.453120	1.689658
4	125.000000	2.041670	21.691960
5	1.000000	.246231	.748478
6	1.000000	INFINITY	.377303
7	1.000000	INFINITY	.656521
8	1.000000	.110610	1.000000
9	1.000000	INFINITY	.952427
10	1.000000	.048086	.962709

CONTOH 3: RECLAIMING SOLID WASTE, IOR P.53

Max 5.5 **XA1** + 5.5 **XA2** + 5.5 **XA3** + 5.5 **XA4** +
 4.5 **XB1** + 4.5 **XB2** + 4.5 **XB3** + 4.5 **XB4** +
 3.5 **XC1** + 3.5 **XC2** + 3.5 **XC3** + 3.5 **XC4**
st

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0.7 XA1 - 0.3 XA2 - 0.3 XA3 - 0.3 XA4 <= 0
-0.4 XA1 + 0.6 XA2 - 0.4 XA3 - 0.4 XA4 >= 0
-0.5 XA1 - 0.5 XA2 + 0.5 XA3 - 0.5 XA4 <= 0
-0.2 XA1 - 0.2 XA2 - 0.2 XA3 + 0.8 XA4 = 0
0.5 XB1 - 0.5 XB2 - 0.5 XB3 - 0.5 XB4 <= 0
-0.1 XB1 + 0.9 XB2 - 0.1 XB3 - 0.1 XB4 >= 0
-0.1 XB1 - 0.1 XB2 - 0.1 XB3 + 0.9 XB4 = 0
0.3 XC1 - 0.7 XC2 - 0.7 XC3 - 0.7 XC4 <= 0
XA1 + XB1 + XC1 <= 3000
XA2 + XB2 + XC2 <= 2000
XA3 + XB3 + XC3 <= 4000
XA4 + XB4 + XC4 <= 1000
XA1 + XB1 + XC1 >= 1500
XA2 + XB2 + XC2 >= 1000
XA3 + XB3 + XC3 >= 2000
XA4 + XB4 + XC4 >= 500
3 XA1 + 3 XB1 + 3 XC1 + 6 XA2 + 6 XB2 + 6 XC2 +
4 XA3 + 4 XB3 + 4 XC3 + 5 XA4 + 5 XB4 + 5 XC4 = 30000
End

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:go
LP OPTIMUM FOUND AT STEP 23

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OBJECTIVE FUNCTION VALUE

1) 35109.6500

VARIABLE	VALUE	REDUCED COST
XA1	644.736800	.000000
XA2	859.649000	.000000
XA3	214.912300	.000000
XA4	429.824500	.000000
XB1	2355.263000	.000000
XB2	517.543900	.000000
XB3	1785.088000	.000000
XB4	517.543900	.000000
XC1	.000000	.557018
XC2	.000000	3.342105
XC3	.000000	.557018
XC4	.000000	2.201754

ROW	SLACK OR SURPLUS	DUAL PRICES
2)	.000000	.000001
3)	.000000	-2.785086
4)	859.649200	.000000
5)	.000000	-1.644736
6)	232.456100	.000000
7)	.000000	-2.785087
8)	.000000	-1.644736
9)	.000000	.000000
10)	.000000	.635965
11)	622.807000	.000000
12)	2000.000000	.000000
13)	52.631590	.000000
14)	1500.000000	.000000
15)	377.193000	.000000
16)	.000000	-.504385
17)	447.368400	.000000
18)	.000000	1.140351

NO. ITERATIONS= 23

DO RANGE (SENSITIVITY) ANALYSIS?

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RANGES IN WHICH THE BASIS IS UNCHANGED

VARIABLE	OBJ COEFFICIENT RANGES		
	CURRENT COEF	ALLOWABLE INCREASE	ALLOWABLE DECREASE
XA1	5.500000	1.380953	.000001
XA2	5.500000	1.035715	.668604
XA3	5.500000	.000001	2.212542
XA4	5.500000	2.071430	1.337208
XB1	4.500000	.000001	.435436
XB2	4.500000	2.220279	3.152175
XB3	4.500000	.424354	.000001
XB4	4.500000	2.299998	3.152176
XC1	3.500000	.557018	INFINITY
XC2	3.500000	3.342105	INFINITY
XC3	3.500000	.557018	INFINITY
XC4	3.500000	2.201754	INFINITY

ROW	RIGHTHAND SIDE RANGES		
	CURRENT RHS	ALLOWABLE INCREASE	ALLOWABLE DECREASE
2	.000000	214.912300	232.456100
3	.000000	170.731700	200.000200
4	.000000	INFINITY	859.649200
5	.000000	66.666670	452.991400
6	.000000	INFINITY	232.456100
7	.000000	830.508400	200.000100
8	.000000	66.666670	418.439700
9	.000000	INFINITY	.000000
10	3000.000000	514.563200	500.000300
11	2000.000000	INFINITY	622.807000
12	4000.000000	INFINITY	2000.000000
13	1000.000000	INFINITY	52.631590
14	1500.000000	1500.000000	INFINITY
15	1000.000000	377.193000	INFINITY
16	2000.000000	704.918000	333.333500
17	500.000000	447.368400	INFINITY
18	30000.000000	1000.000000	3071.428000

CONTOH 4: PERSONNEL SCHEDULING, IOR P.57

Min 170 x1 + 160 x2 + 175 x3 + 180 x4 + 195 x5

st

x1 >= 48

x1 + x2 >= 79

x1 + x2 + x3 >= 87

x2 + x3 >= 64

x3 + x4 >= 82

x4 >= 43

x4 + x5 >= 52

x5 >= 15

End

:GO

LP OPTIMUM FOUND AT STEP 8

OBJECTIVE FUNCTION VALUE

1) 30610.0000

VARIABLE	VALUE	REDUCED COST
X1	48.000000	.000000
X2	31.000000	.000000
X3	39.000000	.000000

X4 43.000000 .000000
 X5 15.000000 .000000

ROW	SLACK OR SURPLUS	DUAL PRICES
2)	.000000	-10.000000
3)	.000000	-160.000000
4)	31.000000	.000000
5)	6.000000	.000000
6)	.000000	-175.000000
7)	.000000	-5.000000
8)	6.000000	.000000
9)	.000000	-195.000000

NO. ITERATIONS= 8

DO RANGE (SENSITIVITY) ANALYSIS?
 ?Y

RANGES IN WHICH THE BASIS IS UNCHANGED

VARIABLE	CURRENT COEF	OBJ COEFFICIENT RANGES	
		ALLOWABLE INCREASE	ALLOWABLE DECREASE
X1	170.000000	INFINITY	10.000000
X2	160.000000	10.000000	160.000000
X3	175.000000	5.000000	175.000000
X4	180.000000	INFINITY	5.000000
X5	195.000000	INFINITY	195.000000

ROW	CURRENT RHS	RIGHTHAND SIDE RANGES	
		ALLOWABLE INCREASE	ALLOWABLE DECREASE
2	48.000000	6.000000	48.000000
3	79.000000	INFINITY	6.000000
4	87.000000	31.000000	INFINITY
5	64.000000	6.000000	INFINITY
6	82.000000	INFINITY	6.000000
7	43.000000	6.000000	6.000000
8	52.000000	6.000000	INFINITY
9	15.000000	INFINITY	6.000000

CONTOH 5: DISTRIBUTING GOODS, IOR P.60

Min 2 F1F2 + 4 F1DC + 9 F1W1 + 3 F2DC + DCW2 + 3 W1W2 + 2 W2W1
 st

- F1F2 + F1DC + F1W1 = 50
- F1F2 + F2DC = 40
- F1DC - F2DC + DCW2 = 0
- F1W1 + W1W2 - W2W1 = -30
- DCW2 - W1W2 + W2W1 = -60

F1F2 <= 10
 DCW2 <= 80

End

:go
 LP OPTIMUM FOUND AT STEP 5

OBJECTIVE FUNCTION VALUE

1) 490.000000

VARIABLE	VALUE	REDUCED COST
F1F2	.000000	1.000000
F1DC	40.000000	.000000
F1W1	10.000000	.000000
F2DC	40.000000	.000000
DCW2	80.000000	.000000
W1W2	.000000	5.000000
W2W1	20.000000	.000000

ROW	SLACK OR SURPLUS	DUAL PRICES
2)	.000000	-7.000000
3)	.000000	-6.000000
4)	.000000	-3.000000
5)	.000000	2.000000
6)	.000000	.000000
7)	10.000000	.000000
8)	.000000	2.000000

NO. ITERATIONS= 5

DO RANGE (SENSITIVITY) ANALYSIS?
?y

RANGES IN WHICH THE BASIS IS UNCHANGED

VARIABLE	CURRENT COEF	OBJ COEFFICIENT RANGES	
		ALLOWABLE INCREASE	ALLOWABLE DECREASE
F1F2	2.000000	INFINITY	1.000000
F1DC	4.000000	1.000000	INFINITY
F1W1	9.000000	INFINITY	2.000000
F2DC	3.000000	INFINITY	1.000000
DCW2	1.000000	2.000000	INFINITY
W1W2	3.000000	INFINITY	5.000000
W2W1	2.000000	2.000000	5.000000

ROW	CURRENT RHS	RIGHTHAND SIDE RANGES	
		ALLOWABLE INCREASE	ALLOWABLE DECREASE
2	50.000000	20.000000	.000000
3	40.000000	20.000000	.000000
4	.000000	20.000000	.000000
5	-30.000000	20.000000	.000000
6	-60.000000	INFINITY	.000000
7	10.000000	INFINITY	10.000000
8	80.000000	10.000000	20.000000

CONTOH 6: CANNERY, IOR P.304

**Min 464 X11 + 513 X12 + 654 X13 + 867 X14 +
352 X21 + 416 X22 + 690 X23 + 791 X24 +
995 X31 + 682 X32 + 388 X33 + 685 X34**

st
X11 + X12 + X13 + X14 = 75
X21 + X22 + X23 + X24 = 125
X31 + X32 + X33 + X34 = 100
X11 + X21 + X31 = 80
X12 + X22 + X32 = 65
X13 + X23 + X33 = 70
X14 + X24 + X34 = 85
End

:go
LP OPTIMUM FOUND AT STEP 13

OBJECTIVE FUNCTION VALUE

1) 152535.000

VARIABLE	VALUE	REDUCED COST
X11	.000000	15.000000
X12	20.000000	.000000
X13	.000000	84.000000
X14	55.000000	.000000
X21	80.000000	.000000
X22	45.000000	.000000
X23	.000000	217.000000
X24	.000000	21.000000
X31	.000000	728.000000
X32	.000000	351.000000
X33	70.000000	.000000
X34	30.000000	.000000

ROW	SLACK OR SURPLUS	DUAL PRICES
2)	.000000	-867.000000
3)	.000000	-770.000000
4)	.000000	-685.000000
5)	.000000	418.000000
6)	.000000	354.000000
7)	.000000	297.000000
8)	.000000	.000000

DO RANGE (SENSITIVITY) ANALYSIS?
?y

RANGES IN WHICH THE BASIS IS UNCHANGED

VARIABLE	CURRENT COEF	OBJ COEFFICIENT RANGES	
		ALLOWABLE INCREASE	ALLOWABLE DECREASE
X11	464.000000	INFINITY	15.000000
X12	513.000000	15.000000	21.000000
X13	654.000000	INFINITY	84.000000
X14	867.000000	21.000000	351.000000
X21	352.000000	15.000000	INFINITY
X22	416.000000	21.000000	15.000000
X23	690.000000	INFINITY	217.000000
X24	791.000000	INFINITY	21.000000
X31	995.000000	INFINITY	728.000000
X32	682.000000	INFINITY	351.000000
X33	388.000000	84.000000	INFINITY
X34	685.000000	351.000000	84.000000

ROW	CURRENT RHS	RIGHTHAND SIDE RANGES	
		ALLOWABLE INCREASE	ALLOWABLE DECREASE
2	75.000000	.000000	55.000000
3	125.000000	.000000	45.000000
4	100.000000	.000000	30.000000
5	80.000000	45.000000	.000000
6	65.000000	55.000000	.000000
7	70.000000	30.000000	.000000
8	85.000000	INFINITY	.000000

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