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PLANT TO OBTAIN MAXIMUM BENEFITS FROM PRODUCTION

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Abstract: Simplex method – linear programming issues effective solution for used strong is an algorithm . Simplex schedule using iterative calculations done increased , optimal solution This is found in method resources distribution , production release planning and logistics in the fields wide is used . This in my article confectionery factory from resources effective use and maximum benefit to take issue linear programming and simplex method using analysis as I'm leaving .

Key words: Simplex method , linear programming , optimal plan , goal function , constraint conditions , pivot element , simplex table , production release optimization , resources distribution , maximum profit , mathematics modeling , linear equations , organization efficiency , economic optimization , product working production , confectionery factory , costs reduction , mathematics programming , executable iterations , business planning .

Login

Modern economic under the circumstances enterprise and factories main purpose – limited resources under the circumstances maximum to income is to achieve . release process effective organization to grow and profit optimization today's of the day current from issues is one . Especially , one how many product working removable in factories resources right distribution , production release size designation and the most high economic benefit to take for clear to the calculations rely on important importance profession will reach .

Such issues in solution mathematician modeling methods , in particular , linear programming and his/her effective solution method was simplex method wide is used . Simplex method through at the factory working release possible was products number of them expenses and causing benefit in consideration taken and optimally worked release plan to compose possible will be .

This in the article simplex method based on product working release plan to compose and maximum benefit to take opportunities study in sight Research during working release resources (raw materials , labor) power , time and hk) restrictions under how from products how much working release need is determined .

Literature analysis

The firm's product working in the release maximum benefit to take plan according to literature analysis working release processes optimization , resources effective distribution and profit maximum to the level to deliver according to various methods to determine help gives . L. Kantorovich's " Mathematical programming and economic analysis " (1959) working release optimal plan in processes to compose and resources distribution methods statement G. Dantzig " Linear programming and his/her in the book " Applications " (1963) simplex method and make it real release to the conditions application issues covered . R. Dorfman, P. Samuelson and R.

Solow " Linear programming and economic analysis " (1958) optimal planning , constraints and goal function based on decision acceptance to do discussion IG Bashmakov's "Optimal production " release systems " (2005) modern working release processes to optimize related theoretical and practical approaches showing Also , GN Nemchinov 's " Linear economic models " (1972) book economic in systems linear programming and analysis methods to be used dedicated .

Research methodology

This research firm product working in the release maximum benefit to take plan to compose according to linear programming methods to apply Research methodology empirical and theoretical analysis own inside Research during literature analysis optimal performance through release plan formation according to there is scientific sources is studied . Various mathematician modeling methods , including simplex method , graphic method and dual method using working release processes optimization opportunities analysis Comparative analysis through various economic models compared and their confectionery products working release to the process compatibility is determined . In this working release resources limited , product types benefit level and demand conditions into account is obtained . Experimental analysis and theoretical basically of the optimal plan formulated to practice implementation to be completed to study aimed at to be , to work release size increase and expenses reduce according to recommendations working Qualitative analysis methodological aspects , work release process conditions and the results quality in terms of to evaluate is based on . Research methodology working release plan thorough planning , resources effective distribution and maximum benefit to take for scientific approaches to determine These methods are aimed at using working release process further improvement and economic efficiency increase possible .

Analyses and results

Simplex method general if the borders equations and goal of functions equations canonical to look has if not optimization linear issues solution for is used . In this case equations system 's appearance as follows .

$$
\left(\begin{array}{l}
a_{11}\ x_1 + a_{12}\ x_2 + ... + a_{1n}\ x_n = b_1 \\
a_{21}\ x_1 + a_{22}\ x_2 + ... + a_{2n}\ x_n = b_2 \\
a_{m1}\ x_1 + a_{m2}\ x_2 + ... + a_{mn}\ x_n = b_m \\
c_1\ x_1 + c_2\ x_2 + ... + c_n\ x_n - z = 0
\end{array}\right. \qquad 1)
$$

Simplex (method) in 2 steps is divided .

Stage 1 - Delimiter equations and goal functions canonical to look to bring

Stage 2 - Stage 1 as a result using simplex algorithm harvest entered goal function optimization .

Step 1 we build .

Artificial in stage 1 changes input way with , such as variables all to equations are entered , equations to the system canonical appearance is given . Basis in character variables was equations in the system and goal in functions uncommon variables and has a coefficient of 1 was coefficients , from this exception . From this outside all to the system artificial of variables from the sum consists of was additional equations is entered .

Then system of equations following to look has will be .

$$
\begin{array}{l}
a_{11}\ x_1 + a_{12}\ x_2 + ... + a_{1n}\ x_n + x_{n+1} = b_1 \\
a_{21}\ x_1 + a_{22}\ x_2 + ... + a_{2n}\ x_n + x_{n+2} = b_2 \\
a_{m1}\ x_1 + a_{m2}\ x_2 + ... + a_{mn}\ x_n + x_{n+m} = b_m \\
c_1\ x_1 + c_2\ x_2 + ... + c_n\ x_n - z = 0 \\
x_{n+1} + x_{n+2} + ... + x_{n++m} - W = 0
\end{array}
$$

this on the ground :
xn $_{+1}$, xn_{+2}, ... , x_{n+m} - artificial variables ;
$W = x_{n+1} + x_{n+2} + \ldots + x_{n+m}$ - their collection
All sizes non-negative to be need .
This for necessary in the case on the left side of the equation of variables gestures change must be . x_{n+1}, x_{n+2}, ... , x_{n+m} variables last entered into the equation (W) for harvest was system solution canonical to look has not . They disappearance for - last to the equation the first m equation will be added and the sum last from the equation is subtracted . In this following equations system harvest It is .

$$a_{11}x_1 + a_{12}x_2 + \ldots + a_{1n}x_n + x_{n+1} = b_1$$
$$a_{21}x_1 + a_{22}x_2 + \ldots + a_{2n}x_n + x_{n+2} = b_2$$
$$a_{m1}x_1 + a_{m2}x_2 + \ldots + a_{mn}x_n + x_{n+m} = b_m$$
$$c_1x_1 + c_2x_2 + \ldots + c_nx_n - z = 0$$
$$-\sum_{i=1}^{m} a_{i1}x_1 + -\sum_{i=1}^{m} a_{i2}x_2 + \ldots + -\sum_{i=1}^{m} a_{mn}x_n - W = -\sum_{i=1}^{m} b_i$$

$d_i = \sum_{i=1}^{m} a_{ij}$ and $W_0 = \sum_{i=1}^{m} b_i$ designation we enter .

In that case Simplex Step 1 of the method beginning for last equations system :

$$a_{11}x_1 + a_{12}x_2 + \ldots + a_{1n}x_n + x_{n+1} = b_1$$
$$a_{21}x_1 + a_{22}x_2 + \ldots + a_{2n}x_n + x_{n+2} = b_2$$
$$a_{m1}x_1 + a_{m2}x_2 + \ldots + a_{mn}x_n + x_{n+m} = b_m$$
$$c_1x_1 + c_2x_2 + \ldots + c_nx_n - z = 0$$

$d_1x_1 + d_2x_2 + \ldots + d_nx_n - W = -W_0$

Simple of the method first in the phase usual simplex algorithm to z using suitable W function This minimization is need as follows :
1) d_j *-2* values is found if all sizes negative If , then W minimize possible not , if W>0 , the path placed solution possibility no .
If the sizes some $d_j<0$ if so , of the unknown $d_s = \min(d_j) d_s < 0$ condition according to to the base incoming S - index is selected .
2) Then from the base $b_r / a_{rs} = \min(b_i / a_{is}) a_{is} > 0$ condition according to from the base of the unknown IV to be released index is found .
3) 2nd system all equations is changed . In this d_j and W_0 those of change additional functions service except for : r all columns for $d_j = d_j - d_s a_{rj} / a_{rs}$, r column for $d_r^* = -d_s / a_{rs}$ $W_0 = W_0 + ds\, b_r / a_{rs}$
Then 13 points all sizes non-negative unless until repeated .
4) W is defined , if W=0 , then it is clear that all artificial variables 0 g a equals . Then equations (2) from the system last equation and all artificial variables lost (2) system again is written . Harvest made system canonical to look has If W<0 , the solution is no .
Stage 2 obtained in Stage 1 system 's algorithm using from optimization consists of .

Issue: Factory product working in the release maximum benefit to take plan

One factory 4 types product making cookies (x_1), pasta (x_2), lag'mon ( ) x_3)and bread (x_4) This products working release 4 types for resource flour (R1), sugar (R2), salt (R3) and eggs (R4) are required . Each product for expendable resource amount table in the form of given . The factory purpose – products working from issuing removable general profit maximum to do

Given information :

Resource	x_1	x_2	x_3	x_4
R1	*2*	*3*	*4*	*1*
R2	*1*	*2*	*1*	*3*
R3	*3*	*2*	*5*	*4*
R4	*2*	*1*	*3*	*2*

Resources total there is quantity :

- *R1*: 100 units
- *R2*: 80 units
- *R3*: 90 units
- *R4*: 70 units

The matter formation :

$$Z_{\max} = 5x_1 + 7x_2 + 6x_3 + 4x_4$$

Limitations :

$2x_1 + 3x_2 + 4x_3 + 1x_4 \leq 100$

$$1x_1 + 2x_2 + 1x_3 + 3x_4 \leq 80$$

$$3x_1 + 2x_2 + 5x_3 + 4x_4 \leq 90$$

$$2x_1 + 1x_2 + 3x_3 + 2x_4 \leq 70$$

Elementary simplex table to compose we will get

B/j	x_1	x_2	x_3	x_4	
x_5	2	3	4	1	100
x_6	1	2	1	3	80
x_7	3	2	5	4	90
x_8	2	1	3	2	70
Z	-5	-7	-6	-4	0

↑

Support column choice for Z row of elements module according to the most the eldest is taken . Our in the matter this is equal to (-7) .

Support line choice for free numbers support column to the elements we will be and the most the youngest we will get .

Min(100/3.80/2.90/2.70/1)=100/3

So we have base element is equal to 3 (column 1, row 2)

Now simplex table We will make it . for solution the element that makes the difference and lines place is replaced by . Solvent line elements solution doer to the element is divided . The determinant column elements solution doer to the (-) sign of the element is divided .

S/j	x_1	x_5	x_3	x_4	
x_2	2/3	1/3	4/3	1/3	100/3
x_6	-1/3	-2/3	-5/3	7/3	40/3
x_7	5/3	-2/3	7/3	10/3	70/3
x_8	4/3	-1/3	5/3	5/3	110/3
Z	-1/3	7/3	10/3	-5/3	700/3

Every one in step right being worked on checking It should be put .

We have the result X=(0, 100/3, 0, 0, 0, 40/3, 70/3, 110/3). We put this result into Z and we have $Z_{\max}$ =700/3. We are calculating correctly.

we select the base row and column as above .

Min(100, 40/7, 7, 22)=40/7

We have the base element is equal to 7/3 (column 4, row 2)

Now again solution doer column and line elements instead by replacing new simplex table to compose we will get .

s/n	x_1	x_5	x_3	x_6	
x_2	5/7	3/7	11/7	-1/7	220/7
x_4	-1/7	-2/7	-5/7	3/7	40/7
x_7	15/7	2/7	33/7	-10/7	30/7
x_8	11/7	1/7	20/7	-5/7	190/7
Z	-4/7	39/21	15/7	5/7	1700/7

We have The result is X =(0, 220/7, 0, 40/7, 0, 0, 30/7, 190/7) .

$Z_{\max}$ and according to the calculation book it is equal to 1700/7.

The only negative element in the Z row is (-4/7) for this the column support We choose as the column .

Min(44,-40,2,190/11)=2

Next the base element is equal to 15/7 (column 1 row 3)

Again above such as support line and the column by replacing new simplex table to compose we will get .

s/n	x_7	x_5	x_3	x_6	
x_2	-1/3	1/3	0	1/3	30
x_4	1/15	-4/15	-2/5	1/3	6
x_1	7/15	2/15	33/15	-2/3	2
x_8	-11/15	-1/15	-3/5	1/3	24
Z	4/15	203/105	51/15	1/3	244

In line Z negative elements There is no more . So the optimal solution arrived We are here .

$x_1=2$ $x_2=30$ $x_3=0$ $x_4=6$

$Z_{\max}=244$

Conclusion: So it can be seen that we should have a production volume of 2 kg of cookies, 30 kg of pasta, 0 kg of lagmanish, and 6 kg of bread. Then we can get maximum profit from the production of the product.

Answer: the maximum profit is 244.

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