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Housing Development Optimizition (Case Study: Anugerah Dian Regency In Kabupaten Banjar)

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ABSTRACT: *The rapid increasingpopulation density of the Banjarmasin city and its surrounding has resulted in higher demandof housing needs. As one of the developers, Anugerah Dian Regency Phase II, which is located on Jalan A. Yani Km. 13.600 offers 200 residences.There are several types of houseoptions such as type 49/80, 79/133, 169/126 and 198/144.The purpose of this optimization is to find out whether the Anugrah Dian Regency housing development is optimal according to market damand.Simplex method assisted with QM program for Windows with Integer Programming is the method that is used in this study.*

The results of this optimization for each types of houseare as follows:69 units of type 49/80, 62 units of type 79/133, 62 units of 169/126 and 38 units of type 198/144.Based on the infrastructure condition, this location is feasible for housing.Meanwhile, the condition of the land which has marshland characteristics type of land, thus constractionit must be done withsurveying, the foundation uses ironwood (ulingalam) beams and cast afterwards.From an accessibility locationpoint of view, AnugrahDian Regency is very feasible because of the easy access within average time 20 minutes only to office buildings, educational facilities, shopping centers, goverment center, culinary spots and Syamsudin Noor Airport. As a result, the position of Anugerah Dian Regency in such exceptionally suitable location for housing development.
KEYWORDS:*Optimization, Anugerah Dian Regency, Evaluation*

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I. PRELIMINARY

One of the housing developers in the city of Banjarmasin, Anugerah Dian Regency Banjar provides several types of house options such as type 49, 79, 169 and 198. This Anugerah Dian Regency Housing is a strategically positioned residence, because it is located in the city border between Banjarmasin and Banjarbaru.Easy access to the city highwayJalan A. Yani Km. 13.600Banjarand only 10 minutes away from Syamsudin Noor Airport.Anugerah Dian Regency housing has excess land area for the future development ofAnugerah Dian Regency phase 2. However, it is known that there are still land that has not been built by the developer due to the decline in public interest for non-subsidized housing.The developer needs to plan carefully for the utilization of the remining land to reach optimal sales.

Previous research is based on study by HardinataWanaAgung (2011) regarding The Evaluation of Housing Construction of Grand Renon Prime Residence.It's located in Denpasar Bali with three types of housing, namely the Grand Primavera 300m^2 building area, Grand Premiere 260m^2 building area and Grand Primo245m^2 building area. As the results of this research are as follows: 17 units of Grand Primavera houses, 36 units of Grand Premiere houses and 13 units of Grand Primo houses.

There is also a research based on study by Astiah Amir (2016) a Study of Profit Optimization Investment Feasibility Proportional to The Number of House Types. It's located in Ranto West Panyang, Meureubo District, in Kabupaten West Aceh with price point for each types of house as follows: Rp. 240,000,000 for type 80, Rp. 195,000,000 for type 64and Rp. 135,000,000 for type 45. The purpose of this research is to determine the investment feasibility of the project and to optimize the amount of types of

housethat will be built to reach maximum profit. The results of optimization concluded by this research are as follows: 31 units of type 80, 29 units of type 64 and 13 units of type 45.

From both of those studies there are several differences such as the study locations, land characteristics, market demand and budget.Also the following difference that is being studied happen to be the type of the house.From thosestarting point mindset, this study aims to examine further issues related to the housing optimization in KabupatenBanjar (Anugerah Dian Regency housing as the object of the research) where it has soft land as the characteristics of the land.Moreover, the wide range variance of housing types from small to large types of house are offered by Anugerah Dian Regency housing developer.Thus,the research will focused on the overall financial feasibility of the housing project based on the estimation of optimized result that will be obtained.Therefore, this study objective is to estimate the optimal amountof types of houseproblem for the future development of PT Anugerah Dian Regency housing phase II.

II. RESEARCH METHODS

The data required is primary data and secondary data, obtained from Anugerah Dian Regency as the developer and other related parties.

This optimization analysis using the simplex method assisted with QM program for Windows software with Integer Programming steps as follows:

1. Analysis with the Simplex Method

The purpose of this analysis is to optimize the types of house that will be built by Anugerah Dian Regency housing to maximize company profits.

The analysis steps are as follows:

a. Determine the decision variable

X_A= the amount of houses will bebuilt for type 49/80 (A)
X_B= the amount of houses will be built for type73/133 (B)
X_C= the amount of houses will be built for type169/126 (C)
X_D = the amount of houseswill be built for type 198/144 (D)

b. Determine the objective function

Maximize $Z = P_A.X_A + P_B.X_B + P_C.X_C + P_D.X_D$
P = Profit

c. Determine the limitation

a) Limitation to the land area used for houses that will be built.

The land area needed to build for each house consists of four types, namely type A, type B, type C and type D. The land area for houses to offer (LT) is ...M² of ...M² total land area. So then, the first limition function we get is:

$LT_A.X_A + LT_B.X_B + LT_C.X_C + LT_D.X_D \leq \ldots$. M²

b) Through the comparison of buyer interests to each of every types of house.

$Type_A$:$Type_B$: $Type_C$: $Type_D$ = X_A : X_B : X_C : X_D = Interest of type A : Interest of type B : Interest of type C : Interest of type D.

So, the second limitation function is Interest of type B. $X_A \leq$ Interest of type A.X_B
The third limitation function is Interest of type C.$X_B \leq$ Interest of type B.$X_C$and
The fourth limitation function is Interest of type D.$X_C \leq$ Interest of type C.X_D

c) From the information given by the developer, they want to build by the maximum amount of 200 houses only. So, the fifth limitation function we get is:

$X_A + X_B + X_C + X_D = 200$

d) And also other information that given by the developer, they want at least 10 units for each types of house must be built. So, the sixth and following limitation functions we get are:

Sixth limitation function : $X_A \geq 10$
Seventh limitation function : $X_B \geq 10$
Eighth limitation function : $X_C \geq 10$
Ninth limitation function : $X_D \geq 10$

e) The last information that given by the developer, they want the budget at the uttermost cost of Rp. 220,000,000,000 for all housing development production. So, the tenth limitation function we get is:

Cost production of type A X_A + Cost production of type B X_B + Cost production of type C X_C + Cost production of type D $X_D \leq$ 220,000,000,000,-

III. DATA ANALYSIS AND DISCUSSION

Optimization Evaluation

The four of decisions variable in this study indicate the types of house that will be built in Anugerah Dian Regency housing are as follows:
X_A = the amount of houses will be built for type 49/80 (A)
X_B = the amount of houses will be built for type 79/133 (B)
X_C = the amount of houses will be built for type 169/126 (C)
X_D = the amount of houses will be built for type 198/144 (D)
The maximum amount of profits aim to reach are as follows:
a. Rp. 166,205,000.- for type A
b. Rp. 633,635,000.- for type B
c. Rp. 860,485,000.- for type C
d. Rp. 901,870,000.- for type D
For the further calculations, the maximum profit for each types of house are rounded up (in millions of Rupiah) :
a. Type A = Rp. 166,205,000.-≈ 16.6 (in millions of Rupiah).
b. Type B = Rp. 633,635,000.- ≈ 63.4 (in millions of Rupiah).
c. Type C = Rp. 860,485,000.- ≈ 86.1 (in millions of Rupiah).
d. Type D = Rp. 901,870,000.- ≈ 90.2 (in millions of Rupiah)
The objective function is$Z = 16.6\ X_A + 63.6\ X_B + 86.1\ X_C + 90.2\ X_D$

Limitation Function
The limitation functions that have been determined are as follows:
a. Land area viewpoint
a. The land area determined for the development of houses to offer for saleis 4,5250 hectares. For the development of public facilities and social facilities are estimated to be 20% of total land area and for infrastructure estimated to be 10% of the total land area. In conclution, the total of land area used for developing new housing is 31675 square meters.
b. Consists of four types of house that will be built on each of certain land area, namely type A, type B, type C and type D, with following land area of 80 m²,133 m², 126 m² dan 144 m².The first limitation function is:
$80\ X_A + 133\ X_B + 126\ X_C + 144X_D \leq 31675$
b. Comparison of buyer interests to each of every types of house.
Based on the results of a market survey conducted to 30 potential buyers who are interested in buying a house in Anugerah Dian Regency, the comparison obtained for each type of house are as follows:
a. 49/80 type of house for 13units (A)
b. 79/133 type of house for 8 units (B)
c. 169/126 type of house for 5 units (C)
d. 198/144 type of house for 4 units (D)
Then, we get the equation for the comparison of interested potential buyers to the four types of house as below:
$Type_A : Type_B : Type_C : Type_D = X_A : X_B : X_C : X_D = 13 : 8 : 5 : 4$
By equally dividing the equation in order to simplify, we obtain new simplified equation as below:
$X_A : X_B : X_C : X_D = 3.25 : 2 : 1.25 : 1$
The second, third and fourth limitation functons we get are as follows:
$2X_A \leq 3.25X_B$
$1.25X_B \leq 2X_C$
$X_C \leq 1.25\ X_D$
c. From the information given by the developer, they want to build by the maximum amount of 200 houses only. So, the fifth limitation function we get is:
$X_A + X_B + X_C + X_D = 200$
d. And also other information that given by the developer, they want at least 10 units for each types of house must be built. So, the sixth, seventh, eighth and ninth limitation functions we get are:
$X_A \geq 10$
$X_B \geq 10$
$X_C \geq 10$
$X_D \geq 10$
e. The last information that given by the developer, they want the budget at the uttermost cost of Rp. 220,000,000,000 for all housing development production. So, the tenth limitation function we get is:
Type A cost production is Rp 562,795,000.00
Type B cost production is Rp 966,365,000.00
Type C cost production is Rp 1,639,515,000.00

Type D cost production is Rp 1,898,130,000.00
Cost production for each types of house are rounded up (in millions of Rupiah) :
a. TipeA = Rp562,795,000.00.- ≈ 56.3
b. TipeB = Rp 966,365,000.00.- ≈ 96.6
c. TipeC = Rp1,639,515,000.00.-≈ 164
d. TipeD = Rp. 1,898,130,000.00.- ≈ 189.8
So the limitation function we get is :
$56.3\ X_A + 96.4\ X_B + 164\ X_C + 189.8\ X_D \leq 22000$

Calculation with the QM Program for Windows version 2.0
The problem of optimization using QM program for Windows version 2.0 assisted with Integer Programming is formulated as below:
MaximizeZ = $16.6\ X_A + 63.4\ X_B + 86.1\ X_C + 90.2\ X_D$becomes $Z - 16.6\ X_A - 63.6\ X_B - 86.1\ X_C - 90.2\ X_D = 0$.
Limited by :
1. $80\ X_A + 133\ X_B + 126\ X_C + 144X_D \leq 45250$
Becomes $80\ X_A + 133\ X_B + 126\ X_C + 144X_D + S1 = 45250$
2. $2X_A \leq 3{,}25X_B$
So, $2X_A - 3.25X_B \leq 0$ becomes $2X_A - 3.25X_B + S2 = 0$
3. $1.25X_B \leq 2X_C$
So, $1.25X_B - 2X_C \leq 0$ becomes $1.25X_B - 2X_C + S3 = 0$
4. $X_C \leq 1.25\ X_D$
So, $X_C - 1.25\ X_D \leq 0$ becomes $X_C - 1.25\ X_D + S4 = 0$
5. $X_A + X_B + X_C + X_D = 200$
6. $X_A \geq 10$
7. $X_B \geq 10$
8. $X_C \geq 10$
9. $X_D \geq 10$
10. $56.3\ X_A + 96.6\ X_B + 164\ X_C + 189.8\ X_D \leq 22000$
Given X :
X_A= 49/80 type of house (A)
X_B= 79/133 type of house (B)
X_C= 169/126 type of house (C)
X_D= 198/144 type of house (D)

The results shown by the calculations with QM software using Integer Programig are as follows: 69 units of type 49/80, 62 units of type 79/133, 38 units of type 169/126 and 31 units of type 198/144. The maximum profit that can be obtained Rp. 111,450,000,000 with 2.3018 ha land area used for building new houses.

Technical Aspects Evaluation
The technical evaluation is done by describing the factors are as follows:
1. Public Infrastructure Condition
   One of the factors implemented byAnugerah Dian Regency that the infrasturcture condition is very accomodatingbecause of the 14 meters wide and smooth track trough the location with excellent drainage and sanitation tunnels.Essential facilities like PDAM clean water and PLN electricity are provided for tenants to be used. In conclusion, the location of Anugerah Dian Regency housing is feasible for housing.
2. Land Condition
   In the housing development planning process, the state of the land is an important factor. Each and every location area has specific and different land condition. The land condition of the Anugerah Dian Regency development locationarea has marshland characteristics type of land.Thus, constraction it must be done with surveying, the foundation uses ironwood (ulingalam) beams and cast afterwards.
3. Accessibility
   Another main factor in selecting housing is the easily accessible housing location to the downtown area such as shopping centers, educational facilities, and the government center also office buildings.The location area of Anugerah Dian Regency has a very convenient access with average time around 20 minutes needed to the offices, shopping centers, government center, educational facilities, culinary spots and Syamsudin Noor Airport. In conclusion, the location of Anugerah Dian Regency housing is exceptionally suitable for housing development.

IV. CONCLUSIONS AND SUGGESTIONS

The conclusions of this study are as follows:

1. Optimization Results
   To reach maximum profit and optimal composition, the developer of Anugerah Dian Regency housing phase II is required to build 69 units of type 49/80, 62 units of type 79/133, 38 units of type 169/126 and 31 units of type 198/144.
2. Technical Aspects Evaluation
   Based on the infrastructure condition, this location is feasible for housing. Meanwhile, the condition of the land which has marshland characteristics type of land, thus constraction it must be done with surveying, the foundation uses ironwood (ulingalam) beams and cast afterwards. From an accessibility location point of view, the location area of Anugerah Dian Regency has a very convenient access with average time around 20 minutes needed to the offices, shopping centers, government center, educational facilities, culinary spots and Syamsudin Noor Airport. As a result, the position of Anugerah Dian Regency in such exceptionally suitable location for housing development.

Suggestions

A suggestion or input that can be taken into consideration is that developer can do a following study related to future potential challenge.Further research can be done by implementing the type of house by considering a good sensitivity analysis to differences in the number of types of house sold, market price fluctuations and related costs.

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